4.0 Landfill No. 1, Parcel 78(6)

4.1 Site Location

Landfill No. 1, Parcel 78(6), is located in the western portion of the Main Post, southeast of the officer's housing area on Avery Drive (Figure 2-1). The site occupies the hillside between Avery Drive and 16th Avenue on Wygant Hill. The officers' housing area partially overlaps the northwestern boundary of the landfill. Figure 4-1 provides a detail map for Landfill No. 1 with surrounding features, boring, trenching, and sample locations.

4.1.1 Facility Type and Operational Status

Landfill No. 1, Parcel 78(6), is a former post sanitary landfill that operated from 1945 to 1947. Clearing for the landfill is documented on 1944 aerial photographs. Historical information regarding the content and operation of the landfill is limited; however, field work performed in support of the EE/CA allowed characterization of some of the fill material and former waste disposal practices at the site.

4.1.2 Previous Work

Previous environmental work conducted at Landfill No. 1, Parcel 78(6), includes the following:

- Enhanced Preliminary Assessment (Weston, 1990)
- Site Investigation (SAIC, 1993)
- Remedial Investigation (SAIC, 1995)
- Remedial Investigation Baseline Risk Assessment (SAIC, 2000)
- Site Investigation and Fill Area Definition Report (IT, 2001a).

4.1.2.1 Investigation

Landfill No. 1 was identified in the preliminary site assessment as an area requiring environmental evaluation (Weston, 1990). A geophysical survey conducted in 1992 over approximately 2 acres of the site found geophysical anomalies that were attributable to surface debris, and not to large-scale land filling (SAIC, 1993).

The estimated boundaries of the landfill were revised in 1993 based on a review of historical aerial photographs conducted during a site (SAIC, 1993). Geophysical surveys were conducted in an attempt to delineate the boundary of the landfill (SAIC, 1993). During this investigation, a larger-scale geophysical survey was conducted using electromagnetic (EM) and magnetometer methods. An approximate landfill boundary for Landfill No. 1 was established based on the results of this survey. This boundary corresponds to the original CERFA Parcel 78(6) boundary.

