Final

Removal Action Report

Iron Mountain Road Ranges Soil Remediation on ALDOT Eastern Bypass Corridor Property

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Task Order CK11
Contract No. DACA21-96-D-0018
Shaw Project No. 800486

March 2006

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1.0 Introduction

The Iron Mountain Road (IMR) Ranges are a series of former weapons firing ranges located along Iron Mountain Road in the western-central portion of the Main Post at Fort McClellan (FTMC) located in Calhoun County, Alabama (Figure 1-1). The IMR Ranges consist of the following parcels:

- Skeet Range, Parcel 69Q
- Range 12, Parcel 70Q
- Range 13, Parcel 71Q
- Range 19, Parcel 75Q
- Former Rifle Grenade Range North of Washington Ranges, Parcel 221Q-X
- Former Rifle Grenade Range at Skeet Range, Parcel 222Q-X
- Former Aboveground Storage Tank (AST) at Range 13, Parcel 176(7).

Between 2000 and 2003, Shaw Environmental, Inc. (Shaw) conducted a remedial investigation (RI) of the IMR Ranges to determine the nature and extent of contamination (Shaw, 2004a). The RI indicated that soil at the IMR Ranges was contaminated with various metals, primarily lead, associated with small-arms ammunition. At three of the ranges – Skeet Range, Range 12, and Range 13 – the area of lead-contaminated soil extended into the Alabama Department of Transportation (ALDOT) proposed Eastern Bypass Corridor (EBC), a tract of land reserved for future construction of public highway. The EBC boundary is shown on Figure 1-1. The Base Realignment and Closure (BRAC) Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. To facilitate transfer of the EBC property to ALDOT, the Army, under management of the U.S. Army Corps of Engineers (USACE)–Mobile District, initiated remedial activities to remove contaminated soil within the EBC. The USACE contracted Shaw to perform contaminated-soil removal within the EBC under Contract DACA21-96-D-0018, Task Order CK11.

This report summarizes the two phases of soil removal activities conducted within the EBC at the IMR Ranges. The initial phase, conducted in late 2004 and early 2005, included the following activities:

- Site surveying and x-ray fluorescence (XRF) soil screening
- Soil removal and treatment
- Post-excavation sampling and analysis
- Soil stabilization and waste disposal characterization
- Transportation and disposal of treated soil
- Site restoration.

Additionally, this report documents supplemental phase activities conducted at Range 12 in February 2006. The supplemental activities included repairing stabilization controls installed during the initial work phase, removing soil that had sloughed into the EBC portion of the site, and applying a mixture of grass seed and bonded fiber matrix (BFM) to the upper hillside to reduce the potential for further erosion.

1.1 Scope and Objective

The scope of work for soil removal activities within the EBC at the IMR Ranges was detailed in a site-specific work plan that was issued in August 2004 (Shaw, 2004b). The purpose of this removal action was to excavate metals-contaminated soil within the EBC at the Skeet Range, Range 12, and Range 13 where lead concentrations exceed the industrial cleanup level of 880 milligrams per kilogram (mg/kg) (Shaw, 2004a). The total area of lead-contaminated soil extending into the EBC was estimated to be approximately 1 acre. Additional activities associated with the soil removal included further delineation of lead-contaminated soil within the EBC using XRF field screening and off-site laboratory analyses, post-excavation confirmation sampling, on-site treatment of contaminated soil to stabilize the metals, waste characterization, and transportation of treated soil to a permitted off-site disposal facility.

1.2 Site Descriptions and History

The IMR Ranges are located just east of Iron Mountain Road in the western-central area of the Main Post (Figure 1-1). Except for two former rifle grenade ranges (Parcels 221Q-X and 222Q-X), the IMR Ranges were used for small-caliber weapons training and shotgun firing and were active immediately prior to Base closure in 1999. Bullets, shot, and bullet fragments are prevalent on the surface of many of the IMR Range impact zones.

1.2.1 Skeet Range, Parcel 69Q and Former Rifle Grenade Range at Skeet Range, Parcel 222Q-X

According to the *Final Environmental Baseline Survey, Fort McClellan, Alabama* (EBS), the Skeet Range was constructed in 1988 and operated until October 1998 (Environmental Science and Engineering, Inc. [ESE], 1998). The Skeet Range (13 acres) was built over the land formerly used as a rifle grenade range (Parcel 222Q-X). The area of the former rifle grenade range (1.7 acres) is completely encompassed by the Skeet Range parcel boundary (Figure 1-2). The Skeet Range was used for clay skeet and trap shooting competition. Historically, weapons fired at the range consisted of various gauge shotguns. The *Archives Search Report* (ASR) indicated that the Skeet Range is within the impact zone of two additional ranges: the rifle grenade range (Parcel 222Q-X) and the former Combat Range #2 (USACE, 2001). Combat

Range #2 was used from sometime between World War I and World War II until 1958 and the weapons used included rifle grenades, rockets, and machine guns.

The Skeet Range had two sets of concrete firing lines with a total of 14 firing points. The direction of fire was to the east and southeast. The western slope of Sunset Hill (rising approximately 150 feet above the range floor) serves as the main impact berm for the range. The range also included three concrete block houses for throwing skeet and one concrete trap bunker, a range office, covered picnic/shelter areas, and male and female latrines. All range structures, except for the concrete firing lines, have been removed since base closure. Vegetation located in the western area of the Skeet Range inside of the EBC has been cleared by ALDOT in preparation of road construction.

1.2.2 Range 12, Parcel 70Q

According to the EBS, Range 12 was constructed in 1951 and operated until October 1998 (ESE, 1998). When the range was built, it was first listed as "Range 14" and was described as a "1000-inch range." By 1967, the range was renamed Range 12, the Competitive Pistol Range. Historically, weapons fired at the range consisted of 9-millimeter (mm) pistol and unspecified machine guns. FTMC Base Regulation 350-2 states .22 to .45-caliber pistols, 9-mm pistols, .22-caliber rifles, and 12-gauge shotguns were fired at Range 12. Interviews conducted by ESE with long-term FTMC employees for the EBS indicate that an area around Range 12 and Range 13 was used as a machine gun range in the 1960s. A map, dated 1966, confirms the interview reports identifying a range in the vicinity of Range 12 and Range 13 as a "Machine gun range, 30m, Basic."

Range 12 included a concrete firing line located 35 meters from the base of the hill that served as the backstop for the firing range (Figure 1-3). This firing line was 275 feet in length and traversed the site from north to south. The concrete foundation has been removed from the range. Three additional firing lines, located 25 meters, 10 meters, and 7 meters from the base of the hill, paralleled the 35 meter firing line. Nine outbuildings and supporting structures were present at Range 12 but these buildings were removed in 1999. The impact berm consisted of the north and west facing slopes of Baltzell Hill rising approximately 200 feet above the range floor. Much of the Range 12 area has been cleared in preparation for the EBC construction.

1.2.3 Range 13, Parcel 71Q

As described in the EBS, Range 13, the Qualification Pistol Range, was constructed in 1951 and operated until October 1998 (ESE, 1998). This range was most recently used by a U.S. Marine Corps detachment for small-arms training. Historically, weapons fired at the range consisted of

9-mm pistol and unidentified machine guns. FTMC Base Regulation 350-2 indicates that .22 to .45-caliber pistols, 9-mm pistols, .22-caliber rifles, and 12-gauge shotguns were fired at Range 13. Spent rifle cartridge casings have been found at Range 13, indicating some larger caliber rifle firing may have also occurred. There is some evidence that this area may have been used as a machine gun range in the 1960s.

Range 13 included a covered, 20-station firing line that was 120-feet in length and located 35 meters west of the target line (Figure 1-4). The firing and target lines were removed from the range in 1999. The direction of fire at Range 13 was to the east, towards the target line and an earthen berm that served as the main impact wall for this portion of the range. The berm is located immediately behind the target line (approximately 25 to 30 feet further downrange). Approximately 150 feet further east of this berm, a secondary impact wall is formed by Baltzell Hill. Both impact areas have bullets and bullet fragments on the ground surface.

An AST was also located at Range 13. The 500-gallon AST contained fuel oil used for heating the range office. The AST is no longer present at the site.

1.3 Extent of Lead-Contaminated Soil

The RI conducted by Shaw identified lead-contaminated soil at the IMR Ranges (Shaw 2004a). A portion of the contamination extended into the EBC at the Skeet Range, Range 12, and Range 13. Figure 1-5, taken from the RI report, shows the estimated extent of lead-contaminated surface soil at the Skeet Range, including the portion that extends into the EBC. The area of lead-contaminated soil in the EBC at the Skeet Range was approximately 0.2 acres. Figures 1-6 and 1-7 show the estimated extent of lead-contaminated surface soil at Ranges 12 and 13, respectively, including the portions that extend into the EBC. The areas of lead-contaminated soil in the EBC at Ranges 12 and 13 were approximately 0.1 and 0.7 acres, respectively.

2.0 Removal Action Field Activities

This chapter summarizes the removal actions conducted during both phases of fieldwork at the IMR Ranges.

2.1 Site Surveying

Using the maps from the work plan, a registered land surveyor in the state of Alabama surveyed the sites, including locating and marking the boundary line of the EBC and establishing the sampling grids identified in the work plan (Shaw, 2004b). A total of three grids were staked, one at each of the three ranges in the EBC.

2.2 Initial XRF Soil Screening

Prior to soil removal, the contaminated areas identified during the RI were further characterized using XRF grid sampling to more precisely delineate the areas with elevated lead concentrations. The initial XRF survey was completed at each range by collecting surface soil samples at each node of the sample grid (25-foot by 25-foot grid squares). Sampling was conducted as described in the work plan and the samples were analyzed on site using XRF. Confirmation samples were sent to EMAX to meet the 10 percent frequency QA goal. A total of 18 samples were collected at Range 13, 30 samples at the Skeet Range, and 99 samples at Range 12. Tables 2-1 and 2-2 summarize the XRF results from the initial characterization. Table 2-3 summarizes the fixed-base laboratory confirmation data.

Appendix A provides photographs documenting all activities performed. Appendix B includes the sample collection logs, XRF analysis forms, and analysis request/chain-of-custody records. The laboratory analytical reports are included in Appendix C. To ensure consistency in the data, all analytical services were provided under subcontract to Shaw by EMAX Laboratories, Inc. (EMAX) in Torrance, California. EMAX is currently validated by the USACE Hazardous, Toxic, and Radioactive Waste Center of Expertise for the applicable methods.

2.3 Preconstruction and Clearing

After the excavation limits at Range 12 were defined, additional clearing and grubbing was performed in the grid areas to the north and south. Trees up to 12 inches in diameter and brush were removed using the excavator and the loader. Felled trees were placed outside of the planned area of excavation.

Site controls were put in place establishing routes of access and egress for personnel and equipment. An area was established near Range 12 for staging and treatment of excavated soil

material prior to shipment off site. Roads were improved using gravel for stabilization and to provide containment around the soil treatment area. The treatment area was established northeast of Range 12 to minimize potential impacts to Remount Creek located approximately 100 feet west of the excavation.

2.4 Excavation

No excavation was required in the EBC at the Skeet Range or Range 13 because all results indicated lead concentrations were less than the 880 mg/kg cleanup goal. Lead concentrations at the Skeet Range ranged from less than 10 mg/kg to 132 mg/kg. Lead concentrations at Range 13 ranged from 18.8 mg/kg to 446 mg/kg. The excavation at Range 12 was defined by the initial XRF screening results (Figure 2-1). Thirty-three points were added to expand the grid and fully encompass the lead impacted area.

In the initial excavation, a 1-foot lift was removed using an excavator and moved to the soil treatment area using a front-end loader. When the 1-foot lift was completed, sampling was performed using XRF. If the XRF results were greater than the remedial goal of 880 mg/kg, an additional 1-foot lift was removed. Figure 2-2 displays the 2-foot depth excavation limit. This process was repeated for a third, 1-foot lift (Figure 2-3).

During the supplemental fieldwork conducted in February 2006, three additional areas of lead-contaminated soil were excavated: sloughed soil breaching the EBC property line, soil around original grid node 0,S25, and a small area near the intersection of the main impact wall and center dividing berm (Figure 2-4). Initially, the upper 1 foot of soil was removed from these areas; however, some areas were excavated an additional 1 foot because lead concentrations in the XRF screening samples exceeded the remedial goal of 880 mg/kg. The depth of excavation is approximate because much of the topsoil was removed exposing only barren rock. Large boulders and stones were removed from the excavated soil pile using the backhoe bucket and by hand. A total of approximately 12 cubic yards (CY) of material was removed from these areas and combined into a 20 CY rolloff box.

2.5 Confirmation Sampling and Analysis

The post-excavation confirmation sampling phase was not performed as described in the work plan. The reason for the change in approach was based on EPA's request at the September 2004 BCT meeting that composite sampling not be used for confirmation samples. The remainder of the BCT (i.e., ADEM and the Army) concurred with this request. Therefore, a sampling scheme that included a combination of grab and composite samples was implemented. This combination of grab and composite sampling helped to ensure a representative data set for the excavated soil.

