Picatinny Installation Restoration Program

Picatinny is an Official Hawk Watch Site

RECORD OF DECISION
SITES 61 AND 104 (PICA 102)

PICATINNY ARSENAL
NEW JERSEY

FINAL **NOVEMBER 2008**

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LIST OF ACRONYMS AND ABBREVIATIONS

4,4-DDD	1,1-dichloro-2,2-bis(*p*-chlorophenyl) ethane
4,4-DDE	1,1-dichloro-2,2-bis(*p*-chlorophenyl) ethylene
4,4-DDT	1,1,1-trichloro-2,2-bis(*p*-chlorophenyl) ethane
AA	Area of Attainment
Alpha-BHC	cyclohexane
ARAR	Applicable or Relevant and Appropriate Requirement
Army	U.S. Department of the Army
bgs	Below Ground Surface
CCME	Canadian Council of Ministers of the Environment
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cm/sec	centimeter per second
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
COPEC	chemical of potential ecological concern
CWA	Clean Water Act
EC	Engineering Control
ELCR	Excess Lifetime Cancer Risk
EPC	exposure point concentration
ERA	Ecological Risk Assessment
ERBCL	Ecological Risk-Based Cleanup Level
ER-L	Effects Range-Low
FS	Feasibility Study
FFS	Focused Feasibility Study
ft	Feet
GIS	Geographic Information System
GPB	Green Pond Brook
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IC	Institutional Control
IGW	Impact to Groundwater
INRMP	Integrated Natural Resource Management Plan
ISQG	Interim Sediment Quality Guidelines
IT	International Technology Corporation
LOAEL	Lowest observed adverse effect level
LOC	Level of Concern
LUC	Land Use Control
MEC	Munitions and Explosives of Concern
µg/L	microgram per liter
MMRP	Military Munitions Response Program
mg/kg	Milligrams per kilogram
NA	not applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJ	New Jersey
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NOAEL	No observed adverse effect level
NPL	National Priorities List
NRDCSCC	Non-Residential Direct Contact Soil Cleanup Criteria
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
PAERAB	Picatinny Arsenal Environmental Restoration Advisory Board
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	tetrachloroethene
PEL	Potential Effects Level
PP	Proposed Plan
PVC	polyvinyl chloride
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RD	Response Design
RDX	Cyclotrimethylenetrinitramine
RI	Remedial Investigation
ROD	Record of Decision
RPM	Regional Project Manager
SARA	Superfund Amendments and Reauthorization Act
SCL	Site Cleanup Level
Shaw	Shaw Environmental
SQB	Sediment Quality Benchmark
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TBC	To Be Considered
TCE	trichloroethene

TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TPH	Total petroleum hydrocarbons
USC	United States Code
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WQC	Water Quality Criteria
WWI	World War I
WWII	World War II

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 and sediment at Sites 61 and 104 (PICA 102) at Picatinny Arsenal (Picatinny), located in Rockaway Township, Morris County, New Jersey (**Figure 1**). The sediments specifically addressed in this ROD include those within Robinson Run. Sediment and surface water from Green Pond Brook (GPB) was addressed in the PICA 193 ROD, dated December 2004. This Site 60 and 104 (PICA 102) ROD includes some sediment and surface water data from GPB. This data is provided for comparison purposes only. Groundwater issues at the Site are being addressed separately under the Mid-Valley Groundwater Operable Unit. For this reason, response actions for groundwater are not discussed herein. Munitions and Explosives of Concern (MEC) at the site will be addressed under the Military Munitions Response Program (MMRP).

Sites 61 and 104 (PICA 102) are located in Area F at Picatinny (see **Figure 1**). Site 61 is north of Site 104 and encompasses approximately 3 acres; located south of Site 61, with GPB to the west, Site 104 consists of approximately 0.96 acre.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the Selected Response Action for Sites 61 and 104 (PICA 102) located at Picatinny Arsenal in Rockaway Township, NJ. The response action is selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 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 response 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 response action. NJDEP concurs with the Selected Response Action.

1.3 ASSESSMENT OF THE SITE

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

1.4 DESCRIPTION OF THE SELECTED RESPONSE ACTION – FOCUSED SOIL EXCAVATIONS AND IMPLEMENTATION OF LAND USE CONTROLS

The response action for Sites 61 and 104 (PICA 102), pursuant to this ROD, is part of a comprehensive environmental investigation and remediation process currently being performed at Picatinny. The remaining areas in Picatinny are being considered separately and remedies for these areas are presented in separate documents. A site location map is presented as **Figure 1**.

Studies conducted at Sites 61 and 104 (PICA 102) have shown various constituents present in soil and sediment at concentrations above the levels of concern (LOCs). **Table 2** and **Table 3** summarize the constituents that exceeded LOCs in surface and subsurface soil. **Table 4** summarizes the constituents that exceeded LOCs in sediment samples collected at Sites 61 and 104 (PICA 102). **Table 5** summarizes the constituents that exceeded LOCs in surface water samples collected at Sites 61 and 104 (PICA 102). These samples were collected to characterize surface water impacts as sediment and surface water coexist in a mobile environment.

The Selected Response Action for soil at Sites 61 and 104 (PICA 102) consists of focused excavations and disposal of soil at two Areas of Attainment (AAs), $AA_{104SS-1}$ and $AA_{104SS-2}$; and institutional controls (ICs) and maintenance of existing engineering controls (ECs), collectively referred to herein as land use controls (LUCs). The Selected Response Action for sediment at Sites 61 and 104 (PICA 102) consists of LUCs. The Selected Response Actions (referred to herein as the Selected Response Action) were chosen based on protection of human health and the environment. The Selected Response Action addresses the limited risk posed by soil and sediment effectively, and is the most implementable and cost-effective, while satisfying the remaining selection criteria.

1.5 STATUTORY DETERMINATIONS

The Selected Response Action satisfies the chemical-specific cleanup levels and complies with action and location-specific applicable or relevant and appropriate requirements (ARARs). Site Cleanup Levels (SCLs) were selected for soil in the Site 61 and 104 (PICA 102) Feasibility Study (FS) based on the New Jersey soil cleanup criteria which were in effect at the time. Subsequently, NJDEP promulgated new soil cleanup standards on June 2, 2008. The Army is complying with the phase-in requirements provided with the new standards by basing SCLs on New Jersey soil cleanup criteria which were in effect prior to June 2, 2008. The Selected Response Action is protective of human health and the environment, and is cost effective.

The Selected Response Action does not address Sites 61 and 104 (PICA 102) through the use of active treatment technologies. As concluded in the Risk Assessment, none of the contaminants that exceeded LOCs at Sites 61 and 104 (PICA 102) meet the criteria of principal threat waste or pose an unacceptable risk to human health and the environment under the current and reasonably anticipated future use. The Selected Response Action provides an optimal balance of controlling human health and ecological risks, incorporating focused soil excavations with minimal intrusive activities, and is more cost effective than technologies that do utilize treatment.

Because the Selected Response Action will result in contaminants remaining on site above levels that do not allow for unlimited use and unrestricted exposure, five-year reviews will be conducted in compliance with CERCLA and NCP to ensure that the Selected Response Action 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 (Part 2) of this ROD. Additional information can be found in the Administrative Record for this site.

Criterion	Section	Page No.
Contaminants of concern and their respective concentrations	Tables 7 and 8	NA
Baseline risk represented by the contaminants of concern	2.7	2-7
Cleanup levels established for contaminants of concern and the basis for these levels	Table 7 and 8 2.7.4	2-11 and 2-12
How source materials constituting principal threats will be addressed	2.12	2-22
Current and reasonably anticipated future land use assumptions used in baseline risk assessment and ROD	2.6	2-7
Potential land and groundwater use available as a result of the Selected Response Action	2.13.4	2-24
Estimated capital, annual operation and maintenance (O&M) and total present worth costs, discount rate, and the number of years over which the Response Action cost estimates are projected	2.13.3	2-23 and 2-24
Key factors leading to selection of Selected Response Action	2.13.1	2-22

NA – Not Applicable

1.7 AUTHORIZING SIGNATURE

6 Nov 08

John P. Stack
Lieutenant Colonel, U.S. Army
Garrison Commander

Date

3/17/09

Walter E. Mugdan, Director
Emergency and Response Division
United States Environmental Protection Agency, Region 2

Date

2.0 PART 2: DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

This ROD describes the Selected Response Action at Sites 61 and 104 (PICA 102) located at Picatinny Arsenal in Rockaway Township, Morris County, New Jersey. Picatinny is a NPL site and is registered under the Comprehensive Environmental Compensation, Response, and Liability Information System number NJ3210020704. The Army is the lead agency for CERCLA actions at these sites, and USEPA Region 2 is the support agency with oversight responsibilities. Plans and activities are also being coordinated with appropriate state agencies, including NJDEP.

Picatinny Arsenal is a 6,500-acre government-operated munitions research and development facility located in Morris County, New Jersey, approximately 40 miles west of New York City and 4 miles northeast of Dover, New Jersey. The Arsenal sits in the Highlands of the state of New Jersey (**Figure 1**).

Sites 61 and 104 (PICA 102) are located in Area F at Picatinny (see **Figure 1**). Area F is approximately 77 acres in size and encompasses 17 sites. Located on Sixteenth Avenue northwest of the intersection of Ninth Street and Buffington Road, Site 61 is north of Site 104 and encompasses approximately 3 acres and includes Building 171 and 176. Robinson Run crosses through the southern portion of Site 61. Located south of Site 61, with GPB to the west, Site 104 consists of approximately 0.96 acre and includes former Building 161 and Building 162. Site 61 was used for laboratory equipment storage, ammunition sampling and photographic laboratory. Site 104 was used as a railroad scale house and for propellant and ammunition analyses.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Picatinny Arsenal Background

Picatinny Arsenal was established in 1880 by the U.S. War Department as a storage and powder depot. Later it was expanded to assemble powder charges for cannons and to fill projectiles with maximite (a propellant). During World War I (WWI), Picatinny Arsenal produced all sizes of projectiles. In the years following WWI, Picatinny Arsenal began projectile melt-loading operations and began to manufacture pyrotechnic signals and flares on a production basis. During World War II (WWII), Picatinny Arsenal produced artillery ammunition, bombs, high explosives, pyrotechnics, and other ordnance. After WWII, Picatinny Arsenal's primary role became the research and engineering of new ordnance. However, during the Korean and Vietnam conflicts, Picatinny Arsenal resumed the production and development of explosives, ammunition, and mine systems.

In recent years, Picatinny Arsenal's mission has shifted to conducting and managing research development, life-cycle engineering, and support of other military weapons and weapon systems. The facility has responsibility for the research and development of armament items. The Base Realignment and Closure process in 2005 resulted in Picatinny being designated to remain open and to expand in mission.

2.2.2 Site 61 and 104 (PICA 102) Background

Currently, Buildings 171 and 176 at Site 61 are used as administrative buildings. Building 176 was originally used for laboratory equipment storage and ammunition sampling. Additionally, the basement of Building 171 has been used as a photographic laboratory.

Site 104 includes Former Building 161 and Building 162. Although the exact location of Former Building 161 is unknown, former Building 161 was located on Kibler Road southeast of Building 162 and was used a railroad scale house. Former Building 161 was demolished sometime prior to 1942. Building 162 is located on Kibler Road and is presently used for administrative purposes. The primary operations conducted at the Building in the past included propellant and ammunition analyses. Historical practices at Building 162 included: chemical disposal in sewers and sinks, using carbon tetrachloride and mercury for cleaning purposes, and the dumping of chemicals and propellants into the swampy area west of the building. The limits of Sites 61 and 104 (PICA 102) are presented in **Figure 2**.

During the Phase I Remedial Investigation (RI) at Site 61, excavated material northwest of Building 176 consisted mainly of fill. Debris material included polyvinyl chloride (PVC)/steel pipes, metal conduit, steel reinforced concrete, nails, and other construction debris (Dames and Moore, 1998). Complete investigation results for Site 61 and 104 (PICA 102) are presented in the Phase I RI (Dames and Moore, 1998).

Previous environmental investigations conducted at Sites 61 and 104 (PICA 102) are listed below:

- Phase I RI conducted by Dames and Moore in 1994 (included in the 1998 RI Report);
- Additional Sampling Investigation conducted by ICF Kaiser in 1998 (IT, 1999);
- Focused Feasibility Study (FSS) for Green Pond and Bear Swamp Brook (IT, 2001) conducted by International Technology Corporation (IT) in 2001;
- A Risk Management Plan (RMP) for Site 61 was conducted by IT. Additional sampling was performed at Site 104 by IT at the request of the Army in April 2000;
- Feasibility Study (FS) for Sites 61 and 104 (PICA 102) was conducted by Shaw Environmental (Shaw) in June 2005.

2.2.3 Enforcement Activities

No formal enforcement activities have occurred at Sites 61 and 104 (PICA 102). Picatinny 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

Sites 61 and 104 (PICA 102) have been the topic of presentations at the Picatinny Arsenal Environmental Restoration Advisory Board (PAERAB). PAERAB members have provided comments regarding the Selected Response Action. A copy of the Proposed Plan (PP) (ARCADIS, 2008) was given to the PAERAB's co-chair and a copy was offered to all PAERAB members. A final PP for Site 61 and 104 (PICA 102) was completed and released to the public on April 17, 2008 at the information repositories listed below:

Installation Restoration Program Office
Building 319
Picatinny Arsenal, New Jersey 07806

Rockaway Township Library
61 Mount Hope Road
Rockaway Township, New Jersey 07866

Morris County Library
30 East Hanover Avenue
Whippany, New Jersey 07981

Multiple newspaper notifications were made to inform the public of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. The notification was run in the Daily Record on April 11, 2008 and in the Star Ledger on April 12, 2008. Copies of the certificates of publication are provided in Appendix A. A public meeting was held on April 17, 2008 to inform the public about the Selected Response Action for Sites 61 and 104 (PICA 102) and to seek public comments. At this meeting, representatives from the U.S. Army, NJDEP, USEPA, and the Army's contractor, ARCADIS U.S., Inc., were present to answer questions about the site and response actions under consideration. Following the public meeting, a public comment period was held from April 17, 2008 to May 17, 2008 during which comments from the public were received. Public comments and prepared responses are presented in Section 3.0 of this ROD.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

This ROD addresses the selection of the response action for soil and sediment at Sites 61 and 104 (PICA 102). The Selected Response Action will address the contaminants of concern (COCs), which were identified in soils and sediment. The COCs are discussed in further detail in Section 2.7.4. The Selected Response Action for Sites 61 and 104 (PICA 102) is designed to provide protection to human health and the environment.

The Selected Response Action for remediation of soil at Sites 61 and 104 (PICA 102) consists of excavation and disposal of soil from two Areas of Attainment, (AAs), $AA_{104SS-1}$ and $AA_{104SS-2}$. Approximately 54 cubic yards of contaminated soil will be excavated, comprising an area of approximately 1,242 square feet. The remaining AAs for soil will be addressed through implementation of LUCs, which include maintenance of existing ECs (i.e., vegetative cover).

The Selected Response Action for sediment at Sites 61 and 104 (PICA 102) consists of enforcing LUCs. LUCs for soil and sediment will be maintained until such time as contaminant levels allow for unrestricted use and unlimited exposure. The property will be subject to access restrictions designed to prevent disturbance of the existing soil cover and to ensure no residential use of the property that results in unacceptable risk. The land use control objectives are:

- Prohibit the development and use of property for residential housing, elementary and secondary schools, child-care facilities and playgrounds that result in unacceptable risks;
- Maintain integrity of engineering controls; and,
- Control excavation at the site through coordination with both Picatinny Environmental and the Safety Office.

The Selected Response Action also involves performing any site maintenance required to maintain the protectiveness of the Response Action. The LUCs and any maintenance that will be implemented by the Army will be detailed in the Remedial Design (RD). Land use controls will be maintained until the concentration of hazardous substances in soil and sediment are at such levels to allow for unrestricted use and unlimited exposure.

Picatinny has many existing LUCs in place. Elements of LUCs in place at Picatinny include: Site Clearance and Soil Management Procedures; MEC Clearance Procedures; Master Plan Regulations; Picatinny Base Access Restrictions; Picatinny Safety Program; Army Military Construction Program; and a facility-wide Classification Exception Area (CEA). As stated above, a RD will be prepared to formalize many of these LUCs.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Characteristics

Size, Topography, and Surface Water Hydrology

Sites 61 and 104 (PICA 102) are located in Area F at Picatinny (see **Figure 1**). Area F is approximately 77 acres in size and encompasses 17 sites. Site 61 encompasses approximately 3 acres and Robinson Run crosses through the southern portion of Site 61. Located south of Site 61, with GPB to the west, Site 104 consists of approximately 0.96 acre.

The topography at Sites 61 and 104 (PICA 102) slopes gently to the west-northwest towards GPB, with ground elevations ranging from 690 feet (ft) to 715 ft above mean sea level. Site 104 is generally flat, with the exception of a low escarpment (2 to 4 ft) west of Building 162. An approximately 10-foot high escarpment exists to the west and northwest of Buildings 171 and 176 (Site 61). This escarpment delineates the floodplain boundary of GPB. The ground surface at both sites is covered by grass lawns, concrete walkways, roadways, and parking lots. Because most of Site 61 is covered by grass, surface water infiltration is common except during excessive rainstorms. Surface water at Site 104 is either collected by storm drains or discharged along GPB or it follows the natural drainage channels west of the buildings and ponds in the low swampy area. GPB in this area is classified as a FW2-TP(C1) which designates is as a trout production, Class A, a source of exceptional recreational or water supply.

A site map showing existing site limits for both sites is provided as **Figure 2**.

Geology and Hydrogeology

The geology at the two sites was inferred from the excavation of three test pits and the installation of two monitoring wells at Site 61 and the installation of monitoring wells, soil borings, and hydro-punches at Site 104. The test pits at Site 61 were excavated to a depth of 9 ft below ground surface (bgs) and the monitoring wells were drilled to a depth of 32 ft bgs. The monitoring wells installed at Site 104 were completed to a maximum depth of 137 ft bgs. The bedrock geology of Area F consists almost entirely of the Cambrian Leithsville Dolomite unit, except for a small portion of the area underlain by the Cambrian Hardyston quartzite. The unconsolidated Pleistocene glacial sediments that fill Picatinny valley also overlie the bedrock units of Area F. The thickest section of glacial sediments occurs in the center of the valley; along the south-western boundary of Area F, where the thickness ranges up to 150 ft. The thinnest section of glacial sediments in Area F is along the northeastern corner where the glacial sediments pinch out along the margin of the steep valley wall where valley fill material gives way to alluvium.

Three aquifers have been identified in the southern portion of Area F; two are in the quaternary unconsolidated glacial sediments. The two unconsolidated aquifers, from shallowest to deepest are: the unconfined, or water table aquifer, and the lower semi-confined aquifer. The third aquifer is in the bedrock, dolomitic unit.

Groundwater at the site is being addressed separately under the Mid-Valley Groundwater Operable Unit.

Climate

Northern New Jersey has a continental temperate climate controlled by weather patterns from the continental interior. Prevailing winds blow from the northwest from October to April and from the southwest from May to September. The average monthly temperature ranges from a high of about 72°F in July to a low of about 27°F in January and February. The average date of the last freeze is May 2, and the first freeze is October 8. Average annual precipitation at the Boonton monitoring station located approximately 5 miles east of Picatinny is 48 inches and is evenly distributed throughout the year.

2.5.2 Summary and Findings of Site Investigations

Table 1 summarizes environmental investigations and reporting that have been conducted at Sites 61 and 104 (PICA 102). The extent of contamination in surface soil, subsurface soil, sediment, and surface water is summarized below. In addition to the LOCs described below, all samples were compared to the Picatinny background thresholds (IT, 2002), when available.

Extent of Surface Soil Contamination

Studies have shown various contaminants present in surface soil at the site above LOCs. The LOCs are based on the NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC). In cases where NJDEP Cleanup Criteria are not available, USEPA Region III Industrial ($1x10^{-06}$) Risk-Based Concentrations (RBCs) were selected as LOCs.

Surface soil samples were collected at Site 61 and 104 (PICA 102) during the Phase I RI (1993-1994) and the Additional Phase I RI (1997). Surface soil samples collected from Sites 61 and 104 (PICA 102) were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPHs), target analyte list (TAL) metals, cyanide, and explosives.

Three samples (SD104-2, SD104-3, and 104SD-6) that were initially classified as sediment, were subsequently determined to be more representative of surface soil based on the percent moisture of the samples (<30%) as well as the physical characteristics of the soil. Therefore, samples SD104-2, SD104-3, and 104SD-6 have been compared to soil LOCs, and the findings are included within the Extent of Surface Soil Contamination discussion. Further the data from these samples was included in the human health risk assessment and subsequently evaluated as soil samples.

Based on the analytical results, the surface soil COCs consist of SVOCs and TAL metals. **Table 2** summarizes the constituents that exceeded LOCs in surface soil samples collected from Sites 61 and 104 (PICA 102).

Figure 3 shows the locations where sample results have indicated LOC exceedances.

Semi volatile organic compounds (SVOCs)

A total of six SVOCs were identified at concentrations exceeding LOCs in surface soil samples collected at Site 61. Two SVOCs were identified at levels exceeding the LOCs in Site 104 surface soil.

