RECORD OF DECISION FOR SITE 25/26 SOIL

PICATINNY NEW JERSEY

FINAL, REVISION 1

JANUARY 2007

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

1,2,3,7,8-PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
AEDB-R	Army Environmental Database - Restoration
AOC	Area of Concern
AR	Army Regulation
ARAR	Applicable or Relevant and Appropriate Requirement
Army	United States Department of the Army
bgs	below ground surface
CDD	chlorinated dibenzo-p-dioxin
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
COPEC	Contaminant of Potential Ecological Concern
DDT	dichlorodiphenyltrichloroethane
DSERTS	Defense Site Environmental Restoration Tracking System
ERA	Ecological Risk Assessment
FS	Feasibility Study
ft	feet
GPB	Green Pond Brook
GRA	General Response Action
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ICFKE	ICF Kaiser Engineers
ICM	Industrial Corrosion Management
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
K_{oc}	carbon/water partition coefficient
K_{ow}	octanol/water partition coefficient
LOC	Level of Concern
LUC	Land Use Control
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
NCEA	National Center for Environmental Assessment
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
NRDCSCC	Non-Residential Direct Contact Soil Cleanup Criteria
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RMP	Risk Management Plan
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCL	Site Cleanup Level
SDGI	Soil Data Gap Investigation
USAEHA	United States Army Environmental Hygiene Agency
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance

1.0 PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

Picatinny Arsenal is formally designated as U.S. Department of the Army (Army), Installation Management Agency, Northeast Regional Garrison Office. It is located in North Central New Jersey (NJ) in Morris County near the city of Dover. The facility was included on the National Priorities List (NPL) in March of 1990 and assigned a Comprehensive Environmental Response, Compensation and Liability Identification System (CERCLIS) number of NJ3210020704.

This Record of Decision (ROD) specifically addresses soil contamination at Site 25 (Sanitary Landfill) and Site 26 (Dredge Pile) located within Area C of Picatinny Arsenal. The Army maintains a comprehensive database of sites that are being addressed within its Installation Restoration Program (IRP) called Army Environmental Data Base-Restoration (AEDB-R). Sites 25 and 26 are designated in the AEDB-R together as Defense Site Environmental Restoration Tracking System (DSERTS) PICA-067. The remaining areas in Picatinny Arsenal are being addressed as separate actions.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the selected remedy for Site 25/26 soil located at Picatinny Arsenal in Rockaway Township, NJ. The remedial action is selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the greatest extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The information supporting the decisions on the selected remedial action is contained in the administrative record file for the site. These decisions have been made by the Army and the U.S. Environmental Protection Agency (USEPA). Comments received from the NJ Department of Environmental Protection (NJDEP) were evaluated and considered in selecting the final remedy. NJDEP concurs with the selected remedy.

Estimated excess human health risk at this site for current and reasonable anticipated future land use is greater than one in one million ($1x10^{-6}$) but less than one in ten thousand ($1x10^{-4}$). This is within USEPA's target range for managing risks as part of a Superfund Cleanup, but greater than NJDEP standards for excess risk in discrete areas of concern (AOCs). EPA uses the general $1x10^{-4}$ to $1x10^{-6}$ risk range as a "target range" within which the Agency strives to manage risks as part of a Superfund Cleanup. Generally, a response action is implemented following NCP guidance when site-specific excess carcinogenic risk to human health exceeds one in ten thousand ($1x10^{-4}$). However, pursuant to the agreement with NJDEP as outlined in memorandum by MG Van Antwerp, 14 Jun 1999, the Army will evaluate and select remedial actions on a case by case basis at Picatinny Arsenal that are protective to the $1x10^{-6}$ level. NJDEP provided their concurrence to this agreement in a letter to BG Geis, 02 Sep 1999. This agreement is specific to Picatinny Arsenal.

1.3 ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The remediation of Site 25/26 is part of a comprehensive environmental investigation and remediation program currently being performed at Picatinny Arsenal. The remaining areas in Picatinny Arsenal, including groundwater at Site 25/26, are being considered separately and remedies for these areas are presented in separate documents.

The Feasibility Study (FS) identified polycyclic aromatic hydrocarbons (PAHs), including benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene, as the contaminants of concern (COCs) targeted for remediation in Site 25/26 soil. The extent of soil contamination at Site 25/26 that exceeds the Site Cleanup Levels (SCLs) covers an area of approximately 13,000 square feet (ft) with a depth of 2 ft, or a volume of 939 cubic yards. The remedial alternative selected to protect human health and the environment for Site 25/26 consists of the following components:

- Design and Permitting;
- Unexploded Ordnance (UXO) Screening Survey;
- Construction of Soil Cover and Revegetation;
- Long-Term Operation and Maintenance (O&M);
- Implementation of land use controls (LUCs) to ensure protectiveness that include land use and access restrictions, public education, and emergency provisions; and,
- Performance of five-year reviews in accordance with CERCLA and the NCP.

LUCs will be continued and five-year reviews will be performed for Site 25/26 until contaminant levels are shown to allow unrestricted use and exposure.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State laws and regulations that are applicable or relevant and appropriate to the remedial action, and is cost effective.

The statutory preference for treatment of Site 25/26 soil is not applicable due to the fact that no source materials constituting principal threats need to be addressed as part of this action. The characteristics of PAHs and their fate and transport in the environment are discussed in Section 2.5 of this ROD. As stated herein, PAHs are relatively immobile and readily contained. Additionally, results of the risk assessment indicate no significant risks to human or ecological receptors. Therefore, the contaminants at Site 25/26 do not constitute principal threat waste, and as such, the statutory preference for treatment is not applicable for Site 25/26 soil. However, the selected remedy would significantly reduce the mobility of contaminants because the vegetated soil cover would help contain the underlying contamination.

Because this remedy will result in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, five-year reviews will be conducted in compliance with CERCLA and NCP to ensure that the remedy is and will be protective of human health and the environment.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Section 2.0) of this ROD. Additional information can be found in the Administrative Record for this site.

Criterion	Section	Page Number
Current and Reasonably Anticipated Future Land Use Assumptions Used in Baseline Risk Assessment and ROD	2.6	2-12
Chemicals of Concern and Their Respective Concentrations	2.7.1.1	2-12
Cleanup Levels Established for Chemicals of Concern and the Basis for These Levels	2.7.1.2	2-14
Baseline Risk Represented by the Chemicals of Concern	2.7.1.5.1	2-16
How Source Materials Constituting Principal Threats will be Addressed	2.11	2-30
Key Factors Leading to Selection of Remedy	2.12.1	2-30
Selected Remedy: Description, Estimated Capital, Annual O&M and Total Present Worth Costs, Discount Rate, and the Number of Years Over Which the Remedy Cost Estimates are Projected	2.12.2 (Description) 2.12.3 (Cost)	2-30 2-33

1.7 AUTHORIZING SIGNATURE

Kerry T. Skelton
Lieutenant Colonel, U.S. Army
Garrison Commander

26 Jan 2007
Date

George Pavlou, Director
Emergency and Remedial Response Division
United States Environmental Protection Agency, Region 2

7/3/07
Date

2.0 PART 2: DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Picatinny Arsenal, located in Rockaway Township, NJ, is listed on USEPA's Superfund NPL. The CERCLIS identification number is NJ3210020704. The Army is the lead agency for the remedial actions at Site 25/26 and USEPA Region 2 is the support agency with oversight responsibilities. Plans and activities are also being coordinated with the appropriate NJ State agencies, including the NJDEP. The funding for this action will be provided from the Environmental Restoration, Army account.

Picatinny Arsenal is located approximately four miles north of the City of Dover in Rockaway Township, Morris County, NJ. The location of Picatinny Arsenal is presented on **Figure 1**. Some of the nearby populous areas are Morristown, Morris Plains, Parsippany, Troy Hills, Randolph Township, and Sparta Township. The Picatinny Arsenal land area consists of 6,491 acres of improved and unimproved land. Picatinny Arsenal is situated in an elongated classic U-shaped glacial valley, trending northeast-southwest between Green Pond Mountain and Copperas Mountain on the northwest and an unnamed hill on the southeast. Most of the buildings and other facilities at Picatinny Arsenal are located on the narrow valley floor or on the slopes along the southeast side.

This ROD describes the Preferred Remedy designed to reduce potential human health and environmental risks associated with elevated concentrations of PAHs that are present in soil at Site 25/26. Groundwater and surface water contamination in Area C, which includes Site 25/26, is currently addressed under separate CERCLA actions. Additionally, UXO will be addressed by Military Munitions Response Program (MMRP) under a separate ROD.

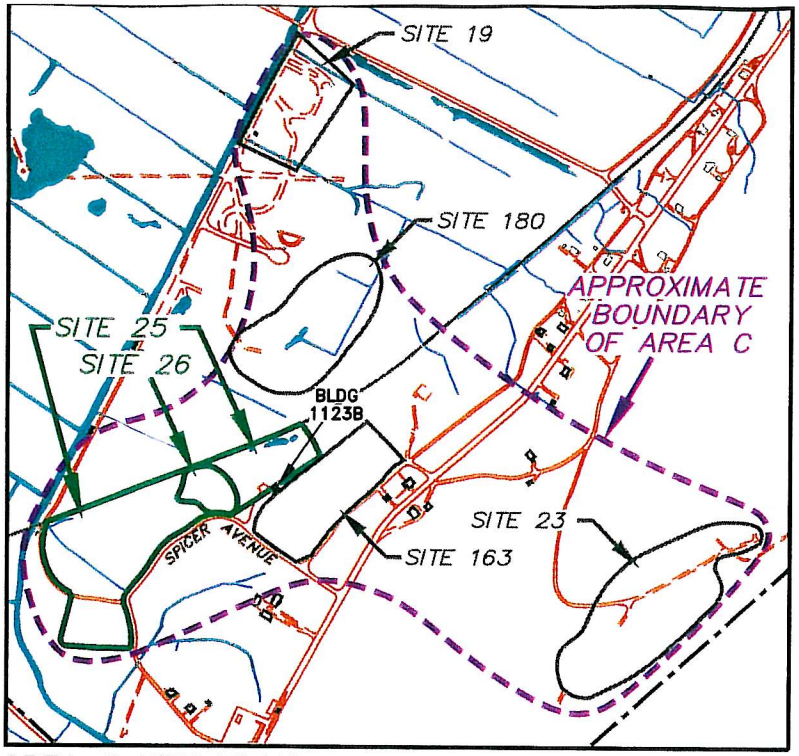
Site 25/26, and Sites 163, 180, and 34 are located within the boundary of Area C. Site 163 (Baseball Fields) borders Site 25 to the east. Site 163 has been addressed in the Proposed Plan and ROD for institutional controls at 13 Sites. Site 180 (Waste Burial Area Near Sites 19 and 34) is located in the undeveloped portion of Area C, north of Site 25/26. Site 34 (Lower Burning Ground) is located in Area A, between Site 180 and Green Pond Brook (GPB). Sites 163, 180, and 34 are addressed under separate actions. This ROD only addresses Site 25/26 soil.

Site 25 (Sanitary Landfill) is located within the central valley of Picatinny Arsenal near the southern boundary. The northeastern section of the site is next to a parking lot used for the softball fields. A large and dense thicket covers the section of the site next to the parking lot. Behind the thicket are shrubs and overgrown grasses. At its closest point (the northwest corner), Site 25 is approximately 50 ft east of GPB. The eight-acre site consists of level grasslands, mounds, and low-lying wet areas.

An abandoned railroad track forms the northern boundary of the site. The eastern and southern boundaries of the site consist of Site 163 (Baseball Fields) and Spicer Avenue, respectively. South Brook Road and the Southern Borrow Area, near the intersection of South Brook Road and Spicer Avenue, lies near the southwestern boundary of Site 25.

Site 26 (The Dredge Pile) consists of an irregularly shaped pile of sediments (approximately 12,000 cubic yards of sediments) dredged from portions of GPB. The dredge pile consists of one pile of dredge spoils deposited after a dredging operation in GPB. The sediments were placed directly on the ground. There is no liner beneath the sediments and no engineered cap was placed over the sediments. Currently the dredge pile is covered with grasses, woody shrubs, and trees. The 2,000 square foot site lies approximately in the center of Site 25. The height of the Dredge Pile varies, but ranges from 15 to 20 ft above ground surface. The Army has agreed with the regulatory agencies to combine Site 25 and Site 26 because Site 26 is located within the physical boundary of Site 25. Site 25/26 is designated in the DSERTS database as PICA-067.

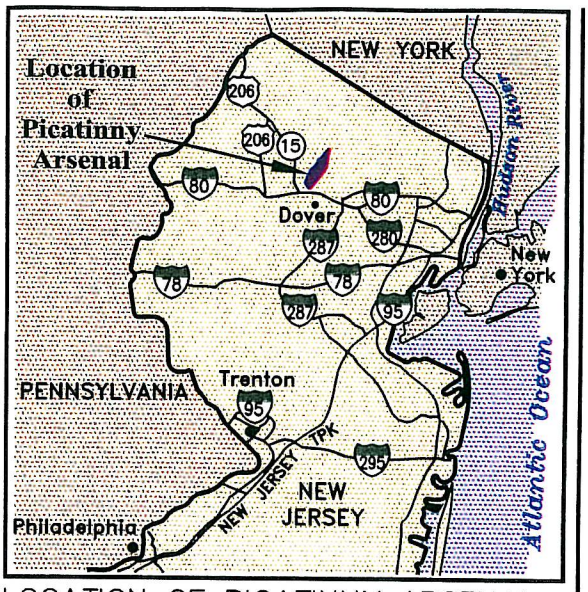
The remedial actions presented in this ROD were selected by the Army, in partnership with USEPA Region 2 in accordance with CERCLA, as amended by the SARA, and to the greatest extent possible, the NCP. NJDEP concurs with the selected remedies. The remedial action is funded by the Army and was selected in accordance with Army Regulation (AR) 200-1, Environmental Protection and Enhancement, as applicable.



AREA C SITE PLAN

0 1000

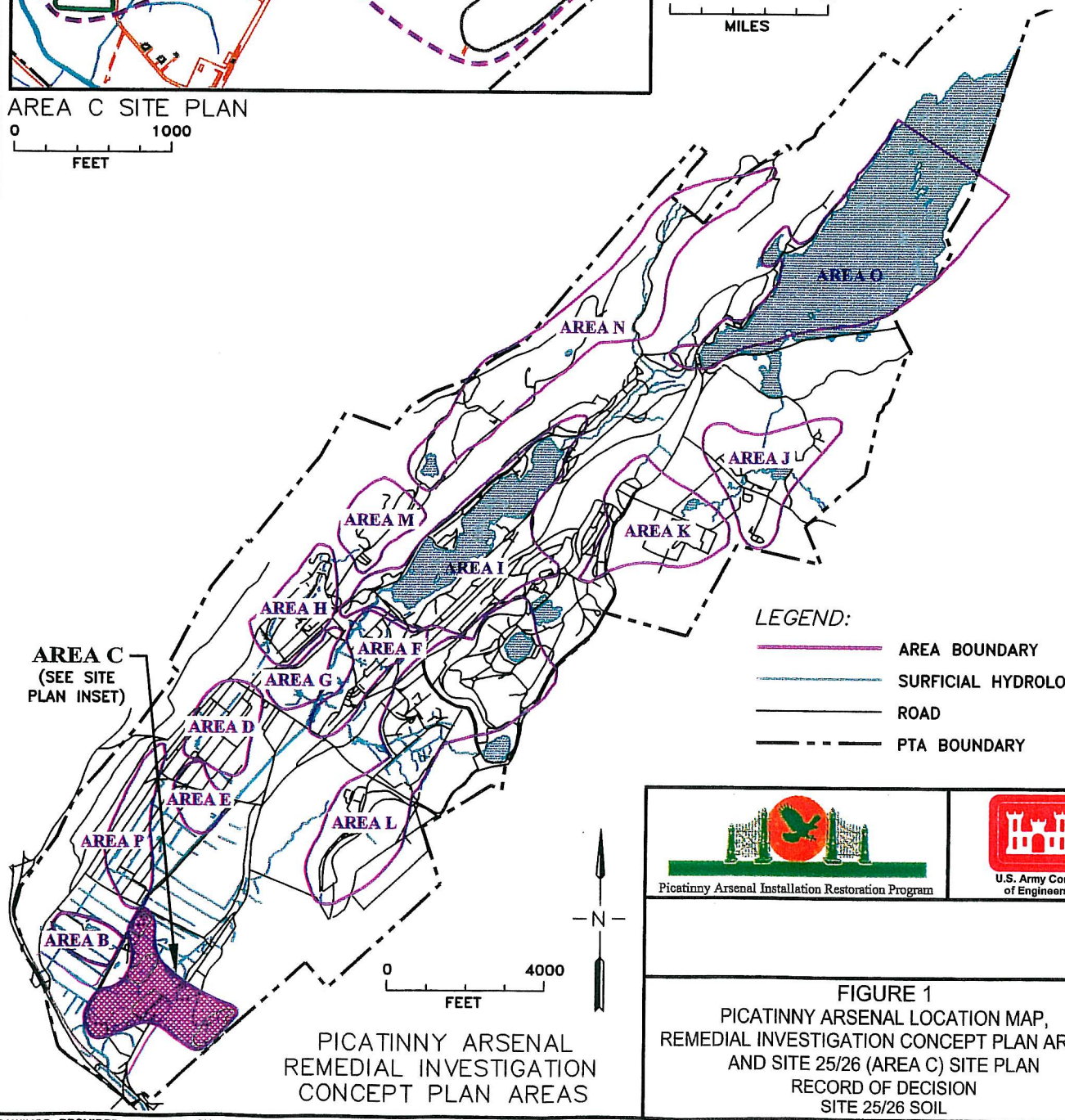
FEET



LOCATION OF PICATINNY ARSENAL

0 50

MILES



PICATINNY ARSENAL
REMEDIAL INVESTIGATION
CONCEPT PLAN AREAS

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 1

PICATINNY ARSENAL LOCATION MAP, REMEDIAL INVESTIGATION CONCEPT PLAN AREAS, AND SITE 25/26 (AREA C) SITE PLAN

RECORD OF DECISION

SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
RLS	TEC	TL	LOCMAP.dwg

File: G:\Prjcts\Pica...\DRAWINGS\PICA 067\Drawings from ROD\LOCMAP_revised.dwg
Plot Date/Time: Jan ..., 2007 - 1:18pm
Plotted By: rsagana

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Operational History

A wide variety of wastes were reportedly disposed of at Site 25 from the 1940s through the early 1970s. These wastes may have included rubbish, industrial wastes, shells, and sewage treatment plant sludge. The Army discontinued use of the landfill in 1972. The landfill area was subsequently covered with soil; vegetation was planted on the newly placed clean soil.

Site 26 consists of an irregularly shaped pile of sediments dredged from portions of GPB. In 1982, the dredged material was taken from two separate locations in GPB. The first location was from Shinkle Road to the section of the brook adjacent to Site 34, the Burning Ground. The second location was adjacent to Site 31, the former Defense Reutilization and Marketing Office (DRMO). The dredging operation was conducted to maintain proper flow conditions in GPB. During the dredging operation, shells were identified in the dredge spoils. GPB has received waste from most operations at Picatinny Arsenal, including sewage and industrial wastewater discharges, storm runoff, and discharge from contaminated groundwater plumes. Consequently, the dredged material from GPB is suspected to contain a variety of potential contaminants.

The soil at Site 25/26 became contaminated with organic compounds and metals due to the landfill and dredging activities. The groundwater beneath the site is being evaluated and addressed separately within the Area C groundwater operable unit. Additionally, based on the history for these sites buried munitions are also a concern here.

2.2.2 Previous Investigations

Eleven previous investigations, listed in **Table 1**, have been conducted at Site 25/26 to evaluate whether past activities may have affected surface water, sediment, or groundwater at these sites. All investigations were performed under contract to the Army and reviewed by the USEPA. The results of the investigations listed in **Table 1** are available as part of the Administrative Record file for Picatinny Arsenal. This ROD describes the Selected Remedy for the soil contamination resulting from the past activities at Site 25/26. The groundwater contamination is addressed under a separate CERCLA action for the Area C groundwater operable unit.

Additional information can be found in greater detail in the following reports: *Picatinny Arsenal Phase I Remedial Investigation Report* (Dames and Moore, 1998b) and *Final Site 25/26 Feasibility Study* (Shaw, 2003), as well as documents or reports cited in the References section (Section 4.0) of this ROD.

No formalized enforcement activities have occurred at Site 25/26. Picatinny Arsenal is working in cooperation with the USEPA and NJDEP to apply appropriate remedies that will preclude the necessity of formalized enforcement actions, such as Notices of Violation.