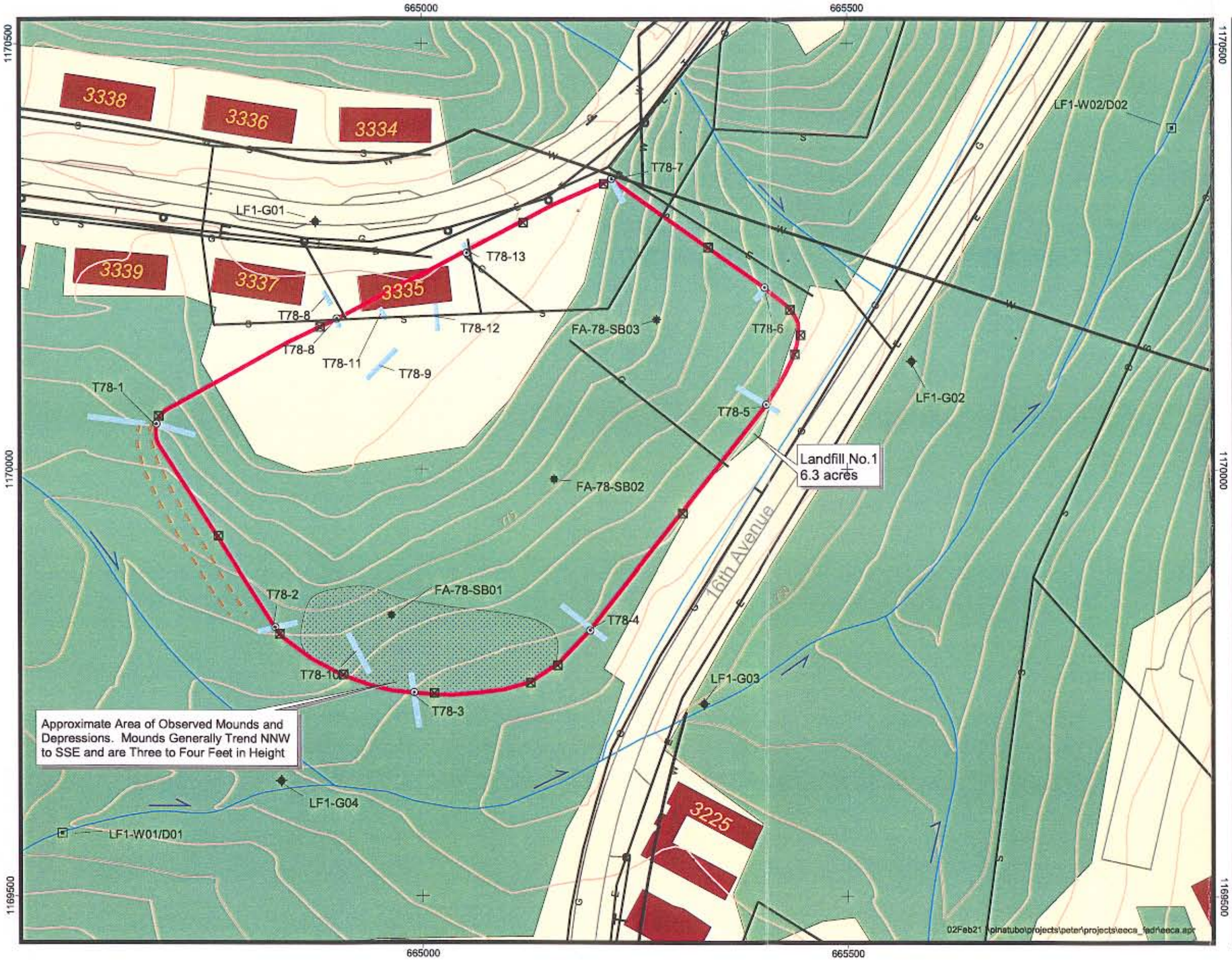

Figure 4-1

Detail Map
Landfill No. 1
Parcel 78(6)

- Surface Water/Sediment Sample Location
- Proposed Concrete Monument
- Bedrock Monitoring Well Location
- Fill Boundary Observed within Trench Excavations
- Subsurface Soil Sample Location
- Telephone Utility
- Water Utility
- Sewer Utility
- Gas Utility
- Electric Utility
- Exploratory Trench
- Improved Roads
- Access Road
- 5' Topographic Contours
- Surface Drainage/Creek w/ Flow Direction
- Landfill Boundary Inferred by Surface Geophysics and Trenches
- Buildings
- Mound Area
- Wooded
- Lawn/Cleared Area

0 100 200

State Plane feet, NAD 83

N

August 2001

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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SAIC collected groundwater samples from the 4 existing monitoring wells (LF1-G01, LF1-G02, LF1-G03, and LF1-G04) at Landfill No. 1 in June and July 1994 and in January and February 1995. Additionally, one monitoring well (LF1-G01) was sampled in October 1997. The results of these sampling events are fully documented in previous reports (SAIC, 1995 and 1999).

IT sampled three monitoring wells (LF1-G01, LF1-G02, and LF1-G03) in February 1998. LF1-G04 was omitted from the sampling event conducted in 1998 because it reportedly contained a broken well screen. The results are summarized in the *Long-Term Monitoring Report – First Quarterly Report for Landfills 1, 2, and 3* (IT, 1999). Groundwater samples were analyzed for VOCs, SVOCs, pesticides and PCBs, metals, and nitroaromatic and nitramine explosives (explosives). Metals, VOCs, and SVOCs were detected above reporting limits. The VOCs and SVOCs that were detected above reporting limits were determined to be the result of sample collection techniques and laboratory methodology, and not the result of source contamination. The levels of metals were within the range of background concentrations for unfiltered groundwater at the FTMC Main Post, with the exception of barium. Analytical data for Landfill No. 1 is presented in Appendix A.

4.1.2.2 EE/CA Fill Area Definition

IT conducted field activities from January through August 2000 for the delineation of the fill area at Landfill No. 1. These activities included a geophysical site survey, exploratory trenches, soil borings, and a visual site walk. Eleven trenches were excavated to determine the horizontal and vertical extent of fill material and to determine the cause of geophysical anomalies identified in 1993 by SAIC. Three soil borings were drilled to determine the vertical extent of the fill material and collect samples for laboratory analysis. IT also conducted a site walk to search for leachate seeps along the toe of the landfill; however, none were observed.