The SVOCs detected at Site 61 included the polynuclear aromatic hydrocarbons (PAHs) benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene. The highest concentrations of benz(a)anthracene (26.5 milligrams/kilogram [mg/kg]), benzo(a)pyrene (25.0 mg/kg), benzo(b)fluoranthene (30.5 mg/kg), benzo(k)fluoranthene (8.65 mg/kg), dibenz(a,h)anthracene (2.10 mg/kg), and indeno(1,2,3-c,d)pyrene (8.95 mg/kg) were identified in sample TP61-2C. Sample TP61-2C was collected from test pit 61TP-2 at a depth of 2 feet bgs. The test pit was installed north of Building 176 during the Phase I RI field investigation.

The SVOCs detected at Site 104 included the PAHs benz(a)anthracene and benzo(b)fluoranthene. The highest concentrations of benz(a)anthracene (2.5 mg/kg) and benzo(b)fluoranthene (4.7 mg/kg) were identified in sample SD104-3.

Target Analyte List (TAL) Metals

Arsenic, beryllium, and thallium were identified at Sites 61 and 104 (PICA 102) at concentrations exceeding LOCs. The highest concentrations of arsenic ranged from 23.8 mg/kg at Site 104 to 83.0 mg/kg at Site 61. These were the only arsenic exceedances identified at Site 61 and 104 (PICA 102). The highest beryllium concentration at Site 61 was observed at sample location SS61-1A (6.52 mg/kg); at Site 104 the highest concentration was at sample location SS104-4A (4.65 mg/kg). Thallium concentrations ranged from 0.0340 mg/kg to 131 mg/kg at Site 61 sample location TP61-3C and from 0.0440 mg/kg to 181 mg/kg at Site 104 sample location SS104-1A.

Copper, lead, mercury, and zinc were detected at Site 104 at levels in excess of LOCs. Mercury was detected at the maximum concentration of 2,700 mg/kg in sample SS104-3A. However, this concentration is considered to be an anomaly, as the result could not be duplicated through additional sampling and analysis of an additional eight surface soil samples from this same location. The maximum concentration of mercury detected in the additional eight samples was 2.68 mg/kg.

Copper concentrations ranged from 13.7 mg/kg to 2,900 mg/kg. The only LOC exceedances for copper were identified in samples SD104-2 (2,900 mg/kg) and 104SD-6 (849 mg/kg). Lead concentrations ranged from 32 mg/kg to 3,100 mg/kg. The only LOC exceedances for lead were identified in samples SD104-2 (3,100 mg/kg) and 104SD-6 (647 mg/kg). Zinc concentrations ranged from 55.7 mg/kg to 4,700 mg/kg in Site 104 surface soil samples. The only LOC exceedance for zinc was identified in sample SS104-2A (4,700 mg/kg).

Extent of Subsurface Soil Contamination

Subsurface soil samples were collected at Sites 61 and 104 (PICA 102) during the Phase I RI (1993-1994) and the Additional Phase I RI (1997). Subsurface soil samples collected from Site 61 and 104 (PICA 102) were analyzed for VOCs, SVOCs, pesticides, PCBs, TPHs, TAL metals, cyanide, and explosives. Limited SVOCs and TAL metals were identified in subsurface soil at concentrations that exceeded LOCs. **Table 3** summarizes the constituents that exceeded LOCs in subsurface soil samples collected from Site 61. No LOC exceedances were identified in subsurface soil at Site 104. The subsurface soil LOCs are based on the lower of either the NJDEP NRDCSCC or NJDEP impact to groundwater (IGW) criteria. In cases where NJDEP cleanup criteria were not available, USEPA Region III Industrial RBCs were used as the LOCs.

Semi volatile organic compounds (VOCs)

A total of five SVOCs were identified at concentrations exceeding LOCs in subsurface soil samples collected from Site 61. No SVOCs were identified at concentrations exceeding the LOCs in Site 104 subsurface soil. The SVOCs detected at Site 61 included the PAHs benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene. The highest concentrations

of benz(a)anthracene (10.0 mg/kg), benzo(a)pyrene (7.90 mg/kg), benzo(b)fluoranthene (10.0 mg/kg), dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene (4.40 mg/kg) were identified in sample TP61-2D. Sample TP61-2D was collected from test pit TP61-2 at a maximum depth of 4 feet bgs.

Target Analyte List (TAL) Metals

Arsenic and thallium were identified at Site 61 at levels exceeding LOCs in subsurface soil. No metals were identified at levels exceeding the LOCs in Site 104 subsurface soil. The highest detected concentration of arsenic was 23.9 mg/kg (LOC = 20 mg/kg) in sample TP61-1C. This was the only sample in which arsenic concentrations exceeded the LOCs. Thallium concentrations ranged from 0.0380 mg/kg to 470 mg/kg. Only two samples (TP61-3D and TP61-2D) had exceedances for this metal.

Extent of Sediment Contamination

Sediment samples collected from Robinson Run and portions of GPB were analyzed for SVOCs, pesticides, PCBs, TPHs, TAL metals, cyanide, explosives, total organic carbon (TOC), and cation exchange capacity. **Table 4** summarizes the constituents that exceeded LOCs in sediment collected from portions of GPB and Robinson Run.

Initial LOCs were derived from standards presented in the Interim Sediment Quality Guidelines (ISQG) of the Canadian Council of Ministers of the Environment (CCME, 2002), New York State Department of Environmental Conservation (NYSDEC) Sediment Criteria, and the Sediment Quality Benchmarks (SQBs) from Jones and Suter. In the absence of these values, the Effects Range – Low (ER-L) values from New Jersey Guidance for Sediment Quality Evaluations (NJDEP, 1998) were used as LOCs. The lower of the USEPA Region III Industrial Soil RBCs and NJDEP NRDCSCC values were used as the LOC only when no other sediment values were available. LOCs were compared to background values and the higher numbers were determined to be the LOC values.

In addition to the above LOCs, sediment samples were also compared against human health-based LOCs or site-specific potential effects levels (PELs) from the Final Green Pond and Bear Swamp Brooks Focused Feasibility Study (FFS). Exceedances of these LOCs are depicted on **Figure 3**.

As stated earlier, samples SD104-2, SD104-3, and 104SD-6 were determined to be more representative of surface soil and are discussed within the Extent of Surface Soil Contamination section, and are therefore not discussed in this section.

SVOCs

Six SVOCs detected in sediments within portions GPB and Robinson Run were identified at levels higher than LOCs. The highest concentrations of acenaphthylene (4.2 mg/kg), fluoranthene (6.70 mg/kg), phenanthrene (11.0 mg/kg), and pyrene (7.90 mg/kg) were identified in sediment sample SDGP-8. Sediment sample SD61-1, which was collected from Robinson Run, had the highest concentrations of benz(a)anthracene (2.60 mg/kg) and benzo(k)fluoranthene (3.20 mg/kg).

Pesticides

No pesticides were identified above LOCs in Robinson Run. One pesticide, heptachlor epoxide was detected at 0.214 mg/kg in sample SDGP-10, which was collected from Green Pond Brook.

Target Analyte List (TAL) Metals

One metal (silver) was detected in Robinson Run at sample location SD61-1 at a concentration onf 186 mg/kg. Three metals (beryllium, chromium, and nickel) were detected in sediment samples collected from GPB. Sample 104SD-5, which was collected from the area of GPB adjacent to Site 104, had the most LOC exceedances for metals (beryllium, chromium, and nickel).

Extent of Surface Water Contamination

Although not addressed in this ROD surface water samples were collected from portions of GPB and Robinson Run and were analyzed for VOCs, pesticides, PCBs, TPHs, TAL metals, explosives, and hardness. These samples were collected to characterize potential surface water impacts, as sediment and surface water coexist in a mobile environment. **Table 5** summarizes the constituents that exceeded LOCs in surface water collected from GPB and Robinson Run. The LOCs are the lower of the USEPA

Water Quality Criteria (WQC), the Federal Drinking Water Advisories for Explosives, and NJ Surface Water Quality Criteria. In the absence of these criteria, the USEPA Tap Water RBC was selected as the LOC. As with the sediment LOCs, if the applicable surface water LOC was lower than the natural background level, the background value was selected as the LOC.

VOCs

No VOCs were identified above LOCs in Robinson Run. The VOCs tetrachloroethene (PCE) and trichloroethene (TCE) were detected in GPB in surface water sample SWGP-7 at concentrations above LOCs. PCE was detected at a concentration of 6.20 micrograms per liter (μg/L), which exceeds the LOC of 0.388 μg/L. TCE was identified at a level of 2.60 μg/L, which exceeds the LOC of 1.00 μg/L.

PCBs

No PCBs were identified above LOCs in Robinson Run. The PCB compounds Aroclor 1016 and Aroclor 1260 were identified in GPB at levels exceeding the LOC in surface water sample 104SW-5, which was collected from the area of GPB adjacent to Site 104. Aroclor 1016 was identified at a concentration of 0.320 μg/L and Aroclor 1260 was detected at a level of 0.274 μg/L. The LOC for both PCB compounds is 0.000064 μg/L.

Explosives

No explosives were identified above LOCs in Robinson Run. One of five explosive compounds detected in surface water was identified in GPB at a concentration exceeding the LOC. Cyclotrimethylenetrinitramine (RDX), which was identified in two surface water samples, was detected at its highest concentration (3.06 μg/L) in sample SWGP-7.

Target Analyte List (TAL) Metals

Five metals (aluminum, copper, lead, silver, and sodium) were identified in surface water samples collected from GPB and Robinson Run at concentrations that exceeded LOCs. The highest concentrations of aluminum (458 µg/L) and lead (13.8 µg/L) were identified in in Robinson Run upstream of Site 61 at sample 61SW-4. In GPB, copper concentrations ranged from 2.40 µg/L to 117 µg/L. The LOC for copper is 9.4 µg/L. Silver was detected in two surface water samples in GPB, but only exceeded the LOC of 3.8 µg/L in one sample (104SW-5). Sodium was detected at its highest concentration (44,500 µg/L) in GPB at sample SWGP-7.

2.6 CURRENT AND POTENTIAL FUTURE LAND USE

Land use within both sites is industrial. Buildings 162, 171, and 176 are located within Sites 61 and 104 (PICA 102) and are currently used to support both administrative functions and propellant analysis at Picatinny. Additionally, the area east of Building 176 is used for employee parking. Even though GPB and Robinson Run are immediately adjacent to Sites 61 and 104 (PICA 102), no recreational activities are associated with either stream in this area of the facility. The future use of either site at Picatinny is not expected to change from the current usage (military/industrial).

2.7 SUMMARY OF SITE RISKS

As part of the RI/FS, baseline risk assessments were conducted for Sites 61 and 104 (PICA 102) to evaluate the potential risks to human health and the environment associated with exposure to site-related chemicals. As discussed previously, these sites are currently used for industrial purposes, and this will not change in the future.

The baseline risk assessments estimate the potential risks and hazards associated with exposure to chemicals at Sites 61 and 104 (PICA 102) under current conditions—i.e., assuming no response action is taken. Unacceptable risks to human health and the environment under the current and reasonably anticipated future use were not identified in soil or sediment at Sites 61 and 104 (PICA 102). The results of the human health risk assessment (HHRA) and ecological risk assessment (ERA) are discussed below.

2.7.1 Human Health Risk Assessment

Dames and Moore (1998) conducted separate risk assessments for Sites 61 and 104 (PICA 102) as part of the Phase I RI. Potential risks associated with exposure to chemicals in soil were quantified for current outdoor maintenance workers, future industrial/research workers, and future construction/excavation workers. Note that risks associated with exposure to groundwater are included as part of the Mid-Valley Operable Unit (PICA 204). The following section summarizes the risk assessment process and results.

2.7.1.1 Contaminants of Potential Concern

Contaminants of Potential Concern (COPCs) were identified by comparing the maximum detected concentration of an individual contaminant to its LOC value. For the purposes of the screening evaluation, surface and subsurface soil concentrations were compared to the New Jersey NRDCSCC, IGW soil clean up criteria, and/or the USEPA Region III RBCs. Sediment concentrations were compared to the Interim Sediment Quality Guidelines (ISQG) of the Canadian Council of Ministers of the Environment, New York State Department of Environmental Conservation (NYSDEC) Sediment Criteria, and the Sediment Quality Benchmarks (SQBs) from Jones and Suter. In the absence of these values, the Effects Range – Low (ER-L) values from New Jersey Guidance for Sediment Quality Evaluations (NJDEP, 1998) were used as LOCs. The lower of the USEPA Region III Industrial Soil RBCs and NJDEP NRDCSCC values were used as the LOC only when no other sediment values were available. Surface water concentrations were compared to USEPA Water Quality Criteria (WQC) and NJ Surface Water Quality Criteria. In the absence of these criteria, the USEPA Tap Water RBC was selected as the LOC. Chemicals detected at concentrations greater than their respective screening levels were identified as COPCs and were further evaluated in the risk assessment.

The identification of COPCs is conservatively biased to ensure that the screening process retains all contaminants that might pose an unacceptable risk. However, the identification of a contaminant as a COPC does not indicate that an unacceptable risk actually exists, but only that further analysis is required. Whether or not the COPCs are addressed qualitatively or quantitatively in the risk assessment is dependent on the result of the comparison to background values and the availability of contaminant-specific toxicity information.

COPCs selected for surface soils at Site 61 include arsenic, beryllium, thallium, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indo(1,2,3-c,d)pyrene.

COPCs selected for subsurface soils at Site 61 include arsenic, thallium, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indo(1,2,3-c,d)pyrene.

COPCs selected for surface soils at Site 104 include arsenic, beryllium, mercury, thallium, and zinc. No COPCs were selected for subsurface soils at Site 104.

COPCs selected for sediments at Site 61 and 104 (PICA 102) include acenaphthene, acenaphthylene, benz(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i,)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, pyrene, aldrin, cyclohexane (alpha-BHC), 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane (4,4'-DDD), 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene (4,4'-DDE), 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (4,4'-DDT), dieldrin, endosulfan I, endosulfan sulfate, heptachlor epoxide, Aroclor 1248, Aroclor 1254, Aroclor 1260, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, and zinc.

COPCs selected for surface water at Site 61 and 104 (PICA 102) include PCE, TCE, Aroclor 1016, Aroclor 1260, RDX, aluminum, copper, lead, silver, and sodium.

2.7.1.2 Exposure Assessment

Exposure pathways were identified based on the site characterization information, the fate and transport properties of the COPCs, and likely points where human receptors may come in contact with affected media under current or potential future conditions at the site. An exposure pathway is defined by the following four elements:

1) a source and mechanism of contaminant release to the environment;

2) an environmental transport medium for the released contaminant;

3) a point of potential contact with the contaminated medium (the exposure point); and,

4) an exposure route at the exposure point.

Exposure can occur only when the potential exists for a receptor to contact released contaminants directly, or when there is a mechanism for released contaminants to be transported to a receptor. Without exposure there is no risk; therefore, the exposure assessment is a critical component of the risk assessment. Based on these criteria, the human health risk assessment focused on several current and hypothetical future exposure scenarios.

Estimated risks and hazards were calculated for the following receptor populations for Sites 61 and 104 (PICA 102):

- Current exposed populations: outdoor maintenance worker
- Future exposed populations: industry/research worker; construction/excavation worker

Within the risk assessment for Site 61 and 104 (PICA 102), exposure to groundwater was not evaluated. Rather, groundwater exposure was evaluated on an area-wide basis in the Mid-Valley Operable Unit. Additionally, human health risks were not quantified for exposures to surface water and sediment at either Site 61 or 104. Exposure to these media is not expected because the recreational value of the stream is very low and children are not expected to visit the area. However, concentrations of chemicals in surface water were compared to USEPA Region III RBCs for tap water, Federal Health Advisories, or New Jersey WQC. The maximum concentration of four chemicals exceeded a respective screening concentration based on drinking water exposure. However, GPB and Robinson Run are not currently used as a drinking water supply and are not expected to be used for that purpose in the future.

2.7.1.3 Risk Characterization

Potential risks to human health are evaluated quantitatively by combining calculated exposure levels and toxicity data. A distinction is made between noncarcinogenic and carcinogenic endpoints, and two general criteria are used to describe risk: the hazard quotient (HQ) for noncarcinogenic effects and excess lifetime cancer risk (ELCR) for contaminants evaluated as human carcinogens. The HQs are summed to calculate the hazard index (HI). The regulatory benchmark for noncancer health effects is 1. An HI less than or equal to 1 indicates that health effects should not occur; an HQ or HI that exceeds 1 does not imply that health effects will occur, but that health effects are possible. The USEPA considers an ELCR within the target risk range of $1x10^{-6}$ to $1x10^{-4}$ as generally acceptable cancer risk. If the ELCR exceeds the $1x10^{-4}$ target risk level, site-specific remedial goal options will be derived for the relevant contaminants and exposure scenarios.

Health effects were evaluated for current and future industrial research workers, and future construction/excavation workers. The HI is the sum of all the HQs for all COPCs that affect the same target organ, or that act through the same mechanism of action within a medium, to which a given individual may reasonably be exposed. An HI of less than 1 indicates that toxic noncarcinogenic effects from all COPCs are unlikely. **Table 6** summarizes the results of the HHRA for Sites 61 and 104 (PICA 102).

Site 61

The cumulative cancer risks for all receptors at Site 61 are within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. The cumulative HI for an outdoor maintenance worker is less than the target hazard level of 1. The HI for an industrial/research worker and a construction worker was calculated to be greater than 1. Therefore, following USEPA (1989) guidance, the HI was segregated by target organ/effect. For the industrial/research worker, the HIs for each target organ/effect was less than or equal to 1 when recalculated, indicating adverse non-cancer effects would not occur under the conditions evaluated. For the future construction worker, the HI was greater than 1 due to inhalation of manganese; however, the HI for target organs/effects was less than 1.

As discussed in the FS (Shaw, 2005), the potential noncancer hazard associated with manganese was re-evaluated in the *Risk Management Plan (RMP) for 9 Sites* (IT, 2000). This evaluation included considering recently collected data, and took into account a more representative dust-loading factor (based on U.S. Department of Energy and National Council on Radiation Protection and Measurements recommendations) and more realistic exposure parameters, as well as the form of manganese in soil (manganese salt vs. manganese dioxide). The results of the evaluation indicate that the HQ for manganese is less than 1, and therefore manganese was not selected as a COC.

In summary, the results of the risk assessment indicate that under the current conditions at Site 61, constituents in soil do not pose an unacceptable risk to human health under the exposure scenarios evaluated in the HHRA.

Site 104

The cumulative cancer risks for all receptors are less than or within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. The cumulative HI for an outdoor maintenance worker is less than the target hazard level of 1. The HI for an industrial/research worker and a construction worker was calculated to be greater than 1. Therefore, following USEPA (1989) guidance, the HI was segregated by target organ/effect. For the industrial/research worker the HI for central nervous system effects was greater than 1 (HI = 2) due to inhalation of manganese. The HI for all other target organs effects was less than 1. For the construction worker the HI for central nervous system effects was also calculated to be greater than 1 (HI = 50) due to inhalation of manganese. In addition, the HI for fetus effects (HI = 3) was also greater than 1 due to inhalation of barium. The HI for all other target organs/effects was less than 1. However, as discussed below, it is unlikely that exposure to these metals results in a HI greater than 1 at Site 104, and consequently, manganese and barium were not selected as COCs.

Manganese was not selected as a COC based on the findings for manganese at Site 61 (discussed above) and because manganese concentrations at Site 104 were significantly lower than concentrations at Site 61. Thus, it is unlikely that exposure to manganese at Site 104 results in a HQ greater than 1. The maximum concentration of barium was also used as the exposure point concentration (EPC) to estimate potential risks because there were only nine samples available for evaluation. However, the noncancer hazard associated with construction worker exposure to barium was re-evaluated in the FS using recently collected data and the HI was less than 1.

In summary, the results of the risk assessment indicate that under the current conditions at Site 104, constituents in soil do not pose an unacceptable risk to human health under the exposure scenarios evaluated in the HHRA.

2.7.2 Ecological Risk Assessment

A baseline ecological risk assessment (ERA) was conducted on Drainage Area 2 (which includes Site 61 and 104 [PICA 102]) as part of the Phase I RI (Dames and Moore, 1998). The purpose of the baseline ERA was to evaluate the potential risk to aquatic and terrestrial receptors associated with exposure to chemicals in environmental media under current conditions at each site. The ERA used the veery, the barred owl, and the American woodcock as the study species for which HQs were calculated. Additional studies such as terrestrial earthworm bioassays, terrestrial plant community assessments, small mammal trapping, and small mammal community assessments also were performed as part of the ERA. The results of the ERA are presented below for soil, sediment, and surface water.

2.7.2.1 Summary of Findings for Soil

The results of the Phase I ERA indicate that soils were generally not toxic in bioassay results and the plant community does not show evidence of impacts. However, modeled results for the veery and woodcock identified the following chemicals of potential ecological concern (COPEC): arsenic, cadmium, chromium, lead, selenium, and zinc.

<u>Site 61</u>

Based on these results, additional samples were collected from Site 61 to further characterize COPEC concentrations. Using the newly collected data along with the historic data, the ecological risks at Site 61 were re-evaluated as part of the *Risk Management Plan for 9 Sites* (IT, 2000). The RMP concluded that

ecological hazards for soil COPECs at Site 61 were acceptable for all surface soil COPECs except 4,4'-DDE (IT, 2000)—the revised HI for 4,4'-DDE ranged from 10 (using the Lowest Observed Adverse Effect Level [LOAEL]) to 97 (using the No Observed Adverse Effect Level [NOAEL]). Although the exposure point concentration for 4,4'-DDE decreased using the newly collected data, the HI increased because the revised toxicity benchmark used in the RMP for 4,4'-DDE was much lower than the benchmark used in the Phase I ERA. However, the RMP noted that 4,4'-DDE was detected in only 4 out of 14 surface soil samples at low concentrations, and removal of surface soil impacted with 4,4'-DDE could result in more long-term ecological damage compared to leaving the soils in place. Furthermore, the maximum detected concentration of 4,4'-DDE was less than the site-specific ecological risk-based cleanup level (ERBCL) derived in the FS for Site 61 (Shaw 2005).