Grab samples were collected at the grid nodes used to outline the excavation limits and at the nodes located within the excavated area (Figure 2-1). Composite samples were collected by subdividing the excavation into areas based on the 25-foot by 25-foot grid system. In some cases, due to the irregular shape of the excavated area, the grids consisted of adjacent areas that were sampled together. Composite samples were collected from grid areas ranging in size from 625 ft^2 (a single 25-foot by 25-foot area) to 1,250 ft^2 (a 25-foot by 50-foot area). Composite samples consisted of two to four subsamples of equal volume, with each subsample representing an area no larger than 312 ft^2 (one half of a 25-foot by 25-foot grid square). Figures 2-2 and 2-3 identify five grids where the composite sample lead concentrations exceeded the 880 mg/kg limit at the 1-foot and 2-foot excavation depths.

During the supplemental soil removal phase, the excavation area was subdivided into five grids (approximately 5 feet by 10 feet) for sampling. Grids 001 through 004 were located in the area of the breached erosion control wall and Grid 005 was located approximately 20 feet to the southwest (Figure 2-4). One surface soil sample was collected from the center of each grid. The samples were analyzed in the field for lead using XRF.

The lead concentrations in two of the grids were below the 880 mg/kg remedial goal following the 1-foot excavation: Grid 001 lead result was 390 mg/kg, and Grid 002 lead result was 124 mg/kg (Table 2-4). Grid locations 003, 004, and 005 were excavated an additional 1 foot and resampled because the lead concentrations (566 mg/kg, 1,989 mg/kg, and 1,120 mg/kg, respectively) exceeded the 880 mg/kg cleanup goal. In these grids, the resamples indicated that the lead results (147 mg/kg, 274 mg/kg, and 112 mg/kg) were below the remedial goal.

A single composite sample (number SN0076) was created from the five grab samples that met the cleanup goal (Grid samples 001, 002, 003+1', 004+1', 005+1'). This composite sample represents the remaining site soil after the supplemental removal activities. Sample SN0076 was shipped to EMAX for lead analysis by EPA Method 6010B.

Analysis. A combination of on-site XRF analysis and off-site laboratory analysis by EPA Method 6010B was used to complete the site characterization. The purpose of the XRF analysis was to screen the samples to confirm lead concentrations were less than the remedial goal prior to shipping to the off-site laboratory. All of the composite grid samples were screened with XRF prior to shipment to the analytical laboratory. Whenever an XRF result indicated lead at a concentration above 400 mg/kg, the sample was sent for confirmation analysis at EMAX. The excavation was considered complete in the sampled area only when laboratory data indicated that the area had lead concentrations less than 880 mg/kg.

If an XRF sample result showed lead at a concentration above the 880 mg/kg limit, the area was marked on the map and physically demarcated with surveyor's tape to facilitate additional soil removal using the excavator. Following removal of the next 1-foot lift, the sampling process was repeated for that area and those results were compared to the remedial goal. In some areas, up to three 1-foot lifts (3-foot total excavation depth) were required to remove lead-contaminated soils to levels less than 880 mg/kg. Table 2-4 summarizes the XRF results and laboratory confirmation data. The laboratory analytical reports for the confirmation samples are included in Appendix C.

Results. The cleanup goal of less than 880 mg/kg was achieved for all of the grid composite samples.

One node sample did not meet the cleanup goal following the 2-foot excavation lift. Grab sample CS:(S75,W50)+2' XRF result was 682 mg/kg and was sent for lead analysis at EMAX. This sample was sent as a regular field sample (sample number SN0064) and as a field duplicate (SN0065). The laboratory reported lead concentrations of 905 mg/kg for SN0064 and 880 mg/kg for SN0065. Because the lead concentration in the regular field sample slightly exceeded the cleanup goal, Shaw resampled this area in February 2006. XRF sample S75,W50(RS) had a lead concentration of 489 mg/kg (Table 2-4). This sample (sample number SN0077) was also sent to EMAX for confirmation analysis and the laboratory reported a lead concentration of 446 mg/kg (Table 2-4). Because both results were below the 880 mg/kg cleanup goal, excavation in this area was considered complete.

At node S25,0 the soil was excavated to the 3-foot depth and barren rock was encountered. A confirmation soil sample, CS(S25,0)+3', was collected by scraping the rock face for loose material with the resulting sample consisting of mostly rock and gravel. This sample was field-analyzed using XRF and a lead result of 502 mg/kg was obtained. The sample was also sent for off-site confirmation analysis as a regular field sample (SN0071) and a field duplicate (SN0072). The laboratory reported lead concentrations of 532 mg/kg in SN0071 and 4,450 mg/kg in SN0072. Because the lead concentration in the field duplicate sample exceeded the cleanup goal, Shaw conducted supplemental soil removal and confirmation sampling in this area in February 2006. As discussed previously, additional XRF confirmation samples (001, 002, 003+1', 004+1', and 005+1') and a single confirmation composite sample (SN0076) were collected. As shown in Table 2-4, all of the XRF and fixed-base laboratory results were below the 880 mg/kg cleanup goal.

2.6 Soil Stabilization and Waste Disposal Characterization

During the initial soil removal effort, excavated soils were stabilized in the soil treatment area established adjacent to Range 12. The excavated soil was staged in stockpiles of approximately 450 CY (300 tons) each. Each stockpile was treated as an individual batch and approximately 20 tons of Portland cement were added to each batch. The Portland cement was delivered to the site in pneumatic tankers and applied immediately upon receipt. Initially, an ash filter system was used during unloading to control fugitive dust; however, its use was discontinued because of the advent of a new treatment technique that allowed application of cement directly onto the soil while the pile was covered under plastic sheeting. Photographs of the soil stabilization process are included in Appendix A.

As was done during the initial soil removal, the 12 CY (approximately 18 tons) of excavated material generated from the supplemental phase was mixed with approximately 5 percent (w/w) Type I Portland cement. The cement was procured locally and transferred to the site in 20, 94-pound bags. About half of the bags were added to the rolloff box and half were used to treat the soil pile on the ground directly.

Each batch of soil and Portland cement was mixed with the excavator until homogenous. After treatment, each batch of stabilized soil was composite sampled to characterize the material for waste disposal. As shown in Table 2-4, all of the XRF and fixed-base laboratory confirmation results were below the cleanup goal of 880 mg/kg. The treated material samples were analyzed by EMAX using EPA Method 1311/6010B for Toxicity Characteristic Leaching Procedure (TCLP) metals on a 72-hour turnaround basis. Stabilized material was covered with heavy-duty plastic sheeting to prevent precipitation run-on and migration of the material.

A total of 10 batches of material were stabilized during both phases of fieldwork at Range 12, including one batch (Batch 10) during the supplemental soil removal effort. In all but one batch, the stabilization was successful after the initial homogenization and the treated material met the project-required leachate concentration standard of less than 5 milligrams per liter (mg/L). The batch had to be remixed and resampled before it passed the standard. The analytical results of the treated soil samples are summarized in Table 2-5 and the laboratory analytical reports are included in Appendix C.

2.7 Transportation and Disposal of Treated Material

Following receipt of the laboratory data indicating the treated soil met the TCLP standard of 5 mg/L, the material was loaded onto dump trucks and transported by a licensed waste hauler to the Onyx Cedar Hill Landfill (Onyx) in Ragland, Alabama. Onyx is a Resource Conservation

and Recovery Act (RCRA)-licensed commercial landfill. Disposal of the material was performed in compliance with applicable federal, state, and local regulations. The treated soil material was considered RCRA special waste rather than hazardous waste for disposal purposes.

The Shaw construction quality control (QC) officer documented the quantities of waste loaded onto each truck and facilitated the special waste manifest documentation (Appendix D). Manifests were signed by a representative of the USACE-Mobile District on behalf of the Army. Onyx provided Shaw with a certificate of disposal for each load received and processed (Appendix D). Including the supplemental soil removal activities, a total of 122 loads were hauled from Range 12, resulting in the disposal of 3,632 tons (approximately 5,500 CY) of material in the Onyx landfill.

2.8 Site Restoration

Site restoration began after the confirmatory sampling results from EMAX indicated the lead concentrations in the remaining site soils were less than 880 mg/kg. Only limited restoration activities were performed because this area will be transferred to ALDOT for the construction of a major highway.

Shaw installed silt fencing and stabilized the unexcavated portion of the Range 12 impact berm east of the EBC property line. Stabilization consisted of staking the property line with steel posts and stacking 12-inch x 1-inch x 5-foot pressure-treated boards along the base of the silt fence. The purpose was to prevent lead contaminated soil from migrating down the face of the berm, over the property line into the area that was excavated. However, heavy precipitation caused a portion of the wooden planking and silt fencing to fail resulting in material sloughing down the hillside. Therefore, additional erosion control measures were implemented as discussed in the following section. A photograph of the initial hillside stabilization is included in Appendix A.

In addition to the hillside stabilization, Shaw removed the gravel berm around the soil treatment area and performed final confirmation sampling using XRF in the treatment area and on the haul roads leading into the treatment area. Sampling consisted of collecting six, 5-point composite soil samples over the treatment area and haul roads and performing on-site XRF analysis for lead. As shown in Table 2-6, all results were less than 880 mg/kg.

2.9 Supplemental Erosion Control Measures

The entire section of wood planking and silt fencing that was constructed during the initial phase was examined for signs of weakness and the breached boards were removed. Additional 2-inch by 12-inch by 12-foot-long pressure-treated boards were installed along the ALDOT property

line. During the supplemental phase, these boards were stacked on end and in layers, two to three boards thick, for added stability. The boards were nailed together and 4-foot-long steel rebar hammered into the berm face was used to secure them in place. The rebar sections were further supported using 2-inch by 4-inch posts (notched and nailed into place) or by securing the rebar to sturdy trees on the berm face using heavy-gauge steel wire.

The breached section of the silt fence was removed and replaced with new fence. This fence was installed adjacent to the wooden boards (on the upslope side) and tied into the original silt fence. Along the steepest sections of the wall, the silt fence was further reinforced by three, 10-foot sections of straw waddles. These waddles were approximately 8 to 10 inches in diameter and constructed of dense straw wrapped in a plastic mesh sheath. Waddles were placed at the bottom of the silt fence/board wall at the berm face to help divert the water away from the wall. A photograph of the repaired wooden planking and silt fencing is provided in Appendix A.

In addition to repairing the wooden boards and silt fencing, Shaw subcontracted Putnam Erosion Controls, Inc. of Ashville, Alabama, to treat the exposed soil above the silt fence to encourage vegetative growth and thereby reduce the likelihood of further sloughing of material downslope. The treatment consisted of the application of grass seed mixed with a polymer and BFM using a hydro-spraying technique. BFM is a hydraulically applied flexible erosion control blanket composed of long strand, thermally processed wood fibers and a proprietary crosslinked, hydro-colloid tackifier (see Appendix E for supplemental information). After curing for approximately 24 to 48 hours, the BFM forms an intimate bond with the soil surface to create a continuous, flexible, and biodegradable erosion blanket that allows for rapid seed germination and accelerated plant ground. A photograph of the BFM-treated area is provided in Appendix A.

2.10 Decontamination

Personnel decontamination areas were established within the contamination reduction zone at the Range 12 work area to provide the field crew with a controlled transition from the exclusion zone to the support zone. Personnel decontamination was performed as outlined in the site-specific work plan.

Final equipment decontamination of the loader and excavator was performed after the last of the treated soil from Range 12 was loaded. Decontamination fluids were combined with FTMC investigation-derived waste (IDW) and characterized for disposal as required in the FTMC IDW plan.

3.0 Summary and Conclusions

Shaw conducted a two-phased soil removal effort at the IMR Ranges to facilitate transfer of the property to ALDOT for construction of the EBC. During the initial phase in 2005, Shaw excavated soil contaminated with lead and other metals associated with small-arms ammunition within the EBC at Range 12 where lead concentrations exceeded the industrial cleanup level of 880 mg/kg. No excavation activities were required in the EBC areas of the Skeet Range or Range 13 because soil lead concentrations were less than the 880 mg/kg cleanup goal. Soil removal activities were performed over an area of approximately 0.6 acre, resulting in the disposal of approximately 5,500 CY of material. Other site activities included on-site treatment of contaminated soil to stabilize the metals, waste characterization, transportation of treated soil to a permitted off-site disposal facility, and post-excavation confirmation sampling. Additionally, supplemental soil removal and erosion control activities were performed in 2006.

Based on the results of the removal action performed at the IMR Ranges, including confirmatory sampling and analysis and supplemental erosion control measures, lead-contaminated soil within the EBC was removed to levels below the industrial cleanup level. Therefore, those portions of the IMR Ranges that lie within the EBC are suitable for transfer to ALDOT.

4.0 References

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, January.

