FINAL

RECORD OF DECISION
FOR SOIL AND DRY SEDIMENT AT THE RVAAP-05 WINKLEPECK BURNING GROUNDS AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

PREPARED FOR

US Army Corps of Engineers®

LOUISVILLE DISTRICT
Contract No. W912QR-04-D-0019
Delivery Order No. 0008

August 2008

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Science Applications International Corporation, Inc.
151 Lafayette Drive
P.O. Box 2501
Oak Ridge, TN 37831

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U.S. Army Corps of Engineers, Louisville District
600 Martin Luther King, Jr. Place
P.O. Box 59
Louisville, KY 40202-0059

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None.

14. ABSTRACT

This Final Record of Decision presents the selected remedial alternative for soil and dry sediment at the Winklepeck Burning Grounds Area of Concern, Ravenna Army Ammunition Plant, Ravenna, Ohio.

15. SUBJECT TERMS

installation restoration program, RVAAP, remediation, RVAAP-05,

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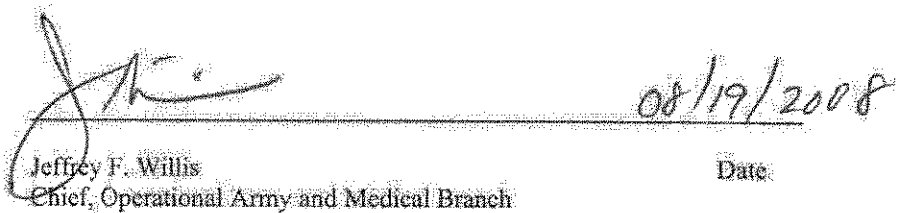
7.0 AUTHORIZING SIGNATURES AND ACCEPTANCE OF REMEDY

Declaration Statement
U. S. Army

Based on the evaluation of analytical data and other information, the U. S. Army has determined that the selected remedy is necessary to ensure protection of human health and the environment at WBG, RVAAP, Ravenna, Ohio. The selected remedy is in accordance with CERCLA and, to the extent practicable, the NCP. The selected remedy meets applicable or relevant and appropriate requirements (ARARs) established by federal and state and/or local environmental laws. The selected remedy is cost effective and uses permanent solutions to the extent practicable. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment) because it is not technically feasible or cost effective. In accordance with NCP Section 300.430 (f)(4)(ii), a review will be performed every 5 years after finalization of this ROD to ensure that this decision provides continued protection of human health and environment.



08/19/2008

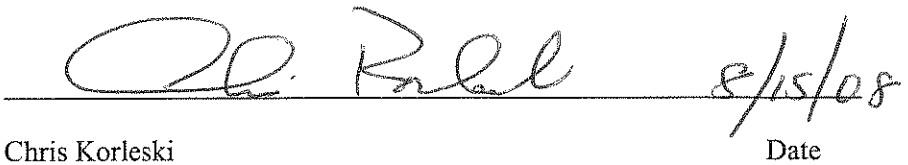
Jeffrey F. Willis
Chief, Operational Army and Medical Branch
Army Base Realignment and Closure Division

Date

8.0 SUPPORT AGENCY ACCEPTANCE OF REMEDY

Declaration Statement
Ohio EPA

Based on the evaluation of analytical data and other information, Ohio EPA has determined that the selected remedy is necessary to ensure protection of human health and the environment at WBG, RVAAP, Ravenna, Ohio. The selected remedy is in accordance with CERCLA and, to the extent practicable, the NCP. The selected remedy meets ARARs established by federal and state and/or local environmental laws. The selected remedy is cost effective and uses permanent solutions to the extent practicable. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment) because it is not technically feasible or cost effective. In accordance with NCP Section 300.430 (f)(4)(ii), a review will be performed every 5 years after finalization of this ROD to ensure that this decision provides continued protection of human health and environment.



Chris Korleski
Director
Ohio Environmental Protection Agency

Date

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ACSIM = Assistant Chief of Staff for Installation Management.
ASA (I&E) = Office of the Assistant Secretary of the Army, Installations and Environment.
BRACD = Base Realignment and Closure Division.
Ohio EPA-NEDO = Ohio Environmental Protection Agency – Northeast District Office.
Ohio EPA-SWDO = Ohio Environmental Protection Agency – Southwest District Office.
RTLS-ENV = Ravenna Training and Logistics Site Environmental Specialist.
RVAAP = Ravenna Army Ammunition Plant.
SAIC = Science Applications International Corporation.
USACE = U. S. Army Corps of Engineers – Louisville District.
USAEC = U. S. Army Environmental Center.
USALSA = U. S. Army Legal Services Agency.

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Final Record of Decision for Soil and Dry Sediment at the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedure, utilizing justified and valid assumption, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

Crystal Hann — 08/08/08

Crystal Hann
Study/Design Team Leader

Date

W. Kevin Jago — 08/08/08

Kevin Jago
Independent Technical Review Team Leader

Date

Significant concerns and the explanation of the resolution are as follows:

Internal SAIC independent technical review comments are recorded on a Document Review Record per SAIC quality assurance procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.

Amanda LaPack — 08/08/08

Principal w/ A-E firm

Date

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U. S. Army Corps of Engineers,
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Prepared by

Science Applications International Corporation
P.O. Box 2501
151 Lafayette Drive
Oak Ridge, TN 37831

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FIGURES

TABLES

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ACRONYMS

AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
ASA (I&E)	Office of the Assistant Secretary of the Army, Installations and Environment
BGS	below ground surface
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	chemical of concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CY	calendar year
DDESB	U. S. Department of Defense Explosive Safety Board
DNT	dinitrotoluene
EPA	U. S. Environmental Protection Agency
ERA	ecological risk assessment
ESS	Explosive Safety Submittal
FFS	focused feasibility study
HHRA	human health risk assessment
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
IRP	Installation Restoration Program
LUC	land use control
MCL	maximum contaminant level
MEC	munitions and explosives of concern
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGB	National Guard Bureau
OAC	Ohio Administrative Code
O&M	operations and maintenance
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppm	part per million
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO	remediation goal option
RI	remedial investigation
ROD	record of decision
RTLS	Ravenna Training and Logistics Site
RVAAP	Ravenna Army Ammunition Plant
SAP	sampling and analysis plan
SRC	site-related contaminant
SVOC	semivolatile organic compound

ACRONYMS (continued)

THI	target hazard index
TNT	trinitrotoluene
TR	target risk
VOC	volatile organic compound
WBG	Winklepeck Burning Grounds

PART I: THE DECLARATION

1.0 AREA OF CONCERN NAME AND LOCATION

This Record of Decision (ROD) addresses chemical contaminants in soil and dry sediment at the Winklepeck Burning Grounds (WBG), Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio (Figure 1). RVAAP is located in east-central Portage County and southwestern Trumbull County, Ohio, approximately 4.8 km (3 miles) east-northeast of Ravenna and approximately 1.6 km (1 mile) northwest of the town of Newton Falls. WBG is an area of concern (AOC) and is located in the central part of RVAAP. The Comprehensive Environmental Response, Compensation, and Liability Information System U. S. Environmental Protection Agency (EPA) identification number for RVAAP is OH5210020736.

2.0 STATEMENT OF BASIS AND PURPOSE

The U. S. Army is the lead agency under the Defense Environmental Restoration Program and has developed this ROD presenting the remedy for WBG as selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; EPA 1990). This decision is based on the administrative record for WBG.

The Ohio Environmental Protection Agency (Ohio EPA), the lead regulatory agency, approved the focused feasibility study (FFS) for WBG (USACE 2005a), which evaluated alternatives for soil and dry sediment at WBG and recommended a preferred remedy. Dry sediment refers to accumulated sediment in ditches and low-lying areas that are only occasionally inundated (e.g., during storm events). The term soil used throughout this ROD refers to soil and accumulated dry sediment. Ohio EPA concurs with the selected remedy. Selection and implementation of the final remedy will satisfy the requirements of the Ohio EPA Director's Final Findings and Orders, dated June 10, 2004.

3.0 ASSESSMENT OF THE AREA OF CONCERN

Actual releases of friable asbestos and chemical contaminants in soil and dry sediment at WBG, if not addressed by implementing the response action selected in this ROD, would pose unacceptable risks to the National Guard Range Maintenance Soldier involved in activities at the WBG Mark 19 Grenade Machinegun Range. The selected remedy is also necessary to protect public health or welfare and the environment. These risks will be mitigated by implementing the selected remedy presented in this ROD.

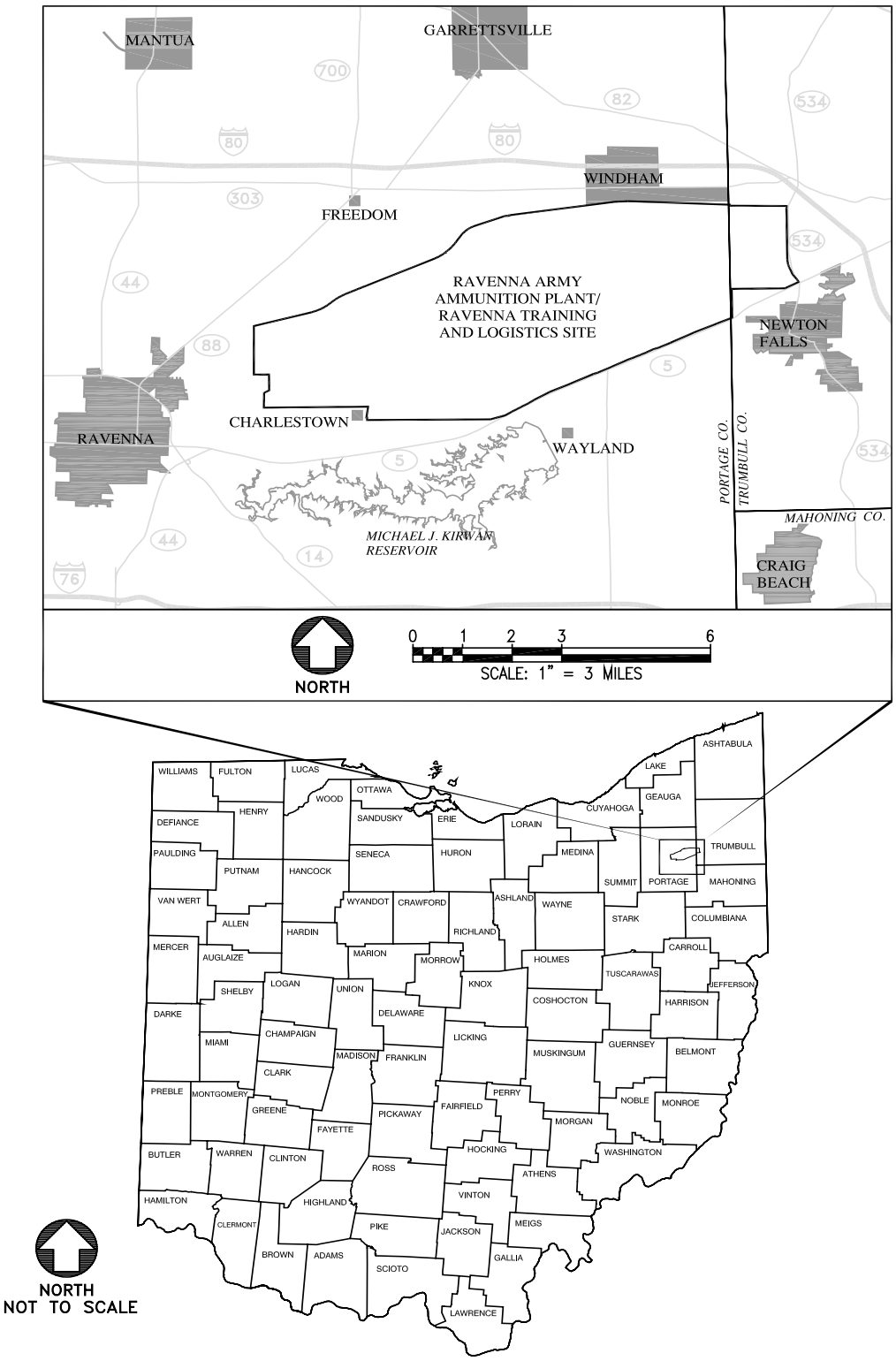

Figure 1. General Location of RVAAP

4.0 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for WBG addresses chemical contaminants in soil and dry sediment only. No perennial streams exist within the AOC and surface water flow within drainage ditches occurs only during storm events. Therefore, surface water is not an exposure media at WBG and all sediment within the AOC boundary is classified as dry (i.e., there are no wet sediments on the AOC). Therefore, neither wet sediment, surface water, nor groundwater is addressed in the scope of the selected remedy. Groundwater is being addressed under the site-wide groundwater AOC (RVAAP-66). Potential remedial actions for groundwater at WBG will be addressed under separate future decisions.

The selected remedy for chemically contaminated soil and dry sediment consists of excavation and disposal of contaminated soil identified at three locations at WBG: Pads 61/61A, Site WBG-217 located near Pads 61/61A, and Pad 67. In addition, soil containing friable asbestos will be excavated and disposed from a fourth location (Pad 70). Munitions and explosives of concern (MEC) exist at WBG; therefore, MEC survey and clearance procedures are incorporated into all excavation activities at WBG. Following excavation, residual contamination at depth will remain at WBG; therefore, land use controls (LUCs) will be implemented and enforced to deter unauthorized access and limit exposure. The selected alternative includes the following:

- clearing of vegetation,
- geophysical surveys and visual inspections for identifying metal debris,
- removal of transite and friable asbestos from the surface and subsurface within the footprint of Pad 70,
- excavation of contaminated soil by layers to a depth of 0.3 to 1.2 m (1 to 4 ft),
- screening (sifting) of the excavated soil for metal debris (potential MEC),
- confirmation sampling of the chemical characteristics of the remaining soil and for the absence of visible asbestos within the sides and bottom of the excavation,
- multi-increment sampling and testing of sifted soil to determine disposal requirements,
- disposal of contaminated soil (above remedial goals) at an approved off-site facility,
- backfill of the excavations using fill material from a source approved by the U. S. Army and Ohio EPA,
- site restoration,
- implementation of LUCs for the AOC, and
- conducting 5-year reviews of the performance of the selected remedy.

The capital cost of soil excavation, screening, sampling, and off-site disposal as non-hazardous waste is estimated at $1,528,994. The 30-year operations and maintenance (O&M) cost for implementing LUCs is estimated at $155,942. The net present value [in calendar year (CY) 2004 dollars] cost of the alternative is $1,592,397.

5.0 STATUTORY DETERMINATION

The selected remedy satisfies the statutory requirements of Section 121 of CERCLA and, to the extent possible, the NCP, in that the remedy is protective of human health and the environment for the intended land use, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions to the maximum extent practicable. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., treatment to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants) because it is not technically feasible or cost effective to treat the small volume of potentially contaminated soil compared to the selected remedy of excavation and disposal at an approved off-site facility.

Because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure, a statutory review of remedy performance will be conducted every 5 years to ensure that it remains protective of human health and the environment.