Site 104

The Phase I ERA identified the following chemicals as COPECs in surface soil at Site 104: arsenic, cadmium, chromium, lead, selenium, and zinc. However, the maximum concentration of these COPECs was generally in soil sample SS104-1A or SS104-2A. The area bound by these samples is very small (less than 0.5 acres), and therefore unlikely to result in population-level ecological impacts. Although Site 104 was not re-evaluated in the RMP, site-specific ERBCLs were derived for these six COPECs in the FS (Shaw 2005). The maximum detected concentration of each COPEC was less than the respective ERBCL for Site 104. Based on these results, no significant ecological risks were identified for surface soil at Site 61 and 104 (PICA 102).

2.7.2.2 Summary of Findings for Surface Water and Sediment

Surface water and sediment within GPB and Robinson Run were evaluated by Dames and Moore during the Green Pond Brook/Bear Swamp Brook RI (Dames and Moore, 1998) and by IT during the Green Pond Brook/Bear Swamp Brook FFS (IT, 2001), and the Phase I RMP (IT, 2000).

Several metals exceeded respective LOCs in surface water and/or sediment in GPB downgradient of Sites 61 and Site 104 (PICA 102), including: cadmium, copper, lead, mercury, and silver. However, sediment bioassay tests did not indicate sediment in Drainage Area 2 (which includes Sites 61 and 104 [PICA 102] and Robinson Run) were associated with toxic effects. In addition, benthic community surveys conducted at three sites in GPB in Drainage Area 2 did not indicate significant impacts are occurring to the benthic community. Benthic community surveys are generally given the most weight when comparing the results of multiple lines of evidence to determine whether significant risks exist, because they are a direct measure of effects on the assessment endpoint (i.e., the benthic invertebrate community). Had adverse effects been observed in the benthic surveys or bioassays, the comparison of chemical concentrations with LOCs could be used to suggest likely causes of those effects. Based on a weight-of-evidence approach, no significant ecological risks were identified for surface water and sediment at Site 61 and 104 (PICA 102).

2.7.3 Munitions and Explosives of Concern

Munitions and Explosives of Concern (MEC) have not been discovered at Sites 61 and 104 (PICA 102), however, Sites 61 and 104 (PICA 102) are included within the 1926 explosion radius, which has been designated PICA 003-R-01. The need for any MEC assessment and/or clearance at Sites 61 and 104 (PICA 102) would be evaluated under the MMRP. Recent activities performed in support of the MMRP include the completion of a Historical Records Review and a Site Inspection. The Site Inspection concluded that PICA 003-R-01 would enter into the RI stage.

Currently, consistent with Army and Picatinny regulations, MEC hazards are controlled by the Picatinny Safety Program. This program includes coordination with the Picatinny Safety Office, soil excavation restrictions, and MEC clearance procedures. These controls are in place to protect construction workers.

2.7.4 Contaminants of Concern and Site Cleanup Levels

COCs in surface soil, subsurface soil, and sediment were identified in the *Feasibility Study for Sites 61 and 104* (Shaw, 2005). As part of the Sites 61 and 104 (PICA 102) FS, the contaminants detected in surface soil, subsurface soil, and sediment were screened to identify COCs. COCs are defined as contaminants that:

1) Contribute to the majority of site-specific human health or ecological risk (Risk-Driver COCs); and,
2) Exceed the NJDEP NRDCSCC, referred to as Non-Risk-Driver COCs.

This ROD does not address groundwater at Sites 61 and 104 (PICA 102); therefore, COCs were not identified for groundwater at either site. However, the soil-to-groundwater pathway was evaluated as part of the Sites 61 and 104 (PICA 102) FS.

Cleanup levels were developed for contaminants identified in surface soil and subsurface soil at Sites 61 and 104 (PICA 102) if the concentrations were a major contributor to human health risks or exceeded NRDCSCC. For soil COCs, NRDCSCC were used as the SCLs. The PELs established for GPB and Bear Swamp Brook in the Green Pond and Bear Swamp Brooks FFS (IT, 2001) were selected as the SCLs for sediment within Robinson Run. The final SCLs for surface and subsurface soil are presented in **Table 7**, and the final SCLs for sediment are presented in **Table 8**.

Six surface water contaminants (TCE, PCE, RDX, Aroclor 1016, Aroclor 1260, and lead) were initially determined to be a potential human health concern if surface water was used as a drinking water supply. However, as surface water is not used as a drinking water supply, these six contaminants are not considered a concern for human health, even taking into account potential incidental surface water ingestion. Swimming is prohibited within Robinson Run, and swimming by a trespasser also is unlikely.

2.7.5 Areas of Attainment

An area of attainment (AA) is defined as the area over which Remedial Action Objectives (RAOs) are to be obtained. The AAs are based on SCL exceedances. AAs were identified for both soil and sediment at Sites 61 and 104 (PICA 102). Because soil exceedances were identified at levels of 4 feet bgs at Site 61, AAs were identified for both surface and subsurface soil at the site. The estimated area and volume of each AAs are presented in the **Table 9**. **Figure 4** shows the AAs for soil and sediment at Sites 61 and 104 (PICA 102).

2.8 REMEDIAL ACTION OBJECTIVES

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 the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 of SARA.

The RAOs for Sites 61 and 104 (PICA 102) have been developed in such a way that attainment of these goals will result in the continuation of protection of human health, ecological receptors, and the environment. The RAOs are specific to the contaminated soil and sediment originating from Sites 61 and 104 (PICA 102). Groundwater contamination at both sites will be addressed separately under the Mid-Valley Groundwater Operable Unit. The RAOs are as follows:

- Manage soils with calculated risk in the risk range of $1x10^{-6}$ to $1x10^{-4}$ following NCP guidance and the Geis Memorandum (1999);
- Maintain current land use (industrial) and current institutional controls; and,
- Control disturbance and exposure to site soils that could lead to unacceptable human health risks.

2.9 DESCRIPTION OF RESPONSE ACTIONS

Sites 61 and 104 (PICA 102) have 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 response actions.

Technology types and process options appropriate for the COCs were identified and screened based on effectiveness, implementability, and cost. The retained technologies and process options were developed into response actions. The response actions for soil at Sites 61 and 104 (PICA 102) are:

- Response Action S-1: No Action;

- Response Action S-2: Implementation of ICs, Land Use and Access Restrictions and Maintenance of Existing ECs;
- Response Action S-3: Capping with a Soil Cover, Land Use and Access Restrictions and Maintenance of ECs;
- Response Action S-4: Capping with a Multilayer Synthetic Cap, ICs, Land Use and Access Restrictions and Maintenance of ECs;
- Response Action S-5: Excavation and Off-Site Disposal of Soil with COCs above SCLs, ICs and Land Use and Access Restrictions;
- Response Action S-5A: Excavation of areas of attainment $AA_{104SS-1}$ and $AA_{104SS-2}$, ICs, Land Use and Access Restrictions and Maintenance of Existing ECs;
- Response Action S-6: Phytoremediation at Site 104, Capping with a Soil Cover at Site 61, ICs, Land Use and Access Restrictions and Maintenance of ECs;
- Response Action S-7: Phytoremediation at Site 104, Capping with a Multilayer Synthetic Cap at Site 61, ICs, Land Use and Access Restrictions and Maintenance of ECs; and
- Response Action S-8: Phytoremediation at Site 104, Excavation and Off-Site Disposal of Soil with COCs above SCLs at Site 61, ICs, and Land Use and Access Restrictions.

The response actions for sediment at Sites 61 and 104 (PICA 102) are:

- Response Action D-1: No action;
- Response Action D-2: Implementation of ICs, land Use and Access Restrictions ;
- Response Action D-3: Long-term Chemical and Biological Monitoring of Sediment and Surface Water, ICs, and Land Use and Access Restrictions ; and
- Response Action D-4: Excavation and Off-Site Disposal of Sediments with COCs above SCLs, ICs, and Land Use and Access Restrictions.

Response actions are described below and a conceptual layout of the response actions is presented in **Figure 5** and **Figure 6**.

2.9.1 Response Action S-1: No Action

Estimated Capital Cost: $0.00
Estimated O&M (Cost over 30 years): $0.00
Estimated Present Worth Cost: $0.00

CERCLA and the NCP require that a No Action response action be evaluated at every site to establish a baseline for comparison of other response actions. Under this response action, all administrative controls would cease, no further site monitoring or oversight would be performed, and no response action would take place.

2.9.2 Response Action S-2: Implementation of ICs, Land Use and Access Restrictions and Maintenance of Existing ECs

Estimated Capital Cost: $32,000
Estimated O&M (Cost over 30 years): $114,000
Estimated Present Worth Cost: $146,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action S-2 involves implementing permanent LUCs to protect any land users from potential exposure above the $1x10^{-6}$ risk-based level. LUCs are administrative measures put in place to control land use. Because contamination would remain in place under this response action, LUCs would be required to ensure human health protectiveness. The remedy also involves performing site maintenance of existing ECs. Existing ECs consist of a vegetative cover (grass) located at AA_{61SS-1}, AA_{61SS-2}, and

$AA_{104SS-3.}$ 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 response action will be detailed in the RD after the ROD has been signed.

Picatinny has many existing LUCs in place. Elements of LUCs in place at Picatinny include: Site Clearance and Soil Management Procedures; MEC Clearance Procedures; Master Plan Regulations; Picatinny Base Access Restrictions; Picatinny Safety Program; Army Military Construction Program; and a Geographic Information System (GIS). The GIS is a tool for the Army to document areas of contamination and restricted land use. All controls and restrictions would remain in place, even if the ownership or site usage changes. Additionally, since the Army is the entity that would be instituting land use controls at Picatinny, the Army would retain ultimate responsibility for ensuring that the land use restrictions remain in place after property transfer. A change in land use would include the re-evaluation of cleanup requirements.

The LUCs and ECs described under this Response Action would be incorporated into Response Actions S-3 through S-8 for soil. These response actions specify active remedies that will contain, treat, or remove contamination exceeding SCLs. However, because some contamination above residential standards would remain at the site, LUCs will be required even after completing active remedies to control use of the site that may lead to unacceptable risk. Land use controls will be maintained until such time as contaminant levels allow for unrestricted use and unlimited exposure.

2.9.3 Response Action S-3: Capping with a Soil Cover, ICs, Land Use and Access Restrictions and Maintenance of ECs

Estimated Capital Cost:	*$363,000*
Estimated O&M (Cost over 30 years):	*$218,000*
Estimated Present Worth Cost:	*$581,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action S-3 involves containment of the contaminated soil using a vegetative soil cover over each of the soil AAs (see **Figure 5**). The area to be contained by the soil covers is approximately 17,000 square feet (0.39 acres).

Soil cover installation would include grading to promote positive drainage; placement and compaction of an 18-inch thick common earth fill layer; placement and compaction of a 6-inch thick topsoil layer; and application of vegetation, as depicted in **Figure 6**. Each individual soil layer would be compacted and graded to promote positive drainage. All soil used in the construction of the cover would consist of certified clean fill from either an on-site or off-site borrow source. A vegetative cover would be planted as soon as practicable following installation of the topsoil layer. The vegetative cover would provide surface stability by minimizing potential for erosion and would consist of grass seed and mulch. Grading of the area surrounding the soil cover would be performed as necessary to ensure proper drainage of surface runoff. Runoff collection and conveyance would be considered during the RD to comply with all location- and action-specific ARARs.

The soil cover would prevent direct contact with contaminated soil, prevent the spread of contaminated soil through erosion or wind dispersion, and reduce infiltration of surface water runoff. Sites 61 and 104 (PICA 102) would be subject to continued LUCs and maintenance of ECs to prevent disturbance of the newly constructed soil cover and exposure to contaminated soil. Maintenance of the existing ECs (vegetative cover) would also be required at $AA_{104SS-3.}$ The vegetative soil cover will require maintenance in the form of mowing and periodic repairs to areas that are prone to surface erosion. Enforcement of these controls would also ensure the integrity of the soil cover.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.4 Response Action S-4: Capping with a Multilayer Synthetic Cap (RCRA C), ICs, Land Use and Access Restrictions and Maintenance of ECs

Estimated Capital Cost:	*$586,000*

Estimated O&M (Cost over 30 years): $287,000
Estimated Present Worth Cost: $873,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action S-4 involves containment of the contaminated soil at AA_{SS61-1} using a multi-layer cap designed to meet Resource Conservation and Recovery Act (RCRA) Subtitle C standards (i.e., for hazardous waste landfills) as depicted in **Figure 6**. Due to the small size of the other soil AAs, RCRA C cap construction is not a practical alternative. Therefore, these AAs would be addressed by the construction of vegetative soil covers as described in Response Action 3. The area to be contained by the RCRA C cap is approximately 16,000 square feet (0.37 acres), with an additional 1,500 square feet contained by vegetative soil covers.

The installation of a multi-layer cap (RCRA C) would involve the following activities: grading to promote positive drainage, placement and compaction of a 2-foot thick low permeability clay layer, followed by placement of a synthetic barrier layer, placement and compaction of a 12-inch thick sand layer, a 12-inch thick common earth fill layer, a 6-inch topsoil layer, and application of vegetation. Soil used as barrier materials generally are clays that are compacted to a hydraulic conductivity no greater than 10^{-6} centimeters/second (cm/sec). A vegetative cover would be planted as soon as practicable following installation of the topsoil layer. Runoff collection and conveyance would be considered during the RD to comply with all location- and action-specific ARARs.

The cap and soil cover would prevent direct contact and prevent the spread of contaminated soil through erosion or wind dispersion, and reduce infiltration of surface water runoff. Sites 61 and 104 (PICA 102) would be subject to LUCs and maintenance of ECs to prevent disturbance of the newly constructed RCRA C cap and exposure to contaminated soil. Maintenance of the existing ECs (vegetated cover) would also be required at $AA_{104SS-3.}$The RCRA C cap and the vegetative soil cover would require maintenance in the form of mowing and periodic repairs to areas that are prone to surface erosion. Enforcement of these controls would also ensure the integrity of the cap/cover.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.5 Response Action S-5: Excavation and Off-Site Disposal of Soil with COCs above SCLs, ICs, and Land Use and Access Restrictions

Estimated Capital Cost: $944,000
Estimated O&M (Cost over 30 years): $114,000
Estimated Present Worth Cost: $1,058,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

This response action would involve excavation of the contaminated soil, including confirmatory sampling at the limits of the excavation. Excavated soil would be transported off-site for disposal in a permitted landfill designed to meet RCRA non-hazardous industrial waste standards (RCRA Subtitle D). Visual observations and results of prior sampling would be used to determine the limits of contaminated soil excavation. Confirmatory samples would be collected and analyzed to confirm that remaining soil meets the SCLs. Standard dust control techniques would be used during the excavation activities to mitigate the potential for release of contaminated dust. Based on existing data, it is estimated that approximately 2,375 cubic yards of contaminated soil would be excavated from the four soil AAs comprising an area of approximately 17,000 square feet (0.39 acres).

Prior to excavation, contaminated soil would be sampled and analyzed for the appropriate waste characterization parameters. This would include, at a minimum, full Toxicity Characteristic Leaching Procedure (TCLP) analyses (VOCs, SVOCs, pesticides/herbicides, and metals) and RCRA characteristics (ignitability, reactivity, and corrosivity).

Once the removal activities are complete, the excavated areas would be backfilled and a vegetative cover would be planted as soon as practicable. Surface water runoff collection and retention would be considered during the design phase to comply with all location- and action-specific ARARs.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.6 Response Action S-5A: Excavation of Areas of Attainment $AA_{104SS-1}$ and $AA_{104SS-2}$, ICs, Land Use and Access Restrictions and Maintenance of Existing ECs

Estimated Capital Cost: *$183,000*
Estimated O&M (Cost over 30 years): *$114,000*
Estimated Present Worth Cost: *$297,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action S-5A would involve excavation of contaminated soil from $AA_{104SS-1}$ and $AA_{104SS-2}$ at Site 104 to specifically address samples SD104-2, SS104-2A, 104TP-2A and 104SD-6. Confirmatory sampling will be performed at the limits of the excavation. Excavated soil would be transported off-site for disposal or disposed at an on-site facility with the approval of NJDEP and USEPA. Based on existing data, it is estimated that approximately 54 cubic yards of contaminated soil would be excavated comprising an area of approximately 1,242 square feet. Sites 61 and 104 (PICA 102) would be subject to continued LUCs and maintenance of ECs to prevent disturbance of the existing vegetative cover and exposure to contaminated soil.

Because some contamination above residential standards would remain at the site, LUCs will be required even after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.7 Response Action S-6: Phytoremediation at Site 104, Capping with a Soil Cover at Site 61, ICs, Land Use and Access Restrictions and Maintenance of ECs

Estimated Capital Cost: $401,000
Estimated O&M (Cost over 30 years): $220,000
Estimated Present Worth Cost: $621,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

This response action involves the use of phytoremediation to treat metals contaminated soil at Site 104. A particular plant species would be selected based on the COCs (TAL metals at Site 104) to bioaccumulate the contaminants within the plant tissue to concentrations significantly greater (dry plant weight) than concentrations in soil. The plants would be planted within the AAs at Site 104, and the metals would be allowed to bioaccumulate over a specific amount of time. The plant matter then would be harvested and disposed of off-site. Because phytoremediation has not been demonstrated successfully for certain COCs at Site 61 (beryllium and PAHs) and is not applicable to contamination below the root level, the AAs at Site 61 would be addressed by the soil cover described in Response Action S-3 (see **Figure 6**).

The cover would prevent direct contact, prevent the spread of contaminated soil through erosion or wind dispersion, and reduce infiltration of surface water runoff. Additionally, LUCs and maintenance of existing ECs would be recommended to prevent the disturbance of the newly installed cover. Maintenance of the existing ECs (vegetative cover) would also be required at $AA_{104SS-3.}$

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.8 Response Action S-7: Phytoremediation at Site 104, Capping with a Multilayer Synthetic Cap at Site 61, ICs, Land Use and Access Restrictions and Maintenance of ECs

Estimated Capital Cost: *$631,000*
Estimated O&M (Cost over 30 years): *$290,000*

Estimated Present Worth Cost: *$921,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

This response action involves the use of phytoremediation to treat metals contaminated soil at Site 104. A particular plant species would be selected based on the COCs (TAL metals at Site 104) to bioaccumulate the contaminants within the plant tissue to concentrations significantly greater (dry plant weight) than concentrations in soil. The plants would be planted within the AAs at Site 104, and the metals would be allowed to bioaccumulate over a specific amount of time. The plant matter then would be harvested and disposed off-site. Because phytoremediation has not been demonstrated successfully for certain COCs at Site 61 (beryllium and PAHs) and is not applicable to contamination below the root level, the AAs at Site 61 would be addressed by the multilayer synthetic cap (RCRA C) described in Response Action S-4 (**Figure 6**).

The cap would prevent direct contact, prevent the spread of contaminated soil through erosion or wind dispersion, and reduce infiltration of surface water runoff. Additionally, LUCs and maintenance of ECs would be recommended to prevent the disturbance of the installed RCRA cover. Maintenance of the existing ECs (vegetative cover) would also be required at $AA_{104SS-3}$.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.9 Response Action S-8: Phytoremediation at Site 104, Excavation and Off-Site Disposal of Soil with COCs above SCLs at Site 61, ICs, and Land Use and Access Restrictions

Estimated Capital Cost: *$922,000*
Estimated O&M (Cost over 30 years): *$117,000*
Estimated Present Worth Cost: *$1,039,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

This response action involves the use of phytoremediation to treat metals contaminated soil at Site 104. A particular plant species would be selected based on the COCs (TAL metals at Site 104) to bioaccumulate the contaminants within the plant tissue to concentrations significantly greater (dry plant weight) than concentrations in soil. The plants would be planted within the AAs at Site 104 and the metals would be allowed to bioaccumulate over a specific amount of time. The plant matter then would be harvested and disposed of off-site. Because phytoremediation has not been demonstrated successfully for certain COCs at Site 61 (beryllium and PAHs) and is not applicable to contamination below the root level, the AAs at Site 61 would be addressed by excavation and off-site disposal as described in Response Action S-5.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.9.10 Response Action D-1: No Action

Estimated Capital Cost: *$0*
Estimated O&M (Cost over 30 years): *$0*
Estimated Present Worth Cost: *$0*

CERCLA and the NCP require that a No Action response action be evaluated at every site to establish a baseline for comparison of other response actions. Under this response action, all administrative controls would cease, no further site monitoring or oversight would be performed, and no remedial action would take place. The evaluation of the No Action response action for sediment is identical to that for soil.

2.9.11 Response Action D-2: Implementation of ICs, and Land Use and Access Restrictions

Estimated Capital Cost: *$32,000*
Estimated O&M (Cost over 30 years): *$114,000*
Estimated Present Worth Cost: *$146,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action D-2 involves implementing permanent LUCs to protect any land users from potential exposure above the $1x10^{-6}$ risk-based level. LUCs are administrative measures put in place to control future land use. Because contamination would remain in place under this response action, LUCs would be required to ensure human health protectiveness. The remedy also involves performing site maintenance. The provisions and requirements of the LUC portion of this remedy will be detailed in the RD after the ROD has been signed.

