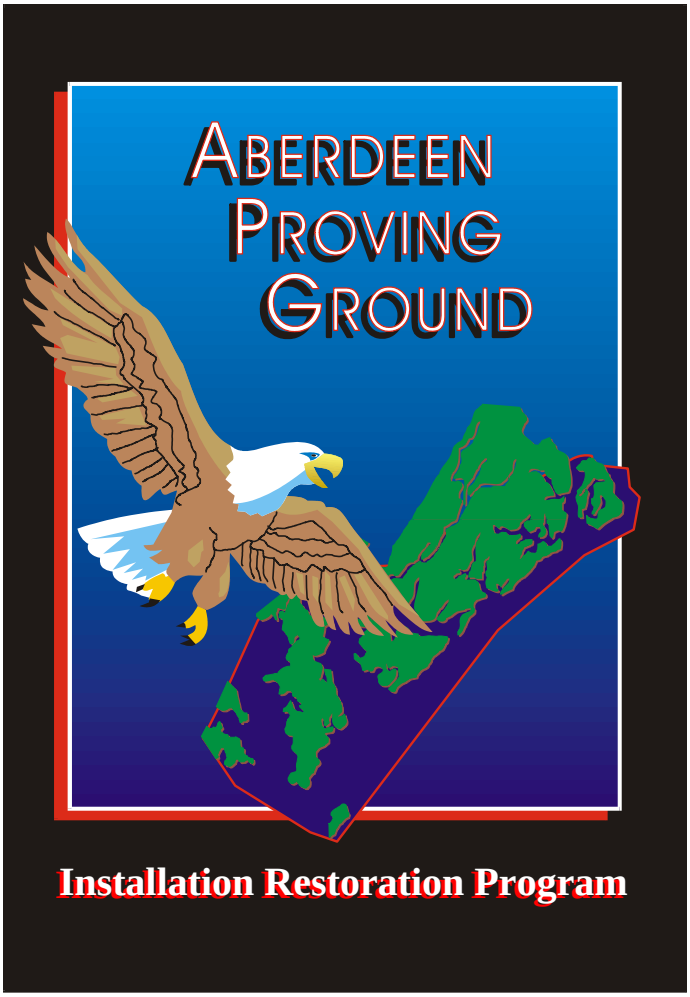

BUSH RIVER STUDY AREA

Proposed Plan for the Cluster 3 Lead-Contaminated Soil Area

April 2004

U.S. Army Garrison
Aberdeen Proving Ground, Maryland

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

This Proposed Plan provides a summary of the remedial alternatives considered during the detailed analysis in the Focused Feasibility Study (FFS) and identifies a preferred alternative. The six alternatives considered to address the Cluster 3 Lead-Contaminated Soil Area include: (1) No Action; (2) Institutional Controls; (3) Excavation with Off-Site Disposal; (4) Excavation with On-Site Reuse; (5) Containment (Capping); and, (6) Treatment (Phytoremediation). The preferred alternative is Alternative 4, Excavation with On-Site Reuse.

15. SUBJECT TERMS

Proposed Plan, Bush River Study Area, Cluster 3 Lead-Contaminated Soil Area, Lead

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE		23	19b. TELEPHONE NUMBER *(Include area code)*

Proposed Plan for:

REMEDIAL ACTION
ABERDEEN PROVING GROUND
BUSH RIVER STUDY AREA
CLUSTER 3, LEAD-CONTAMINATED SOIL AREA

Aberdeen Proving Ground, Maryland
April 2004

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

INTRODUCTION AND PURPOSE

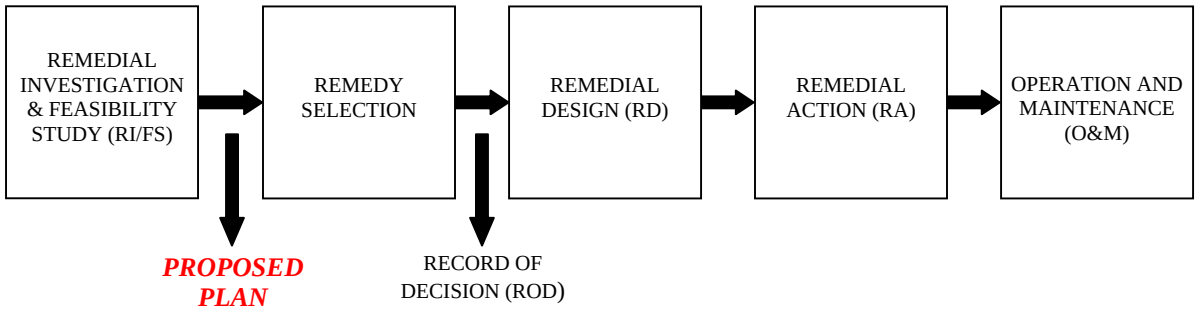
The US Army Garrison Aberdeen Proving Ground (APG), the US Environmental Protection Agency (EPA), and the Maryland Department of the Environment (MDE) invite public comment on this Proposed Plan for the Cluster 3 Lead-Contaminated Soil Area in the Bush River Study Area (BRSA). This area, associated with Defense Site Environmental Restoration Tracking System (DSERTS) Site #EABR03-B (Transformer Storage Area), is located within the Edgewood Area of APG, Maryland (Figure 1). The Army is the lead agency for this site; and, EPA and MDE serve as support agencies.

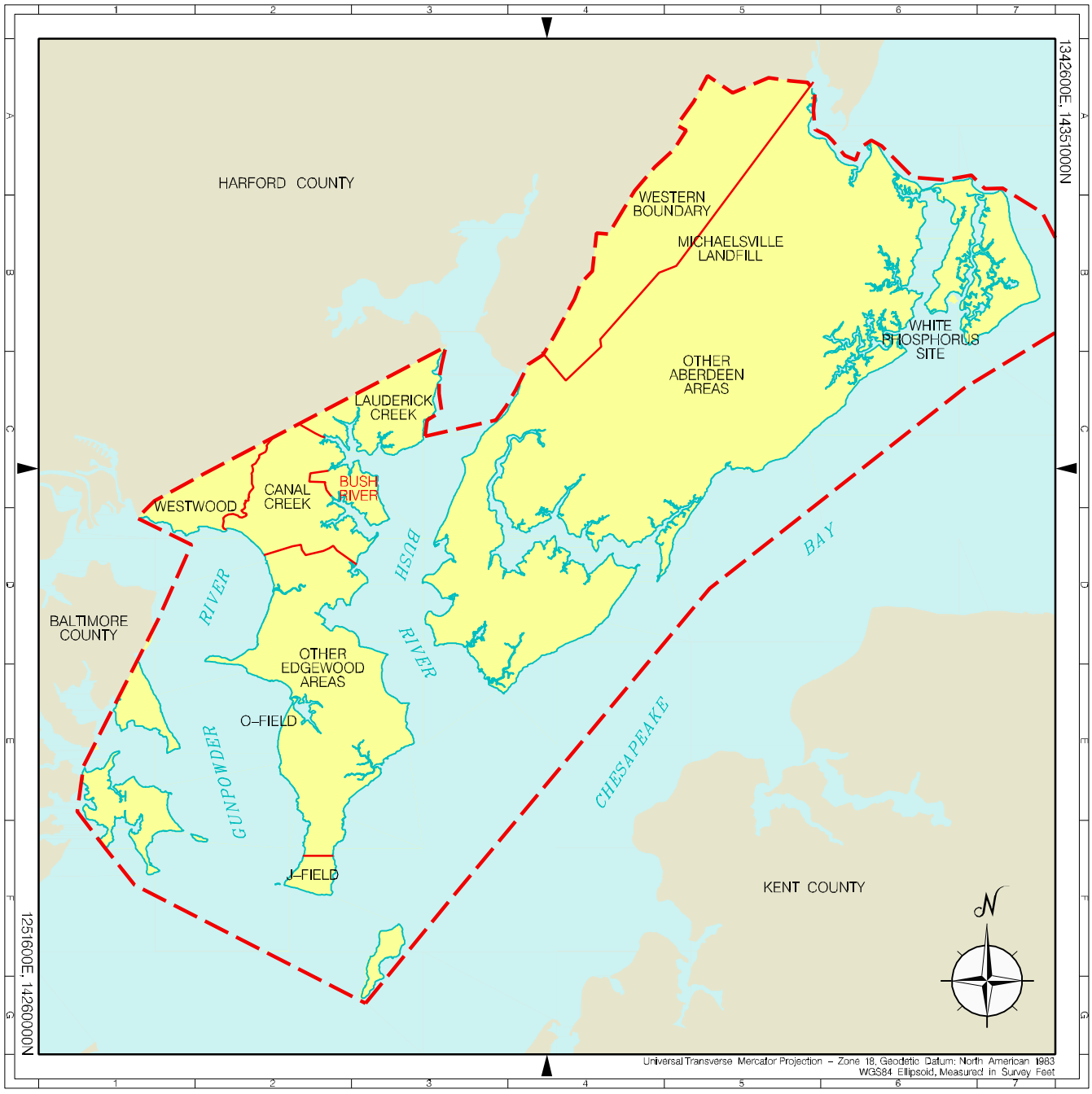
This Proposed Plan provides a summary of the remedial alternatives considered during the detailed analysis phase of the Focused Feasibility Study (FFS) and identifies the preferred alternative. The six alternatives considered to address the Lead-Contaminated Soil Area at Cluster 3 include: (1) No Action; (2) Institutional Controls; (3) Excavation with Off-Site Disposal; (4) Excavation with On-Site Reuse; (5) Containment (Capping); and (6) Treatment (Phytoremediation). The preferred alternative is Alternative 4, Excavation with On-Site Reuse.

The Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act and the National Environmental Policy Act.

This Proposed Plan summarizes information that can be found in greater detail in the FFS Report and other documents contained in the Administrative Record. The public is encouraged to review these documents to gain a more comprehensive understanding of the site and the environmental activities conducted to date. Although the Proposed

REMEDIAL RESPONSE PROCESS





1400010500 7000 3500 0 7000 14000 28000

GRAPHICAL SCALE

IN FEET (1" = 14000')

1:168000

L E G E N D

- Aberdeen Proving Ground
- Water
- Installation Boundary
- Study Area Boundary

TITLE:

BUSH RIVER STUDY AREA IN APG

CARTOGRAPHER:	APPROVED BY:	DATE:	FIGURE:
B. JOYCE	J. HARRIS	11-04-03	1

x

Plan highlights pertinent information from the FFS, it is not intended as a substitute for the detailed evaluation.

The Administrative Record, which contains all of the information that will be used to select the response action, is available for public review at the following locations:

Harford County Library
Aberdeen Branch
21 Franklin Street
Aberdeen, MD 21001
(410) 273-5608

Harford County Library
Edgewood Branch
2205 Hanson Road
Edgewood, MD 21040
(410) 612-1600

Kent County
Washington College
Miller Library
Chestertown, MD 21620
(410) 778-2800

A public comment period will extend from April 21, 2004 through June 4, 2004. The public comment period will include a public meeting during which the Army, EPA, and MDE will present information on the site and answer questions. The public meeting is scheduled for May 4, 2004 at 6:30 p.m. at the Edgewood Senior Center, Edgewood, Maryland.

Based on new information that may become available or on public comments, the Army and EPA, in consultation with the MDE, may modify the preferred alternative outlined in this plan. Therefore, the public is encouraged to review and comment on all alternatives discussed herein.

DATES TO REMEMBER

Public Comment Period:
April 21, 2004 to June 4, 2004. The Army will accept written comments on the Proposed Plan during this period.

Public Meeting:
The Army, EPA, and MDE will hold a public meeting to explain the Proposed Plan and to answer any questions. Oral and written comments will also be accepted at the meeting. The meeting is scheduled for May 4, 2004 at 6:30 p.m. at the Edgewood Senior Center in Edgewood, Maryland. An information/ poster session at 6:30 p.m. will be followed by a presentation at 7:15 p.m.

SITE BACKGROUND

APG is a 72,500 acre Army installation located in southern Harford and southeastern Baltimore Counties, on the western shore of the upper Chesapeake Bay. The installation is bordered to the east and south by the Chesapeake Bay; to the west by Gunpowder Falls State Park, the Crane Power Plant, and residential areas; and to the north by the City of Aberdeen and the towns of Edgewood, Joppatowne, Magnolia, and Perryman. The Bush River divides APG into two areas: the Edgewood Area to the west and the Aberdeen Area to the east.

Since 1917, the Edgewood Area has been a center for research, development, testing, and manufacture of military related chemicals and chemical agents. The Edgewood Area is listed on the National Priorities List, which is the EPA's list of hazardous waste sites that have been identified as priorities for remedial evaluation and response.

The BRSA covers approximately 500 acres on a peninsula located in the northeastern portion of the Edgewood Area of APG. The BRSA is bounded on the north by Lauderick Creek, on the east and south by the Bush River, southwest by Kings Creek, and to the west by the Canal Creek Study Area (Figure 2).

As early as 1918, portions of the BRSA were used for training, test activities, waste disposal, and chemical storage. The southern portion of the peninsula, identified as "A-Field", was used for artillery firing, training, testing, and smoke/incendiary munitions testing. During the two World Wars, the BRSA served as a storage and shipment depot for chemical-filled munitions.

SCOPE AND ROLE OF THE RESPONSE ACTION

The problems at the BRSA are complex; therefore, the Army subdivided the site into three areas of environmental concern: Northern Bush River, Southern Bush River, and Cluster 3.

Cluster 3, located north of Bush River Road in the westernmost portion of the BRSA, includes two DSERTS investigation sites: Site 3 - Old Bush River Road Dump (OBRRD) and Site 23 – the former Transformer Storage Area (TSA). The Army currently uses Cluster 3 for industrial land use (maintenance) activities.

The Record of Decision (ROD) for the OBRRD was signed in June 1999, and construction of the soil cover was completed in March 2000. The removal of an underground storage tank, sump, and concrete slab from a former gas station at the TSA in 1991 eliminated sources of contamination within this area (i.e., clean closure approved by EPA and MDE). As a result, no further action is required for the TSA.