IT Corporation, 2002a, ***Draft Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, Revision 3, prepared for the U.S. Army Corps of Engineers, Mobile District, February.

IT Corporation, 2002b, ***Draft Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, Revision 3, February.

IT Corporation, 2000, ***Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, March.

IT Corporation, 1998, ***Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, prepared for the U.S. Army Corps of Engineers, Mobile District, August.

Shaw Environmental, Inc. (Shaw), 2004a, ***Draft Remedial Investigation Report, Iron Mountain Road Ranges, Fort McClellan, Calhoun County, Alabama***, April.

Shaw Environmental, Inc. (Shaw), 2004b, ***Draft Soil Remediation, Interim Removal Action Work Plan, Safety and Health Plan, Iron Mountain Road Ranges on ALDOT EBC Property, Skeet Range, Parcel 69Q, Range 12, Parcel 70Q, and Range 13, Parcel 71Q, Fort McClellan, Calhoun County, Alabama***, August.

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

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2-ADNT	2-amino-4,6-dinitrotoluene
4-ADNT	4-amino-2,6-dinitrotoluene
2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
ABLM	adult blood lead model
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEDA	ammunition, explosives, and other dangerous articles
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALARNG	Alabama Army National Guard
ALAD	δ-aminolevulinic acid dehydratase
ALDOT	Alabama Department of Transportation
amb.	amber
amsl	above mean sea level
ANAD	Anniston Army Depot
ANOVA	Analysis of Variance
AOC	area of concern
AP	armor piercing
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
AS/SVE	air sparging/soil vapor extraction
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
atm-m^3/mol	atmospheres per cubic meter per mole
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWQC	ambient water quality criteria
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BAF	bioaccumulation factor
BBGR	Baby Bains Gap Road
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BFM	bonded fiber matrix
BG	Bacillus globigii
BGR	Bains Gap Road
bgs	below ground surface
BHC	hexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
$CaCO_3$	calcium carbonate
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CACM	Chemical Agent Contaminated Media
CAIS	chemical agent identification set
CAMU	corrective action management unit
CBR	chemical, biological, and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	chloroform
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	phosgene (carbonyl chloride)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIH	Certified Industrial Hygienist
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; chemical of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical of potential concern
COPEC	constituent of potential ecological concern
CPOM	coarse particulate organic matter
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model

CT	central tendency
CT	carbon tetrachloride
ctr.	container
CWA	chemical warfare agent; Clean Water Act
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAAMS	depot area agent monitoring station
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DD	Defense Department
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEHP	di(2-ethylhexyl)phthalate
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DNAPL	dense nonaqueous-phase liquid
DNT	dinitrotoluene
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBC	Eastern Bypass Corridor
EBS	environmental baseline survey
EBV	EBV Explosives Environmental Co.
EC_{20}	effects concentration for 20 percent of a test population
EC_{50}	effects concentration for 50 percent of a test population
ECBC	Edgewood Chemical Biological Center
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Eh	oxidation-reduction potential
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
EPT	Ephemeroptera, Plecoptera, Trichoptera
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESL	ecological screening level
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	Explosives
EXTOXNET	Extension Toxicology Network
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FBI	Family Biotic Index
FD	field duplicate
FDC	Former Decontamination Complex
FDA	U.S. Food and Drug Administration
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
f_{oc}	fraction organic carbon
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	Federal Register
Frtn	fraction
FS	field split; feasibility study; fuming sulfuric acid
FSP	field sampling plan
ft	feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin (isopropyl methylphosphonofluoridate)
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.

GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
H&S	health and safety
HA	hand auger
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
HCl	hydrochloric acid
HD	distilled mustard (bis-[dichloroethyl]sulfide)
HDPE	high-density polyethylene
HE	high explosive
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
HN	hydrogen mustard
H_2O_2	hydrogen peroxide
HPLC	high-performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
HRC	hydrogen releasing compound
HSA	hollow-stem auger
HSDB	Hazardous Substance Data Bank
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IASPOW	Impact Area South of POW Training Facility
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_d	soil-water distribution coefficient
kg	kilogram
KeV	kilo electron volt
K_{oc}	organic carbon partioning coefficient
K_{ow}	octonal-water partition coefficient
$KMnO_4$	potassium permanganate
L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)
L/kg/day	liters per kilogram per day
l	liter
LAW	light anti-tank weapon
lb	pound
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LOEC	lowest-observable-effect-concentration
LRA	land redevelopment authority
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MEC	munitions and explosives of concern
MeV	mega electron volt
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MNA	monitored natural attenuation
MnO_4-	permanganate ion
MOA	Memorandum of Agreement
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPC	maximum permissible concentration
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate; minimum separation distance
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&MP	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983

$NaMnO_4$	sodium permanganate
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO_3^-	nitrate
NOEC	no-observable-effect-concentration
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
NRT	near real time
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O_3	ozone
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PERC	perchloroethene
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritoltetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
QuickSilver	QuickSilver Analytics, Inc.
R	rejected data; resample; retardation factor
R&A	relevant and appropriate
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RBP	Rapid Bioassessment Protocol
RBRG	risk-based remedial goal
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RD	remedial design
RDX	cyclotrimethylenetrinitramine
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RR	range residue
RRF	relative response factor
RRSE	Relative Risk Site Evaluation
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RWIMR	Ranges West of Iron Mountain Road
SA	exposed skin surface area

SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRI	supplemental remedial investigation
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TEA	triethylaluminum
TeCA	1,1,2,2-tetrachloroethane
Tetryl	trinitrophenylmethylnitramine
TERC	Total Environmental Restoration Contract
TEU	Technical Escort Unit
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TSS	total suspended solids
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
URF	unit risk factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards
ZVI	zero-valent iron

TABLES

Table 2-1

Initial XRF Survey Results - Range 13 and Skeet Range
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Range	Grid Location	XRF Result (mg/kg) Pb
Range 13, Parcel 71Q	71Q-(0,0)	397
	71Q-(0,W25)	34.5
	71Q-(0,W50)	34.5
	71Q-(N25,0)	77
	71Q-(N25,W25)	71.9
	71Q-(N25,W50)	27.2
	71Q-(N50,0)	218
	71Q-(N50,W25)	24.2
	71Q-(N50,W50)	70.2
	71Q-(S25,0)	207
	71Q-(S25,W25)	97.9
	71Q-(S25,W50)	25.4
	71Q-(S50,0)	446
	71Q-(S50,W25)	99.6
	71Q-(S50,W50)	22.2
	71Q-(S75,0)	20.8
	71Q-(S75,W25)	30.4
	71Q-(S75,W50)	18.8
18 Samples in Range 13		
Skeet Range, Parcel 69Q	69Q-(0,0)	129
	69Q-(0,W25)	46.3
	69Q-(0,W50)	<LOD
	69Q-(N25,0)	77.2
	69Q-(N25,W25)	57.6
	69Q-(N25,W50)	<LOD
	69Q-(N50,0)	60
	69Q-(N50,W25)	18.8
	69Q-(N50,W50)	24.3
	69Q-(N75,0)	40.9
	69Q-(N75,W25)	18.6
	69Q-(N75,W50)	29.6
	69Q-(N100,0)	60.6
	69Q-(N100,W25)	30.7
	69Q-(N100,W50)	22
	69Q-(S25,0)	30.6
	69Q-(S25,W25)	22.8
	69Q-(S25,W50)	<LOD
	69Q-(S50,0)	53.2
	69Q-(S50,W25)	28.7
	69Q-(S50,W50)	47.6
	69Q-(S75,0)	54

Table 2-1

Initial XRF Survey Results - Range 13 and Skeet Range
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Range	Grid Location	XRF Result (mg/kg) Pb
Skeet Range, Parcel 69Q (cont.)	69Q-(S75,W25)	23.7
	69Q-(S75,W50)	<LOD
	69Q-(S100,0)	132
	69Q-(S100,W25)	28.2
	69Q-(S100,W50)	19.5
	69Q-(S125,0)	49.6
	69Q-(S125,W25)	34.6
	69Q-(S125,W50)	28.9

30 Samples in Skeet Range

mg/kg - milligrams per kilogram.
Pb - lead.
< LOD - less than limit of detection.
XRF - x-ray fluorescence.

All samples collected in October 2004.

Table 2-2

Initial XRF Survey Results - Range 12
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Range	Grid Location	XRF Result (mg/kg) Pb
Range 12, Parcel 70Q	70Q-(0,0)	5629
	70Q-(0,W25)	2699
	70Q-(0,W50)	524
	70Q-(0,W75)	178
	70Q-(0,W100)	93.3
	70Q-(0,W125)	156
	70Q-(0,W150)	<LOD
	70Q-(N25,0)	1540
	70Q-(N25,W25)	<LOD
	70Q-(N25,W50)	506
	70Q-(N25,W75)	594
	70Q-(N25,W100)	252
	70Q-(N25,W125)	369
	70Q-(N50,0)	2200
	70Q-(N50,W25)	2229
	70Q-(N50,W50)	40.2
	70Q-(N50,W75)	224
	70Q-(N50,W100)	432
	70Q-(N50,W125)	129
	70Q-(N75,0)	237
	70Q-(N75,W25)	242
	70Q-(N75,W50)	324
	70Q-(N75,W75)	136
	70Q-(N100,0)	387
	70Q-(N100,W25)	118
	70Q-(N100,W50)	130
	70Q-(N100,W75)	164
	70Q-(N125,0)	1390
	70Q-(N125,W25)	160
	70Q-(N125,W50)	71.3
	70Q-(N150,0)	66
	70Q-(N150,W25)	80.3
	70Q-(N150,W50)	68.1
	70Q-(N175,0)	64.7
	70Q-(N175,W50)	41.1
	70Q-(S25,0)	10298
	70Q-(S25,W25)	1840
	70Q-(S25,W50)	1190
	70Q-(S25,W75)	92.7
	70Q-(S25,W100)	184
	70Q-(S25,W125)	578

Table 2-2

Initial XRF Survey Results - Range 12
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Range	Grid Location	XRF Result (mg/kg) Pb
Range 12, Parcel 70Q (Cont.)	70Q-(S25,W150)	575
	70Q-(S25,W175)	208
	70Q-(S50,0)	1150
	70Q-(S50,W25)	66.9
	70Q-(S50,W50)	410
	70Q-(S50,W75)	988
	70Q-(S50,W100)	1210
	70Q-(S50,W125)	413
	70Q-(S50,W150)	171
	70Q-(S75,0)	298
	70Q-(S75,W25)	2080
	70Q-(S75,W50)	958
	70Q-(S75,W75)	2480
	70Q-(S75,W100)	883
	70Q-(S75,W125)	1070
	70Q-(S75,W150)	162
	70Q-(S75,W175)	12.8
	70Q-(S100,0)	1000
	70Q-(S100,W25)	103
	70Q-(S100,W50)	1350
	70Q-(S100,W75)	1150
	70Q-(S100,W100)	520
	70Q-(S100,W125)	465
	70Q-(S100,W150)	340
	70Q-(S125,0)	468
	70Q-(S125,W25)	314
	70Q-(S125,W50)	640
	70Q-(S125,W75)	1370
	70Q-(S125,W100)	1880
	70Q-(S125,W125)	1930
	70Q-(S125,W150)	43.8
	70Q-(S150,0)	306
	70Q-(S150,W25)	532
	70Q-(S150,W50)	747
	70Q-(S150,W75)	186
	70Q-(S150,W100)	352
	70Q-(S150,W125)	444
	70Q-(S150,W150)	64.4
	70Q-(S175,W25)	490

Table 2-2

Initial XRF Survey Results - Range 12
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Range	Grid Location	XRF Result (mg/kg) Pb
Range 12, Parcel 70Q (Cont.)	70Q-(S175,W50)	583
	70Q-(S175,W75)	882
	70Q-(S175,W100)	27.7
	70Q-(S175,W125)	60.8
	70Q-(S175,W175)	111
	70Q-(S200,0)	284
	70Q-(S200,W50)	75.6
	70Q-(S200,W75)	341
	70Q-(S200,W100)	3389
	70Q-(S200,W125)	46.5
	70Q-(S200,W150)	24.7
	70Q-(S225,W25)	101
	70Q-(S225,W75)	46.9
	70Q-(S225,W100)	22.1
	70Q-(S225,W175)	10.7
	70Q-(S250,W50)	39.9
	70Q-(S250,W100)	30.8
	70Q-(S250,W150)	21.4

99 Samples in Range 12

mg/kg - milligrams/kilogram.
Pb - lead.
< LOD - less than limit of detection.
XRF - x-ray fluorescence.

All samples collected in October 2004.