2.3 COMMUNITY PARTICIPATION

Site 25/26 has been the topic of presentations to the Picatinny Arsenal Environmental Restoration Advisory Board (RAB). The Army briefed the RAB in October 2004 on the proposed remedial approach for Site 25/26. RAB members have provided comments regarding the proposed remedial alternative. A courtesy copy of the Proposed Plan was given to the RAB's co-chair and a complimentary copy was offered to any RAB member who requested it. A final Proposed Plan for Site 25/26 was completed and released to the public in December 2004. The Proposed Plan is part of the Administrative Record for Picatinny Arsenal available at the Picatinny Arsenal IRP Office, and the Rockaway Township and Morris County Libraries.

Multiple newspaper notifications were made to inform the public of the start of the Proposed Plan comment period, solicit comments from the public, and announce the public meeting. The notification was run in the New Jersey-Star Ledger and the Daily Record on November 24, 2004. A public comment period was held from December 8, 2004 to January 8, 2005 during which comments from the public were received. A public meeting was held on December 8, 2004 to inform the public about the Selected Remedy for Site 25/26 soil and to seek public comments. At this meeting, representatives from the Army, NJDEP, USEPA, and the U.S. Army Corps of Engineers were present to answer questions about the site

Table 1: Chronological Order of Investigations Conducted at Site 25/26

Investigation/Study	Year	Site	Type Of Investigation/Study
USAEHA/ICM/NJDEP	1981-1984	25	Groundwater Sampling
ICM Soil Investigation	1984	26	Soil Sampling
USGS Geophysical Survey	1986	25	Seismic Refraction, Electric Resistivity, and Electromagnetic Conductivity Surveys
Dames and Moore SI	1988	25,26	Surface Water, Sediment, and Groundwater Sampling
Carpenter Soil Investigation	1991	26	Soil Sampling
Dames and Moore Phase I RI (including HHRA and ERA)	1993-1994	25,26	Geophysical, Radiological and Soil Gas Surveys, Soil Sampling, Test Pitting, Monitoring Well Installation, and Groundwater Sampling
ICF Kaiser Engineers (ICFKE) Additional Soil Investigation	1997	25	Additional Soil Sampling for Polycyclic Aromatic Hydrocarbon (PAH)
Dames and Moore Draft FS	1997	25	Preliminary Evaluation of Remedial Alternatives
IT Corporation (IT) Phase I Risk Management Plan (RMP)	2000	25,26	Further Evaluation of Human Health and Ecological Risks
IT Facility-Wide Background Investigation	2000	Facility-Wide	Facility-wide sampling and analysis of background Target Analyte List metals, inorganic anions, and radiological parameters in surface soil, subsurface soil, surface water, and sediment.
IT Soil Data Gap Investigation	2002	25,26	Additional soil sampling for PAHs at Site 25 and dioxins and DDT at Site 26 to address the data gaps and better delineate the area of LOC exceedances.
Shaw FS	2003	25,26	Feasibility Study for Site 25/26 soil including selection of COCs and analysis of remedial action alternatives.

and alternatives under consideration. The Army's responses to comments made at the public meeting are included in the Responsiveness Summary (Section 3.0) of this ROD.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

As outlined in the IRP at Picatinny Arsenal, the overall environmental cleanup goal is to protect human health and the environment by eliminating or reducing to prescribed, safe levels any potential risks caused by past installation activities. The remediation of Site 25/26 soil is part of a comprehensive environmental investigation and remediation process currently underway to meet the IRP goals at Picatinny Arsenal. Presently, Picatinny Arsenal has two signed Final RODs. The RODs were signed in 2001 and 2004. The first remedial action was completed in 2003, and planning for the second is underway. The Army has submitted, and is awaiting signature on several RODs for other sites at Picatinny Arsenal. The Army intends to submit numerous RODs for other sites at Picatinny Arsenal in the coming years. This ROD addresses the selection of the remedial action for soil at Site 25/26.

The proposed remedial action is primarily targeted at the surface soil which is affected by PAHs. No contaminants were identified for subsurface soil, and there are no sources to groundwater contamination in surface or subsurface soil attributable to Site 25/26. Groundwater in Area C is being addressed under a separate action, and is not included in this ROD. The selected remedial action for Site 25/26 is designed to provide the most protection of human health and the environment through the reduction of exposure and mobility of contaminants at the site. There are no contaminants that constitute principal threat wastes at Site 25/26. Both active (capping) and passive (implementation of LUCs) remedial actions are suggested for this site. The Army will act to ensure only appropriate land use of Site 25/26 takes place. Five-year reviews will be conducted in compliance with CERCLA and the NCP to ensure that the remedy is and will be protective of human health and the environment. The selected remedial action for Site 25/26 does not address munitions that may be buried at the site. The MMRP will address the potential for buried munitions at the site in the future. Site 25/26 has been assigned number PICA-006-R-01 under the MMRP. In addition, construction work that may occur within the defined site boundaries will be required to implement current DOD and Picatinny regulations regarding avoidance and clearing of potential military munitions. Currently, this issue is already addressed through the LUC

objective which states "Prevent site access for intrusive work without UXO precautions". More information on the LUC objectives is provided in Section 2.12.2 Description of the Selected Remedy.

Estimated excess human health risk at this site for current and reasonably anticipated future land use is greater than one in one million ($1x10^{-6}$) but less than one in ten thousand ($1x10^{-4}$). This is within USEPA's target range for managing risks as part of a Superfund Cleanup, but greater than NJDEP standards for excess risk in discrete AOCs. EPA uses the general $1x10^{-4}$ to $1x10^{-6}$ risk range as a "target range" within which the Agency strives to manage risks as part of a Superfund Cleanup. Generally, a response action is implemented following NCP guidance when site-specific excess carcinogenic risk to human health exceeds one in ten thousand ($1x10^{-4}$). However, pursuant to the agreement with NJDEP as outlined in a memorandum by MG Van Antwerp, 14 Jun 1999, the Army will evaluate and select remedial actions on a case by case basis at Picatinny Arsenal that are protective to the $1x10^{-6}$ level. NJDEP provided their concurrence to this agreement in a letter to BG Geis, 02 Sep 1999. This agreement is specific to Picatinny Arsenal.

2.5 SITE CHARACTERISTICS

2.5.1 Conceptual Site Model

A conceptual site model has been developed for Site 25/26 soil (**Figure 2**) to illustrate contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors in order to convey the salient processes affecting the introduction, movement, and distribution of contaminant mass at the site. The risk assessments and response actions for the site are based on the conceptual site model.

The primary sources of contamination in Site 25/26 surface soil were releases from the unlined landfill. There has been no evidence of source areas or containers that may act as a source at the site. The contamination consists of soils impacted by relatively immobile contaminants, primarily PAHs, and therefore present little risk or evidence of risk through contaminant migration. The fate and transport of these compounds is further discussed in Section 2.5.9 of this ROD.

The primary release mechanism for introduction of contaminants, including PAHs, metals, pesticides, and polychlorinated biphenyls (PCBs) to the surface soil and subsurface was through surface runoff and infiltration/percolation from the unlined sanitary landfill and dredge pile.

Through the secondary release mechanisms of wind, infiltration/percolation, surface water runoff, and plant/animal uptake mechanisms, contaminants were gradually transported to the air through dust, animal tissue primarily through earthworms, plant tissue, and groundwater.

Contamination accumulated in dust, groundwater, surface water, and earthworms (bioaccumulation) is accessible to a number of human and biota receptors through various exposure routes, as presented on **Figure 2**. It should be noted that **Figure 2** presents the conceptual site model as established for the Remedial Investigation (RI) in 1994 (Dames and Moore, 1998a). At the time, the Army considered the risk implications associated with contamination at Site 26 as a stand-alone site. Risk implications for sites as small as Site 26 are typically not independently evaluated. Had the risk assessment been performed at a later date, this evaluation would not have been performed. However, the risk results presented in the Phase I RI are presented here for consistency with earlier documents. The risk exposure pathways were identified and evaluated in the human health and ecological risk assessments, further discussed in Section 2.7 of this ROD. The potential exposures via surface water and groundwater pathways are currently being addressed under separate CERCLA actions at Picatinny Arsenal. The scope of this ROD is limited to exposure via soil pathways.

2.5.2 Surface and Subsurface Features

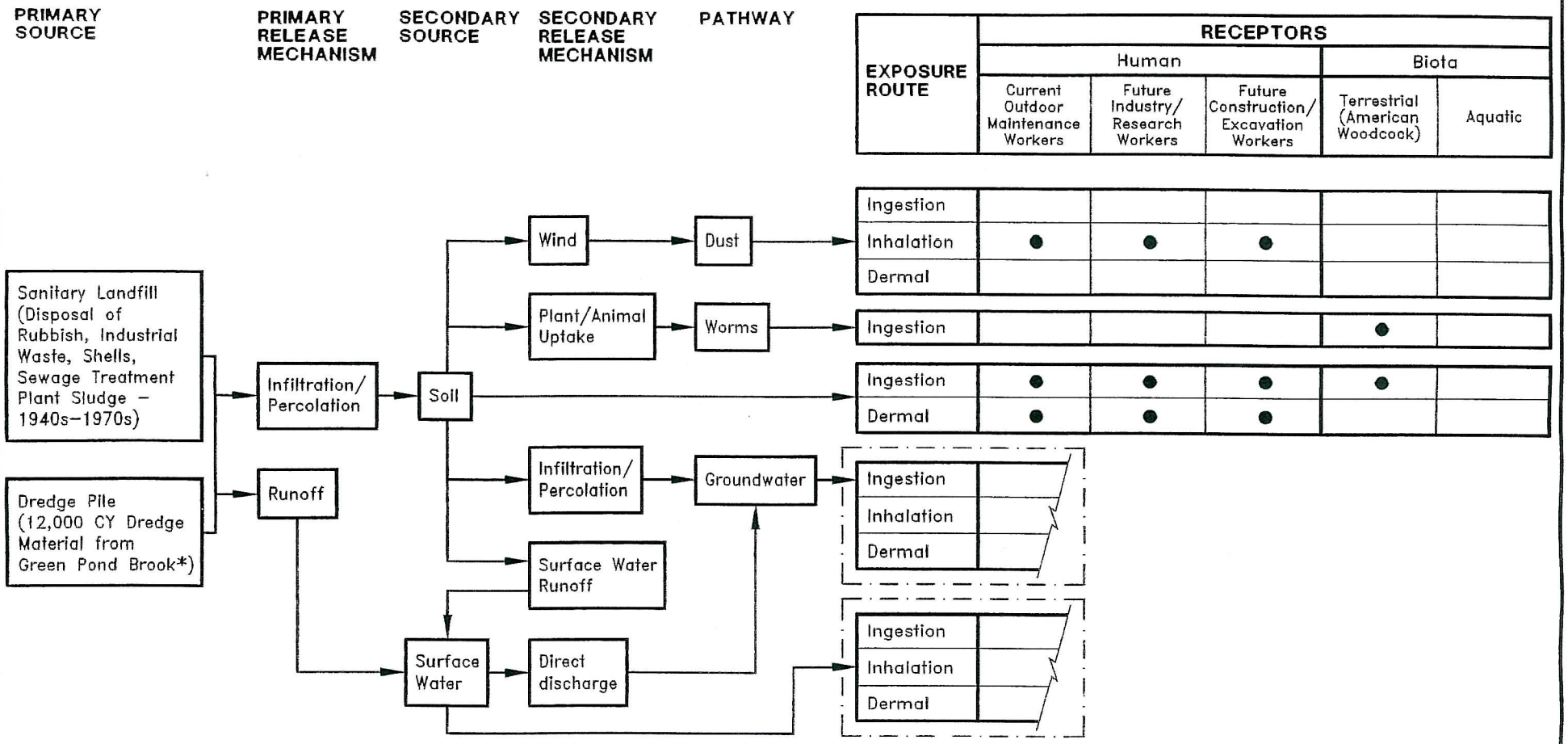
The surface and subsurface features of Site 25/26, such as topography, surface water hydrology, geology, and hydrogeology are described in Sections 2.5.3 through 2.5.5 below.

According to data contained in the Picatinny Arsenal geographic information system (GIS), there are no archeologically sensitive or potentially archeologically sensitive areas within the boundaries of Site 25/26. Cultural and historic data contained in the Picatinny Arsenal GIS was primarily obtained from

Architectural Assessment of Historic Structures at Picatinny Arsenal, Morris County, New Jersey, August 1999.

File: C:\PROJECTS\PICATINNY\Area C\25-26 ROD\Risk\Model.dwg
Plot Date/Time: Mar 30. 2005 - 12:33pm
Plotted By: cindy.troxell

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
--	--	--	RiskModel.dwg



*Green Pond Brook received waste from sewage and industrial waste water, stormwater runoff, and from construction water.

Note:

Indicates items addressed by a separate CERCLA action (Area C Proposed Plan) for different human receptors.

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 2

CONCEPTUAL SITE MODEL FOR SITE 25/26

RECORD OF DECISION SITE 25/26 SOIL

Drawings provided by Shaw on September 2006; modified by ARCADIS on January 2007.

2.5.3 Topography/Surface Water Hydrology

Site 25 is characterized as essentially flat reclaimed wetlands comprising the floodplain of GPB. Excluding the Dredge Pile, ground elevations at the site range from approximately 695 to 700 ft above mean sea level. The landfill material under Site 25 ranges in thickness from four feet to more than eight feet. Site 25 can be subdivided into four separate areas: the Southern Borrow Area, the Landfill Area, the Northeastern Area, and the Dredge Pile. Except for the Dredge Pile Area, little to no surface water runoff is anticipated at the site.

Surface water drainage within the Southern Borrow Area is from the northeast to the southwest towards a low-lying excavated area where standing water has been observed. Although most of Site 25 is flat, surface water flow is controlled by a man-made drainage ditch, which bisects the area. A low-lying area is located at the southern end of this ditch near the intersection of Spicer Avenue and South Brook Road. Drainage within Site 26 is influenced greatly by the Dredge Pile. Although no erosional features (i.e., gullies) were observed at the Dredge Pile during the Phase I RI, surface water runoff is significant along the steep flanks of the Dredge Pile during large storms. Because of the hummocky nature of the terrain, surface water runoff in the Northeastern Area is fairly complicated. Near Spicer Avenue and the ballfield parking lot, surface water runoff is to the south-southwest towards Spicer Avenue. However, surface water runoff in the forested northeast corner of Site 25 flows to the north towards several small ponds. **Figure 3** shows the general direction of surface water flow.

2.5.4 Geology and Soils

Because Site 26 lies completely within the boundaries of Site 25, geologic conditions at Site 26 are expected to be consistent with those at Site 25. A light brown to gray, fine to coarse silty sand (i.e., fill) underlies Site 26 to a depth of approximately 5 ft. The locations of all monitoring wells, soil borings, and site-specific geologic cross-section A-A' are shown on **Figure 3**.

Site 25 is underlain by landfilled material consisting of miscellaneous construction debris (e.g., concrete and wood fragments) in a dark brown/yellowish red silty sand matrix. The thickness of the fill material ranges from approximately 4 ft northeast of the Dredge Pile to greater than 8 ft in the Landfill Area. No fill was encountered within the Southern Borrow Area, suggesting that this area was not used for landfilling purposes.

As shown on **Figure 3**, the fill at Site 25 overlies a well-sorted fluvial sand unit with boulders and gravel at the base, upper glacial sequence. The thickness of the upper glacial sequence varies from approximately 25 ft in the northeastern corner of the site to 35 ft near the western site boundary.

Underlying the upper glacial sequence is the middle glacial sequence that consists of heterogeneous layers of laminated clay, silt, and fine sand. The top of the middle glacial sequence is encountered at depths ranging from 25 to 35 ft below ground surface (bgs). A sand and gravel layer approximately 17 ft thick was encountered in the southwestern portion of the site. The thickness of the middle sequence varies from approximately 20 ft in the northeast to 125 ft in the southwest across the site.

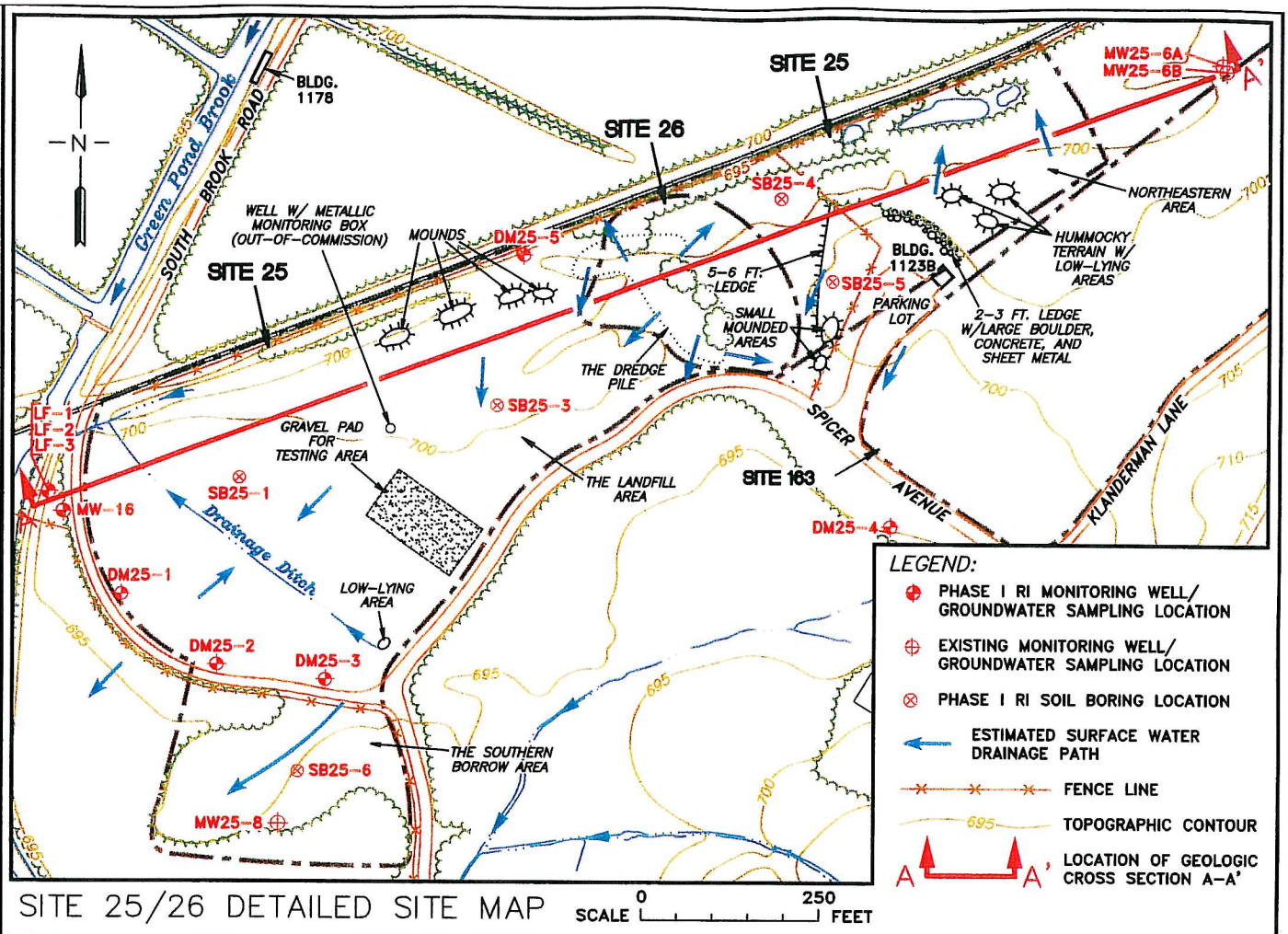
The middle sequence overlies a layer of till (corresponding to the lower glacial sequence) composed of poorly sorted gravel, cobbles, and boulders in a matrix of sand, silt, and clay. The top of the lower glacial sequence is encountered at depths ranging from 35 ft bgs in the northeast to 150 ft bgs in the southwest.

Correspondingly, the thickness of this sequence decreases from approximately 110 ft in the northeast to 35 ft in the southwest.