Picatinny has many existing LUCs in place. Elements of LUCs in place at Picatinny include: Site Clearance and Soil Management Procedures; MEC Clearance Procedures; Master Plan Regulations; Picatinny Base Access Restrictions; Picatinny Safety Program; Army Military Construction Program; and GIS. The GIS is a tool for the Army to document areas of contamination and restricted land use. All controls and restrictions would remain in place, even if the ownership or site use would change. Additionally, since the Army is the entity that would be instituting land use restrictions at Picatinny, the Army would retain responsibility for ensuring that the land-use restrictions remain in place after the property transfer. A change in land use would include the re-evaluation of cleanup requirements.

LUC components for surface water include advisories or bans on fishing and other recreational uses of the surface water. Recreational activities that surround Robinson Run are limited, as swimming is not permitted in any part of either brook, and fishing is not permitted in the study area (in the vicinity of Sites 61 and 104). Although swimming is not permitted in any part of Robinson Run, trespasser swimming could possibly occur in the more remote reaches of Robinson Run. However, trespasser swimming in the vicinity of Sites 61 and 104 (PICA 102) is unlikely due to the shallow depth and low surface water flow of Robinson Run. Additionally, public access to the surface water at the sites is very limited because both sites are located within the installation boundary of Picatinny.

The LUCs described under this Response Action would be incorporated into Response Actions D-3 and D-4. These Response Actions specify active remedies that will contain, treat, or remove contamination above industrial SCLs. However, because some contamination above residential standards would remain on-site, continued implementation of LUCs would be required to control use of the site that may lead to unacceptable risk.

2.9.12 Response Action D-3: Long-term Chemical and Biological Monitoring of Sediment and Surface Water, ICs, and Land Use and Access Restrictions

Estimated Capital Cost:	*$69,000*
Estimated O&M (Cost over 30 years):	*$255,000*
Estimated Present Worth Cost:	*$324,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

Response Action D-3 consists of long-term chemical and biological monitoring of sediment and surface water within Robinson Run (see **Figure 5**). Chemical monitoring of sediment would be performed periodically for a 15-year period. Sampling would occur on an annual basis for a period of five years followed by biennial sampling for an additional ten years. Sediment samples would be analyzed for PAHs, pesticides, and metals. Surface water sample locations would be selected to address contaminants detected in prior surface water sampling events, as well as potential sources identified in the sediment AAs. Surface water samples would be collected annually for a five-year period and analyzed for VOCs, PCBs, TAL metals, and explosives.

Biological monitoring also would be performed to address the sediment AAs in Robinson Run to ensure that the improved environmental quality is having a positive impact on the sediments that represent a potential risk to the aquatic ecology. Biological monitoring will include macroinvertebrate studies and toxicity testing studies. Benthic macroinvertebrate samples would be collected using a D-ring aquatic net. The benthic invertebrates would be enumerated and identified to the lowest taxonomic level practical (typically genus or species). Toxicity testing studies would use two species, the amphipod (*Hyalella azteca*) and the midge (*Chironomus tentans)* and would be conducted using 10-day whole sediment

bioassays. The macroinvertebrate studies and toxicity testing will be carried out according to established USEPA protocols.

The results of the chemical and biological monitoring would be reviewed and compiled on a yearly basis. After a five-year period, the results of the monitoring would be assessed. The monitoring program may be terminated, extended, or the frequency may be reduced if the results indicate compliance or non-compliance with the exit strategy.

Because some contamination above residential standards would remain at the site, LUCs will be required to control use of the site that may lead to unacceptable risk.

2.9.13 Response Action D-4: Excavation and Off-Site Disposal of Sediments with COCs above SCLs, ICs, and Land Use and Access Restrictions

Estimated Capital Cost:	*$49,000*
Estimated O&M (Cost over 30 years):	*$114,000*
Estimated Present Worth Cost:	*$163,000*

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7% discount rate.)

This response action involves the excavation of sediments Robinson Run contaminated at levels greater than the SCLs and confirmatory sampling at the limits of the excavation (see **Figure 5**). Based on the analytical data, it is estimated that approximately 12 cubic yards of contaminated sediment would be excavated from one sediment AA comprising an area of approximately 319 square feet.

Prior to remedial activities, the water flowing within Robinson Run would be diverted from the AA using temporary sumps. The sumps would be maintained on a 24-hour basis during remedial operations. Prior to excavation, contaminated sediment would be sampled and analyzed for the appropriate waste characterization, TCLP analyses and RCRA characteristics.

Contaminated sediment would be excavated and loaded directly into a 20 cubic yard roll-off container and mixed with portland cement to stabilize the sediment and interstitial water prior to being transported off-site for disposal in a RCRA D landfill. Confirmatory samples would be collected and analyzed to confirm that the remaining sediment meets the SCLs. Once the remedial activities are completed, the excavated area would be backfilled with rip-rap stone in order to stabilize the limits of the excavation.

Because some contamination above residential standards would remain at the site, LUCs will be required after completing active remedies to control use of the site that may lead to unacceptable risk.

2.10 COMPARATIVE ANALYSIS OF RESPONSE ACTIONS

The U.S. Army and the USEPA selected the preferred response action by evaluating each of the response actions against nine criteria established by the USEPA. These criteria are described below.

The advantages and disadvantages of each of the response actions were compared using the nine CERCLA evaluation criteria established by the USEPA in Section 300.430(e) of the NCP. The detailed comparative analysis of all the response actions is provided in the FS for Site 61 and 104 (PICA 102); a summary of this comparison is provided in the following text.

2.10.1 Protection of Human Health and the Environment

Risks to human health posed by contaminants in soil are within the generally acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$, and there are no unacceptable noncancer risks under the current and reasonably anticipated future use. Therefore, all response actions provide effective protection to human health under the current conditions.

Human health risks were not quantified for exposure to surface water and sediments at either Site 61 or Site 104 as exposure to this media is not expected to occur. Therefore, all response actions provide effective protection to human health under the current conditions.

Ecological risks posed by soil and sediments at Sites 61 and 104 (PICA 102) are considered minimal as no significant ecological risks were identified. Therefore, all response actions provide sufficient protection to the environment.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements

COCs were identified for soil and sediment at Sites 61 and 104 (PICA 102). SCLs were selected for soil in the Site 61 and 104 (PICA 102) FS based on the New Jersey soil cleanup criteria which were in effect at the time. Subsequently, NJDEP promulgated new soil cleanup standards on June 2, 2008. The Army is complying with the phase-in requirements provided with the new standards by basing SCLs on New Jersey soil cleanup criteria which were in effect prior to June 2, 2008. Therefore, no chemical-specific ARARs were established for soil and sediment at Sites 61 and 104 (PICA 102). Response Actions S-1 and D-1 would not satisfy the chemical-specific SCLs. All other Response Actions would satisfy the chemical-specific SCLs through active remediation or by controlling access and exposure to soil and sediment with concentrations in excess of SCLs.

Compliance with the action-specific and location-specific ARARs is readily achievable with currently available technologies proposed for each response action.

2.10.3 Long-term Effectiveness and Permanence

Response Actions S-1 and D-1 provide no long-term effectiveness or permanence. All current and future risks would remain the same under these response actions. Response Actions S-2 and D-2 reduce the long-term risks by limiting direct contact human exposure pathways using LUCs and maintaining ECs.

Response Actions S-3, S-4, S-5A, S-6, S-7 and S-8 would provide additional long-term effectiveness and permanence; however, this is dependent entirely upon the adequacy of maintenance and the success of phytoremediation treatment included as part of S-6, S-7, and S-8. Response Actions D-4, S-5 and S-5A would provide the greatest degree of long-term effectiveness and permanence with the removal of contaminants from the site, but a potential long-term liability would exist because untreated contaminated soil would be disposed off-site.

2.10.4 Reduction in Toxicity, Mobility, or Volume through Treatment

Response Actions S-1 through S-3, D-1, D-2, and D-3 provide no reduction in toxicity, mobility and volume through treatment. Only Response Actions S-6, S-7, and S-8 provide a reduction in toxicity, mobility and volume through phytoremediation at Site 104, but do not fully address Site 61 via treatment. Response Action D-1 provides no reduction in mobility through containment or removal of impacted soil. Depending on the technology utilized in each response action, Response Actions S-2 through S-5A and D-4 provide varying levels of reduction in mobility through containment or removal of impacted soil. Among these, Alternative S-5A provides the greatest reduction of arsenic, copper, lead, and zinc contaminant mobility. The toxicity and volume of the metals contaminated soil would be removed from the site; however, both toxicity and volume would be transferred to the disposal facility rather than eliminated.

2.10.5 Short-term Effectiveness

Response Actions S-1 and D-1 for soil and sediment would have no short-term impact to workers, the community, or the environment since there are no remedial activities associated with these response actions. Response Actions S-2 and D-2 for soil and sediment and Response Action D-3 for sediment also would not produce any short-term impacts on workers and the surrounding community because no construction activities are proposed.

Short-term risks resulting from Response Actions S-3 and S-4 would be low. Construction of either the soil cover or RCRA C cap would require limited handling of contaminated soil and would not produce significant short-term impacts to workers or the surrounding community. However, these two response actions will result in significant short-term impacts to the environment and some dust generation. Risks posed by dust would be controlled through the use of suitable protective equipment by properly trained site workers, good construction practices, real-time air monitoring, and standard dust suppression techniques (e.g., water spray).

The risks associated with Response Actions S-5, S-5A, and S-8 for soil and Response Action D-4 for sediment would be greater than those associated with the other response actions. Soil and sediment excavation activities would result in significant materials handling and some dust generation. The necessity to divert a portion of GPB as part of sediment Response Action D-4 would have significant localized environmental effects in the immediate vicinity of contamination. Finally, additional risks exist with the transportation of contaminated soil and sediment on public roadways (i.e., highway accidents). In order to minimize the risks associated with waste transportation, the appropriate Department of Transportation, State, and local shipping requirements for all transportation-related activities would be observed.

Response Action S-5A would have less associated short-term risks than Response Actions S-5 and S-8 as the volume of soil required for excavation would be significantly less than that of Response Actions S-5 and S-8. However, the additional risk of transporting contaminated soil on public roadways would still exist.

The phytoremediation component of Response Actions S-6, S-7, and S-8 would have limited short-term risks with the only contact to contaminated soils occurring during plant installation, and removal. Additionally, there would be no dust generation unlike with the other response actions. Remediation of arsenic contamination is expected to be rapid, but remediation of copper, lead, and zinc would require the longest amount of time of any of the active response actions (approximately 8–11 years).

2.10.6 Implementability

Response Actions S-1 and S-2 are readily implementable. Response Action S-1 has no action to implement. Response Action S-2 is the most implementable, as it requires establishing institutional controls that are largely already in place as various installation-wide regulations and/or have been readily implemented at other CERCLA sites at Picatinny. Response Actions S-3 through S-8 pose varying challenges to implementation as the remedial activities increase in complexity. These Response Actions also include intrusive remedial activities in the Administration and Research Historic District, which will require additional coordination with the Cultural Resources Coordinator. Response Actions S-5, S-6, S-7, and S-8 would be the most challenging to implement as these response actions are the most complex, requiring additional third party approvals and planning, as well as the most services and materials.

Response Action D-1 for sediment would require no actions to implement. The remaining response actions for sediment (D-2, D-3, and D-4) are all readily implementable. The required equipment, services, and materials are readily available, including the appropriately-permitted disposal facilities required for Response Action D-4.

Response Action D-2 for sediment would require minimal resources and effort. Response Action D-3 for sediment would be easier to implement than Response Action D-4. Additionally, the administrative implementability of Response Action D-4 with the diversion of Robinson Run would be dependent upon satisfying the stringent stream encroachment requirements set forth in New Jersey's Flood Hazard Area Control Act (New Jersey Administrative Code 7:13-1 *et seq.*).

2.10.7 Cost

Present worth (discount rate of 7%) for each response action is presented. With the exception of Response Actions S-1 and D-1, Response Actions S-2 and D-2 have the lowest cost for both the soil and sediment response actions. It should be noted that the cost of LUCs (present worth of $146,000) encompasses both the soil and sediment contamination at Sites 61 and 104 (PICA 102). As the remaining response actions also include implementation of LUCs, the costs for Response Action S-2 or D-2 have also been added to the remaining Response Actions. Response Action S-5A has the second lowest cost at $297,000, and Response Action S-5 is the most expensive of the soil response actions ($1,058,000). Response Action D-3 (long term monitoring) has the highest cost of the sediment response actions at $324,000.

2.11 MODIFYING CRITERIA

2.11.1 State/Support Agency Acceptance

This document was prepared in partnership with USEPA and NJDEP representatives. NJDEP approval of the Selected Response Action is expected. The NJDEP has demonstrated that it concurs with the Selected Response Action through the approval of the final PP. During preparation of the FS, NJDEP commented that it will require the removal of $AA_{104SS-1}$ and $AA_{104SS-2}$ at Site 104 to address NJ NRDCSCC exceedances at these two locations. The Army agreed that this limited removal action was warranted at Site 104 based on contaminant concentrations and the proximity to GPB, even though there is no unacceptable risks to human health and the environment at Sites 61 and 104 (PICA 102). This agreement is consistent with the Geis Memorandum. Per the Geis Memorandum, the Army agreed with NJDEP to control exposure to soils using technologies such as ECs and ICs rather than removal or treatment actions for sites where risks to human health fall within the generally acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. Decisions regarding remedial actions at sites in this range are made on a site by site basis under both the NCP and the Geis Memorandum.

2.11.2 Community Acceptance

Community acceptance is addressed in the Responsiveness Summary (Section 3) of this ROD.

2.12 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 threat wastes are those source materials that generally can be reliably contained and would present only a low risk in the event of exposure. In addition, principal threat wastes are identified based upon the results of the quantitative risk assessment, with those compounds that have a value of $1x10^{-03}$ or higher being considered as principal threat waste. As concluded in the Risk Assessment, none of the contaminants that exceeded LOCs in soil or sediment at Sites 61 and 104 (PICA 102) meet the criteria of principal threat waste. Therefore, the Selected Response Action does not need to address principal threat waste.

2.13 SELECTED RESPONSE ACTION

This ROD represents the Selected Response Action for Sites 61 and 104 (PICA 102) at Picatinny, Rockaway Township, Morris County, New Jersey, developed in accordance with CERCLA as amended and consistent with the NCP. Based on the results of the comparative analysis and comments received from the USEPA and NJDEP, the Selected Response Actions include the following:

- Soil: Response Action S-5A: Excavation of Areas of Attainment $AA_{104SS-1}$ and $AA_{104SS-2}$, ICs, Land Use and Access Restrictions, and Maintenance of Existing ECs; and,
- Sediment: Response Action D-2 – Implementation of ICs, and Land Use and Access Restrictions.

2.13.1 Summary of the Rationale for the Selected Response Action

The Selected Response Action achieves the RAOs, meets the threshold criteria, and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. The Selected Response Action addresses the limited risk posed by soil and sediment effectively, is the most implementable, and is cost efficient.

Further, the Selected Response Action is consistent with CERCLA and the Geis Memorandum. Per the Geis Memorandum, the Army agreed with NJDEP to control exposure to soils using technologies such as ECs and ICs rather than removal or treatment actions for sites where risks to human health fall within the generally acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. Decisions regarding remedial actions at sites in this range are made on a site by site basis under both the NCP and the Geis Memorandum. The excavation of $AA_{104SS-1}$ and $AA_{104SS-2}$ at Site 104 was considered appropriate based on contaminant concentrations and proximity to Green Pond Brook.

A detailed description of the Selected Response Action is provided section 2.13.2.

2.13.2 Detailed Description of Selected Response Action

The Selected Response Action for remediation of soils at Sites 61 and 104 (PICA 102) includes the excavation of approximately 54 cubic yards of contaminated soil from two AAs ($AA_{104SS-1}$ and $AA_{104SS-2}$). The area of excavation is approximately 1,242 square feet and is depicted on **Figure 5**. Excavated soil would be transported off-site for disposal or disposed of at an on-site facility with the approval of NJDEP and USEPA. LUCs, consisting of ICs and maintenance of existing ECs, would also be implemented because some contamination above residential standards would remain at the site. Impacted soil at $AA_{104SS-3}$ will be addressed through implementation of ICs and maintenance of existing ECs (i.e., vegetative cover). In order to implement the Selected Response Action, the following actions will be required:

- Preparation of the following documents:
  - Remedial Design and construction work plans
  - Remedial Action Report
- Construction surveys;
- Waste characterization;
- Erosion and sediment controls as needed;
- Clearing of vegetation, as needed;
- Soil excavation and disposal;
- Confirmatory sampling;
- Backfilling;
- Site restoration; and,
- Implementation of LUCs.

2.13.2.1 Land Use Controls

Because the Selected Response Action leaves some contamination above residential standards on site, LUCs will be required to control use of the site that may lead to unacceptable risk. The Army is responsible for implementing, enforcing, maintaining, and reporting on the LUCs. The LUCs that will be implemented at the site will be included as part of the RD. The LUC objectives include the following:

- Prohibit the development and use of property for residential housing, elementary and secondary schools, child-care facilities and playgrounds that result in unacceptable risks;
- Maintain integrity of engineering controls; and,
- Control excavation at the site through coordination with both Picatinny Environmental and the Safety Office.

Land use controls will be maintained until the concentration of hazardous substances in soil and sediment are at such levels to allow for unrestricted use and unlimited exposure. Requirements of NJDEP Deed Restriction policies will be included in the LUC Remedial Design. Many of the exhibits required (maps, engineering drawings, location maps) are already incorporated into the Army's plans. It should be noted that in the event that Picatinny is closed and the land ownership transferred, the LUCs would need to be documented through an appropriate mechanism for privately owned property (i.e., deed notice). Although the Army may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Army shall retain ultimate responsibility for remedy integrity. Upon implementation of the remedy the following activities will be completed to fully implement LUCs:

- Install and maintain engineering controls (typically signs) per the LUC Remedial Design;
- Amend the GIS to document the area of applicability, engineering controls, and sign locations;

- Prepare an announcement for all Picatinny employees and residents informing them of the LUCs at Site 61 and 104; and,
- Conduct annual inspections of the site and complete an Annual Certification of LUCs.

2.13.3 Summary of Expected Response Action Costs

The costs associated with the excavation of soil at two AAs and implementation of LUCs for soil and sediment are summarized in the following list:

Capital Costs

▪ Soil Excavation	$151,079
- Permit and Report Writing	$ 63,000
- Characterization and Sampling and Analysis	$ 7,760
- Site Preparation	$ 11,831
- Excavation and Disposal of Contaminated Soil	$ 8,573
- Site Restoration	$ 4,345
- Mobilization and Demobilization	$ 3,251
- Construction Oversight	$ 26,018
- Travel and Per Diem	$ 6,594
- Contingency of Scope (10%)	$ 13,137
- Contingency of Bid (5%)	$ 6,569
▪ Implementation of Land Use Controls	$ 32,200
Total Capital Costs	**$ 183,279**

O&M Costs (30 Years)

▪ Annual Site Inspection	$ 5,000
▪ 5-Year Reviews (5 total for 30 years)	$15,000
▪ Maintenance of Engineering Controls	$ 2,000
Total Present Worth O&M Costs (7% Dis., 30 years)	**$113,537**
TOTAL PRESENT WORTH	**$296,816**

The costing information in this section is based on the estimates created in support of the FS (Shaw, 2005).

2.13.4 Expected Outcomes of the Selected Response Action

It is anticipated that current land use will continue unchanged after implementation of the Selected Response Action. It is expected that enforcement of LUCs will ensure that risks to human and ecological receptors remain within acceptable levels. However, as contaminants will remain at levels exceeding the residential standards, unrestricted use of the site is not provided by completing this action.

2.14 STATUTORY DETERMINATIONS

Under CERCLA § 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, and comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and response action treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment and permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Response Action meets these statutory requirements.

2.14.1 Protection of Human Health and the Environment

The Selected Response Action will protect human health and the environment by maintaining LUCs that limit exposure. It was determined that unacceptable risks to human health and the environment are not associated with the site under current conditions if LUCs are enforced and land use restrictions are implemented.

The Selected Response Action will ensure that risks remain below the $1x10^{-4}$ cancer risk level and a HI of less than 1. This level falls within the USEPA's target risk range of 10^{-4} to 10^{-6}. There are no short-term threats associated with the Selected Response Action. In addition, no adverse cross-media impacts are expected from the Selected Response Action.

2.14.2 Compliance with Applicable or Relevant and Appropriate Requirements

Three types of ARARs, chemical-specific, location-specific, and action-specific, were considered as part of the FS and are summarized in **Table 13**, **Table 14,** and **Table 15** . COCs were identified for soil and sediment at Sites 61 and 104 (PICA 102). SCLs were selected for soil in the Site 61 and 104 (PICA 102) FS based on the New Jersey soil cleanup criteria which were in effect at the time. Subsequently, NJDEP promulgated new soil cleanup standards on June 2, 2008. The Army is complying with the phase-in requirements provided with the new standards by basing SCLs on New Jersey soil cleanup criteria which were in effect prior to June 2, 2008. Therefore, no chemical-specific ARARs were established for soil and sediment at Sites 61 and 104 (PICA 102). Response Actions S-1 and D-1 would not satisfy the chemical-specific SCLs. All other Response Actions would satisfy the chemical-specific SCLs either through active remediation or by controlling access and exposure to soil and sediment with concentrations in excess of the SCLs.

