APPENDIX H

PRELIMINARY ECOLOGICAL RISK ASSESSMENT

TECHNICAL MEMORANDUM

PRELIMINARY ECOLOGICAL RISK ASSESSMENT FOR THE FORMER MORTAR FIRING POINT, PARCEL 105Q-X, AND FORMER DEFENDAM RANGE (EASTERN), PARCEL 225Q

FORT McCLELLAN
CALHOUN COUNTY, ALABAMA

This Technical Memorandum presents the Preliminary Ecological Risk Assessment (PERA) for the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q at Fort McClellan (FTMC) located in Calhoun County, Alabama. The PERA approach is a shortened version of the Screening-Level Ecological Risk Assessment (SLERA) protocol which has been developed for FTMC as a means to evaluate numerous sites in a uniform and economical way. It is assumed that the reader is familiar with FTMC and the fundamentals of the SLERA protocol presented in the Installation-Wide Work Plan (IT Corporation [IT], 1998). Each step of the PERA is described in the following sections.

1.0 Ecological Habitat Description

The area of investigation for Parcels 105Q-X and 225Q is approximately 41.4 acres in size and is located in the northeastern portion of FTMC Main Post. Parcel 105Q-X is located on the top of a southern-facing hillside at an elevation of approximately 1,125 feet above mean sea level (msl). Parcel 225Q is located southeast of the Former Mortar Firing Point and encompasses a valley and two north-facing hillsides. Site elevation ranges from approximately 1,010 feet above msl in the valley to approximately 1,250 feet above msl on one of the north-facing slopes. Parcel 105Q-X is a cleared area dominated by grasses and weeds, characteristic of an oldfield, early successional ecosystem. The entire area of Parcel 225Q is forested with a relatively mature mixed deciduous/coniferous forest. The cover species typically found in these forested areas include shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), post oak (*Quercus stellata*), chestnut oak (*Quercus prinus*), southern red oak (*Quercus falcata*), wild black cherry (*Prunus serotina*), hackberry (*Celtis occidentalis*), black walnut (*Juglans nigra*), and flowering dogwood (*Cornus florida*). These mixed deciduous/coniferous forests exhibit sparse, shade-tolerant undergrowth species such as Virginia creeper (*Parthenocissus quinquefolia*), Christmas fern (*Polystrichum acrotichoides*), and poison ivy (*Toxicodendron radicans*). Understory and shrub species are typically sparse in this type of habitat. A mat of pine needles and leaves generally inhibits the growth of shrub and herbaceous layers within this forest type. Typical terrestrial species inhabiting this type of habitat include eastern gray squirrel (*Sciurus carolinensis*), whitetail deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), shorttail shrew (*Blarina brevicauda* or *Blarina carolinensis*), red fox (*Vulpes vulpes*), white-footed mouse (*Peromyscus leucopus*), American robin (*Turdus migratorius*), and red-tailed hawk (*Buteo jamaicensis*).

Two ephemeral streams run through the valley portion of the area of investigation in a southeast-to-northwest direction. These streams are normally dry during significant periods of time during a normal year and only exhibit flowing water during periods of significant precipitation. Both of these streams are narrow (1 to 2 feet wide) and shallow (0 to 6 inches deep) with substrates of mainly cobbles and gravel interspersed with small depositional areas of mud and sand. Leaf litter is also significant in these small depositional areas. The small size and ephemeral nature of these streams preclude the presence of large fish species; however, semi-aquatic species (amphibians) would be expected to occur in these streams, particularly during periods of significant precipitation.

2.0 Media of Interest and Data Selection

The media of interest at Parcels 105Q-X and 225Q are surface soil, surface water, and sediment. Exposures to subsurface soil and groundwater are unlikely for ecological receptors at this study

area. Twenty surface soil samples and three depositional soil samples were collected and analyzed for metals and explosive compounds. Three of the 23 surface and depositional soil samples were analyzed for a broader suite of analytes including volatile organic compounds (VOC), semivolatile organic compounds (SVOC), pesticides, and herbicides. Three surface water and three sediment samples were collected and analyzed for metals and explosives. One of the surface water samples was also analyzed for VOCs, SVOCs, pesticides, and herbicides. Sediment samples were also analyzed for total organic carbon and grain size.

3.0 Identification of Constituents of Potential Ecological Concern

In order to determine whether constituents detected in samples collected at Parcels 105Q-X and 225Q have the potential to pose adverse ecological risks, screening-level hazard quotients were developed. The screening-level hazard quotients were developed via a three-step process as follows:

- Comparison to Ecological Screening Values (ESV);
- Identification of essential macronutrients; and
- Comparison to naturally occurring background concentrations.

The ESVs used in this assessment represent the most conservative values available from various literature sources and have been selected to be protective of the most sensitive ecological assessment endpoints. These ESVs have been developed specifically for FTMC in conjunction with EPA Region 4 and are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000). The ESVs used in this assessment are based on no-observed-adverse-effect-levels (NOAEL) when available. If a NOAEL-based ESV was not available for a certain constituent, then the most health-protective value available from the scientific literature was used in this assessment.