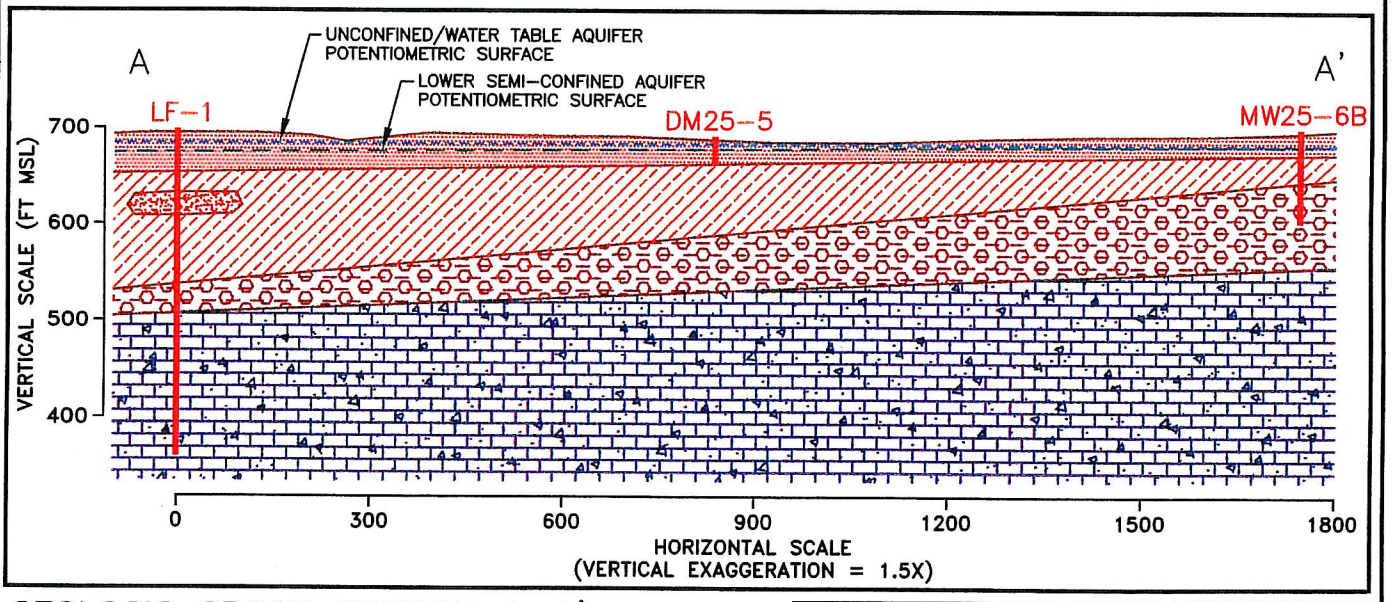
Weathered dolomite, consisting of disseminated Leithsville Dolomite rock fragments in a silty clay matrix, underlies the till unit at Site 25. Encountered at a depth of 180 ft in the southwest, the weathered dolomite unit is estimated to be approximately 150 ft bgs in the northeast based on data from the 1986 U.S. Geological Survey (USGS) Geophysical Survey.

2.5.5 Hydrogeology

Based on the geology of Site 25 and Site 26, four aquifers are identified. The aquifers are an unconfined glacial aquifer, an upper semi-confined glacial aquifer, a lower semi-confined glacial aquifer, and a bedrock aquifer. The unconfined glacial aquifer corresponds to the upper glacial sequence and is encountered at the surface. The unconfined glacial aquifer has a thickness range of 25 to 35 ft. The



SITE 25/26 DETAILED SITE MAP



GEOLOGIC CROSS SECTION A-A'

CROSS SECTION LEGEND:

- SAND, WELL-SORTED (UNCONFINED/WATER TABLE AQUIFER)
- SAND AND GRAVEL
- LAMINATED SILT, CLAY, SAND, AND GRAVEL (UPPER SEMI-CONFINED AQUIFER)
- TILL-POORLY SORTED GRAVEL, COBBLES AND BOULDERS, SUPPORTED IN A MATRIX OF SILT, SAND, AND CLAY (LOWER SEMI-CONFINED AQUIFER)
- WEATHERED LEITHSVILLE DOLOMITE - DISSEMINATED DOLOMITE FRAGMENTS IN A SILTY CLAY MATRIX (BEDROCK AQUIFER)

NOTE: GROUNDWATER ELEVATION FROM APRIL 1994 SAMPLING ROUND

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 3

SITE 25/26 DETAILED SITE MAP

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

DRAWING NUMBER DRAIN-XS.dwg
APPROVED BY TL
CHECKED BY TEC
DRAWN BY RLS

File: G:\Prjcts\Pi...ty\DRAWINGS\PICA 067\Drawings from ROD\Detailed site map_revised.dwg
Plot Date/Time: Jan 15, 2007 - 12:51pm
Plotted By: rsagana

upper semi-confined glacial aquifer corresponds to the fine-grained middle glacial sequence that is first encountered at depths ranging from 25 to 35 ft bgs.

Only one well at Site 25 is screened in a sand and gravel lens located within the upper semi-confined glacial aquifer. The upper semi-confined glacial aquifer has a thickness range of 20 to 125 ft. Corresponding to the lower glacial sequence is the lower semi-confined glacial aquifer, which is first encountered at depths ranging from 35 to 150 ft bgs. This aquifer has a thickness range of 35 to 110 ft. The bedrock aquifer is first encountered at depths ranging from approximately 150 to 180 ft bgs. Groundwater within the unconfined aquifer generally flows towards the west-northwest (most of the site) or the west-southwest (the Southern Borrow Area and the southwestern portion of the Landfill Area) towards GPB.

Only one well in the vicinity of Site 25 is screened in the upper semi-confined glacial aquifer. The general direction of groundwater flow is towards GPB. Similar to the unconfined glacial aquifer, groundwater within the semi-confined glacial aquifer flows west-northwest towards GPB.

Only one well penetrated the weathered Leithsville Dolomite bedrock aquifer at Site 25. Groundwater in the bedrock aquifer flows south; down the valley towards the Rockaway River.

Because Site 26 lies completely within the boundaries of Site 25, the hydrogeologic characteristics of the site will be similar to those of Site 25.

2.5.6 Sampling Strategy

Surface soil, soil gas, and groundwater sampling, have been conducted for the Phase I RI (Dames and Moore, 1998b) and the Additional Soil Sampling (ICFKE, 1997) to evaluate whether past activities may have affected surface water, sediment, or groundwater at Site 25/26.

As part of the FS, IT conducted a Soil Data Gap Investigation (SDGI) in February 2002 to address data gaps and to better delineate the area of LOC exceedance. Additional surface soil sampling was conducted for dioxins and dichlorodiphenyl-trichloroethane (DDT) at Site 26 and PAHs at Site 25.

Groundwater contamination at Site 25/26 is being addressed separately in the Area C Groundwater Operable Unit. Further detail on these investigations is summarized in the following sections. Sampling data was used to evaluate potentially applicable remedial alternatives.

2.5.7 Nature and Extent of Contamination

This summary of the nature and extent of contamination is based on studies performed by USGS, the RI and additional DGI performed for the Army to focus on the nature and extent of contamination present at Site 25/26. The Army is conducting separate studies which focus on contamination known or suspected to be present at other sites in Picatinny Arsenal. The administrative record file for the site includes detailed information about individual investigations and sampling results summarized herein.

2.5.7.1 Surface Soil

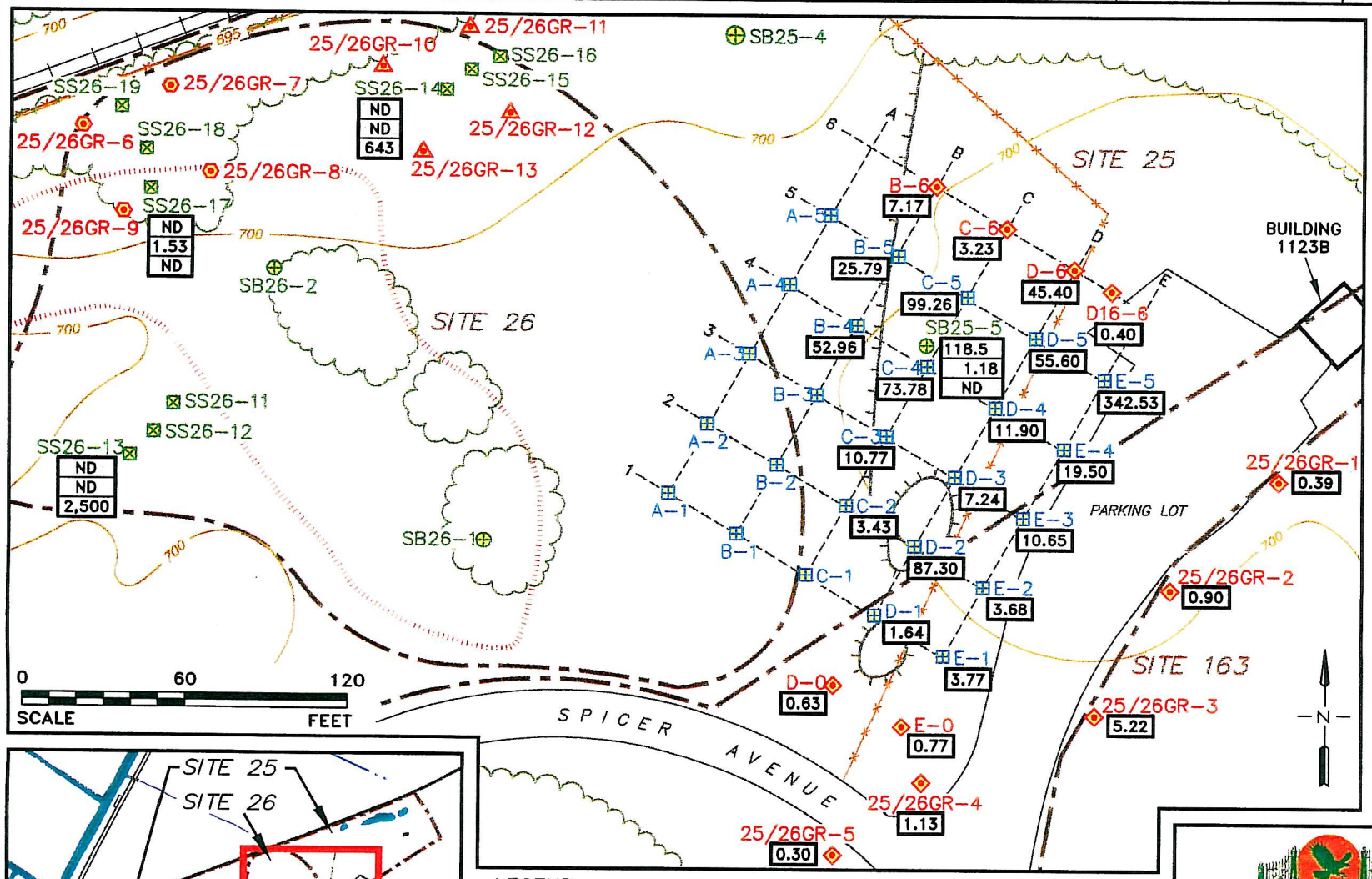
The three most comprehensive data sets (1993 Phase I RI, 1997 Additional Soil Sampling, and 2002 SDGI) were used to spatially evaluate the area of surface soil that exceeded Levels of Concern (LOCs). The LOCs are based on the NJDEP NRDCSCC. In cases where NJDEP cleanup criteria are not available, USEPA Region III Industrial ($1x10^{-06}$) Risk-Based Concentrations (RBCs) were used as LOCs.

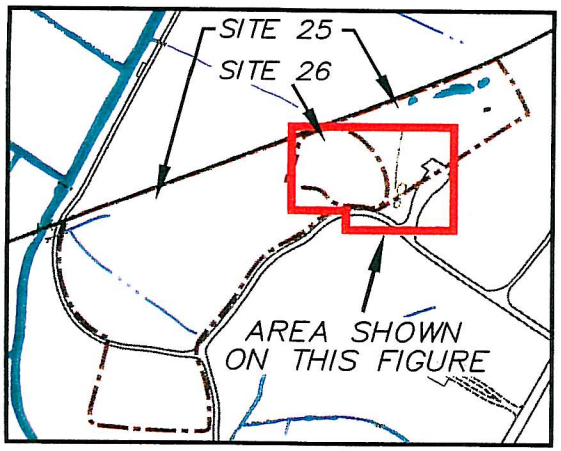
Seven PAHs were detected in the Site 25 surface soil samples at concentrations that exceeded LOCs during the 1993 Phase I RI and the 1997 Additional Soil Sampling. The results of the SDGI indicated that with the exception of one low-level LOC exceedance at location 25/26GR-3, the PAHs exceedance area at Site 25 is confined within the area of the 1997 ICFKE sampling grid and does not extend to the parking lot area. **Table 2** lists contaminants detected in surface soil above LOCs. **Figure 4** shows the locations where sample results have indicated LOC exceedances. Please refer to the FS (Shaw, 2003) for all soil sampling locations at Site 25/26.

The results of the SDGI also confirmed that elevated concentrations of pesticides, dioxins, and furans were only present in localized areas at Site 26. Surface soil samples at locations 25/26GR-6 through 25/26GR-9, collected approximately 30 ft from SS26-18A, indicated no LOC exceedances for

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 067\Drawings from ROD\ROD Drawings_revised.dwg
Plot Date/Time: Jan 15, 2007 – 12:57pm
Plotted By: rsagana

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
RLS	--	TEC	--	TL	--	AOC-REMALT.dwg





SAMPLING RESULTS ARE REPRESENTED AS FOLLOWS:

PAH
Beryllium
Copper

(SEE NOTES 1 & 2)

NOTES:

1. AT LOCATIONS WHERE ONLY ONE SAMPLING RESULT IS SHOWN, THE RESULT SHOWN REPRESENTS THE PAH DETECTIONS ONLY, AND BERYLLLIM AND COPPER DETECTIONS WERE LESS THAN LOC OR NON-DETECT.
2. PAH SAMPLING RESULTS SHOWN REPRESENT THE TOTAL OF THE DETECTIONS OF THE FOLLOWING COMPOUNDS, WHICH ARE CLASSIFIED BY EPA AS CARCINOGENIC PAHs:
   - Benzo (a) anthracene
   - Benzo (a) pyrene
   - Benzo (b) fluoranthene
   - Benzo (k) fluoranthene
   - Chrysene
   - Dibenz (a,h) anthracene
   - Indeno (1,2,3-cd) pyrene
3. REFER TO TABLE 1-4 IN THE FS FOR LOC LEVELS FOR ALL CHEMICALS.
4. AT LOCATIONS WHERE NO SAMPLING RESULTS ARE SHOWN, ALL RESULTS WERE NON-DETECT.
3. ND INDICATES RESULTS WERE NON-DETECT.
5. ALL SAMPLING RESULTS ARE SHOWN IN mg/kg.

LEGEND:

- 1993/1994 PHASE I RI SURFACE SOIL SAMPLE LOCATION
- 1993/1994 PHASE I RI SOIL BORING LOCATION
- 1997 ADDITIONAL SOIL SAMPLE LOCATION (PAHs)
- 2002 SDGI SOIL SAMPLE LOCATION (PAHs)
- 2002 SDGI SOIL SAMPLE LOCATION (DIOXINS & FURANS)
- 2002 SDGI SOIL SAMPLE LOCATION (PESTICIDES)
- RAILROAD
- FENCE
- TREE LINE
- 700 TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- APPROXIMATE LIMITS OF DREDGE PILE

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 4

LOC EXCEEDANCES IN SURFACE SOIL SAMPLES

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

pesticides, including DDT. Also, no LOC exceedances were observed for dioxins and furans for samples at locations 25/26GR-10 through 25/26GR-13, collected approximately 30 ft from location SS26-14A/B.

Copper was detected at concentrations above the LOC in two Site 26 soil samples. No exceedances of beryllium (LOC=2 milligrams per kilogram [mg/kg]) were found in the 2002 sampling round. **Table 2** lists contaminants detected in surface soil above LOCs.

Table 2: Contaminants Detected in Surface Soil Samples that Exceed LOCs (1997 and 2002 data)

Contaminant	Concentration (mg/kg)			LOC (mg/kg)	Source of LOC	Frequency of Detection	# of Samples Exceeding LOC
	Minimum	Maximum	Average				
Benz(a)anthracene (PAH)	0.4	52.667	4.9	4	NJDEP-NRDCSCC	21/36	8
Benzo(a)pyrene (PAH)	0.547	87.228	4.4	0.66	NJDEP-NRDCSCC	16/36	17
Benzo(b)fluoranthene (PAH)	0.427	59.207	5.1	4	NJDEP-NRDCSCC	19/36	9
Benzo(k)fluoranthene (PAH)	0.4	59.207	4.9	4	NJDEP-NRDCSCC	20/36	9
Chrysene (PAH)	0.15	61.068	3.9	40	NJDEP-NRDCSCC	23/36	1
Dibenz(a,h)anthracene (PAH)	1	4.386	0.52	0.66	NJDEP-NRDCSCC	4/36	5
Indeno(1,2,3-cd)pyrene (PAH)	0.393	23.156	1.16	4	NJDEP-NRDCSCC	10/36	1
Copper	7.17	2,500	434.27	600	NJDEP-NRDCSCC	22/22	2

It should be noted that low levels of cadmium, PCBs, chlorinated dibenzo-p-dioxins (CDDs), lead and DDT were detected at Site 25/26 at concentrations below LOCs in the 1993 Phase I RI (Dames and Moore, 1998b) and the SDGI. As discussed in the Section 2.7 of this ROD, although detected at concentrations below the LOC, these contaminants were included in the risk assessment.

An isolated exceedance area of benzo(a)pyrene was identified at the location of sample 25/26GR-3. Because of its low level of exceedance (0.31 mg/kg above the SCL) and isolated nature, this area will be excavated and the contaminated soil (approximately two cubic feet) will be transported to the main AOC and subsequently covered by the vegetated soil cover.

2.5.7.2 Subsurface Soil

Previous investigations have shown contaminants detected in subsurface soils at Site 25/26. All of the detections have been low-level and have not exhibited a pattern of widespread contamination. The contaminants detected in the soil samples have shown no impact to groundwater from Site 25/26. The LOCs are based on the lower of either the NJDEP Impact to Groundwater criteria or the NJDEP NRDCSCC.

Four PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene] were detected at concentrations exceeding LOCs in one of 22 subsurface soil samples. All of the subsurface soil exceedances were detected in one sample collected from SB25-5C.

There were no LOC exceedances for VOCs, metals, dioxins/furans, explosives, or radionuclides. Twenty-two subsurface soil samples were analyzed for metals. Aroclor 1260 exceeded its LOC in a single sample.

2.5.8 Characterization of COCs

The Army has identified benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene as chemicals that pose the greatest potential risk to human health in soil at Site 25/26. PAHs are a class of diverse organic compounds containing two or more fused aromatic rings of carbon and hydrogen atoms. There are more than 100 different PAHs. PAHs generally occur as complex mixture. PAHs, including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene are formed during incomplete combustion of coal, oil, gas, wood, or other organic substances. PAHs are used in medicines, dyes, plastics, and pesticides. They can also be found in coal and roofing tar. PAHs have caused tumors in laboratory animals, and the International Agency of Research on Cancer has listed benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene as probable human carcinogens.

2.5.9 Fate and Transport of PAHs

The fate and transport characteristics of the contaminants in the subsurface system are vital aspects of the chemical contaminants that affect their behavior, ability to mobilize, rate of degradation, and probability of human, biotic, or ecological exposure.

Fate and transport of PAHs in the environment are determined to a large extent by their physical and chemical properties. In general, PAHs have low solubility in water. PAHs are adsorbed strongly to the organic fraction of sediment and soils, therefore, leaching of PAHs from the soil to groundwater is not considered to be a significant transport mechanism, although their presence in groundwater has been reported in a number of contaminated sites. The volatility of PAHs from water phases is low. PAHs are very slowly biodegraded under aerobic conditions in the aqueous environment. The biodegradation rates decrease drastically with increasing number of aromatic rings. PAHs with four or more aromatic rings are persistent in the environment.

The physical and chemical properties of PAHs, together with the data collected at Site 25/26 indicate that the transport potential from the soil is very low. There has been no impact to groundwater from PAHs originating at Site 25/26. Further details on the fate and transports of PAHs as the COCs in Site 25/26 soil are discussed in the FS (Shaw, 2003).

2.6 CURRENT AND POTENTIAL FUTURE LAND USES AND DESIGNATION OF SITE 25/26

Future land use for Site 25/26 and surrounding area is expected to include hunting and occasional use by site workers for the guidance system test area. The Army anticipates this current land use continuing. However, this site is contained within the footprint of the Enhanced Use Lease initiative at Picatinny. Should the Army lease this site the lease agreement will include the requirements of the engineering controls to maintain protection to human health and the environment. Any redevelopment to the site pursuant to the lease agreement shall be coordinated with EPA and NJDEP and shall meet the remedial action objective (RAO) of eliminating the pathway to soils with contaminants that exceed the $1x10^{-6}$ level, set forth in this ROD.

