FINAL

Proposed Plan

Bains Gap Road Ranges

Fort McClellan

Calhoun County, Alabama

May 2013

Task Order CK10
Contract Number DACA21-96-D-0018

Shaw Environmental, Inc.
(A CB&I Company)

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SHAW-MC-CK10-1301
Project No. 796887

Mr. Robert Beacham
U.S. Army Corps of Engineers, Mobile District
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109 St. Joseph Street
Mobile, Alabama 36602

Contract: **DACA21-96-D-0018, Task Order CK10**
Fort McClellan, Alabama

Subject: **Final Proposed Plan for the Bains Gap Road Ranges**

Dear Mr. Beacham:

An electronic (PDF) copy of the subject document is provided on compact disc for your records. The Proposed Plan was revised based on comments received from the Alabama Department of Environmental Management (ADEM) on the draft document. Responses to ADEM comments are included in Attachment 1 of the subject document. Upon completion of your review to ensure that the comments were adequately addressed, please provide a letter of concurrence on this submittal.

At the Army's request, I have distributed copies of this document according to the distribution listed below. If you have any questions or need additional information, please feel free to contact me as indicated below.

Sincerely,

J. Troy Winton

J. Troy Winton, PMP
Project Manager
Shaw Environmental, Inc. (A CB&I Company)

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Enclosure

Distribution: Lisa Holstein, Army TF (3 hardcopies; 2 CDs)
Brandi Little, ADEM (2 hardcopies; 1 CD)
Sarah Clardy, USFWS (1 hardcopy; 1 CD)

FINAL PROPOSED PLAN
BAINS GAP ROAD RANGES
FORT MCCLELLAN, CALHOUN COUNTY, ALABAMA
MAY 2013

1.0 ARMY ANNOUNCES PROPOSED PLAN

This Proposed Plan (PP) identifies the Preferred Alternative for the Bains Gap Road (BGR) Ranges, located at the former Fort McClellan (FTMC) in Calhoun County, Alabama. The BGR Ranges are located in the central-eastern portion of the former FTMC Main Post (see figure on page 2). This PP identifies the preferred remedial alternative for addressing soil and sediment contamination present at the site. The soil and sediment at the site are contaminated with metals (particularly lead, antimony, copper, and zinc) related to the historical use of the ranges for small arms training and skeet shooting. Small arms include pistol and rifle calibers of .50 caliber and less and shotguns used for skeet shooting. Bullets, bullet fragments, and lead shot are clearly visible on the surface in range target areas and in the stream beds of Cane Creek and its tributaries.

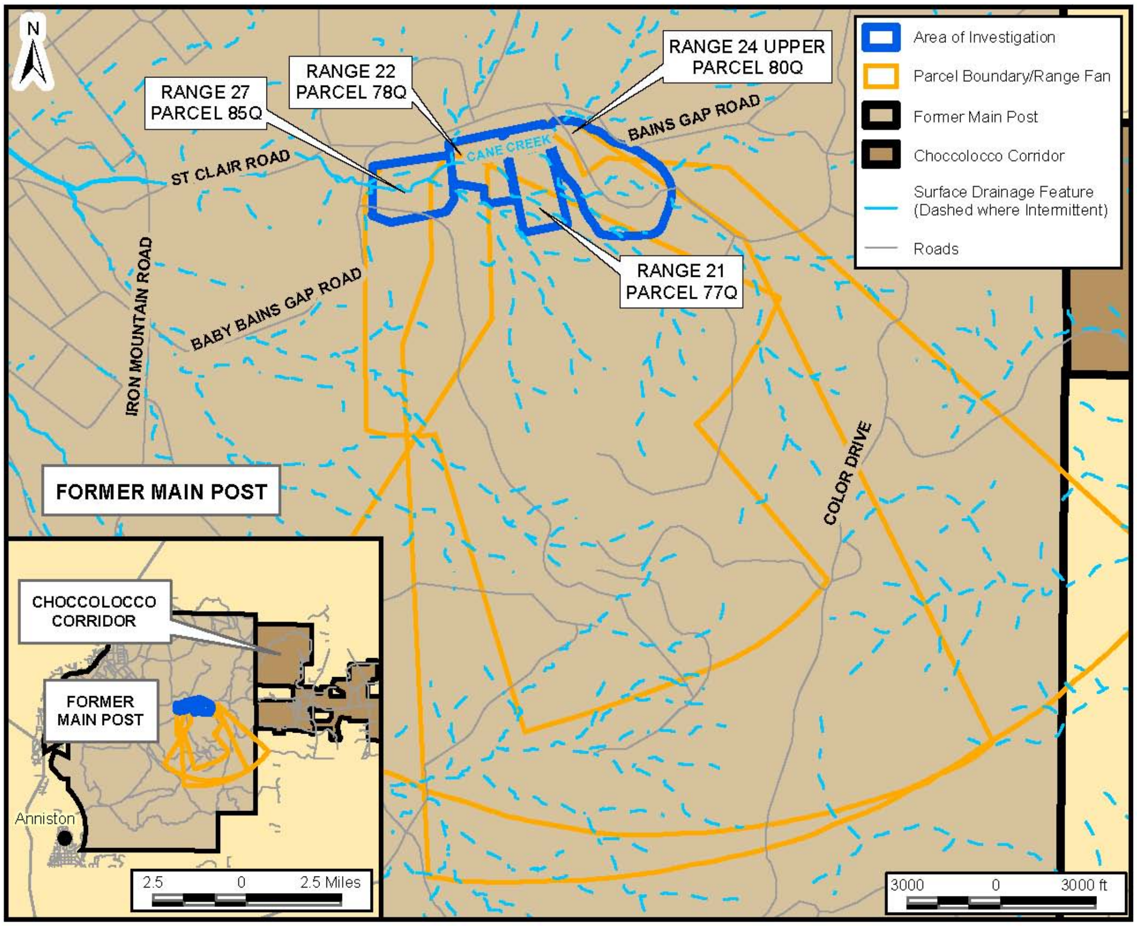
> **Preferred Alternative:** To address the soil and sediment contamination at the BGR Ranges, the U.S. Army, ADEM, and USFWS recommend **Alternative 3b – Stream Diversion, Excavation of Soil/Sediment, Land-Use Controls, On-Site Stabilization, and Off-Site Disposal**.

The public is invited to participate in the decision-making process for this site by reviewing and commenting on the remedial alternatives presented in this PP (see Section 10.0, *Community Participation*). Following the public comment period and the Army's response to public comment, the Army will make the final remedial decision in consultation with the Alabama Department of Environmental Management (ADEM) and the U.S. Fish and Wildlife Service (USFWS).

The environmental characterization performed at this site supports this action (see Section 4.0, *Site Characteristics*). The PP documents that the current site conditions pose a risk to potential site receptors and that a remedial action is necessary (see Section 5.0, *Analysis of Site Risks*). A remedial action objective (RAO) was developed to protect human health and ecological receptors from the contaminated soil and sediment at the site (see Section 6.0, *Remedial Action Objectives*). The alternatives initially screened and further evaluated in a Focused Feasibility Study (FFS) are summarized in this PP (see Section 7.0, *Summary of Remedial Alternatives*). The alternatives were evaluated against specific criteria and against each other to select a Preferred Alternative (see Section 8.0, *Evaluation of Alternatives*). The Preferred Alternative is protective of human health and ecological receptors and complies with applicable requirements (see Section 9.0, *Summary of the Preferred Alternative*). Once the action is taken at the BGR Ranges, the site will be suitable for its continued use as a wildlife refuge area managed by the USFWS. The general public uses the wildlife refuge area for recreational purposes.

This document has been prepared in accordance with *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Documents*. This PP is issued by the Army, the lead agency for the site activities; by ADEM, the regulatory agency providing oversight of the Army's cleanup program at FTMC; and the USFWS, who manages the wildlife refuge area. This PP summarizes information presented in detail in the documents that are part of the Administrative Record for this site. Paper and/or electronic copies of documents in the Administrative Record for this site are provided at the following locations:

> **PUBLIC COMMENT PERIOD:**
>
> **July 1, 2013 to July 30, 2013**
>
> The Army will hold a public comment period to encourage the public to review & comment on the Proposed Plan (see Section 10.0 for more info).
>
> **Administrative Record - Web Access Only:**
> **Public Library of Anniston-Calhoun County**
> 108th East 10th Street
> Anniston, Alabama 36201
> Telephone: (256) 237-8501, extension 13
> (A shortcut to access the website is provided on the desktop of all computers in the library)
> www.mcclellan.army.mil/AdminRec.asp
>
> **Administrative Record - Paper Copy:**
> **Gadsden State Community College**
> **McClellan Center Library**
> 100A Gamecock Drive (Room 1153)
> Anniston, Alabama 36205
> Telephone: (256) 238-9352



2.0 SCOPE AND ROLE OF ACTION

The U.S. Department of Defense (DOD) Environmental Restoration Program at FTMC follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) processes, consistent with the Defense Environmental Restoration Program guidance. The BGR Ranges are located within the former FTMC, an inactive Army installation that was closed by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which DOD installations would be closed or realigned. Under the BRAC Environmental Restoration Program, federal properties were identified for investigation and cleanup prior to transfer. Consequently, the Army is conducting environmental studies and cleanup of contaminants at parcels at the former FTMC. The former FTMC is not a National Priorities List site. However, the BRAC Environmental Restoration program at FTMC follows the CERCLA process. The cleanup at the BGR Ranges represents the U.S. Army's compliance with both BRAC and CERCLA requirements.