Table 2-3

Laboratory Confirmation Results of Initial XRF Survey
Removal Action at Iron Mountain Road Ranges
Fort McClellan, Calhoun County, Alabama

Range	Sample Location	XRF Lead Result (mg/kg)	Sample Number	Laboratory Confirmation Lead Result (mg/kg)
Range 13	71Q-(0,W50)	29.6	SN0012	39.3
	71Q-(N50,0)	224	SN0007	356
Skeet Range	69Q-(N50,0)	104	SN0010	84.6
	69Q-(N50,W25)	20.5	SN0014	31.8
	69Q-(S100,0)	82.5	SN0008	89.8
Range 12	70Q-(0,W150)	25.8	SN0015	29.4
	70Q-(N50,W100)	500	SN0004	521
	70Q-(N50,W25)	2250	SN0001	2780
	70Q-(N75,W50)	341	SN0006	355
	70Q-(S100,W25)	129	SN0005	127
	70Q-(S100,W75)	1140	SN0002	3700
	70Q-(S125,W150)	101	SN0011	104
	70Q-(S125,W50)	788	SN0003	766
	70Q-(S175,W100)	33.2	SN0013	20.6
	70Q-(S200,W50)	39.7	SN0009	36.4

XRF - x-ray fluorescence.
mg/kg - milligrams per kilogram.

All samples were collected and analyzed in October 2004.

Table 2-4

XRF and Laboratory Confirmation Data
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Grid/Sample Location	Analysis Month/Year	XRF Result (mg/kg)	Laboratory Confirmation Result	
		Pb	Sample ID	Pb (mg/kg)
Grid Composite Samples				
CS:(Grid#1)+1'	November 2004	94.6	SN0016	82.1
CS:(Grid#1)+2'	January 2005	48.3	SN0062	61.8
CS:(Grid#2)+1'	November 2004	<LOD	SN0017	11.1
CS:(Grid#3)+1'	November 2004	15.9	SN0018	18.4
CS:(Grid#4)+1'	November 2004	<LOD	SN0019	25.6
CS:(Grid#5)+1'	November 2004	25	SN0020	11.7
CS:(Grid#6)+1'	November 2004	77.9	SN0048	160
CS:(Grid#7)+1'	November 2004	1070	SN0040	1220
CS:(Grid#7)+2'	December 2004	73.1	SN0051	90.5
CS:(Grid#8)+1'	November 2004	272	SN0033	5450
CS:(Grid#8)+2'	January 2005	119	SN0067	193
CS:(Grid#9)+1'	November 2004	33.2	SN0031	25.1
CS:(Grid#10)+1'	November 2004	133	SN0047	165
CS:(Grid#11)+1'	November 2004	222	SN0041	255
CS:(Grid#12)+1'	November 2004	379	SN0038	586
CS:(Grid#12)+2'	January 2005	594	SN0068	838
CS:(Grid#13)+1'	November 2004	38.8	SN0034	24.5
CS:(Grid#14)+1'	November 2004	298	SN0049	530
CS:(Grid#15)+1'	November 2004	91.6	SN0050	66.4
CS:(Grid#16)+1'	November 2004	108	SN0044	100
CS:(Grid#17)+1'	November 2004	480	SN0045	693
CS:(Grid#17)+2'	January 2005	311	SN0060	489
CS:(Grid#18)+1'	November 2004	2450	SN0030	2820
CS:(Grid#18)+2'	January 2005	1180	SN0061	2120
CS:(Grid#18)+3'	February 2005	538	SN0070	503
CS:(Grid#19)+1'	November 2004	465	SN0027	530
CS:(Grid#20)+1'	November 2004	676	SN0024	946
CS:(Grid#20)+3'	February 2005	91.3	SN0075	66.3
CS:(Grid#21)+1'	November 2004	87.3	SN0025	72.6
CS:(Grid#22)+2'	January 2005	572	SN0069	857
CS:(Grid#23)+2'	January 2005	54.7	SN0059	65.9
CS:(Grid#24)+3'	February 2005	145	SN0073	55.5
CS:(Grid#25)+3'	February 2005	45	SN0074	44.6
Node Samples				
CS:(0,0)+1'	November 2004	299		
CS:(0,0)+2'	January 2005	469	SN0052	232
CS:(0,0)+3'	February 2005	25.9		
CS:(0,W25)+1'	November 2004	589	SN0026	779
CS:(0,W25)+2'	January 2005	747	SN0054	1650
CS:(0,W25)+2' (FD)	January 2005	NA	SN0055	1330
CS:(0,W25)+3'	February 2005	330		
CS:(0,W50)+1'	November 2004	322		
CS:(0,W50)+2'	January 2005	663	SN0058	1020
CS:(0,W50)+3'	February 2005	15.9		
CS:(0,W75)+3'	February 2005	<LOD		
CS:(N25,0)+1'	November 2004	19.4		
CS:(N25,0)+2'	January 2005	57.4		
CS:(N25,0)+3'	February 2005	140		
CS:(N25,W25)+1'	November 2004	18.1		
CS:(N25,W25)+2'	January 2005	<LOD		
CS:(N25,W25)+3'	February 2005	18.6		
CS:(N25,W50)+3'	February 2005	<LOD		
CS:(N50,0)+1'	November 2004	62.5		
CS:(N50,0)+2'	January 2005	396		
CS:(N50,W25)+1'	November 2004	<LOD		

Table 2-4

XRF and Laboratory Confirmation Data
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Grid/Sample Location	Analysis Month/Year	XRF Result (mg/kg) Pb	Laboratory Confirmation Result Sample ID	Laboratory Confirmation Result Pb (mg/kg)
CS:(N50,W25)+2'	January 2005	189		
CS:(N50,W25)+3'	February 2005	93		
CS:(N50,W50)+1'	November 2004	23		
CS:(N50,W50)+3'	February 2005	16.9		
CS:(N75,0)+1'	November 2004	<LOD		
CS:(N75,W25)+1'	November 2004	22.5		
CS:(N100,0) +1'	November 2004	20.1		
CS:(N100,0)+2'	January 2005	<LOD		
CS:(N125,0) +1'	November 2004	942	SN0021	1310
CS:(N125,0) +1' (FD)	November 2004	NA	SN0022	2720
CS:(N125,0)+2'	January 2005	55.5		
CS:(N125,W25) +1'	November 2004	25.9		
CS:(N125,W25)+2'	January 2005	<LOD		
CS:(N150,0) +1'	November 2004	17.6		
CS:(N150,0)+2'	January 2005	20		
CS:(S25,0)+1'	November 2004	4160	SN0028	6800
CS:(S25,0)+2'	January 2005	2520	SN0053	5650
CS:(S25,0)+3'	February 2005	502	SN0071	532
CS:(S25,0)+3' (FD)	February 2005	NA	SN0072	4450
CS:(S25,W25)+1'	November 2004	626	SN0029	857
CS:(S25,W25)+2'	January 2005	1380	SN0056	2990
CS:(S25,W25)+3'	February 2005	36.9		
CS:(S25,W50)+1'	November 2004	822	SN0042	1260
CS:(S25,W50)+1' (FD)	November 2004	NA	SN0043	1310
CS:(S25,W50)+2'	January 2005	123		
CS:(S25,W50)+3'	February 2005	128		
CS:(S25,W75)+1'	November 2004	31		
CS:(S25,W75)+2'	January 2005	21.1		
CS:(S25,W100)+1'	November 2004	16.6		
CS:(S50,0)+1'	November 2004	<LOD		
CS:(S50,0)+2'	January 2005	22.6		
CS:(S50,0)+3'	February 2005	34		
CS:(S50,W25)+1'	November 2004	207		
CS:(S50,W25)+2'	January 2005	503	SN0057	294
CS:(S50,W25)+3'	February 2005	182		
CS:(S50,W50)+1'	November 2004	<LOD		
CS:(S50,W50)+2'	January 2005	100		
CS:(S50,W75)+1'	November 2004	43.8		
CS:(S50,W75)+2'	January 2005	124		
CS:(S50,W100)+1'	November 2004	54.5		
CS:(S50,W125)+1'	November 2004	20		
CS:(S75,0)+1'	November 2004	75.4		
CS:(S75,W25)+1'	November 2004	37.7		
CS:(S75,W25)+2'	January 2005	194		
CS:(S75,W50)+1'	November 2004	1250	SN0035	1680
CS:(S75,W50)+2'	January 2005	683	SN0064	905
CS:(S75,W50)+2' (FD)	January 2005	NA	SN0065	880
CS:(S75,W50)+2' (RS)	**February 2006**	**489**	**SN0077**	**446**
CS:(S75,W75)+1'	November 2004	890	SN0036	1160
CS:(S75,W75)+1' (FD)	November 2004	NA	SN0037	1330
CS:(S75,W75)+2'	January 2005	496	SN0063	718
CS:(S75,W100)+1'	November 2004	68.7		
CS:(S75,W100)+2'	January 2005	323		
CS:(S75,W125)+1'	November 2004	<LOD		
CS:(S75,W150)+1'	November 2004	<LOD		
CS:(S100,0)+1'	November 2004	27.6		
CS:(S100,W25)+1'	November 2004	33.6		

Table 2-4

XRF and Laboratory Confirmation Data
Removal Action at the Iron Mountain Road Ranges
Fort McClellan, Alabama

Grid/Sample Location	Analysis Month/Year	XRF Result (mg/kg)	Laboratory Confirmation Result	
		Pb	Sample ID	Pb (mg/kg)
CS:(S100,W50)+1'	November 2004	202		
CS:(S100,W50)+2'	January 2005	539	SN0066	577
CS:(S100,W75)+1'	November 2004	142		
CS:(S100,W75)+2'	December 2004	33.6		
CS:(S100,W100)+1'	November 2004	616	SN0032	591
CS:(S100,W100)+2'	January 2005	309		
CS:(S100,W125)+1'	November 2004	43.9		
CS:(S100,W125)+2'	January 2005	37.5		
CS:(S125,0)+1'	November 2004	15.1		
CS:(S125,W25)+1'	November 2004	242	SN0046	414
CS:(S125,W50)+1'	November 2004	42.2		
CS:(S125,W50)+2'	December 2004	49.1		
CS:(S125,W75)+1'	November 2004	2019	SN0039	2230
CS:(S125,W75)+2'	December 2004	58.6		
CS:(S125,W100)+1'	November 2004	103	SN0023	65.8
CS:(S125,W100)+2'	December 2004	<LOD		
CS:(S125,W125)+1'	November 2004	<LOD		
CS:(S125,W150)+1'	November 2004	<LOD		
CS:(S150,W25)+1'	November 2004	38.3		
CS:(S150,W50)+1'	November 2004	125		
CS:(S150,W75)+1'	November 2004	<LOD		
CS:(S150,W75)+2'	December 2004	<LOD		
CS:(S150,W100)+1'	November 2004	16.7		
CS:(S150,W125)+1'	November 2004	<LOD		
CS:(S175,W50)+1'	November 2004	28.9		
CS:(S175,W75)+1'	November 2004	38		
CS:(S175,W100)+1'	November 2004	<LOD		
CS:(S200,W75)+1'	November 2004	29.9		
CS:(S200,W100)+1'	November 2004	<LOD		
CS:(S200,W125)+1'	November 2004	<LOD		
CS:(S225,W100)+1'	November 2004	<LOD		
CS:001	**February 2006**	**390**	**SN0076[a]**	**538**
CS:002	**February 2006**	**124**		
CS:003+1'	**February 2006**	**147**		
CS:004+1'	**February 2006**	**274**		
CS:005+1'	**February 2006**	**112**		
CS:003	**February 2006**	**566**		
CS:004	**February 2006**	**1989**		
CS:005	**February 2006**	**1120**		

[a] Sample number SN0076 is a composite of XRF grid samples 001, 002, 003+1', 004+1' & 005+1'.

Bold - samples collected during supplemental soil removal and erosion control activities.

Grid/sample location - CS (confirmation sample), grid number/node, +1', +2', +3' = depth of excavation at sample location.
FD - Field duplicate.
<LOD - less than limit of detection.
mg/kg - milligrams per kilogram.
Pb - Lead.
RS - Resample. Grid node location was resampled to confirm previous lead results.
SDG No. - Sample delivery group number.
XRF - x-ray fluoresence.

Table 2-5

Treated Soil XRF and Laboratory TCLP Lead Data
Removal Action at Iron Mountain Road Ranges
Fort McClellan, Calhoun County, Alabama

	XRF Result (mg/kg)	Laboratory TCLP Result	
Batch Sample	Total Pb	Sample ID	TCLP Pb (mg/L)
TS:(Batch#1)	75.4	SN1000	ND
TS:(Batch#2)	307	SN1001	ND
TS:(Batch#3)	295	SN1002	ND
TS:(Batch#4)	313	SN1003	ND
TS:(Batch#5)	467	SN1004	0.0711
TS:(Batch#6)	382	SN1005	32.4
TS:(Batch#6) - Resample	NS	SN1007	ND
TS:(Batch#7)	NS	SN1006	ND
TS:(Batch #8)	225	SN1008	0.144
TS:(Batch#9)	328	SN1009	0.0758
TS:(Batch#10)	NS	SN1010	0.0752 J

Batch Sample - TS (treated soil), sequential batch number. Batches 1-9 were sampled during the initial phase of fieldwork in 2004/2005. Batch 10 was sampled during the supplemental fieldwork in February 2006.