2.7 SUMMARY OF SITE RISKS

This section presents the results of the human health and ecological risk assessments that were conducted for the Phase I RI (Dames and Moore, 1998b) and the Risk Management Plan (RMP) (IT, 2000a). The risk assessments were designed to evaluate the potential impact to human health and the environment.

The response action selected in this ROD is necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment.

It should be noted that this risk assessment summary presents the results of the risk assessment performed for the Phase I RI (Dames and Moore, 1998a) as well as the later RMP (IT, 2000a). At the time these risk evaluations were performed, the Army considered the risk implications associated with contamination at Site 26 as a stand-alone site. Risk implications for sites as small as Site 26 are typically not independently evaluated. Had the risk assessment been performed at a later date, this evaluation would not have been performed. However, the risk results presented in the Phase I RI and risk management plan are presented here for consistency with earlier documents.

2.7.1 Human Health Risk Assessment

To determine whether remedial action is warranted, USEPA requires a baseline human health risk assessment (HHRA) be conducted for each site. The baseline risk assessment is an evaluation of cancer risks and non-cancer hazards of contaminants of potential concern (COPCs) associated with a site if no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section summarizes the results of the baseline risk assessment for this site. As part of the baseline HHRA, estimates of cancer risks and non-cancer health hazards are quantified for potential receptor populations and exposure scenarios.

Currently, USEPA guidelines for cumulative carcinogenic site risk to an individual, based on reasonable maximum exposure for both current and future land use, use a risk range of $1x10^{-6}$ (one in

one million) to $1x10^{-4}$ (one in ten thousand) as a target range within which the USEPA strives to manage risks as part of a Superfund Cleanup. Exceedances of this target range may trigger remedial action. The response action selected in this ROD is based on estimated excess human health risk greater than one in one million ($1x10^{-6}$), which is within USEPA's target range for managing risks as part of a Superfund Cleanup, but greater than NJDEP standards for excess risk in discrete AOCs. Based on the current and reasonably anticipated future land use, industrial/research, potential risks to human health were found to be within the USEPA target range of $1x10^{-6}$ to $1x10^{-4}$. However, the Army agreed to evaluate response actions on a case-by-case basis that will eliminate the exposure pathway for each discrete AOC where the risk exceeds the $1x10^{-6}$ level; to evaluate the implementation of LUCs in accordance with the agreed to Department of Navy Principles which state that LUCs will be used where contaminants are left in place to ensure that such contaminants do not pose an unacceptable risk to human health or the environment; and to document the decision in a ROD.

Potential non-carcinogenic effects are evaluated by comparing the COPCs calculated exposure intake to the chemical-specific reference dose. This ratio of exposure to toxicity is called the hazard quotient (HQ). HQs greater than 1 are indicative of potential adverse health effects. The hazard index (HI) is the sum of all HQs for all COPCs that affect the same target organ, or act through the same mechanism of action within a media or across all media, of a reasonably maximum exposed individual. In general, HIs that are less than 1 are not likely to be associated with non-cancer hazards.

The Phase I RI HHRA was prepared to evaluate the probability and magnitude of adverse effects on human health associated with actual or potential exposure to COPCs that were selected for evaluation. The HHRA was based on groundwater, surface soil, subsurface soil, sediment, and surface water data collected during the Phase I RI. Dames and Moore conducted independent HHRAs at Site 25 and Site 26 as part of the Phase I RI. In 2000, IT reevaluated the human health risks at Site 25 based on new soil data collected during the 1997 ICFKE Data Gap Investigation. The results of the re-evaluation are presented in the following sections.

Because Site 26 is relatively small and located within the boundary of Site 25, it should be noted that independent HHRA evaluations as compared with a combined evaluation correlate to a greater uncertainty in the results. As noted above, the independent risk evaluation of Site 26 should not have been performed. The independent evaluation results in a greater uncertainty. This is because an independent risk evaluation cannot demonstrate that a receptor would differentially contact one site versus the other. More importantly, it should also be noted that the FS for Site 25/26 soil was performed to evaluate the remedial alternatives, including LUCs, for the site, and due to the exceedances of the NJDEP non-residential direct contact soil cleanup criteria. Therefore, the uncertainties associated with the results of HHRA would not affect the outcome of the FS, nor would it change the Selected Remedy presented in this ROD.

2.7.1.1 Identification of COCs

This section presents a summary of the COC selection that was performed as part of Site 25/26 soil FS (Shaw, 2003). A determination of COCs was also performed for the Phase I HHRA (Dames and Moore, 1998a) in accordance with the Risk Assessment Guidance for Superfund. The COC selection performed for the FS presented below included an evaluation of the HHRA COCs.

Surface and subsurface soil data were evaluated to determine if there was a need to establish COCs. COCs were identified for Site 25/26 surface soil based on contribution to the majority of site-specific human health or ecological risk and exceedance of NJDEP soil cleanup criteria. The COCs identified in surface soil are copper, lead, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, total PCBs, DDT, 1,2,3,7,8-PeCDD and 2,3,7,8-TCDD.

Site 25/26 groundwater and subsurface soil data were examined to determine if there was a link between contaminants seen in subsurface soil and contaminants seen as a plume in groundwater. This examination concluded that contaminants in subsurface soil do not adversely affect groundwater beneath the site. No COCs were identified in subsurface soil.

2.7.1.2 Identification of Site Cleanup Levels

Final site clean up levels (SCLs) for COCs in surface soil at Site 25/26 were developed by using NJDEP criteria. SCLs for lead, total PCBs, DDT, 1,2,3,7,8-PeCDD, and 2,3,7,8-TCDD were higher than the maximum detection for each of these compounds, therefore they are not presented here. Further remedial action is not targeted for these compounds because the SCL values are higher than the maximum detected concentration for the contaminants. The final SCLs are given in **Table 3**.

Table 3: Final SCLs for Site 25/26

COC	SCL (mg/kg)	Maximum Detected Concentration (mg/kg)
Benz(a)anthracene	4	52.667
Benzo(a)pyrene	0.66	87.228
Benzo(b)fluoranthene	4	59.207

The contaminants included as COCs because they exceeded the NJDEP criteria, but did not contribute to a major portion of the risk identified in the site-specific risk assessment, were copper, chrysene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The areas where these contaminants exceeded the NJDEP criteria, except copper, were within the area of elevated PAHs contributing to the majority of the risk. Therefore, the Preferred Alternative addresses these contaminants.

In the Site 25/26 FS, an AOC was established. In this document, an AOC is defined as the area over which RAOs are to be obtained. This definition departs from the convention employed in the field of health risk assessment for contaminated sites. The AOC was based on the SCL exceedances. Surface soil samples were taken at the depth interval of 0 to 2 ft bgs at Site 25; therefore, the vertical extent of the AOC is approximately 2 ft bgs. The estimated area of the AOC is 12,678 square ft and the estimated volume is 939 cubic yards. **Figure 5** shows the AOC for surface soil at Site 25/26.

Since copper was contained in an isolated location outside the limits of the AOC, it was further evaluated by obtaining the arithmetic average concentration of copper in accordance with the New Jersey Technical Requirements for Site Remediation. The average was calculated using results from the 1993 Dames and Moore Phase I study, the 1997 ICFKE Additional Investigation, and the 2002 IT SDGI, of sample points around the original hot spot for copper. The results indicated the arithmetic average for copper did not exceed the SCL. Therefore, remedial action at Site 25/26 is not targeted for copper.

2.7.1.3 Exposure Assessment

Figure 2 presents a conceptual site model of environmental transport media and principal exposure routes for Site 25/26.

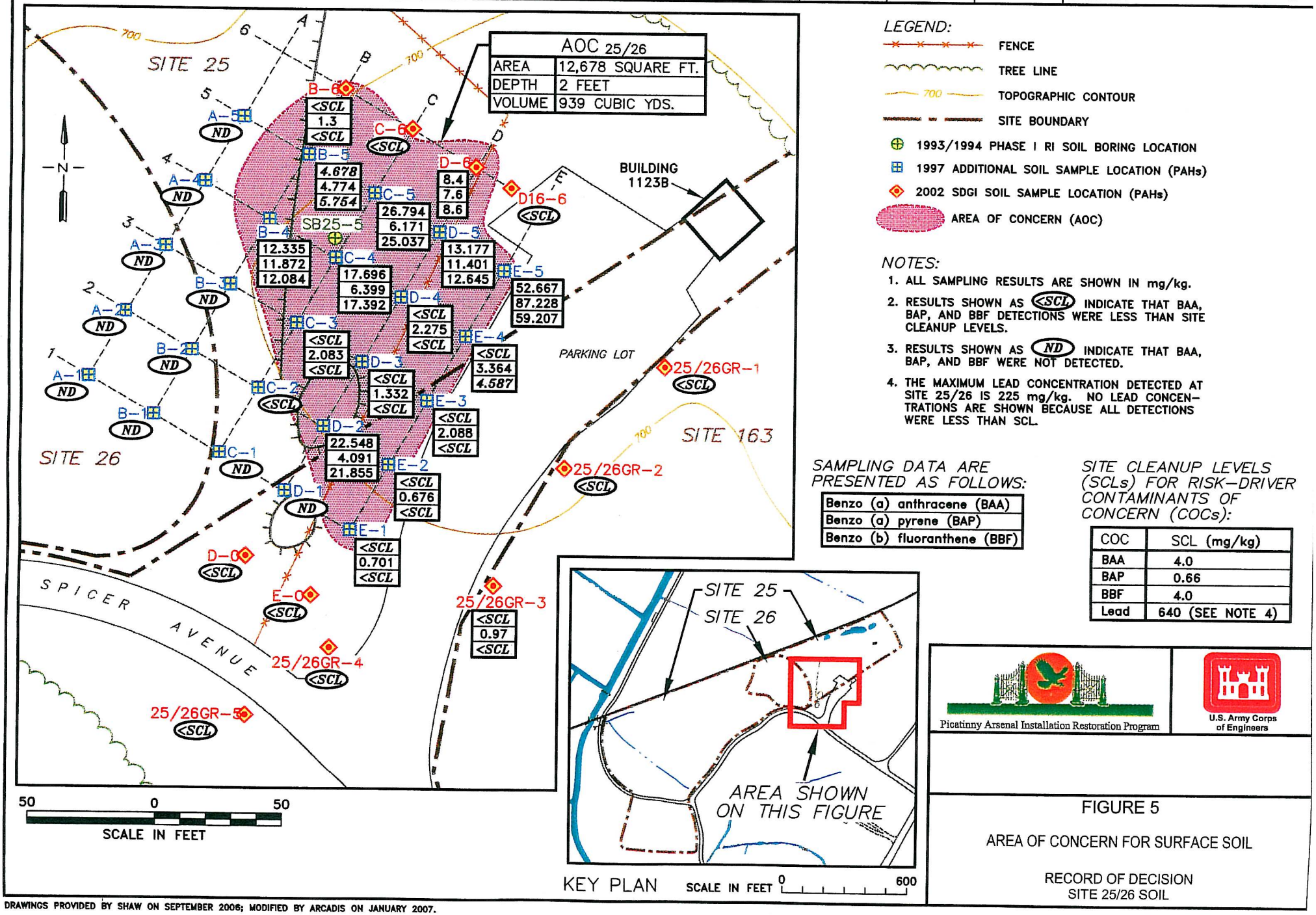
The potential pathways through which individuals may be exposed to COPCs were discussed in detail within the Phase I RI HHRA and the RMP. Probable exposure pathways were then selected for quantitative evaluation in the HHRA. Using the site-specific data obtained from the field samples, chemical concentrations were computed for the points of potential exposure associated with each pathway selected for quantitative evaluation. Assumptions were made for the magnitude, frequency, and duration of exposure for each pathway, and potential exposures (intakes) were then quantified. The three primary human receptors evaluated were outdoor maintenance workers, industry/research workers, and construction/excavation workers. The three primary exposure routes evaluated were inhalation of contaminated dust, ingestion of, and dermal contact with contaminated soil. A future residential scenario was not examined for Site 25/26 because the Army does not anticipate that type of land use. The recommended remedial alternative will preclude residential land use of the site.

2.7.1.4 Toxicity Assessment

The potential toxicity of chemicals to humans was presented and the chemical-specific toxicity criteria were compiled for each COPC within the Phase I risk assessment. Specifically, the toxicity criteria

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 067\Drawings from ROD\ROD Drawings_revised.dwg
Plot Date/Time: Jan 15, 2007 - 1:21pm
Plotted By: rsagana

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
RLS	--	TEC	--	TL	--	AOC-REMALT.dwg



LEGEND:

- FENCE
- TREE LINE
- 700 TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- 1993/1994 PHASE I RI SOIL BORING LOCATION
- 1997 ADDITIONAL SOIL SAMPLE LOCATION (PAHs)
- 2002 SDGI SOIL SAMPLE LOCATION (PAHs)
- AREA OF CONCERN (AOC)

NOTES:

1. ALL SAMPLING RESULTS ARE SHOWN IN mg/kg.
2. RESULTS SHOWN AS <SCL INDICATE THAT BAA, BAP, AND BBF DETECTIONS WERE LESS THAN SITE CLEANUP LEVELS.
3. RESULTS SHOWN AS ND INDICATE THAT BAA, BAP, AND BBF WERE NOT DETECTED.
4. THE MAXIMUM LEAD CONCENTRATION DETECTED AT SITE 25/26 IS 225 mg/kg. NO LEAD CONCENTRATIONS ARE SHOWN BECAUSE ALL DETECTIONS WERE LESS THAN SCL.

SAMPLING DATA ARE PRESENTED AS FOLLOWS:

Benzo (a) anthracene (BAA)
Benzo (a) pyrene (BAP)
Benzo (b) fluoranthene (BBF)

SITE CLEANUP LEVELS (SCLs) FOR RISK-DRIVER CONTAMINANTS OF CONCERN (COCs):

COC	SCL (mg/kg)
BAA	4.0
BAP	0.66
BBF	4.0
Lead	640 (SEE NOTE 4)

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 5

AREA OF CONCERN FOR SURFACE SOIL

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

used in the quantitative assessment were obtained from USEPA's Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Tables (HEAST), and the National Center for Environmental Assessment (NCEA). The hierarchy presented here, which was used in the Phase I risk assessment, was current when the risk assessment was performed. Had the risk assessment been performed currently, the hierarchy would be different. However, the toxicity values for all of the primary risk-driving chemicals were obtained from IRIS. Under both the previous and current hierarchies, IRIS is identified as a Tier 1 source. Therefore, no significant change to either the risk assessment, or the remedy selection process, would be expected.

2.7.1.5 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

where:
risk = a unitless probability (e.g., 2×10^{-5}) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$.

These risks are probabilities that usually are expressed in scientific notation (e.g., $1x10^{-6}$). An excess lifetime cancer risk of $1x10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. USEPA identifies cancer risks of 10^{-6} to 10^{-4} as a target range within which USEPA strives to manage risks for site-related exposures for Superfund sites.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called an HQ. An HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The HI is generated by adding the HQs for all chemicals of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI>1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

$$\text{Non-cancer HQ} = CDI/RfD$$

where:
CDI = Chronic daily intake
RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

2.7.1.5.1 Site 25/26 Soil

Upon completion of the Phase I RI, because of the limited risk at the site, the Army had not yet determined if the data warranted the performance of an FS. Additionally, a final recommendation for the site based on both human health and ecological concerns had not been made in the Phase I RI. In 2000, IT completed an RMP to further evaluate the human health and ecological risks and to determine whether the data warranted the performance of an FS. The recalculated risk in the RMP included the results from the 1997 additional soil investigation. Risk estimates were revised for the three primary risk drivers at Site 25, benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. **Table 4** presents the revised risk estimates for contaminants with carcinogenic endpoints at Site 25. The risk drivers at Site 26 were PCBs, and CDDs, including 1,2,3,7,8-pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD) and 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). **Table 5** presents the risk estimates for contaminants with carcinogenic endpoints at Site 26.

Table 4[a]: Site 25 Risk Characterization Summary – Carcinogens

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Outdoor Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Benz(a)anthracene	4.0×10^{-7}	0	0	4.0×10^{-7}
			Benzo(a)pyrene	7.0×10^{-7}	0	0	7.0×10^{-7}
			Benzo(b)fluoranthene	2.0×10^{-7}	0	0	2.0×10^{-7}
						TOTAL RISK	**1.3×10^{-6}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Industry/Research Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Benz(a)anthracene	7.0×10^{-6}	0	0	7.0×10^{-6}
			Benzo(a)pyrene	9.0×10^{-6}	0	0	9.0×10^{-6}
			Benzo(b)fluoranthene	3.0×10^{-6}	0	0	3.0×10^{-6}
						TOTAL RISK	**1.9×10^{-5}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Construction/Excavation Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Total Soil	Total Soil	Benz(a)anthracene	8.0×10^{-7}	0	0	8.0×10^{-7}
			Benzo(a)pyrene	1.0×10^{-6}	0	0	1.0×10^{-6}
			Benzo(b)fluoranthene	3.0×10^{-6}	0	0	3.0×10^{-6}
						TOTAL RISK	**4.8×10^{-6}**

[a] Risk results for Site 25 from Risk Management Plan (IT, 2000a). All estimated hazards less than 1.0.

Table 5[a]: Site 26 Risk Characterization Summary – Carcinogens

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Outdoor Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	PCBs - total	1×10^{-7}	0	1×10^{-6}	1.1×10^{-6}
			2,3,7,8-TCDD	3×10^{-8}	4×10^{-10}	3×10^{-7}	3.3×10^{-7}
			12378-PeCDD	2×10^{-8}	2×10^{-10}	2×10^{-7}	2.2×10^{-7}
						TOTAL RISK	**1.7×10^{-6}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Industrial/Research Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	PCBs - total	1×10^{-6}	0	1×10^{-5}	1.1×10^{-5}
			2,3,7,8-TCDD	4×10^{-7}	5×10^{-9}	2×10^{-6}	2.4×10^{-6}
			12378-PeCDD	2×10^{-7}	2×10^{-9}	1×10^{-6}	1.2×10^{-6}
						TOTAL RISK	**1.5×10^{-5}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Construction/Excavation Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Total Soil	Total Soil	PCBs - total	3×10^{-7}	0	2×10^{-7}	5.0×10^{-7}
			2,3,7,8-TCDD	1×10^{-7}	2×10^{-8}	7×10^{-8}	1.9×10^{-7}
			12378-PeCDD	6×10^{-8}	1×10^{-8}	4×10^{-8}	1.1×10^{-7}
			Cadmium	0	1×10^{-6}	0	1.0×10^{-6}
						TOTAL RISK	**1.8×10^{-6}**

[a] Risk results for Site 26 from Dames and Moore, 1998a. All estimated hazards less than 1.0.

At Site 25, excess non-cancer hazard was estimated to be 0.02, 0.01, and 0.04 for the outdoor maintenance worker, industry/research worker, and construction/excavation worker respectively. The contaminant that accounted for the most elevated HI was cadmium. Cadmium makes up nearly 100% of the HI for current outdoor maintenance workers and future industrial/research workers, and 50% of the HI for future construction workers. **Table 6** presents the excess non-cancer hazard for Site 25.

At Site 26, excess non-cancer hazard was estimated to be 0.09, 0.1, and 0.5 for the outdoor maintenance worker, industry/research worker, and construction/excavation worker respectively. The contaminant that accounted for the most elevated HI was cadmium. Cadmium makes up nearly 90% of the HI for current outdoor maintenance workers, approximately 60% for industry/research workers and nearly 75% of the HI for future construction workers. The results of the HHRA indicated that noncarcinogenic hazards did not exceed the HI criterion of 1 for any of the receptors. **Table 7** presents the excess non-cancer hazard for Site 26.

2.7.2 Ecological Risk Assessment

Dames and Moore conducted an Ecological Risk Assessment (ERA) at Site 25/26 as part of the Phase I RI. The ERA used the veery, the barred owl, and the American Woodcock as the study species. The calculated ecological hazards were found to be sufficiently elevated to warrant some form of risk management attention or monitoring. IT completed a Phase I RMP report to further evaluate the ecological risks at Site 25/26. The RMP determined that ecological hazards at Site 25/26 are borderline and acceptable for all surface soil contaminants of potential ecological concern (COPECs), except for selenium and DDT. Analytical results from the Facility-Wide Background Investigation performed by IT in September 2000 indicated that the background threshold value for selenium was higher than detections of selenium at Site 25/26. Therefore, selenium was eliminated from the list of COPECs. Remedial action is not warranted for DDT because: 1) The SCL, based on NJDEP NRDCSCC standards, is higher than the maximum detected concentration of DDT in surface soil; 2) The site is too small to support enough species of concern, such as the veery, the barred owls, and the American Woodcock; and, 3) The ecological receptors do not spend a sufficient amount of time contacting the affected media.