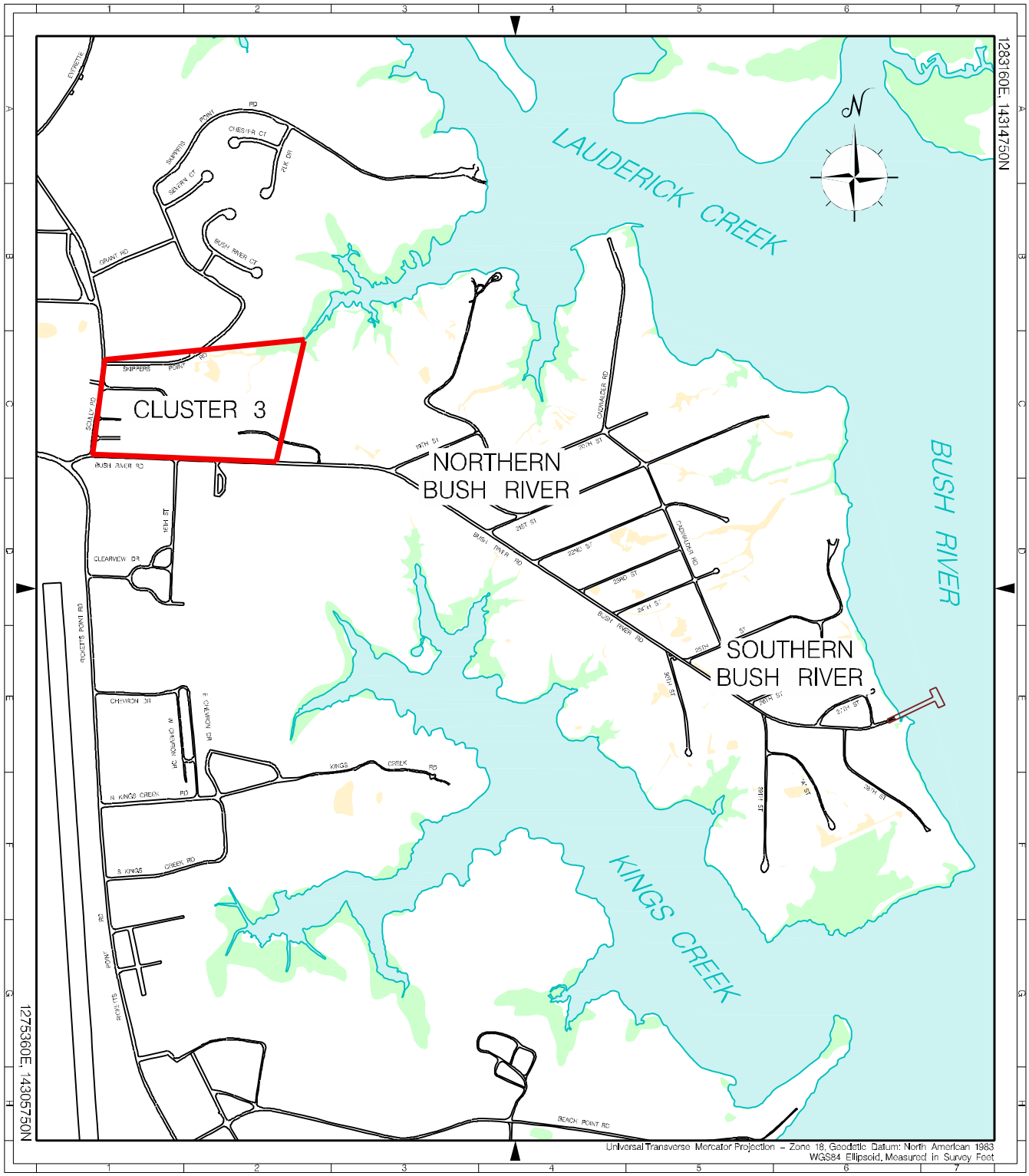
The focus of this Proposed Plan is a two-acre parcel located northeast of the TSA and south of the OBRRD, referred to as the Cluster 3 Lead-Contaminated Soil Area. Former use of this site is unknown; however, lead screening results as high as 11,000 milligram per kilogram (mg/kg) have been detected in the soil. These high levels of lead present the principal risks to human health and the environment at the site.

As discussed later, there is no shallow aquifer present at this site. Consequently no remediation of the shallow zone is necessary, practical, or required. The deeper groundwater at the site is considered part of the East Branch Canal Creek Aquifer, which was addressed by a separate ROD for the Canal Creek Study Area. Therefore, the action proposed in this plan and documented in the ROD will be the only action for the Cluster 3 Lead-Contaminated Soil Area.

SITE CHARACTERISTICS

The average ground elevation across Cluster 3 is approximately 20 feet above mean sea level, with local highs of approximately 30 feet mean sea level in the western portion of the site. The topography at the site slopes eastward toward a wetland area bordering Lauderick Creek, at a slope of approximately two percent. However, this site is not located within the 100-year floodplain.

Northeast and southeast of the Lauderick Creek wetland area, steeper slopes of approximately ten and eight percent, respectively, can be found. Within Cluster 3, the local topography is slightly uneven, with a gentle eastward slope.



1200 900 600 300 0 600 1200 2400

GRAPHICAL SCALE
IN FEET (1" = 1200')

1:14400

L E G E N D

- Water
- Road
- Tidal Wetland
- Non-tidal Wetland

TITLE:

BUSH RIVER STUDY AREA
CLUSTER LOCATIONS

CARTOGRAPHER:	APPROVED BY:	DATE:	FIGURE:
B. JOYCE	J. HARRIS	11-04-03	2

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Surface runoff at Cluster 3 flows northeast toward the OBRRD and Lauderick Creek wetland areas. A drainage stream flows along the north side of the OBRRD, northeast of the OBRRD soil cap, and discharges to an unnamed tributary of Lauderick Creek. This stream receives surface water discharge from unimproved roads north of Skippers Point Road and east of Scully Road, as well as runoff from nearby paved areas.

Cluster 3 is located within the Atlantic Coastal Plain Physiographic Province. Underlying the area of investigation are predominately fine-grained unconsolidated sediments, comprised primarily of clay with a lesser fraction of sand and gravel. Borings conducted within the vicinity of the Cluster 3 Lead-Contaminated Soil Area confirmed this assessment and showed that the thickness and lateral continuity of the aquifers underlying Cluster 3 are variable.

Three aquifers have been identified at Cluster 3: the Surficial Aquifer, the Canal Creek Aquifer, and the Lower Confined Aquifer. Based on available literature, the Surficial Aquifer is discontinuous and semi-confined to the north and northeast, and exists under confined conditions to the south. Where present beneath Cluster 3, the Surficial Aquifer is separated from the underlying Canal Creek Aquifer by approximately 15-20 feet of intervening dense clay and silty-clay.

The Canal Creek Aquifer lies under confined conditions beneath the entire BRSA. The Canal Creek Aquifer is approximately 15 feet thick beneath Cluster 3 and dips to the southeast across the Lead-Contaminated Soil Area. The clay layer underlying this area makes contaminant migration to the Canal Creek Aquifer unlikely.

Based on a boring located approximately 400 feet northeast of the Cluster 3 Lead-Contaminated Soil Area, the Lower Confined Aquifer is present at approximately 125 feet below mean sea level with a thickness of approximately 30 feet. However, the presence of this aquifer beneath the Cluster 3 Lead-Contaminated Soil Area is limited.

The forest, field, and wetland habitats at Cluster 3 support a wide variety of wildlife and vegetation. Although there are no endangered flora or fauna species know to exist within Cluster 3, the bald eagle (which is considered “threatened”) is known to forage in and around the Cluster 3 Lead-Contaminated Soil Area. The closest known active bald eagle nest is located on the north shoreline of Lauderick Creek, approximately 6,000 feet northeast of Cluster 3.

Secondary forest at Cluster 3 is dominated by tulip poplar, various species of oak, maple, and pine, and sweet gum. Fauna within this area includes: red fox, gray squirrel, white-tailed deer, American crow, and a variety of songbirds. Herbaceous plants including various shrubs and native grasses dominate ground cover across major portions of Cluster 3, including the Lead-Contaminated Soil Area. Typical open area faunal species include field mice, voles, cottontail rabbits, bobwhite quail, mourning dove, killdeer, and various species of hawks and songbirds.