Constituents detected in surface soil, surface water, and sediment at Parcels 105Q-X and 225Q were evaluated against the corresponding ESVs by calculating a screening-level hazard quotient (HQ_{screen}) for each constituent in each environmental medium. An HQ_{screen} was calculated by dividing the maximum detected constituent concentration in each medium by its corresponding ESV as follows:

$$HQ_{screen} = \frac{MDCC}{ESV}$$

where:

HQ_{screen}	=	screening-level hazard quotient;
$MDCC$	=	maximum detected constituent concentration; and
ESV	=	ecological screening value.

A calculated HQ_{screen} value of one indicated that the MDCC was equal to the chemical's conservative ESV and was interpreted in this assessment as a constituent that does not pose the potential for adverse ecological risk. An HQ_{screen} value less than one indicated that the MDCC was less than the conservative ESV and that the chemical is not likely to pose adverse ecological hazards to most receptors. Conversely, an HQ_{screen} value greater than one indicated that the

MDCC was greater than the ESV and that the chemical might pose adverse ecological hazards to one or more receptors.

In order to better understand the potential risks posed by chemical constituents at Parcels 105Q-X and 225Q, a mean hazard quotient was also calculated by comparing the arithmetic mean constituent concentrations in surface soil, surface water, and sediment to the corresponding ESVs. The calculated screening-level hazard quotients for constituents in surface soil, surface water, and sediment are presented in Table 1, Table 2, and Table 3, respectively.

EPA recognizes several constituents in abiotic media that are necessary to maintain normal function in many organisms. These essential macronutrients are iron, magnesium, calcium, potassium, and sodium (EPA, 1989). Most organisms have mechanisms designed to regulate nutrient fluxes within their systems; therefore, these nutrients are generally only toxic at very high concentrations. Although iron is an essential nutrient and is regulated within many organisms, it may become increasingly bioavailable at lower pH values, thus increasing its potential to elicit adverse affects. Therefore, iron was not evaluated as an essential nutrient in this PERA. Essential macronutrients were considered COPECs only if they were present in site samples at concentrations ten times the naturally-occurring background concentration.

A comparison of detected constituent concentrations to background constituent concentrations was conducted in order to identify inorganic constituents that may be present in site media at concentrations consistent with background concentrations. In the process of calculating screening level hazard quotients (HQ_{screen}), the background analysis consisted of a comparison of the maximum detected constituent concentrations to the background threshold values (BTV). A study of the natural geochemical composition associated with FTMC (SAIC, 1998) determined the mean concentrations of 24 metals in surface soil, surface water, sediment, and groundwater samples collected from presumably un-impacted areas. Per agreement with EPA Region 4, the background threshold value (BTV) for each metal was calculated as two times the mean background concentration for that metal. The BTV for each metal was used to represent the upper boundary of the range of natural background concentrations expected at FTMC, and was used as the basis for evaluating metal concentrations measured in site samples. Site sample metal concentrations less than or equal to the corresponding BTV represent the natural geochemical composition of media at FTMC, and not contamination associated with site activity. Site sample metal concentrations greater than the corresponding BTV require further background assessment.

Thus, the first step in determining screening-level hazard quotients was a comparison of maximum detected constituent concentrations to appropriate ESVs. Constituents with HQ_{screen} values less than one were considered to pose insignificant ecological risk and were eliminated from further consideration. Constituents with HQ_{screen} values greater than one were eliminated from further consideration if they were macronutrients and their detected concentrations were less than ten-times background levels. Those constituents that had HQ_{screen} values greater one and were not considered macro-nutrients were then compared to their corresponding BTVs. If constituent concentrations were determined to be less than their respective BTV concentrations, then a risk management decision could result in eliminating these constituents from further assessment.

A constituent was identified as a COPEC if the following conditions were met:

- The maximum detected constituent concentration exceeded the ESV;
- The maximum detected constituent concentration was 10 times the BTV if the constituent was identified as a macro-nutrient; and
- Constituent concentrations were determined to be greater than their respective BTVs.

If a constituent in a given environmental medium did not meet these conditions, then it was not considered a COPEC at the Former Mortar Firing Point and Former Defendam Range (Eastern) and was not considered for further assessment. If a constituent met these conditions, then it was considered a COPEC. Identification of a constituent as a COPEC indicates that further assessment of that particular constituent in a given environmental medium may be appropriate. It does not imply that a particular constituent poses risk to ecological receptors.

In order to focus future ecological assessment efforts (if necessary) on the constituents that are the most prevalent at the Former Mortar Firing Point and Former Defendam Range (Eastern), and have the greatest potential to pose ecological risk, additional lines of evidence were assessed. Additional lines of evidence are sometimes useful in determining whether a certain constituent is in fact site-related and a COPEC. Some of the additional lines of evidence used in the process of identifying COPECs include: 1) frequency of detection, 2) magnitude of the HQ_{screen} value, 3) spatial distribution, 4) comparison to alternative ESVs; 5) additional comparisons to naturally occurring background concentrations (statistical and geochemical); and 6) association of a chemical with known Army activities. These additional lines-of-evidence were used to further define the COPECs at the Former Mortar Firing Point and Former Defendam Range (Eastern) and are discussed below.