Compliance with the action-specific and location-specific ARARs is readily achievable with currently available technologies proposed for each response action.

2.14.3 Cost Effectiveness

In the lead agency's judgment, the Selected Response Action 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 determination was accomplished by evaluating the "overall effectiveness" of those response actions 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 costs). A comparison of the costs to the overall effectiveness was conducted to determine cost effectiveness. The relationship of the overall effectiveness of the Selected Response Action was determined to be proportional to its costs. and hence the Selected Response Action represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Response Action for soil is $296,816. Although Response Action S-1 and D-1 are less expensive than the Selected Response Action, Response Action S-1 and D-1 do not include any additional remedial activity that reduces potential site risks. The Army believes that the Selected Response Action is cost-effective and is protective of human health and the environment.

2.14.4 Utilization of Permanent Solutions and Response Action Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Possible

Active remediation is not required to achieve the RAOs developed for Sites 61 and 104 (PICA 102). However, active remediation (excavation of soils) is proposed, in accordance with the Geis Memorandum. Consequently, the Selected Response Action employs permanent solutions to reduce the volume of contaminants present at the site. The Selected Response Action satisfies the criteria for long-term effectiveness by preventing unacceptable exposures to site soils and sediments. In addition, permanent reduction of risks could be accomplished through proper implementation of LUCs. Picatinny is an active military facility, and there are currently no plans to change its status. However, should Picatinny ever be closed and the property transferred, the LUCs would need to be documented through an appropriate mechanism for privately owned property (i.e. deed restriction). Although the Selected Response Action does not remove all soil contamination above SCLs, it does reduce the toxicity, mobility and volume of contamination. The Selected Response Action is minimally intrusive and has reduced short-term risks by reducing handling of contaminated soils. Additionally, there are no special implementability issues associated with the Selected Response Action as the remedial activities are commonly applied construction practices.

2.14.5 Preference for Treatment as a Principal Element

The Selected Response Action does not address Sites 61 and 104 (PICA 102) through the use of active treatment technologies. As concluded in the Risk Assessment, none of the contaminants that exceeded LOCs at Sites 61 and 104 (PICA 102) meet the criteria of principal threat waste or pose an unacceptable risk to human health and the environment under the current and reasonably anticipated future use. Additionally, the Selected Response Action provides an optimal balance of controlling human health and ecological risks at an acceptable level with effective use of funding. Therefore the Selected Response Action is easier to implement, less harmful to ecological receptors, and is more cost effective than technologies that do utilize treatment.

2.14.6 Five-Year Review Requirements

Because this Response Action will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted every five years after response action initiation. Five-year reviews will ensure that the Response Action is, or will be, protective of human health and the environment.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED RESPONSE ACTION FROM PROPOSED PLAN

The PP presented the same selected response action as this ROD. No significant changes have been made.

3.0 PART 3: RESPONSIVENESS SUMMARY

The final component of this 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 Response Action for Site 61 and 104 (PICA 102) and the Army's responses to these concerns.

Sites 61 and 104 (PICA 102) have been the topic of presentations at the Picatinny Arsenal Environmental Restoration Advisory Board (PAERAB). PAERAB members have provided comments regarding the proposed Response Action. A copy of the PP was given to the PAERAB's co-chair and a copy was offered to all PAERAB members. A final PP for Sites 61 and 104 (PICA 102) was completed and released to the public on April 17, 2008 at the information repositories listed in Section 2.3.

Multiple newspaper notifications were made to inform the public of the start of the PP comment period, solicit comments from the public, and announce the public meeting. The notification was run in the Daily Record on April 11, 2008 and in the Star Ledger on April 12, 2008. Copies of the certificates of publication are provided in Appendix A. A public meeting was held on April 17, 2008 to inform the public about the Selected Response Action for Sites 61 and 104 (PICA 102) and to seek public comments. At this meeting, representatives from the U.S. Army, NJDEP, USEPA, and the Army's contractor, ARCADIS U.S., Inc., were present to answer questions about the site and response actions under consideration. A public comment period was held from April 17, 2008 to May 17, 2008 during which comments from the public were received.

In general, the community is accepting of the selected response action and is in favor of removing contaminated soils from the site. All comments and concerns summarized below have been considered by the Army, USEPA, and NJDEP in selecting the final cleanup methods for Site 61 and 104 (PICA 102) at Picatinny.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

As of the date of this ROD, the Army endorses the Selected Response Action for Sites 61 and 104 (PICA 102). The USEPA and the NJDEP support the Army's plan. Comments received during the Sites 61 and 104 (PICA 102) public comment period on the PP are summarized below. The comments are categorized by source.

3.1.1 Summary of Written Comments Received during the Public Comment Period

No written comments were received during the public comment period.

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

Fourteen comments specific to the Selected Response Action were received during the public meeting held on April 17, 2008. Transcripts from the public meeting have been submitted into the Administrative Record (located at the information repositories listed in Section 3.2) for the site.

The comments received on the Selected Response Action are summarized as follows:

Comment 1: Mr. William Roach, USEPA: USEPA approved the release of the Proposed Plan for public comment, and our approval of the remedy comes when the Director of the Emergency and Remedial Response Division signs the Record of Decision. At this point, we look at the public's comments and whether the State concurs on the remedy and then decide whether to sign the Record of Decision.

Response: No response necessary.

Comment 2: Jim Kealy, NJDEP: NJDEP also reviewed the Feasibility Study and Proposed Plan and is in favor of the Proposed Plan. Our management also has not yet concurred on the Record of Decision but that will be next step after the public comments.

Response: No response necessary.

Comment 3: Michael Glaab, Jefferson Township Resident, PAERAB Community Co-Chair: I, in principal, am encouraged by the anticipated removal action, and I think it's safe to say most of the community members of the Restoration Advisory Board would be encouraged. In general, the Board seems to favor removal of contamination whenever possible. What sort of monitoring plan do you anticipate, if any?

Response: There will be an annual land use certification process where the Army will certify that conditions have remained protective. For example, this process will certify that engineering controls remain in place. The Army will submit these reports to the regulators. There also is the five-year review process, a more formal process under CERCLA, where there is a more detailed assessment of the remedy. Also, after the soils have been excavated at Site 104, confirmatory sampling will be completed.

Comment 4: Michael Glaab: Will there be any long-term sampling of soil?

Response: [No long-term sampling is planned for soil, but] long term sampling is planned [for sediment, as this is part of the remedy for Green Pond Brook per the 2005 ROD].

Comment 5: Michael Glaab: I'm especially concerned about areas where thallium and beryllium have been detected.

Response: The concentrations of these contaminants do not result in an unacceptable risk to human health. Further, the cleanup level in New Jersey for beryllium is increasing above the number used here for a cleanup level. Also, surface water and sediment in Green Pond Brook is continually monitored, so if there is any migration, these contaminants will be detected.

Comment 6: Michael Glaab: Can you describe in more detail the engineering controls that will be in place where thallium and beryllium were detected?

Response: We will be maintaining the vegetative cover which is the manicured lawn at that location. We will be installing signage and restricting access.

Comment 7: Michael Glaab: What is the nature of beryllium and thallium? Are they radioactive isotopes? Can they decay?

Response: These are not radioactive isotopes. They are stable version of the natural elements.

Comment 8: Michael Glaab: Are they naturally occurring?

Response: Thallium can be found in rat poisoning. Beryllium was detected at concentrations below the new residential clean up level of 16 mg/kg so it is not a concern. Further, there was a radiological survey conducted in 1996, and the survey found no areas of concern.

Comment 9: Michael Glaab: I would like to note for the record it would be advisable in the future that at least two weeks notice be given to the general public to ensure they have sufficient time to make arrangements to attend the meeting.

Response: Typically we want to give two weeks notice and will try to do that in the future.

Comment 10: Barbara Dolce, TAPP Contractor: Is monitoring the surface water part of another Record of Decision?

Response: Yes, surface water monitoring is part of the Green Pond Brook Record of Decision.

Comment 11: Barbara Dolce: The surface water levels here are relatively high. How close are the surface water monitoring points in the Record of Decision compared to the detections here?

Response: The monitoring locations required by the Green Pond Brook Record of Decision are approximately 400 ft downstream of Site 61.

Comment 12: Barbara Dolce: PCE and RDX are also fairly high in Green Pond Brook.

Response: We didn't detect those constituents in sediments or soils at these sites, but they may be related to the Mid-Valley groundwater plume.

Comment 13: Barbara Dolce: There was a high mercury concentration detected in soil. Is any action proposed?

Response: No action is proposed. Initially there was a high mercury detection reported in one of the earlier studies. There were attempts to repeat the sampling to re-confirm the detection but nothing was ever found. It is believed to be a false positive. During subsequent sampling from this immediate location, nine samples were collected after the original detection and of those nine samples; the highest mercury level detected was 2.69 mg/kg, which is two orders of magnitude below the original detection.

Comment 14: Barbara Dolce: Were any at the original sample location?

Response: One sample was collected within 4 feet of the original location and then eight more samples were collected around the original sample location. All sample locations were discussed with USEPA and NJDEP.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised on the Selected Response Action.

4.0 PART 4: REFERENCES

ARCADIS U.S. Inc. (ARCADIS), 2008. *Site 61 and 104 (PICA 102) Proposed Plan, Picatinny Arsenal, New Jersey.* April.

Canadian Council of Ministers of the Environment (CCME), 2002. Interim Sediment Quality Guidelines as presented in the Canadian Environmental Quality Guidelines. 2002.

Dames and Moore, 1998. *Phase I Remedial Investigation Report*, prepared for Army Total Environmental Program Support, Delivery Order No. 0005, May.

IT Corporation (IT), 1999. *Phase I Additional RI Report Sites 22, 44, 61, 104, 122, 135, 141, and 145 – Final*. Prepared by IT, Mt. Arlington, New Jersey for the U.S. Army Corps of Engineers – Baltimore District Total Environmental Restoration Contract (TERC), Delivery Order No. 007, September.

IT, 2000. *Risk Management Plan for 9 Sites in the Phase I Area, Picatinny Arsenal, New Jersey – Draft Final*. U.S. Army Corps of Engineers – Baltimore District TERC, Delivery Order No. 0017, August.

IT, 2001. *Green Pond and Bear Swamp Brooks Focused Feasibility Study - Final*. Prepared for the U.S. Army Corps of Engineers – Baltimore District TERC, Delivery Order No. 0017, May.

IT, 2002. *Background Study Investigation,* May.

New Jersey Department of Environmental Protection (NJDEP), 1998. *Guidance for Sediment Quality Evaluations,* November.

Shaw Environmental, Inc. (Shaw), 2005. *Feasibility Study for Sites 61 and 104, Picatinny, New Jersey – Final*. Prepared by Shaw, Mt. Arlington, New Jersey for the U.S. Army Corps of Engineers-Baltimore District TERC, Delivery Order No. 0017, June.

U. S. Army, 1999. *Geis Memorandum*, January 13.

U.S. Environmental Protection Agency (USEPA). 1989. *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume 1, Part A*. Interim Final. Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-89/002. December.

Tables

Table 1
Chronological Order of Investigations Conducted at
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Site No.	Investigation/Study	Year	Type of Investigation/Study
61, 104	Dames and Moore Phase I Remedial Investigation	1993-1994	Geophysical Survey, Radiological Survey, Soil Gas Survey, Surface Soil Sampling, Subsurface Soil Sampling, Surface Water Sampling, Sediment Sampling, Groundwater Sampling, Test Pit Excavation, Human Health and Ecological Risk Assessment
61,104	ICF KE/IT Additional Sampling Investigation	1997-1998	Surface Soil Sampling, Subsurface Soil Sampling, Surface Water Sampling, Sediment Sampling, Monitoring Well Installations, Groundwater Sampling, Test Pit Excavation
61	IT Phase I Risk Management Plan	2000	Further Evaluation of Human Health and Ecological Risks
104	IT Additional Sampling	2000	Surface Soil Sampling, Sediment Sampling
61,104	Shaw Feasibility Study	2005	Preliminary Evaluation of Response Actions

Table 2
Contaminants Detected in Surface Soil Samples that Exceed LOCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant	Range of Concentrations (mg/kg) Minimum	Maximum	LOC (mg/kg)	Source of LOC Value	Frequency of Detection	No. of Samples Exceeding LOC
Site 61						
Benz(a)anthracene	0.430	26.5	4	NRDCSCC	8/12	2
Benzo(a)pyrene	0.439	25.0	0.66	NRDCSCC	6/12	5
Benzo(b)fluoranthene	0.548	30.5	4	NRDCSCC	7/12	4
Benzo(k)fluoranthene	0.548	8.65	4	NRDCSCC	7/12	1
Dibenz(a,h)anthracene	0.660	2.10	0.66	NRDCSCC	3/12	2
Indeno(1,2,3-c,d)pyrene	8.95	8.95	4	NRDCSCC	1/12	1
Arsenic	4.59	83.0	20	NRDCSCC	11/12	1
Beryllium	0.224	6.52	2	NRDCSCC	12/12	2
Thallium	0.0340	131	2	NRDCSCC	5/12	3
Site 104						
Benz(a)anthracene	0.44	2.5	2.2	NRDCSCC	3/10	1
Benzo(b)fluoranthene	1.1	4.7	4	NRDCSCC	3/10	1
Arsenic	3.40	23.8	20	NRDCSCC	17/18	1
Beryllium	0.212	4.65	2	NRDCSCC	20/25	2
Copper	13.7	2,900	600	NRDCSCC	19/19	2
Lead	32	3,100	600	NRDCSCC	14/14	2
Thallium	0.0440	181	2	NRDCSCC	8/26	3
Zinc	55.7	4,700	1,500	NRDCSCC	10/10	1

Notes:
1. LOCs = levels of concern
2. NRDCSCC = Non-Residential Direct Contact Soil Cleanup Criteria
3. Mercury was detected at a maximum concentration of 2,700 mg/kg in sample SS104-3A. However, this sample is considered to be an anomaly, as the result could not be duplicated through additional sampling and analysis of eight subsequent surface soil samples from this same location. The maximum concentration of mercury detected in the additional eight samples was 2.68 mg/kg.

Table 3
Contaminants Detected in Subsurface Soil Samples that Exceed LOCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant	Range of Concentrations (mg/kg)		LOC (mg/kg)	Source of LOC Value	Frequency of Detection	No. of Samples Exceeding LOC
	Minimum	Maximum				
Site 61						
Benz(a)anthracene	1.50	10.0	4	NRDCSCC	3/8	1
Benzo(a)pyrene	2.70	7.90	0.66	NRDCSCC	2/8	2
Benzo(b)fluoranthene	2.20	10.0	4	NRDCSCC	3/8	2
Dibenz(a,h)anthracene	0.500	0.970	0.66	NRDCSCC	2/8	1
Indeno(1,2,3-c,d)pyrene	4.40	4.40	4	NRDCSCC	1/8	1
Arsenic	0.244	23.9	20	NRDCSCC	6/8	1
Thallium	0.0380	470	2	NRDCSCC	5/8	2
Site 104						
None						

Notes:
NRDCSCC = Non-Residential Direct Contact Soil Cleanup Criteria
LOC = levels of concern
mg/kg = milligrams per kilogram

Table 4
Contaminants Detected in Sediment Samples that Exceed LOCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant	Range of Concentrations (mg/kg)		LOC (mg/kg)	Source of LOC Value	Frequency of Detection	No. of Samples Exceeding LOC
	Minimum	Maximum				
Acenaphthylene	4.20	4.20	2.2	GPB FFS	1/15	1
Benz(a)anthracene	0.78	2.60	2.2	GPB FFS	2/15	1
Benzo(k)fluoranthene	2.40	3.20	2.0	GPB FFS	2/16	2
Fluoranthene	0.29	6.70	3.995	GPB FFS	5/16	1
Phenanthrene	0.320	11.0	5.4	GPB FFS	5/15	1
Pyrene	0.320	7.90	3.8	GPB FFS	5/15	2
Heptachlor epoxide	0.0217	0.0217	0.18	GPB FFS	1/26	1
Beryllium	0.09	11.7	2	NRDCSCC	5/17	1
Chromium	1.31	256	247	GPB FFS	18/20	1
Nickel	2.16	90.2	42	GPB FFS	13/18	1
Silver	0.118	186	36.4	GPB FFS	5/19	1

Notes:
GBP FFS - Green Pond and Bear Swamp Brook Focused Feasibility Study PEL
NRDCSCC - Non-Residential Direct Contact Soil Cleanup Criteria
LOC - levels of concern
mg/kg - milligrams per kilogram

Table 5
Contaminants Detected in Surface Water Samples that Exceed LOCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant	Range of Concentrations (µg/L)		LOC (µg/L)	Source of LOC Value	Frequency of Detection	No. of Samples Exceeding LOC
	Minimum	Maximum				
Tetrachloroethene	6.20	6.20	0.388	SWQC	1/12	1
Trichloroethene	2.6	2.6	1.09	SWQC	1/12	1
Aroclor 1016	0.320	0.320	0.000064	AWQC, SWQC	1/10	1
Aroclor 1260	0.274	0.274	0.000064	AWQC, SWQC	1/10	1
RDX	0.220	3.06	2.0	FDWHA	2/8	1
Aluminum	47.2	458	190	BG Value	4/10	2
Copper	2.40	117	9.4	AWQC	4/10	1
Lead	1.45	13.8	3.2	AWQC	5/10	4
Silver	0.300	9.88	3.8	AWQC	2/10	1
Sodium	732	44,500	42,300	BG Value	10/10	1

Notes:
SWQC - New Jersey Surface Water Quality Criteria
AWQC - USEPA Ambient Water Quality Criteria
TWRBC - tap water risk based concentration
BG Value - Surface Water Background Threshold Value
RDX - Cyclotrimethylenetrinitramine
LOC - levels of concern
µg/L - micrograms per liter
FDWHA - Federal Drinking Water Health Advisory

Table 6
Human Health Risk Assessment Results
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Site ID	Receptor	Cumulative Cancer Risk	Hazard Index
Site 61			
	Current Outdoor Maintenance Worker	5×10^{-6}	0.2
	Future Industrial/Research Worker	4×10^{-5}	>1*
	Future Construction Worker	1×10^{-5}	>1**
Site 104			
	Current/Future Outdoor Maintenance Worker	8×10^{-7}	0.6
	Current/Future Industrial/Research Worker	7×10^{-6}	>1***
	Future Construction Worker	1×10^{-6}	>1***

Notes:

* The originally calculated Hazard Index was 2. However, the Hazard Indexes for each target organ/effect were less than or equal to one, indicating adverse non-cancer effects are unlikely.

** The originally calculated Hazard Index for the future construction worker was 30 and is primarily associated with inhalation of manganese. However, this Hazard Index was re-evaluated in the Risk Management Plan (RMP) (IT, 2000) and the results indicate that exposure to manganese will not result in unacceptable noncancer hazards.

*** The originally calculated Hazard Indexes for the current/future industrial/research worker and future construction worker were 8 and 80, respectively. However, these Hazard Indexes are primarily driven by inhalation of mercury and barium. As discussed in the text, these Hazard Indexes are overestimated and re-evaluation indicated that exposure to manganese and barium will not result in unacceptable noncancer risks.

Table 7
Final Site Cleanup Levels (SCLs) for Surface and Subsurface Soil
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant of Concern	Surface Soil[1]		Subsurface Soil	
	SCL (mg/kg)	Maximum Detected Concentration (mg/kg)	SCL (mg/kg)	Maximum Detected Concentration (mg/kg)
Site 61				
Arsenic	20	83	20	23.9
Beryllium	2	6.52	-	-
Thallium	72	131	72	470
Benz(a)anthracene	4	26.5	4	10
Benzo(a)pyrene	0.66	25	0.66	7.9
Benzo(b)fluoranthene	4	30.5	4	10
Benzo(k)fluoranthene	4	8.65	-	-
Dibenz(a,h)anthracene	0.66	2.1	0.66	0.97
Indeno(1,2,3-c,d)pyrene	4	8.95	4	4.4
4,4'-DDE	1.2	0.23	-	-
Site 104				
Arsenic	20	23.8	-	-
Beryllium	2	4.65	-	-
Copper	600	2,900[2]	-	-
Lead	600	3,100[3]	-	-
Thallium	72	181	-	-
Zinc	1,500	4,700	-	-

Notes:

(1) Although a potential modeled risk to the veery and American woodcock was calculated due to 4,4'-DDE cadmium, chromium, and selenium, these contaminants were deleted from the list of surface soil COCs because the maximum detected concentrations of the contaminants do not exceed the ecological risk based clean up levels (ERBCL). The maximum detected concentration for 4,4'-DDE cadmium, chromium, and selenium was 0.23 mg/kg (ERBCL of 1.2 mg/kg), 1.74 mg/kg (ERBCL of 18 mg/kg), 43 mg/kg (ERBCL of 53 mg/kg) and 7.79 mg/kg (ERBCL of 120 mg/kg), respectively.

(2) Copper was identified as a COC for sediment as a result of concentrations detected in samples SD104-2 and 104SDS-6. These samples were initially characterized as sediment and then later determined to be more representative of surface soil. Therefore cooper has been added to the list of COCs for surface soil at Site 104.