6.0 RECORD OF DECISION DATA CERTIFICATION CHECKLIST

The following information is included in Section II, Decision Summary, of this ROD:

- chemicals of concern (COCs) and their respective concentrations;
- baseline risk represented by the COCs;
- cleanup levels (remedial goals) established for COCs and the basis for these levels;
- identification that there are no source materials, other than transite and friable asbestos, constituting principal threats at WBG;
- current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD;
- land use designation at WBG (Mark 19 Grenade Machinegun Range for training);
- estimated capital, annual O&M, and total present worth costs; discount rate; and number of years over which the remedy cost estimates are projected; and
- decisive factors that led to the remedy selection.

Additional information can be found in the Administrative Record file for WBG.

7.0 AUTHORIZING SIGNATURES AND ACCEPTANCE OF REMEDY

Declaration Statement
U. S. Army

Based on the evaluation of analytical data and other information, the U. S. Army has determined that the selected remedy is necessary to ensure protection of human health and the environment at WBG, RVAAP, Ravenna, Ohio. The selected remedy is in accordance with CERCLA and, to the extent practicable, the NCP. The selected remedy meets applicable or relevant and appropriate requirements (ARARs) established by federal and state and/or local environmental laws. The selected remedy is cost effective and uses permanent solutions to the extent practicable. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment) because it is not technically feasible or cost effective. In accordance with NCP Section 300.430 (f)(4)(ii), a review will be performed every 5 years after finalization of this ROD to ensure that this decision provides continued protection of human health and environment.

_____

Jeffrey F. Willis — Date
Chief, Operational Army and Medical Branch
Army Base Realignment and Closure Division

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8.0 SUPPORT AGENCY ACCEPTANCE OF REMEDY

Declaration Statement
Ohio EPA

Based on the evaluation of analytical data and other information, Ohio EPA has determined that the selected remedy is necessary to ensure protection of human health and the environment at WBG, RVAAP, Ravenna, Ohio. The selected remedy is in accordance with CERCLA and, to the extent practicable, the NCP. The selected remedy meets ARARs established by federal and state and/or local environmental laws. The selected remedy is cost effective and uses permanent solutions to the extent practicable. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment) because it is not technically feasible or cost effective. In accordance with NCP Section 300.430 (f)(4)(ii), a review will be performed every 5 years after finalization of this ROD to ensure that this decision provides continued protection of human health and environment.

_____

Chris Korleski Date
Director
Ohio Environmental Protection Agency

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PART II: DECISION SUMMARY

1.0 AREA OF CONCERN NAME, LOCATION, AND DESCRIPTION

RVAAP is located in northeastern Ohio within east-central Portage County and southwestern Trumbull County, about 1.6 km (1 mile) northwest of the town of Newton Falls and 4.8 km (3 miles) east-northeast of the city of Ravenna (Figure 1). Until 1999, RVAAP was identified as a 21,419-acre installation. The Ohio Army National Guard (OHARNG) resurveyed the property boundary, finishing in 2003, and the actual total acreage was found to be 21,683.289 acres. As of February 2006, a total of 20,403 acres of the former 21,683-acre RVAAP have been transferred to the National Guard Bureau (NGB) for use as an OHARNG training site. Currently, RVAAP consists of 1,280 acres in several distinct parcels scattered throughout the confines of OHARNG's Ravenna Training and Logistics Site (RTLS). RVAAP's remaining parcels of land are located completely within the RTLS. RTLS did not exist when RVAAP was operational, and the entire 21,683-acre parcel was a government-owned, contractor-operated industrial facility. The RVAAP Installation Restoration Program (IRP) encompasses investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP. References to RVAAP in this document consider the historical extent of RVAAP, inclusive of the combined acreages of the current RTLS and RVAAP, unless otherwise specifically stated. The Comprehensive Environmental Response, Compensation, and Liability Information System EPA identification number for RVAAP is OH5210020736.

RVAAP was constructed in 1940 and 1941 for depot storage and ammunition assembly/loading; it was placed on standby status in 1950. Production activities were resumed between 1954 and 1957 and 1968 to 1972. Demilitarization activities, including disassembly of munitions and explosives melt-out and recovery, continued until 1992. The only U. S. Army activities still being carried out at RVAAP are environmental restoration, ordnance clearance and infrequent demolition of any unexploded ordnance, building decontamination and demolition, and training.

WBG (Figure 2) is located in the center of RVAAP and encompasses approximately 200 acres. Historical activities at WBG included destruction of explosives in munitions, bulk explosives, propellants, and explosives-contaminated combustible material using open burning. Approximately 180 acres of WBG was transferred to NGB for construction of a Mark 19 Grenade Machinegun Range, a target practice range for use in firing non-explosive practice rounds. In advance of site transfer and range construction, the U. S. Army Joint Munitions Command conducted MEC removal in August 2005. The MEC removal action was conducted under a U. S. Department of Defense Explosive Safety Board (DDESB) Explosive Safety Submittal (ESS) and associated project work plans. Construction of three of the four firing lanes is complete. The remaining acreage will be transferred once the remediation is complete and the final firing lane will be constructed. The range is managed by RTLS and subject to restricted entry and range operational requirements. Initially, the range will be used for target practice for the Mark 19 Grenade Machinegun. In the future, other weapons will be fired on the Mark 19 range and additional ranges may be developed within the WBG AOC. All range construction will require review and coordination with Ohio EPA and possible additional remediation sufficient to facilitate range construction, operations, and maintenance.

The U. S. Army is the lead agency for AOC remediation activities and is responsible for cleanup at WBG. The remediation activities at WBG are being conducted under the IRP. Ohio EPA is the lead regulatory agency.

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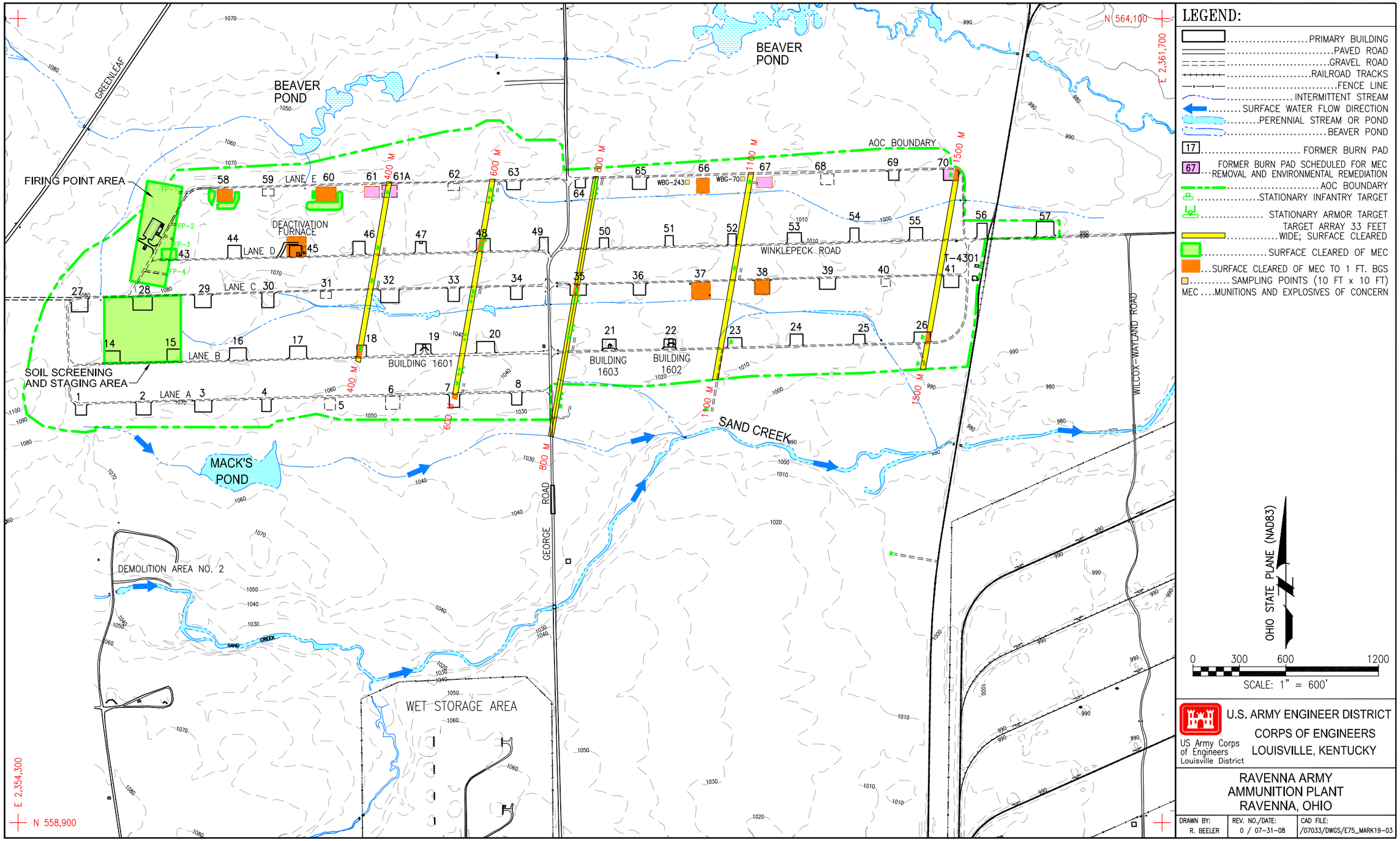

Figure 2. Map of Winklepeck Burning Grounds and Mark 19 Range

2.0 AREA OF CONCERN HISTORY AND ENFORCEMENT ACTIVITIES

WBG was identified as an AOC at RVAAP in the Preliminary Assessment (USACE 1996). WBG, designated as AOC RVAAP-05, encompasses approximately 80.9 ha (200 acres) in the central portion of RVAAP (Figure 1). A map for WBG is shown in Figure 2. Historical operations at WBG included destruction of explosives from various types of munitions by open burning. In some instances, black powder and explosives were laid out along roads and burned. Burning is also known to have occurred along Lane D. Prior to 1980, materials destroyed by burning included bulk explosives and explosives-contaminated burnable wastes, propellants, black powder, sludge and sawdust from load lines, and domestic wastes. Also, small amounts of laboratory chemicals were burned during production periods. Metallic munitions fragments were allowed to remain on the site after burning, as were possible residual explosives. Waste oil (hydraulic oils from machines and lubrication oils from vehicles) was burned in the northeast corner of WBG until 1973.

Prior to 1980, burning was carried out in four earthen-bermed burn pits, on gravel-covered or bare soil burn pads, and sometimes on the roads. The burn pits consisted of areas bermed on three sides, approximately 15.2 to 22.9 m (50 to 75 ft) in width and length. The four burn pits are believed to correspond to Pads 58, 59, 60, and 61 (USACE 2001a). The burn pads generally consisted of level areas without berms 6 to 12.2 m (20 to 40 ft) in width and length. Although the exact number is not known, 70 burn pads have been identified from historical drawings and aerial photographs, and others may have existed. Burning was conducted on bare ground. Ash from these areas was not collected (Jacobs Engineering 1989). Unsalvageable scrap metal was taken to the landfill north of WBG (RVAAP-19); salvageable metal was taken to a scrap salvage yard and sold as marketable scrap metal.

After 1980, open burning was conducted in metal, refractory-lined trays within a 1-acre Resource Conservation and Recovery Act (RCRA)-permitted area at Pad 37. Ash residues were drummed and stored in Building 1601, also a RCRA-permitted facility, on the west side of WBG pending proper disposition. The burn trays were decontaminated and removed from Pad 37 in 1998 and closed under RCRA. Building 1601, a storage building, was also closed under RCRA. Soil and groundwater at a former deactivation furnace located at Pad 45 were transferred to CERCLA under the Ohio EPA Director's Final Findings and Orders (Figure 2).

WBG was the subject of a Phase I Remedial Investigation (RI; USACE 1998), a Phase II RI (USACE 2001a), an Ecological Field Effects Study (USACE 2003a), and a Phase III RI (USACE 2004). The purpose of the investigations was to confirm whether contamination was present at the AOC, to determine the nature and extent of chemicals of potential concern (COPCs), and to evaluate chemical risks and hazards to human and ecological receptors.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The U. S. Army conducted community relations activities throughout the RI and FFS for WBG to provide interested citizens and officials with information about the progress of activities. The status of investigations, including anticipated future land use, was communicated to the public through Restoration Advisory Board meetings, which are generally held every 2 months. Draft and final documents, including work plans, were submitted to the Administrative Record and two information repository locations. The Administrative Record is located at RVAAP, Building 1037, Conference Room 8451, St. Route 5, Ravenna, Ohio, 44266. The two information repositories are Reed Memorial Library, 167 East Main

Street, Ravenna Ohio, 44266, and Newton Falls Public Library, 204 South Canal Street, Newton Falls, Ohio, 44444.

A notice of availability for the Proposed Plan was sent to all media outlets (newspapers, radio stations, and television stations) in accordance with the RVAAP Community Relations Plan (USACE 2003b) on December 9, 2005. The notice of availability initiated the 30-day public comment period ending on January 8, 2006. A public meeting was held on December 20, 2005, at the Newton Falls Community Center, Ohio, at 5:00 p.m. to present the Proposed Plan to the community. The U. S. Army and Ohio EPA addressed questions from the public. Oral comments and questions were addressed at the public meeting. No additional comments were received during the public comment period. The Responsiveness Summary, which is Part III of this ROD, contains U. S. Army responses to questions and comments received at the public meeting.

4.0 SCOPE AND ROLE OF RESPONSE ACTION WITHIN AREA OF CONCERN STRATEGY

The U. S. Army transferred approximately 180 acres of WBG to NGB for the construction of a Mark 19 Grenade Machinegun Range following the removal of MEC from designated areas and remediation of contaminated soil and dry sediment from the target array construction areas and firing points. MEC and some associated contaminated soil were removed under an approved DDESB ESS and associated project work plans (MKM 2004a, 2004b, 2005a, 2005b). Final grading, seeding, mulching, and road repair were completed in August 2005. These actions were completed under an accelerated schedule to meet the military mission requirements. The following is a summary of the MEC removal action completed in August 2005.

Initial plans and design for range construction revealed that MEC was present in some areas needed for the project. To protect range construction and maintenance workers, soil contaminated with MEC and chemical contaminants needed removal. The target cleanup goals for chemical contaminants were developed in the FFS. During MEC removal actions, some soil containing some chemical contamination and transite was removed and disposed of off-site as asbestos-containing material consistent with the recommended CERCLA alternative described in the FFS and the preferred alternative presented in the Proposed Plan (USACE 2005a).

At the conclusion of MEC removal actions, confirmation sampling indicated that additional soil contamination above cleanup goals, relative to estimated volumes in the FFS, remained on-site. Portions of the soil at Pads 61/61A and 67 within the line of sight for firing lane 1 are contaminated with hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) or semivolatile organics above levels that are considered safe for range construction workers and range maintenance personnel. In addition, transite and friable asbestos was observed at Pad 70. If the asbestos becomes airborne, it could pose a hazard to the health and safety of the range personnel.

After the initial removal action, OHARNG constructed a Mark 19 Grenade Machinegun Range. Three of the four firing lanes have been constructed. Once the cleanup is complete, the remaining acreage will be transferred and the final lane of the range will be constructed.

The selected remedy addresses the remaining soil at WBG that contains contamination above risk-based cleanup goals based on the current use as a Mark 19 Grenade Machinegun Range. The selected remedy is consistent with past MEC and soil removal, and focuses on additional soil removal to protect future range maintenance personnel. The remedial action objective (RAO) is to prevent exposure of the National

Guard Range Maintenance Soldier to contaminants in soil exceeding risk-based cleanup levels extending to a maximum depth of 4 ft below ground surface (BGS).