2.7.3 Risk Assessment Conclusions

The highest levels of potential risk to human health are to the Picatinny Arsenal industrial/research worker due to dermal PAH exposure. The results of the HHRA indicated that noncarcinogenic hazards did not exceed the HI criterion of 1 for any of the receptors.

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are based on human health and environmental factors, which are considered in the formulation and development of response actions. Such objectives are developed based on criteria outlined in Section 121 of SARA and the NCP. The RAOs for Site 25/26 have been developed in such a way that attainment of these goals will result in the protection of human health, ecological receptors, and the environment. The RAOs are specific to the contaminated soil originating from Site 25/26. The RAOs for Site 25/26 are:

- Prevent exposure to contaminated soil impacted by COCs above the SCLs.

Table 6[a]: Site 25 Non-Carcinogenic Effect Summary

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Outdoor Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Beryllium	6×10^{-6}	0	0	6×10^{-6}
			Cadmium	2×10^{-4}	0	2×10^{-2}	2×10^{-2}
			Chromium	1×10^{-6}	0	0	1×10^{-6}
						TOTAL	**2×10^{-2}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Industry/Research Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Beryllium	8×10^{-5}	0	0	8×10^{-5}
			Cadmium	3×10^{-3}	0	1×10^{-2}	1×10^{-2}
			Chromium	1×10^{-5}	0	0	1×10^{-5}
						TOTAL	**1×10^{-2}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Construction/Excavation Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Total Soil	Total Soil	Antimony	9×10^{-3}	0	0	9×10^{-3}
			Cadmium	5×10^{-3}	0	2×10^{-2}	2×10^{-2}
			Nickel	4×10^{-3}	0	0	4×10^{-3}
						TOTAL	2×10^{-2}

[a] Risk results for Site 25 from Risk Management Plan (IT, 2000a). All estimated hazards less than 1.0.

Table 7[a]: Site 26 Non-Carcinogenic Effect Summary

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Outdoor Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Mirex	1×10^{-3}	0	0	1×10^{-3}
			Cadmium	1×10^{-3}	0	8×10^{-2}	8×10^{-2}
			Copper	3×10^{-3}	0	0	3×10^{-3}
						TOTAL	**9×10^{-2}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Industry/Research Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Surface Soil	Mirex	2×10^{-2}	0	0	2×10^{-2}
			Cadmium	7×10^{-2}	0	5×10^{-2}	6×10^{-6}
			Copper	3×10^{-2}	0	0	3×10^{-2}
						TOTAL	**1×10^{-1}**

Scenario Time Frame: Current/Future
Receptor Population: Picatinny Arsenal Construction/Excavation Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Predominant Contaminants	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Total Soil	Total Soil	Mirex	4×10^{-2}	0	0	4×10^{-2}
			Cadmium	7×10^{-2}	0	3×10^{-1}	3.7×10^{-1}
			Copper	1×10^{-1}	0	0	1×10^{-1}
						TOTAL	**5×10^{-1}**

[a] Risk results for Site 26 from Dames and Moore, 1998a. All estimated hazards less than 1.0.

2.9 DESCRIPTION OF ALTERNATIVES

Site 25/26 has undergone an RI/FS in accordance with the CERCLA process. The RI phase is the mechanism for collecting data to characterize the site and assess potential human health and ecological risk. The RI phase is followed by the FS phase, which involves the development, screening, and detailed evaluation of remedial alternatives.

It should be noted that two of the three RAOs that were listed in the FS and the Proposed Plan are not presented in this ROD. The two RAOs were: "Protect uncontaminated media from impact by COCs above SCLs" and "Prevent impact to groundwater by site COCs". The COCs at the site do not readily migrate in the soil column; therefore, these RAOs are unnecessary and their removal does not change the fundamental objective or protectiveness of the Selected Remedy."

General Response Actions (GRAs) are broad categories of remedial actions that could be taken to achieve the RAOs for the media and COCs at the site. The GRAs that can potentially be used to achieve the RAOs for Site 25/26 are: No Action, LUCs, Containment, Removal, Treatment, and Disposal. Numerous remedial technologies were identified for each GRA and screened with respect to their suitability for use at Site 25/26 based on compatibility with site and contaminant characteristics, ability to achieve RAOs, and cost. The remedial technologies were combined to form the eight remedial action alternatives listed on **Table 8**.

Table 8: Estimated Completion Times for the Site 25/26 Alternatives

NUMBER	ALTERNATIVE	CLEANUP TIME (weeks)	O&M (yrs)
1	No Action	NA	NA
2	Implementation of LUCs	NA	30
3	Limited Action with Site Improvements, Slope Stabilization, and LUCs	Not Evaluated	
4	Installation of a Vegetated Soil Cover and LUCs	6	30
5	Installation of a Water Harvesting Landfill Cap and LUCs	Not Evaluated	
6	Installation of a Multi-Layered Cap and LUCs	18	30
7	Excavation, Off-site Disposal, and LUCs	5	30
8	Extension of the Existing Parking Lot and LUCs	4	30

All of the alternatives, with the exception of Alternative 1 require LUCs to limit the use of portions of the property because the SCLs were developed based on a restricted use scenario. These resource-use restrictions are discussed in each alternative as appropriate. Monitoring to ensure the effectiveness of the remedy is a component of each alternative except the "no-action" alternative. All alternatives, except the "no-action" alternative, are expected to attain the RAOs.

According to USEPA guidance (1988), screening of remedial alternatives may be required, depending on the complexity of the site and media requiring remediation, the number of suitable technologies available for implementation, and the number of remedial action alternatives that are initially developed. Due to a large number of potentially applicable remedial action alternatives identified, a screening process was conducted to limit the number of alternatives to be analyzed and evaluated in detail based on the criteria of effectiveness, implementability, and cost. As a result, Alternatives 3 and 5 were eliminated from further consideration.

The effectiveness of **Alternative 3** would be comparable with Alternative 2. However, the implementation cost of this alternative is higher than Alternative 2. Therefore, the additional benefit afforded by Alternative 3 is marginal compared to Alternative 2.

Alternative 5 would effectively meet the RAOs. Alternative 5 also presents an additional benefit in terms of its ability to store and distribute excess water during wet seasons or heavy precipitation events, which will minimize the infiltration of precipitation to groundwater. However, this additional benefit would result in only a minor increase in protection of human health and the environment because the impact of

contaminated soil on the groundwater quality is minimal. The remaining alternatives are discussed below. The estimated costs associated with each alternative are presented in Section 2.10.2.5.

2.9.1 Alternative 1: No Action

CERCLA and the NCP require that a No Action alternative be evaluated at every site to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial action would take place.

2.9.2 Alternative 2: Implementation of LUCs

Property access restrictions, such as site security, and restrictions on future site activities, are already in place at Site 25/26. Enforcement of these restrictions will ensure the protection of human health. Some restrictions are already in place at Picatinny Arsenal by virtue of it being an active military installation. However, in the event that Picatinny Arsenal would be closed and declared excess property, the land use restrictions would be legally recorded (e.g., in zoning ordinances, property deeds, etc.) and incorporated into the provisions for the new land use. A change in land use would include the reevaluation of cleanup requirements and a notification and concurrence requirement to USEPA and NJDEP.

Because contamination would remain in place as part of this alternative, LUCs to ensure protectiveness would be required. Additionally, LUCs would be required because risks were not calculated for the unrestricted use scenario. LUCs are administrative measures put in place to affect human activity in order to preclude undesirable land use. In the case of Site 25/26, LUCs will be established to preclude activities that could lead to human exposure to environmental contaminants. Although precluding contact with buried munitions is not a specific RAO for this site, implementation of LUCs will ensure protection from potential contact with buried munitions. The provisions and requirements of the LUC portion of this remedy necessary to ensure that land use remains safe and appropriate for the level of protection afforded by the remedial action will be detailed in the remedial design after the ROD has been signed.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentrations of hazardous substances in the soil are at such levels to allow for unrestricted use and exposure. An LUC remedial design will be prepared as the land use component of the remedial design. Within 90 days of ROD signature, the Army will prepare and submit to the USEPA for review and approval an LUC remedial design that shall contain implementation and maintenance actions, including periodic inspections.

The following LUC objectives will be met by implementation of LUCs:

- Prevent site access for intrusive work without UXO precautions;
- Maintain the engineering controls that provide a barrier to direct contact with contaminated soils that exceed the $1x10^{-6}$ level; and,
- Maintain a land use that is consistent with the remedial action.

The remedy of LUCs will enforce the maintenance of existing engineering controls of a vegetative cover to provide a barrier between human receptors, under current and reasonably anticipated future use scenarios, and soils with contaminants that exceed the $1x10^{-6}$ level. A change in the land use that alters the engineering control, affecting the barrier between human receptors and soils with contaminants that exceed the $1x10^{-6}$ level, shall include a requirement to achieve the RAO of this ROD in the final site development to maintain protectiveness to human health and the environment. The LUC objectives listed above will be met through the implementation of LUCs as part of all remedial alternatives. LUCs will be continued and five-year reviews, including visual inspection of the vegetated soil cover, will be performed for Site 25/26. The area of applicability of LUCs is shown on **Figure 8**. In the interest of streamlining this text, these details will not be repeated in the discussion of each alternative.

2.9.3 Alternative 4: Installation of a Vegetated Soil Cover and LUCs

This containment option uses a vegetated soil cover to prevent exposure to the contaminated soil. Approximately 15,064 square ft would be covered in this remedial option. If selected, the vegetation will be planted and maintained in accordance with recommendations from the U.S. Fish and Wildlife Service.

The soil cover will consist of a common earth fill layer of 12 inches. The purpose of this layer is to provide a buffer between the contaminated soil and possible future site activities, and to provide adequate drainage to eliminate water ponding. Then a 6-inch thick layer of topsoil would be placed above the common earth fill layer. The purpose of this layer is to provide soil suitable for growth of vegetation. Additionally, implementation of LUCs to ensure protectiveness and long-term monitoring will be performed in conjunction with this alternative. A full description of the LUCs that would be implemented as part of this alternative can be found in the discussion of Alternative 2 in Section 2.9.2. Enforcement of these controls would also ensure the integrity of the cover. **Figure 6** shows the AOC and a cross section for Alternative 4.

2.9.4 Alternative 6: Installation of a Multi-layer Cap (RCRA C) and LUCs

This remedial alternative would include a multi-layer capping system (Resource Conservation and Recovery Act [RCRA] C cap) to contain the contaminated soil in place. The total area to be capped is approximately 15,064 square ft. If selected, this cap will be implemented in accordance with grass seed mixture and maintenance recommendations from the U.S. Fish and Wildlife Service.

The RCRA C cap would include grading to promote positive drainage, placement and compaction of a 12-inch thick common fill layer, placement and compaction of a 2-foot thick low permeability clay layer, placement of a 12-inch thick drainage layer, placement of a synthetic barrier layer (> 20 mil thickness), placement and compaction of a 24-inch thick vegetative layer, and application of vegetation. **Figure 6** includes a cross section of the RCRA landfill cap.

The cap would prevent direct contact and prevent the spread of contaminated soil through erosion or wind dispersion, and reduce infiltration of surface water runoff. Additionally, implementation of LUCs to ensure protectiveness and long-term monitoring will be performed in conjunction with this alternative. A full description of the LUCs that would be implemented as part of this alternative can be found in the discussion of Alternative 2 in Section 2.9.2. Enforcement of these controls would also ensure the integrity of the cap.

2.9.5 Alternative 7: Excavation of Contaminated Soil with Off-site Disposal and LUCs

This remedial alternative would involve excavation and off-site disposal of contaminated soil at a permitted RCRA D or sanitary landfill. The total area of excavation is approximately 13,900 square ft. This area is based on the results of previous investigations and the delineation of the AOCs, and accounts for additional area due to sloped excavation sidewalls. Based on this area and a depth of 2.5 ft, the volume of soil to be excavated is approximately 1,300 cubic yards. **Figure 6** presents the limits of excavation for Alternative 7.

Excavation of the contaminated soil would be performed using standard earthmoving equipment (tracked excavators, dump trucks, etc.) and techniques. Prior to excavation, erosion and sedimentation controls would be installed. Water spray will be used to control dust created during excavation. To further delineate the area that needs to be excavated, additional surface soil sampling will be performed prior to excavation. Post-excavation confirmatory samples will also be collected to verify that contamination has been removed. The excavation will be backfilled with clean soil, and approximately six inches of topsoil will be placed on top.

Under Alternative 7, the SCLs are based on non-residential criteria. Therefore, even though soil contaminants would be removed, implementation of LUCs to ensure protectiveness will be performed in conjunction with this alternative. A full description of the LUCs that would be implemented as part of this alternative can be found in the discussion of Alternative 2 in Section 2.9.2.

2.9.6 Alternative 8: Extension of the Existing Parking Lot and LUCs

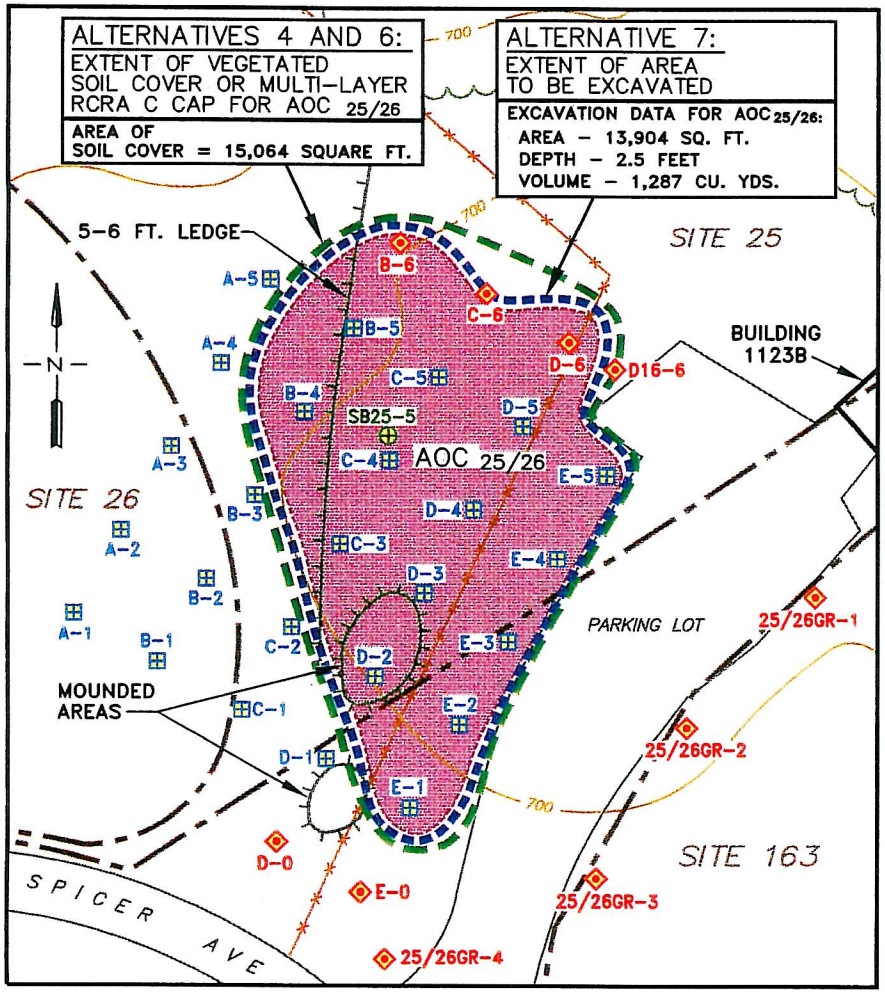
This alternative would involve construction of an asphalt pavement cap to extend the existing parking lot for the adjacent park and the parking lot accessories, including the storm drainage system, and implementation of LUCs. The area of additional pavement is approximately 17,775 square ft.

The construction of asphalt pavement would include excavation, redistribution, and grading of soil to promote positive drainage; compaction of soil; placement and compaction of a 6-inch thick stone base layer; placement and compaction of a 2-inch thick base course layer; placement of a 1-inch thick layer of

asphalt topping; and construction of a storm drainage system. **Figure 7** shows details of the asphalt parking lot extension. Additionally, implementation of LUCs to ensure protectiveness and long-term

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 067\Drawings from ROD\ROD Drawings_revised.dwg
Plot Date/Time: Jan 15, 2007 – 1:02pm
Plotted By: rsagana

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
RLS	--	TEC	--	TL	--	AOC-REMALT.dwg



LEGEND:

- FENCE
- TREE LINE
- 700 TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- AREA OF CONCERN (AOC)
- 1993/1994 PHASE I RI SOIL BORING LOCATION
- 1997 ADDITIONAL SOIL SAMPLE LOCATION (PAHs)
- 2002 SDGI SOIL SAMPLE LOCATION (PAHs)

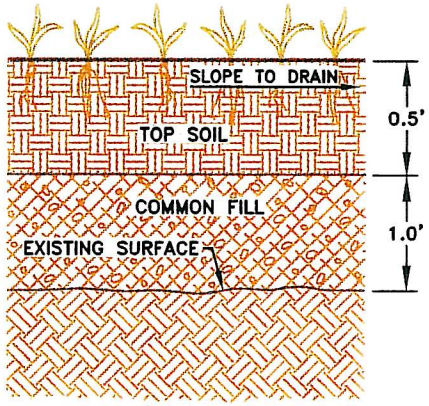
60 0 60
SCALE IN FEET

REMEDIAL ALTERNATIVES SHOWN ON THIS SHEET:

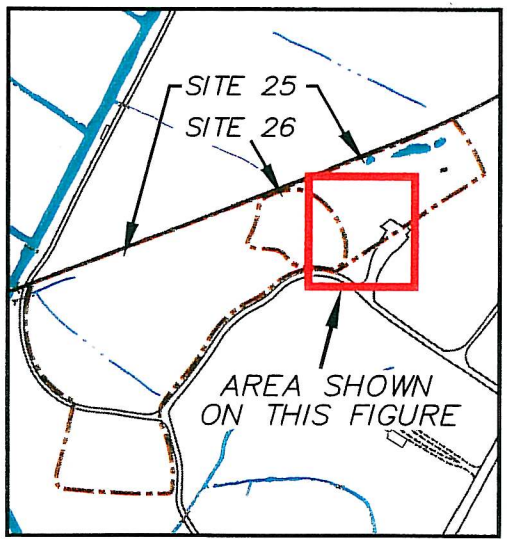
ALTERNATIVE 4:
INSTALLATION OF A VEGETATED SOIL COVER

ALTERNATIVE 6:
INSTALLATION OF A MULTI-LAYER RCRA C CAP

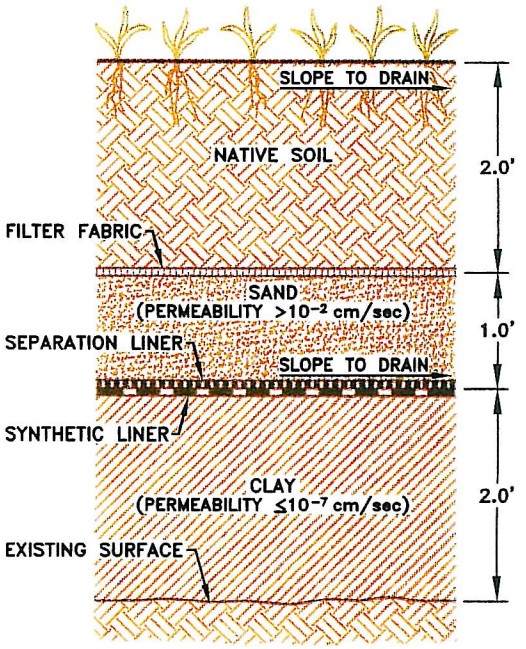
ALTERNATIVE 7:
EXCAVATION AND OFF-POST DISPOSAL