The wetland habitat at Cluster 3 is dominated by estuarine emergent marsh. Floral species common to this area include: common reed (phragmites), cord grass, cattails, and various species of rush. Faunal species include great blue heron, spotted sandpiper, yellowlegs, muskrat, and various species of turtle, snake, rail, and puddle and diving ducks. Estuarine fish expected within nearby Lauderick Creek include striped bass, largemouth bass, black crappie, white perch, yellow perch, killifish, and several species of catfish, sunfish, and minnow.

Soil samples were collected during Remedial Investigation (RI) activities in August 1993, October 1998, January 1999, and March 1999. During these events, lead was consistently detected above the maximum reference value (i.e., background) of 117 mg/kg.

In August 1993, lead was detected at an elevated concentration of 2,470 mg/kg in soil sample SS-05 (Figure 3). The highest detected concentrations of beryllium and iron were also identified in sample SS-05. However, during the risk assessment, beryllium and iron were eliminated from consideration as chemicals of potential concern based on a comparison to site background data.

The elevated concentration of lead in soil sample SS-05 led to an expanded investigation in October 1998, January 1999, and March 1999. In October 1998, a second soil sample from the SS-05 location exhibited a lead concentration of 643 mg/kg at 0-6 inches. During this investigation, seventy-five multi-level soil samples and thirty-one soil borings were advanced near soil sampling location SS-05. Lead was detected in all seventy-five surface soil samples, ranging from 7.9 to 4,650 mg/kg.

A four-phase supplemental lead delineation effort was conducted from July 2000 through March 2001, to further assess the extent of contamination within the Cluster 3 Lead-Contaminated Soil Area. Lead screening results ranged from less than 100 mg/kg to a maximum of 11,000 mg/kg (at the 0 to 6 inch interval for sample N96E96 in Round 4). During this effort, most of the elevated concentrations were confined to the upper two feet of the soil profile; however, the vertical distribution was not uniform. A graphical interpretation of the lead delineation data is provided as Figure 4. As discussed in the following section, these high levels of lead present the principal risks to human health and the environment at the site.

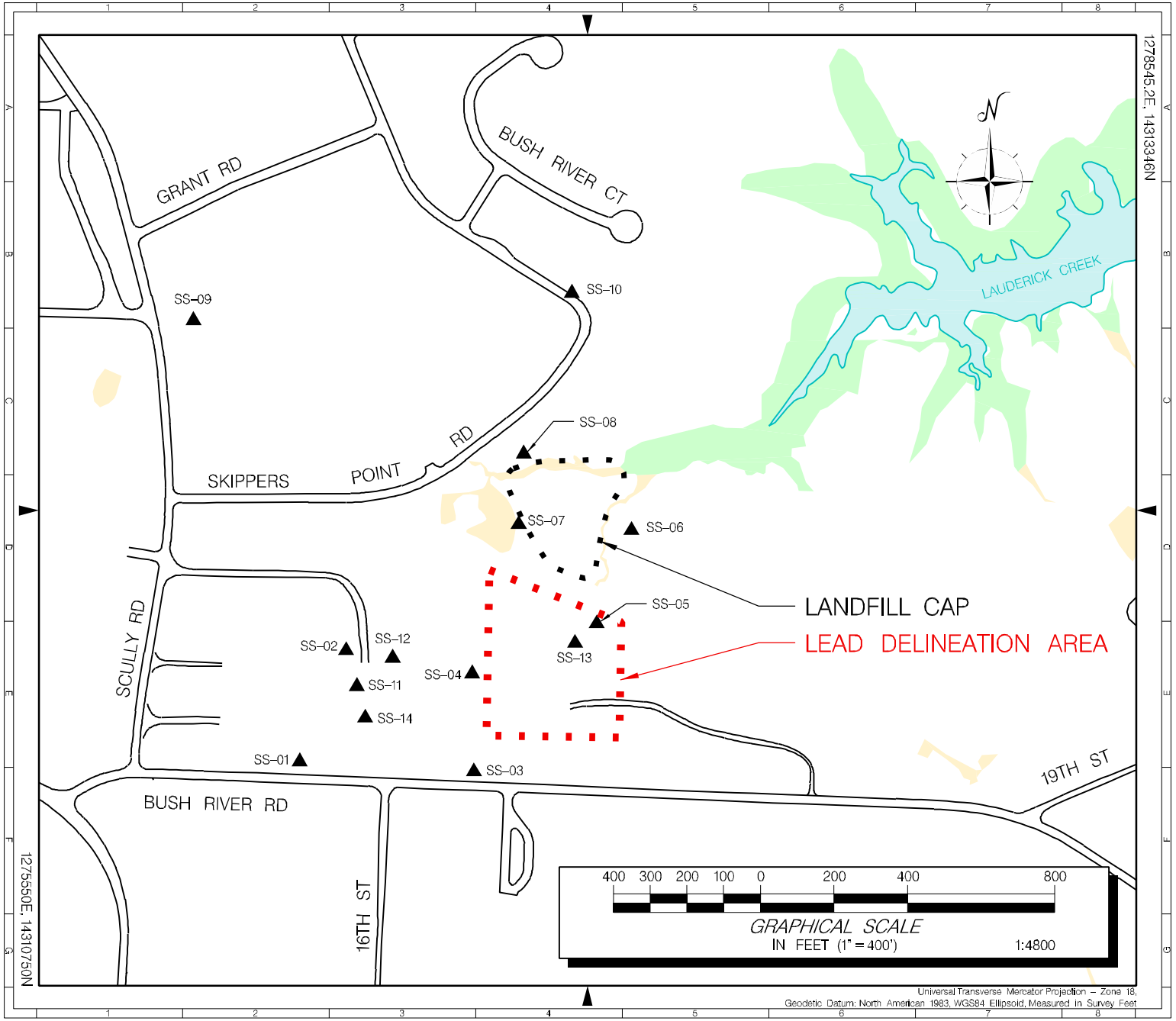
Groundwater was not encountered during the advancement of soil borings in Rounds 3 or 4, and, was encountered in only one of four soil borings conducted during the limited groundwater characterization in May 2003. A cross section of this area is provided as Figure 5. These observations support the assumptions in the FFS Report that the Surficial Aquifer is absent or laterally discontinuous across the Cluster 3 Lead-Contaminated Soil Area. Because there is no surficial aquifer present within this area, groundwater cleanup is not required.

Throughout the investigation of this site, the Army has solicited input from the support agencies and public. Comments from EPA, EPA Biological Technical Assistance Group, MDE, and Aberdeen Proving Ground Superfund Citizens Coalition were incorporated into the FFS. Comments on this Proposed Plan will be documented in the ROD.

HUMAN HEALTH RISK ASSESSMENT

Based on the human health risk assessment conducted in July 1998, lifetime excess cancer risks for current and future land-use scenarios at Cluster 3 were within the EPA's acceptable cancer risk range[1] (i.e., 1×10^{-6} to 1×10^{-4}).

[1] A cancer risk level of 1×10^{-6} represents a probability of one in one million that an individual could contract cancer as a result of exposure.