5.0 SUMMARY OF AREA OF CONCERN CHARACTERISTICS

The site characteristics, nature and extent of contamination, and conceptual site model are based on RIs conducted from 1998 through 2003.

5.1 TOPOGRAPHY/PHYSIOLOGY

The topography at WBG is gently undulating with a general elevation decrease from west to east. Elevations at WBG vary from 341.2 to 312.3 m (1,084.9 to 993.2 ft) above mean sea level. Gravel or dirt roads running east to west are tied together with connecting roads at the eastern and western ends of the site. George Road roughly bisects the site. Burn pads (total of 70) are located on one side of each of the east/west trending lanes (Figure 2). The burn pads range in appearance from distinct areas of soil and slag that are partially vegetated to non-descript (no visible slag and heavily vegetated). WBG is bounded on its eastern end by a railroad spur. Four of the burn pads (Pads 58, 59, 60, and 61) are surrounded on three sides by earthen berms and have previously been referred to as burn pits. Several concrete bunkers (Buildings 1601, 1602, and 1603) located on Lane B remain at WBG.

Surface water drainage during storm events generally flows from west to east to southeast across WBG (Figure 2). No perennial streams exist within WBG. Storm run-off ditches ultimately flow into Sand Creek, a major drainage feature at RVAAP. Sand Creek joins Eagle Creek near the RVAAP boundary in the northeast quadrant. Eagle Creek traverses north and east (north of RVAAP) where it then empties into the mainstream of the Mahoning River near Leavittsburg, Ohio, approximately 5.5 miles northeast of RVAAP's northeast corner. The extreme northwest corner of WBG (Pads 58 through 61) drains northeastward off of the AOC.

5.2 GEOLOGY

WBG is overlain by low-permeability soil and glacial sediment except where the natural materials have been either eroded, removed, reworked, or covered during RVAAP operations. The glacial material varies in thickness and character across the AOC and is presumed to be tens of feet thick. The dominant soil at WBG is silts or clay loams. Permeabilities of unconsolidated material range from 4.2×10^{-4} to 1.4×10^{-7} cm/sec. The glacial material lies over bedrock consisting of an upper hard fissile shale unit and a lower, highly porous and permeable, cross-bedded and, in some locations, highly fractured and weathered sandstone unit. The shale unit has been eroded and is absent in many locations. Bedrock has been encountered from 5.5 to 13 m (18 to 43 ft) BGS.

5.3 AREA OF CONCERN HYDROGEOLOGY

Groundwater at WBG occurs under unconfined conditions in discontinuous, generally thin, sandy interbeds within heterogeneous unconsolidated glacial till deposits. The general groundwater flow pattern at WBG mimics the site topography and surface water drainage patterns, which indicate an overall flow direction to the east across the site. Localized variants in the overall flow patterns and preferred migration

pathways (i.e., gravel or sand stringers) likely exist at the site. Slug tests conducted on unconsolidated zone wells show hydraulic conductivities range from 2.12×10^{-2} to 4.46×10^{-6} cm/sec.

5.4 ECOLOGY

The dominant cover types at RVAAP are forests, forest patches, and old fields of various ages. Much of the land at RVAAP was cleared for agriculture before government acquisition of the property in the 1940s. WBG is primarily old farm fields with forest remnants. While under cultivation, the land was tilled and grazed, with little regard for management of soil or erosion, leaving the topsoil in a depleted condition. After the U. S. Army developed WBG, the fields were mowed regularly to reduce the growth of woody brush and the fire hazard associated with the explosives burning operations. Once mowing was discontinued, species such as black locust, aspen, and red maple pioneered the site. These species are the current dominant woody vegetation, with some cottonwood and black willow occurring along drainage areas.

WBG harbors a wide variety of birds, mammals, reptiles, amphibians, and even a few aquatic organisms. Some of the burn pad areas have abundant meadow voles. Tunnels of these small mammals occur throughout the area, and numerous individuals were observed during the collection of surface soil samples. Soil of some pad areas also contains abundant earthworms. Cottontail rabbits were observed on numerous occasions along the field/forest edges of WBG. Red fox and coyote scat were observed on a few occasions. Numerous songbirds also occupied these areas, as well as reptiles and amphibians. Red-tailed hawks were observed daily roosting on tree limbs in the edge habitats and appear to be the top predator.

Small aquatic habitats consist mainly of small, intermittently flowing streams with moist edges draining the burn pad areas. Willow is the predominant flora of the headwater areas, while cattails, rushes, grasses, and sycamore are also found.

No federally listed species have been identified at RVAAP.

5.5 NATURE AND EXTENT OF CONTAMINATION

The site characteristics, nature and extent of contamination, and conceptual model are based on RIs conducted from 1998 through 2003. Groundwater and surface water/sediment sampling and analysis were conducted as part of the various RIs; however, these media will be addressed in separate decisions. The nature and extent of contamination focused on surface and subsurface soil.

5.5.1 Surface Soil Contamination

During the Phase I, II, and III RIs (USACE 1998, USACE 2001a, USACE 2004), 273 surface soil samples encompassing all 70 pads were collected and analyzed for explosives, metals, propellants, and other organics. The Phase III RI surface soil sampling strategy was biased toward areas known or suspected to have the greatest soil contamination based on data from the Phase I and II RIs. Areas thought to be uncontaminated outside of former burn pads were characterized using random-grid sampling.

Trinitrotoluene (TNT) is the most commonly detected explosive at WBG, along with degradation products such as 2,4-dinitrotoluene (DNT); 2,6-DNT; 2-amino-4,6-DNT; and 4-amino-2,6-DNT. RDX was detected in 13 of 117 samples sent for fixed-base laboratory analyses and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) was detected in 17 of 117 samples. Overall, ten explosives and the propellant nitroguanidine were identified as site-related contaminants (SRCs). In the random-grid samples, explosives were either not detected or were detected at low concentrations [less than one part per

million (ppm)]. Burn pads documented to contain explosives at concentrations greater than 1 ppm include Pads 5, 6, 37, 38, 59, 60, 62, 66, 67, and 68.

Twenty metals were identified as SRCs for surface soil because they either exceeded background criteria in at least 5% of all samples or did not have background data to compare against. Eleven of the 20 metals were detected in every sample analyzed, but exceed background in only a few samples. The random-grid sampling showed frequently detected low levels (maximum concentration generally less than twice the background value) of inorganic contaminants in surface soil across the site. Lead, cadmium, chromium, barium, zinc, and antimony had the highest concentrations relative to background values.

Organic compounds other than explosives include primarily polycyclic aromatic hydrocarbons (PAHs), which were detected and identified as SRCs at seven pads. Pesticides, such as dieldrin and pesticide heptachlor epoxide, were detected at several pads. Polychlorinated biphenyls (PCBs) and volatile organic compounds (VOCs) were noted on a sporadic basis. Concentrations of organics were mostly estimated values at or below the method reporting limit.

5.5.2 Subsurface Soil Contamination

Ninety-five subsurface soil samples were collected during the Phase II and Phase III RIs (USACE 1999, USACE 2004) at 14 different pads. Subsurface sampling was biased toward areas that were known or suspected to have the greatest surface soil contamination. The subsurface soil samples were analyzed for field explosives and propellants, metals, and organics. A minimum of one 2- to 4-ft depth sample was collected for determination of the vertical extent of contamination. Based on these results, further sampling was conducted to depths up to 10 ft.

All subsurface soil samples were field analyzed for TNT and RDX, and samples with greater than or equal to 1 ppm TNT or RDX were submitted to the fixed-base laboratory for confirmation sampling. TNT was the most commonly detected explosive compound. Also found were RDX; 2,4-DNT; 1,3,5-trinitrobenzene; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and HMX. Overall, 11 different explosives were detected at least once at concentrations ranging from 0.05 to 5,200 mg/kg. Pads 58, 59, 61, 66, and 67 exhibited the greatest number and concentration of explosive compounds. Some explosives were present in the 6- to 8-ft depth interval at Pad 38, but most contaminants were identified in the 2- to 4-ft depth interval.

Fifteen metals and cyanide were determined to be SRCs for subsurface soil. Results indicate that the metal contamination extends beyond the pad boundary in subsurface soil at eight pads. Eight of the inorganic SRCs were detected in every sample but exceeded background criteria very infrequently. Most contamination decreased with depth, but in some cases, particularly in samples collected from areas surrounding the pads, concentrations were higher in deeper intervals than shallow subsurface intervals. This was noted at Pads 45, 58, and 67. For example, at Pad 45, the maximum concentration of hexavalent chromium occurred in the 4- to 6-ft depth interval, while the 2- to 4-ft depth interval did not contain any SRCs above background. At Pad 58, concentrations, in general, were higher in the 2- to 4-ft and 6- to 8-ft depth intervals than in the 4- to 6-ft depth interval, although the number of SRCs decreases with depth. At Pad 67, antimony, barium, and lead were detected above background in all four depth intervals analyzed. Copper, cadmium, and zinc also occurred above background. The 4- to 6-ft depth interval contains the highest concentrations of most of these metals except lead, which was highest in the 6- to 8-ft depth interval.

Four samples, collected at Pads 58, 59, 61, and 68 from the 2- to 4-ft or 4- to 6-ft depth interval, were submitted for organics analysis other than explosives [e.g., semivolatile organic compounds (SVOCs), VOCs, PCBs, pesticides]. Occurrences of organic compounds were sporadic, and concentrations were

generally estimated concentrations less than 0.01 mg/kg. A total of 26 organic compounds were detected and determined to be SRCs. Two pesticides, heptachlor epoxide and endrin ketone, were detected once, as were the VOCs dimethylbenzene, ethylbenzene, toluene, trichloroethylene, acetone, and methylene chloride. PAH compounds were detected in between one to three samples each with the highest concentrations and frequency of detection at Pad 61. All detections of VOCs came from the 2- to 4-ft depth interval, while the SVOCs (PAHs) were found in the 2- to 4-ft and 4- to 6-ft depth intervals.

5.5.3 Conceptual Site Model

The conceptual site model (USACE 2005a) for WBG identifies the primary contaminants as PAHs, metals, and explosives in soil at six source areas: Pads 58, 59, 60, 61/61A, 66, and 67. PAHs were determined to be above risk-based cleanup goals (see Chapter 7) at one location (Pads 61/61A) to a depth of 4 ft BGS. Soil contamination by explosives is present to the maximum depths sampled (6 to 10 ft) at Pads 58, 59, 61, and 67. One explosive, RDX, exceeded its remedial goal option (RGO) at Pads 66 and 67. Metals SRCs substantially above background also were observed at Pads 37, 38, 45, 62, and 68.

Surface Water Pathways. Migration of contaminants from soil sources via surface water occurs primarily by (1) movement of particle-bound contaminants (e.g., clays or colloids) in surface water run-off and (2) transport of dissolved constituents in surface water. Surface run-off is directed to drainage ditches and tributaries to Sand Creek, as well as to a ditch that drains the northwest portion of WBG and exits the AOC between Pads 58 through 61 to a surface drainage conveyance north of WBG. Sediment-bound contaminants may be remobilized during storm events or partition to surface water and be transported in dissolved phase.

Modeling of surface water transport pathways in the Phase II RI (USACE 1999) indicated that erosional transport mechanisms are not expected to contribute substantial flux of contaminants to Sand Creek. Biased sampling of sediment in the ditch flowing north out of WBG indicates that the drainage is not an exit point for contaminants.

Leaching and Groundwater Pathways. Explosives and metals may be expected to leach from the contaminated surface soil into the groundwater and reach concentrations exceeding groundwater maximum contaminant levels (MCLs) or risk-based concentrations (RBCs). The presence of explosives and metals in groundwater near source areas suggests that leaching processes are ongoing near the source areas. PAHs were not modeled for contaminant transport for soil to groundwater because they were determined not to have the potential to leach to groundwater. Timeframes for leaching of the explosive compounds are relatively short (2 to 12 years), indicating that peak concentrations in groundwater beneath the source areas may have already passed considering that no open burning on bare ground has occurred since 1980. Timeframes to attain predicted peak concentrations for metals are much longer (approximately 300 to 1,000 years).

Shallow groundwater flow follows stream drainage and topographic patterns with flow east-southeast across the AOC. WBG occupies an upland area that acts as a recharge area to shallow groundwater. Modeling of contaminant transport in shallow groundwater showed that no metals were predicted to reach any receptor points at concentrations greater than MCLs or RBCs within the modeling period. RDX may be expected to reach certain receptor locations (e.g., Sand Creek), depending on the source area modeled, at concentrations exceeding its RBC. However, as with the leaching results, the predicted timeframes to attain peak concentrations (6 to 11 years) suggest that most migration has already occurred.

Conceptual Site Model for Contaminated Soil. Under the present and future land use, WBG will be managed and used as a range training area, as detailed in the LUC remedial design (RD) language. Under this land use, the Range Maintenance Soldier receptor has the highest potential for exposure to

contaminants. The Range Maintenance Soldier will be exposed to deep surface soil, defined as 0 to 4 ft BGS, through the following potential pathways: incidental soil ingestion, dermal contact with soil, and inhalation of VOCs and dust.

6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCES USE

As of February 2006, approximately 20,403 acres of a total 21,683 acres of land at RVAAP have been transferred from the U. S. Army to NGB and subsequently licensed to OHARNG for use as a military training site. OHARNG uses the property for training and related activities, including field operations and bivouac training, convoy training, equipment maintenance, and storage of heavy equipment. Approximately 1,280 acres of property remain under the control of RVAAP; this acreage includes AOCs and active mission areas. As AOCs are remediated, transfer of the remaining acreage to NGB will occur. Future uses of the land include mounted and dismounted maneuver training areas and development of ranges, as well as the construction of additional field support and cantonment facilities to support future training.

The Mark 19 Grenade Machinegun Range at WBG supports the RTLS mission. The Mark 19 target practice grenade is fired on this range. The Mark 19 target practice grenade is not a high-explosive round and carries a small bursting charge to allow a visual determination of the impact point. The range has four fixed firing points, located to the west of Pads 43 and 58 (Figure 2) oriented to fire eastward. The Mark 19 fires 40-mm target practice grenades into a series of five target array bands located 400; 600; 800; 1,100; and 1,500 m east of the firing points. The firing point area is situated at the west end of the range and encompasses an area 200 m long by 70 m wide. The target array bands are 10 m wide. The limit of the range or dispersion area is 2,095 m (6,874 ft). Targets are a combination of computerized pop-up silhouette-type targets and hard targets. Hard targets are fixed, inoperable, obsolete armored vehicles and tanks. The engines, as well as all petroleum products and lubricants, have been removed from these vehicles. The computerized pop-up targets are remotely operated and display a specific silhouette for a programmed time for target acquisition and engagement.

Best management practices (BMPs) that have been determined to be protective of human health and environment are employed to ensure that range activities minimize impacts to environmental media (e.g., soil and sediment).

7.0 SUMMARY OF AREA OF CONCERN RISKS

As mentioned previously, groundwater human health risks will be addressed under a separate AOC (RVAAP-66). Human health risks only for the purposes of soil remediation at WBG were evaluated using a baseline risk assessment. Potential risks to ecological receptors were evaluated using a screening-level risk assessment. Potential site risks were identified for the Range Maintenance Soldier, which require corrective actions to be taken to protect public health or welfare from actual and threatened releases of hazardous substances, pollutants, or contaminants.