The additional background comparisons consist of statistical comparisons and geochemical analyses. If maximum constituent concentrations are greater than the BTV, then the second tier of the background comparison is employed. Tier two of the background comparison consists of statistical comparisons of the site data to background data using the hot measurement test and the Wilcoxon Rank Sum (WRS) Test. If the site data failed either the hot measurement test or the WRS Test, then the site data were subjected to a geochemical evaluation to determine whether concentrations of inorganic compounds are naturally occurring or are elevated due to contamination (Tier 3). The three-tier background comparison process is described in detail in Appendix G of the SI report.

As presented in Table 1, none of the constituents detected in surface or depositional soil at the Former Mortar Firing Point and Former Defendam Range (Eastern) have been identified as COPECs. Although the maximum detected concentrations several metals exceeded their respective ESVs, the statistical/geochemical evaluation indicated that these metals concentrations were consistent with naturally occurring background levels and should not be considered COPECs in surface soil or depositional soil.

As presented in Table 2, none of the constituents detected in surface water at the Former Mortar Firing Point and Former Defendam Range (Eastern) have been identified as COPECs. Although

chromium was detected at a maximum concentration exceeding its ESV, the geochemical evaluation indicated that the detected concentration of chromium in surface water was consistent with naturally occurring levels.

As presented in Table 3, none of the constituents detected in sediment at the Former Mortar Firing Point and Former Defendam Range (Eastern) have been identified as COPECs. Selenium and vanadium do not have ESVs for sediment but were eliminated from consideration as COPECs in sediment because geochemical evaluation indicated that the concentrations of these two metals were consistent with naturally occurring levels.

4.0 Ecological Risk Characterization

None of the constituents detected in surface soil, surface water, or sediment at the Former Mortar Firing Point and Former Defendam Range (Eastern) were identified as COPECs. Aluminum, barium, beryllium, chromium, cobalt, lead, manganese, and selenium were detected in surface and depositional soil samples at maximum concentrations that exceeding their respective ESVs; however, concentrations of all these constituents were found to be consistent with naturally occurring levels via statistical analyses and/or geochemical evaluation.

Per EPA (2000) guidance, aluminum toxicity is associated with soluble aluminum only. Numeric screening values for aluminum are considered inappropriate due to the uncertainty in the solubility of aluminum in any given soil type under different environmental conditions. Alternatively, potential ecological risks associated with exposure to aluminum are associated with soil pH. Aluminum is identified as a COPEC only if the soil pH is less than 5.5 (EPA, 2000). Since the pH of soils at the Former Mortar Firing Point and Former Defendam Range (Eastern) is greater than 5.5, aluminum is not considered a COPEC in surface or depositional soil at the Former Mortar Firing Point and Former Defendam Range (Eastern).

Barium, beryllium, cobalt, and selenium were detected in one out of 23 surface and depositional soil samples at concentrations that exceeded their respective ESVs. The HQ_{screen} values for these constituents in surface and depositional soil were 1.3, 1.1, 2.0, and 2.1, respectively. Lead was detected in four out of 23 surface and depositional soil samples at concentrations that exceeded its ESV. The HQ_{screen} value for lead was 4.0. If an alternative screening value for lead was considered (1,700 mg/kg based on soil invertebrate toxicity), then all of the detected lead concentrations would be less than the alternative screening value (EPA, 2005). Consideration of an alternative screening value for lead provides a perspective of the range of screening values that have been derived for lead through various scientific studies. The ESVs presented in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000) and used to calculate HQ_{screen} values in this PERA represent the most conservative screening values found in the scientific literature; therefore, consideration of alternative screening values provides a certain measure of the range of screening values available for a certain COPEC.

These constituents were detected in surface soil and depositional soil at concentrations that exceeded their ESVs infrequently and the exceedances were relatively small. Taking into account the fact that the ESVs are highly conservative screening values based on no observed adverse effects and the HQ_{screen} value is calculated using the maximum detected constituent concentration at the site, these constituents most likely do not pose significant risk to ecological

receptors at FTMC. Based on the lines of evidence described above, none of the constituents detected in surface soil or depositional soil were identified as COPECs.

Chromium was detected in one of the three surface water samples at a concentration that exceeded its ESV. Geochemical evaluation of chromium in surface water indicated that the detected concentration was consistent with naturally occurring background levels. The HQ_{screen} value for chromium in surface water was calculated to be 1.7, and the ESV for chromium in surface water is based on the toxicity of hexavalent chromium, the more toxic valence state of chromium. It is likely that the majority, if not all, of the chromium detected in the single surface water sample is in the trivalent state and, therefore, less toxic. Additionally, the surface water sample that exhibited the slightly elevated concentration of chromium was collected in the southern portion of the study area in the southernmost ephemeral stream. None of the downstream samples exhibited elevated concentrations of any constituents. Based on the lines of evidence presented above, chromium was not identified as a COPEC in surface water.

Selenium and vanadium do not have sediment ESVs and were eliminated from consideration as COPECs because the geochemical evaluation indicated the detected concentrations were consistent with naturally occurring levels of these two metals in sediment.