This PP is being issued for public review, comment, and participation to fulfill part of the Army's public participation responsibilities under Section 117(a), 113(k)(2)(B), and 121(f)(1)(G) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, and under Section 300.430(f)(2) of the NCP.

3.0 SITE BACKGROUND

The BGR Ranges consist of a series of former weapons firing ranges located adjacent to one another immediately south of Bains Gap Road in the central-eastern portion of the former FTMC Main Post. The BGR Ranges consist of the following historical ranges/parcels: Range 24 Upper, Parcel 80Q; Range 21, Parcel 77Q; Range 22, Parcel 78Q and Former Mortar Range (Firing Line), Parcel 109Q; and Range 27, Parcel 85Q.

PRIMARY BACKGROUND DOCUMENTS FOR THE BAINS GAP ROAD RANGES

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland.

IT Corporation, 2002, ***Site Investigation, Report Artillery and Mortar Impact Areas South of Bains Gap Road, Parcels 138Q-X, 139Q-X, 140Q-X, 141Q-X, and 142Q-X, Fort McClellan, Calhoun County, Alabama,*** May.

Shaw Environmental, Inc. (Shaw), 2009, ***Remedial Investigation Report, Bains Gap Road Ranges, Range 24 Upper, Parcel 80Q; Range 21, Parcel 77Q; Range 22, Parcel 78Q and Former Mortar Range, Parcel 109Q; and Range 27, Parcel 85Q, Fort McClellan, Calhoun County, Alabama***, Final, April.

Shaw Environmental, Inc. (Shaw), 2010, ***Identification of Risk-Based Remedial Goals, Iron Mountain Road and Bains Gap Road Ranges, Fort McClellan, Calhoun County, Alabama***, Final-Revision 2, April.

Shaw Environmental, Inc. (Shaw), 2013, ***Focused Feasibility Study, Bains Gap Road Ranges, Range 24 Upper, Parcel 80Q; Range 21, Parcel 77Q; Range 22, Parcel 78Q and Former Mortar Range, Parcel 109Q; and Range 27, Parcel 85Q, Fort McClellan, Calhoun County, Alabama***, Final, January.

TetraTech EC, Inc., 2011, ***Site Specific Final Report, Remedial Action at Selected Sites within Charlie Area at Fort McClellan, Alabama***, March.

U.S. Army Corps of Engineers (USACE), 2001, ***Archives Search Report, Maps, Fort McClellan, Anniston, Alabama***, Revision 1, September.

The Archives Search Report (U.S. Army Corps of Engineers [USACE], 2001) and the Environmental Baseline Survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998) summarize much of what is known about these ranges. Each of these ranges had a direction of fire to the south, away from Bains Gap Road and towards the natural hillsides south of Cane Creek. The target impact areas were mainly these north-facing hillsides.

Range 24 Upper, Parcel 80Q

Range 24 Upper is a densely wooded area located immediately south of Bains Gap Road. An unimproved road connects this area to Bains Gap Road east of the parcel and a second unimproved road on the southwest side of the parcel connects Range 24 Upper to the area east of Range 21. Site drainage is to the west along two ditches that join west of the parcel near Range 21.

Range 24 Upper was constructed between 1983 and 1989 and deactivated in 1990. Weapons fired at this range consisted of M-16 rifles with tracers (white phosphorus) and flares. The direction of fire was to the south-southeast. The study area covers about 11 acres and does not have a defined safety fan. The site has few remaining distinguishing features or intact structures. Barren areas present were small impact zones (soil mounds) with pop-up targets similar to those found on other FTMC ranges. Some of these areas have been disturbed and graded, and limited evidence of the impact mounds, pop-up targets, or foxholes remains. Bullet fragments have been found in these areas.

In addition to the small-arms training, an 81-millimeter (mm) mortar range (listed as old Range 28) covered the area of Range 24 Upper (USACE, 2001). The firing point for this mortar range appears to have been just south of Bains Gap Road. The impact area was located south-southeast toward the hills beyond. The mortar range was abandoned in 1967 (USACE, 2001).

Range 21, Parcel 77Q

Range 21 is a flat open area with a grass covering. Wooded areas are located east and south of the site. Five target lines were used at the range: 25, 50, 75, 175, and 300 meters. The single firing line and the target lines are all located within the flat open area. This site lacks a definitive soil berm downrange that would usually form a target berm. The area between Cane Creek and the 175-meter target line has eroded. Bullet fragments have been observed on the ground surface of the range. The concrete structures that were used to store and present pop-up targets during training exercises have been removed. Site access is via a gravel road that connects the firing line area to Bains Gap Road.

Range 21 was used from 1951 through installation closure in 1999. Weapons fired at this range consisted of M-16 rifles (5.56 mm) with tracers. The EBS indicates that white phosphorus was used as the tracer material for M-16 training at some of the BGR Ranges. Unspecified small arms were also used at this range prior to the M-16 (ESE, 1998). The study area consisted of an approximately

25-acre area that included the firing line, range floor, and target area.

Range 22, Parcel 78Q and Former Mortar Range (Firing Line), Parcel 109Q

Range 22 and the Former Mortar Range (Firing Line) are located on a flat, open area with a rocky soil berm that forms the main impact zone. On the eastern portion of the range, the berm height is reduced and the impact zone extends into the wooded area south of the target line. Cane Creek flows to the west along the base of the berm. Soil erosion into the creek is evident along the berm. No structures are present at the site. Access to the site is via a gravel road that connects the firing line area to Bains Gap Road.

Range 22 was a rifle range used from 1961 through installation closure in 1999. Weapons fired at this range consisted of M-16 rifles (5.56 mm) with tracers. Range 22 had a single firing line and a single target line at 25 meters. Parcel 109Q is a 1.5-acre parcel located within the Range 22 area. This parcel is the firing line area for a historical mortar range (dates of operation unknown) where 81-mm and 60-mm mortars may have been fired (ESE, 1998).

Probable impact zones for this range are located south of Range 24 Upper and have been investigated and reported separately in the *Site Investigation Report, Artillery and Mortar Impact Areas South of Bains Gap Road* (IT Corporation, 2002). The study area for this portion of the BGR Ranges was approximately 18 acres, which encompassed the firing line, range floor, and target area.

Range 27, Parcel 85Q

Range 27 was referred to as the Special Operations Range. This range was historically subdivided into four main areas: Range 27A - Shooting House; Range 27B - Live Fire and Maneuver Close Quarters Battle Range; Range 27C - Stress Pistol and Shotgun Range; and Range 27D - Pistol and Submachine Gun Qualification Range. Cane Creek flows to the west across the entire width of this study area; two tributaries merge with Cane Creek in the western portion of the area. Access to the site is provided by a gravel road that connects the firing line areas of Ranges 27B and 27C to Bains Gap Road.

Conflicting information exists regarding the site history of Range 27. The Archives Search Report indicates that the range was built after World War II, and it appears on the 1958 Range Map as Close Combat 1 and 2 (USACE, 2001). The EBS indicates that the range was "in use from 1976 through the present" and that weapons fired at this range consisted of M-16 rifles (5.56 mm) between 1983 and 1989; and 9mm pistol, 12-gauge shotgun, and .45-caliber pistol and machine gun "from 1989 to present" (ESE, 1998). The study area for Range 27 was approximately 26 acres and encompassed the firing line, range floor, and target area.

Range 27A, the Shooting House, was constructed of stacks of tires that were staked upright using 4-by-4-inch wood posts and filled with sand to simulate the walls of rooms. The "house" had a gravel floor and no roof. The Army used the shooting house for live-fire training exercises. Wooden doors and interior divider walls in the structure sustained heavy damage from training, and bullets could be found in the tires and wood. Demolition, removal, and off-site disposal of the shooting house were performed in 2009 (Tetra Tech EC, Inc., 2011).

Range 27B consists of a flat, open area between two soil berms that lie roughly perpendicular to Bains Gap Road. Range 27C is a large, flat, open area separated from Range 27B on the east and Range 27D on the west by perpendicular soil berms. This area may have once contained a rappelling tower and obstacle course. No structures currently remain. Range 27D is a narrow area in the far western portion of Range 27. Numerous bullets and fragments are present along the base of an unnamed hill to the south and in Cane Creek.

Site investigation (SI) and remedial investigation (RI) activities were conducted at the site and documented in the RI report (Shaw Environmental, Inc. [Shaw], 2009). These investigations included sampling of all potentially affected environmental media at the site, including surface and subsurface soil, sediment and surface water, and groundwater. The RI determined the nature and extent of environmental contamination resulting from historical military activities and waste disposal activities at the site. The results of these investigations are discussed in greater detail in Section 4.0.

4.0 SITE CHARACTERISTICS

The BGR Ranges lie directly south of Bains Gap Road in the central-eastern section of the former FTMC Main Post. Marcheta Hill to the southeast and Reeves Hill to the south form natural backstops that enclose the BGR Ranges on the floor of a shallow valley. The BGR Ranges are located within the Mountain Longleaf National Wildlife Refuge managed by the USFWS. The headwaters of Cane Creek are located in this valley. Several small tributary streams flow from the surrounding hillsides, meet in this area, then flow westerly towards the developed portion of the former FTMC.

Elevations range from about 975 to 1,050 feet above mean sea level (amsl) at Range 24 Upper, 900 to 960 feet amsl at Range 21, 900 to 975 feet amsl at Range 22, and about 875 to 1,000 feet amsl at Range 27. The ground surface across the portion of the ranges between the firing line and the target berms is generally flat, with a gradual slope to the north-northwest towards Bains Gap Road.