7.1 HUMAN HEALTH RISK ASSESSMENT

This baseline human health risk assessment (HHRA) summary documents the potential health risks to humans resulting from exposure to soil contamination within WBG if no remedial action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for WBG presented in the FFS (USACE 2005a).

The HHRA followed a four-step process: (1) identification of COPCs; (2) exposure assessment, including identification of receptors and exposure pathways; (3) toxicity assessment, including identification of toxicity values for COPCs; and (4) risk characterization, including quantification of risks and hazards and identification of COCs.

7.1.1 Identification of Chemicals of Potential Concern

The purpose of the COPC screening process is to (1) evaluate data quality and (2) identify chemicals for which risk evaluation is needed. One exposure medium, deep surface soil (0 to 4 ft BGS), is evaluated in this HHRA. Table 1 summarizes the surface soil COPCs at WBG. For a complete discussion of the data evaluation and selection of COPCs, see Section 2.1.1 of the FFS (USACE 2005a).

Table 1. Risk Characterization Results for Surface Soil COPCs at Winklepeck Burning Grounds

COPC	Frequency of Detection	Detected Concentration (mg/kg)		EPC (mg/kg)	Total ILCR[a]	Total HI[a]
		Min	Max			
Arsenic	320/320	3.1E-01	3.8E+01	1.3E+01	1.3E-06	8.2E-03
Benz(*a*)anthracene	13/59	4.3E-02	5.7E+02	2.6E+01	3.5E-06	NA
Benzo(*a*)pyrene	13/59	4.0E-02	5.1E+02	2.4E+01	3.1E-05	NA
Benzo(*b*)fluoranthene	14/59	5.4E-02	6.2E+02	2.9E+01	3.8E-06	NA
Dibenz(*a,h*)anthracene	8/59	5.4E-02	5.9E+01	3.1E+00	4.1E-06	NA
Indeno(1,2,3-*cd*)pyrene	10/59	1.3E-01	3.2E+02	1.5E+01	2.0E-06	NA
RDX	34/176	1.4E-01	9.5E+03	1.9E+02	3.1E-06	2.6E-02
Total—all COPCs					5.0E-05	1.7E-01

[a] Total ILCR and total HI for exposure to surface soil via incidental ingestion, dermal contact, and inhalation of particulates (dust) and vapors.
COC = Chemical of concern.
COPC = Chemical of potential concern.
EPC = Exposure point concentration.
HI = Hazard index.
ILCR = Incremental lifetime cancer risk.
NA = Not applicable for this toxic endpoint or toxicity data not available.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

7.1.2 Risk Characterization Summary

Results of the surface soil risk characterization are presented in Table 1. Table 1 includes the calculated incremental lifetime cancer risk (ILCR) and/or hazard index (HI) for each COPC identified in soil 0 to 4 ft BGS, as well as the cumulative ILCR and HI for all COPCs in surface soil. COCs are defined as those COPCs that have an ILCR greater than 1E-06 and/or an HI greater than 1. The risk characterization includes uncertainty regarding sampling and analysis results, exposure assumptions, and availability and quality of toxicity data. Whenever possible, data and assumptions used in the risk assessment are selected

so that errors occur on the side of conservatism and that risks are more likely to be overestimated than underestimated. A summary of the HHRA results follows.

- The total HI for all COPCs is 0.2 (i.e., < 1); thus, there were no non-carcinogenic COCs.

- The total ILCR from exposure to contaminated soil 0 to 4 ft BGS is 5E-05. Seven chemicals with ILCR >1E-06 were identified as potential soil COCs: arsenic; RDX; benz(*a*)anthracene; benzo(*a*)pyrene; benzo(*b*)fluoranthene; dibenz(*a,h*)anthracene; and indeno(1,2,3-*cd*)pyrene (Table 1).

Although arsenic was identified as a potential soil COC at WBG, it is also naturally present in soil in the RVAAP area. The estimated risk from exposure of the Range Maintenance Soldier receptor to the background concentration of arsenic (15.4 mg/kg) is 1.5E-06. Risk to this receptor from arsenic at WBG (1.3E-06) is below the risk associated with the background concentration of this metal. Therefore, arsenic was not retained as a COC for soil and dry sediment at WBG.

A supplemental HHRA was performed in May 2006 (USACE 2006) to evaluate if new COCs or cleanup goals would be required if the Range Maintenance Soldier were to be present on the Mark 19 Grenade Machinegun Range for a greater number of days or longer period of time each day than was assumed in the FFS HHRA. A summary of the supplemental HHRA is as follows:

- The total HI for all COPCs in soil 0 to 4 ft BGS was 0.64 (i.e., <1); thus, there were no non-carcinogenic COCs.

- The total ILCR from exposure to soil 0 to 4 ft BGS is 2.3E-05. Five COCs were identified for the Revised National Guard Range Maintenance Soldier including arsenic; RDX; 2,4,6-TNT; benzo(*a*)pyrene; and dibenz(*a,h*)anthracene. Therefore, no new chemicals were identified as COCs in the revised risk assessment.

Again, the primary contributor to the total ILCR of 2.3E-05 was arsenic with an individual ILCR of 7.4E-06. This risk was less than the estimated risk from exposure of the Revised Range Maintenance Soldier to the background criterion for arsenic (8.5E-06). Therefore, arsenic was not retained as a COC for soil and dry sediment for the Revised Range Maintenance Soldier at WBG.

7.2 ECOLOGICAL RISK ASSESSMENT SUMMARY

The ecological risk assessment (ERA) presented in Section 2.2 of the FFS (SAIC 2005a) estimates potential risk to various ecological receptors living or foraging at the AOC. Just as in the HHRA (Section 7.1), there are four steps in this process: (1) identification of COCs and problem formulation, (2) exposure assessment, (3) ecological effects assessment, and (4) ecological risk characterization. Each step and the results are summarized below.

7.2.1 Identification of Chemicals of Concern and Problem Formulation

The scope of the ERA is to determine risk associated with surface soil. There were more than 20 inorganics and 10 organics identified as chemicals of potential ecological concern (COPECs), including chromium; lead; 2,6-DNT; and RDX. For a more complete presentation of the identification of COPECs, see the RI (USACE 2001a) and Section 2.2.1 of the FFS (USACE 2005). The ecological COCs and the ecological risk characterization are summarized in Section 7.2.4.

7.2.2 Mitigation and Ecological Risk Characterization Summary

The existing and small amount of risk specific to plants and animals at WBG will not be reduced through ecologically driven remedial actions per se. Mitigation of relatively small current risks to ecological resources will be achieved through remediation and any concurrent MEC removal to protect the Range Maintenance Soldier. Removal of soil will consequently reduce exposure and ecological risk to any remaining organisms on the Mark 19 Range. Habitat alteration associated with the remedial action for the protection of human health is expected to impact an area of approximately 2,270 m^2 (24,500 ft^2). This area (i.e., less than 1 acre) of potential remedial action is small compared to the total area of WBG (200 acres) and to the total RVAAP area (21,683 acres). The contemplated alterations to these small areas would be of very small consequence to ecological function and sustainability.

In summary, ecological risk exists from chemicals in the soil at WBG. There are both metal (e.g., chromium and zinc) and explosive (e.g., 2,6-DNT and RDX) ecological COCs, but risks are small as defined by hazard quotients (HQs) and field biological measurements. Any remedial action for protection of human health will alter habitat consisting of typical old fields and typical forest patches, but the potential area of involved habitat is insignificant compared to the total area of WBG and RVAAP. Soil removal to attain human health cleanup goals will remove contaminant mass and, therefore, reduce already low ecological risks.

8.0 REMEDIAL ACTION OBJECTIVES

The RAOs for contaminated soil at WBG include the following.

Human Health RAOs. The human health RAO is to prevent exposure of the National Guard Range Maintenance Soldier to contaminants in soil exceeding risk-based cleanup goals extending to a maximum depth of 4 ft BGS. The numeric criteria developed to meet this RAO are risk-based cleanup goals. Risk-based cleanup goals (referred to as RGOs in the FFS) were calculated for the Range Maintenance Soldier using the methodology presented in Risk Assessment Guidance for Superfund Part B (EPA 1991) and incorporating site-specific exposure parameters applicable to WBG. A National Guard Trainee would be present at the Mark 19 Grenade Machinegun Range for only a fraction of the annual training time at RVAAP and much less time than the Range Maintenance Soldier. Therefore, the Range Maintenance Soldier scenario is protective of the National Guard Trainee.

The Ohio EPA Division of Emergency and Remedial Response identifies 1E-05 as the official cumulative target risk (TR) goal for development of cleanup goals and an HI <1 as the cumulative target hazard index (THI; Ohio EPA 2004). Exposure to multiple COCs (e.g., more than ten with similar target organs and/or toxic endpoints) may require downward (more stringent) adjustment of these targets. A chemical-specific TR of 1E-05 and THI of 1.0 were identified as appropriate for calculating risk-based cleanup goals for WBG based on the small number of COCs and the variation in the target organs and toxic endpoints of these COCs. For COCs with both cancer and non-cancer effects (i.e., RDX), risk-based cleanup goals were calculated for both a TR of 1E-05 and a THI of 1.0; the final risk-based cleanup goal is the smaller of the two results. The resulting risk-based cleanup goals are presented in Table 2.

An analysis of sample results indicates soil concentrations exceed the risk-based cleanup goals for the five PAHs in the vicinity of Pad 61/61A, and RDX concentrations exceed its risk-based cleanup goal at Pad 67.

Table 2. Risk-based Cleanup Goals for COCs in Soil and Dry Sediment at Winklepeck Burning Grounds

Contaminant	Cleanup Goal
RDX	617 mg/kg
Benzo(*a*)pyrene	7.5 mg/kg
Dibenzo(*a*,*h*)anthracene	7.5 mg/kg
Benzo(*a*)anthracene	75 mg/kg
Benzo(*b*)fluoranthene	75 mg/kg
Indeno(*1,2,3-cd*)pyrene	75 mg/kg

COC = Chemical of concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Ecological RAOs. No RAOs were developed to protect ecological receptors because of the low ecological risk (HQs under 1 and, if not, mostly under 30 for conservative scenarios) and the potential disturbance from range maintenance activities resulting in vegetation removal (simpler or missing habitat), shorter food chains (simpler ecosystem), and lower exposure (fewer organisms). In addition, the implementation of the selected remedy to achieve human health risk-based cleanup goals will reduce the overall concentration of many contaminants and would have the effect of lowering the already low exposure and low risk to ecological receptors.

9.0 DESCRIPTION OF ALTERNATIVES

The following general response actions were considered in the FFS for remediation of RDX- and SVOC-contaminated soil at WBG:

- no action,
- institutional actions,
- excavation actions
- beneficial reuse actions, and
- disposal actions.

The technologies/process options screened under each general response action were selected for their ability to remove or reduce RDX and SVOCs in soil. Because the AOC soil contains chemical contamination above the cleanup goals, the technologies/process options were evaluated for their applicability to remove or reduce contaminants in the shortest timeframe. The following two alternatives (including no action as required by the NCP) were developed for remediation of contaminated soil at WBG.

9.1 ALTERNATIVE 1: NO ACTION

The no action alternative provides an assessment of the consequences of taking no remedial response and acts as a baseline for comparison with other alternatives as required under CERCLA. For this alternative, no action would be taken to reduce the hazards present at the site to potential human or ecological receptors. There would be no reduction in toxicity, mobility, or volume of contaminated soil. Access to

the site by the Range Maintenance Soldier would continue so that the soldier could come into contact with contaminated surface soil.

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$0
Estimated Present Work Cost:	$0
Time to Implement:	0 years

9.2 ALTERNATIVE 2: CHEMICAL CONTAMINATION REMOVAL CONCURRENT WITH MUNITIONS AND EXPLOSIVES OF CONCERN REMOVAL—EXCAVATION, SCREEN FOR POTENTIAL MUNITIONS AND EXPLOSIVES OF CONCERN, COMPOSITE SAMPLING, AND DISPOSAL

Under this alternative, areas designated for MEC removal as part of the target practice range construction were expanded to include excavation of soil containing friable asbestos and chemical contaminants above cleanup goals. Because soil containing asbestos and exceeding cleanup goals is within or adjacent to (<30 ft) areas subject to the MEC removal action, excavation of the soil became part of the MEC contractor's scope of work. Excavation of soil exceeding cleanup goals was addressed, in part, at the same time as the MEC removal activities. Based on RI data, contaminated soil exceeding cleanup goals was excavated to a maximum depth of 4 ft. RI data indicated that a total of 34 yds^3 of soil surrounding five sample locations exceeded cleanup goals and required excavation. At the completion of MEC removal actions in August 2005, additional soil (total estimated volume of about 5,965 yd^3) containing asbestos or chemical contamination above cleanup goals was encountered. Under this ROD, the selected alternative is to remove this additional soil.

Due to past activities at WBG, areas to be excavated will be surveyed and cleared of potential MEC prior to removing chemical contamination. This process will include clearing vegetation, geophysical surveys and visual inspections, excavation by layers, and removal of metal debris from the soil. Soil with contamination greater than cleanup goals will be segregated and managed separately from soil with chemicals less than cleanup goals. After completing the excavation, samples will be collected from the bottom and sides of the excavation following the Facility-wide Sampling and Analysis Plan (SAP; USACE 2001b) and SAP Addendum for the Characterization of 14 RVAAP AOCs (MKM 2004c), which specifically addresses multi-increment sampling, for comparison against the cleanup goals. Any additional soil with contaminants exceeding cleanup goals will be further excavated and screened. Once screened and stockpiled, soil will be characterized by collecting multi-increment samples from the stockpile. Soil with contaminants below cleanup goals may be beneficially used as backfill in the excavation, and soil with contaminants above cleanup goals will be disposed off-site at an approved disposal facility. Any remaining space in the excavations will be backfilled using clean soil.

The U. S. Army will implement and maintain various LUCs to prohibit unauthorized access and land use to protect human receptors. LUCs for WBG will be detailed in a LUC RD document. Section 12.2.3 of this ROD describes the implementation of institutional controls associated with the selected remedy. CERCLA 121(c) 5-year reviews will be conducted to assess the long-term effectiveness of the remedy, including LUCs, until concentrations of hazardous substances in soil and groundwater are reduced to levels that allow for unrestricted use.

The costs for Alternative 2 are presented in Table 3.

Table 3. Costs for Alternative 2

Action	Disposal Non-hazardous
Estimated Capital Cost	$1,528,994
Estimated O&M Cost Over 30-year Period	$155,942
Estimated Present Worth Cost (in CY 2004 dollars)	$1,592,397

CY = Calendar year.
O&M = Operations and maintenance.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This chapter presents a comparative analysis of the each alternative against the nine criteria required by NCP. In NCP, 40 *Code of Federal Regulations (CFR)* Part 300.430, EPA has established nine criteria that assist in determining the most appropriate remedial alternative to be selected for the site. The criteria are designed to select a remedy that will be protective of human health and the environment, attain ARARs, utilize permanent solutions and treatment technologies to the maximum extent practicable, and be cost effective. The nine criteria were used to evaluate and compare the alternatives for the WBG. A brief description of the nine criteria followed by a comparative analysis of the alternatives for soil is presented in the following sections.