Based on the lines of evidence presented above, none of the constituents detected in surface soil, surface water, or sediment at the Former Mortar Firing Point and Former Defendam Range (Eastern) were identified as COPECs.

5.0 References

IT Corporation (IT), 1998, ***Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, Final, August.

IT Corporation (IT), 2000, ***Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,*** Final, July.

Science Applications International Corporation (SAIC), 1998, ***Background Metals Survey Report, Fort McClellan, Alabama,*** Final, July.

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

U.S. Environmental Protection Agency (EPA), 2003, ***Ecological Soil Screening Level for Aluminum***, Office of Solid Waste and Emergency Response, Washington, D.C., OSWER Directive 9285.7-60.

U.S. Environmental Protection Agency (EPA), 2005, ***Ecological Soil Screening Level for Lead,*** Office of Solid Waste and Emergency Response, Washington, D.C., OSWER Directive 9285.7-70.

TABLE 1

CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IN SURFACE SOIL[a]
Former Mortar Firing Point and Defendum Range (Parcels 105Q-X and 225Q)
Fort McClellan, Calhoun County, Alabama

Detected Constituents	Background Threshold Value[b] (mg/kg)	Ecological Screening Value[c] (mg/kg)	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Minimum Detected Concentration (mg/kg)	Mean Detected Concentration (mg/kg)	Maximum Hazard Quotient	Mean Hazard Quotient	Constituent of Potential Ecological Concern[d]
Volatile Organic Compounds									
Acetone	NA	2.5	2 of 3	0.150	0.024	0.091	0.060	0.036	1
Metals									
Aluminum	16,300	50	23 of 23	17,600	3,060	8852.609	352.000	177.052	5
Arsenic	13.7	10	23 of 23	5.780	1.170	3.516	0.578	0.352	1,3
Barium	124	165	23 of 23	212	13	56.304	1.285	0.341	4
Beryllium	0.8	1.1	8 of 23	1.180	0.442	0.646	1.073	0.587	4
Calcium	1,720	NA	23 of 23	182.0	46.7	98.183	ND	ND	2,3
Chromium	37	0.4	23 of 23	37.50	4.48	11.633	93.750	29.084	4
Cobalt	15.2	20	20 of 23	39.20	1.13	7.126	1.960	0.356	4
Copper	12.7	40	23 of 23	17.20	1.96	7.000	0.430	0.175	1,4
Iron	34,200	200	23 of 23	29,600	5,540	12773.913	148.000	63.870	3
Lead	40.1	50	23 of 23	200	3.120	34.717	4.000	0.694	4
Magnesium	1,030	440,000	23 of 23	822	103	306.391	0.0019	0.0007	1,2,3
Manganese	1,580	100	23 of 23	3,270	13	632.548	32.700	6.325	4
Mercury	0.08	0.1	13 of 23	0.093	0.036	0.054	0.932	0.537	1,4
Nickel	10.3	30	23 of 23	14	1.53	5.760	0.467	0.192	1,4
Potassium	800	NA	20 of 23	684	94.4	277.583	ND	ND	2,3
Selenium	0.48	0.81	16 of 23	1.710	0.515	0.783	2.111	0.966	5
Sodium	634	NA	19 of 23	53.5	20.3	31.226	ND	ND	2,3
Thallium	3.43	1.0	2 of 23	1.93	1.09	1.191	1.930	1.191	3
Vanadium	58.8	2.0	23 of 23	49.40	7.99	19.894	24.700	9.947	3
Zinc	40.6	50	23 of 23	41.80	4.22	16.617	0.836	0.332	1,4
Pesticides									
Aldrin	NA	0.0025	1 of 3	0.001	0.001	0.001	0.400	0.480	1
beta-BHC	NA	0.0010	1 of 3	0.00062	0.00062	0.0010	0.620	1.023	1

[a] Surface soil at the Former Mortar Firing Point and Former Defendam Range (Eastern) is defined as the interval from 0 to 1 foot below ground surface..

[b] Background threshold value is two times (2x) the arithmetic mean of background metals (SAIC, 1998).

[c] Ecological Screening Values (ESV) are presented in *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000).

[d] Rationale for exclusion as a COPEC:

1 - Maximum detected concentration is less than ESV.

2 - Essential macro-nutrient, only toxic at extremely high concentrations (i.e. 10-times naturally occurring background concentrations).

3 - Maximum detected concentration is less than the background threshold value (BTV).

4 - Wilcoxon Rank Sum (WRS) Test and Hot Measurement Test indicate the concentration of this constituent is statistically similar to background concentrations.

5 - Geochemical evaluation of the data indicate that this constituent is naturally occurring.

NA - Not available. ND - Not determined.