DETAIL
VEGETATED SOIL COVER
(REMEDIAL ALTERNATIVE 4)
(SELECTED REMEDY)
NOT TO SCALE



KEY PLAN SCALE IN FEET 0 600



DETAIL
MULTI-LAYER RCRA C CAP
(REMEDIAL ALTERNATIVE 6)
NOT TO SCALE

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 6

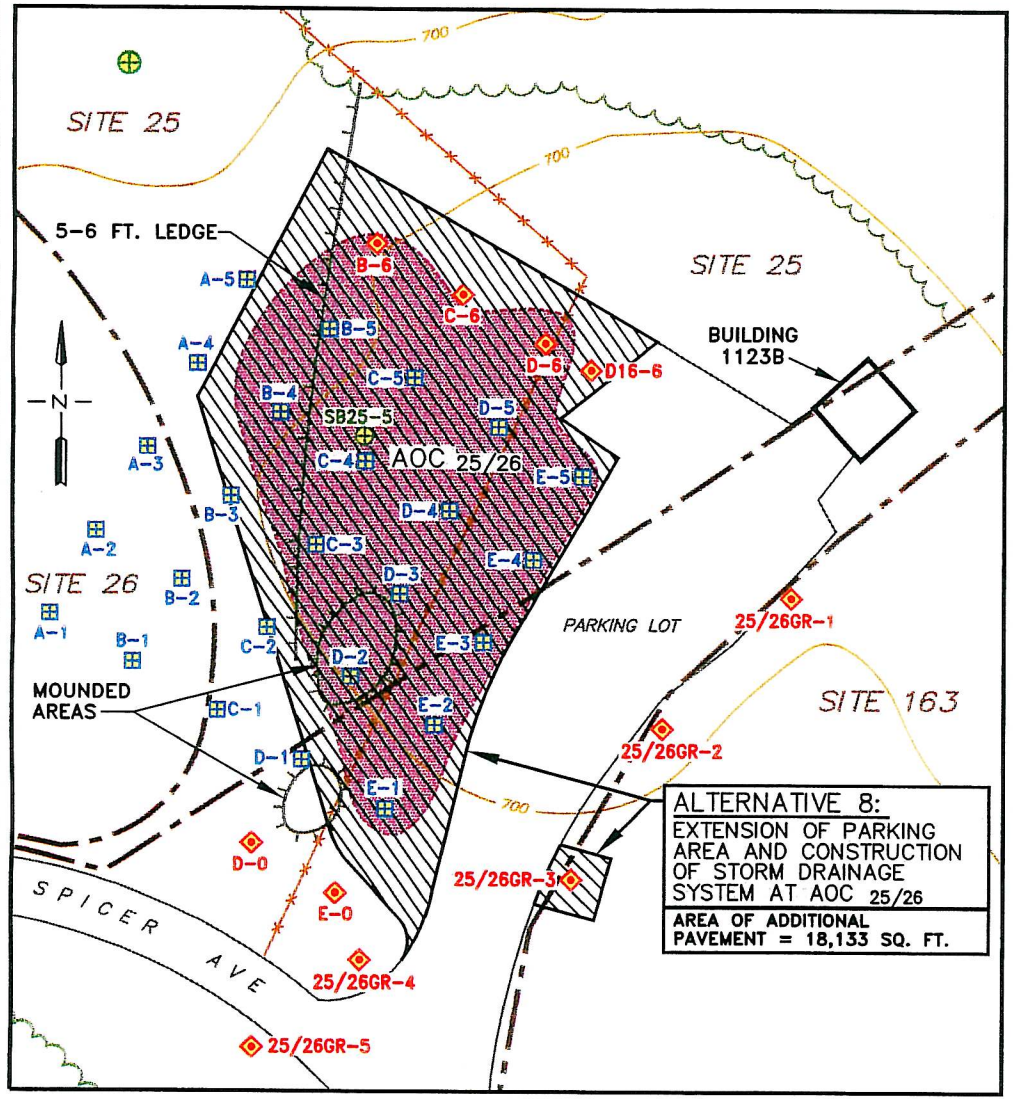
REMEDIAL ALTERNATIVES 4, 6, & 7

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 067\Drawings from ROD\ROD Drawings_revised.dwg
Plot Date/Time: Jan 15, 2007 - 1:04pm
Plotted By: rsagana

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
RLS	--	TEC	--	TL	--	AOC-REMALT.dwg

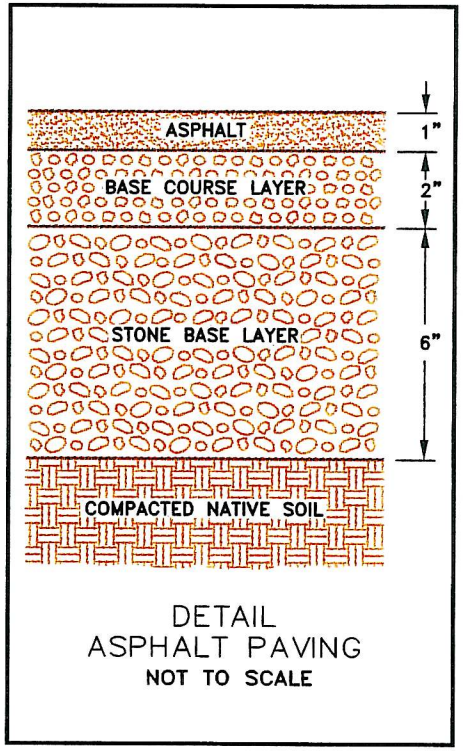


ALTERNATIVE 8:
EXTENSION OF PARKING AREA AND CONSTRUCTION OF STORM DRAINAGE SYSTEM AT AOC 25/26

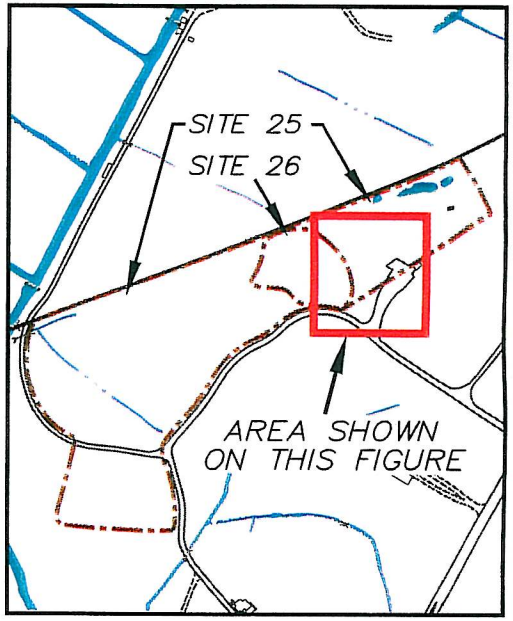
AREA OF ADDITIONAL PAVEMENT = 18,133 SQ. FT.

LEGEND:

- FENCE
- TREE LINE
- 700 TOPOGRAPHIC CONTOUR
- SITE BOUNDARY
- AREA OF CONCERN (AOC)
- 1993/1994 PHASE I RI SOIL BORING LOCATION
- 1997 ADDITIONAL SOIL SAMPLE LOCATION (PAHs)
- 2002 SDGI SOIL SAMPLE LOCATION (PAHs)



DETAIL
ASPHALT PAVING
NOT TO SCALE



KEY PLAN SCALE IN FEET 0 600

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

FIGURE 7

REMEDIAL ALTERNATIVE 8

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

monitoring will be performed in conjunction with this alternative. A full description of the LUCs that would be implemented as part of this alternative can be found in the discussion of Alternative 2 in Section 2.9.2.

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

The Army and USEPA selected the preferred alternative by evaluating each of the alternatives against the nine criteria established by USEPA. These criteria are described below.

The advantages and disadvantages of each of the alternatives were compared using the nine CERCLA evaluation criteria established by USEPA in Section 300.430(e) of the NCP. The detailed comparative analysis of all the alternatives is provided in the FS for Site 25/26; a summary of this comparison is provided in the following text.

2.10.1 Threshold Criteria

2.10.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment by eliminating, reducing, or controlling exposure to human or environmental receptors. Generally, a response action is implemented following NCP guidance when site-specific excess carcinogenic risk to human health exceeds one in ten thousand ($1x10^{-4}$). The response action selected in this ROD is based on estimated excess human health risk greater than one in one million ($1x10^{-6}$), which is within USEPA's target range for managing risks as part of a Superfund Cleanup, but greater than NJDEP standards for excess risk in discrete AOCs. Based on current and reasonably anticipated future land use, potential risks to human health were found to be within the USEPA target range of $1x10^{-6}$ to $1x10^{-4}$. However, the Army agreed to evaluate response actions on a case-by-case basis that will eliminate the exposure pathway for each discrete AOC where the risk exceeds the $1x10^{-6}$ level; to evaluate the implementation of LUCs in accordance with the agreed to Department of Navy Principles which state that LUCs will be used where contaminants are left in place to ensure that such contaminants do not pose an unacceptable risk to human health or the environment; and document the decision in a condensed decision document.

Except for Alternative 1, No Action, each of the other alternatives is protective of human health. Alternative 1 is not considered protective. Alternative 1 does not include any additional remedial activity that reduces potential site risks. However, the existing security gate, access restrictions, and current zoning help prevent human exposure.

Under Alternative 2, protection of the ecological receptors would not be achieved, although the results of the ERAs performed for the site indicate that remedial action is not warranted based on ecological risks. Although Alternative 2 does not address the potential for contaminant migration to groundwater, previous investigations at Site 25/26 indicated that the impact of the contaminated soil on the groundwater is minimal.

Alternative 4 is protective of human health and ecological receptors. However, the degree of long-term protection is dependent on proper maintenance as well as enforcement of land use and access restrictions. Alternative 4 would also be protective of the environment (groundwater, surface water, and air) because it would prevent the migration of the contaminated soil via wind dispersion, surface erosion, runoff, and groundwater infiltration.

Alternative 6 would be protective of human health, ecological receptors, and the environment. The cap would prevent the transport of the contaminated soil to surface water bodies during rain events and minimize the infiltration of contaminants to groundwater.

Alternative 7 provides complete protection of human health, ecological receptors, and the environment because contaminated soil would be removed from the site.

Alternative 8, similar to Alternative 4, is protective of human health and ecological receptors, as long as the integrity of the pavement is maintained.

2.10.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses if a remedy would meet all of the Applicable or Relevant and Appropriate Requirements (ARARs) related to the hazardous substances at the site and the circumstances of their

release. ARARs are Federal and State environmental laws and promulgated regulations identified for the cleanup.

With the exception of the no action alternative, Alternative 1, all alternatives comply with ARARs as discussed in detail in the Site 25/26 FS. All alternatives, with the exception of Alternative 1, include implementation of LUCs for the duration of the remedial action to ensure protection of the environmental receptors. For Alternatives 4, 6, 7, and 8, compliance with the location- and action-specific ARARs is readily achievable with currently available technologies.

2.10.2 Primary Balancing Criteria (identifies major trade-offs among alternatives)

2.10.2.1 Long-term Effectiveness and Permanence

This criterion addresses the remaining risk and the ability to protect human health and the environment over time, once cleanup levels have been met.

Alternative 1 provides no long-term effectiveness or permanence. Alternatives 2, 4, 6, and 8 reduce the long-term risks by eliminating direct contact human exposure pathways. Permanent reduction of risks for Alternatives 4, 6, and 8 could be accomplished through proper construction, appropriate and extended maintenance, and proper enforcement of LUCs. Alternative 7 is effective and permanent.

2.10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the anticipated performance of treatment systems that permanently and significantly reduce toxicity, mobility, or volume of hazardous substances as a principal threat at the site.

Alternatives 1 and 2 would not actively reduce the toxicity, mobility, or volume of the contaminated soil. Alternatives 4, 6, and 8 would not reduce the toxicity or volume of contaminated soil, but they would reduce the mobility through containment. Alternatives 4 and 8 would reduce the potential migration of contaminants to groundwater, and Alternative 6 would eliminate the potential migration of contaminants to groundwater. Alternative 7 would provide reduction in toxicity, mobility and volume through removal and off-site disposal of the contaminated soil.

2.10.2.3 Short-term Effectiveness

This criterion addresses impacts to the community and site workers during cleanup including the amount of time it takes to complete the action.

Alternatives 1 and 2 do not pose any hazards to workers in the short-term. Alternatives 4, 6, and 8 would not produce significant short-term impacts on workers, the surrounding community, or the environment; these three alternatives would result in some dust generation, but risks would be controlled through the use of suitable protective equipment by site workers, food safety construction practices, real-time air monitoring, and standard dust suppression techniques (i.e., water spray). Alternative 7 would produce acceptable risks, but greater than Alternatives 4, 6, and 8. Additional risks associated with the transportation of the contaminated soil on public roadways would include the potential for highway accidents involving hauling vehicles. Following appropriate Department of Transportation, State, and local shipping requirements for all transportation-related activities would minimize the risks associated with waste transportation.

2.10.2.4 Implementability

This criterion addresses the technical and administrative feasibility of an alternative, including the availability of materials and services required for cleanup.

Alternative 1 would require no resources to implement. Alternatives 2, 4, 6, 7, and 8 are readily implementable. The required equipment, services, and materials are readily available, as are the required off-site disposal facilities. Administratively, no permitting issues or regulatory approval are anticipated for implementation of these alternatives.

2.10.2.5 Cost

This criterion compares the differences in cost, including capital, operation, and maintenance costs.

Present worth costs were calculated with a discount rate of 7 percent for each alternative. **Table 9** shows the estimated present worth and capital cost for each alternative for Site 25/26.

Table 9: Summary of Costs of Remedial Alternatives

Alternative	Capital	Lifetime O&M	Present Worth
Alternative 1	No costs associated with this alternative.		
Alternative 2	$19,600	$108,600	$128,200
Alternative 4	$191,500	$259,400	$450,900
Alternative 6	$410,700	$390,400	$801,100
Alternative 7	$394,500	$108,600	$503,100
Alternative 8	$140,900	$268,300	$409,200

The FS also evaluated an unrestricted use alternative. This alternative included excavation and off-site disposal of soil exceeding direct contact residential cleanup criteria. The total present worth cost of this alternative of $3,489,335 included a capital cost of $3,380,761 for a 31-week remediation duration.

2.10.3 Modifying Criteria (formally evaluated after the comment period)

2.10.3.1 State Acceptance

This criterion evaluates whether the State agrees with, opposes, or has no comment on the preferred alternative. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

State acceptance was evaluated formally after the public comment period on the Proposed Plan. The Proposed Plan and this ROD were prepared in partnership with USEPA and NJDEP representatives. The NJDEP approved the Proposed Plan for Site 25/26 in August 2004.

Generally, the NJDEP accepts **Alternative 4: Installation of a Vegetated Soil Cover and Implementation of LUCs** for Site 25/26.

2.10.3.2 Community Acceptance

This criterion addresses the issues and concerns the public may have regarding each of the alternatives. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

A final Proposed Plan for Site 25/26 was completed and released to the public in December 2004 at the information repositories listed in Section 2.3. The notice of availability of this document was published on November 24, 2004 in the New Jersey-Star Ledger and the Daily Record. A public meeting was held on December 8, 2004 to inform the public about the Preferred Remedy for Site 25/26 soil and to seek public comments. A public comment period was held from December 8, 2004 to January 8, 2005 during which comments from the public were received.

The Proposed Plan for Site 25/26 presented Alternative 8, Extension of the Existing Parking Lot to Cover the PAH-Contaminated Area and Implementation of LUCs as the preferred alternative. Upon consideration of comments received during the public comment period and further analysis by the Army, the Selected Remedy presented in this ROD is Alternative 4, Installation of a Vegetated Soil Cover and Implementation of LUCs. Both remedial alternatives are cost effective and afford the same level of protection through the use of engineering controls and LUCs to control exposure to site contaminants. Alternative 8 would cover the PAH contaminated soil with an asphalt cover which also contains PAHs. Therefore that remedy would not allow for any future analysis of the soil concentrations, should this future analysis be deemed necessary. Responses to written comments received during the public comment period are presented in the Responsiveness Summary (see Section 3.0). A community relations program has been established and is maintained for Picatinny Arsenal.

Community acceptance was evaluated formally after the public comment period on the Proposed Plan. Community acceptance is addressed in the Responsiveness Summary, Section 3.0, of this ROD.

Present worth costs were calculated with a discount rate of 7 percent for each alternative. **Table 9** shows the estimated present worth and capital cost for each alternative for Site 25/26.

Table 9: Summary of Costs of Remedial Alternatives

Alternative	Capital	Lifetime O&M	Present Worth
Alternative 1	No costs associated with this alternative.		
Alternative 2	$19,600	$108,600	$128,200
Alternative 4	$191,500	$259,400	$450,900
Alternative 6	$410,700	$390,400	$801,100
Alternative 7	$394,500	$108,600	$503,100
Alternative 8	$140,900	$268,300	$409,200

The FS also evaluated an unrestricted use alternative. This alternative included excavation and off-site disposal of soil exceeding direct contact residential cleanup criteria. The total present worth cost of this alternative of $3,489,335 included a capital cost of $3,380,761 for a 31-week remediation duration.

2.10.3 Modifying Criteria (formally evaluated after the comment period)

2.10.3.1 State Acceptance

This criterion evaluates whether the State agrees with, opposes, or has no comment on the preferred alternative. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

State acceptance was evaluated formally after the public comment period on the Proposed Plan. The Proposed Plan and this ROD were prepared in partnership with USEPA and NJDEP representatives. The NJDEP approved the Proposed Plan for Site 25/26 on in August 2004.

Generally, the NJDEP accepts **Alternative 4: Installation of a Vegetated Soil Cover and Implementation of LUCs** for Site 25/26.

2.10.3.2 Community Acceptance

This criterion addresses the issues and concerns the public may have regarding each of the alternatives. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

A final Proposed Plan for Site 25/26 was completed and released to the public in December 2004 at the information repositories listed in Section 2.3. The notice of availability of this document was published on November 24, 2004 in the New Jersey-Star Ledger and the Daily Record. A public meeting was held on December 8, 2004 to inform the public about the Preferred Remedy for Site 25/26 soil and to seek public comments. A public comment period was held from December 8, 2004 to January 8, 2005 during which comments from the public were received.

The Proposed Plan for Site 25/26 presented Alternative 8, Extension of the Existing Parking Lot to Cover the PAH-Contaminated Area and Implementation of LUCs as the preferred alternative. Upon consideration of comments received during the public comment period and further analysis by the Army, the Selected Remedy presented in this ROD is Alternative 4, Installation of a Vegetated Soil Cover and Implementation of LUCs. Both remedial alternatives are cost effective and afford the same level of protection through the use of engineering controls and LUCs to control exposure to site contaminants. Alternative 8 would cover the PAH contaminated soil with an asphalt cover which also contains PAHs. Therefore that remedy would not allow for any future analysis of the soil concentrations, should this future analysis be deemed necessary. Responses to written comments received during the public comment period are presented in the Responsiveness Summary (see Section 3.0). A community relations program has been established and is maintained for Picatinny Arsenal.

Community acceptance was evaluated formally after the public comment period on the Proposed Plan. Community acceptance is addressed in the Responsiveness Summary, Section 3.0, of this ROD.

2.11 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site wherever practicable [NCP §300.430(a)(1)(iii)(A)]. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

The statutory preference for treatment of Site 25/26 soil is not applicable due to the fact that no source materials constituting principal threats need to be addressed as part of this action. The characteristics of PAHs and their fate and transport in the environment are discussed in Section 2.5 of this ROD. As stated herein, PAHs are relatively immobile and readily contained. Additionally, results of the risk assessment indicate no significant risks to human or ecological receptors. Therefore, the contaminants at Site 25/26 do not constitute principal threat waste, and as such the statutory preference for treatment is not applicable for Site 25/26 soil.

With the exception of Alternative 1, No Action, all of the remedial alternatives for Site 25/26 soil address remaining contamination through containment or removal to reduce exposure to both human and ecological receptors.

2.12 SELECTED REMEDY

The Selected Remedy for Site 25/26 is **Alternative 4: Installation of a Vegetated Soil Cover and Implementation of LUCs**. This section provides a detailed description of the selected remedy. This decision is based on the administrative record for the Site.

2.12.1 Summary of the Rationale

The remedy for Site 25/26 was chosen by the RI/FS process. The selected remedy would satisfy the requirement of the RAOs, meet the FS criteria, including provide adequate protection to human health and ecological receptors and be cost effective. Alternative 4 is the preferred alternative for Site 25/26 soil because it provides the best balance between the assessed criteria while still providing overall protection of human health, ecological receptors, and the environment.

The selected remedy meets the threshold criteria and provides the best overall balance of tradeoffs in terms of the five balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

The selected remedy addresses State and community concerns by containing the contamination and implementing LUCs to ensure protectiveness.