The BGR Ranges are located along an east-west-trending valley formed by Cane Creek and three unnamed headwater tributaries within the North Fork Cane Creek Watershed. Surface runoff from the BGR Ranges discharges into the two southern tributaries and Cane Creek. Cane Creek flows to the west and exits the former Main Post near Baltzell Gate.

One spring (named the Reeves-Truitt spring) is located immediately south of Bains Gap Road between Range 22 and Range 27. A groundwater elevation map was constructed for the residuum water-bearing zone using 2002 water level data. The horizontal groundwater flow across the area of investigation is generally to the west.

The soils mapped within the area of investigation for the BGR Ranges are gravelly and stony loam, gravelly fine sandy loam, stony fine sandy loam, and rough land sandstone. The rough land sandstone underlies the majority of the area of investigation, with only the northern portion of the area of investigation underlain by gravelly and stony fine sandy loam and the extreme southwestern portion of the area of investigation underlain by gravelly and stony fine sandy loam. Stony rough land sandstone is a land type that is found in rough, steep areas with many outcrops of sandstone or quartzite bedrock, loose rock fragments, and scattered patches of sandy soil material. The soil materials found in these areas are generally thin. The runoff is high, the infiltration is slow, and the capacity for available moisture is low.

In general, the residuum at the BGR Ranges predominantly consists of light brown to reddish-brown gravelly sand and clay from ground surface to approximately 5 to 20 feet below ground surface (bgs). Below this gravelly sand and clay exists a dark reddish-brown to purple clay residuum with varying amounts of silts, sand, and gravel to the total depth of the borings (i.e., up to 100 feet bgs). The cobbles and gravel typically consist of quartz sandstone and quartzite with occasional chert observed in the western portion of Range 27. Bedrock was not encountered during drilling activities. The soil and residuum encountered are consistent with the gravelly fine sandy loam, stony fine sandy loam, and the Stony rough land sandstone. Further east at Range 24 Upper, bedrock or auger refusal was encountered during the SI. The lithology encountered consisted of sandstone, quartz-rich gravel, and some occasional weathered mudstone or weathered shale.

The majority of the BGR Ranges RI study area is not located within any special interest natural areas (SINA), defined as locations where habitat fosters one or more rare, threatened, or endangered species. However, the southern portion of Range 21 and Range 24 Upper (and the southeastern corner of Range 22) fall within the northernmost reaches of the Marcheta Hill Orchid Seep SINA. This SINA is the largest forested wetland seepage on the installation and contains the White fringeless orchid (*Plantanthera integrilabia*). The orchid is a candidate for inclusion on the federal threatened and endangered species list. In addition, the Cane Creek stream corridor has been designated as providing "low quality" foraging habitat for the federally endangered Gray bat (*Myotis grisescens*).

SI/RI field activities at the site were performed in several stages beginning in June 2002 and concluding in February 2008. The investigative fieldwork consisted of the collection and analysis of 191 surface and depositional soil samples, 73 subsurface soil samples, 21 groundwater samples, 45 surface water and sediment samples, and one seep sample. In addition, 18 monitoring wells were installed. Forty x-ray fluorescence soil screening samples were also collected within the range safety fans associated with the BGR Ranges.

The results of the SI/RI are reported in the final RI report (Shaw, 2009). The nature and extent of contamination at the site was assessed by comparing the analytical data to human health site-specific screening levels (SSSL) and ecological screening values (ESV) developed for FTMC.

Surface Soil. A total of 191 surface and depositional soil samples were collected for chemical analysis at the site. Surface and

What are the "Chemicals of Concern" at the Bains Gap Road Ranges?

The BGR Ranges were used for small arms firing and training, including skeet shooting. Bullets and bullet fragments are present in great quantity on the surface of many of the target impact areas. Small-arms ammunition is known to contain **lead** and other metals (including **antimony**, **copper**, and **zinc**). These metals were detected in soil, sediment, and surface water at concentrations above naturally occurring background levels and risk-based criteria. The RI identified **lead** as the chemical of concern in soil that poses the greatest risk to human health. **Lead** and the other metals detected above risk-based criteria (**antimony**, **copper** and **zinc**) also pose risks to ecological receptors.

depositional soil samples were collected from the uppermost foot of soil. Samples were collected for lead analysis only at 109 surface and depositional locations, and 82 additional locations included target analyte list metals analysis (which included lead). In addition, 40 surface soil samples were collected within the BGR Ranges safety fans for lead analysis using hand-held portable x-ray fluorescence technology.

All 191 samples contained detectable concentrations of lead, ranging from 3.9 to 114,000 milligrams per kilogram (mg/kg). Other than lead, eight metals exceeded their respective background concentrations and human health SSSLs: aluminum, antimony, arsenic, chromium, copper, iron, manganese, and zinc. Thirteen metals were detected at concentrations exceeding background concentrations and ESVs: aluminum, antimony, arsenic, barium, beryllium, chromium, copper, iron, manganese, mercury, selenium, silver, and zinc.

In addition, 51 surface and depositional soil samples were analyzed for volatile organic compounds (VOC) and semivolatile organic compounds (SVOC), which included polynuclear aromatic hydrocarbons (PAH). Nineteen SVOCs, including 13 PAH compounds, and one nitroaromatic explosive were detected in samples collected at Ranges 21 and 22. Benzo(a)pyrene results in two samples exceeded the SSSL, but both samples were located near the asphalt driveway for the range. Further, four SVOCs exceeded ESVs. All other SVOC results were below SSSLs and ESVs.

A total of 29 surface and depositional soil samples were analyzed for chlorinated pesticides and polychlorinated biphenyls (PCB). A total of 26 surface and depositional soil samples were analyzed for organophosphorus pesticides, chlorinated herbicides, and explosive compounds. Detected concentrations of PCBs, pesticides, herbicides, and explosive compounds were most often low estimated results that were below the SSSLs or ESVs or both. Five surface and depositional soil samples were analyzed for perchlorate and cyanide; however, these compounds were not detected.

Subsurface Soil. A total of 73 subsurface soil samples (depths greater than 1 foot bgs) were collected from 58 soil borings at the site. Thirty subsurface soil samples were analyzed for lead only, and another 43 samples were analyzed for target analyte list metals. A total of 72 samples contained detectable levels of lead, ranging in concentration from less than 1 mg/kg to 43,100 mg/kg. The highest concentrations of lead were generally found in target impact areas located along the hillside south of the firing lines. The depth of lead contamination in soil is generally limited to the upper 1 to 3 feet, although it may extend a few feet deeper in isolated portions of the target line areas and the hillside impact areas.

Other than lead, six metals exceeded their respective background concentrations and human health SSSLs: aluminum, antimony, arsenic, chromium, iron, and vanadium.

Eleven subsurface soil samples were analyzed for VOCs and SVOCs. All results were below SSSLs. A total of 15 SVOCs, including 13 PAHs, were detected in three samples from two locations at Range 21. However, all SVOC concentrations were below SSSLs, except for benzo(a)pyrene (0.12 mg/kg), which exceeded its SSSL at one location.

Three subsurface soil samples were analyzed for chlorinated pesticides, organophosphorus pesticides, chlorinated herbicides, and PCBs. One chlorinated pesticide and one chlorinated herbicide were detected at concentrations below SSSLs. No PCBs or organophosphorus pesticides were detected in the samples. Seventeen subsurface soil samples were analyzed for explosives. No explosives were detected in the samples.

Groundwater. A total of 21 groundwater samples were collected from monitoring wells installed at the BGR Ranges. A total of 17 metals were detected in the samples, but only aluminum, barium, iron, manganese, and thallium exceeded their respective background screening values and SSSLs.

Eleven groundwater samples were analyzed for VOCs, SVOCs, and perchlorate. Six VOCs were detected in the samples, but all results were below SSSLs. SVOC compounds and perchlorate were not detected in the samples. All of the groundwater samples were analyzed for explosive compounds. A total of four compounds were initially detected: 2,4-dinitrotoluene (DNT), 2-amino-4,6-DNT, 2-nitrotoluene, and 4-amino-2,6-DNT. To confirm the presence of explosives in groundwater at the BGR Ranges, three existing wells and one newly installed well were resampled. Explosive compounds were not detected in these samples.

Surface Water. A total of 45 unfiltered surface water samples, including 10 samples collected as part of a baseline ecological risk assessment (BERA), were collected from 30 locations for chemical analysis at the BGR Ranges. Lead was detected in 34 of the 45 unfiltered surface water samples at concentrations ranging from 0.0019 to 1.6 milligrams per liter. The samples exceeded the background screening value and the ESV in 29 samples and the SSSL in 25 samples. The data indicated increasing concentrations in Cane Creek and its tributaries in the BGR Ranges as the samples were collected east to west. This surface water data trend is also reflected in the sediment sample locations, with the highest lead concentrations in surface water corresponding to the highest lead concentrations in sediment locations.

In addition to lead, 18 other metals were detected in surface water samples collected at the BGR Ranges. The thallium concentrations exceeded its background screening value and SSSL at two sample locations. Four metals were detected at concentrations exceeding background screening values and ESVs: beryllium (only 1 result), copper (15 results), sodium (only 1 result), and thallium (2 results).

SVOCs, organophosphorous pesticides, herbicides, PCBs, perchlorate, and cyanide were not detected in the surface water samples. Two VOCs, one chlorinated pesticide, and one nitroaromatic compound were detected at concentrations below SSSLs and ESVs (where available).