L E G E N D

- Water
- Road
- Tidal Wetland
- Non-tidal Wetland
- Site Boundary
- Landfill Cap
- Surface Soil Sampling Location

TITLE:

CLUSTER 3 SURFACE SOIL SAMPLING LOCATIONS

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B. JOYCE	J. HARRIS
DATE:	FIGURE:
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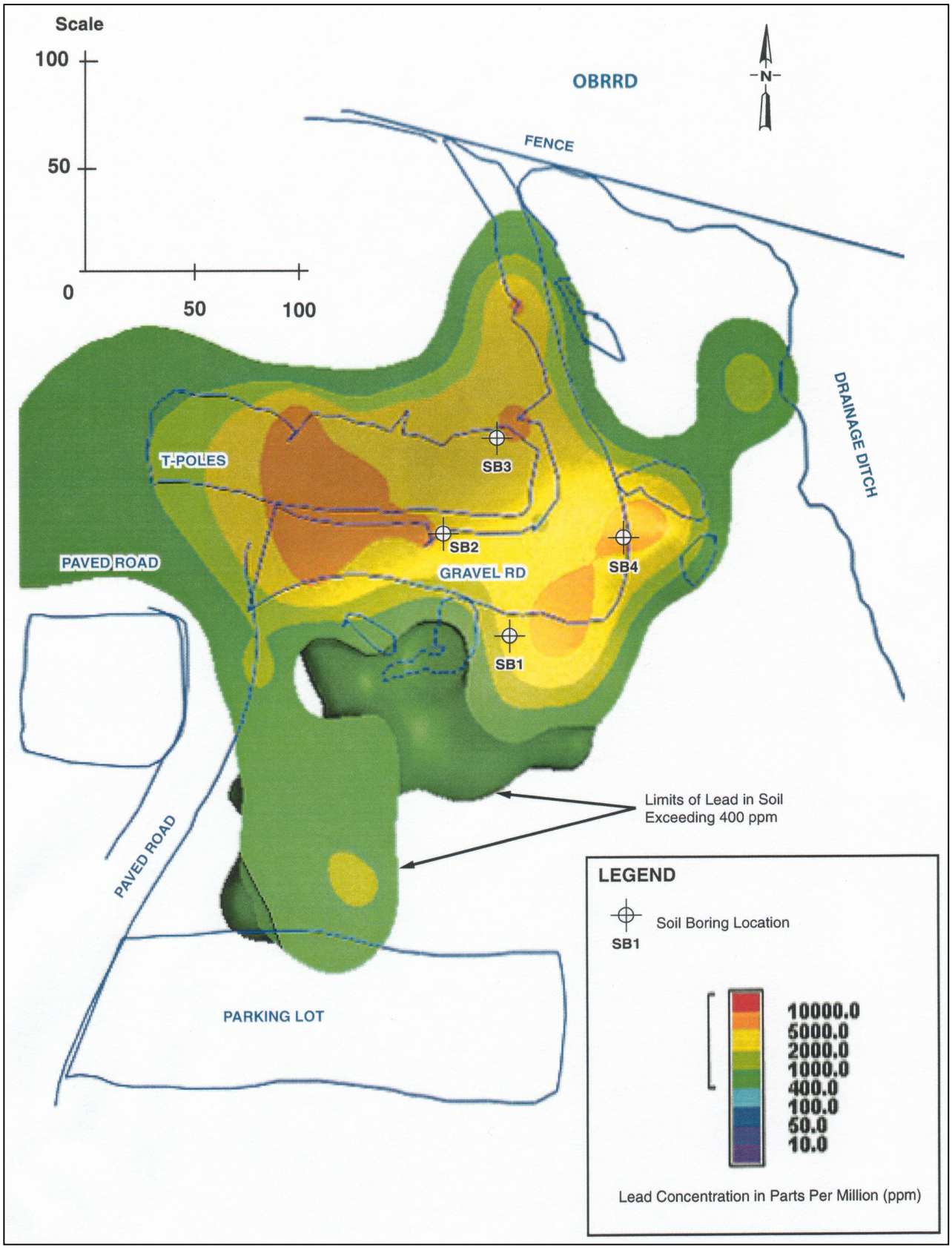

Figure 4. Lead Concentrations in Excess of 400 mg/kg in Soil at the Cluster 3 Lead-Contaminated Soil Area

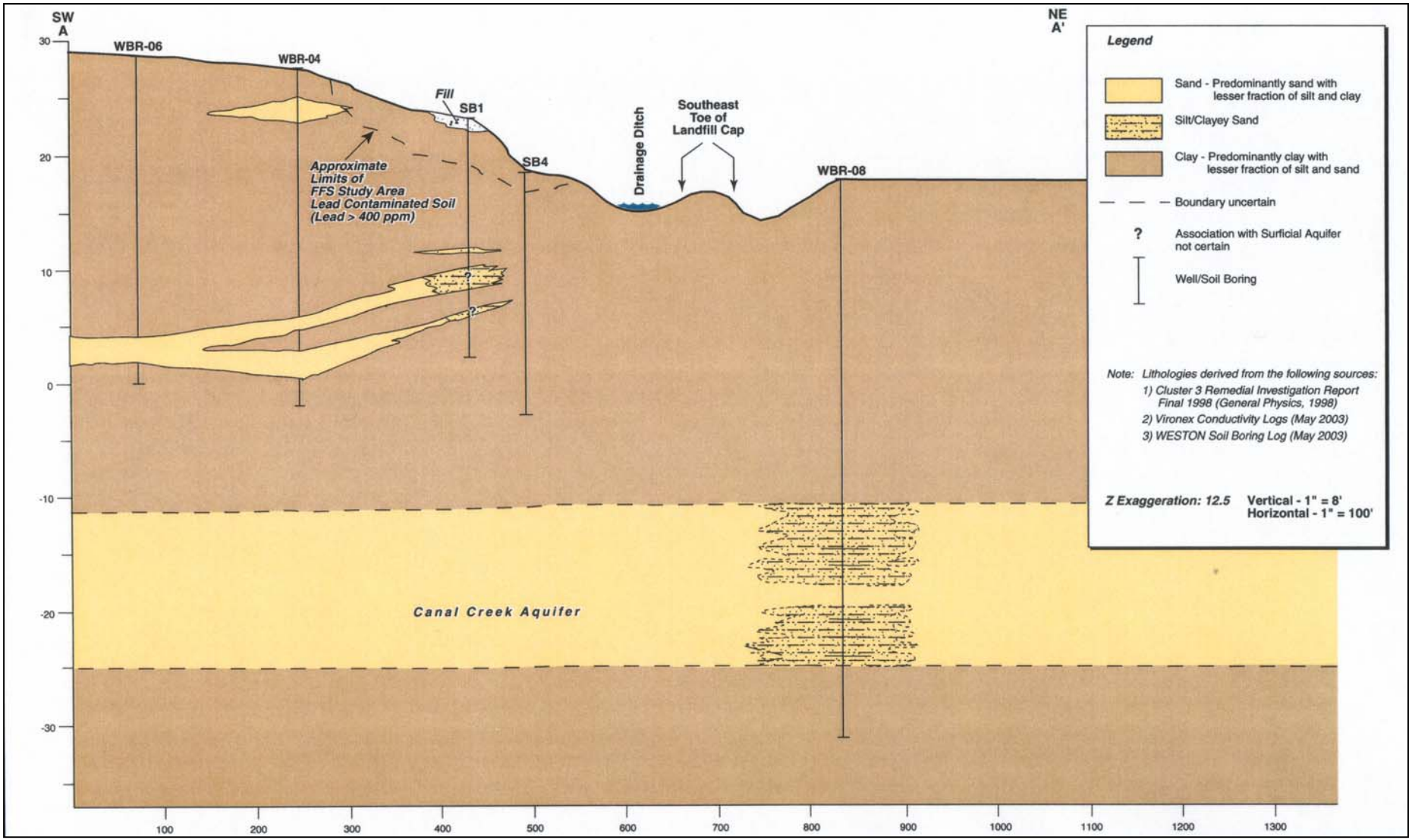

Figure 5. Cross Section, Cluster 3 Lead-Contaminated Soil Area

The hazard indices[2] (non-carcinogenic risk) were all less than one, except for the hazard index for ingestion of groundwater by a future site worker. This elevated hazard index was primarily associated with exposure to manganese (with an individual hazard quotient of two). The hazard quotients for the other individual chemicals were all less than one. However, EPA uses the aggregate risk from all compounds.