A geophysical survey was conducted at Landfill No. 1 by IT in January 2000 to determine the boundaries of the fill area. A total of 4,200 linear feet of geophysical survey were conducted at the landfill (Figure 4-2). Eleven exploratory trenches were excavated to determine the fill area boundary and to characterize the fill material. Two additional exploratory trenches were excavated to determine the cause of isolated anomalies identified during the geophysical survey conducted by SAIC in 1992. Trenches were excavated to depths ranging from 4 to 10 feet below ground surface (bgs). Trench logs do not indicate the presence of groundwater in any of the trenches.

During trenching operations at trench number "T78-1" in Landfill No. 1, the onsite geologist identified what was thought to be a grenade within the trench excavation. The field crew

DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DWG. NO.: ...\796886es.020
PROJ. NO.: 793886
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 02/18/01
DRAWN BY: D. BOMAR
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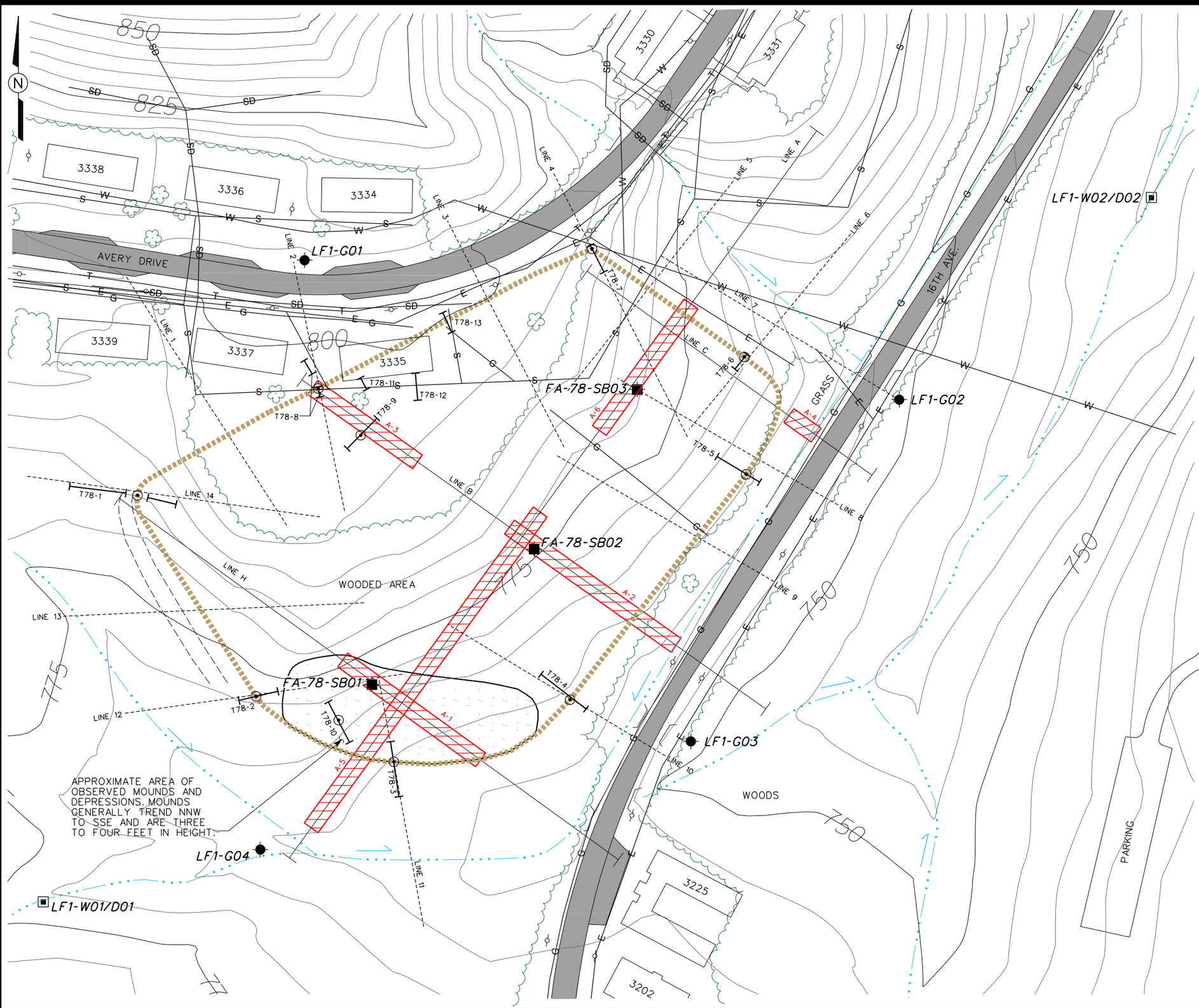