Sediment. A total of 45 sediment samples, including 10 samples collected for the BERA, were collected from 30 locations at the BGR Ranges. Lead was detected in all 45 sediment samples at concentrations ranging from 8.75 to 3,280 mg/kg. The highest lead concentration in sediment was found at Range 22. Nineteen lead results exceeded the background screening value and SSSL, and 36 lead results exceeded the background screening value and ESV. Lead-contaminated sediments are associated with all of the BGR Ranges, but the highest concentrations are present at Ranges 21, 22, and 27.

In addition to lead, 21 other metals were detected in sediment samples collected at the BGR Ranges. These metals results were all below SSSLs; however, two metals exceeded background screening values and ESVs: antimony and copper. Organophosphorous pesticides, PCBs, perchlorate, and cyanide were not detected in the sediment samples. A total of three VOCs (acetone, 2-butanone, and trichlorofluoromethane) were detected at concentrations above ESVs. Two chlorinated pesticides (heptachlor and heptachlor epoxide) and one nitroaromatic compound (2,4-DNT) exceeded ESVs.

Seep Water. One seep water sample was collected from the Reeves-Truitt Spring located south of Bains Gap Road, between Range 22 and Range 27. Seven metals were detected at concentrations above their respective background screening values but below SSSLs in the seep water sample: aluminum, barium, calcium, iron, magnesium, manganese, and sodium. Aluminum and barium exceeded their respective ESVs but were below their background values. The seep sample did not have detectable concentrations of VOCs, SVOCs, pesticides, or herbicides.

5.0 ANALYSIS OF SITE RISKS

A streamlined human health risk assessment (SRA) and BERA were performed as part of the RI for the BGR Ranges (Shaw, 2009; 2010). These risk assessments were prepared to characterize the potential risks to human and ecological receptors associated with exposure to contaminants on the site. The results of the SRA and BERA are summarized in the following paragraphs.

Human Health Risk Assessment. The SRA was performed to determine the potential threat to human health from exposure to environmental media at the site. The following receptor scenarios were evaluated in the SRA: recreational site user, groundskeeper, construction worker, and on-site resident. Because the site is located within a wildlife refuge area, the recreational site user is the most relevant receptor scenario. The groundskeeper and construction worker are also relevant receptor scenarios should any facilities (e.g., ranger stations, trails, offices) be erected and maintained on the site. A hypothetical on-site resident was included in the SRA to provide a conservative basis for the evaluation of potential site risks and for the additional perspective it provides for risk managers.

The SRA concluded that lead in soil was the only chemical of concern (COC) at the site. Lead concentrations pose a potential risk to the groundskeeper, construction worker, and on-site resident but not the recreational site user. The FFS identified a remediation goal (RG) of 400 mg/kg for lead in soil to protect the on-site resident (based on unrestricted reuse without land-use controls [LUC]). The FFS identified an RG of 800 mg/kg for lead in soil to protect human health in an industrial scenario (i.e., groundskeeper and construction worker) (Shaw, 2013).

Selection of Remedial Goals for Lead in Soil		
Media	**RG (mg/kg)**	**Basis for Selection**
Soil	400	ADEM Preliminary Screening Value and U.S. Environmental Protection Agency Regional Screening Level for residential soil
Soil	800	ADEM Preliminary Screening Value and U.S. Environmental Protection Agency Regional Screening Level for commercial/industrial soil

Ecological Risk Assessment. A BERA was performed to evaluate potential risks to ecological receptors from exposure to site media. The BERA identified four munitions-related constituents (antimony, copper, lead, and zinc) as chemicals of potential ecological concern (COPEC) in surface soil at the site. Copper and lead were identified as COPECs in surface water and sediment at the site.

Ecological risk-based remediation goals (Eco-RBRG) have been developed for FTMC (Shaw, 2010). The recommended Eco-RBRGs for COPECs in soil at the site are:

Recommended Eco-RBRGs for Soil	
COPEC	**Concentration (mg/kg)**
Lead	500
Antimony	18
Copper	334
Zinc	100

The recommended Eco-RBRGs for COPECs in sediment and in surface water are:

Recommended Eco-RBRGs for Sediment and Surface Water		
COPEC	**Sediment (mg/kg)**	**Surface Water (mg/L)**
Lead	68	0.0179
Copper	69	0.0211

It was determined in the FFS that the Eco-RBRG for lead in sediment (i.e., 68 mg/kg) will only apply to the portions of Cane Creek that flow perennially. The Eco-RBRG for lead in surface soil (i.e., 500 mg/kg) will apply to the nonsaturated portions of Cane Creek (and its tributaries) because these intermittent drainages contain material that is more appropriately considered surface soil than sediment.

Based on the risks identified in the RI and the current and projected future land use at the site, the minimum RG for lead in surface soil at the site would be the Eco-RBRG of 500 mg/kg (Shaw, 2010). This RG is below the industrial cleanup level of 800 mg/kg and, therefore, is also protective of human health in an industrial reuse scenario (e.g., groundskeeping or construction). Exposures to subsurface soil (i.e., greater than 1 foot deep) by ecological receptors are not considered complete exposure pathways. Therefore, the RG for lead in subsurface soil was selected as 800 mg/kg, based on protection of human health under an industrial land use scenario.

Risk Summary. The SRA concluded that lead is the only COC and that exposure to site surface soil presents an unacceptable risk to potential human receptors in both industrial (groundskeeper, construction worker) and residential reuse scenarios.

The BERA concluded that lead, antimony, copper, and zinc in surface soil and lead and copper in surface water and sediment have the potential to pose adverse effects to sensitive ecological receptors.

It is the Army's current judgment that the Preferred Alternative identified in this PP or one of the other active measures considered in the PP is necessary to protect human health and the environment at the BGR Ranges. These measures are necessary because soil and sediment at the site are contaminated with lead and other metals associated with small arms firing.

6.0 REMEDIAL ACTION OBJECTIVES

The primary RAO for the BGR Ranges is to minimize the potential risks to human health and ecological receptors associated with metals-contaminated soil and sediment. A secondary RAO is to eliminate the potential for these metals to migrate from the soil/sediment to surface water and possibly groundwater. These RAOs can be achieved by reducing the potential for soil exposure (e.g., through the use of LUCs) and/or reducing the contaminant concentrations to specified RGs through an active remedial approach (e.g., stream diversion, soil/sediment excavation, stabilization, and disposal). The RGs are protective of human and ecological receptors and comply with federal and state applicable or relevant and appropriate requirements (ARAR).

Remedial Goals for Lead in Soil

Media	RG (mg/kg)	Basis for Selection
Surface Soil	500	Eco-RBRG (also protective of human health in an industrial use scenario)
Sub-surface Soil	800	ADEM Preliminary Screening Value and U.S. Environmental Protection Agency Regional Screening Level for commercial/industrial soil

7.0 SUMMARY OF REMEDIAL ALTERNATIVES

A technology screening was performed in the FFS to evaluate a number of remedial technologies and process options that are potentially applicable to the treatment of the contaminated soil/sediment at the BGR Ranges (Shaw, 2013).

Based on the technology screening, the following six remedial alternatives were selected for detailed analysis:

- Alternative 1 – No Action
- Alternative 2 – Stream Diversion, Excavation, LUCs, and Off-Site Treatment and Disposal
- Alternative 3a – Stream Diversion, Excavation, On-Site Stabilization, and Off-Site Disposal (Unrestricted Reuse Option)
- Alternative 3b – Stream Diversion, Excavation, LUCs, On-Site Stabilization, and Off-Site Disposal
- Alternative 4 – Stream Diversion, Excavation, LUCs, On-Site Soil Washing/Stabilization, and Off-Site Disposal
- Alternative 5 – Stream Diversion, Excavation, LUCs, On-Site Soil Washing, Phytoremediation, and Off-Site Disposal.

7.1 Alternative 1: No Action

Estimated Capital Cost: $0
Estimated Annual Present Worth Operations and Maintenance (O&M) Cost: $0
Estimated Present Worth Cost: $0

CERCLA regulations require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, no action would be taken at the site to prevent human or ecological exposure to soil or sediment contamination.

7.2 Alternative 2: Stream Diversion, Excavation, LUCs, and Off-Site Treatment and Disposal

Estimated Capital Cost: $27,690,360
Estimated Annual Present Worth O&M Cost: $130,378
Contingency (10 percent): $2,782,070
Estimated Present Worth Cost: $30,603,000
Estimated Time to Achieve RAOs: 11 months
Estimated Alternative Duration: 30 years

Stream Diversion, Excavation of Soil/ Sediment, and Off-Site Disposal. This alternative involves the excavation of soil and sediment from areas where the concentrations of lead exceed 500 mg/kg in surface soil and exceed the industrial soil RG of 800 mg/kg in subsurface soil. Concentrations of lead in sediment greater than the Eco-RBRG of 68 mg/kg would be removed. Following excavation, contaminated soil and sediment would be transported to an appropriately licensed off-site facility for disposal. Excavation would proceed until confirmatory analysis determined that all soil/sediment with concentrations of COCs above their respective RGs were removed. Excavation would be accomplished using conventional earthmoving equipment (e.g., wheeled loaders and bulldozers). Some clearing of wooded areas would be required prior to excavation. Subsurface soil would generally require excavation to a depth of 1 to 3 feet (although in isolated areas, the contamination may extend slightly deeper).