Although the cancer risk and the hazard indices were within acceptable levels, risks from exposure to lead are not calculated the same as other chemicals. Safe lead levels are generally determined by EPA guidance (i.e., 1,000 ppm for commercial/industrial, 500 ppm for grassed residential areas, and 400 ppm for play areas) or by modeling. If the level of lead is above these levels, then action is generally taken to remediate lead to a level below the appropriate cleanup level.

Based on input from the Project Team, two scenarios were run using EPA's Adult Blood Lead Model. The first scenario was for a commercial/industrial worker (the assumed land use) and the second scenario was for an older child trespasser. Both scenarios assumed women of childbearing age. The resulting action levels predicted by the model were 1,067 mg/kg for the commercial/ industrial worker scenario and 2,964 mg/kg for the trespasser scenario. The highest levels of lead in soil at Cluster 3 (e.g., maximum detected concentration of 11,000 mg/kg) were well above the action levels for lead for all scenarios.

[2] Hazard quotients are calculated for individual chemicals based on a ratio of the dose that a receptor may be exposed to, divided by a reference dose (i.e., dose just below the threshold where harm may begin to occur). The effects from simultaneous exposure to all chemicals of potential concern are determined by summing the individual hazard quotients within each exposure pathway. This sum is known as the hazard index. In general, hazard indices that are greater than one are indicative of a potential for adverse health effects.

ECOLOGICAL RISK ASSESSMENT

The baseline ecological risk assessment indicated a limited potential for adverse affects to terrestrial plants and soil-dwelling invertebrates, primarily due to the presence of lead, mercury, and zinc in surface soil. There was also potential for adverse affects to aquatic life from carbon disulfide and lead in the surface water of the creek, and from lead in the surface water of the nearby freshwater marsh.

A re-evaluation of the ecological significance of the site contamination was conducted using the results of the baseline ecological assessment, additional data, and a site visit in August 2001. This evaluation recognized that there may be a risk to floral and faunal species directly exposed to lead in soil or indirectly through uptake and trophic transfer. Yet, the habitat quality was described as marginal to sub-optimal based on the small spatial scale of the site, its disturbed soil conditions, limited vegetative structure and species composition, and current land use. As a result, impacts on individual species within this area would result in an insignificant affect on the total local population. However, due to the elevated concentrations of lead in soil, surface water runoff from the Cluster 3 Lead-Contaminated Soil Area was identified as a potential risk to ecological receptors in adjacent wetland areas.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are goals developed for the protection of human health and the environment. The following RAOs were developed for the lead-contaminated soil area at Cluster 3:

- Prevent ingestion, inhalation, or direct contact with surface soil that contains concentrations in excess of the remedial goals;
- Prevent transport and migration of site contaminants to the adjacent wetlands and streams;
- Control future releases of contaminants to ensure protection of human health and the environment; and
- Control surface water runoff from the site so as to avoid damage to the OBRRD containment system located down gradient from the site.

The following lead action levels were established for the Cluster 3 Lead-Contaminated Soil Area: 400 mg/kg (residential) for the 0-2 foot interval and 1,000 mg/kg (industrial) for the 2-4 foot interval. The lower action level for the 0-2 foot interval was also selected for protection of ecological receptors.

SUMMARY OF THE REMEDIAL ALTERNATIVES

This section presents a description of the six remedial alternatives that were developed in the FFS for the Cluster 3 Lead-Contaminated Soil Area:

- Alternative 1 – No Action;
- Alternative 2 – Institutional Controls;
- Alternative 3 – Excavation and Off-Site Disposal;
- Alternative 4 – Excavation and On-Site Reuse;
- Alternative 5 – Containment (Capping); and
- Alternative 6 – In-Situ Treatment (Phytoremediation).

Alternative 1: No Action

Capital Cost:	$0
Present Worth (PW) Operation and Maintenance (O&M) Cost:	$159,700
Total PW Cost:	$159,700

The National Contingency Plan requires consideration of "No Action", as a baseline with which to compare other alternatives. Under this alternative, no active remedial measures would be taken to control risks to human or ecological receptors; treat or remove wastes; or reduce the toxicity, mobility, or volume of contaminated media. Institutional controls would not be implemented, and actions such as land use controls would not continue. Five-year reviews would be required for a period of 30 years, because contamination would remain on site.

Alternative 2: Institutional Controls

Capital Cost:	$72,800
PW O&M Cost:	$271,700
Total PW Cost:	$344,500

For this alternative, institutional controls would be used to limit exposure to the lead-contaminated soil at Cluster 3. These controls would include warnings and restrictive measures, engineered access controls, and prohibition of unauthorized excavation or construction at the site. Similar to Alternative 1, five-year reviews would be conducted for a period of 30 years.

Alternative 3: Excavation and Off-Site Disposal

Capital Cost:	$2,309,000
PW O&M Cost:	$45,000
Total PW Cost:	$2,354,000

Under Alternative 3, lead-contaminated soil above action levels would be removed and replaced with clean backfill. Based on a cleanup level of 400 mg/kg (residential) for the 0-2 foot interval and 1,000 mg/kg (industrial) for the 2-4 foot interval, a total of approximately 4,305 tons of soil would be removed and transported off site for disposal. Since lead would be remediated to 400 mg/kg only up to 2 feet below ground surface, institutional controls prohibiting residential soil disturbance at greater depths would be required. Similar limitations on industrial soil disturbance would be required beyond a depth of 4 feet (unless confirmation sampling indicates otherwise).

This alternative does not include a treatment component, thus, all excavated materials would be managed and disposed in accordance with Resource Conservation and Recovery Act (RCRA) solid waste requirements. As a result, excavated soils will be tested for total lead and Toxicity Characteristic Leaching Procedure (TCLP) criteria and segregated in a secure manner so that contamination of the underlying soils does not occur. If the excavated soils fail the TCLP criteria, they will be managed as RCRA Subtitle C characteristic waste at an off-site RCRA permitted disposal facility. If the soils pass TCLP but do not meet reuse criteria, they will be disposed off site as Subtitle D solid wastes. During all excavations, appropriate personal protective equipment will be used to prevent worker exposures to high levels of lead.

Site restoration activities would include recontouring the site and modifying drainage as necessary to prevent stormwater runoff onto, and possible erosion of, the nearby OBRRD cap. This will include reconstruction of the drainage ditch on the eastern side of the site, using perforated pipe and a high-density polyethylene liner cut-off wall on the downstream side of the contaminated area. The remaining portion of the ditch would be retained as an open channel, vegetated with straw matting.

One formal five-year review was included in the cost for this alternative, to assess post-remediation site conditions. However, the Army plans to re-assess conditions at the Bush River Study Area on a continuing basis, as part of the Edgewood Area Five-Year Review.

Alternative 4: Excavation and On-Site Reuse

Capital Cost:	$973,200
PW O&M Cost:	$45,000
Total PW Cost:	$1,018,200

The removal and site restoration activities planned for this alternative are identical to Alternative 3. However, under this alterative, excavated materials from Cluster 3 that are not hazardous by RCRA characteristic (based on TCLP analysis) and meet other reuse criteria would be staged on-site for reuse within the Bush River Study Area as a base layer under landfill caps.