(3) This concentration was detected in SD104-2, a sample that was initially characterized as sediment and then later determined to be more representative of surface soil.

SCL = site cleanup level

mg/kg = milligram per kilogram

4,4'-DDE = 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene

Table 8
Final Site Cleanup Levels (SCLs) for Sediment
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Contaminant of Concern	SCL (mg/kg)	Maximum Detected Concentration (mg/kg)
Beryllium	2	6.52
Chromium	72	131
Nickel	4	26.5
Silver	0.66	25
Acenaphthylene		
Benz(a)anthracene		
Benzo(b)fluoranthene	4	30.5
Benzo(k)fluoranthene	4	8.65
Fluoranthene	0.66	2.1
Phenanthrene	4	8.95
Pyrene		
Heptachlor epoxide		

Notes:

(1) Copper, lead, mercury and zinc have been listed as COCs for surface soil and compared to surface soil LOCs. These contaminants were detected in SD104-2, SD104-3, and 104SD-6. These samples were initially characterized as sediment and then later determined to be more representative of surface soil.

SCL = site cleanup levels

mg/kg = milligram per kilogram

Table 9
Areas of Attainment (AA)
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

AA	Media	Area (square feet)	Depth (feet)	Volume (cubic yard)
Site 61				
AA_{61SS-1}	Surface/Subsurface Soil	14,175	0-4	2,100
AA_{61SS-2}	Surface Soil	314	0-1	12
AA_{61SD-1}	Sediment	319	0-1	12
Site 104				
$AA_{104SS-1}$	Surface Soil	787	0-1	29
$AA_{104SS-2}$	Surface Soil	455	0-1.5	25
$AA_{104SS-3}$	Surface Soil	628	0-1	23

Table 10
Cost Summary for Selected Response Actions
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Response Action	Description	Capital Cost	Discounted O&M	Total Present Worth	Duration
Soil					
Response Action S-5A	Excavation of $AA_{104SS-1}$ and $AA_{104SS-2}$ with Off-Site Disposal	$151,079.00	$0.00	$151,079.00	42 days
Soil and Sediment					
Response Action S-2 and D-2	Implementation of Land Use and Access Restrictions	$32,200.00	$113,537.00	$145,737.00	30 years
			Total	**$296,816.00**	

Table 11
Costs for Continued Implementation of Land Use and Access Restrictions
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

	Description	Costs
Capital Costs		
	Land Use Restrictions and Institutional Controls	$ 32,200.00
Total Capital Cost		**$ 32,200.00**
O&M Costs		
	Annual Site Inspection	$ 5,000.00
	5-Year Review (including draft, draft final, and final reports)	$ 15,000.00
	Maintenance of engineering controls	$ 2,000.00
Present Worth O&M Costs (7% Int.) *		**$ 98,728.09**
Contingency (15%)		**$ 14,809.21**
Total Remediation Cost		**$ 145,737.30**

* O&M Costs are totaled as a present worth cost based on a 7% net investment rate for a 30-year period.

Table 12
Costs for Response Action S-5A - Excavation of $AA_{104SS-1}$ and $AA_{104SS-2}$ with Off-Site Disposal
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

	Description	Costs
Capital Costs		
	Permits and Report Writing	$63,000.00
	Characterization Sampling and Analysis	$7,760.00
	Site Preparation	$11,831.90
	Excavation and Disposal of Contaminated Soil	$8,572.76
	Site Restoration	$4,345.42
	Mobilization and Demobilization	$3,251.01
	Construction Oversight	$26,017.66
	Travel and Per Diem	$6,594.00
	Subtotal	**$131,372.75**
Contingency of Scope (10%)		**$13,137.28**
Contingency of Bid (5%)		**$6,568.64**
TOTAL CAPITAL COST		**$151,078.66**

Table 13
Surface and Subsurface Soil Chemical-Specific To Be Considereds (TBCs)
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Law/Regulation	Requirement of Law Regulation	TBC Status
Soil cleanup standards based on New Jersey Non-Residential Direct Contact Soil Cleanup Criteria	Non-residential cleanup criteria.	TBC Cleanup criteria for contaminated soils. *Note: These standards are being used per the phase-in requirements of New Jersey's newly promulgated soil standards (June 2, 2008).
Effects Range Low (ER-L)	Provides sediment screening guidelines for evaluating ecological risks	TBC Provides values which may indicate an ecological risk in sediment
Interim Sediment Quality Guidelines (ISQGs)	Effects-based criteria for sediment	TBC to develop cleanup criteria for sediment based on ecological effects
Benthic Aquatic Life Chronic Toxicity Sediment Criteria	Value which is estimated to be the approximate concentration at which adverse effects are likely to occur in sensitive life stages and/or species	TBC to develop cleanup criteria for sediment based on ecological effects
USEPA Region 3 Soil Risk Based Concentrations (RBCs)	Risk-based concentration in soil for residential and non-residential land use	TBC Evaluation criteria for contaminated soils. Since sediments are dry the majority of the time in the ditches, may be appropriate for use
Sediment Quality Benchmarks (SQB) for the Protection of Benthic Organisms	Concentrations of a substance in sediment that will not unacceptably affect benthic organisms	TBC to develop cleanup criteria for sediment based on ecological effects

Table 14
Location-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC 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.	ARAR Applicable to the substantive requirements if clearing and/or excavation activities encroach upon stream, wetlands and/or transition areas identified in the Picatinny facility-wide GIS at Sites 61 and 104.
	Presence of wetlands as defined in the Clean Water Action (CWA) 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, or create alternative wetlands.	ARAR Applicable to the substantive requirements if clearing and/or excavation activities encroach upon stream, wetlands, and/or transition areas identified in the Picatinny facility-wide GIS at Sites 61 and 104.
Integrated Natural Resource Management Plan (INRMP)	Interagency Agreement with the United States Army Environmental Center, as required by: - Sikes Act (16 U.S.C. 670a *et seq*) - Army Regulation 200-3 - Department of Defense Instruction 4715.3	The purpose of the INRMP is to ensure that natural resources conservation measures and Army mission activities are integrated and are consistent with federal stewardship requirements. Stated goals of the INRMP include minimizing habitat fragmentation and protect unique or sensitive habitats; and protect native species, rare and ecologically important species and protect genetic diversity.	TBC Applicable to clearing and/or excavation activities which could affect the multipurpose uses of natural resources at Picatinny. Remedial activities at Sites 61 and 104 will be conducted in accordance with the INRMP, including guidelines on the harvesting of trees required for site clearance.

Table 14
Location-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Floodplains	Protection of floodplains as defined in Executive Order 11988 § 6 (c) and 40CFR 6, Appendix A § 4 (j)	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 the potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management.	ARAR Applicable for areas within the 100-year floodplain of GPB, which includes sections of both Sites 61 and 104 according to the Picatinny facility-wide GIS.
	Within 100-year floodplain as defined in 40 CFR 6, Appendix A § 4 (d)	Facility must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by flooding.	ARAR Applicable for areas within the 100-year floodplain of GPB, which includes sections of both Sites 61 and 104 according to the Picatinny facility-wide GIS.
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) - 50 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 rare, threatened, or endangered species protection consideration into planning, regulating, and decision-making processes.	ARAR Potentially applicable since clearing and/or excavation activities could impact habitat typical of several State-listed threatened or endangered species. Sites 61 and 104 are outside of any known or suspected federal threatened or endangered species habitat.

Table 14
Location-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
FW2-TP (C1) Designation and Associated Buffers	Green Pond Brook is specifically in statute N.J.A.C 7:9B as FW2-TP(C1)	This regulations constitutes the rules of the New Jersey Department of Environmental Protection governing matters of policy with respect to the protection and enhancement of surface water resources, class definitions and quality criteria, and use designation.	TBC as relates to the adjacent buffer areas to Green Pond Brook. Regulation is specific to Green Pond Brook (not addressed in this ROD) but does establish a 300 foot buffer. This regulation may be applicable to specific activities which could impact topography or grading within the 300 foot buffer.

Table 15
Action-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Action	Law/Regulation	Requirements of Law/Regulation	ARAR/TBC Status
Generation of Hazardous Wastes and Testing of Excavated Materials	Resource Conservation and Recovery Act (RCRA) methods for identification and evaluation of solid and hazardous wastes • 40 CFR 261, Subparts A, B, C and D • 40 CFR 136, App. A (SW-846 including method 608, 8082 by gas chromatography for PCB wastes). • NJAC 26G-5.1 (incorporated by reference)	Specific requirements for identifying hazardous wastes. Establishes analytical requirements for testing and evaluating solid, hazardous, and water wastes	ARAR Applicable. Toxicity characteristic leaching procedure (TCLP) analysis and testing results are used to determine if any soils disposed of are a hazardous waste.
Excavation and Capping	40 CFR 264.310(a) New Jersey Soil Erosion and Sediment Control Act, NJAC 7:13-3 and NJAC 2:90	Requirements for the placement of fill for a soil cover and soil erosion and sediment controls	ARAR Applicable to the placement of a soil cap on site, excavation, and clearing activities.
Sampling and Analysis	Remediation Technical Requirements NJAC 7:26E-3	Requirements of quality assurance for sampling and analysis at remediation sites	ARAR 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.	ARAR Applicable when selecting a laboratory for sampling activities during remediation.
	Notice of Intent to implement a Performance-Based Measurement System 62 FR 52098, Oct. 6, 1997 (FRL-5903-2)	Give the public an opinion on selecting any appropriate analytical test method to use in complying with USEPA regulations	TBC Applies to analytical methods in regards to waste generation

Table 15
Action-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Action	Law/Regulation	Requirements of Law/Regulation	ARAR/TBC Status
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) Category 1 Waterway (NJAC 7:9B) 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 • Compliance with requirements of waterways designated as FW2-TP(C1). Green Pond Brook (adjacent to Picatinny 102) is specifically in statute as FW2-TP(C1).	ARAR Applicable to the substantive requirements of the program for remediation activities that occur in the floodplain or vicinity of GPB
General Remediation	Technical Requirements for Ste Remediation NJAC 7:26E 1, 4-7	Specifies the minimum technical requirements to investigate and remediate contamination on any site.	ARAR 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 feet of surface area of land	ARAR Applicable to the substantive requirements for site activities involving excavation, grading, or other soil disturbance activities exceeding 5,000 square feet
	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.	TBC 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	ARAR Applicable for discharge of storm water that may result from on-site in-situ and/or excavation and clearing activities to the drainage ditch. Discharge of treated wastewater is not anticipated.

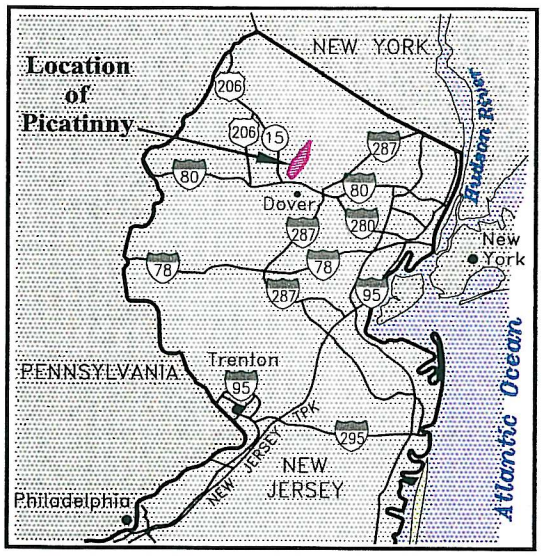
Table 15
Action-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Action	Law/Regulation	Requirements of Law/Regulation	ARAR/TBC Status
	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 sites is regulated via NJPDES requirements. NJPDES requirements include completing 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.	ARAR Applicable to the substantive requirements of the program for storm water discharges to the drainage ditch. Discharge of treated wastewater is not anticipated.
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.	ARAR May be 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	Provides requirements applicable to ambient air pollution sources.	ARAR Potentially 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 $\mu g/m^3$ (not to exceed 260 $\mu g/m^3$ more than once) and secondary standard of 60 $\mu g/m^3$ (not to exceed 150 $\mu g/m^3$ more than once), both for geometric mean value of all 24-hour average concentration standard over 12 consecutive months.

Table 15
Action-Specific ARARs and TBCs
Site 61 and 104 (PICA 102)
Picatinny Arsenal, New Jersey

Action	Law/Regulation	Requirements of Law/Regulation	ARAR/TBC Status
Disposal Off-Site	RCRA Land Disposal Restrictions 40 CFR 268, Subparts A, B, C, D, and E NJAC 7:26-11 *et seq.*	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise restricted waste may continue to be land disposed.	ARAR Applicable if any excavated soil or sediments are a hazardous waste and disposed of on-site or transported off-site to a landfill.
Packaging, Labeling and Storage	RCRA Hazardous Waste Generation 40 CFR 262, Subparts A, B, C, D, and E NJAC 7:26G-6	Specifies requirements for hazardous waste packaging, labeling, manifesting, and storage.	ARAR Potentially applicable for packaging and labeling requirements prior to off-site transportation of excavated soil or sediments if a hazardous waste.
Labeling and Transportation	NJDEP – Division of Waste Management: NJAC 7:26 Subchapter 3; NJAC 7:26 – 3.2(c), - 3.2(b), - 3.2(a), - 3.2(a)2, - 3.2(a)6; NJAC 7:26-16.4; and NJAC 7:26-3.4 and 7:26-3.5	Solid investigation-derived waste (IDW) for off-site transportation must obtain proper written approval from the State prior to transporting the waste. Once approved, the transporting vehicle has to be properly registered to handle the waste with appropriate placard.	ARAR Potentially applicable for packaging and labeling requirements prior to off-site transportation of excavated sediments if a hazardous waste.
Transportation	RCRA – Solid/Hazardous Waste Regulations: 40 CFR, Subparts A, B, C, and D and 40 CFR 263, Subparts A, B, and C Directive #9330.2-07,49 NJAC 7:26G-7	Hazardous waste-containing vehicles must be properly registered to handle and transport the waste to a regulated facility. In addition, waste must be properly packed and accompanied with proper emergency response spill procedures and manifests.	ARAR Potentially applicable for packaging and labeling requirements prior to off-site transportation of excavated sediments if a hazardous waste.
	U.S. Department of Transportation (DOT) Hazardous Materials Transportation Regulations 49 CFR 171-180	Establishes classification, packaging, and labeling requirements for shipments of hazardous materials.	ARAR Potentially applicable for packaging and labeling requirements prior to off-site transportation of excavated sediments if a hazardous waste.

Figures



LOCATION OF PICATINNY

0 50
MILES

N

AREA O
AREA N
AREA J
AREA K
AREA M
AREA I
AREA H
AREA F
AREA G
AREA D
AREA E
AREA L
AREA P
AREA A
AREA B
SITE LOCATION
POST FARM

LEGEND:
AREA BOUNDARY
SURFICIAL HYDROLOGY
ROAD
PICATINNY BOUNDARY

0 4000
FEET

Picatinny Installation Restoration Program

FIGURE No. 1
SITE LOCATION MAP
RECORD OF DECISION
FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY

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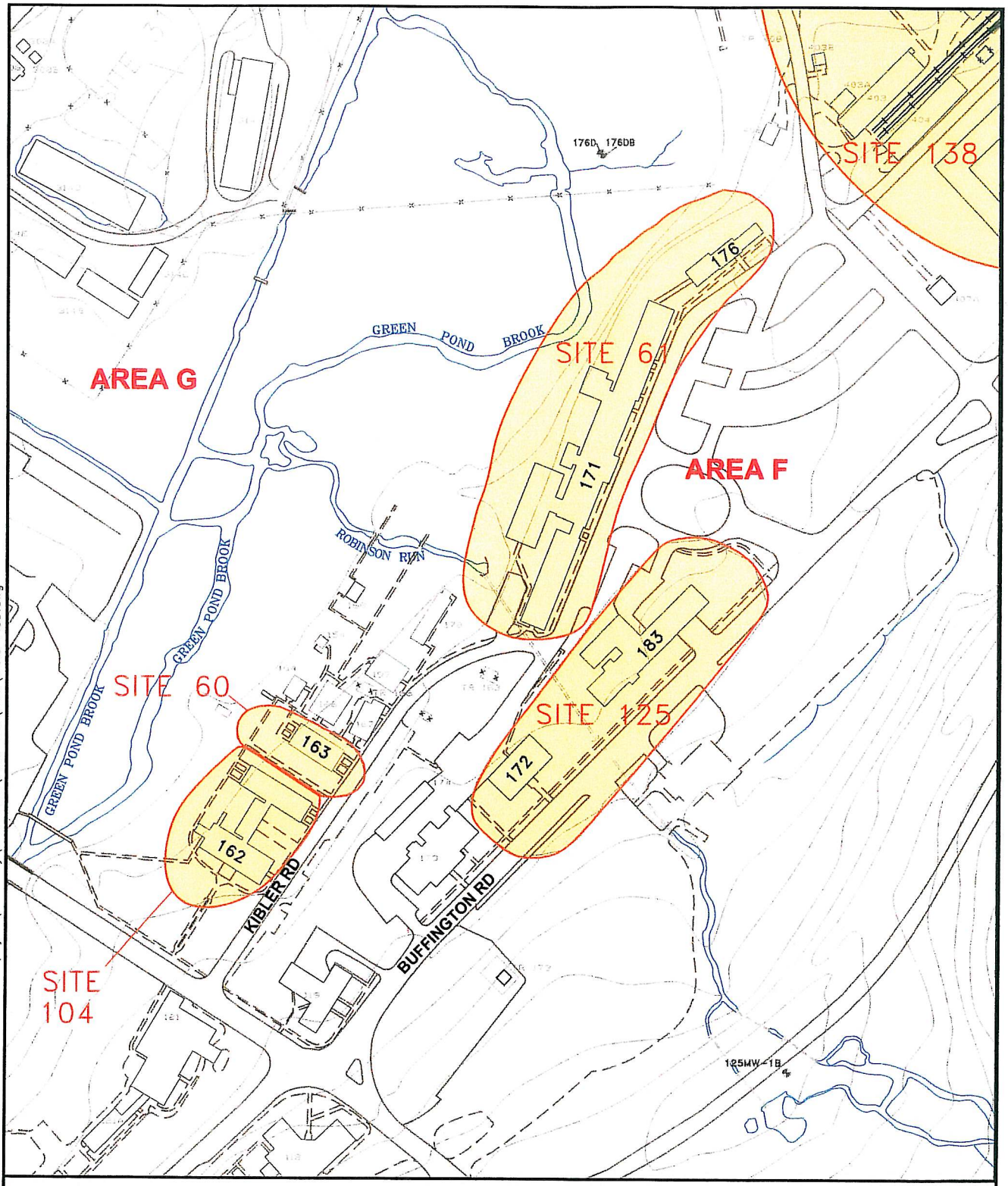

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Plot Date/Time: Apr 25, 2008 - 4:07pm

0 200
FEET

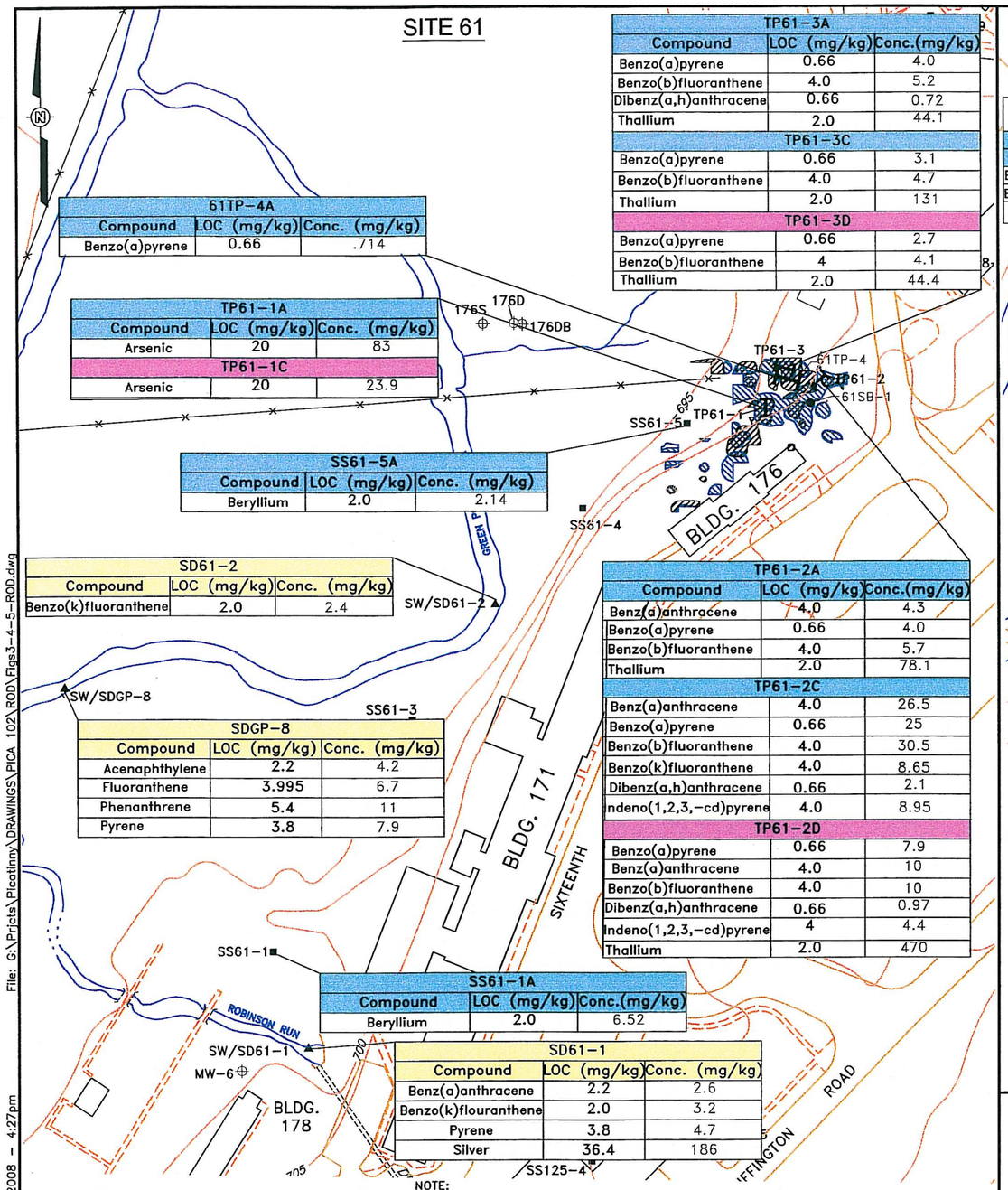
-N-

Picatinny Installation Restoration Program

FIGURE No. 2

SITES 61 AND 104 SITE MAP

RECORD OF DECISION
FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY



61TP-4A		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Benzo(a)pyrene	0.66	.714