10.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Alternative 1 would not be protective of human health or of the environment. No effort would be taken to prevent or minimize human or environmental exposure to contaminated soil.

Alternative 2 would provide a high level of long-term protectiveness to human health because soil containing contaminants above the risk-based cleanup levels would be removed and disposed of off-site and LUCs would be established and maintained. Alternative 2 would provide a high level of protectiveness to human health because soil containing contaminants above the risk-based cleanup levels would be removed and disposed of off-site and LUCs would be established and maintained by the U. S. Army to lower the long-term potential risk from human exposure. LUCs will reduce the potential for residual contamination exposure to future users by controlling the future use and activities on this military training site, including the management of activities that would disturb or excavate soil at WBG.

The current and future land use as a Mark 19 Range allows for limited habitat for ecological receptors and, thus, minimal exposure. Therefore, the relative low risks to ecological receptors that occupy or visit WBG would also be further reduced.

10.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of CERCLA and NCP 300.430(f)(1)(ii)(B) requires that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statues or provides a basis for invoking a waiver.

There are no identified chemical-specific ARARs for WBG soil remedial alternatives. Location- and action-specific ARARs for alternatives are listed on Table 4.

10.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain at WBG following remediation and the adequacy and reliability of controls.

Alternative 1 would have no long-term effectiveness or permanence. Risks would essentially remain the same because no soil removal or controls would be implemented to prevent potential exposure.

Alternative 2 is a protective for the Range Maintenance Soldier because contaminated soil is removed to below the risk-based cleanup levels for this land use designation. The long-term effectiveness of this alternative can be adequately and reliably addressed by LUCs, which prohibit unauthorized access and land use inconsistent with the purpose of military training, including unauthorized soil disturbance or excavation. Because soil will remain at WBG with contaminant concentrations that do not allow for unrestricted land use, site reviews would be conducted once every 5 years to evaluate current and anticipated land use, as well as to ensure that LUCs remain effective.

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at Winklepeck Burning Grounds

Type of ARAR	Requirements	Prerequisite	Citation(s)
	Location-Specific		
Surface Waters and Wetlands	All waters of the state shall be free of suspended solids, floating debris, oil, scum, or toxic substances from human activity that create a nuisance, cause degradation, or adversely affect aquatic life. There may be no degradation of water quality that results in violation of the applicable water quality criteria or the impairment of existing uses. Wetlands-designated uses shall be maintained and protected such that degradation through direct, indirect, or cumulative impacts do not result in wetland loss or function.	Applicable to activities at WBG that may impact waters of the state (connected drainageways) or wetlands, including isolated wetlands.	OAC 3745-1-04 OAC 3745-1-51 OAC 3745-1-54(B)(1)
	Action- Specific		
Activities Causing Fugitive Dust Emissions	Persons engaged in construction activities shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions include, but are not limited to, the following: – the use of water or chemicals for control of dust during construction operations or clearing of land; and – the application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces, which can create airborne dusts. No person shall cause, or allow, fugitive dust to be emitted in such a manner that visible emissions are produced beyond the property line. Monitoring may be employed to determine the effectiveness of dust emission controls.	Applicable to fugitive emissions from demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land. Applicable to pre-construction clearing activities and soil excavation activities.	OAC 3745-17-08(B)

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

Type of ARAR	Requirements	Prerequisite	Citation(s)
Construction Activities Causing Storm Water Run-off (e.g., clearing, grading, and excavation)	Construction activities disturbing more than 1 acre must develop and implement a stormwater pollution prevention plan incorporating best management practices (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the requirements of the Ohio EPA General Permit for Construction Activities (Permit ORC 000002).	Applicable to stormwater discharges from land disturbances from a construction activity involving more than 1 acre.	40 *CFR* 122.26 OAC 3745-38-06
Generation and Characterization of Solid Waste (all primary and secondary wastes)	The generator must determine if the material is a solid waste, as defined in 40 *CFR* 261.2 and 40 *CFR* 261.4(a). If the material is a solid waste, the generator must determine if the solid waste is a hazardous waste by: • determining if the waste is listed under 40 *CFR* Part 261; or • determining if the waste exhibits characteristics by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used; and • determining if the waste is excluded under 40 *CFR* Parts 261, 262, 266, 268, and 273.	Applicable to generation of a solid waste as defined in 40 *CFR* 261.2 and that is not excluded under 40 *CFR* 261.4(a).	40 *CFR* 262.11(a)(b)(c) OAC 3745-52-11(A)(B)(C)(D)
		Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Process history indicates that soil may have been contaminated with K047 (pink/red water) from RVAAP operations. Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Site data indicate that soil contains metals at concentrations that exceed 20 times the toxicity characteristic limit and may exhibit the characteristics D008. Applicable to generation of decontamination wastewater.	40 *CFR* 262.11(a)(b)(c) OAC 3745-52-11(A)(B)(C)(D)
	The generator must determine if the waste is restricted from land disposal under 40 *CFR* 268 *et seq.* by testing in accordance with prescribed methods or use of generator knowledge of waste.	Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Applicable to generation of decontamination wastewater.	40 *CFR* 268.7 OAC 3745-270-07

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

Type of ARAR	Requirements	Prerequisite	Citation(s)
	The generator must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 *CFR* 268.40, Subpart D.	Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Applicable to generation of decontamination wastewater.	40 *CFR* 268.9(a) OAC 3745-270-07 OAC 3745-270-09
	The generator must determine the underlying hazardous constituents [as defined in 40 *CFR* 268.2(i)] in the waste.	Applicable to the generation and characterization of RCRA characteristic hazardous waste (except D001 non-wastewaters treated by combustion, recovery of organics, or polymerization. see 268.42, Table I) and to hazardous-contaminated soil for their subsequent storage, treatment, or disposal.	40 *CFR* 268.9(a) OAC 3745-270-09
Accumulation of Hazardous Debris from Excavation and Screening (it is assumed that any debris resulting from excavation and screening will be accumulated for less than 90 days)	A generator may accumulate for up to 90 days or conduct treatment of hazardous wastes in containers without an Ohio EPA permit. Generators that accumulate for 90 days or conduct on-site treatment of hazardous waste in containers must comply with the personnel training, preparedness and prevention requirements, and contingency plan requirements of 40 *CFR* 265.16; 40 *CFR* 265, Subpart C; and 40 *CFR* 265, Subpart D, respectively. Personal training and contingency plan requirements would appear to be administrative in nature. Arguably, some of the components/goals of the contingency plan such as: (1) to minimize the hazards to human health or environment from fire, explosion, or sudden release of hazardous waste or hazardous constituents; or (2) presence of an emergency coordinator on-site, could be viewed as substantive. If determined to be substantive, these provisions should be	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 *CFR* 262.34(a)(4) OAC 3745-52-34(A)(4) OAC 3745-66-70 to 66-77

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

Type of ARAR	Requirements	Prerequisite	Citation(s)
	cited as ARAR; however, the plans, details, or implementation steps should be included in the CERCLA documentation for the site (i.e., remedial design documents).		
	Containers must be marked with the date upon which period of accumulation began and with the words "Hazardous Waste."	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 *CFR* 262.34 (a)(2)(3) OAC 3745-52-34 (A)(2)(3)
	Containers holding hazardous wastes must be kept closed except to add or remove wastes and must not be managed in a manner that would cause them to leak. Containers of hazardous waste must be maintained in good condition and comparable with the waste stored therein. Containers holding ignitable or reactive wastes must be separated from potential ignition sources and located 50 ft from the property boundary.	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 *CFR* 264.171 40 *CFR* 264.172 40 *CFR* 264.173 40 *CFR* 264.176 40 *CFR* 264.17 OAC 3745-52-34(A)(1)
Placement of Hazardous-contaminated Soil in a Staging Pile	In 1988, EPA created a new unit for the temporary management of remediation waste known as a staging pile. The staging pile is an accumulation of solid, non-flowing remediation wastes that may be used for storage of those wastes for 2 years.	Applicable to storage of hazardous-contaminated soil in staging piles. Potentially relevant and appropriate if excavated soil are determined to not contain listed wastes or exhibit the toxicity characteristics of soil.	40 CFR 264.554 OAC 3745-57-74

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

Type of ARAR	Requirements	Prerequisite	Citation(s)
	The requirements for staging piles include the performance criteria of 40 *CFR* 264.554(d). These standards require that: – the staging pile must be designed to prevent or minimize releases of hazardous waste or hazardous constituents into the environment, and – the staging pile must be designed to minimize cross-media transfer as necessary to protect human health and the environment (by using liners, run-off/run-on controls as appropriate). The staging pile requirements also contain closure requirements (separate provisions for staging piles located in previously contaminated areas and those located in previously uncontaminated areas).		
Generation and Storage of Wastewater from Equipment Decontamination (wastewater may contain listed wastes or exhibit a hazardous waste characteristic)	The generator must determine if the wastewater contains listed wastes or exhibits a characteristic, and must characterize the pollutants sufficiently to meet the waste acceptance criteria of the receiving facility. See previous requirements concerning the generation/characteristic of solid wastes.	Applicable to generation of wastewater from equipment decontamination.	40 *CFR* 262.11 OAC 3745-52-11 (A)(B)(C)(D)
Asbestos-Containing Materials at Pad 70 (worker training, material handling, containerization, transport and disposal)	The management of Asbestos Containing Materials (ACM) is subject to the technical requirements found at 40 CFR 61.145 and OAC 3745-20. These standards require: • That prior to the management of any asbestos material at least one trained person be present at all times that is trained in accordance with OAC3745-20-5.	Applicable for asbestos-containing material generated from remedial actions at Pad 70.	40 *CFR* 61.145 OAC 3745-20

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

Type of ARAR	Requirements	Prerequisite	Citation(s)
	• That no visible dust emissions occur during activities and that sufficient asbestos control measures (e.g., wetting, fixing, etc.) be included within the activities to prevent fugitive emissions of asbestos particles. • That asbestos wastes be controlled at all times (e.g., adequately wetted/fixed, work controls preclude the potential of rendering non-friable asbestos airborne, etc.). • The emission control measures be included within the planned actions and be approved prior to implementation. • Wastes be properly marked and disposed of at an approved facility. The technical or substantive requirements will govern the manner in which ACM are removed, managed, packaged, and shipped for final disposal.		

Table 4. ARARs for the Selected Alternative for Contaminated Soil and Dry Sediment at for Winklepeck Burning Grounds (continued)

ARAR = Applicable or relevant and appropriate requirement.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CFR = Code of Federal Regulations.
COC = Chemical of concern.
EPA = U. S. Environmental Protection Agency.
OAC = Ohio Administrative Code.
Ohio EPA = Ohio Environmental Protection Agency.
ORC = Ohio Revised Code.
PCB = Polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
RVAAP = Ravenna Army Ammunition Plant.
TSCA = Toxic Substances Control Act.
WBG = Winklepeck Burning Grounds.

10.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Neither alternative meets the statutory preference for treatment because no treatment would be implemented; therefore, there would be no reduction in toxicity, mobility, or volume through treatment. No assessment would be performed to confirm potential decreases in volume or mass of COCs due to natural attenuation or changes in mobility (migration). Under Alternative 2, however, the volume of contaminants in soil at WBG would be reduced through excavation and disposal at an approved off-site facility.

10.5 SHORT-TERM EFFECTIVENESS

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1, no action, would not be an effective alternative because current risks for direct contact with contaminated soil would continue to exist.

Alternative 2 would present minimal risk to the community and current U. S. Army personnel during implementation. WBG is an isolated AOC with controlled access. Air quality could be affected by the release of particulates, and potential exposure to workers could occur during soil excavation and sifting activities. Fugitive dust emission controls would be addressed as specified in the action-specific ARARs. Air monitoring and engineering controls would be implemented, as necessary, during remedial actions to ensure emissions do not exceed levels that could pose a risk to human health. Exposure through inhalation is not expected to be of a concern because the risk assessment indicated there was no long-term risk from inhalation. Potential exposure would be mitigated through the use of appropriate levels of personal protective equipment and decontamination procedures described in an approved site-specific health and safety plan.

Potential releases to the environment (i.e., air and surface water) during excavation and soil processing would be controlled with management and engineering practices (e.g., hay bales, silt fences, dust control, temporary covering, revegetation, etc.).

10.6 IMPLEMENTABILITY

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative 1 is readily implementable because no remedial actions would be taken.

Alternative 2 would also be readily implementable. Excavation of impacted soil, MEC surveys, and off-site disposal are conventional activities in construction projects of this kind. Multiple disposal facilities are available that could accept the waste soil. Resources are readily available for removing soil, and hardened standard excavation and construction equipment would be used. Methods for identifying

and disposing of MEC have been implemented, and subcontractors are available to perform MEC removal or detonation work.

LUCs are implementable. No technical difficulties are anticipated in establishing or maintaining land use or access controls.

Under Alternative 2, contaminants would remain on-site above the soil cleanup goals for unrestricted land use; however, they would be below the cleanup goals for Range Maintenance Soldier land use. As long as contaminants in soil remain at WBG above unrestricted cleanup goals, remedy effectiveness reviews would be conducted once every 5 years pursuant to requirements of CERCLA. The purpose of these reviews is to evaluate data obtained from ongoing monitoring to provide information on the presence and behavior of contaminants across WBG, as well as to ensure that the engineering controls and LUCs are retaining their effectiveness.

10.7 COST

Cost addresses the estimated capital and O&M costs evaluated as the present worth cost. Present worth is the present value of the capital and future O&M costs of an alternative based on the time value of money.

Alternative 1 has no associated costs.

The Alternative 2 capital cost for soil excavation, screening, sampling, and off-site disposal as non-hazardous waste is estimated at $1,528,994. The 30-year O&M cost for implementation of LUCs is estimated at $155,942. The total capital and O&M cost for Alternative 2 is approximately $1,684,937. The present-value cost (in CY 2004 dollars) to complete Alternative 2 is $1,592,397.

If analytical results indicate that the excavated soil is hazardous and exceeds applicable land disposal restriction standards, the transportation and disposal costs could increase by approximately $250 to $500 per cubic yard. Process knowledge and results from investigations to date indicate that the soil is non-hazardous.

10.8 STATE ACCEPTANCE

State acceptance indicates whether, based on its review of the FFS (USACE 2005a) and the Proposed Plan (USACE 2005b), the lead regulatory agency (in this case, Ohio EPA) concurs with, opposes, or has no comment on the recommended alternative.

The final approved FFS recommended Alternative 2, Chemical Contamination Removal Concurrent with MEC Removal Action—Excavation, Screen for Potential MEC, Composite Sampling, and Disposal.

10.9 COMMUNITY ACCEPTANCE

Community acceptance is addressed in this ROD based on review of the public comments received on the FFS (USACE 2005a), the Proposed Plan (USACE 2005b), associated public comment period (December 9, 2005, to January 8, 2006), and the public meeting held on December 20, 2005, at Newton Falls Community Center, Ohio. No public comments were received during the public comment period. Questions and oral comments were received and addressed during the public meeting as presented in the Responsiveness Summary, which is presented in Part III of this document.

11.0 PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. NCP establishes an expectation that treatment will be used to address principal threat wastes.