On-site reuse of the non-hazardous soils is a very cost-effective alternative to off-site disposal. However, several of the waste characterization samples collected in May 2003 failed TCLP [i.e., lead values ranging from 3.7 milligrams per liter (mg/L) to 44 mg/L, compared to the RCRA reporting limit of 5 mg/L]. Consequently, a portion of the excavated soils may require off-site disposal and additional costs may be incurred.

Similar to Alternative 3, one formal five-year review was included in the cost for this alternative. However, the Army plans to re-assess conditions at the Bush River Study Area on a continuing basis, as part of the Edgewood Area Five-Year Review.

Institutional controls will also be required to prohibit residential soil disturbance at depths below 2 feet and industrial soil disturbance below 4 feet.

Alternative 5: Containment (Capping)

Capital Cost:	$451,400
PW O&M Cost:	$655,700
Total PW Cost:	$1,107,100

Under this alternative, a soil cover would be constructed over the contaminated area. The cap would be designed to minimize direct contact with the soils by human receptors and would also prevent migration via surface water runoff.

The soil cover would consist of at least two feet of clean backfill and an animal intrusion barrier. The surface of the cap would be contoured with drainage as necessary, to prevent stormwater runoff onto, and possible erosion of, the nearby OBRRD cap. Similar to Alternatives 3 and 4, the drainage ditch on the eastern side of the site would be reconstructed using perforated pipe and a high-density polyethylene liner cut-off wall on the downstream side of the contaminated area. The remaining portion of the ditch would be retained as an open channel, vegetated with straw matting.

This alternative would also include the components of Alternative 2, namely five-year reviews and institutional controls over a 30-year timeframe. Long-term maintenance would also include periodic monitoring for stability and integrity of the soil cover.

Alternative 6: In-Situ Phytoremediation

Capital Cost:	$915,700
PW O&M Cost:	$80,200
Total PW Cost:	$995,900

Components of this alternative would include: a phytoremediation pilot test, planting of appropriate phytoremediation plants, and periodic sampling and analysis of soil and plants as appropriate to monitor performance. Once the site soils have been remediated below action levels, site restoration activities such as recontouring and drainage control would be implemented.

Based on the results of the treatability study, site conditions are amenable to phyto-remediation using either Indian mustard or sunflower. However, an extraction agent may be required to facilitate lead uptake.

Two five-year reviews were included in the cost for this alternative (due to the extended treatment timeframe). However, the Army plans to re-assess conditions at the Bush River Study Area on a continuing basis, as part of the Edgewood Area Five-Year Review.

EVALUATION OF ALTERNATIVES

This section evaluates the potential performance of each remedial alternative with respect to nine comparison criteria. Additional information can be found in Section 5.0 (Summary and Comparison of Alternatives) of the *Cluster 3 Lead-Contaminated Soil Area FFS Report.*

1. Overall Protection of Human Health and the Environment

All of the alternatives, with the exception of Alternative 1, provide adequate protection of human health by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls. Alternatives 3 through 6 also protect the environment, by preventing surface runoff and migration.

Since Alternative 1 is not protective of human health or the environment, it is eliminated

from further consideration under the remaining eight criteria.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternative 2 involves no active remediation, thus, action- and location-specific ARARs do not apply. Alternatives 3 through 6 would meet both action- and location-specific ARARs, through the proper planning and execution of construction and waste management activities. Compliance with chemical-specific ARARs could not be evaluated, because there are no promulgated Federal or State standards for total lead in soil[3].

3. Long-Term Effectiveness and Permanence

Alternative 2 would partially meet this criterion, through the long-term maintenance of access and land use restrictions. Alternatives 3 and 4 are the most effective and permanent of the proposed alternatives, because they would both remove contamination above action levels from the site. Alternative 5 would also be an effective and permanent control measure if properly constructed and maintained; however, contaminants would remain on site. The long-term effectiveness of Alternative 6 would depend on the successful growth of the plant species and on the ability of the plants to completely and consistently treat high contaminant concentrations in source areas.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

Treatment is not a component of Alternatives 2 through 5; consequently, these alternatives would not result in a reduction of toxicity, mobility, or volume. Over time, Alternative 6 would remove contaminants from the soils, but the plant tissue would require harvesting and proper disposal.

5. Short-Term Effectiveness

Alternatives 3 through 6 would require proper engineering controls and safety procedures to protect the site workers, the community, and the environment during implementation. Unexploded ordnance (UXO) clearance would also be required during any intrusive activities, such as fence installation, excavation, capping, and planting. Alternative 2 presents the lowest risk, because site activities are limited to the installation of fencing and signs. Alternatives 2 through 5 would be completed within one year; whereas, Alternative 6 may require several growing seasons to achieve cleanup goals.

6. Implementability

Alternative 2 would be rather simple to implement, requiring only administrative actions and fence/sign installation. Alternatives 3, 4, and 5 would involve conventional construction activities, however, the potential for encountering UXO provides a minor challenge. Alternatives 3 and 4 also involve the treatment and/or disposal of the excavated materials. Alternative 6 would be relatively easy to implement, but a pilot study is recommended prior to full-scale implementation.

7. Cost

The costs considered in this analysis include total capital cost, annual O&M costs, and present worth over a 30-year period. The alternatives in order from highest to lowest

[3] While there are no promulgated standards for total lead in soil, there are "To-Be-Considered" guidance levels based on risk for various land-use scenarios.

Summary of the Remedial Alternatives for the Cluster 3 Lead-Contaminated Soil Area at the Bush River Study Area

	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3 Excavation and Disposal	Alternative 4 Excavation and Reuse	Alternative 5 Containment (Capping)	Alternative 6 In-Situ Phyto-remediation
Protection of Human Health and the Environment	○	◒	●	●	●	●
Compliance with ARARs	○	◒	●	●	●	●
Long-Term Effectiveness and Permanence	○	◒	●	●	●	●
Reduction of Toxicity, Mobility, or Volume Through Treatment	○	○	○	○	○	◒
Short-Term Effectiveness	○	◒	●	◒	◒	○
Implementability	●	●	◒	◒	◒	◒
Cost	●	●	○	◒	◒	◒

● Fully meets criterion ◒ Partially meets criterion ○ Does not meet criterion

cost are: Alternative 3 ($2,354,000), Alternative 5 ($1,107,100), Alternative 4 ($1,018,200), Alternative 6 ($995,900), Alternative 2 ($344,500), and Alternative 1 ($159,700).

8. State Acceptance

State representatives have reviewed the remedial alternatives and provided preliminary comments that were addressed in the FFS Report and Proposed Plan. However, final concurrence from the State will be determined at the conclusion of the public review period and documented in the ROD for the site.

9. Community Acceptance

Community acceptance of the preferred alternative will also be evaluated at the end of the public comment period and documented in the ROD.

PREFERRED ALTERNATIVE

The Preferred Alternative for the Cluster 3 Lead-Contaminated Soil Area is Alternative 4 (Excavation and On-Site Reuse) at an estimated cost of $1,018,200. Under this alternative, contaminated soil above action levels would be removed and replaced with clean backfill. Based on a cleanup level of 400 mg/kg (residential) for the 0-2 foot

interval and 1,000 mg/kg (industrial) for the 2-4 foot interval, a total of approximately 4,305 tons of soil would be removed. Excavated materials from Cluster 3 that are not hazardous by RCRA characteristic (based on TCLP analysis) and meet other reuse criteria would be staged on-site for reuse within the Bush River Study Area as a base layer under landfill caps.