TP61-1A		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Arsenic	20	83
TP61-1C		
Arsenic	20	23.9

SS61-5A		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Beryllium	2.0	2.14

SD61-2		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Benzo(k)fluoranthene	2.0	2.4

SDGP-8		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Acenaphthylene	2.2	4.2
Fluoranthene	3.995	6.7
Phenanthrene	5.4	11
Pyrene	3.8	7.9

TP61-3A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Benzo(a)pyrene	0.66	4.0
Benzo(b)fluoranthene	4.0	5.2
Dibenz(a,h)anthracene	0.66	0.72
Thallium	2.0	44.1
TP61-3C		
Benzo(a)pyrene	0.66	3.1
Benzo(b)fluoranthene	4.0	4.7
Thallium	2.0	131
TP61-3D		
Benzo(a)pyrene	0.66	2.7
Benzo(b)fluoranthene	4	4.1
Thallium	2.0	44.4

TP61-2A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Benz(a)anthracene	4.0	4.3
Benzo(a)pyrene	0.66	4.0
Benzo(b)fluoranthene	4.0	5.7
Thallium	2.0	78.1
TP61-2C		
Benz(a)anthracene	4.0	26.5
Benzo(a)pyrene	0.66	25
Benzo(b)fluoranthene	4.0	30.5
Benzo(k)fluoranthene	4.0	8.65
Dibenz(a,h)anthracene	0.66	2.1
Indeno(1,2,3,-cd)pyrene	4.0	8.95
TP61-2D		
Benzo(a)pyrene	0.66	7.9
Benz(a)anthracene	4.0	10
Benzo(b)fluoranthene	4.0	10
Dibenz(a,h)anthracene	0.66	0.97
Indeno(1,2,3,-cd)pyrene	4	4.4
Thallium	2.0	470

SS61-1A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Beryllium	2.0	6.52

SD61-1		
Compound	LOC (mg/kg)	Conc. (mg/kg)
Benz(a)anthracene	2.2	2.6
Benzo(k)flouranthene	2.0	3.2
Pyrene	3.8	4.7
Silver	36.4	186

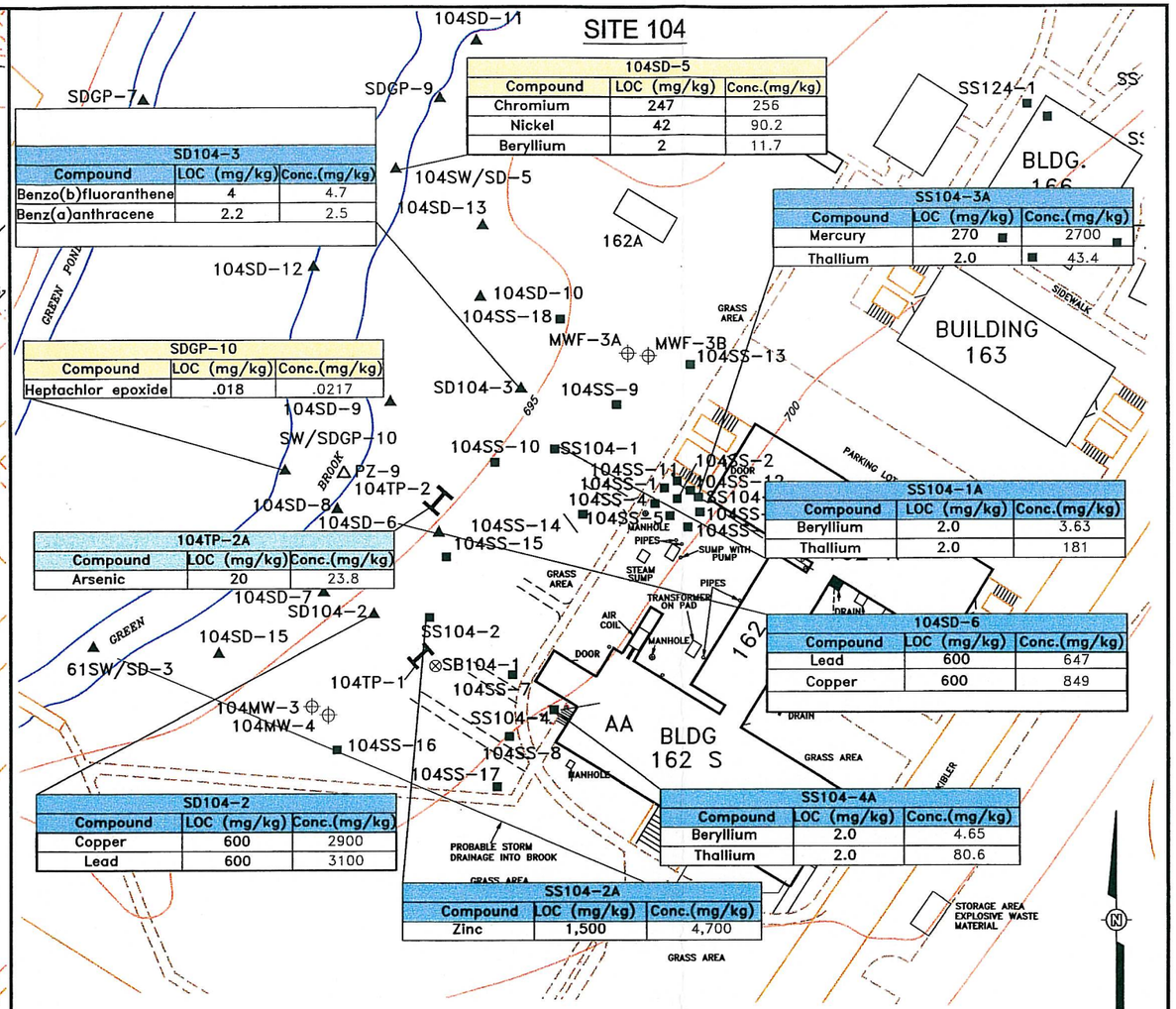
NOTE:

SURFACE SOIL DATA IS PRESENTED IN BLUE TEXT BOXES.
SUBSURFACE SOIL DATA IS PRESENTED IN PURPLE TEXT BOXES.
SEDIMENT DATA IS PRESENTED IN YELLOW TEXT BOXES.
SEDIMENT LOC VALUES PRESENTED ARE THE LOWER OF THE HUMAN HEALTH BASED LOCs OR THE PELs FROM THE GREEN POND BROOK AND BEAR SWAMP BROOK FEASIBILITY STUDY (IT, 2001).

SCALE
0 120 240 FEET

ICF KAISER PHASE I SAMPLING LOCATIONS
- TEST PIT (TP) LOCATION
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SOIL BORING (SB) LOCATION

DAMES & MOORE PHASE I SAMPLING LOCATIONS
- GRADIENT MAGNETOMETER
- TOTAL FIELD MAGNETOMETER
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SURFACE SOIL (SS) SAMPLING LOCATION
- TEST PIT (TP) LOCATION
- MONITORING WELL/GROUNDWATER SAMPLING LOCATION



SD104-3		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Benzo(b)fluoranthene	4	4.7
Benz(a)anthracene	2.2	2.5

SDGP-10		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Heptachlor epoxide	.018	.0217

104TP-2A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Arsenic	20	23.8

SD104-2		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Copper	600	2900
Lead	600	3100

104SD-5		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Chromium	247	256
Nickel	42	90.2
Beryllium	2	11.7

SS104-3A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Mercury	270	2700
Thallium	2.0	43.4

SS104-1A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Beryllium	2.0	3.63
Thallium	2.0	181

104SD-6		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Lead	600	647
Copper	600	849

SS104-4A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Beryllium	2.0	4.65
Thallium	2.0	80.6

SS104-2A		
Compound	LOC (mg/kg)	Conc.(mg/kg)
Zinc	1,500	4,700

NOTE:

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SEDIMENT DATA IS PRESENTED IN YELLOW TEXT BOXES.
SEDIMENT LOC VALUES PRESENTED ARE THE LOWER OF THE HUMAN HEALTH BASED SCLs OR PELs FROM THE FINAL GREEN POND AND BEAR SWAMP BROOKS FOCUSED FEASIBILITY STUDY (IT, 2001).

SCALE
0 60 120 FEET

LEGEND
- RAILROAD
- TREE LINE
- FENCE
- TRANSFORMER (TR-732)
- BLAST WALL
- STORM SEWER
- SANITARY SEWER
- EARTH MOUND
- BUILDING
- FORMER BUILDING
- COVERED WALKWAY
- SWAMP
- WATER
- 10' SURFACE CONTOUR
- PAVED ROADWAY
- UNPAVED ROADWAY

SAMPLING LOCATIONS
- MONITORING WELL
- SURFACE WATER/SEDIMENT
- SURFACE SOIL
- SOIL BORING
- TEST PIT

Picatinny Installation Restoration Program

FIGURE No. 3
SITES 61 AND 104
LOC EXCEEDANCES IN SOIL AND SEDIMENT
RECORD OF DECISION
FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY

File: G:\Prjcts\Picatinny\DRAWINGS\PICA 102\ROD\Figs3-4-5-ROD.dwg
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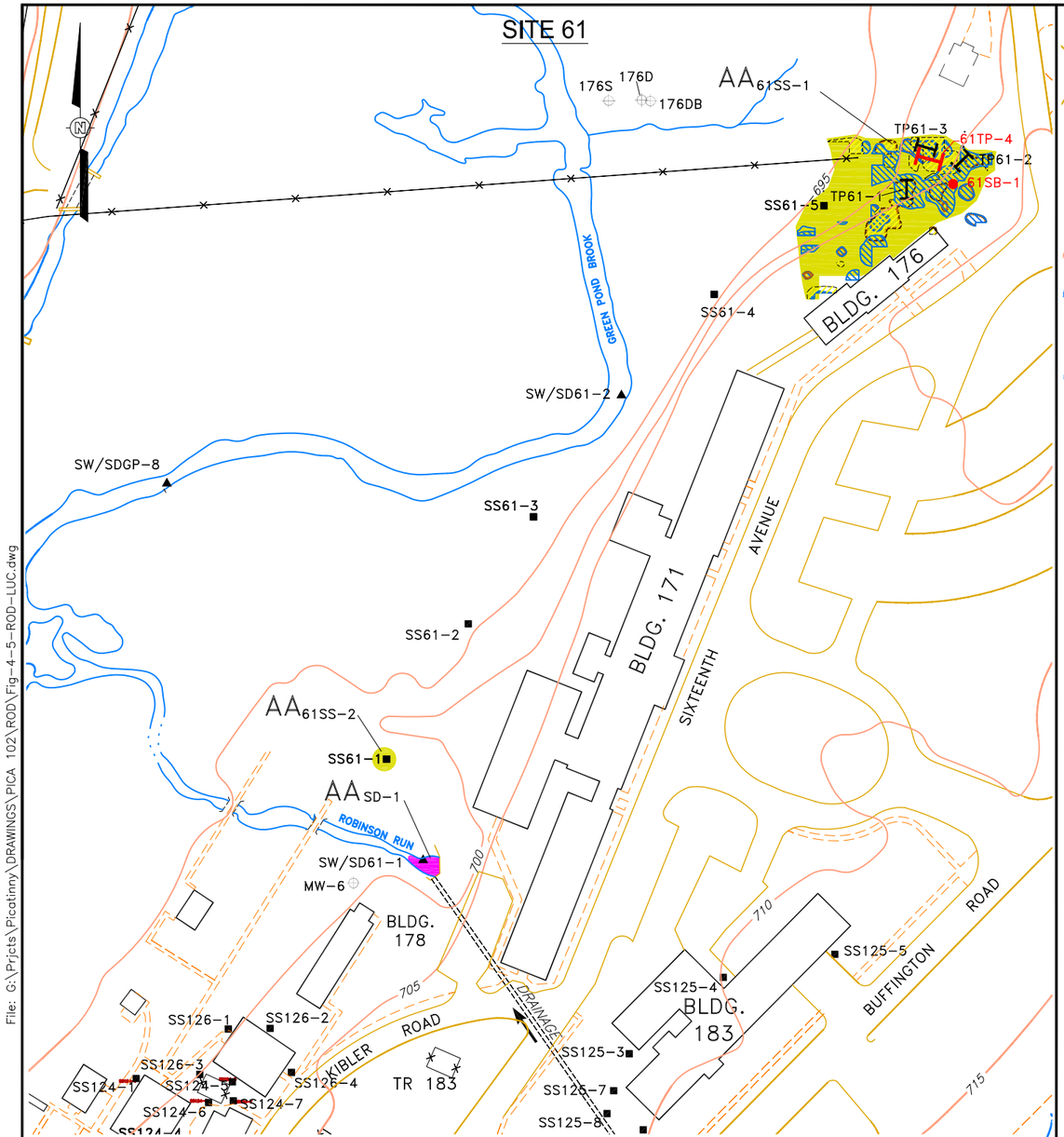

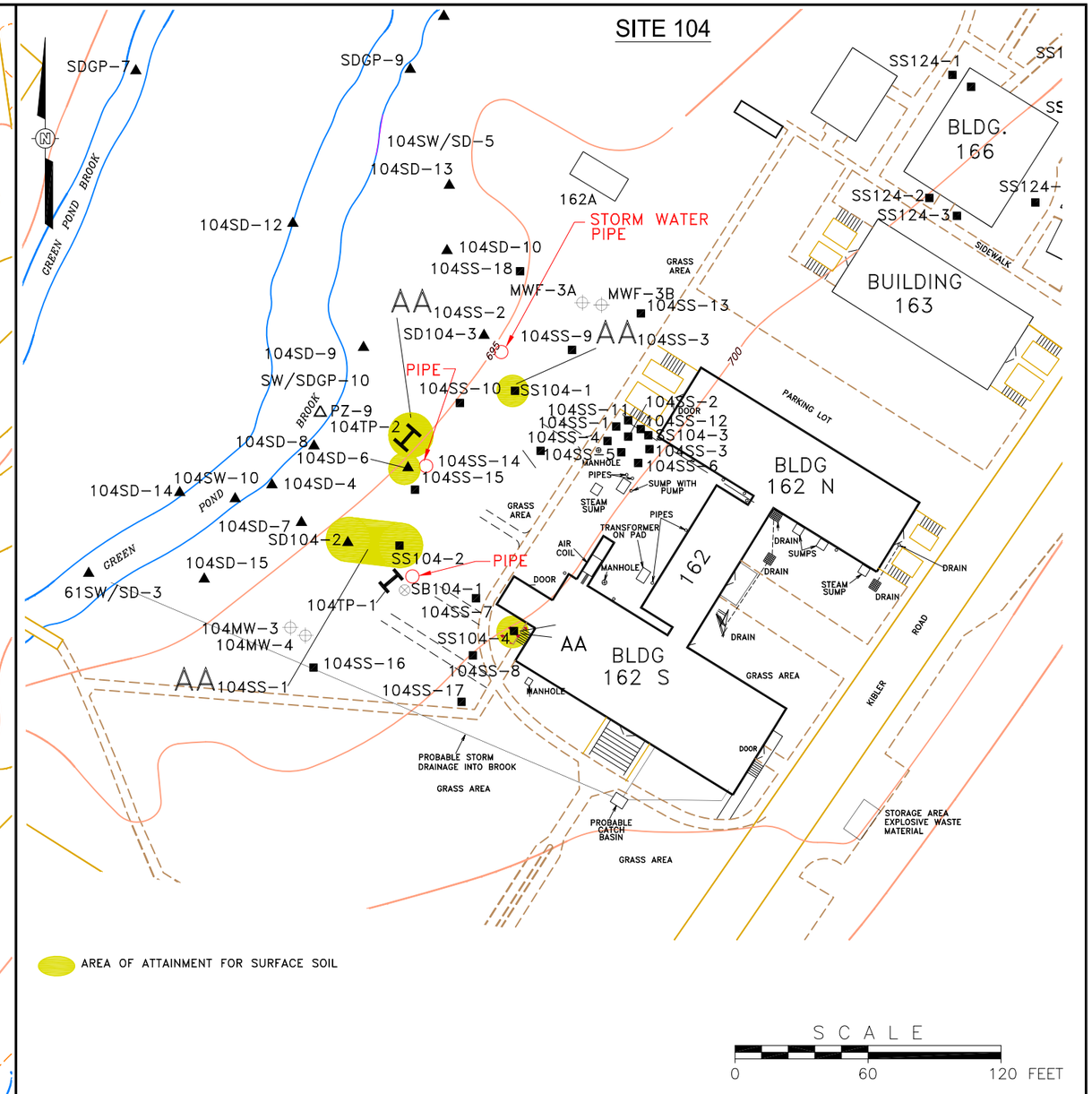

AREA OF ATTAINMENT FOR SURFACE SOIL

S C A L E
0 60 120 FEET

AREA OF ATTAINMENT FOR SURFACE AND SUBSURFACE SOIL

AREA OF ATTAINMENT FOR SEDIMENT

ICF KAISER PHASE I SAMPLING LOCATIONS
- TEST PIT (TP) LOCATION
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SOIL BORING (SB) LOCATION

DAMES & MOORE PHASE I SAMPLING LOCATIONS
- GRADIENT MAGNETOMETER
- TOTAL FIELD MAGNETOMETER
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SURFACE SOIL (SS) SAMPLING LOCATION
- TEST PIT (TP) LOCATION
- MONITORING WELL/GROUNDWATER SAMPLING LOCATION

S C A L E
0 120 240 FEET

LEGEND
- RAILROAD
- TREE LINE
- FENCE
- TRANSFORMER
- BLAST WALL
- STORM SEWER
- SANITARY SEWER
- EARTH MOUND
- BUILDING
- FORMER BUILDING
- COVERED WALKWAY
- SWAMP
- WATER
- 10' SURFACE CONTOUR
- PAVED ROADWAY
- UNPAVED ROADWAY

SAMPLING LOCATIONS
- MONITORING WELL
- SURFACE WATER/SEDIMENT
- SURFACE SOIL
- SOIL BORING
- TEST PIT

Picatinny Installation Restoration Program

FIGURE No. 4
SITES 61 AND 104
AREAS OF CONCERN
RECORD OF DECISION
PLAN FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY

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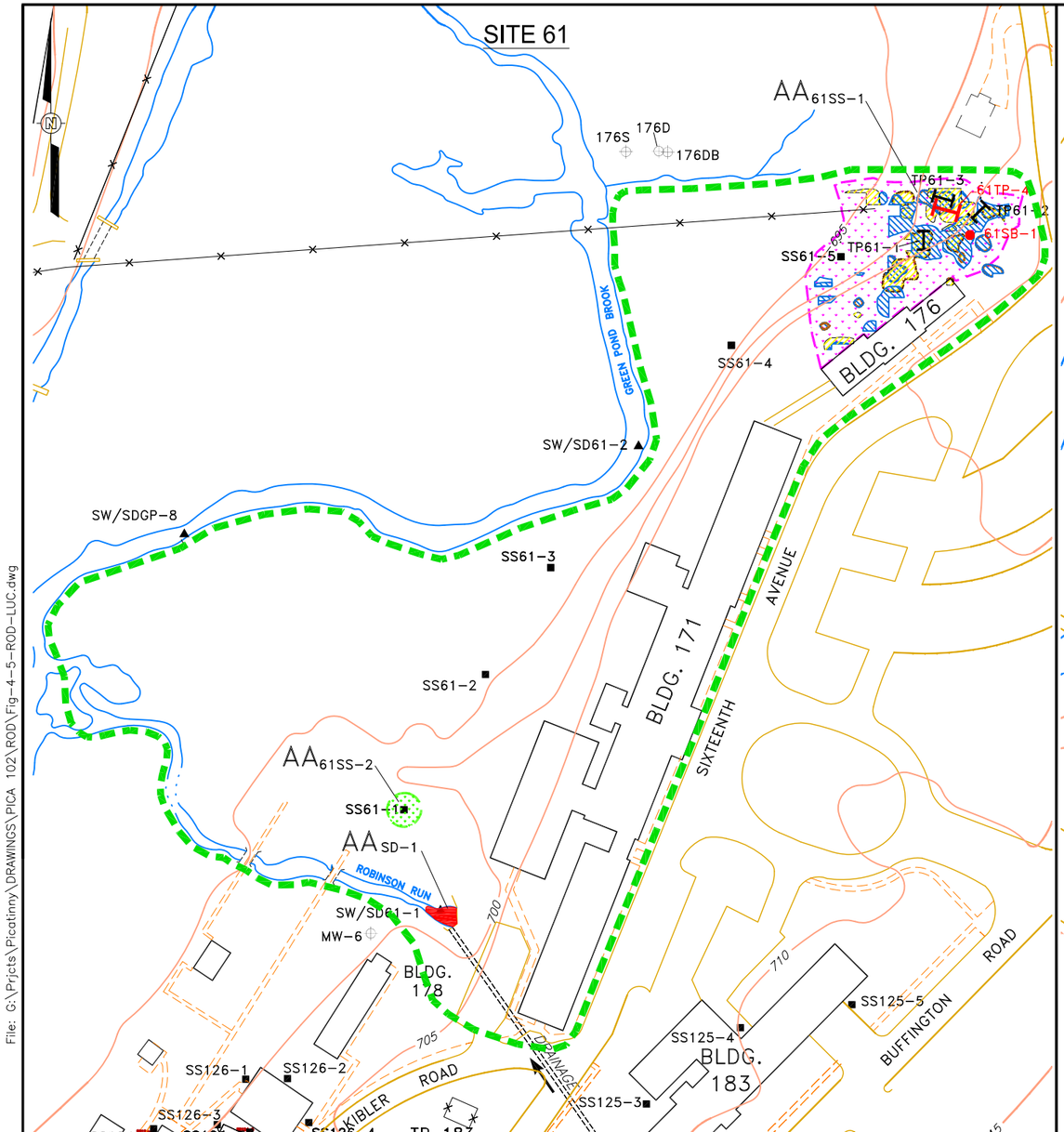