TABLE 2

CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IN SURFACE WATER
Former Mortar Firing Point and Defendam Range (Parcels 105Q-X and 225Q)
Fort McClellan, Calhoun County, Alabama

Detected Constituents	Background Threshold Value[a] (mg/L)	Ecological Screening Value[b] (mg/L)	Frequency of Detection	Maximum Detected Concentration (mg/L)	Minimum Detected Concentration (mg/L)	Mean Detected Concentration (mg/L)	Maximum Hazard Quotient	Mean Hazard Quotient	Constituent of Potential Ecological Concern[c]
Volatile Organic Compounds									
Methylene chloride	NA	1.93	1 of 1	0.0002	0.0002	0.0002	0.00010	0.00010	1
Metals									
Aluminum	5.26	0.087	3 of 3	0.274	0.107	0.188	3.149	2.161	3
Arsenic	0.00217	0.19	2 of 3	0.005	0.00217	0.003	0.026	0.017	1,4
Barium	0.0754	0.0039	3 of 3	0.0221	0.0196	0.0204	5.667	5.239	3
Calcium	25.2	116	3 of 3	0.249	0.225	0.238	0.0021	0.0020	1,2,3
Chromium	0.0111	0.011	1 of 3	0.0191	0.0191	0.0130	1.736	1.185	5
Iron	19.6	1	3 of 3	0.637	0.22	0.48	0.637	0.477	1,3
Magnesium	11	82	3 of 3	0.209	0.189	0.198	0.0025	0.0024	1,2,3
Manganese	0.565	0.08	3 of 3	0.0321	0.0201	0.0270	0.401	0.338	1,3
Potassium	2.56	53	3 of 3	1.22	0.837	1.00	0.023	0.019	1,2,3
Sodium	3.44	680	3 of 3	0.909	0.909	0.909	0.0013	0.0013	1,2,3

[a] Background threshold value is two times (2x) the arithmetic mean of background metals (SAIC, 1998).

[b] Ecological Screening Values (ESV) are presented in *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000).

[c] Rationale for exclusion as a COPEC:

1 - Maximum detected concentration is less than ESV.

2 - Essential macro-nutrient, only toxic at extremely high concentrations (i.e. 10-times naturally occurring background concentrations).

3 - Maximum detected concentration is less than the background threshold value (BTV).

4 - Wilcoxon Rank Sum (WRS) Test and Hot Measurement Test indicate the concentration of this constituent is statistically similar to background concentrations.

5 - Geochemical evaluation of the data indicate that this constituent is naturally occurring.

NA - Not available.

ND - Not determined.

TABLE 3

CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IN SEDIMENT
Former Mortar Firing Point and Defendam Range (Parcels 105Q-X and 225Q)
Fort McClellan, Calhoun County, Alabama

Detected Constituent	Background Threshold Value[a] (mg/kg)	Ecological Screening Value[b] (mg/kg)	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Minimum Detected Concentration (mg/kg)	Mean Detected Concentration (mg/kg)	Maximum Hazard Quotient	Mean Hazard Quotient	Constituent of Potential Ecological Concern[c]
Metals									
Aluminum	8,590	NA	3 of 3	7,000	4,450	5,310	ND	ND	3
Arsenic	11.3	7.24	3 of 3	5.75	2.93	4.66	0.794	0.644	1,3
Barium	98.9	NA	3 of 3	88.5	32.1	57.8	ND	ND	3
Beryllium	0.97	NA	2 of 3	0.912	0.418	0.697	ND	ND	3
Calcium	1,110	NA	3 of 3	238	82.6	142	ND	ND	2,3
Chromium	31.2	52.3	3 of 3	25.6	11.6	20.8	0.489	0.397	1,3
Cobalt	11	50	3 of 3	7.65	3.57	4.95	0.153	0.099	1,3
Copper	17.1	18.7	3 of 3	7.34	4.13	5.58	0.393	0.299	1,3
Iron	35,300	NA	3 of 3	33,300	14,900	24,167	ND	ND	3
Lead	37.8	30.2	3 of 3	20.1	10.6	14.9	0.666	0.494	1,3
Magnesium	906	NA	3 of 3	220	90.8	136	ND	ND	2,3
Manganese	712	NA	3 of 3	490	187	309	ND	ND	3
Nickel	13	15.9	3 of 3	2.72	1.93	2.41	0.171	0.152	1,3
Potassium	1,010	NA	3 of 3	355	222	273	ND	ND	2,3
Selenium	0.72	NA	3 of 3	1.96	0.87	1.58	ND	ND	5
Sodium	692	NA	1 of 3	61	28.5	49	ND	ND	2,3
Vanadium	40.9	NA	3 of 3	41.4	20.6	33.9	ND	ND	5
Zinc	52.7	124	3 of 3	10.2	6.16	8.9	0.082	0.071	1,3

[a] Background threshold value is two times (2x) the arithmetic mean of background metals (SAIC, 1998).

[b] Ecological Screening Values (ESV) are presented in *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000).

[c] Rationale for exclusion as a COPEC:

1 - Maximum detected concentration is less than ESV.

2 - Essential macro-nutrient, only toxic at extremely high concentrations (i.e. 10-times naturally occurring background concentrations).

3 - Maximum detected concentration is less than the background threshold value (BTV).

4 - Wilcoxon Rank Sum (WRS) Test and Hot Measurement Test indicate the concentration of this constituent is statistically similar to background concentrations.