J - Estimated concentration; detected concentration was above method detection limit but below reporting limit.
mg/L - Milligrams per liter.
ND - Not detected.
NS - not sampled.
Pb - Lead.
SDG No. - sample delivery group designation from the laboratory.
TCLP - toxicity characteristic leachate procedure, EPA Method 1311.
XRF - x-ray fluorescence.

Table 2-6

Confirmation XRF Results - Range 12
Removal Action at Iron Mountain Road Ranges
Fort McClellan, Calhoun County, Alabama

Sample Location	XRF Result (mg/kg)
	Pb
R12 Final - Grid 1	241
R12 Final - Grid 2	255
R12 Final - Grid 3	233
R12 Final - Grid 4	181
R12 Final - Grid 5	139
R12 Final - Grid 6	206

mg/kg - milligrams/kilogram.
Pb - lead.
XRF - x-ray fluorescence instrument.

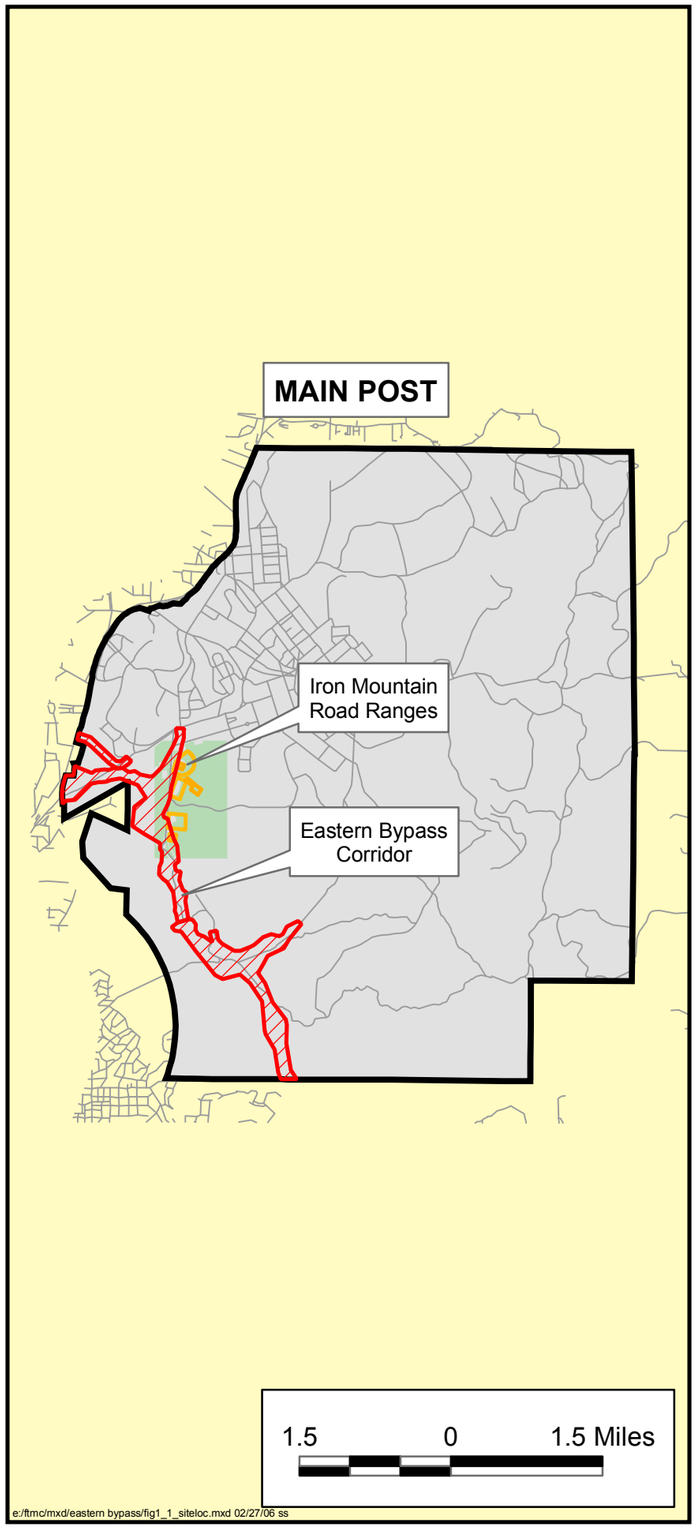
All samples collected on March 30, 2005.

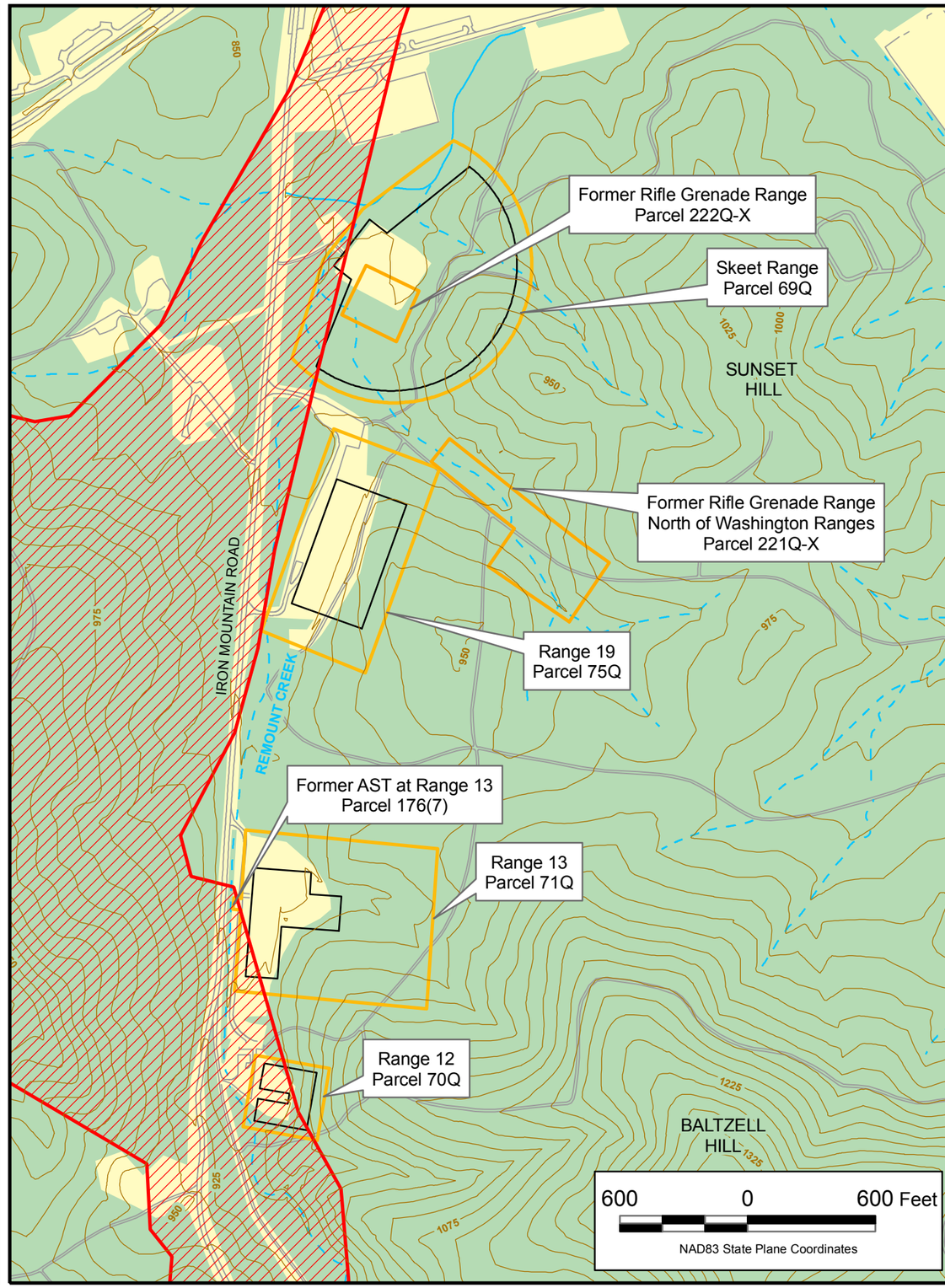
FIGURES

Figure 1-1

Site Location Map

Iron Mountain Road Ranges
Fort McClellan, Alabama





Legend

- Fort McClellan Main Post
- Eastern Bypass Corridor
- Study Area
- Wooded
- Cleared
- Roads
- Surface Drainage Feature (Dashed where intermittent)
- Topographic Contour (25-foot interval)
- Parcel Boundary

N

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U.S. Army Corps of Engineers Mobile District

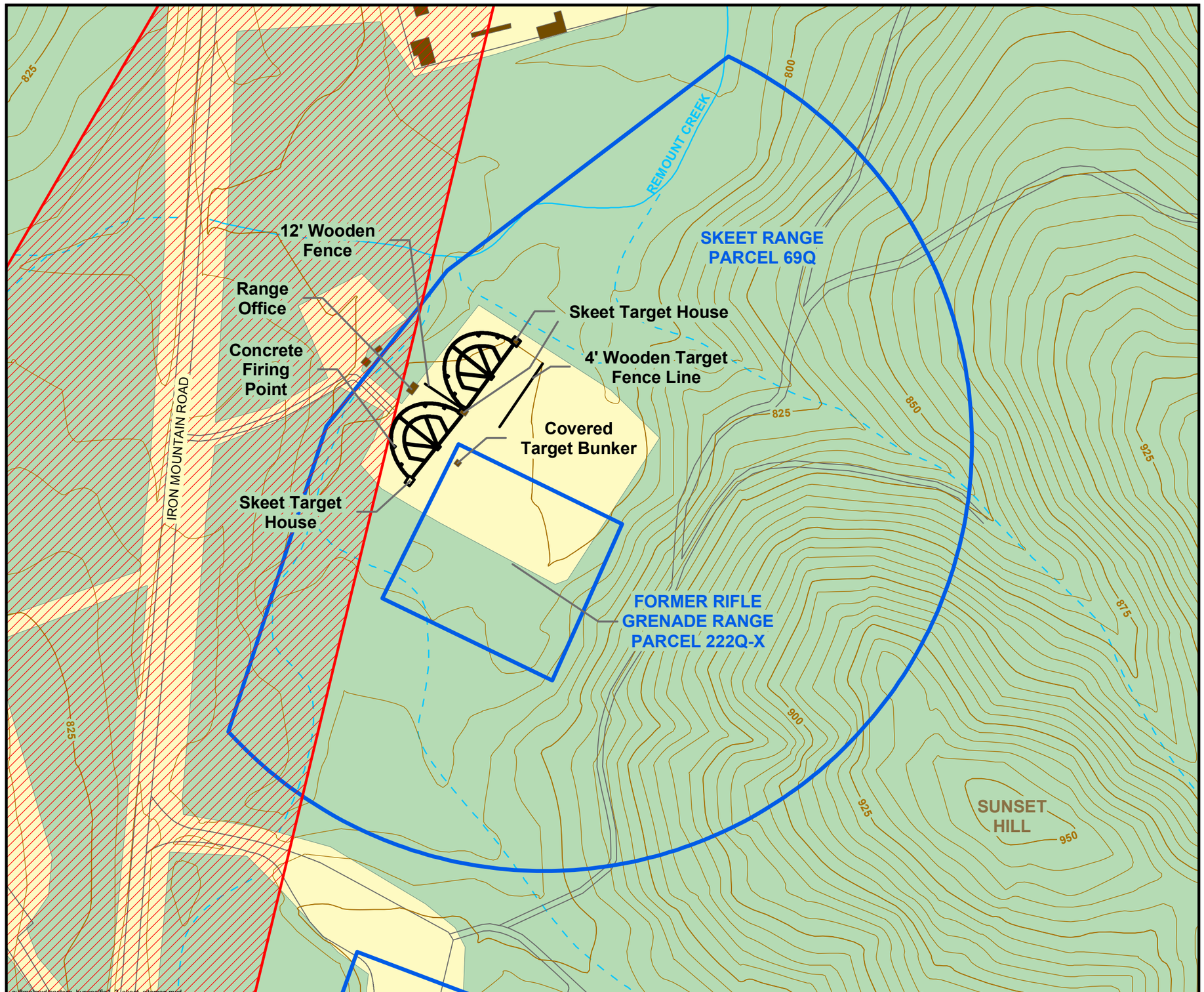
Contract No. DACA21-96-D-0018

e:/ftmc/mxd/eastern bypass/fig1_1_siteloc.mxd 02/27/06 ss

Figure 1-2

Site Map
Skeet Range, Parcel 69Q and Former Rifle Grenade Range, Parcel 222Q-X

Iron Mountain Road Ranges
Fort McClellan, Alabama



Legend

- Study Area
- Building/Former Building
- Wooded
- Not Wooded
- Roads
- Surface Drainage Feature (Dashed where Intermittent)
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