Excavation of stream sediment would be performed for the perennial stream sections where lead concentrations in sediments exceeded the remedial goal option of 68 mg/kg. The total estimated length of perennial stream sections requiring remediation is approximately 1,400 linear feet. The average width of the stream is estimated to be 4 feet. Sediment removal would be accomplished by isolating and dewatering the stream sections through the placement of temporary upstream and downstream dams. Two dams would be constructed from sandbags for each stream section, one upstream of the area to be excavated to prevent upstream flow from entering the excavation area and one downstream to prevent backflow into the excavation. The isolated section would then be dewatered using a temporary pipe through the work area or using a system of sumps, dewatering pumps, and hose assemblies.

All excavated soil and sediment with lead concentrations above the RGs would be disposed off site at a Resource Conservation and Recovery Act (RCRA) Subtitle C permitted disposal facility. Confirmatory post-excavation samples would be collected from the excavated areas and the results reported to the appropriate regulatory agency. Upon completion of the soil removal, the excavation area would be backfilled with certified clean fill from an approved source, compacted to restore the site, covered with topsoil, and seeded, as required.

Land-Use Controls. Because this alternative would not achieve cleanup to a level that would allow unrestricted reuse, LUCs preventing residential site use would be required for portions of the site where lead remains in soil above the residential RG of 400 mg/kg. LUCs include physical, legal, and administrative mechanisms used to restrict the use of, or limit access to, property to prevent exposure to contaminants above permissible levels and monitoring of such mechanisms. The intent of LUCs is to protect human health and the environment by limiting the type and extent of activity at a site and ensuring the future land use is compatible with the restrictions imposed at the site. Maintenance of the LUCs would be required indefinitely because a significant decrease in the concentrations of COCs in soil would not be expected in the post-remedial action period.

The long-term effectiveness of the LUCs would depend on the annual and five-year reviews and inspections of the physical mechanisms in place at the site. The effectiveness of the LUCs would also depend on the proper implementation and coordination of activities defined in the land-use control implementation plan (LUCIP). The LUCIP, which will be prepared following approval of the Record of Decision (ROD), will specify the detailed restrictions to be placed on the site. Adequate long-term control would be established as long as the LUCs are maintained as defined in the LUCIP.

The LUCIP, along with an Environmental Covenant/Notice of Environmental Use Restrictions, will be developed in coordination with the USFWS and provided to ADEM for review and comment with the remedial design document.

7.3 Alternative 3a: Stream Diversion, Excavation, On-Site Stabilization, and Off-Site Disposal (Unrestricted Reuse Option)

Estimated Capital Cost: $23,049,700
Estimated Annual Present Worth
O&M Cost: $0
Contingency (10 percent): $2,304,970
Estimated Present Worth Cost: $25,355,000
Estimated Time to Achieve RAOs: 1 year
Estimated Alternative Duration: 1 year

Stream Diversion, Excavation of Soil/ Sediment, On-Site Stabilization, and Off-Site Disposal. This alternative involves the excavation of soil and sediment from areas where the concentrations of lead exceed the RG for residential soil (400 mg/kg) and the Eco-RBRG for sediment (68 mg/kg). This alternative includes all of the soil and sediment removal components associated with Alternative 2. However, excavated soil and sediment would be treated on site using a reagent-based stabilization technology and disposed off site. Stabilization is a process in which contaminated soil and/or sediment is mixed with reagents to ensure hazardous constituents are maintained in their least mobile or toxic form (i.e., fixed). These reagents may include portland cement, Enviroblend® products, cement kiln dust, lime kiln dust, triple superphosphate, or fly ash. The treated soil material would be considered a nonhazardous special waste rather than a hazardous waste for disposal purposes. Therefore, the stabilized material would be disposed of off site as nonhazardous special waste at a permitted Subtitle D disposal facility.

Implementation of this alternative would result in the complete removal, stabilization, and off-site disposal of soil and sediment with lead concentrations above the RG. Therefore, this alternative provides permanent and long-term protection of human health under an unrestricted (residential) reuse scenario, thereby preventing the need for future on-site management or LUCs.

7.4 Alternative 3b: Stream Diversion, Excavation, LUCs, On-Site Stabilization, and Off-Site Disposal

Estimated Capital Cost: $12,330,940
Estimated Annual Present Worth
O&M Cost: $130,378
Contingency (10 percent): $1,233,090
Estimated Present Worth Cost: $13,694,000
Estimated Time to Achieve RAOs: 11 months
Estimated Alternative Duration: 30 years

Stream Diversion, Excavation of Soil/ Sediment, On-Site Stabilization, and Off-Site Disposal. This alternative includes all of the soil and sediment removal components that are associated with Alternative 3a. However, the remedial action would address lead in surface soils greater than the Eco-RBRG (500 mg/kg) and lead in subsurface soils above the RG for industrial soil (800 mg/kg), respectively. The RG for lead in sediment is the sediment Eco-RBRG (68 mg/kg). The figure shown on page 12 depicts the limits of excavation and RAOs.

Land-Use Controls. Because this alternative would not achieve cleanup to a level that would allow unrestricted reuse, LUCs, as described previously under Alternative 2, would be required for portions of the site where lead remains in soil above the residential RG of 400 mg/kg.

7.5 Alternative 4: Stream Diversion, Excavation, LUCs, On-Site Soil Washing/ Stabilization, and Off-Site Disposal

Estimated Capital Cost: $14,501,560
Estimated Annual Present Worth
O&M Cost: $130,378
Contingency (10 percent): $1,450,160
Estimated Present Worth Cost: $16,082,000
Estimated Time to Achieve RAOs: 14 months
Estimated Alternative Duration: 30 years

Stream Diversion, Excavation of Soil/ Sediment, On-Site Soil Washing/ Stabilization, and Off-Site Disposal. This alternative includes all of the soil removal components associated with Alternatives 2, 3a, and 3b. However, the excavated soil and sediment would also be treated on site using soil washing and stabilization technologies. Soil washing is a water-based process that uses mineral processing techniques to recover particulate contaminants as refined "products." The alternative involves the removal, on-site stabilization, and off-site disposal of surface soil with lead concentrations above 500 mg/kg and subsurface soil with lead concentrations above 800 mg/kg. The RG for sediment is the sediment Eco-RBRG (68 mg/kg).

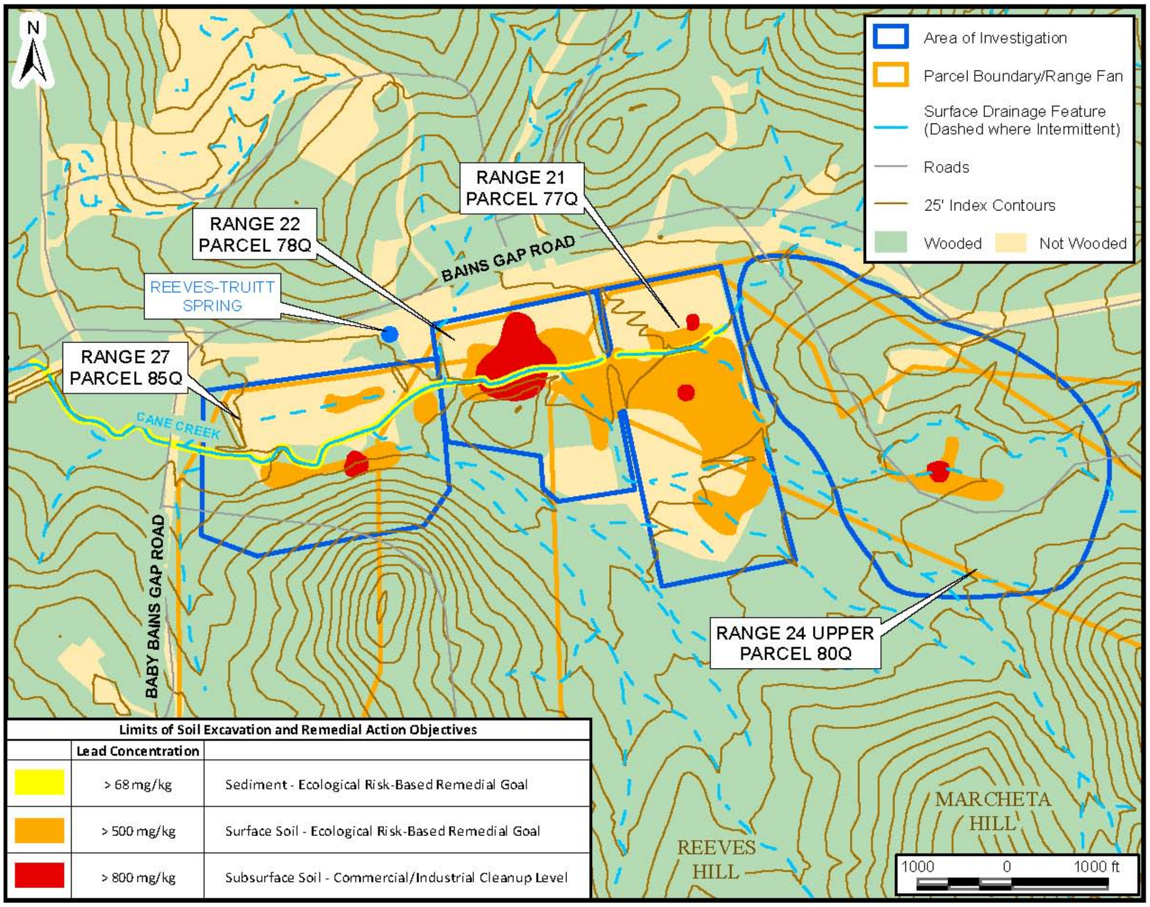
The recovered metal is expected to be sufficiently pure for disposal at a metals recycling facility. The soil washing technology uses water and mechanical energy to slurry soil into its constituent particles of gravel, sand, silt, and clay. The contaminant-bearing material (i.e., sand, silt, and clay) can be segregated from the clean soil for subsequent treatment via reagent-based stabilization. Based on the results of a soil washing treatability study performed as part of the FFS (Shaw, 2013), non-contaminant-bearing material would be suitable for use as backfill after remedial activities have been completed. The stabilized contaminant-bearing material would be suitable for disposal at a permitted Subtitle D disposal facility as nonhazardous waste.