Since lead would be remediated to 400 mg/kg only up to 2 feet below ground surface, institutional controls prohibiting residential soil disturbance at greater depths would be required. Similar limitations on industrial soil disturbance would be required beyond a depth of 4 feet (unless confirmation sampling indicates otherwise).

This alternative does not include a treatment component, thus, all excavated materials would be managed in accordance with RCRA solid waste requirements. As a result, excavated soils will be tested for total lead and TCLP criteria and segregated in a secure manner so that contamination of the underlying soils does not occur. If the excavated soils fail the TCLP criteria, they will be managed as RCRA Subtitle C characteristic waste at an off-site RCRA permitted disposal facility. If the soils pass TCLP but do not meet reuse criteria, they will be disposed off site as Subtitle D solid wastes. During all excavations, appropriate personal protective equipment will be used to prevent worker exposures to high levels of lead.

Site restoration activities would include recontouring the site and modifying drainage as necessary to prevent stormwater runoff onto, and possible erosion of, the nearby OBRRD cap. This will include reconstruction of the drainage ditch on the eastern side of the site, using perforated pipe and a high-density polyethylene liner cut-off wall on the downstream side of the contaminated area. The remaining portion of the ditch would be retained as an open channel, vegetated with straw matting.

One formal five-year review was included in the cost for this alternative, to assess post-remediation site conditions. However, the Army plans to re-assess conditions at the Bush River Study Area on a continuing basis, as part of the Edgewood Area Five-Year Review.

Based on the information currently available, the Army believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives and modifying criteria. The Army expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA Section 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 principle element when justified.

EPA and MDE have both reviewed the Proposed Plan and generally support the Preferred Alternative. However, based on new information that may become available or on public comments, the Army and EPA, in consultation with the MDE, may modify the preferred alternative outlined in this plan. Therefore, the public is encouraged to comment.

COMMUNITY PARTICIPATION

The Army, EPA, and MDE are soliciting input from the community on each of the proposed alternatives for the Cluster 3 Lead-Contaminated Soils. The 45-day comment period extends from April 21, 2004 through June 4, 2004. This comment period includes

a public meeting at which the Army, EPA, and MDE will present the Proposed Plan and accept both oral and written comments. The public meeting will be held on May 4, 2004 at 6:30 p.m. at the Edgewood Senior Center in Edgewood, MD.

Additional details regarding the Cluster 3 Lead-Contaminated Soil Area can be found in the Feasibility Study located within the Administrative Record File. The Administrative Record is available for public review at the following locations:

Harford County Library
Aberdeen Branch
21 Franklin Street
Aberdeen, MD 21001
(410) 273-5608

Harford County Library
Edgewood Branch
2205 Hanson Road
Edgewood, MD 21040
(410) 612-1600

Kent County
Washington College
Miller Library
Chestertown, MD 21620
(410) 778-2800

Comments on the Proposed Plan will be summarized in the ROD, which is the document that presents the selected remedy.

To send written comments or obtain further information, contact any of the following representatives:

Mr. Kenneth Stachiw, Program Manager
Directorate of Safety, Health & Environment
ATTN: AMSSB-GSH-ER
5179 Hoadley Road
Aberdeen Proving Ground, MD 21010
(410) 436-3320

Mr. Frank Vavra
US Environmental Protection Agency,
Region III
1650 Arch Street (3HS13)
Philadelphia, PA 19103-2029
(215) 814-3221

Mr. Curtis DeTore
Maryland Department of the Environment
Federal/Superfund Division
1800 Washington Blvd., Suite 625
Baltimore, MD 21230-1719
(410) 537-3440

Written comments must be postmarked no later than the last day of the public comment period, which is June 4, 2004.

EXPLANATION OF EVALUATION CRITERIA

THRESHOLD CRITERIA:

- **Overall Protection of Human Health and the Environment** refers to whether a remedy provides adequate protection against harmful effects. It calls for consideration of how human health or environmental risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** addresses whether a remedy meets all the applicable or relevant and appropriate requirements of Federal and State environmental statutes.

PRIMARY BALANCING CRITERIA:

- **Long-Term Effectiveness and Permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment after cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume Through Treatment** refers to the effectiveness of the treatment technologies in reducing the toxicity, mobility, or volume of contaminants.

- **Short-Term Effectiveness** refers to the speed with which the remedy achieves protection and to the remedy's potential during construction and implementation to have adverse effects on human health and the environment.

- **Implementability** refers to the technical and administrative feasibility of a remedy, including the availability of required materials and services.

- **Cost** includes capital expenditures and operation and maintenance costs.

MODIFYING CRITERIA:

- **State Acceptance** indicates whether the state concurs with, opposes, or has no comment on the preferred alternative based on its review of the Remedial Investigation/Feasibility Study Reports and Proposed Plan.

- **Community Acceptance** is documented in the Record of Decision following a review of public comments on the Proposed Plan.

ACRONYMS AND ABBREVIATIONS

APG.....Aberdeen Proving Ground

ARAR .....Applicable or Relevant and Appropriate Requirement

BRSA .....Bush River Study Area

CERCLA.....Comprehensive Environmental Response, Compensation, and Liability Act

DSERTS.....Defense Site Environmental Restoration Tracking System

EPA.....Environmental Protection Agency

FFS .....Focused Feasibility Study

MDE.....Maryland Department of the Environment

mg/kg .....milligram per kilogram

mg/L.....milligram per Liter

OBRRD.....Old Bush River Road Dump

O&M.....Operation and Maintenance

PW.....Present Worth

RAO.....Remedial Action Objective

RCRA.....Resource Conservation and Recovery Act

RI.....Remedial Investigation

ROD.....Record of Decision

TCLP.....Toxicity Characteristic Leaching Procedure

UXO.....Unexploded Ordnance

GLOSSARY OF TERMS

Administrative Record – This is a collection of documents that contain information and reports generated during the site investigation and remediation, which is available for public review.

Applicable or Relevant and Appropriate Requirements – These criteria are set forth by Federal and States statutes and regulations and must be considered in the evaluation of remedial alternatives.

Comprehensive Environmental Response, Compensation, and Liability Act – A Federal law, which was passed in 1980 and is commonly referred to as the "Superfund Law". It provides for the cleanup of inactive hazardous waste disposal sites that endanger public health or the environment.

Focused Feasibility Study – This provides a detailed analysis of remedial alternatives for a site. This analysis supports risk management decisions to select the most appropriate remedy.

National Contingency Plan – Officially the "National Oil and Hazardous Substances Pollution Contingency Plan", the Federal regulation that guides determination of the sites to be addressed or cleaned up under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere.

National Environmental Policy Act – Enacted on January 1, 1970, this act stated that any Federal branch or agency proposing a project that might have a significant effect on the environment must provide a detailed statement of the potential concerns.

National Priorities List – The list, developed by EPA, identifies the uncontrolled hazardous substance release sites in the United States that are considered priorities for remedial evaluation and response.

Record of Decision – The document signed by the Army, and EPA, that describes the clean up action selected for a site, the basis for selecting that remedy, public comments on alternative remedies, responses to comments, and the cost of the remedy.

Remedial Investigation – The purpose of the Remedial Investigation is to characterize possible contamination and to determine whether a site requires remedial action.

Resource Conservation and Recovery Act – This act governs the generation, transportation, treatment, storage, and disposal of hazardous wastes at active disposal sites.

Superfund Amendments and Reauthorization Act – In 1986, this act amended the Comprehensive Environmental Response, Compensation, and Liability Act.