150 0 150 Feet

NAD83 State Plane Coordinates

N

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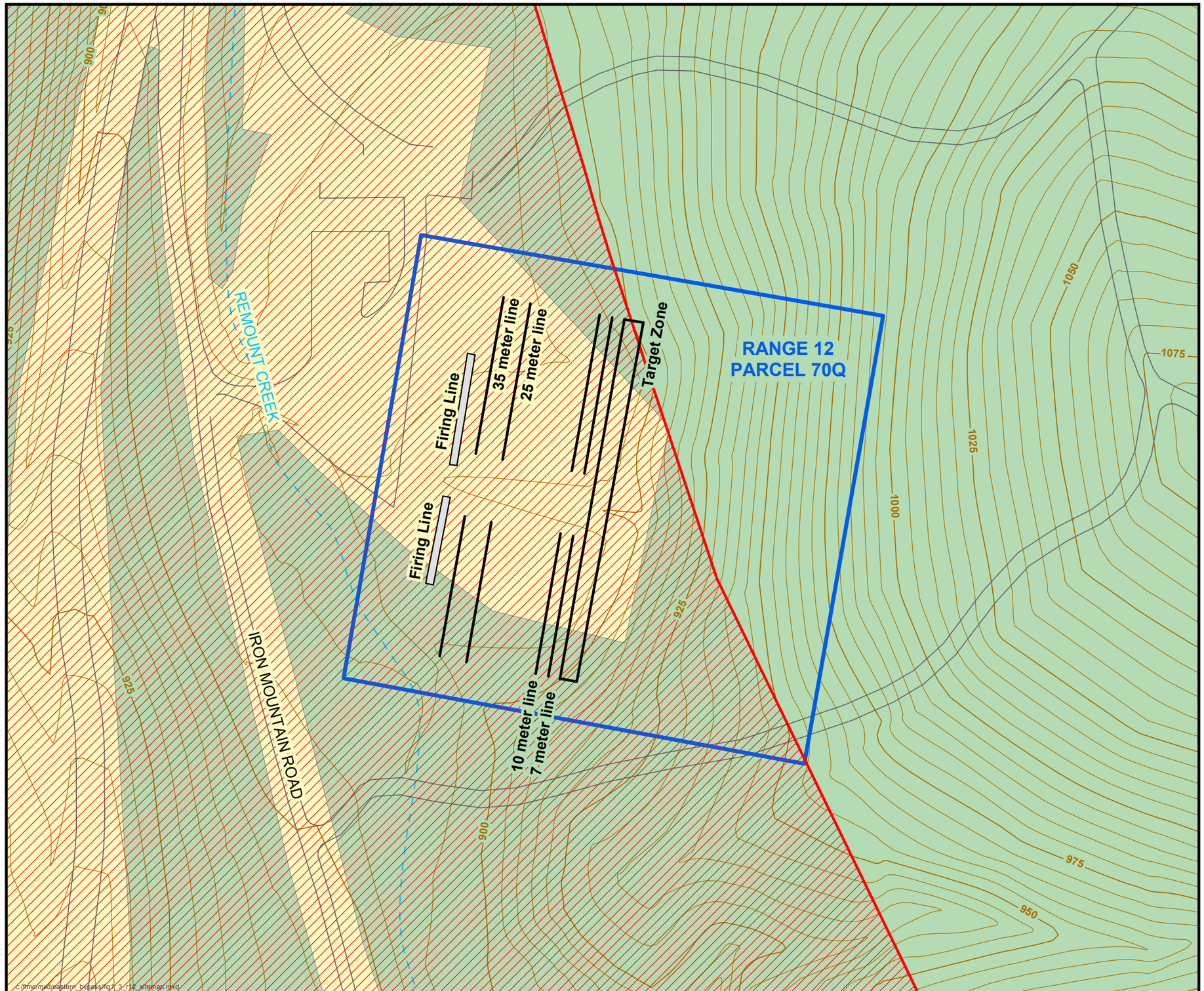
U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

Figure 1-3

Site Map
Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama



Legend

- Study Area
- Firing Lines
- Wooded
- Not Wooded
- Roads
- Intermittent Surface Drainage Feature
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

75 0 75 Feet

NAD83 State Plane Coordinates

N

Shaw Environmental, Inc.

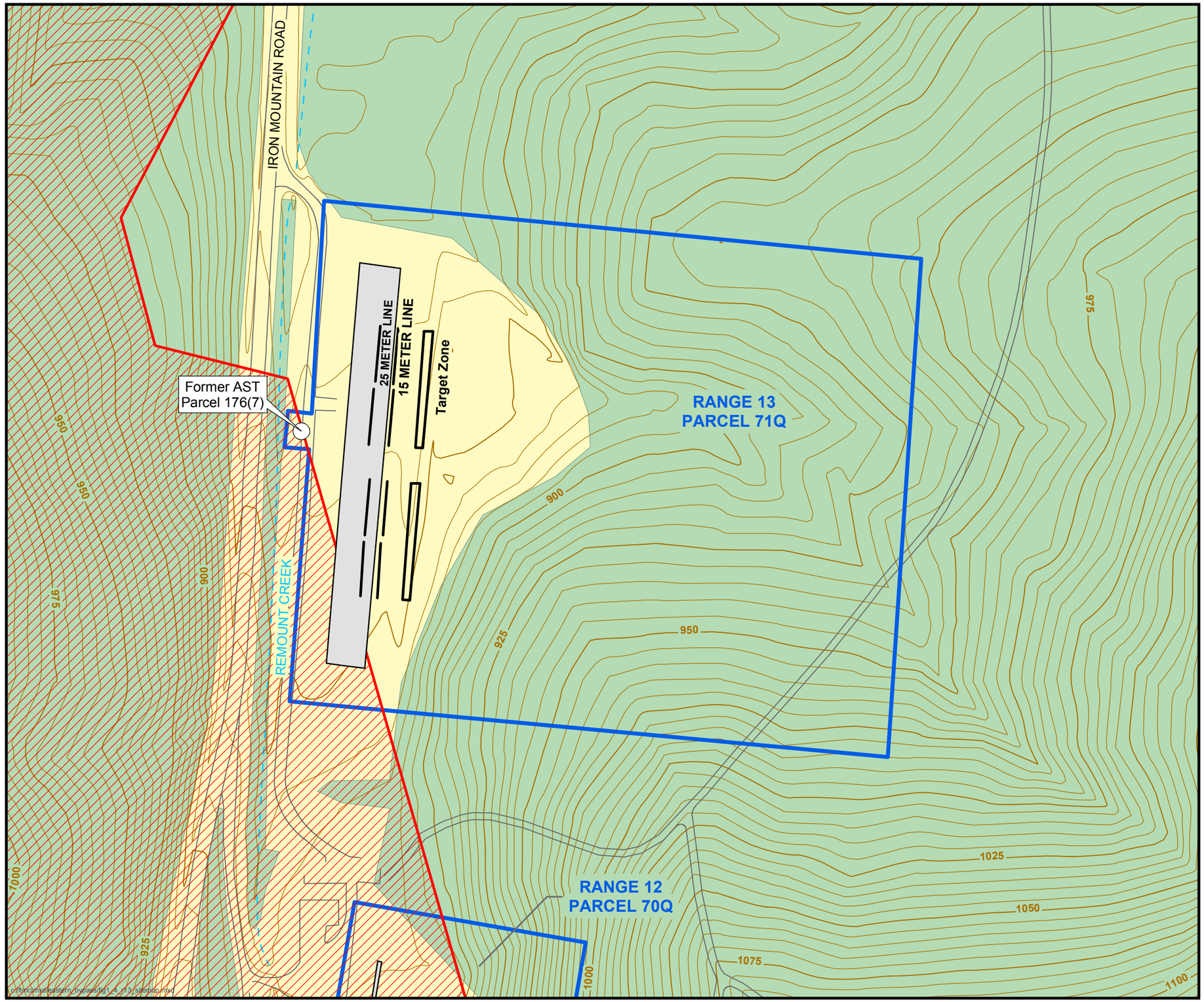
U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

Figure 1-4

Site Map
Range 13, Parcel 71Q and Former AST at Range 13, Parcel 176(7)

Iron Mountain Road Ranges
Fort McClellan, Alabama



Legend

- Study Area
- Firing Lines
- Wooded
- Not Wooded
- Roads
- Intermittent Surface Drainage Feature
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

150 0 150 Feet

NAD83 State Plane Coordinates

N

Shaw Environmental, Inc.

U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

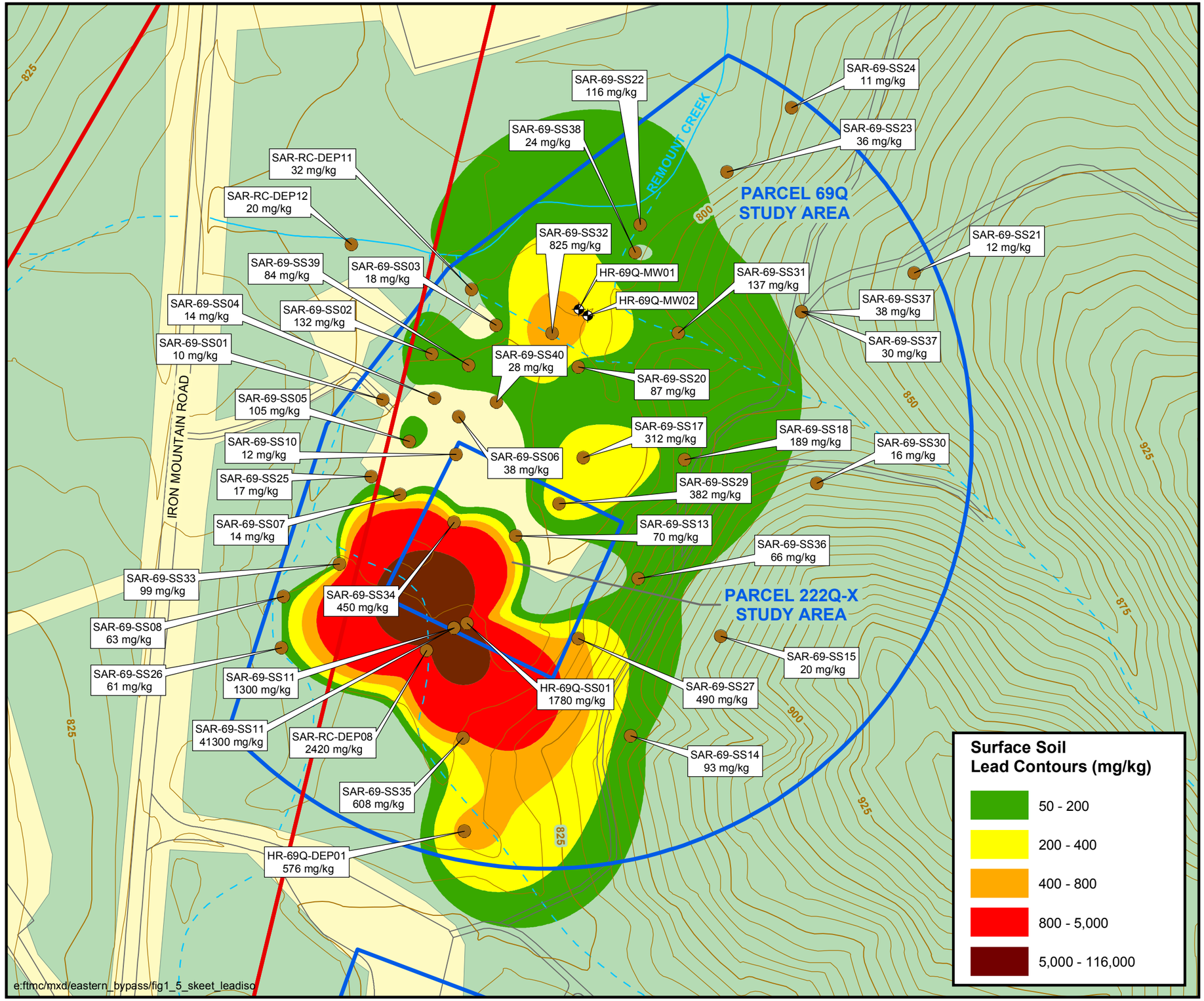


Figure 1-5

Lead in Surface Soil Isocontour Map Skeet Range, Parcel 69Q and Former Rifle Grenade Range, Parcel 222Q-X

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- Surface Soil Sample Location
- Monitoring Well (No Soil Sample Collected)
- Study Area
- Wooded
- Not Wooded
- Roads
- Surface Drainage Feature (Dashed where Intermittent)
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