No principal threat wastes are located at WBG, with the exception of friable asbestos at Pad 70, which could become airborne and present a health concern. No treatment of chemically contaminated soil or asbestos is proposed under the selected alternative. However, the volume of chemically contaminated soil and asbestos would be reduced through excavation and disposal at an approved off-site facility.

12.0 THE SELECTED REMEDY

The selected remedy for contaminated soil at WBG is Alternative 2, Chemical Contamination Removal Concurrent with MEC Removal Action—Excavation, Screen for Potential MEC, Composite Sampling, and Disposal. The U. S. Army believes implementation of this alternative is necessary to protect public health and welfare and the environment from actual releases of pollutants or contaminants from this site.

12.1 RATIONALE FOR THE SELECTED REMEDY

Based on the available risk information, the selected remedy will achieve the project's RAO, which is to attain protection of the National Guard Range Maintenance Soldier from asbestos and RDX and PAH contaminants in deep surface soil (defined as extending to a maximum depth of 4 ft BGS). In addition, already low risks to ecological receptors will be further reduced. The selected remedy will be protective of human health and the environment by removing all soil contaminated with asbestos and RDX or PAHs at concentrations exceeding their respective cleanup goals and will be in compliance with ARARs. Excavation of contaminated soil at WBG is cost effective because of the small volumes and relatively shallow depths. Excavation will also remove contaminants in the shortest timeframe. Short-term effects during construction will be mitigated with engineering controls, personal protective equipment, air quality monitoring, erosion and sediment controls, and proper waste-handling practices. Implementing and enforcing long-term LUCs will effectively deter unauthorized access to WBG and limit exposures to residual contamination at depth.

12.2 DESCRIPTION OF THE SELECTED REMEDY

Procedures for MEC surveys and, if required, removal will be applied to eliminate any potential safety concerns due to MEC during the excavation activities for remaining soil above risk-based cleanup goals. Once the identification of MEC and its removal is completed, specific procedures for completing the soil removal will be initiated (e.g., confirming that cleanup levels have been achieved and characterizing the soil for disposal, etc.). Therefore, the description of the selected removal is divided into: (1) MEC removal, (2) soil characterization and disposal, and (3) implementation of institutional controls.

12.2.1 Munitions and Explosives of Concern Surveys

The general MEC procedure includes clearance of vegetation, geophysical surveys and visual inspections to identify MEC and metal debris, excavation of soil by layers, and sifting (screening) of the excavated

soil for metal debris. MEC-trained personnel will be required for all work at WBG. Below is a general discussion of the MEC removal process.

Site preparation for excavation of MEC will include—as required based on the local site topography—constructing temporary diversion ditches to minimize surface run-on into the excavations, installing silt fence and staked hay bales to minimize transport of soil in run-off, constructing temporary pads for soil, and establishing equipment laydown areas at the site. Qualified personnel will survey the areas to be excavated using magnetometers prior to initiation of excavation activities. A backhoe, excavator, or other suitable equipment will be used to excavate soil materials. Excavated material will be placed directly into a "Grizzly" unit to remove metal debris or stockpiled in temporary storage piles for future soil sifting. After the first 0.3 m (1 ft) of soil is excavated, the MEC team will survey the area again if additional soil is to be excavated to remove chemical contamination. If surveys indicate the area is clear, the excavation will proceed in 0.3-m (1-ft) increments until the excavation of soil with chemical contaminants is complete. The excavated, chemically contaminated soil will be placed in temporary storage piles to await characterization for disposal. The temporary storage piles will be covered with reinforced polyethylene covers. Measures will be taken to avoid erosion of soil or ponding of water in open excavations. BMPs (i.e., diversion ditches, silt fences, and staked hay bales) will be used to control erosion and sediment. In addition, local weather forecasts will be evaluated prior to initiation of excavation activities to limit work delays due to rain while the excavation is open. The project health and safety plans will specifically address MEC concerns and actions to limit hazards associated with MEC. If MEC is identified, it will be managed in accordance with the approved MEC procedures.

12.2.2 Soil Characterization and Disposal

Additional chemically contaminated soil exceeding cleanup levels was discovered at Pads 61/61A and 67 during the MEC removal performed in August 2005 (Figure 3). Transite and friable asbestos was also observed at Pad 70.

Table 5 presents the estimated volume and depth of excavation of each location containing asbestos and chemically contaminated soil above cleanup levels that will require remediation as part of the selected remedy. The three contaminated soil locations will be excavated to depths between 1 and 4 ft to achieve cleanup levels (Figure 3). A total of approximately 5,965 yds^3 of soil exceeding cleanup levels will require excavation: 5,125 yds^3 at Pads 61/61A, 40 yds^3 at Pad 67 and 800 yds^3 at Pad 70.

Table 5. Estimated Volume of Contaminated Soil and Dry Sediment Requiring Excavation for the Selected Remedy

Site	Name	Media/ COC	Depth [m (ft)]	Excavated Volume [m^3 (yd^3)]
1	Pad 61/61A (residual remaining at WBGss-217, entire Pad 61A, mound east of Pad 61, and cut south of Pad 61)	Soil/ PAHs	1.2 (4)	3,918.6 (5125)
2	Pad 67 (residual remaining west of WBSss-071)	Soil/ RDX	0.3 (1)	30.6 (40)
3	Pad 70	Soil/ Asbestos	0.6 (2)	612.1 (800)
			Totals	**4,531.3 (5,965)**

COC = Chemical of concern.
PAH = Polycyclic aromatic hydrocarbon.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

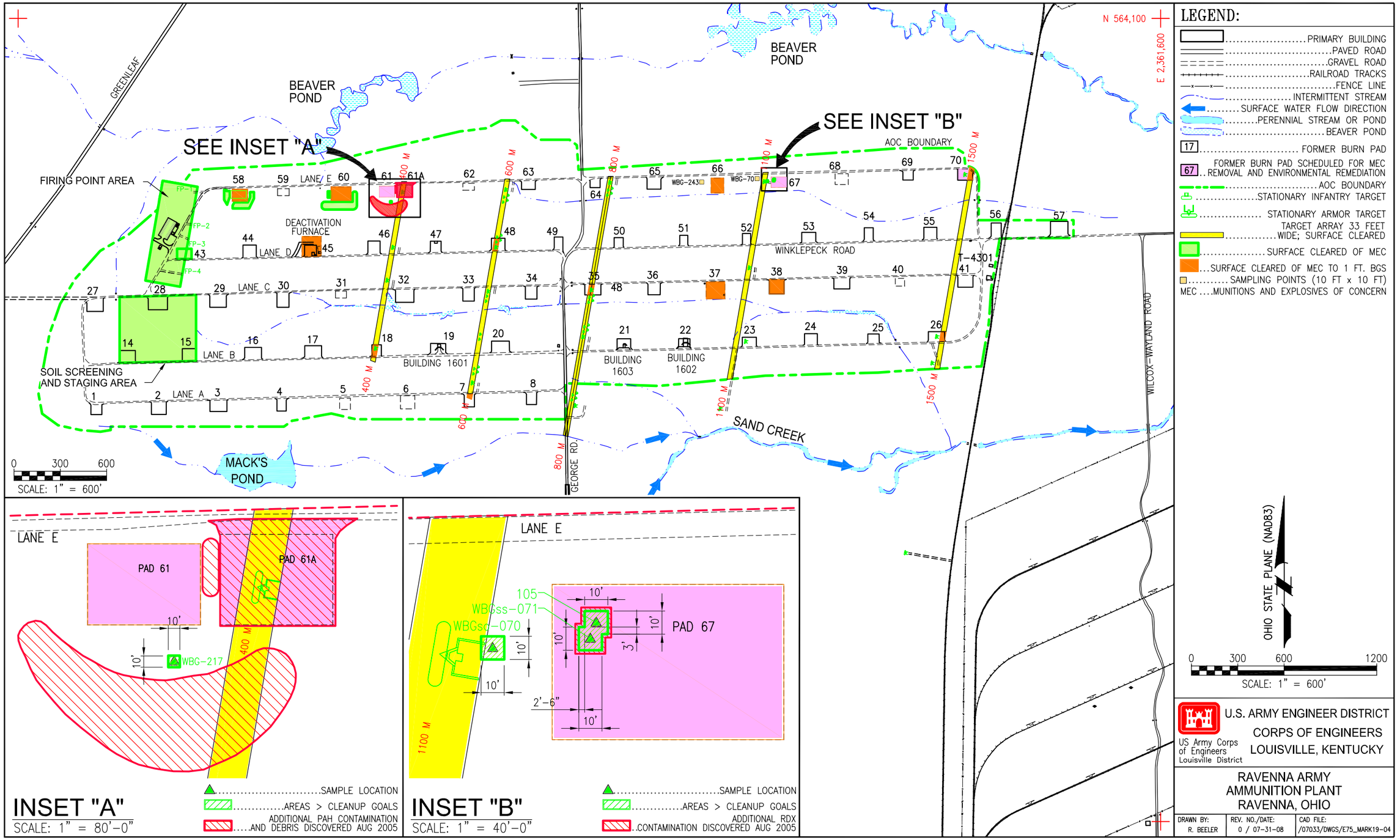

Figure 3. Selected Remedy for Mark 19 Range, Winklepeck Burning Grounds, Areas of Contamination above Cleanup Levels

MEC survey and removal procedures will be incorporated at locations with chemical contaminants above cleanup levels. Figure 4 presents a schematic of the selected remedy as it will be implemented at a chemically contaminated soil location.

The perimeter of the chemically contaminated location to be excavated will be delineated with flagging and enclosed with temporary fencing or another barrier to limit access. A sign will be posted at the entrance of the work area listing the hazards present at the site and a telephone number of someone to contact to gain access to the site.

A temporary decontamination and soil screening and staging area will be established within a MEC cleared area at the west end of WBG (Figure 3). Soil excavated from Pads 61/61A, station WBG-217, Pad 67, and Pad 70 will be transported within the AOC to the screening and staging area for processing. Staging piles will be covered with reinforced polyethylene covers.

Excavation and sifting of the chemically contaminated soil will be performed as described under MEC removal procedures; however, the sifted soil will be placed in its designated waste staging area to determine disposition. In addition, confirmatory samples will be collected from the sidewalls and bottom of the completed excavations to verify that the contaminated soil above cleanup levels was removed. The estimated number and analytical requirements for the confirmatory samples will be described in the RD document. If confirmatory results indicate that contamination above cleanup levels remains in the ground, additional soil will be excavated as directed by the U. S. Army and Ohio EPA. Confirmatory samples will be collected from the extended excavation, and the process will be repeated as necessary until the soil remaining in-place is below the cleanup levels.

Disposition requirements for the sifted soil in the staging piles will be determined by collecting multi-increment samples for comparison against the cleanup levels. The disposition soil samples will be obtained by compositing a minimum of 30 sample aliquots for each storage pile or as the piles are created.

Fill will be placed in the excavation in lifts of 15 cm (12 in.) maximum lift thicknesses, then compacted. Fill material will be from a source approved by the U. S. Army and Ohio EPA. The top or final lift will be filled with soil capable of sustaining vegetation. The area will be seeded with an RTLS-approved seed mixture, mulched, and maintained and irrigated as necessary until a stand of grass is developed.

Following excavation and MEC removal, soil may be subject to beneficial reuse as backfill in the excavation if disposition sampling indicates contaminants are below cleanup goals and no asbestos is present. After characterization, if contaminants in excavated soil exceed the cleanup levels or asbestos is present, the soil will be transported to an off-site disposal facility appropriate for the type of waste. If the soil is determined to be non-hazardous but above cleanup goals, it will be disposed of at a Subtitle D Landfill permitted to accept special waste. The soil will be placed into lined intermodal containers and transported to an approved facility. Labeling or placarding is not required for non-hazardous soil, and the transporter will not be required to be licensed for hazardous waste transportation. If, however, the characterization of the soil indicates that it is hazardous, the soil will be handled in accordance with local, state, and federal regulations and requirements for management, transport, and disposition. Process knowledge and results from investigations to date indicate that the soil is non-hazardous.

All construction equipment (earth movers, drill rigs, etc.) and tools that come into contact with contaminated or potentially contaminated media will be decontaminated before they are used for site restoration activities or moved out of the controlled area. Equipment and tools will be thoroughly cleaned with a steam cleaner to remove all visible soil and mud. No soap or detergent will be used. The

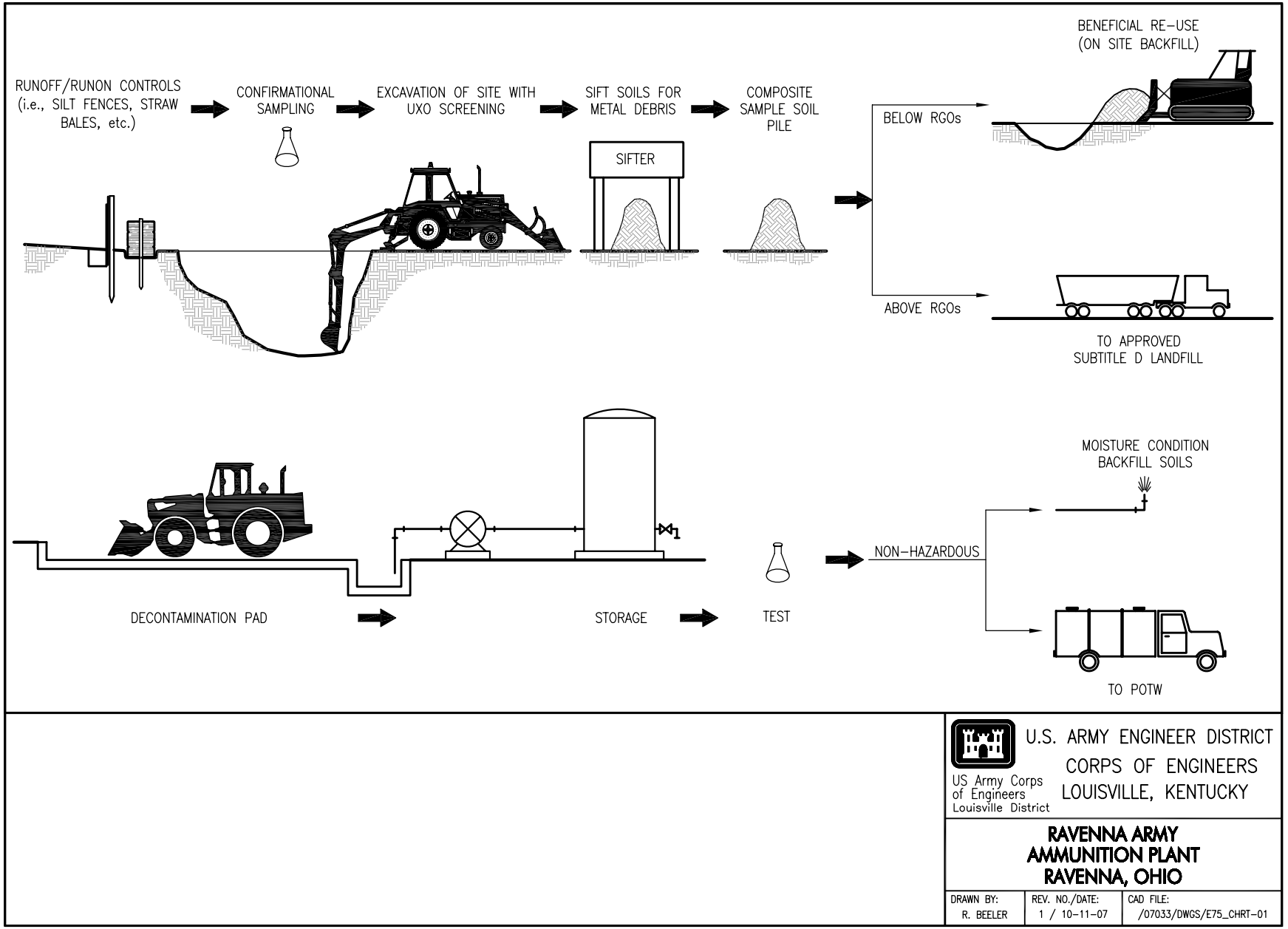

Figure 4. Remedial Action Process Flow Chart for Selected Alternative

decontamination water will be collected in portable poly tanks. Sediment residue from the decontamination pad will be placed in the temporary storage piles. Other smaller tools and sampling equipment will be decontaminated as provided for in the RVAAP Facility-wide SAP (USACE 2001b).