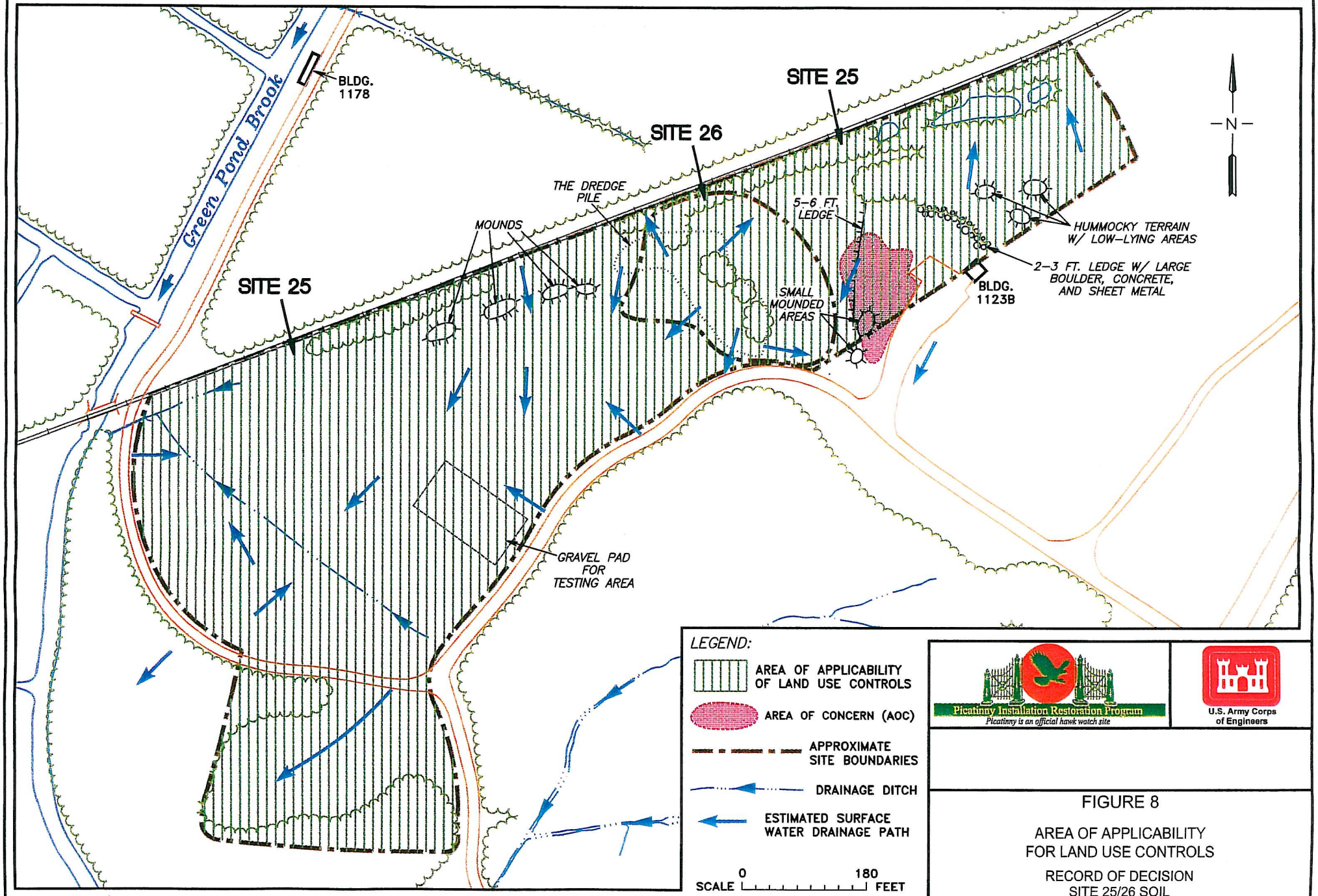
2.12.2 Description of the Selected Remedy

Alternative 4 involves construction of a vegetated soil cover over the AOC to provide a barrier between human receptors and soil with contaminants that exceed the $1x10^{-6}$ level. The area to be covered is approximately 15,064 square ft as depicted on **Figure 6**. In addition, the property will be subject to LUCs to ensure the integrity of the cover and mitigate exposure to the contaminated soil. The area covered by LUCs is depicted on **Figure 8**. The need for long-term groundwater monitoring under this alternative will be addressed in the Area C Groundwater PP. The major components of the selected remedy (Alternative 4) include:

- Design and Permitting – Once the ROD is signed, a remedial design would be prepared. This would include a site-specific work plan describing the remediation and activities, quality assurance/control procedures, technical specifications, erosion and sedimentation control plan, and a site health and safety plan. The design documents, work plans, and permit

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 067\Drawings from ROD\LUC area_revised.dwg
Plot Date/Time: Jan 15, 2007 – 1:06pm
Plotted By: rsagana

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
RLS	--	TEC	--	TL	--	DRAIN-XS.dwg



Picatinny Installation Restoration Program
Picatinny is an official hawk watch site

U.S. Army Corps of Engineers

FIGURE 8

AREA OF APPLICABILITY FOR LAND USE CONTROLS

RECORD OF DECISION
SITE 25/26 SOIL

DRAWINGS PROVIDED BY SHAW ON SEPTEMBER 2006; MODIFIED BY ARCADIS ON JANUARY 2007.

equivalents would be submitted for review and approval by the appropriate agencies prior to initiation of remedial activities.

- The health and safety plan would outline the physical and chemical hazards associated with the work to be performed at the site and would serve as the instrument of control for ensuring the health and safety of personnel working on the site.
- Permit equivalents may also be required, including a general storm water permit equivalent (i.e., New Jersey Pollution Discharge Elimination System Permit).
- UXO Screening Survey – The Picatinny Arsenal Safety Office has indicated that a UXO safety survey for non-intrusive activities will be required. Based on the existing site use and the determination by the Picatinny Arsenal Safety Office, there may be explosive ordnance disposal activities associated with this remedial alternative. A 40% mark up would be added to account for the UXO screening for certain cost associated with construction activities, such as clearing and grubbing, excavation, and sampling.
- Contractor and Material Procurement – This task would include preparation of bid packages for the remedial activities, solicitation of bids, bid review, and contractor selection. Materials and equipment required to complete the remedial activities would also be selected and procured.
- Mobilization and Site Preparation – The first phase of the site improvement would include mobilization of the required personnel and equipment, establishment of support facilities, and site preparation.
- Facilities may include office trailers, support and tool trailers, sanitary facilities, and utilities.
- Equipment would include heavy construction equipment and small equipment required for sampling and monitoring.
- Site preparation activities would include construction of temporary equipment and materials staging and decontamination areas, and implementation of erosion and sedimentation controls.
- Construct a vehicle decontamination pad to allow for the decontamination of heavy equipment used on site during construction activities. The vehicle decontamination pad will be constructed to contain liquids generated during the decontamination activities. Sand will be used on top of and beneath the liner to smooth existing terrain and to protect the liner from being punctured. Liquids generated during decontamination activities will collect in a sump located at the lowest point of the pad. Decontamination water will be pumped periodically from the sump to a holding tank and will be sampled, analyzed, and disposed of at an appropriate, permitted facility.
- Construct a material stockpile and staging area to provide an area for storage of soils, materials, and miscellaneous equipment to be used in improving the existing site landscape. A "clean" access road constructed of crushed stone may also be required to allow the trucks carrying the soils and materials to enter and exit the site without requiring decontamination.
- Abandon any existing monitoring wells located within the proposed site improvement areas per applicable State and Federal requirements prior to initiating the site improvement activities.
- Install all sediment and erosion controls required to meet applicable local, State, and Federal guidelines prior to ground clearing operations. These sediment controls will be properly maintained during the site improvement, and will be removed at the conclusion of construction, unless they are part of the permanent design. At a minimum, the sediment controls will consist of installation of a silt fence and straw bale barriers, and construction of a stabilized entrance through which construction traffic will enter and exit the site.
- Clearing and Grubbing – Includes removal of trees, brush, vegetation, and debris in the areas where site improvement will be performed and in areas where support facilities will be located.

- Vegetated Soil Cover Installation – The construction of the soil cover would include grading to promote positive drainage; placement and compaction of a 12-inch thick common fill layer to provide a barrier between the soils with contaminants that exceed the $1x10^{-6}$ level and human receptors and to provide adequate drainage to eliminate water ponding; placement and compaction of a 6-inch thick layer of topsoil over the common fill to provide soil suitable for growth of vegetation.
- Revegetation – A vegetative cover will be planted as soon as practicable following installation of the topsoil layer. The vegetative cover will provide surface stability by minimizing potential for surface erosion and will consist of grass and mulch. Seed and mulch will be placed by mechanical means. Vegetation will be planted and maintained in accordance with recommendations from U.S. Fish & Wildlife Service.
- Grading – Grading of the surrounding area will be performed as necessary to ensure proper drainage of surface runoff. Construction of surface water conveyance systems may be constructed as necessary based on design requirements. Runoff collection and conveyance would be considered during the design phase to comply with all ARARs.
- Long-Term O&M – The vegetated soil cover will require long-term site inspection and O&M, including mowing and periodic cover maintenance and replacement of vegetative soil layer due to weathering, and stabilization of repaired areas with grass seeding and straw mulch. Visual drive-by site inspection will be performed quarterly and a formal O&M and inspection report will be submitted every 5 years.
- The selected remedy will comply with the requirements in N.J.A.C. 7:26E-8.1. This includes the monitoring, maintenance and biennial certification of the protectiveness of the remedial action.
- Implement and maintain LUCs – LUCs will state that the landfill cover will be maintained and the LUCs be continued until contaminant levels are shown to allow unrestricted use.

The following LUC objectives for Site 25/26 will be met by implementation of LUCs:

- Prevent site access for intrusive work without UXO precautions.
- Maintain the engineering controls that provide a barrier to direct contact with contaminated soils that exceed the $1x10^{-6}$ level.
- Maintain a land use that is consistent with the remedial action.
- Conduct five-year reviews in accordance with CERCLA and the NCP to ensure the remedy is and will be protective of human health and the environment.

2.12.3 Summary of the Estimated Remedy Costs

The total project estimated present worth cost, if approved, is $450,900, the sum total of which will be paid by the Army. The costs associated with the preferred alternative for Site 25/26 soil are outlined in **Table 10**.

The costing information in this section is based on the best available information regarding the anticipated scope of the remedial alternative. Details on the cost items are presented in Appendix B of the Final FS for Site 25/26 (Shaw, 2003). Changes in the cost elements are likely to occur as a result of new information and data collected during the work plan phase and the five-year review(s). Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost. Although a time period of 30 years of O&M was selected for developing a cost estimate, LUCs will be exercised by the Army until such time as the site is determined to be safe for unrestricted use. The lifetime O&M cost was calculated with a 7% discount rate.

Table 10: Summary of Estimated Lifetime Costs of the Selected Remedy	
CAPITAL COST (TOTAL)	**$191,495**
LUCs	$2,000
Permits and Report Writing	$45,000
Site Preparations and Improvements	
Clearing, Grubbing, and Grading	$5,299
Erosion Control	$693
Vehicle and Personnel Decontamination Area	$5,500
Layout and Construction Survey	$3,300
Parking Lot Construction	$24,514
Storm Drainage	$3,571
Construction Oversight	$42,890
Travel and Per Diem	$33,750
Subtotal Capital Costs	***$166,517***
Scope Contingency (15%)	$24,978
O&M AND PERIODIC COSTS (TOTAL – 30 years)	**$259,395**
Annual Inspection	$124,090
Periodic Parking Lot Maintenance	$47,526
Five Year Reviews	$53,945
Subtotal O&M Cost	***$225,561***
Scope Contingency (15%)	$33,834
TOTAL PRESENT WORTH COST	**$450,900**[1]

2.12.4 Expected Outcomes of the Selected Remedy

The RAOs for Site 25/26 would be achieved through implementation of the selected remedy. The estimated outcome would also include compliance with ARARs. However, as contaminants will remain in soil, completion of this action does not allow uncontrolled use of soil at the site. For Site 25/26, enforcement of LUCs will ensure the protection of human health. Some restrictions are already in place at Picatinny Arsenal by virtue of it being an active military installation. However, in the event that Picatinny Arsenal would be closed and declared excess property, the land use restrictions would be legally recorded (e.g., in zoning ordinances, property deeds, etc.) and incorporated into the provisions for the new land use. A change in land use would include the re-evaluation of clean-up requirements and a notification and concurrence requirement to USEPA and NJDEP.

2.13 STATUTORY DETERMINATIONS

The selected remedy satisfies the statutory requirements of CERCLA §121 and the NCP, as described below.

2.13.1 Protection of Human Health and the Environment

Because this alternative does not remove the source of contamination and only relies on natural attenuation processes to reduce concentrations of contaminants in soil to ARAR levels, the environment is still being exposed to the COCs. However, construction of vegetated soil cover over the AOC and implementation of LUCs would tremendously reduce the potential human health and ecological exposure pathways.

2.13.2 Compliance with ARARs

This alternative is not intended to reduce COC concentrations in soil. However, it is intended to address the contamination through containment to reduce the human health and ecological risks to acceptable levels.

[1] Rounded.

Location-specific ARARs (**Table 11**) would be met by obtaining appropriate permits and implementing appropriate mitigation measures in the event that the wetlands or stream encroachment areas would be affected.

Action-specific ARARs (**Table 12**) will be met by obtaining appropriate permits for the installation of the soil cover. All personnel will be properly trained to handle hazardous materials in accordance with Occupational Safety and Health Administration (OSHA) Act 29 CFR 1910.

2.13.3 Cost Effectiveness

In the lead agency's judgment, the Selected Remedy is cost effective and represents a reasonable value in the money to be spent. In making this determination, the following definition was used: *"A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D))*. This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; short-term effectiveness; implementability; and cost). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is approximately **$450,900**. Although Alternative 1 (No Action) is the least expensive, this alternative affords no mechanisms to reduce the potential human and ecological exposures to the contaminants. Among all alternatives that involve active engineering measures, Alternative 8 is the least expensive, but the introduction of an asphalt cap raised community concerns. Alternative 4 affords the same level of protection, is only slightly more expensive than Alternative 8, and is more widely accepted.

The Army believes that the Selected Remedy is cost effective and the additional cost compared to Alternative 1 provides a significant increase in protection to human health and the environment.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The Army has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. The Army has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering regulatory and community acceptance.

The Selected Remedy employs a vegetated soil cover as an engineering control and LUCs to reduce the human and ecological exposures to COCs. As long as the integrity of the soil cover is maintained, the Selected Remedy would satisfy the criteria for long-term effectiveness and permanence. The Selected Remedy does not present short-term risks that cannot be effectively controlled through safe work practices. There are no special implementability issues that set the Selected Remedy apart from any of the other alternatives evaluated.

2.13.5 Preference for Treatment as a Principal Element

The Selected Remedy does not address Site 25/26 soil through the use of active treatment technologies. The statutory preference for treatment of Site 25/26 soil is not applicable due to the fact that no source materials constituting principal threats need to be addressed as part of this action. The characteristics of PAHs and their fate and transport in the environment are discussed in Section 2.5 of this ROD. As stated herein, PAHs are relatively immobile and readily contained. Additionally, results of the risk assessment indicate no significant risks to human or ecological receptors. Therefore, the contaminants at Site 25/26 do not constitute principal threat waste, and as such the statutory preference for treatment is not applicable for Site 25/26 soil. However, the selected remedy would significantly reduce the mobility of contaminants because the vegetated soil cover would help contain the underlying contamination. Additionally, the Selected Remedy provides an optimal reduction of the existing human

Table 11. Location-specific ARARs, Site 25/26

Location	Law/Regulation	Requirement of Law/Regulation	Status
Wetlands	Presence of wetlands as defined in Executive Order 11990 § 7(c) and 40 CFR 6, Appendix A § 4(j)	Whenever possible, Federal agency actions must avoid or minimize adverse impacts on wetlands and act to preserve and enhance their natural and beneficial values. Agencies should particularly avoid new construction in wetland areas unless there are no practicable alternatives. Federal agencies shall incorporate wetlands protection consideration into planning, regulating, and decision-making processes.	Applicable to the substantive permit requirements if clearing and/or excavation activities encroach upon stream wetlands, and/or transition areas.
	Presence of wetlands as defined in the Clean Water Act Section 402.33 CFR 320.4 and NJAC 7:7A (The Freshwater Wetlands Protection Act, P.L. 1987)	To the extent possible, action must be taken to avoid degradation or destruction of wetlands. Discharges for which there are practicable alternatives with less adverse impacts or those that would cause or contribute to significant degradation are prohibited. If adverse impacts are unavoidable, action must be taken to enhance, restore, and create alternative wetlands.	
Floodplains	Protection of floodplains as defined in Executive Order 11988 § 6(c) and 40 CFR 6, Appendix A § 4(d)	Federal agencies shall take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, Federal agencies shall consider alternatives to avoid adverse effects, and potential.	Applicable to removal activities since a small portion of the southwest corner of Site 25 is within the 100-year floodplain of GPB. If this portion of the Site is included in the action, this regulation will need to be applied.
	Within 100-year floodplain as defined in 40 CFR 264.18(b) and NJAC 7:13 (New Jersey Flood Hazard Area Control Regulations)	Facility must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by flooding.	
Endangered Species Act (Rare, Threatened, or Endangered Species)	Presence of those species listed in the following acts and regulations: - Endangered Species Act (16 U.S.C. 1531 *et seq*) - Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*) - 40 CFR 6.302(h) - 40 CFR 402 - CWA § 404 - 40 CFR 231.10(b) - RSN 37-430 to -438 - NJAC 7:25-4 as being rare, threatened, or endangered species.	Whenever possible, Federal agency actions must avoid or minimize adverse impacts on rare, threatened, or endangered species and act to preserve and enhance their natural and beneficial values. Agencies should particularly avoid new construction in those areas containing these species unless there are no practicable alternatives. Federal agencies shall incorporate on rare, threatened, or endangered species protection consideration into planning, regulating, and decision-making processes.	Applicable since clearing, and/or excavation activities could impact habitat typical of several sensitive species listed within the Endangered Species Act. Protected species resident at Picatinny Arsenal are the Indiana bat, barrel owl, blue heron, bog turtle, wood turtle, timber rattlesnake, and brook trout.
U.S. Army Site	Army Regulations for Environmental Protection and Enhancement	These regulations are the primary Army environmental policy. A more detailed guidance on compliance with environmental laws and regulations is found in the accompanying draft final technical document DA PAM 200-1.	Applicable for site removal activities. All hazardous materials will be disposed of through the Environmental Coordinator or the local DRMO.

Table 12. Action-specific ARARs, Site 25/26			
Action	**Law/Regulation**	**Requirement of Law/Regulation**	**Status**
Sampling and Analysis	Remediation Technical Requirements NJAC 7:26X10-3	Requirements of quality assurance for sampling and analysis at remediation Site.	Applicable to sampling and analytical activities at the site.
	Regulations Governing the Certification of Laboratories and Environmental Measurements NJAC 18:1-3, 5 and 9	Establishes the procedures for obtaining and maintaining certifications and the criteria and procedures that certified laboratories shall follow in handling, preserving, and analyzing regulatory samples.	Applicable when selecting a laboratory for sampling activities during remediation.
Military Munitions Identification, Treatment, and Disposal	40 CFR 266.200 – 266.206, Subpart M (reference 40 CFR 260-270)	Regulations which identify when military munitions become a solid waste and if hazardous.	Applicable if UXO are discovered during excavation and/or clearing activities at the site.
	40 CFR 300.120	DOD will have removal response authority and Remedial Project Manager will be the prime contact for incidents involving military weapons and munitions under control of DOD.	Applicable if UXO are discovered during excavation and/or clearing activities at the site. DOD and Remedial Project Manager will be contacted.
	ER-1110-1-8153	Defines response actions and roles and responsibilities for UXO removal. Adapts criterion of 10% explosive content as a measure of contaminated soil reactivity to differentiate between hazardous and explosive waste.	Applicable if UXO are discovered during excavation and/or clearing activities at the site. Applies to explosive content in soil. Not applicable to UXO directly.
	EP-1110-1-18	Provides the procedures to implement UXO removal actions.	Applicable, if UXO are discovered during excavation and/or clearing activities at the site.
	TM-9-1375-213-12	Defines the minimum safe distance between emitters of electromagnetic radiation in the radio frequency range and UXO clearance/demolition activities.	
	TM-5-855-1	Defines protective measures to be taken to reduce blast shock and fragmentation damage.	
	DA PAM 385-61 DA PAM 385-64	Defines procedures for health and safety, emergency decontamination of site workers, and minimum safe distance for UXO removal.	
	TM60-A-1-1-31	Provides UXO disposal requirements.	
	DOD 6055.9-STD	Requires specialized personnel in detection, removal, and disposal of ordinance and explosive; stipulates required safety precautions and procedures for detonation/disposal; establishes depth of remediation based on land use.	