5 - Geochemical evaluation of the data indicate that this constituent is naturally occurring.

NA - Not available.

ND - Not determined.

RESPONSE TO COMMENTS

Response to ADEM Comments
Draft Site Investigation Report, Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q
Fort McClellan, Calhoun County, Alabama (February 2003)

Comments from Stephen A. Cobb, Chief, Governmental Hazardous Waste Branch, Land Division, dated September 22, 2005.

GENERAL COMMENTS

Comment 1: **Appendix H, page 4, next to last paragraph: The report states that "lead was detected at 4 out of 23 samples at concentrations exceeding the Ecological Screening Value (ESV). The HQscreen value for lead was 4.0. If an alternative screening value for lead was considered (500 mg/kg based on earthworm toxicity), then all of the detected lead concentrations would be less than the alternative screening value."**

The Department understands that the Army looked at alternative ESVs as additional lines-of-evidence when identifying chemicals of potential ecological concern (COPECs) and making risk management decisions. However, additional rationale is warranted for this PERA to justify considering alternative ESVs in general, and especially the alternative ESV for lead. Please revise the preliminary ecological risk assessment (PERA) and the report conclusions as appropriate.

Response 1: The use of additional lines of evidence (including the consideration of alternative ESVs) as a means of identifying COPECs in SLERAs and PERAs was adopted by the Army at the suggestion of EPA Region 4 and has been in use at Fort McClellan for a number of years. The ESVs presented in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000) represent the most conservative screening values found in the scientific literature; therefore, consideration of alternative ESVs provides some perspective of the range of screening values that have been derived through various scientific studies. Because none of the ESVs used at FTMC are site-specific, there is an unknown degree of uncertainty in the application of a certain ESV at any given site. Therefore, it is most appropriate to provide a range of screening values to compare to site concentrations. Alternative ESVs provide a certain measure of that range. In fact, there are numerous screening values for many of the COPECs (including lead) that are significantly higher than the alternative ESVs presented in the subject PERA. Therefore, the alternative ESVs presented in the PERA for the Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q maintain a degree of conservatism.

A number of lines of evidence (i.e., rationale) are presented in the PERA for the Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q, including the frequency of detection, magnitude of the

HQ_{screen} value, consideration of an alternative ESV, consideration of the fact that the ESV is based on a NOAEL, and consideration of the fact that the maximum detected concentration was used to calculated the HQ_{screen} value. All of these lines of evidence were considered in a weight-of-evidence assessment in order to make risk management recommendations.

In order to clarify the rationale for the consideration of alternative ESVs in the PERA for the Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q, additional text was included in the PERA.

Comment 2: **Table 3-1 and Table 3-2: Surface and subsurface soil samples at sample location HR-225Q-GP08 were chosen in the central portion of the investigation area, where numerous vehicle body parts used as targets were located. However, these samples were only analyzed for metals and explosives. The sample at the only other location where numerous vehicle parts were used as targets (HR-225Q-DEP02), parameters were measured for metals, VOCs, SVOCs, pesticides, herbicides, and explosives. It seems appropriate for areas where vehicles were used as targets would be sampled for all of the above these parameters. Please explain why HR-225Q-GP08 was not analyzed for the full set of analytical parameters.**

Response 2: Please note that the SI report indicates that Parcel 225Q contains vehicle parts, not entire vehicles. The majority of the site samples (including HR-225Q-GP08) were only analyzed for metals and explosives because these are the appropriate and BCT-agreed-upon analytical parameters for former weapons firing ranges. Also, the work plan for this site, which was approved by ADEM on May 30, 2002, included the rationale for each of the proposed samples.

SPECIFIC COMMENTS

Comment 1: **Appendix H, page 2: The PERA states that 20 surface soil samples were collected and analyzed for metals, VOCs, SVOCs, pesticides, herbicides, and explosives. According to Table 3-2, only two soil samples and one depositional soil sample were tested for all these constituents. The remaining samples were only sampled for metals and explosives. Please correct the text.**

Response 1: Agree. The text was revised per the comment.

Comment 2: **Appendix H, page 2: The PERA states that three surface water and three sediment samples were collected and analyzed for metals, VOCs, SVOCs, pesticides, herbicides, and explosives. This appears to be incorrect as only one surface water/sediment sample was analyzed for all of the above constituents (HR-225Q- SWlSD02). Please correct the text.**

Response 2: Agree. The text was revised per the comment.

Comment 3: **Appendix H, page 4, next to last paragraph, 3rd sentence: Please replace the text "twenty three samples" with "twenty surface soil and three depositional soil samples".**

Response 3: Agree. The text was revised per the comment.

Comment 4: **Appendix H, page 4, last paragraph: Based on the PERA, chromium was detected in one out of the three surface water samples. The PERA states that this is infrequent. One out of three samples is not an "infrequent" detection rate. Please revise the language to reflect a more appropriate representation of the detection of chromium in the surface water.**

Response 4: The PERA provides several lines of rationale for not considering chromium as a COPEC in surface water including the relatively low HQ_{screen} value (HQ_{screen} = 1.7), the ephemeral nature of the stream from which the sample was collected, and no downstream samples exhibited elevated concentrations of any constituents, in addition to the fact that chromium was only detected in one surface water sample. The last sentence of the second-to-last paragraph of the PERA will be revised to read "Based on the lines of evidence presented above, chromium was not identified as a COPEC in surface water."