The wastewater stored in portable poly tanks will be analyzed for contaminants prior to disposal. Wastewater that meets drinking water MCLs and background values may be used to moisture-condition the storage piles to reduce dust and allow for optimum compaction. If any fluids other than potable water are used on the backfill soil and/or stockpiled soil, it will only be done subsequent to testing the fluids and approval by Ohio EPA. If wastewater is determined to be above MCLs, the wastewater will be transported to an approved off-site treatment and disposal facility according to its waste profile. No wastewater is expected to be hazardous waste; therefore, the poly tanks will be stored at the waste staging areas without the need for secondary containment.

12.2.3 Implementation of Institutional Controls

LUCs shall be maintained until the concentrations of hazardous substances in the soil and groundwater are reduced to levels that allow for unrestricted use. If WBG is subsequently remediated to unrestricted use, this ROD will be changed to remove the LUCs as part of the remedy. If the U. S. Army proposes to modify the LUCs for WBG, the U. S. Army shall submit a modified LUC RD to Ohio EPA for review and approval. CERCLA 121(c) 5-year reviews shall be conducted to assess the long-term effectiveness of the remedy, including LUCs.

The RD shall include a LUC component describing the details of LUC implementation and maintenance, including periodic inspections. The U. S. Army is responsible for implementation, maintenance, periodic reporting, and enforcement of LUCs in accordance with the RD. Although the U. S. Army may transfer these responsibilities to another party by contract, property transfer agreement, or through other means, the U. S. Army remains responsible for remedy integrity to include (1) CERCLA 121(c) 5-year reviews; (2) notification of the appropriate regulators and/or local government representatives of any known LUC deficiencies or violations; (3) provision of access to the property to conduct any necessary response; (4) the ability to change, modify, or terminate LUCs and any related deed or lease provisions; and (5) assurance that the LUC objectives are met to maintain remedy protectiveness.

If the U. S. Army determines that there is non-compliance with a LUC, the U. S. Army will address the effectiveness of the LUC, including any required notifications and corrective measures. The U. S. Army will seek Ohio EPA approval prior to a land use change that is inconsistent with the LUC objectives, the use assumptions of the remedy, or results in the termination of LUCs.

The U. S. Army will provide notice to Ohio EPA prior to any transfer or sale of the WBG AOC or any portion thereof.

If the U. S. Army transfers ownership of the WBG AOC or any portion thereof to another federal agency, department, or entity, the transfer documents shall require that the federal transferee include the LUCs in its property management plan or equivalent document. The U. S. Army shall advise the federal transferee of all obligations contained in this ROD and the LUC RD.

If the U. S. Army transfers ownership of the WBG AOC or any portion thereof to a non-federal entity, the U. S. Army will provide information to that entity in the draft deed and transfer documents regarding necessary LUCs. The U. S. Army will provide notice to Ohio EPA prior to any transfer or sale of any such site.

The U. S. Army will, upon transfer of fee title, ensure that the transferee executes and records an environmental covenant acceptable to Ohio EPA that would impose the LUC terms and conditions of the ROD and the LUC RD against the transferee(s), as well as subsequent property owner(s) or user(s) or their contractors, tenants, lessees, or other parties. This covenant will be recorded in the deed records of the Portage County Recorder's office immediately following the recording of the transfer deed and will run with the land in accordance with state law. Ohio EPA's right to enforce the LUCs would supplement, not replace, the U. S. Army's right and responsibility to enforce the LUCs. As a condition of property transfer, lease, or license, the U. S. Army may require the transferee or lessee, in cooperation with other stakeholders, to assume responsibility for various implementation actions. Third-party LUC responsibility will also be incorporated into pertinent contractual, property, and remedial documentation, such as a purchase agreement, deed, lease, license, or permit and an RD addendum.

12.3 SUMMARY OF THE ESTIMATED REMEDY COSTS

The cost of the selected remedy reflects the estimated capital and O&M costs. The costs are based on quotes from suppliers, generic unit costs, vendor information, cost-estimating guides, prior experience, and other information. The primary methodology used is a quantity takeoff method in which costs are calculated based on a unit cost multiplied by a quantity. The cost estimates were initially developed using fiscal year 2006 dollars, with no escalation or discount factors. Next, the costs were discounted to calculate the present-value costs. The present-value analysis is a method of evaluating expenditures, typically O&M costs, that occur over different time periods. Present-value calculations allow for cost comparisons of different remedial alternatives on the basis of a single cost figure. A discount rate of 7% was used to approximate the marginal pretax rate of return on an average investment and has been adjusted to eliminate the effect of inflation. The capital costs have not been discounted because of their relatively short implementation duration. The costs are believed to be accurate within a range between -30 and +50% of the actual costs. The actual costs for these actions could be higher than estimated because of unexpected site conditions. Correspondingly, costs could be lower if construction efficiencies are achieved, for example some portion of soil is subject to beneficial reuse as backfill. A summary of the non-discounted and discounted cost, lifecycle cost, and key parameters and assumptions used in developing the cost for the selected remedy for soil is presented in Table 6.

The capital costs to excavate the remaining soil exceeding cleanup levels, screen for potential MEC, conduct multi-increment sampling, and dispose of the soil off-site in a Subtitle D facility are estimated to be approximately $1,528,994.

O&M costs (for monitoring and LUCs) are estimated to be approximately $155,942 for a 30-year period. The imposition of LUCs and the implementation of a LUC plan are included in this cost. In addition, 5-year reviews are required throughout the costing period. Table 6 presents a detailed description of the O&M costs.

The total estimated capital and O&M costs are $1,684,937. The present-value cost (in CY 2004 dollars) to complete the selected remedy is estimated to be $1,592,397.

If analytical results indicate that the excavated soil is hazardous and exceed land disposal restriction standards, then the capital costs for transportation and disposal of the soil would increase by approximately $250 to $500 per cubic yard. Process knowledge and results from investigations to date indicate that the soil is non-hazardous.

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds

Winklepeck Burning Grounds (WBG) Record of Decision
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of Alternatives

SELECTED ALTERNATIVE		O&M Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
2	Chemical Contamination Removal Concurrent with MEC Removal	30 yr	$1,528,994	$155,942	$1,684,937

SELECTED ALTERNATIVE		O&M Duration	Discounted Cost (7%)		
			Capital Cost	O&M Cost	Total
2	Chemical Contamination Removal Concurrent with MEC Removal	30 yr	$1,528,994	$63,403	$1,592,397

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Land Use Controls			
Base Master Planning Documents	hrs	120	Assume 120 hrs to review and revise BMP Documents or similar.
Legal/Technical Labor	$/hr	80	
Site Prep			
Civil Survey	day	3	Survey existing area, after excavation, and after restoration. RSMeans 01107 700 1100.
Civil Survey	$/day	925	
As Built Drawings	hrs	32	
As Built Drawings	$/hr	50	
Silt Fences	LF	1,250	Vinyl, 3' High with 7.5' Posts
Silt Fences	$/LF	3.10	ECHOS 18050206
Mobilize Equipment	$/lot	3,100.00	
Site Visit			
Sedan, Automobile, Rental	days	3.00	
Sedan, Automobile, Rental	$/day	55	ECHOS 33010108
Senior UXO Supervisor (SUXOS)	hrs	40	Includes sifting and geophysical surveys.
Senior UXO Supervisor (SUXOS)	$/hr	75.00	ECHOS 33040921
Senior UXO Project Manager	hrs	40	Includes sifting and geophysical surveys.
Senior UXO Project Manager	$/hr	111.00	ECHOS 33040921
UXO Staff Engineer	hrs	40	Includes sifting and geophysical surveys.
UXO Staff Engineer	$/hr	83.00	ECHOS 33040925
Other Direct Costs	$/lot	600	ECHOS 33240101
Excavation			
Excavate Soils	hrs	110	Crawler-mounted, 4.0 CY, Koehring 1166 Hydraulic Excavator.
Excavate Soils	$/hr	277.00	ECHOS 17030234
UXO Vehicle Modification	LS	0.00	Assume modified vehicles are available
Sifting			
Dump Truck	hrs	110	12 CY Dump.
Dump Truck	$/hr	97.00	ECHOS 17030285
Sand Bags	ea	1,000	
Sand Bags	$/ea	0.52	ECHOS 17030427
Wheel Loader	hrs	330.00	0.75 CY. Loader
Wheel Loader	$/hr	112.00	ECHOS 17030436
UXO - Vehicle Modification	LS	0.00	Assume modified vehicles are available
Truck - 4x4	day	22.00	
Truck - 4x4	$/day	73.00	ECHOS 33040662
Trommel Screener	mo	1.00	
Trommel Screener	$/mo	5,860.00	ECHOS 33040662
Grizzly Shaker Unit	mo	1.00	
Grizzly Shaker Unit	$/mo	3,520.00	ECHOS 33040663
UXO Technician II	hrs	630	
UXO Technician II	$/hr	52.00	ECHOS 33040934

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
UXO Technician III (UXO Supervisor)	hrs	315	
UXO Technician III (UXO Supervisor)	$/hr	62.00	ECHOS 33040935
Conveyor	ea	1.00	61.5' Automatic, 45 FPM, Horizontal 24" Belt, Center Drive.
Conveyor	$/ea	9,300.00	ECHOS 33188402
Other Direct Costs	$/lot	6,200	ECHOS 33240101
Man-Lift	mo	1.00	Scissor, 26' High, 1500# capacity.
Man-Lift	$/mo	2,700.00	ECHOS 33341006
Confirmational Sampling			
Confirmation Samples - Field and Lab	ea	10	Obtain 10 RDX samples from excavations at former burn pads.
Confirmation Samples - Lab	ea	8	Obtain 8 PAH samples from former burn pads.
Confirmation Samples - Lab	ea	6	Obtain 6 PLM samples from former burn pads.
Confirmation Samples - Lab	ea	2	Obtain 2 TCLP samples for waste sample analysis.
Confirmation Sample Materials	ea	21	Reference ECHOS 33 02 0401/0402 for disposable sampling and decon materials.
Confirmation Sample Materials	$/ea	17.75	
Confirmation Sampling Labor	hrs	80	Includes 1 FTE sampling over a 9 day period and 1 day for travel.
Confirmation Sampling Labor	$/hr	60	
Confirmation Sample Analysis - Field	$/ea	250	Analyze samples for RDX (10 @ $25).
Confirmation Sample Analysis - Lab	$/ea	5,480	Analyze samples for RDX (10 @ $96), SVOCs (8 @ 220), PLM (6 @ $260), and TCLP (2 @ $600).
Data Management	hrs	21	Data validation
Data Management	$/hr	80	
Offsite Disposal			
Dump Charges	CY	7,900	Assume all soils disposed offsite. (5,965 cy with 15% constructability factor and 15% swell factor). ECHOS 17020401.
Dump Charges	$/CY	56.50	
Wheel Loader	hrs	32.00	Caterpillar Model 966, 4 CY. Loader
Wheel Loader	$/hr	145.00	ECHOS 17030436
Dump Truck	hrs	1,050	26 CY dump and 50 mi round trip haul
Dump Truck	$/hr	130.00	ECHOS 17030288
Restoration			
General Area Cleanup	acre	2.0	
General Area Cleanup	$/acre	570	ECHOS 17040101
Area Preparation	acre	2.0	
Area Preparation	$/acre	106.00	ECHOS 18050101
Unclassified Fill	CY	7,900.0	
Unclassified Fill	$/CY	11.00	ECHOS 18050101
Hydroseeding	acre	2.00	
Hydroseeding	$/acre	650.00	ECHOS 18050401
Fertilize	acre	2.0	Hydro Spread
Fertilize	$/acre	200.00	ECHOS 18050408
Demobilize Equipment	$/lot	3,100.00	
Work Plans			
Site Specific Work Plan	$/LS	14,000	Reduce by 50% for similar work already complete.
Explosive Safety Submission	$/LS	0	Plan in place.
UXO Removal Report	$/LS	20,000	

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	Inspect site annually.
Site Inspections	hrs	16	Inspect site and interview site management regarding soil disturbance activities. Complete checklist and letter report.
Field Labor	$/hr	45	
Site Maintenance	events	30	Assume $500/yr for fence/signs. Assume $500/ for reseeding and erosion control measures.
Site Maintenance	$/yr	1,000	
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	7,400	Assume 80 hours/review @ $80/hr. Add $1,000 misc expenses.