Land-Use Controls. Because this alternative would not achieve cleanup to a level that would allow unrestricted reuse, LUCs, as described previously under Alternative 2, would be required for portions of the site where lead remains in soil above the residential RG of 400 mg/kg.

7.6 Alternative 5: Stream Diversion, Excavation, LUCs, On-Site Soil Washing, Phytoremediation, and Off-Site Disposal

Estimated Capital Cost: $15,877,900
Estimated Annual Present Worth
O&M Cost: $130,378
Contingency (10 percent): $1,587,790
Estimated Present Worth Cost: $17,596,000
Estimated Time to Achieve RAOs: 1+ years
Estimated Alternative Duration: 30 years

Stream Diversion, Excavation of Soil/ Sediment, On-Site Soil Washing, Phytoremediation, and Off-Site Disposal. The remedial alternative would address lead in surface soil greater than the Eco-RBRG (500 mg/kg) and lead in subsurface soil above the RG for industrial soil (800 mg/kg). The RG for lead in sediment is the sediment Eco-RBRG (68 mg/kg). This alternative includes all of the components associated with Alternative 4, except for on-site



reagent-based stabilization. Instead, phytoremediation and metals recovery/gravity separation would be used to treat the contaminated material resulting from the soil washing process.

Treatability testing has indicated that the soil washing process would achieve treatment of lead (greater than ¼-inch material) to below the RGs. This soil fraction would then be used as backfill during site restoration activities. The material less than ¼-inch would be prepared for phyto-remediation and spread across the excavated area within the site. A phytoextraction plant species would be planted and an amendment added to the soil to render the lead bioavailable to the plant species, and then the plants would be harvested for subsequent disposal off site as a hazardous waste at a RCRA Subtitle C facility. Soils treated through phytoremediation are anticipated to meet the RGs and pass RCRA toxicity characteristic leaching procedure (TCLP) testing. However, as phyto-remediation is a relatively innovative treatment method, a field pilot test would be required prior to full-scale implementation to eliminate any uncertainties associated with the effectiveness of this approach in achieving the RAO.

Land-Use Controls. Because this alternative would not achieve cleanup to a level that would allow unrestricted reuse, LUCs, as described previously under Alternative 2, would be required for portions of the site where lead remains in soil above the residential RG of 400 mg/kg.

8.0 EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remedial alternatives individually and against each other in order to select a remedy. This section compares the relative performance of each alternative against the nine criteria listed in the NCP (40 *Code of Federal Regulations* 300 as derived from the statutory requirements of CERCLA Section 121), noting how each alternative compares to the other alternatives under consideration. The “Detailed Analysis of Remedial Alternatives” is presented in the FFS for the BGR Ranges (Shaw, 2013).

The alternative that is selected for this range must satisfy the threshold criteria (as shown in the table on page 14). Primary balancing criteria weigh the major tradeoffs among alternatives, and modifying criteria are considered after the public comment period on the PP.

8.1 Overall Protection of Human Health and the Environment. Alternative 1 (No Action) does not achieve the RAO for the BGR Ranges. It provides no reduction in the risk to human health or ecological receptors (i.e., flora and fauna) because measures would not be implemented to eliminate the pathway for exposure to the contaminated soils. Further, Alternative 1 does not actively reduce the lead concentrations to the RG. Alternatives 2, 3a, 3b, 4, and 5 would provide a higher level of protection of human health and ecological receptors by excavating contaminated soil and sediment and either treating these materials or transporting them to an appropriate off-site disposal facility. Alternative 3a provides the greatest degree of protection because the RG (400 mg/kg) is lower than the RGs for the other alternatives and allows for unrestricted future land use. Alternative 2 (off-site treatment and disposal) provides the next greatest degree of protection because it completely removes the source of the risk without remaining on-site treatments. However, Alternative 2 does not meet the preference for on-site treatment as a principal element. Alternatives 3b and 4 also provide a high level of protection because the stabilized soil and sediment would be disposed off site at a controlled facility and satisfy the preference for on-site treatment. Alternatives 2, 3a, 3b, and 4 all achieve the RAOs for the site. Although Alternative 5 would reduce potential soil exposure risks through excavation, soil washing, and phytoremediation, it would provide somewhat less protection than the other alternatives because phytoremediation is a relatively innovative treatment method whose effectiveness is uncertain without conducting a full-scale field pilot test. Alternative 3a would allow for unrestricted land use without the need for LUCs. For Alternatives 2, 3b, 4, and 5, implementation of LUCs would restrict land uses other than those fitting the definition of industrial reuse and reduce the risk of exposure to soil and sediment with COC concentrations above residential cleanup levels.

8.2 Compliance with ARARs. No promulgated chemical-specific ARARs exist for soil at the BGR Ranges. Action-specific and location-specific ARARs do not pertain to Alternative 1 because no active remedial actions would be conducted under this alternative. Alternatives 2, 3a, 3b, and 4 would comply with all action-specific and location-specific ARARs specific to the remedial activities included in those alternatives, provided proper planning and management and engineering controls were implemented. Alternative 5 would comply with action-specific ARARs only if the soils passed the TCLP testing after phytoremediation treatment, but this is still uncertain pending completion of a pilot test.

8.3 Long-Term Effectiveness and Permanence. Alternative 1 does not reduce the concentrations of COCs in soil and sediment or provide any controls to reduce the potential for human or ecological exposure to the COCs and, therefore, would be the least effective alternative over the long term. Alternative 1 would not provide a permanent remedy for the exposure risk posed by the elevated concentrations of COCs in the soil and sediment.

Alternatives 2, 3a, 3b, and 4 are each similarly effective over the long term and would provide permanent protection of human health and the environment under an industrial reuse scenario. Under Alternative 2, contaminated soil and sediment that pose an unacceptable risk to ecological and industrial receptors would be removed and transported for treatment and/or disposal at an off-site landfill facility and, therefore, would not require on-site management of any residual media. Alternative 3a (removal, treatment, and off-site disposal of contaminated soil and sediment that pose an unacceptable risk under a residential or unrestricted reuse scenario) would require no on-site management of residual media. Under Alternatives 3b and 4, contaminated soil and sediment that pose an unacceptable risk to ecological and industrial receptors would be removed, treated, and transported for disposal at an off-site facility and, therefore, would require no on-site management of residual media. The on-site stabilization treatment method under Alternatives 3a, 3b, and 4 has been demonstrated through treatability testing and implementation during cleanups at other FTMC ranges to effectively immobilize and reduce the leachability of lead and other metals, and would, therefore, be considered permanent. Alternative 5 is the least effective and permanent of the active remedial alternatives evaluated over the long term because of the

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES

<u>**Threshold Criteria:**</u>

Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site. ARARs may be waived under certain circumstances. ARARs are divided into chemical-specific, location-specific, and action-specific criteria.

<u>**Primary Balancing Criteria:**</u>

Long-Term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time. It evaluates magnitude of residual risk and adequacy of reliability of controls.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-Term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

<u>**Modifying Criteria:**</u>

State Support/ Agency Acceptance considers whether ADEM agrees with the analyses and recommendations by the Army, as described in the RI/feasibility study and PP.

Community Acceptance considers whether the local community agrees with the Preferred Alternative. Comments received on the PP during the public comment period are an important indicator of community acceptance.

uncertainties associated with the phytoremediation treatment method.

For Alternatives 2, 3b, 4, and 5, implementation of LUCs would restrict land uses other than those fitting the definition of industrial reuse and reduce the risk of exposure to soil and sediment with COC concentrations above residential cleanup levels, thereby eliminating potential unacceptable human exposure to the COCs.

8.4 Reduction of Toxicity, Mobility, or Volume through Treatment. Alternative 1 would not provide a reduction in toxicity, mobility, or volume of the COCs because no removal, treatment, or control measures would be conducted to address the contaminated soil and sediment. Alternative 2 does not meet the statutory preference for on-site treatment as a principal element, although off-site treatment via stabilization at an appropriate disposal facility would achieve a reduction of contaminant toxicity and mobility because the COCs would be fixed and then disposed at a controlled facility. Alternatives 3a, 3b, 4, and 5 all meet the statutory preference for on-site treatment as a principal element. Alternatives 3a, 3b, and 4 both achieve a reduction in toxicity and mobility of lead through stabilization, but Alternative 4 would also reduce the volume of the waste by removing particulate lead from the excavated soil through soil washing. The soil washing and phytoremediation components of Alternative 5 would reduce the toxicity, mobility, and volume of the lead in the excavated soil, although the degree to which phytoremediation would achieve this reduction is still uncertain without a full-scale field pilot test.

8.5 Short-Term Effectiveness. Short-term effectiveness does not pertain to Alternative 1 because no active remedial actions would be conducted under this alternative. Alternatives 2, 3a, 3b, 4, and 5 each involve the excavation of soil and sediment. The extensive handling and processing of the contaminated soil and sediment associated with these alternatives increases the potential for workers to be exposed to contaminants through ingestion or inhalation. Implementation of engineering controls, the use of personal protective equipment, and the presence of an industrial hygienist during excavation activities are expected to reduce the short-term risks to human health and the environment to acceptable levels.