Comment 5: **Page 1-4 lines 14-15: Please clarify in the text if the 12 items reported to be 81 mm mortars were buried in a pit or if they were shot into this location.**

Response 5: The text was revised to indicate that the items were found on the ground surface.

Response to U.S. Environmental Protection Agency Comments
Draft Site Investigation Report, Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q
Fort McClellan, Calhoun County, Alabama
February 2003

Comments from Doyle T. Brittain, EPA Remedial Project Manager, dated April 3, 2003.

GENERAL COMMENTS

Comment 1: **The COPC selection process for both human health and ecological risk must be redone to follow the technical memorandum on background comparison that the Army is writing.**

Response 1: Comment noted. The COPC selection process was redone per the latest version of the background screening technical memorandum and based on discussions during the February 14-16, 2006, BCT meeting at Fort McClellan.

Comment 2: **A summary table needs to be added to section 5.0 which includes COPC, maximum and average concentrations, location of maximum concentration, frequency of detection, ESV, and BTV. This table would assist in the review of the PERA for this site.**

Response 2: Comment noted. This information is presented in tabular form in the PERA (Appendix H).

SPECIFIC COMMENT

Comment: **Appendix A. Comparisons of the Sample Collection Logs with the Chain of Custody Records indicated some inconsistencies. In all cases, the name of the person relinquishing custody on the Chain of Custody form does not appear on the sample collection log as one of the samplers. In addition, in the Relinquished-By block on four of the Chain of Custody Records, a printed name is included instead of a signature. Unless these inconsistencies can be satisfactorily explained, chain of custody was not maintained on these samples.**

Response: Disagree. Shaw followed the procedures outlined in Section 6.1.7.1 Field Custody Procedures presented in the Draft Installation-Wide Sampling and Analysis Plan, Revision 3, February 2002 (SAP). This sections states, "The sampling team, sample coordinator, and site manager will maintain overall responsibility for the care and custody of the samples until they are transferred or properly dispatched to the on-site screening facility and/or fixed-based laboratory." In addition, SAP Section 6.1.7.2 Transfer of Custody and Shipment states, "General custody of the sample will be maintained by the sample collection

team members from the time of collection in the field through preparation and shipment to the laboratory. The main custody transfer will occur when the sample shipment is received into the laboratory from the field and is documented." Similar language is also provided in the QAP.

Using these two sections as guidance, all Shaw field personnel who are responsible for the collection of field samples (which includes the sample coordinator and the site manager) were considered part of the "sample team." No custody transfer record was considered to be necessary among members of the same sample collection team. If another contractor, a subcontractor to Shaw, the Army, or other personnel had collected samples and transferred them to Shaw for processing or analysis, then the transfer of custody of those samples would have been formally recorded using a COC form.

Multiple sample technicians were responsible for collecting samples and completing the sample collection logs. The samples and logs were funneled to the Shaw sample coordinator, who then reviewed the documentation, inventoried all of the samples collected, and compiled a single COC record to list all the samples collected (daily) for transfer to the receiving analytical laboratories. Therefore, the sample coordinator's signature on the form represents the transfer of custody from the Shaw sample team in the field to the analytical laboratory personnel (per Section 6.1.7.2 of the SAP). Shaw believes that this is satisfactory custody transfer documentation and, therefore, does not agree this indicates that sample custody was not maintained as stated in the comment. Shaw personnel followed the same chain-of-custody procedures that have been in effect since the beginning of the FTMC project in 1998. It is perplexing that until now these issues have never been called into question.

However, in light of recent comments received by EPA, Shaw has changed its COC procedures to include a separate COC for each sample collection team. Each sample collection team will submit samples, COCs, and SCLs to the sample coordinator. The SCLs and COCs will be reviewed by the sample coordinator prior to taking possession of the samples and signing the COC. This process will be repeated for each sample collection team in the field. The COCs will then be copied for the field records and maintained onsite. The original forms will be transmitted to the office for filing in the project central files. In future reports, this appendix will include all "supplementary" sample team COCs to document intra-team custody transfers and all SCLs.

Disagree with the second part of the comment. All "Relinquished By" blocks on the COCs contained cursive-written signatures. However, the reviewer is reminded that if an individual willingly marks a document and affirms that the mark is indeed his own, then the manner in which that mark is made and the form that mark takes are irrelevant. In other words, cursive-written marks do not necessarily carry any more authenticity or credibility than printed marks.

Response to U.S. Fish and Wildlife Service Comments
Draft Site Investigation Report
Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q (dated February 2003)
Fort McClellan, Calhoun County, Alabama

Comments from Mr. Larry E Goldman, Field Supervisor, received February 10, 2004.