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Cost Estimate

CAPITAL COST **$1,528,994**

Activity (unit)	Quantity	Unit Cost	Total
Capital Cost			
Land Use Controls			
Base Master Planning Documents	120	$80.00	$9,600
Site Work			
Civil Survey (day)	3	$925.00	$2,775
As Built Drawings (hrs)	32	$50.00	$1,600
Silt Fences (LF)	1,250	$3.10	$3,875
Demobilize Equipment (lot)	1.00	$3,100.00	$3,100
Site Visit			
Sedan, Automobile, Rental (days)	3.00	$55.00	$165
Senior UXO Supervisor (hrs)	40.00	$75.00	$3,000
Senior UXO Project Manager (hrs)	40.00	$111.00	$4,440
UXO Staff Engineer (hrs)	40.00	$83.00	$3,320
Other Direct Costs (lot)	1.00	$600.00	$600
Excavation			
Excavate Soils (hrs)	110.00	$277.00	$30,470
Sifting			
Dump Truck (hrs)	110.00	$97.00	$10,670
Sand Bags (ea)	1,000.00	$0.52	$520
Wheel Loader (hrs)	330.00	$112.00	$36,960
Truck - 4x4 (day)	22.00	$73.00	$1,606
Trommel Screener (mo)	1.00	$5,860.00	$5,860
Grizzly Shaker Unit (mo)	1.00	$3,520.00	$3,520
UXO Technician II (hrs)	630.00	$52.00	$32,760
UXO Technician III (UXO Supervisor) (hrs)	315.00	$62.00	$19,530
Conveyor (ea)	1.00	$9,300.00	$9,300
Other Direct Costs ($/lot)	1.00	$6,200.00	$6,200
Man-Lift (mo)	1.00	$2,700.00	$2,700

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Cost Estimate

CAPITAL COST

Activity (unit)	Quantity	Unit Cost	Total
Confirmational Sampling			
Confirmation Sample Materials (ea)	21	$17.75	$373
Confirmation Sampling Labor (hrs)	80	$60.00	$4,800
Confirmation Sample Analysis - Field (lot)	1	$250.00	$250
Confirmation Sample Analysis - Lab (lot)	1	$5,480.00	$5,480
Data Management (hrs)	21	$80.00	$1,680
Offsite Disposal			
Dump Charges (cy)	7,900	$56.50	$446,350
Wheel Loader (hrs)	32.00	$145.00	$4,640
Dump Truck (hrs)	1,050	$130.00	$136,500
Restoration			
General Area Cleanup (acre)	2.00	$570.00	$1,140
Area Preparation (acre)	2.00	$106.00	$212
Unclassified Fill (cy)	7,900.00	$11.00	$86,900
Hydroseeding (acre)	2.00	$650.00	$1,300
Fertilize (acre)	2.00	$200.00	$400
Demobilize Equipment (lot)	1.00	$3,100.00	$3,100
Work Plans			
Site Specific Work Plan	1	$14,000.00	$14,000
Explosive Safety Submission	1	$0.00	$0
UXO Removal Report	1	$20,000.00	$20,000
Subtotal			$919,696
Design		5%	$45,985
Office Overhead		5%	$45,985
Field Overhead		15%	$137,954
Subtotal			$1,149,620
Profit		8%	$91,970
Contingency		25%	$287,405
Total			$1,528,994

Table 6. Costs for the Selected Remedy for Soil and Dry Sediment at Winklepeck Burning Grounds (continued)

Winklepeck Burning Grounds (WBG) Feasibility Study
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Alternative 2 - Chemical Contamination Removal Concurrent with MEC Removal
Cost Estimate

OPERATION AND MAINTENANCE				$155,942
Activity (unit)	Quantity	Unit Cost	Total Cost	Present Value*
Site Long-term O&M (Years 0-30)				
Site Inspection and Maintenance				
Site Inspection (years)	30	$720	$21,600	$9,655
Site Maintenance (years)	30	$1,000	$30,000	$13,409
CERCLA Reviews				
CERCLA 5-Year Reviews (event)	6	$7,400	$44,400	$15,968
Subtotal O&M			$96,000	$39,031
Design		4%	$3,840	$1,561
Office Overhead		5%	$4,800	$1,952
Field Overhead		15%	$14,400	$5,855
Subtotal			$119,040	$48,399
Profit		6%	$7,142	$2,904
Contingency		25%	$29,760	$12,100
Total			$155,942	$63,403

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost) $1,684,937

*Present value is the current worth of an amount to be received or a cost incurred in the future at an applied rate of interest (7% in this cost estimate).

CY = Cubic yard.
ea = Each.
ECHOS = Environmental Cost Handling Operations and Solutions.
FPM = Feet per minute.
FTE = Full-time equivalent.
hr(s) = Hour(s).
LF = linear foot.
LS = Lump sum.
MEC = munitions and explosives of concern.
mo = Month.
O&M = Operations and maintenance.
PAH = Polycyclic aromatic hydrocarbon.
PLM = Polarized light microscope.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
TCLP = Toxicity Characteristic Leaching Procedure.
UXO = Unexploded ordnance.
yr = Year.

12.4 EXPECTED OUTCOMES OF THE SELECTED REMEDY

The purpose of the remedial action at WBG is to reduce potential risks to a Range Maintenance Soldier posed by direct contact with soil contaminated with PAHs, RDX, and asbestos. Table 7 presents the expected outcomes of the selected remedy in terms of resulting land use and risk reduction achieved as a result of the response action. WBG will remain under government control with land use as a Mark 19 Grenade Machinegun Range administered by OHARNG. The remedial action will attain acceptable risk for the Range Maintenance Soldier who is subject to potential direct dermal contact with soil contaminated with RDX and PAHs or possible exposure to friable asbestos. The current low risks to ecological receptors will be further reduced by the removal of the contaminated soil. LUCs will be developed and implemented by the U. S. Army and OHARNG to deter unauthorized access and protect human receptors. Five-year reviews will be performed to ensure remedy protectiveness.

Table 7. Expected Outcome and Cleanup Goals for COCs for the Selected Remedy

Media: Soil.
Site Area: Winklepeck Burning Grounds.
Available Use of Land Upon Achieving Cleanup Goals: Restricted use as a small arms weapons range. Access will be limited only to personnel involved in required activities at the range.
Timeframe: Immediate upon completion of construction. Duration = indefinite.
Controls to Ensure Restricted Use: Land use controls, such as security, warning signs, and administrative controls.

Contaminant in Soil	Risk at Cleanup Level	Basis of Cleanup Level	Cleanup Level (mg/kg)
RDX	= or <1E-05	Risk Assessment	617
Benz(*a*)anthracene	= or <1E-05	Risk Assessment	75
Benzo(*a*)pyrene	= or <1E-05	Risk Assessment	7.5
Benzo(*b*)fluoranthene	= or <1E-05	Risk Assessment	75
Dibenz(*a*,*h*)anthracene	= or <1E-05	Risk Assessment	7.5
Indeno(1,2,3-*cd*)pyrene	= or <1E-05	Risk Assessment	75

COC = Chemical of concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

13.0 STATUTORY DETERMINATION

Based on the consideration of the requirements of CERCLA, the comparative analysis of alternative remedies, and public comments, U. S. Army and Ohio EPA believe the selected remedy for the WBG provides the best balance of trade-offs among the alternatives with respect to the criteria used to evaluate the remedies. The selected remedy is consistent with CERCLA and complies with NCP.

Protective of Human Health and Environment. The selected remedy is protective of human health and the environment. The contaminated soil will be removed to risk-based cleanup levels for the Range Maintenance Soldier land use. Various types of LUCs, such as fences, warning markers, safety training, and localized directives, will reduce the potential for exposure of future users to residual contamination by controlling the future use and activities on this military training site. The present low risks to ecological receptors will be further reduced by the removal of contaminated soil.

Compliance with ARARs. The selected remedy will be in compliance with ARARs. Action- and location-specific ARARs for the excavation and management of excavated soil will be implemented as

part of the remedial construction activities (e.g., BMPs for stormwater mitigation, waste staging, etc.). Excavated soil will be characterized in accordance with 40 *CFR* 262.11 [Ohio Administrative Code (OAC) 3745-52-11] to determine disposal requirements. Process knowledge and analytical results to date indicate that the contaminated soil at WBG is not hazardous; however, requirements (40 *CFR* 264.554) for placement of potentially hazardous remediation wastes in temporary staging piles may be potentially relevant and appropriate. Wastewater generated from equipment decontamination during the excavation of contaminated soil will be contained and characterized in accordance with 40 *CFR* 262.11 [OAC 3745-52-11(A)(B)(C)(D)] to determine disposal requirements. Table 4 presents the ARARs for the chemically contaminated soil to be remediated under the selected remedy.

Cost Effectiveness. The selected remedy is cost effective for the small quantities of contaminated soil and because MEC removal procedures need to be implemented with any soil excavation activities at WBG. This maximizes cost effectiveness of the alternative while attaining the same protectiveness as a separate soil removal action. The estimated present-value cost (in CY 2004 dollars) to complete the selected remedy is approximately $1,592,397.

Utilization of Permanent Solutions. The selected remedy is a permanent solution for contaminated soil at WBG under the future Range Maintenance Soldier land use. The contaminated soil will be removed to depths of 4 ft BGS as required to attain risk-based cleanup goals for a Range Maintenance Soldier who is subject to direct dermal contact with contaminated soil. In addition, low risks to ecological receptors will be further reduced. The long-term effectiveness of this remedy can be adequately and reliably addressed by LUCs, which prohibit unauthorized access and land use inconsistent with the purpose of military training, including unauthorized soil disturbance or excavation. Because soil may remain on-site at concentrations that do not allow for unrestricted land use, site reviews would be conducted once every 5 years to evaluate current and anticipated land use, as well as to ensure that LUCs remain effective. The selected remedy will be readily implementable and will be completed in a short timeframe. Short-term effects during construction will be managed by using engineering controls, personal protective equipment, air quality monitoring, erosion and sediment controls, and proper waste-handling practices.

Statutory Preference for Treatment as a Principal Element. The selected remedy does not satisfy the statutory preference for treatment as a principal element because treatment would not be cost effective for the relatively low concentrations of contaminants associated with small quantities of contaminated soil.

Five-Year Review. NCP 300.430(f)(4)(ii) requires a 5-year review if the remedial action results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Unrestricted land use will not be obtained by implementation of the selected remedy because contaminants in soil would remain at WBG above levels allowing for unrestricted use. The selected remedy will attain cleanup goals for the intended future Range Maintenance Soldier land use. Therefore, 5-year reviews pursuant to requirements of CERCLA are required as long as soil remains on-site above unrestricted cleanup goals. The 5-year reviews will evaluate data obtained from any monitoring associated with WBG and provide information on the presence and behavior of contaminants at the AOC. The reviews will also ensure that the engineering controls and LUCs retain their effectiveness.

14.0 DOCUMENTATION OF NO SIGNIFICANT CHANGE

The Proposed Plan for WBG was released for public comment on December 9, 2005. A public meeting was held on December 20, 2005. The public comment period ended on January 8, 2005. The Proposed Plan identified Alternative 2, Chemical Contamination Removal Concurrent with MEC

Removal Action—Excavation, Screen for Potential MEC, Composite Sampling, and Disposal, as the preferred alternative. No written comments were received during the public comment period; questions and verbal comments were addressed at the public meeting. No changes to the selected remedy were required as a result of the public comment process.

15.0 REFERENCES

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PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE U. S. ARMY PROPOSED PLAN FOR SOIL AND DRY SEDIMENT AT THE WINKLEPECK BURNING GROUNDS AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

1.0 OVERVIEW

On December 9, 2005, the U. S. Army released the *Proposed Plan for Winklepeck Burning Grounds, Ravenna Army Ammunition Plant* (USACE 2005b) for public comment. A notice of availability for the Proposed Plan was sent to all media outlets in accordance with the RVAAP Community Relations Plan (USACE 2003b). A 30-day public comment period was held between December 9, 2005, and January 8, 2006. The U. S. Army hosted a public meeting on December 20, 2005, at 5:00 pm to present the Proposed Plan and take questions and comments from the public for the record. The public meeting included presentation of the recommended alternative for soil and dry sediment at WBG.

For soil and dry sediment at WBG, the U. S. Army recommended "Chemical Contamination Removal Concurrent with MEC Removal" during the public meeting. Ohio EPA concurred with the recommendation of this alternative. Several oral comments were received at the public meeting and are addressed under Chapter 2.0 below.

Based on comments received, the community voiced few objections to the recommended alternative. The community comments were considered in the selection of the final remedy for WBG in this ROD.

2.0. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

Comments were received verbally during the public meeting. No written comments were received during the 30-day public comment period.

2.1 ORAL COMMENTS FROM PUBLIC MEETING

Oral comments received during the public meeting and addressed by personnel from the U. S. Army and Ohio EPA are listed below. Oral comments and responses are paraphrased, as required for brevity and presentation in this section. The transcript from the meeting was incorporated into the Administrative Record.

Comment: One commenter asked for clarification relative to the MEC screening process during soil removal and the misting of soil to prevent contaminants from getting into the air. The commenter asked how the soil would be misted during the screening, and if the misting procedure would get the soil too wet to conduct the MEC screening.

Response: Using misting to reduce dust generation, or fugitive dust, would be incorporated into the remedy as a health and safety engineering control. There would be an evaluation of the amount of water or misting required to minimize dust emissions without affecting sifting and the MEC removal operations.

Comment: A commenter inquired if equipment was going to be cleaned on-site, and if the soil removed from the equipment was going to be taken care of the same way that is proposed for the other (excavated) soil.

Response: Any equipment brought on-site to remove soil with chemical contaminants would be thoroughly decontaminated before it was removed from WBG. This decontamination practice is standard for remedial actions at RVAAP. Soil removed from equipment is disposed of in the same manner as excavated soil. Water or other fluids used for decontamination are contained in drums or tanks, tested, and disposal is arranged through a commercial disposal firm.

Comment: One commenter asked who establishes the cleanup goals.

Response: In general, the cleanup goals are established by the team through the risk assessment process. Mutual agreement is reached for a most likely land use for the AOC. From that land use, those users who may be most affected by the chemicals present are evaluated. The team risk assessors then evaluate what contaminant levels would need to be attained to ensure that those users are protected. These protective levels are the cleanup goals. This process is done through team consensus, subject to reviews by technical experts both within the Army and the Ohio EPA, and the decisions presented in the final reports.

Comment: One commenter asked if the goals are intended to get the land back to the level (of contamination) it might have been at if this activity (WBG operations) had not occurred, or if they allow more materials of concern left there than if the activity had never occurred.

Response: Cleanup goals depend on the particular land use situation. For WBG, the cleanup goals are specific to the Range Maintenance Soldier scenario and the planned use of the AOC as a target practice range. The WBG cleanup goals are not based on residential land use and will not restore the soil to residential standards. LUCs will be required to deter unauthorized access. Reviews of the final remedy will be performed every 5 years to ensure it remains protective and that land use and other key factors have not changed.

Comment: One commenter noted that it is mentioned in the proposal that some of the soil may be reused if it falls under the cleanup standards. The commenter asked what standards will be used when the soil is reused, and if the standard will be for the Maintenance Soldier that is on the range, or determined by the location or where the soil will be used.

Response: The answer to the first part of the comment is that the standards will be the cleanup goals for the Range Maintenance Soldier. The answer to the second part of the comment is that the soil will remain on WBG. The soil will not be moved off of the AOC to other parts of the installation. The cleanup standards apply within the WBG boundary (i.e., the future target practice range).

Comment: One commenter asked for clarification on the section in the report (page 5 of the report) that states “Total carcinogenic risk to a Range Maintenance Soldier from all COCs,” and then it says “indicating unacceptable risk.” Does that situation still exist after the removal, or is that pre-removal?

Response: The current risk, prior to the remediation, is unacceptable for the Range Maintenance Soldier. Once the soil is removed, then the exposure point concentrations are reduced and the risk would fall within the acceptable CERCLA risk range. That is the basis for the remedial alternative. In reality,

because the chemicals tend to be clustered in "hot spots," once the soil is removed as planned, the concentrations will actually fall well below the cleanup goals, so the risk will be well below the 1×10^{-5} risk criteria.

Comment: One commenter asked for clarification on the excellent (uncontaminated) condition of sediment in Sand Creek. How can contaminated sediment on top of the ground not run-off into this creek?

Response: The sediment and soil within WBG is fairly well vegetated, and the creek lies on the very southern boundary of WBG. Characterization efforts to this point in time have not shown any substantial contaminants within the sediment of Sand Creek or within the surface water. This interpretation is based on the 2003 Installation-Wide Surface Water investigation. The surface water, sediment, fish, and bugs were examined, and the surface water conditions in all of the drainage basins across the installation are really excellent and, for the most part, meet or exceed water quality standards.

Comment: One commenter asked if they ever checked any of the animals, beavers, that sort of thing.

Response: Tissue samples have not been collected from animals along Sand Creek. With regard to the actual remedial alternative, run-off from excavated and stockpiled soil will be managed using engineering controls to prevent any erosion and run-off into surface water. Under the preferred alternative, if a soil pile is generated, appropriate silt fencing and plastic covering of the soil will be used to reduce run-off of contaminated water and sediment away from the stockpile.

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