Alternatives 2, 3a, 3b, 4, and 5 each involve transport of contaminated soils. This may present a risk to the surrounding community due to the heavy truck traffic and potential for spillage. This risk is greatest for Alternative 2 because soils excavated under this alternative would not be treated on site prior to transportation and disposal at an off-site facility. The risk is less for Alternatives 3a, 3b, 4, and 5 because the contaminated soils would be treated on site prior to transportation and disposal at an off-site landfill.

Alternatives 2 and 3b could achieve the RAOs and provide protection within 11 months. For Alternative 3a, the RAO would be achieved in about 1 year. For Alternative 4, the time required to complete the remedial activities is estimated to be about 14 months, and for Alternative 5, the time to achieve the RAOs could be 1 year or longer.

8.6 Implementability. This criterion does not apply to Alternative 1 because no remedial action would be taken as part of this alternative. Alternative 2 (the excavation and direct off-site treatment and disposal of soil and sediment) is easily implementable. From a technical standpoint, the methods under this alternative are well developed, proven, and conventionally used. The reliability associated with the use of these methods is expected to be high. This alternative is administratively feasible because the equipment and materials required to conduct this alternative are commercially available. Significant coordination with regulatory agencies and disposal facilities would be required.

The excavation, stockpiling, and material transport components of Alternatives 3a, 3b, 4, and 5 are also implementable. However, the on-site treatment components associated with these alternatives render them less implementable than Alternative 2. The stabilization treatment method common to Alternatives 3a, 3b and 4 would be both technically and administratively feasible because it is an accepted approach for treating metals-contaminated materials and has been proven effective during cleanups at other FTMC ranges. Alternatives 3a and 3b are more easily implemented than Alternatives 4 and 5 because these alternatives require the synchronization of multiple technologies (i.e., soil washing with stabilization or phytoremediation). Alternative 5 is the least feasible from a technical standpoint because of the uncertainties associated with the effectiveness of phytoremediation in reducing the concentrations of the COCs sufficiently to allow reuse of the treated material as backfill.

8.7 Cost. The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1 ($0), Alternative 3b ($13,694,000), Alternative 4 ($16,082,000), Alternative 5 ($17,596,000), Alternative 3a ($25,355,000), and Alternative 2 ($30,603,000). The total present worth cost estimates for each alternative are summarized in the table below:

Alter-native	Description	Present Worth Cost
1	No action	$0
2	Stream Diversion, Excavation, LUCs, and Off-Site Disposal	$30.6M
3a	Stream Diversion, Excavation, On-Site Stabilization, and Off-Site Disposal (Unrestricted Reuse Option)	$25.4M
3b	Stream Diversion, Excavation, LUCs, On-Site Stabilization, and Off-Site Disposal	$13.7M
4	Stream Diversion, Excavation, LUCs, On-Site Soil Washing/ Stabilization, and Off-Site Disposal	$16.1M
5	Stream Diversion, Excavation, LUCs, On-Site Soil Washing, Phytoremediation, and Off-Site Disposal	$17.6M

8.8 State Support/Agency Acceptance. Based on its approval on the Final FFS and comments on the Draft PP, ADEM is in agreement with Alternative 3b, the Preferred Alternative. ADEM's concurrence on the Final FFS and comments on the Draft PP for BGR Ranges are included as Attachment 1 of this document.

8.9 Community Acceptance. Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be addressed in the Responsiveness Summary prepared for the ROD for the BGR Ranges.

9.0 SUMMARY OF THE PREFERRED ALTERNATIVE

Based on the detailed analysis of remedial alternatives presented in the FFS, **Alternative 3b – Stream Diversion, Excavation, Land-Use Controls, On-Site Stabilization, and Off-Site Disposal**, most appropriately addresses the soil contamination at the BGR Ranges in a manner that is cost-effective and consistent with the current and anticipated future land use at the site. Alternative 3b would be protective of human health and ecological receptors because soil and sediment with COC concentrations above the RGs would be removed from the site and disposed off site in a controlled, engineered facility. The implementation of LUCs would restrict land uses other than those fitting the definition of industrial or recreational reuse and reduce the risk of exposure to soil or sediment with COC concentrations above residential cleanup levels, thereby preventing unacceptable human exposure to the COCs. Alternative 3b satisfies the RAO for the site and complies with all action-specific and location-specific ARARs specific to the remedial components of the alternative, provided proper planning and management and engineering controls are implemented. Further, Alternative 3b is easily implemented because the equipment and materials required to conduct the remedial activities are readily available and proven, and its execution would not require the synchronization of multiple technologies (i.e., soil washing with stabilization or phytoremediation). Also, Alternative 3b is the most cost-effective of all the active remedial alternatives evaluated in the FFS. The present value costs for the Preferred Alternative are:

Estimated Capital Cost: $12,330,940
Estimated Annual Present Worth
O&M Cost: $130,378
Contingency (10 percent): $1,233,090
Estimated Present Worth Cost: $13,694,000

These costs include remedial action work plans and LUC implementation plan and all site preparation and site restoration.

This Preferred Alternative was selected over the other alternatives because it provides for the removal, stabilization, and off-site disposal of surface soil with lead concentrations above 500 mg/kg and subsurface soil with lead concentrations above 800 mg/kg. In addition, it provides for the removal of sediment with lead concentrations above 68 mg/kg. The preferred alternative is expected to allow the site to be used for continued use as a USFWS wildlife refuge area. This alternative will provide adequate protection of human health and the environment under the future land use scenario for the site. Any public concerns about the Preferred Alternative that are received during the public comment period could result in the selection of a final remedy that differs from the alternative currently recommended.

Based on information currently available, the Preferred Alternative provides the best balance of trade-offs among the other alternatives with respect to the evaluation criteria. The Army and ADEM expect the Preferred Alternative to satisfy the statutory requirements in CERCLA Section 121(b) to (1) provide adequate protection of human health and the environment; (2) comply with federal and state ARARs, including CERCLA requirements; (3) be a cost-effective use of public funds for the site; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible; and (5) satisfy the preference for treatment as a principal element. ADEM concurs with the Preferred Alternative.

10.0 COMMUNITY PARTICIPATION

The Army provides information to the public regarding the remedial actions at FTMC through public meetings, the Administrative Record file, and announcements published in the local newspaper, *The Anniston Star*. The Army encourages the public to gain a more comprehensive understanding of the BGR Ranges and the activities that have been conducted at the site. The locations of documents in the Administrative Record are provided on the first page of this PP. To obtain further information about this document or other primary documents, please contact Mr. Scott Bolton:

Mr. Scott J. Bolton
Site Manager
U.S. Army Transition Force
681 Castle Avenue
Fort McClellan, AL 36205-3937
Phone: (256) 848-3847
E-mail: **scott.j.bolton@us.army.mil**

Alternatively, the public may contact Ms. Brandi Little with ADEM:

Ms. Brandi Little
Remedial Project Manager
Alabama Department of Environmental Management
Governmental Hazardous Waste Branch, Land Division
1400 Coliseum Boulevard
Montgomery, Alabama 36110-2059
Phone: (334) 274-4226
E-mail: **blittle@adem.state.al.us**

The final remedial decision for the BGR Ranges will be made only after the public comment period has ended and all of the comments received have been reviewed and considered. Because any of the alternatives in this PP may be selected, comments are requested on all of the alternatives. Comments received regarding potential options not considered in this PP will also be given serious consideration. Army responses to comments received during the public comment period on the PP will be presented in the Responsiveness Summary of the ROD. It is important to note that the final remedial action for the site may be different from the preferred alternative presented in this PP depending upon any new information or public comments received.

Dates to remember:

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:

July 1, 2013 to July 30, 2013

The Army will hold a 30-day public comment period to encourage the public to review and comment on this Proposed Plan.

The public will be notified of the public comment period through a notice published in *The Anniston Star*.

PUBLIC MEETING:

The Army will schedule a meeting during the public comment period if sufficient interest is expressed from the public. The public will be notified of the date, time, and location of the meeting through a notice in *The Anniston Star*.

To request that a public meeting be held to discuss the Preferred Alternative with the Army and the regulators, please contact Mr. Scott Bolton as indicated below:

Mr. Scott J. Bolton
Site Manager
U.S. Army Transition Force
681 Castle Avenue
Fort McClellan, AL 36205-3937
Phone: (256) 848-3847
E-mail: **scott.j.bolton@us.army.mil**

In addition, contact Mr. Bolton to request an extension to the 30-day comment period or to obtain further information about this document or other primary reference documents for the Bains Gap Road Ranges.

ACRONYMS

ADEM	Alabama Department of Environmental Management
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirements
BGR	Bains Gap Road
bgs	below ground surface
BERA	baseline ecological risk assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
COPEC	chemical of potential ecological concern
DNT	dinitrotoluene
DOD	U.S. Department of Defense
EBS	environmental baseline survey
Eco-RBRG	ecological risk-based remediation goal
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
FFS	focused feasibility study
FTMC	Fort McClellan
LUC	land-use control
LUCIP	land-use control implementation plan
mg/kg	milligrams per kilogram
mm	millimeter
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
O&M	operations and maintenance
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PP	Proposed Plan
RAO	remedial action objective
RCRA	Resource Conservation Recovery Act
RG	remediation goal
RI	remedial investigation
ROD	Record of Decision
Shaw	Shaw Environmental, Inc. (a CB&I company)
SI	site investigation
SINA	special interest natural area
SRA	streamlined human health risk assessment
SSSL	site-specific screening level
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound

GLOSSARY OF TERMS

Administrative Record file – The body of reports, official correspondence, and other documents that establish the official record of analysis, cleanup, and final closure of a CERCLA site.