General Comments

Comment 1: **The Site Investigation Report does not provide information habitat characteristics or biological conditions of the site. Such information is needed to adequately understand the ecological importance of the area, the significance of potential threats, and the implications of selecting a particular course of action. We recommend adding appropriate information on habitat types and biological communities.**

Response 1: Comment noted. However, this level of information is outside of the scope of a site investigation (SI) according to the CERCLA process and the terms of this contract. An SI is conducted to confirm the presence or absence of contamination in site media.

Reference: U.S. Environmental Protection Agency, 1992, ***CERCLA/Superfund Orientation Manual, EPA/542/R-92/005***, October.

Comment 2: **We were informed in a November 18, 2003, meeting with Ft. McClellan staff that visible lead particles were removed from soil samples prior to conducting chemical analyses. As such, the concentrations and overall risks of lead at this site are likely underestimated. The Site Investigation Report should indicate if bullets or lead fragments were removed from soils and/or sediment samples prior to chemical analysis. If particles were removed, the report should note the amounts, general form (e.g., whole bullets and/or fragments), and size ranges of particles removed from analytical samples. Such information is needed to evaluate long-term human health and ecological risks associated with this site.**

Response 2: Comment noted. It should be noted very few bullet fragments were observed on the ground surface at this site. Only one sample collection log notes the presence of bullets on the ground surface. It is possible that these bullets were actually blank ammunition that was observed in the northern area of the site. Nevertheless, the report was revised to indicate that any visible bullet fragments observed during surface soil sampling were removed prior to sample collection.

Comment 3: **We are concerned about the increase in the ecological risk of potentially toxic metals at this site over time. The solubility, mobility, and toxicity of most metals increase under acidic conditions. Acidic conditions would also promote increased rates of degradation of metal particles, thereby enhancing the biological availability of the metals. Information provided in Section 4.1.2 (Site Geology) indicates that the dominant soils in this parcel are acidic. Data provided in Appendix A (Sample Collection Logs) indicate that surface water on this site is also acidic. As such, site conditions appear to favor enhanced solubility, mobility, biological availability, and toxicity of lead and other potentially toxic metals. The Site Investigation Report should provide a discussion on the potential for site conditions to alter the ecological risk of contamination at this site over time. The discussion should include information on the prevalence of particulate metals, rates of particle degradation, changes in mobility and biological availability, and potential changes to overall ecological risk at this site.**

Response 3: Comment noted. See response to General Comment No. 1.

Comment 4: **The Site Investigation Report recommends "No Further Action" at this site. We believe that such a determination is premature. Additional information and discussions are needed to appropriately evaluate the current and future implications of contamination at this site to wildlife, aquatic life, and habitat quality. We look forward in continuing discussions on this matter with your staff, the U.S. Environmental Protection Agency, and the Alabama Department of Environmental Management.**

Response 4: Comment noted.

Specific Comments

Comment 1: **Section 3, Figure 3-1. Figure 3-1 notes the high occurrence of assorted scrap and debris at this site. The Site Investigation Report should provide an account of scrap and debris occurring at the site and discuss chemical and/or physical hazards associated with such debris.**

Response 1: The SI Report does provide an account of the scrap and debris identified during the SI. Figure 1-2 shows the approximate location and provides a brief description of the items observed. Potential chemical hazards associated with the scrap and debris were evaluated based on the sampling data collected around these features.

Comment 2: **Section 4.2 (Site Surface Water Hydrology). Section 4.2 should provide information on surface water bodies occurring within the area of**

investigation. Appendix A (Sample Collection Logs) indicates that minnows were present in the creek from samples HR-225Q-SW01 and HR-225Q-SD01 were collected. This would suggest that suitable aquatic habitats occur in the area of investigation. We recommend expanding the descriptions of surface water hydrology.

Response 2: Comment noted. There are no perennial water bodies in the vicinity of the site, only the intermittent drainages shown on Figure 1-2 and briefly discussed in Section 4.2. Section 4.2 was expanded to better describe site surface water hydrology.

Comment 3: **Section 5.2. Section 5.2 (Pesticides) indicates that two pesticides (alpha-BHC and beta-BHC) were detected at location HR-105Q-GP04. However, no results are provided for alpha BHC in Table 5-1. We recommend that all pesticides results be presented and that pesticides quantified at levels above method detection limits be evaluated in terms of human health and environmental risks.**

Response 3: Disagree. The reviewer is mistaken. Section 5.2 discusses subsurface soil sample results, which are summarized in Table 5-2 – not Table 5-1. Table 5-2 shows both pesticide results, which were screened against SSSLs to evaluate potential human health risks.

Comment 4: **Table 5.3. It appears that mercury concentrations were not determined in surface water samples. Please provide the rationale for not determining mercury concentrations in water. Also, please provide a discussion of the potential for mercury in water to represent potential risks to human health or the environment. If appropriate, additional water samples should be collected for mercury analysis.**

Response 4: Disagree. Mercury was analyzed for in all site samples. However, the analytical summary tables provided in Chapter 5.0 of the SI report only include those metals that were detected at levels above reporting limits. Mercury does not appear in Table 5-3 because it was not detected in surface water. Appendix E contains the complete summary of validated analytical data. Because mercury was not detected in site surface water, it is not expected to represent potential risks to human health or the environment.