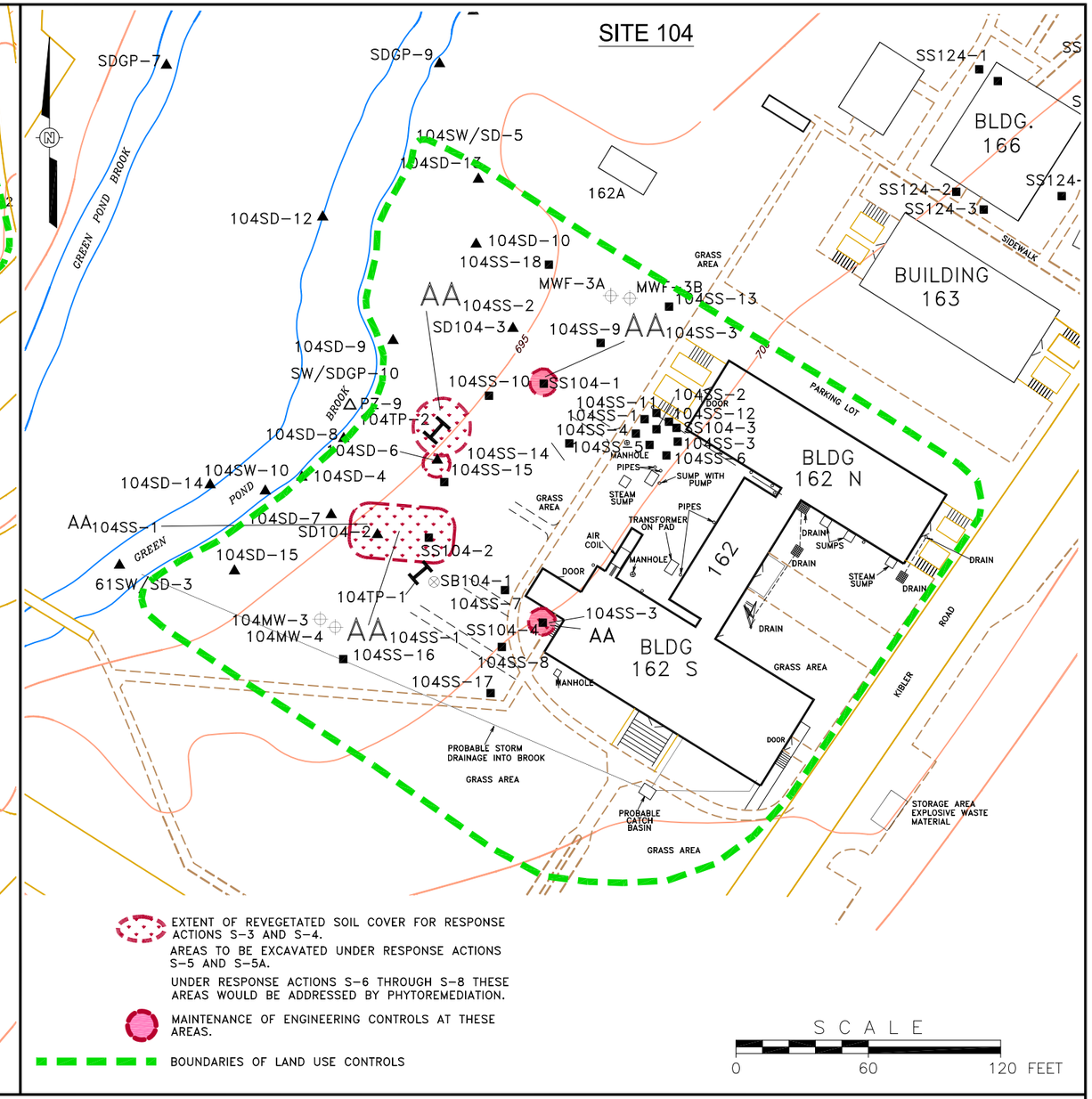

EXTENT OF REVEGETATED SOIL COVER FOR RESPONSE ACTIONS S-3 AND S-4.

AREAS TO BE EXCAVATED UNDER RESPONSE ACTIONS S-5 AND S-5A.

UNDER RESPONSE ACTIONS S-6 THROUGH S-8 THESE AREAS WOULD BE ADDRESSED BY PHYTOREMEDIATION.

MAINTENANCE OF ENGINEERING CONTROLS AT THESE AREAS.

BOUNDARIES OF LAND USE CONTROLS

SCALE 0 60 120 FEET

EXTENT OF REVEGETATED SOIL COVER FOR RESPONSE ACTIONS S-3 AND S-6.

EXTENT OF RCRA C CAP FOR RESPONSE ACTIONS S-4 AND S-7.

EXTENT OF SOIL EXCAVATION FOR RESPONSE ACTIONS S-5 AND S-8.

EXTENT OF REVEGETATED SOIL COVER FOR RESPONSE ACTIONS S-3 AND S-6.

EXTENT OF SOIL EXCAVATION FOR RESPONSE ACTIONS S-5 AND S-8.

AREA TO BE MONITORED OR EXCAVATED UNDER RESPONSE ACTIONS D-3 AND D-4.

BOUNDARIES OF LAND USE CONTROLS

ICF KAISER PHASE I SAMPLING LOCATIONS
- TEST PIT (TP) LOCATION
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SOIL BORING (SB) LOCATION

DAMES & MOORE PHASE I SAMPLING LOCATIONS
- GRADIENT MAGNETOMETER
- TOTAL FIELD MAGNETOMETER
- SURFACE WATER/SEDIMENT (SW/SD) SAMPLING LOCATION
- SURFACE SOIL (SS) SAMPLING LOCATION
- TEST PIT (TP) LOCATION
- MONITORING WELL/GROUNDWATER SAMPLING LOCATION

SCALE 0 120 240 FEET

LEGEND

RAILROAD
TREE LINE
FENCE
TRANSFORMER
BLAST WALL
STORM SEWER
SANITARY SEWER
EARTH MOUND
BUILDING
FORMER BUILDING
COVERED WALKWAY
SWAMP
WATER
10' SURFACE CONTOUR
PAVED ROADWAY
UNPAVED ROADWAY

SAMPLING LOCATIONS
- MONITORING WELL
- SURFACE WATER/SEDIMENT
- SURFACE SOIL
- SOIL BORING
- TEST PIT

Picatinny Installation Restoration Program

FIGURE No. 5
SITES 61 AND 104
CONCEPTUAL LAYOUT FOR SOIL RESPONSE ACTIONS S-3 THROUGH S-8 AND SEDIMENT RESPONSE ACTIONS D-3 AND D-4
RECORD OF DECISION
PLAN FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY

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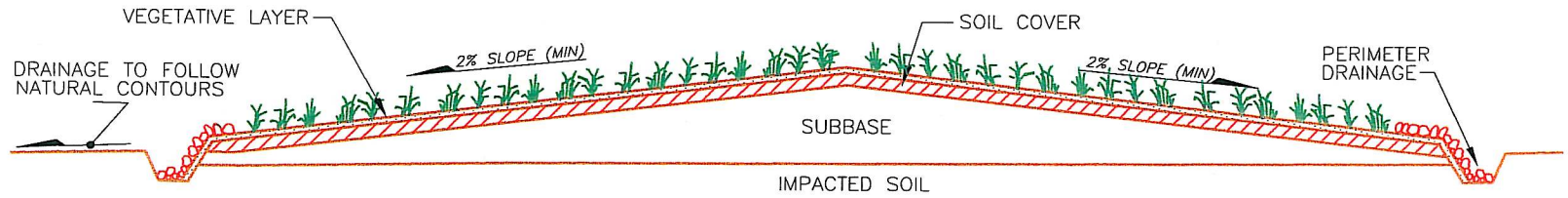
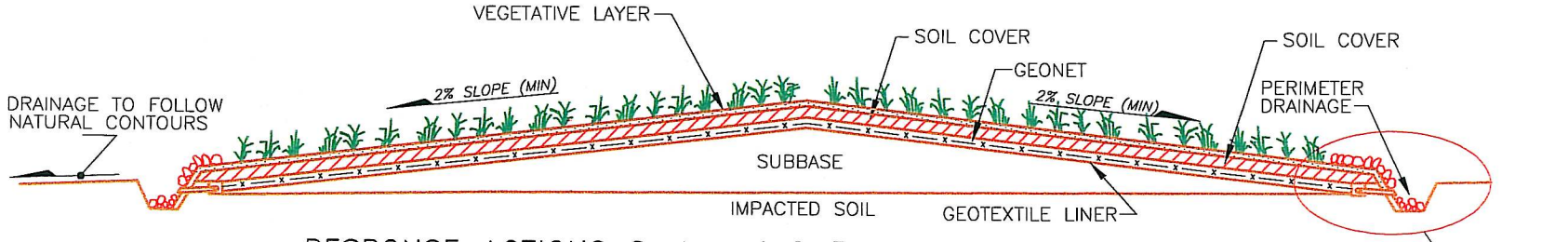


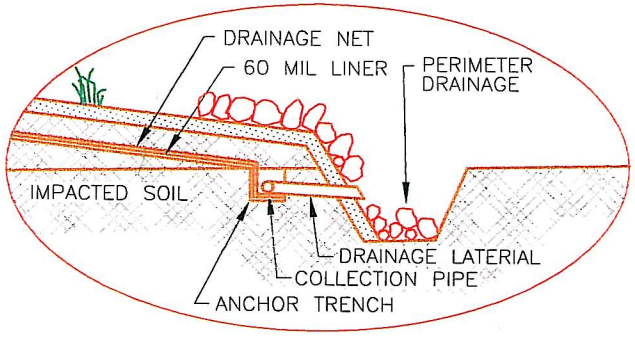
RESPONSE ACTIONS S-3 and S-6 – SOIL COVER

N. T. S.



RESPONSE ACTIONS S-4 and S-7 – MULTI LAYER RCRA C CAP

N. T. S.



DETAIL

NOTE:

THIS IS A CONCEPTUAL DESIGN. THE DETAILS PROVIDED ARE THE BASIS FOR COST ESTIMATE.

Picatinny Installation Restoration Program

FIGURE 6

SOIL RESPONSE ACTIONS S-3, S-4, S-6, AND S-7 TYPICAL CAP CROSS-SECTIONS

RECORD OF DECISION FOR SITES 61 AND 104 (PICA 102)
PICATINNY, DOVER, NEW JERSEY

Appendix A

Daily Record

AN OFFICIAL
AFFIDAVIT (PROOF) OF PUBLICATION
(Cut, stamped and sealed at and by the Daily Record)

STATE OF NEW JERSEY, } ss.

Morris County

ALLISON KEENAN,

Of full age, being fully sworn according to law, doth depose and say that she is employed in the Advertising Marketing Services Dept. of Morris County's **Daily Record** a newspaper printed and published in Parsippany and circulated in the County of Morris, in this State, and generally circulating in Warren, Sussex, Essex, Union, Passaic and Somerset Counties, in this State, and the notice, of which the annexed is a printed copy, has been published in said newspaper 1 time. Publication being made the 11th day of April, A.D. 2008.

Allison Keenan

Sworn to and subscribed before me

this 11th day of April, A.D. 2008.

Sharon Glover NOTARY PUBLIC

SHARON GLOVER
Notary Public of New Jersey
My Commission Expires Dec. 01, 2009

PUBLIC NOTICE

U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED PLAN FOR SITE 61 AND 104 (PICA 102), PICATINNY ARSENAL

The U.S. Army at Picatinny Arsenal (Picatinny) invites the public to comment on a Proposed Plan for addressing soil and sediment/surface water at Site 61 and 104 (PICA 102), located in the central portion of Picatinny Arsenal. The Proposed Plan is summarized below.

SITE 61 AND 104 (PICA 102) INFORMATION

Sites 61 and 104 (PICA 102) are located in Area F of Picatinny Arsenal. Both sites are bounded by Green Pond Brook (GPB) to the west. Robinson Run crosses through the southern portion of Site 61. Site 61 encompasses approximately three acres and includes Buildings 171 and 176. Currently, Buildings 171 and 176 are used as administrative buildings. Building 176 was originally used for laboratory equipment storage and ammunition sampling. Additionally, the basement of Building 171 has been used as a photographic laboratory. Located south of Site 61, with GPB to the West, Site 104 occupies an area of approximately 0.96 acres and includes Former Building 161 and Building 162. Former Building 161 was located off Buffington Road (near the golf course) and was demolished sometime after 1989. It was used for storing pesticides applied at the golf course. Building 162 is located on Kibler Road and used as administrative building. The primary operations that had been conducted at the building included propellant and ammunition analyses.
The Army conducted comprehensive environmental investigations at the Site. Various chemicals and metals have been detected at elevated levels in the surface soil, sub-surface soil and surface water; however unacceptable risk to human health and the environment was not identified. Response actions were developed for soil at Site 61 and 104 (PICA 102) and for sediment/surface water within GPB and Robinson Run. Groundwater is being addressed under a separate broader groundwater investigation.

SITE 61 AND 104 (PICA 102) Response Actions Evaluated

The Army, the US Environmental Protection Agency, and the New Jersey Department of Environmental Protection evaluated the following alternatives:

Soil:

Response Action 1: No Action.

Response Action 2: Implementation of land use and access restrictions, Institutional Controls (ICs), and maintenance of the existing Engineering Controls (ECs) (i.e. vegetative cover).

Response Action 3: Installation of a soil cover, revegetation, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 4: Capping with a multilayer soil cap, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 5: Excavation and off-Site disposal of all soil contaminated in excess of Site cleanup levels to a maximum depth of 4 feet below ground surface (bgs), backfilling with clean soil, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 5A: Excavation of Areas of Attainment AA104SS-1 and AA104SS-2, off-Site disposal, implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 6: Phytoremediation at Site 104, installation of a soil cover (Response Action 3) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 7: Phytoremediation at Site 104, installation of a multilayer soil cap (Response Action 4) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 8: Phytoremediation at Site 104, excavation and off-Site disposal of all soil contaminated in excess of Site cleanup levels to a maximum depth of 4 feet bgs (Response Action 5) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Sediments:

Response Action 1: No Action.

Response Action 2: Implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 3: Long-term chemical and biological monitoring, continued implementation of land-use and access restrictions, and ICs.

Response Action 4: Excavation and off-Site disposal of sediments contaminated in excess of Site cleanup levels to a depth of 1 foot bgs, continued implementation of land-use and access restrictions, and ICs.

SITE 61 AND 104 (PICA 102) Preferred Alternative

The Preferred Response Action for soils at Site 61 and 104 (PICA 102) is 5A. The Preferred Response Action for sediments at Site 61 and 104 (PICA 102) is 2. The preferred response actions represent the best balance of the evaluation criteria and protection of human health and environment. The preferred response actions may be modified or a new alternative may be developed based on public input. The final response action selected will be documented in a Record of Decision that summarizes the decision-making process. The Army will summarize and respond to comments received during the comment period as part of the Record of Decision.

PUBLIC MEETING

The Army invites the public to attend a meeting on **Thursday, April 17, 2008, 7 p.m.** , Hilton Garden Inn (near the Rockaway Townsquare Mall), 375 Mt. Hope Avenue, Rockaway, NJ 07866. The meeting location is wheelchair accessible.

WRITTEN COMMENTS

Copies of the Remedial Investigation and Feasibility Study are available for public review at the Environmental Affairs Directorate at Picatinny by contacting **Mr. Ted Gabel at (973) 724-6748** in advance. Starting April 17, 2008, a copy of the Proposed Plan is available for review at the Rockaway Township Library (61 Mount Hope Road) and Morris County Library (30 East Hanover Avenue, Whippany).The public may submit written comments during the 30-day comment period (April 17 to May 17, 2008). Comments must be postmarked by May 17 and sent to Mr. Ted Gabel, Environmental Affairs Office, U.S. Army Installation Management Agency, Northeast Regional Garrison Office, Building 319, Picatinny, NJ, 07806.

P.F.$180.48,1-T,4/11 0100688327

PUBLIC NOTICE

U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED PLAN FOR SITE 61 AND 104 (PICA 102), PICATINNY ARSENAL

The U.S. Army at Picatinny Arsenal (Picatinny) invites the public to comment on a Proposed Plan for addressing soil and sediment/surface water at Site 61 and 104 (PICA 102), located in the central portion of Picatinny Arsenal. The Proposed Plan is summarized below.

SITE 61 AND 104 (PICA 102) INFORMATION

Sites 61 and 104 (PICA 102) are located in Area F of Picatinny Arsenal. Both sites are bounded by Green Pond Brook (GPB) to the west. Robinson Run crosses through the southern portion of Site 61. Site 61 encompasses approximately three acres and includes Buildings 171 and 176. Currently, Buildings 171 and 176 are used as administrative buildings. Building 176 was originally used for laboratory equipment storage and ammunition sampling. Additionally, the basement of Building 171 has been used as a photographic laboratory. Located south of Site 61, with GPB to the West, Site 104 occupies an area of approximately 0.96 acres and includes Former Building 161 and Building 162. Former Building 161 was located off Buffington Road (near the golf course) and was demolished sometime after 1989. It was used for storing pesticides applied at the golf course. Building 162 is located on Kibler Road and used as administrative building. The primary operations that had been conducted at the building included propellant and ammunition analyses.

The Army conducted comprehensive environmental investigations at the Site. Various chemicals and metals have been detected at elevated levels in the surface soil, sub-surface soil and surface water; however unacceptable risk to human health and the environment was not identified. Response actions were developed for soil at Site 61 and 104 (PICA 102) and for sediment/surface water within GPB and Robinson Run. Groundwater is being addressed under a separate broader groundwater investigation.

SITE 61 AND 104 (PICA 102) Response Actions Evaluated

The Army, the US Environmental Protection Agency, and the New Jersey Department of Environmental Protection evaluated the following alternatives:

Soil:

Response Action 1: No Action.

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Response Action 3: Installation of a soil cover, revegetation, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 4: Capping with a multilayer soil cap, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 5: Excavation and off-Site disposal of all soil contaminated in excess of Site cleanup levels to a maximum depth of 4 feet below ground surface (bgs), backfilling with clean soil, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 5A: Excavation of Areas of Attainment $AA_{104SS-1}$ and $AA_{104SS-2}$, off-Site disposal, implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 6: Phytoremediation at Site 104, installation of a soil cover (Response Action 3) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 7: Phytoremediation at Site 104, installation of a multilayer soil cap (Response Action 4) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 8: Phytoremediation at Site 104, excavation and off-Site disposal of all soil contaminated in excess of Site cleanup levels to a maximum depth of 4 feet bgs (Response Action 5) at Site 61, long-term monitoring, continued implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Sediments:

Response Action 1: No Action.

Response Action 2: Implementation of land use and access restrictions, ICs, and maintenance of existing ECs.

Response Action 3: Long-term chemical and biological monitoring, continued implementation of land-use and access restrictions, and ICs.

Response Action 4: Excavation and off-Site disposal of sediments contaminated in excess of Site cleanup levels to a depth of 1 foot bgs, continued implementation of land-use and access restrictions, and ICs.

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STATE OF NEW JERSEY
COUNTY OF ESSEX } SS

Lauren Kincaid

Being duly sworn, according to law, on her oath sayeth that she is Clerk of the Star-Ledger, in said County of Essex, and that the notice, of which the attached is a copy, was published in said paper on the 12th day of April 08 and continued therein for _____ successively, at least once in each _____ for 1 day

Lauren Kincaid

Sworn to and subscribed before me this 15th day of April, 2008

Kathleen Sconzo
NOTARY PUBLIC of NEW JERSEY

KATHLEEN SCONZO
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES NOV. 13, 2012