Table 12. Action-specific ARARs, Site 25/26 (Continued)

Action	Law/Regulation	Requirement of Law/Regulation	Status
General Remediation	Technical Requirements for Site Remediation NJAC 7:26E 1, 4-7	Specifies the minimum technical requirements to investigate and remediate contamination on any site.	Relevant and appropriate for on-site remediation activities.
	New Jersey Soil Erosion and Sediment Control Act 40 CFR 122.26(c) NJAC 7:13-3 and 4:24 40 CFR 122.26 (c)	Requires the implementation of soil and erosion and sediment control measures for activities disturbing over 5,000 square ft of surface area of land.	Applicable for site activities involving excavation, grading, or other soil disturbance activities exceeding 5,000 square ft.
	USEPA OSWER Publication 9345.3-03FS, January 1992	Investigation-derived wastes generated from remedial activities (e.g., drilling muds, purged water, etc.) are required to be properly stored, managed and disposed. Guidance given in the publication includes waste material containment, collection, labeling, etc.	Applicable for wastes generated during excavation activities and groundwater monitoring.
Discharge of Aqueous Waste to Surface Water	CWA Effluent Guidelines 40 CFR 401 40 CFR 122 and 125 40 CFR 136.1 – 136.4	Provides requirements for point source discharges of pollutants.	Applicable for discharge of storm water that may result from on-site in situ and/or excavation and clearing activities to GPB. Discharge of treated wastewater is not anticipated.
	New Jersey Water Pollution Control Act – New Jersey Pollutant Discharge Elimination System (NJPDES) (NJAC 7:14A)	Discharge of pollutants to surface water and groundwater from remediation Site is regulated via NJPDES requirements. NJPDES requirements include obtaining a discharge to surface water or groundwater permit equivalent and meeting substantive requirements of the permit. Requirements include effluent limitations, water quality based limitations, monitoring, and monitoring techniques.	Applicable to the substantive requirements of the permit program for storm water discharges to GPB. Discharge of treated wastewater is not anticipated.
Stream Wetland Encroachment	33 CFR 320.4 Flood Hazard Area Control (NJAC 7:13-1.1 et seq.) Freshwater Wetland Protection Act Rule (NJAC 7:7A-9, NJSA 13:9A-1) All the regulations require equivalency permit and correlate with location-specific requirements.	Equivalency permit required for the following activities: - Development or disturbances in floodplain and wetland area - Stream encroachment - Soil erosion and sediment control	Applicable to the substantive requirements of the permit program for remediation activities that occur in the floodplain or vicinity of GPB.

Table 12. Action-specific ARARs, Site 25/26 (Continued)			
Action	**Law/Regulation**	**Requirement of Law/Regulation**	**Status**
On-Site Treatment, Storage, and Disposal	RCRA Treatment, Storage and Disposal of Hazardous Waste 40 CFR 264, Subparts A, B, C, D, E, G and I 265, Subparts A, B, C, D, E, G and I NJAC 26G-8 and 9 (incorporation by reference)	Standards and requirements for facilities that treat, store, and dispose of hazardous waste. Requirements include: - General Facility Standards - Emergency Preparedness and Prevention - Contingency Plan and Emergency Procedures - Manifest System - Use and Management of Containers - Closure and Post Closure	Applicable to the substantive requirements if hazardous waste is treated or stored on site.
	RCRA Treatment, Storage and Disposal of Hazardous Waste 40 CFR 264, Subparts J, L and X 40 CFR 265, Subparts J, L and Q RCRA – New Jersey Hazardous Waste Regulations Incorporates the above regulations (NJAC 7:26G-8 and 9)	Provides requirements for handling waste at the following facility types: - Tank systems - Waste piles - Chemical, physical and biological treatment - Miscellaneous units	Applicable to the storage and treatment of wash water and soils from remediation activities. This would be applicable if wash water and/or excavated soils were identified as hazardous waste and treated on site.
Air Emissions	Clean Air Act (CAA) National Ambient Air Quality Standards (NAAQS) Particulates 40 CFR 50 40 CFR 52, Subpart FF	Establishes maximum concentrations for particulates and fugitive dust emissions; and records New Jersey's State Implementation Plan.	Applicable for on-site activities which would generate particulate matter and fugitive dust emissions from construction vehicles and equipment. Standards have been deferred to the State. See State Air Quality Regulations.
	Air Quality Regulations New Jersey NJAC 7:27-13	Provide requirements applicable to ambient air pollution sources.	Applicable to the on-site generation and emission of ambient air pollutants. Air monitoring will be performed and if the following air quality standards are exceeded, then requirements are applicable. Primary air quality standard is 75 grams per cubic meter (g/m^3) (not to exceed 260 g/m^3 more than once) and secondary standard of 60 g/m^3 (not to exceed 150 g/m^3 more than once), both for geometric mean value of all 24-hour average concentration standard over 12 consecutive months.

health and ecological risks to an acceptable level with an effective use of funding; therefore, it is much more cost effective than the technologies that do utilize treatment.

2.13.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, five-year reviews will be conducted in compliance with CERCLA and the NCP to ensure that the remedy is and will be protective of human health and the environment.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Site 25/26 presented Alternative 8, Extension of the Existing Parking Lot to Cover the PAH-Contaminated Area and Implementation of LUCs as the preferred alternative. Upon consideration of comments received during the public comment period and further analysis conducted by the Army, the Selected Remedy presented in this ROD is Alternative 4, Installation of a Vegetated Soil Cover and Implementation of LUCs. The public could have reasonably anticipated this change in remedy because both remedies were presented in the proposed plan and at the public meeting. Both remedial alternatives are cost effective and afford the same level of protection through the use of engineering controls and LUCs to control exposure to site contaminants. Therefore, the Selected Remedy presented in this ROD is not a significant change from the preferred alternative presented in the proposed Plan.

3.0 PART 3: RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary. The purpose of the Responsiveness Summary is to provide a summary of the stakeholders' comments, concerns, and questions about the Selected Remedy for Site 25/26 soil and the Army's responses to these concerns.

In general, the community is accepting of the selected alternative. Some community concern has been expressed because contamination will be controlled on site as opposed to off site. The Army, USEPA, and NJDEP have considered all comments and concerns, summarized below, in selecting the final cleanup methods for Site 25/26 soil at Picatinny Arsenal.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

As of the date of this ROD, the Army endorses the preferred alternative for Site 25/26 soil of Installation of a Vegetated Soil Cover and Implementation of LUCs. The USEPA and the NJDEP support the Army's plan. Comments received during the Site 25/26 soil public comment period on the Proposed Plan are summarized below. Written comments were received from Subsurface Solutions, LLC on behalf of the Picatinny Arsenal RAB. Subsurface Solutions, LLC is under contract to the Army under the Technical Assistance for Public Participation (TAPP) program. The comments are categorized by source.

3.1.1 Summary of Comments Received during the Public Meeting on the Proposed Plan and Agency Responses

The following summarize the Army responses to the comments received during the public meeting on December 8, 2004.

Comment 1: The commenter, Michael Glaab, is the co-chair of the Picatinny Arsenal Environmental Restoration Advisory Board. He is questioning what volume of soil is being excavated why excavated soil is not being removed for off-site disposal.

Response: The isolated exceedance of PAHs outside the limits of the AOC at sample location 25/26GR-3 (total PAH concentration of 5.22 parts per million) will be excavated (approximately a couple of cubic feet) and placed under the parking lot extension. This approach was considered protective since the construction crew would be performing the remedial action, and placing the excavated soil under a cap could be accomplished on site. This approach was discussed and agreed upon by USEPA and NJDEP at a technical partnering meeting and during the approval process of the Proposed Plan.

Comment 2: Is there any groundwater sampling associated with the Site 25/26 asphalt cover?

Response: There will be post-ex sampling at that spot, per the requirement of the New Jersey technical regulation. The groundwater will be monitored separately as part of Area C. The groundwater monitoring and the cost are not associated with the Site 25/26 proposed plan, which deals only with the soil.

Comment 3: The commenter is concerned that the 7% discount rate used to calculate lifetime O&M cost is too low, and that if a higher rate were used, another alternative in the long run might actually be more cost effective.

Response: The discount rate is a tool for stating the estimated cost of each alternative in present-day dollars. Alternatives are then evaluated relative to one another. It is a common engineering method for doing comparisons. A 30-year timeframe and a discount rate of 7% were used for each alternative. The 7% discount rate represents a conservative estimate at this time. Further, the effectiveness of the remedial action is evaluated in the five-year review. If, during the course of that review, it is determined that the remedy is no longer protective of human health and the environment, the need for additional action will be examined and any modifications to the remedy will require regulatory approval.

3.1.2 Summary of Comments Received during the Public Comment Period and Agency Responses

This section summarizes comments received from Subsurface Solutions, LLC on behalf of the RAB. These comments were received through a letter dated January 6, 2005 to the Environmental Affairs Office of Picatinny Arsenal.

Comment 1: Length of Time for Cost Estimating of Remedial Alternatives

U.S. Environmental Protection Agency (USEPA) guidance states that "in general, the period of performance for costing purposes should not exceed 30 years for the purpose of the detailed analysis." The asphalt parking lot preferred for Site 25/26 will require maintenance essentially in perpetuity or until some other alternative is selected in the future that would be able to render the contaminants harmless. Further discussion related to the time period of performance associated with costing is provided below (Comment 3).

Response: For the purposes of cost estimating for the FS, a period of 30 years was assumed as the O&M timeframe for all alternatives that are based on restricted use criteria. LUCs and five-year reviews are required for each of these alternatives. The Army will ensure that no inappropriate land use of Site 25/26 occurs until such time as the site conditions are protective. Implementation of LUCs and five-year reviews will be continued until contaminant levels are shown to allow unrestricted use. The LUCs will be legally recorded (e.g., in zoning ordinances, property deeds, etc.) in the event that Picatinny Arsenal would be closed and declared excess property. Additionally, the LUCs would be incorporated into the provisions for the new land use. A change in land use would include the re-evaluation of cleanup requirements and a notification requirement to USEPA and NJDEP. Since each of the alternatives is based on a restricted use scenario, the 30-year O&M timeframe is appropriate for cost estimating purposes. Further discussion is provided in the Army's response to Comment 3 below.

Comment 2: The following concern has been expressed amongst the RAB members:

"In the event that consideration is given to the importing onsite of contaminated soil from other locations, perhaps as fill intended to establish an appropriate grade level, that due consideration be given to either avoiding the use of already contaminated soil from other locations or that reasonable and judicious efforts be taken to minimize the possibility that the reuse of contaminated soil as fill will result in the compounding and complicating of the existing contamination problem onsite. Certainly the reuse of contaminated soil onsite has such obvious disadvantages as the increasing of the existing environmental remediation cost and bureaucratic overhead associated with:

1. Tracking the locations of individual contaminants.
2. Monitoring soil and groundwater.
3. The possibility that newly introduced, identified and unidentified, contaminants from imported contaminated fill soil may adversely react chemically with those contaminants already existing onsite in an unanticipated and undesirable manner."

Response: The Army recognizes the RAB's concerns regarding the potential for introducing contamination by using fill from other CERCLA sites on Picatinny Arsenal. This is being considered for some of Picatinny Arsenal's sites, however, there are currently no plans to use contaminated fill beneath the Site 25/26 cover.

Comment 3: Given the much higher costs that would be associated with the parking lot extension if a longer time period of performance were used, other alternatives might have fared differently during the detailed analysis of alternatives, at least from a cost perspective. Certainly, there has been fairly widespread opinion amongst the RAB membership that removal of contaminated waste/soil from Picatinny Arsenal to a controlled off-site waste

facility may be preferable in many situations. Such an option can result in the land being dedicated for unrestricted use. In the case of Site 25/26, costs for excavation and disposal of the affected soil were estimated to be $503,100 in comparison to $409,200 for the preferred alternative of extending the parking lot – less than $100,000 difference. As a further consideration, the cost for the parking lot is skewed on the lower end because it reflects only a 30-year timeframe for the costs. It is probable that costs for the parking lot would be much greater using a more realistic timeframe. Given the potential for privatization of the base in the vicinity of Site 25/26, the excavation and disposal option would leave the area available for uses other than parking, such as a building site, park, or recreation site.

Response: The Final FS for Site 25/26 soil (Shaw, 2003) presents detailed cost estimates for each alternative presented in the Proposed Plan, as well as a detailed cost estimate for cleanup of Site 25/26 to unrestricted use criteria. If soil excavation and off-site disposal were performed to the unrestricted use action levels, the total remediation cost using the 7% discount rate would be $3,380,761 for a 31-week remediation duration, which is clearly a cost-prohibitive alternative given the lack of risk presented by the site. Alternative 7 assumes excavation and cleanup to restricted use action levels; therefore, the site would not be available for use as a park or recreation site should the property be transferred. Additionally, LUCs and five-year reviews are still required for Site 25/26 as part of Alternative 7. The O&M period for both Alternatives 7 and 8 was assumed to be 30 years, a reasonable time-frame for the purposes of alternative analysis and cost estimating. The 7% discount rate represents a conservative estimate at this time. Alternative 4 affords the same level of protection as Alternative 7 and is more cost effective. Further, the effectiveness of the remedial action is evaluated in the five-year review. If, during the course of that review, it is determined that the remedy is no longer protective of human health and the environment, the need for additional action will be examined and any modifications to the remedy will require regulatory approval.

Comment 4: Costs for remedial actions are permitted to be calculated such that they may underestimate the cost by 30 percent or overestimate the cost by 50 percent. Furthermore, costs may typically include a contingency for capital costs but not for operation and maintenance. However, there is no provision for the inclusion of contingency costs such as might be incurred if excavation of the contaminants beneath the parking lot is required at some future date.

Response: The estimated costs associated with each remedial alternative evaluated for Site 25/26 included contingency for both capital and O&M costs. Further, the effectiveness of the remedial action is evaluated in the five-year review. If, during the course of that review, it is determined that the remedy is no longer protective of human health and the environment, the need for additional action will be examined and any modifications to the remedy will require regulatory approval.

Comment 5: Soil remediation standards recently proposed by the New Jersey Department of Environmental Protection (NJDEP) include notably more stringent standards for a number of contaminants. Should these standards be promulgated as currently proposed, the Army would need to evaluate the newly enacted standards against those for which the remedy was formulated. Newly enacted standards differing by an order of magnitude (lower) will trigger a re-evaluation of remedial options to ensure that the most protective standard is utilized. The contaminants at Site 25/26 are limited to several PAHs based on currently applicable NJDEP soil cleanup criteria. It is possible that other contaminants could trigger the need for cleanup based on future, more stringent criteria. Before proceeding with the remedy as proposed, the RAB would like to know whether the recently proposed standards have been considered for all contaminants found at Site 25/26.

Response: Although it is not yet promulgated, the Army agreed to consider the proposed criteria as part of the ROD. Although some proposed values are more stringent than current criteria, many of the proposed criteria for PAHs and pesticides are greater than existing. The

Army screened the results of the 2002 SDGI against the proposed NJ criteria. Results of this screening did not indicate additional contaminants not included in the proposed remedy. The five-year review process includes a review of any new or changed regulation, as applicable.

Comment 6: Construction of the parking lot extension will necessitate removal of the fence near the ball field. To prevent access to the dredge pile which will be closer to populated areas, the fence should be re-established at the edge of the pavement. Presumably, details regarding the fence will be described as part of the Remedial Design phase of the project. The current fence near the ball field is obscured by thick bushes and undergrowth and barely visible; it would be difficult for a trespasser to scale. Given that a new fence would be more visible and accessible, appropriate signage would also be necessary to warn of the hazards in the area (potential for unexploded ordnance) and to discourage trespassers.

Response: The commenter is correct in that the Remedial Design will include details regarding fencing around the site and signage. The Army acknowledges the commenter's concerns.

Comment 7: The RAB previously commented on their concern for the creation of additional impervious surfaces at the base in regard to the MatCon cap proposed for Site 34. The membership has expressed a concern for downstream flooding associated with the creation of numerous additional impervious surfaces at Picatinny Arsenal. The continued creation of multiple impervious areas such as the MatCon cap for Site 34 and the parking lot extension at Site 25/26 is of concern. As requested for Site 34, the RAB also requests that consideration be given in the Remedial Design phase of the Site 25/26 project to the creation of infiltration basins or some other means of recharge for stormwater so that stormwater can be recharged to the ground. Recharge would have to be designed such that deleterious effects on groundwater beneath the parking lot would not be produced. Furthermore, filtration of the stormwater prior to recharge should be considered to prevent the introduction of parking lot contaminants (grease, oil, gasoline, etc.).

Response: The requests of the RAB are noted. The Army understands the potential drainage impacts of the asphalt cap. The Selected Remedy now includes installation of a vegetated soil cover rather than an asphalt pavement cap. The remedy includes runoff and erosion control, the details of which will be presented in the remedial design after the ROD is signed. The proposed remedy also includes quarterly inspection, annual maintenance of the vegetated soil cover, and five-year reviews to ensure the continued protectiveness of the remedy. In addition, groundwater at Area C is currently being addressed under a separate CERCLA action. The current plan for Area C groundwater includes long-term monitoring.

Comment 8: In the "Summary of the Preferred Alternative for Site 25/26 Soil," the report states the following: "The Army expects the preferred alternative to satisfy the following statutory requirements of CERCLA § 121 (b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and, 5) satisfy the preference for treatment as a principal element." While the preferred alternative does meet the threshold criteria, it is uncertain whether the preferred alternative provides "the best balance of trade-offs among the alternatives with respect to the balancing and modifying criteria." Satisfaction of the above cited requirements may sometimes be better served by the application of an active remedy involving treatment rather than limited containment such as that afforded by a cap.

Response: The preferred alternative affords the same level of protection and is more cost effective than excavation of the small volume of soils exceeding restricted use criteria. Cleanup to unrestricted use criteria would afford more protection to human health, but is disproportionately expensive. Therefore, the preferred alternative does represent the best balance of trade-offs among the alternatives.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised on the Selected Remedy.

4.0 PART 4: REFERENCES

Dames and Moore. 1988. Site Investigation of Picatinny Arsenal, New Jersey. Volume 1, Main Report and Appendices A-E. Prepared for USATHAMA, Aberdeen Proving Ground, Maryland.

Dames and Moore. 1997. Phase I – Site 25 Draft Feasibility Study, prepared for the Army Total Environmental Program Support (ATEPS). November.

Dames and Moore. 1998a. Phase I Remedial Investigation Report – Human Health and Ecological Risk Assessments. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland.

Dames and Moore. 1998b. Phase I Remedial Investigation Report – Picatinny Arsenal, New Jersey. Draft Final Document. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland.

ICF Kaiser Engineers (ICFKE). 1997. Memorandum from Douglas L. Schicho of ICFKE to Greg Hatchett of USACE-Baltimore District on the Subject of Site 25 Surface Soil Grid Sampling Data, WBS# 07.005.04 Delivery Order 0007. DACA31-95-D-0083. August.

IT Corporation (IT). 2000a. Risk Management Plan for 9 Sites in the Phase I Area – Draft Final. Prepared for the U.S. Army Corps of Engineers, Baltimore District. August.

IT Corporation (IT). 2000b. Picatinny Arsenal Facility-Wide Background Investigation. Prepared for the U.S. Army Corps of Engineers, Baltimore District. September.

IT Corporation (IT). 2001. Picatinny Arsenal Area C Groundwater Data Report. Prepared for the U.S. Army Corps of Engineers, Baltimore District. July.

IT Corporation (IT). 2002. Picatinny Arsenal Area C Groundwater Data, unpublished, IT Corporation, Mt. Arlington, New Jersey office. February.

New Jersey Department of Environmental Protection (NJDEP). 1999. Soil Cleanup Criteria. May 1999.

Shaw Environmental, Inc. (Shaw). 2003. Final Feasibility Study Site 25/26. Prepared for the U.S. Army Corps of Engineers, Baltimore District. Contract No. DACA-31-95-D-0083.

Shaw Environmental, Inc. (Shaw). 2004. Proposed Plan for Site 25/26 Soil, Picatinny, New Jersey. Final Revision 1. November 2004.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). 1976. Installation Assessment of Picatinny Arsenal, Report No. 102. Aberdeen Proving Ground, Maryland. November.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). 1981. Reassessment of Picatinny Arsenal, New Jersey. USATHAMA Report No. DRXTH-AS-IS-81102A.

U.S. Environmental Protection Agency (USEPA). 1988. Guidance for Conducting Remedial Investigations & Feasibility Studies Under CERCLA, EPA/540/G-89/004. October 1988.

U.S. Environmental Protection Agency (USEPA). 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. EPA 540-R-98-031, OSWER 9200.1-23P, PB98-963241. July 1999.