Applicable or Relevant and Appropriate Requirements (ARARs) – Any enforceable state or federal requirement that pertains to protection of human life and the environment in addressing specific conditions or use of a particular cleanup technology at a site. Such requirements may include laws, regulations, policy, and/or guidance and may vary among sites and alternatives.

Bioavailability – Bioavailability is the amount of a contaminant (in this instance the metal lead) that is absorbed into the body following skin contact, ingestion, or inhalation.

Chemicals of Concern – Those chemicals that significantly contribute to an unacceptable risk to human receptors at the site.

Chemicals of Potential Concern – Those chemicals that may contribute to an unacceptable risk to human receptors at the site.

Exposure – Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of agent available at the exchange boundaries of the organism (e.g., skin, lungs) and available for absorption.

Land Use Controls (LUC) – Any type of physical, legal, or administrative mechanism that restricts the use of or limits access to real property to prevent or reduce risks to human health and the environment.

Phytoremediation – Phytoremediation is a biological treatment process that is used to address contaminated soils. The process uses plants to remove, transfer, stabilize, and destroy contaminants in soil, sediment, and water.

RCRA Subtitle C – Resource Conservation Recovery Act (RCRA) hazardous waste regulations that govern the disposal of regulated hazardous wastes and may include lead-contaminated soil/sediment that has not been treated (Alternative 2) or soil/sediment treated through Phytoremediation (Alternative 5).

RCRA Subtitle D – Resource Conservation Recovery Act (RCRA) waste regulations that govern the disposal of non-hazardous wastes and may include lead-contaminated soil/sediment that has been stabilized or treated (Alternatives 3a, 3b, and 4).

Record of Decision (ROD) – A legal document that explains to the public which remedial clean up alternative will be used at a site. The ROD is based on information and technical analysis generated during the remedial investigation, risk assessments, feasibility study, and consideration of public comments and concerns.

Remediation Goal (RG) – Media-specific cleanup goal for a selected remedial action.

Responsiveness Summary – A summary of oral and/or written comments received during the statement of basis/proposed plan comment period and includes responses to those comments. The Responsiveness Summary is a key part of the ROD, highlighting community concerns.

Soil Washing – Soil washing is a physical treatment technology used to address contaminated soil. Soil washing separates contaminants from soil resulting in the generation of clean soil and a contaminant waste stream that requires further treatment and disposal. The technology utilizes water and mechanical energy to slurry the soil into its constituent particles of gravel, sand, silt, and clay.

Stabilization – Stabilization technologies are used to immobilize toxic and hazardous constituents in a waste stream. Stabilization technology is often conducted by mixing soils with a physical binding agent (e.g., lime or cement) to form a granular material or solid.

Streamlined Human Health Risk Assessment – Analysis of the potential adverse human health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

PUBLIC COMMENT FORM

YOU MAY USE THIS SPACE TO WRITE YOUR COMMENTS

Your input to this Proposed Plan for the Bains Gap Road Ranges is important to the Army. Comments provided by the public are valuable in helping the Army select the final remedy for the site.

Comments may be submitted by any of the following methods provided they are dated or postmarked by July 30, 2013.

- You may use the space below to hand write your comments, then fold and mail.
- You may send comments by email to **scott.j.bolton@us.army.mil**. Please note in your e-mail communication that your comments are for the Bains Gap Road Ranges.

If you have questions about the comment period or would like to discuss the remedial alternatives for the site, please contact Mr. Scott Bolton at:

Mr. Scott J. Bolton
Site Manager
U.S. Army Transition Force
681 Castle Avenue
Fort McClellan, AL 36205-3937
Phone: (256) 848-3847
E-mail: **scott.j.bolton@us.army.mil**

ATTACHMENT 1

ADEM COMMENTS AND CONCURRENCE LETTERS

LANCE R. LEFLEUR
DIRECTOR

ADEM

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

ROBERT J. BENTLEY
GOVERNOR

April 8, 2013

Mr. Scott Bolton
Site Manager
U. S. Army Transition Force
P. O. Box 5022
Fort McClellan, Alabama 36205

RE: ADEM Review and Concurrence: Army's Responses to ADEM's Review of Evaluations and Replacement Pages for the *Final Focused Feasibility Study Bains Gap Road Ranges, Range 24, Parcel 80Q; Range 21, Parcel 77Q; Range 22, Parcel 78Q and Former Mortar Range, Parcel 109Q; Range 27, Parcel 85Q*
Fort McClellan, Calhoun County, Alabama
Facility I.D. No. AL4 210 020 562

Dear Mr. Bolton:

The Alabama Department of Environmental Management (ADEM or the Department) has reviewed the Army's subject documents. ADEM has determined all comments to be resolved. Therefore, the Department concurs with the overall content of the *Final Focused Feasibility Study Bains Gap Road Ranges*. Please note that only hazardous, toxic, and radioactive waste (HTRW) issues were considered during the review of this document.

If you have any questions or concerns regarding this matter please contact Ms. Kaneshia Townsend at 334-394-4356 or via email at ktownsend@adem.state.al.us.

Sincerely,

Stephen A. Cobb, Chief
Governmental Hazardous Waste Branch
Land Division

cc: Mr. Robin Scott/MDA
Ms. Tracy P. Strickland/ADEM
Mr. Richard Satkin/Matrix
Mr. Lee Coker/USACE, Mobile District
Ms. Brandi Little/ADEM
Mrs. Leigh Lattimore/EPA Region 4

Lance R. LeFleur
Director

Robert J. Bentley
Governor

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ▪ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

May 16, 2013

Mr. Scott Bolton
Site Manager
U. S. Army Transition Force
P. O. Box 5022
Fort McClellan, Alabama 36205

RE: ADEM Review and Comments: *Proposed Plan for Bains Gap Road Ranges* dated April 2013
Fort McClellan, Calhoun County, Alabama
Facility I.D. No. AL4 210 020 562

Dear Mr. Bolton:

The Alabama Department of Environmental Management (ADEM or the Department) has reviewed the Army's subject *Draft Proposed Plan (PP) Bains Gap Road Ranges*. ADEM comments are attached for your review and response.

If you have any questions or concerns regarding this matter please contact Ms. Kaneshia Townsend at 334-394-4356 or via email at ktownsend@adem.state.al.us.

Sincerely,

Stephen A. Cobb, Chief
Governmental Hazardous Waste Branch
Land Division

cc: Mr. Robin Scott/MDA
Ms. Tracy P. Strickland/ADEM
Mr. Richard Satkin/Matrix
Mr. Lee Coker/USACE, Mobile District
Ms. Brandi Little/ADEM
Mrs. Leigh Lattimore/EPA Region 4

ATTACHMENT
ADEM Review Comments
Draft Proposed Plan for Bains Gap Road Ranges
Fort McClellan, Alabama

General Comment

1. According to Environmental Protection Agency's (EPA) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, a summary of any formal comments received from the support agency should be included in the document. Please revise the text to include a summary of formal comments received from ADEM.

Specific Comment

1. Page 6, Surface Soil. In accordance with the Focus Feasibility Study (FFS), please revise the text to state that nineteen semi-volatile organic compounds, including thirteen polynuclear aromatic hydrocarbon compounds and one nitroaromatic explosive, were detected in the samples from Ranges 21 and 22.

2. Page 7, Seep Water. In accordance with the FFS, please modify the text to state that aluminum and barium exceeded ecological screening values but were below their respective background values.

3. Page 8, Recommended Eco-RBRGs for Sediment and Surface Water Table. Please revise the units for the surface water ecological risk-based remediation goals (Eco-RBRG) to mg/L instead of µg/L.

Response to Alabama Department of Environmental Management (ADEM) Comments on Draft Proposed Plan for Bains Gap Road Ranges (dated April 2013)
Fort McClellan, Alabama

Comments from Stephen A. Cobb, Chief – ADEM Governmental Hazardous Waste Branch, Land Division, provided in a letter dated May 16, 2013.

General Comment

Comment 1: **According to Environmental Protection Agency's (EPA) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, a summary of any formal comments received from the support agency should be included in the document. Please revise the text to include a summary of formal comments received from ADEM.**

Response 1: Comment noted. Section 8.0, *State Support/Agency Acceptance*, has been revised to indicate that ADEM's concurrence on the Final FFS and comments on the Draft Proposed Plan are provided as Attachment 1 (a reference to the attachment has been added to the section).

Specific Comments

Comment 1: **<u>Page 6, Surface Soil.</u> In accordance with the Focus Feasibility Study (FFS), please revise the text to state that nineteen semi-volatile organic compounds, including thirteen polynuclear aromatic hydrocarbon compounds and one nitroaromatic explosive, were detected in the samples from Ranges 21 and 22.**

Response 1: The text has been revised as requested.

Comment 2: **<u>Page 7, Seep Water.</u> In accordance with the FFS, please modify the text to state that aluminum and barium exceeded ecological screening values but were below their respective background values.**

Response 2: The text has been revised as requested.

Comment 3: **<u>Page 8, Recommended Eco-RBRGs for Sediment and Surface Water Table.</u> Please revise the units for the surface water ecological risk-based remediation goals (Eco-RBRG) to mg/L instead of µg/L.**

Response 3: The units have been corrected as requested.