150 0 150 Feet

NAD83 State Plane Coordinates

N

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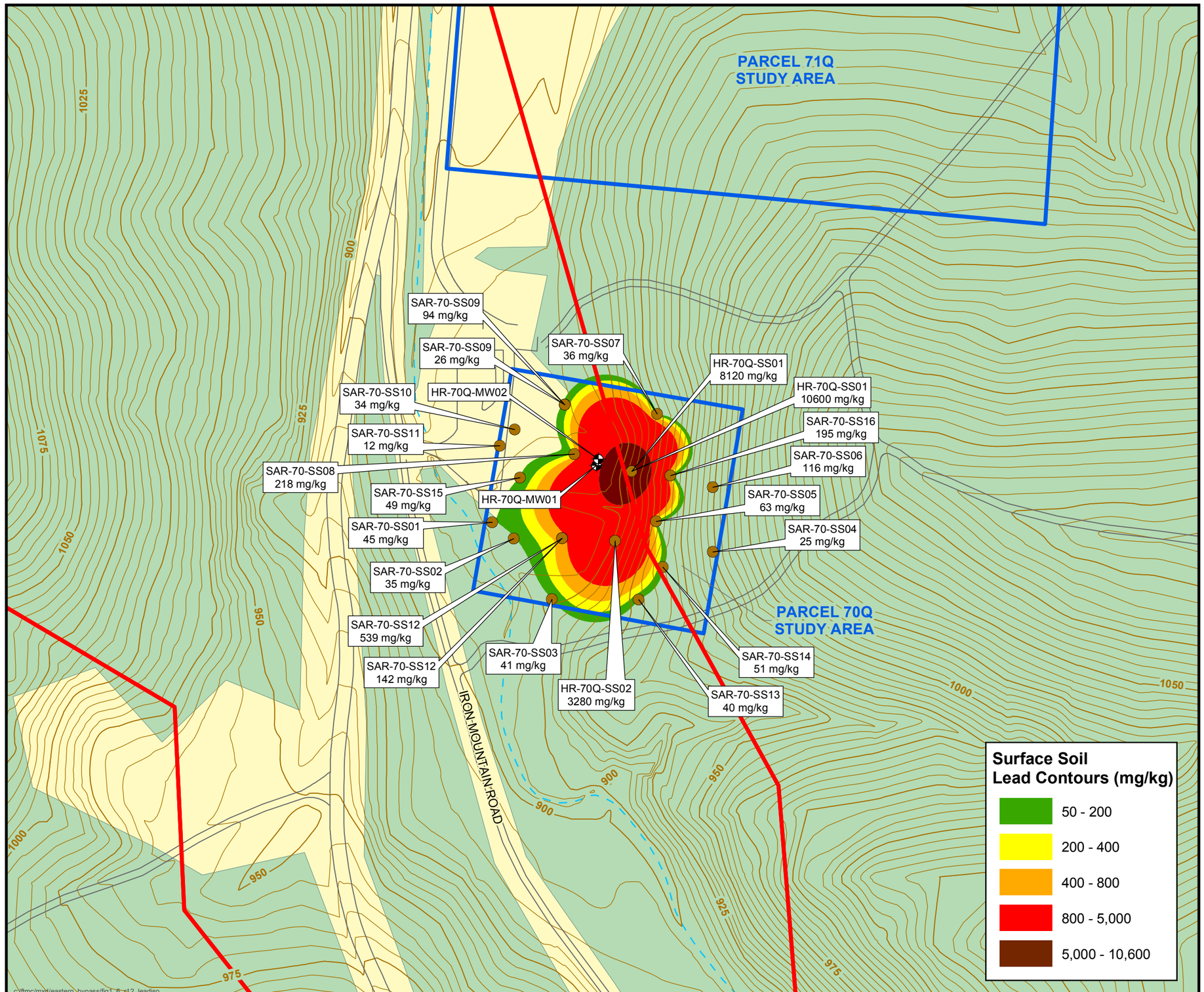
Contract No. DACA21-96-D-0018

Figure 1-6

Lead in Surface Soil Isocontour Map Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama



Legend

- Surface Soil Sample Location
- Monitoring Well (No Soil Sample Collected)
- Study Area
- Wooded
- Not Wooded
- Roads
- Intermittent Surface Drainage Feature
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

150 0 150 Feet

NAD83 State Plane Coordinates

N

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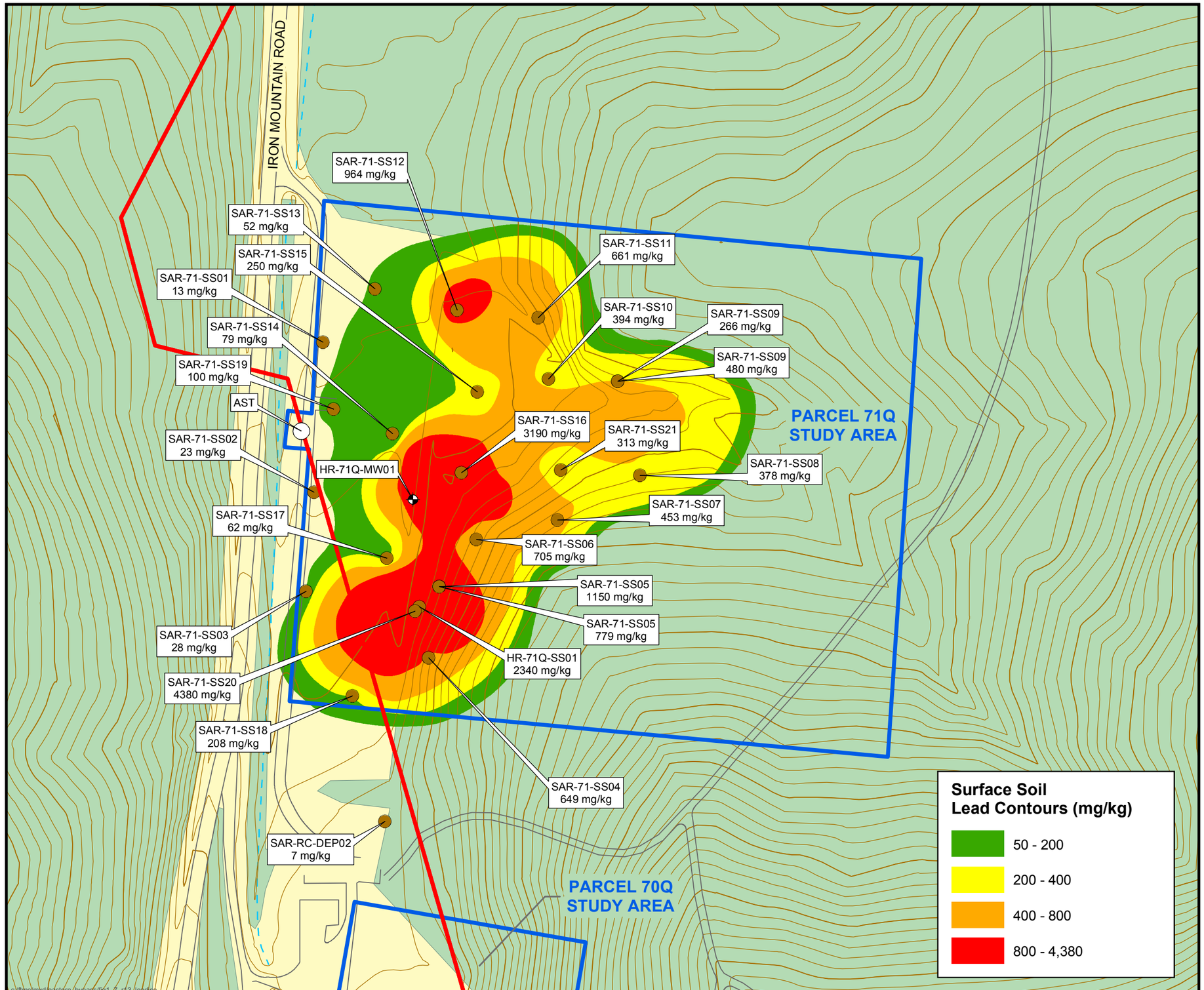

Figure 1-7

Lead in Surface Soil Isocontour Map Range 13, Parcel 71Q

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- Surface Soil Sample Location
- Monitoring Well (No Soil Sample Collected)
- Study Area
- Wooded
- Not Wooded
- Roads
- Intermittent Surface Drainage Feature
- Topographic Contour (5-foot interval)
- Eastern Bypass Corridor

150 0 150 Feet

NAD83 State Plane Coordinates

N

Shaw Environmental, Inc.

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Contract No. DACA21-96-D-0018

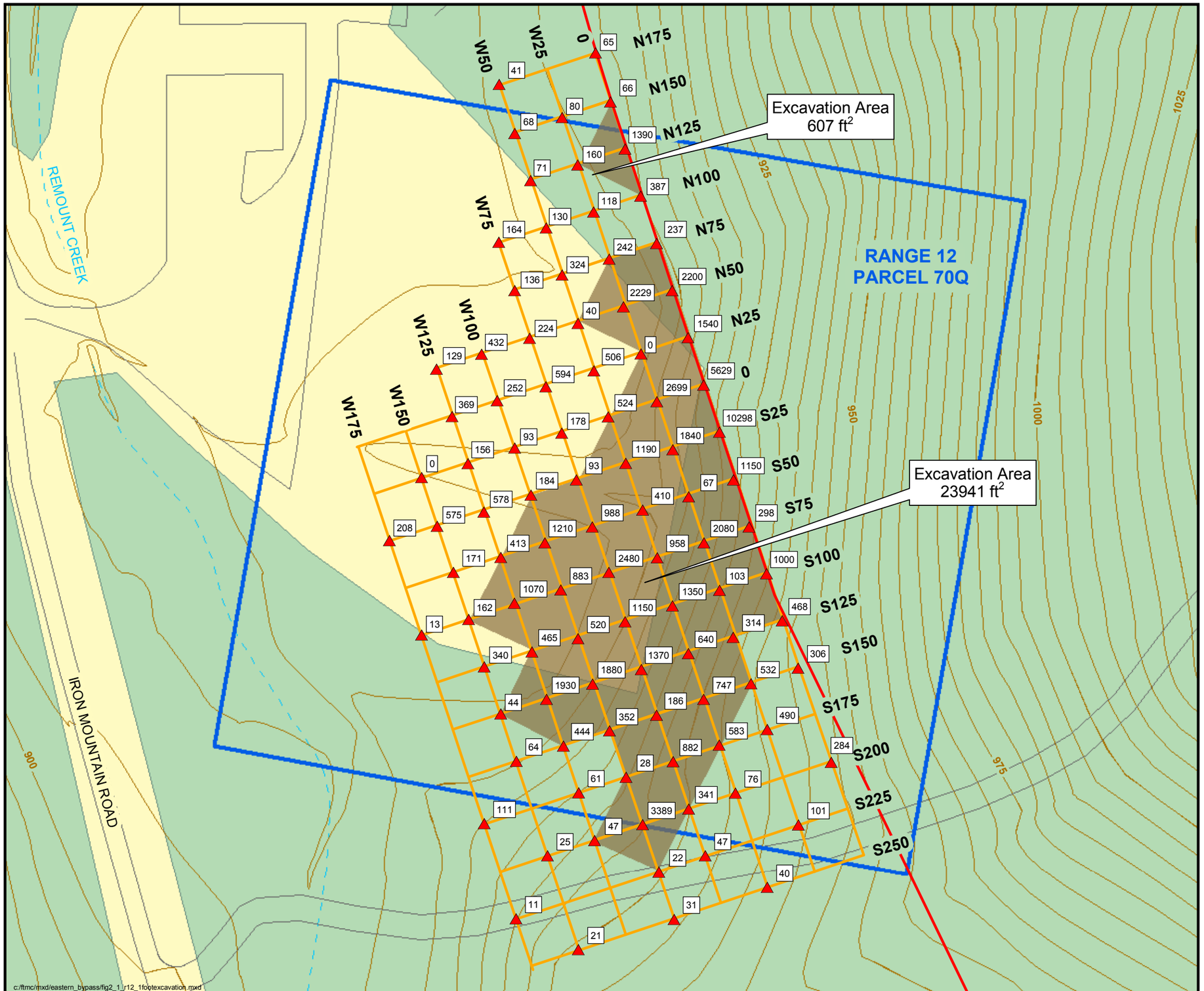

Figure 2-1

1-Foot Depth Excavation Limit Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- XRF Sample Location (Surface Soil)
- 178 Lead Concentration (mg/kg)
- Eastern Bypass Corridor
- Study Area
- Original Sample Grid (25-foot Squares)
- 1-Foot Excavation Area
- Wooded
- Not Wooded
- Topographic Contour (5-foot interval)

50 0 50 Feet

NAD83 State Plane Coordinates

N

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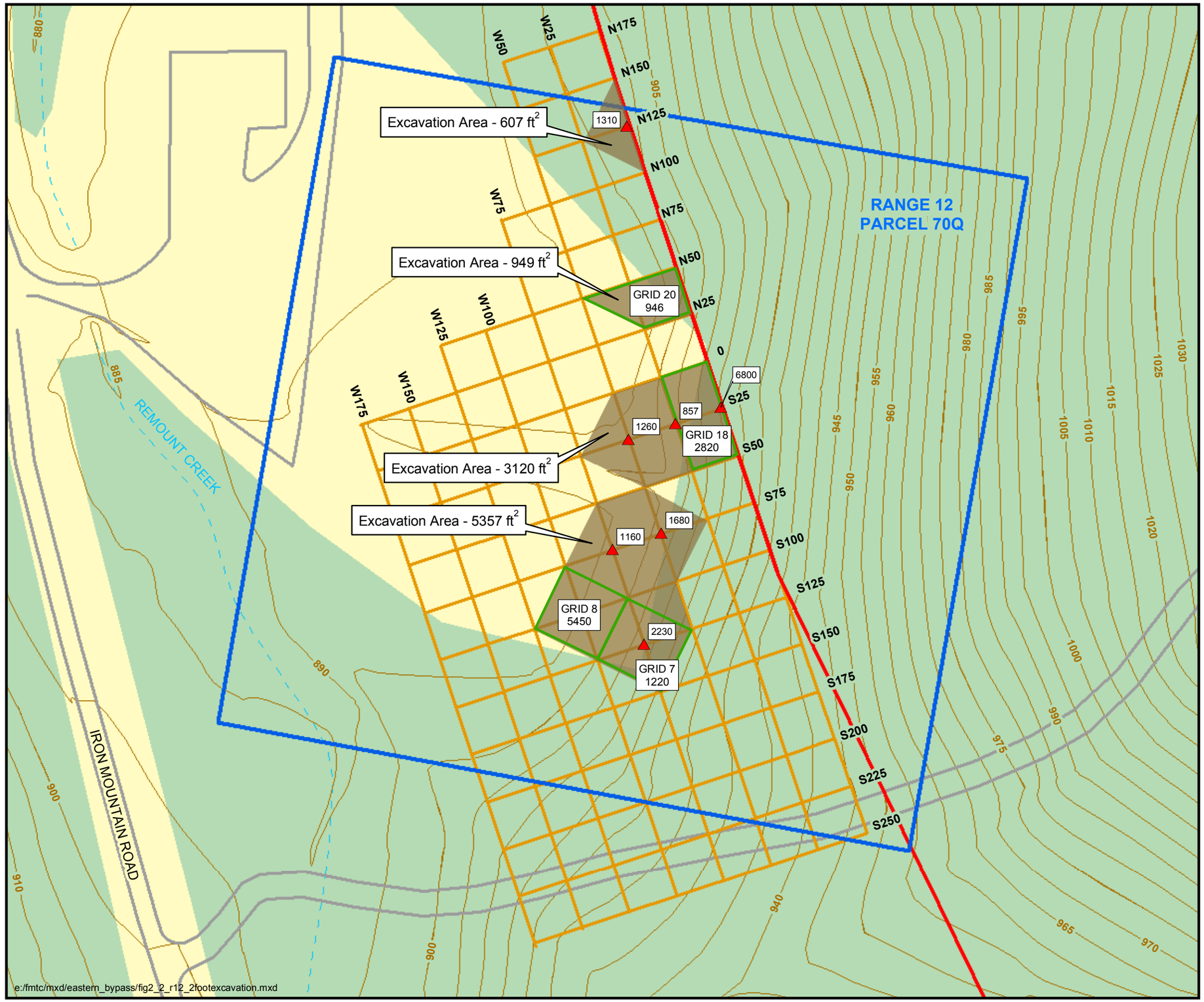

Figure 2-2

2-Foot Depth Excavation Limit Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- XRF Sample Location (1-Foot Depth)
- 946 Lead Concentration (mg/kg)
- Eastern Bypass Corridor
- Study Area
- Composite Sample Grid
- Original Sample Grid (25-foot Squares)
- 2-Foot Excavation Area
- Wooded
- Not Wooded
- Topographic Contour (5-foot interval)

50 0 50 Feet

NAD83 State Plane Coordinates

N

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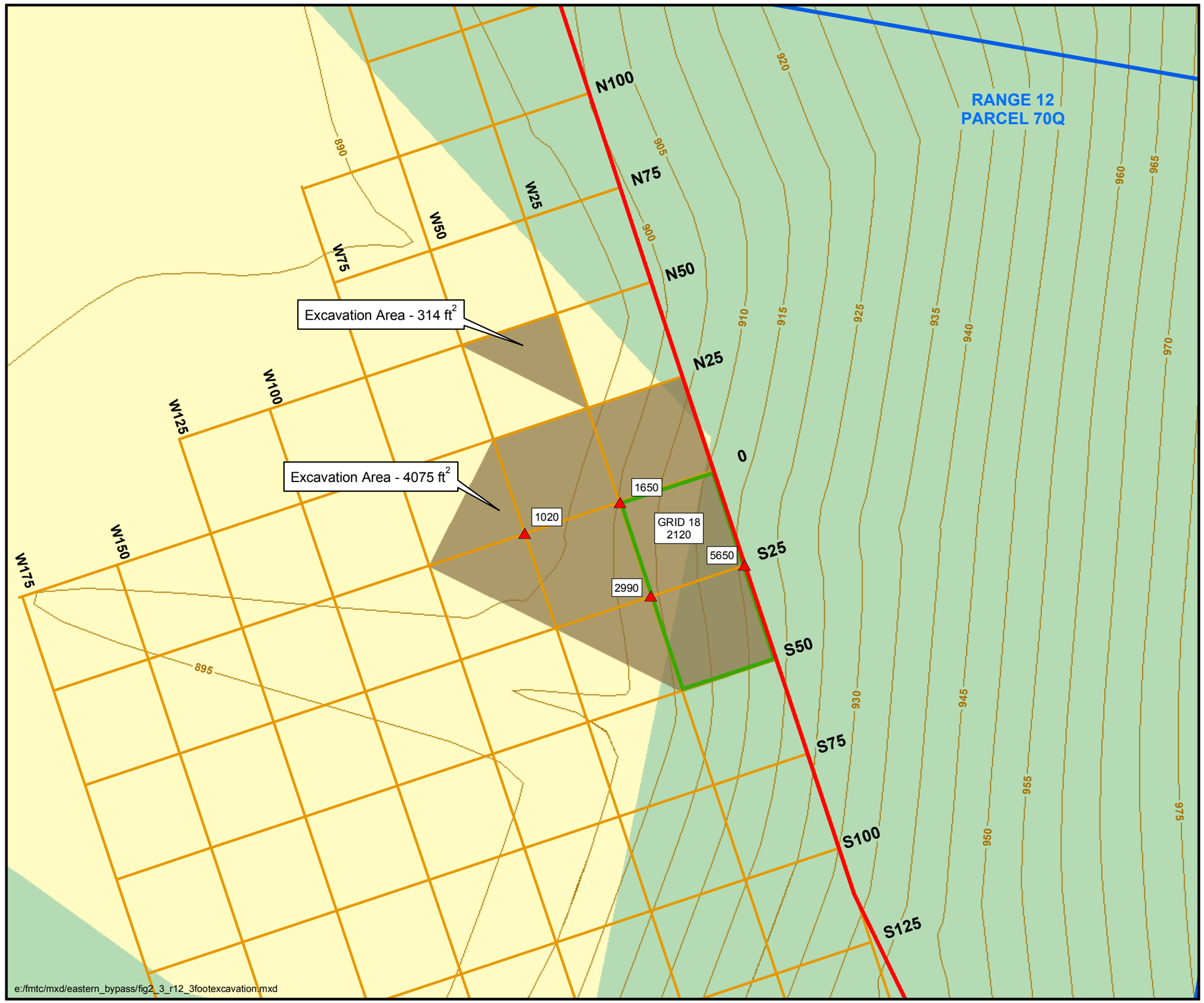

Figure 2-3

3-Foot Depth Excavation Limit Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- XRF Sample Location (2-Foot Depth)
- 1020 Lead Concentration (mg/kg)
- Eastern Bypass Corridor
- Study Area
- Composite Sample Grid
- Original Sample Grid (25-foot Squares)
- 3-Foot Excavation Area
- Wooded / Not Wooded
- Topographic Contour (5-foot interval)

25 0 25 Feet

NAD83 State Plane Coordinates

N

Shaw™ Shaw Environmental, Inc.

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Contract No. DACA21-96-D-0018

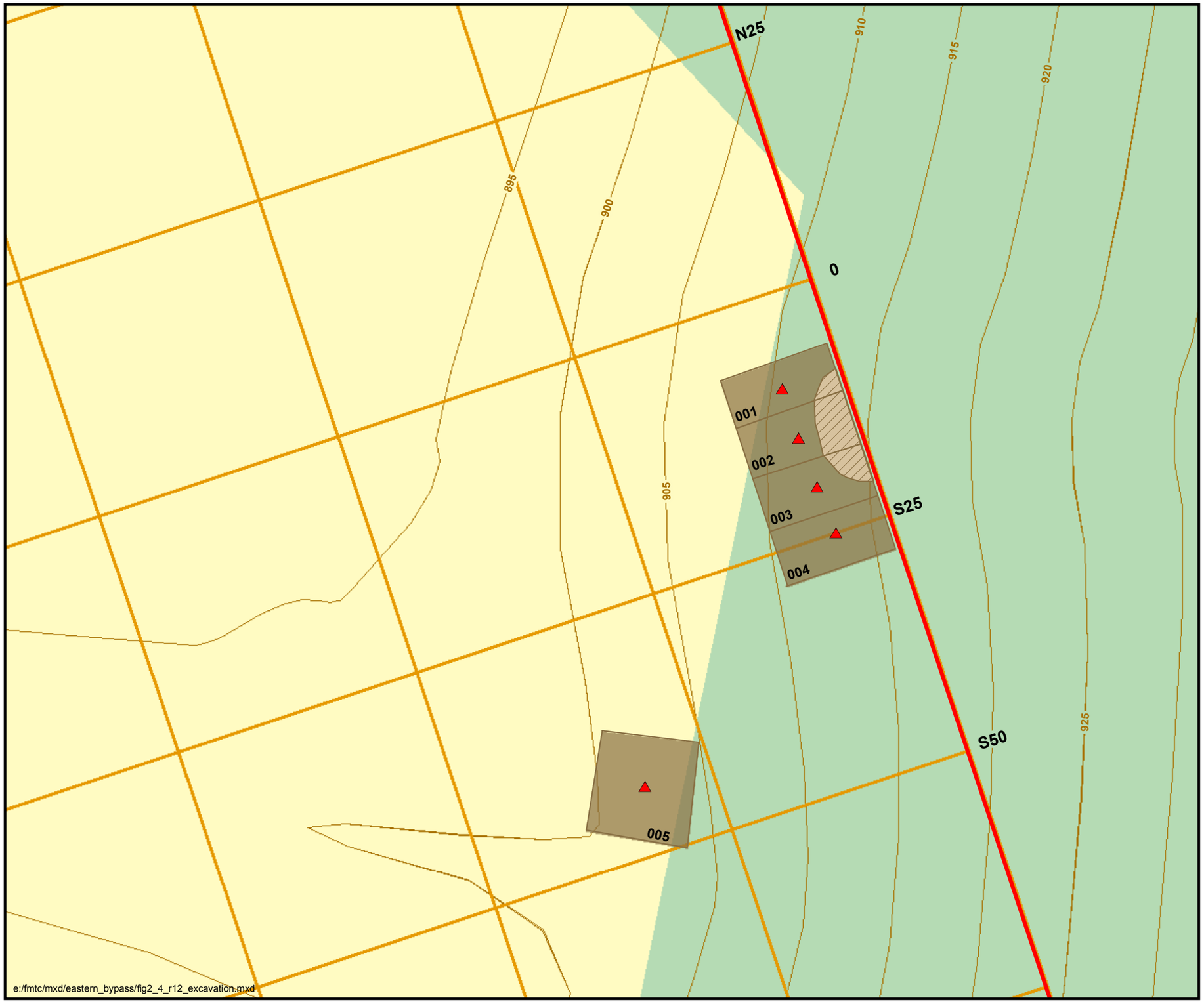

Figure 2-4

Supplemental Soil Removal Excavation Areas and Sample Locations Range 12, Parcel 70Q

Iron Mountain Road Ranges
Fort McClellan, Alabama

Legend

- XRF Sample Location
- Eastern Bypass Corridor
- Original Sample Grid (25-foot Squares)
- Wooded / Not Wooded
- Topographic Contour (5-foot interval)
- Area of Sloughed Soil
- Excavation Area
- **001** Grid Number

Note:
Grids 001 and 002 were excavated to a depth of approximately 1 foot. Grids 003 through 005 were excavated to depths of 1.5 to 2 feet.

10 0 10 Feet

NAD83 State Plane Coordinates

N

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