LEGEND

- LANDFILL BOUNDARY INFERRED BY SURFACE GEOPHYSICS AND TRENCHES
- SAIC GEOPHYSICAL SURVEY LINE
- A-1 — SAIC GEOPHYSICAL ANOMALY
- GEOPHYSICAL TRANSECTS
- TRENCH EXCAVATION
- FILL BOUNDARY OBSERVED WITHIN TRENCH EXCAVATION
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- SURFACE DRAINAGE / CREEK W/FLOW DIRECTION
- TREES / TREELINE
- UTILITY POLE
- SD — STORM DRAIN UTILITY
- T — TELEPHONE UTILITY
- W — WATER UTILITY
- S — SEWER UTILITY
- G — GAS UTILITY
- E — ELECTRIC UTILITY
- BEDROCK MONITORING WELL LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE WATER/SEDIMENT SAMPLE LOCATION

NOTES:

1. WELL LF1-G04 LOCATION IS ESTIMATED BECAUSE COORDINATES ON BORING LOG DO NOT MATCH FIGURE IN SAIC RI REPORT, 1995.

SCALE

0 120 240 FEET

FIGURE 4-2
GEOPHYSICAL INTERPRETATION MAP
LANDFILL NO. 1
PARCEL 78(6)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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notified the IT site manager and requested unexploded ordnance (UXO) support at the trench site to examine the item. Before the UXO technician was able to fully examine the item, the walls of the trench collapsed, burying the observed item and preventing positive identification. The item is currently buried approximately 8 feet bgs. Additional fill material associated with trench T78-1 included glass bottles, broken plates, scrap metal, and pieces of coal.

Trenches T78-5 and T78-10 contained medical debris as well as typical waste encountered in the other trenches including glass bottles and jars, metal food containers, and jar lids. Medical items at trench T78-5 included three glass medical bottles with rubber septa. Trench T78-5 encountered gray green shale bedrock at 7 feet bgs. This was the only trench location where bedrock was encountered during trenching at Landfill No. 1. Medical items associated at T78-10 consisted of a glass syringe (no needle) and three medical bottles.

Fill material associated with trenches T78-2, T78-3, T78-4, T78-6, T78-7, and T78-8 included glass bottles, coal, scrap metal, metal food containers, wood pieces, broken plates, melted glass, black to gray ash, newspaper, leather boots, brick, and pieces of steel cable. Trench T78-9 fill material included the previously mentioned fill materials, as well as a piece of sheet metal identified as the cause of the geophysical anomaly detected at this trench location. Trench T78-10 fill material included the previously mentioned fill materials, as well as coiled steel wire, and miscellaneous scrap metal pieces identified as the cause of the geophysical anomaly detected at this trench location. Trenches T78-11, T78-12, and T78-13 fill material mainly consisted of ash, wood, glass, and some metal pieces at depths ranging from 3 to 8 feet bgs. Based on the results of the trenching activities, the estimated extent of waste fill at Landfill No. 1 was reduced from approximately 12 to 6.3 acres in size.

In March 2000, IT installed three direct-push soil borings at Landfill No.1 to determine the vertical extent of the fill material. Soil borings were installed at depths ranging from 14.8 to 18 feet bgs. Soil samples were collected from the borings. A total of 21 metals were detected in the subsurface soil/fill material samples collected at Landfill No. 1. The concentrations of arsenic detected in the sample collected from location FA-78-SB01 and aluminum detected in the sample collected from FA-78-SB03 exceeded the background screening values and the SSSLs. The concentrations of 12 metals (aluminum, arsenic, beryllium, boron, cadmium, cobalt, iron, lead, manganese, mercury, nickel, and vanadium) exceeded background screening values in various samples. No other metals exceeded background screening values or SSSLs.

Nineteen VOCs were detected in the subsurface/fill material samples collected at Landfill No. 1, with two VOCs (methylene chloride and trichlorofluoromethane) detected in all four samples collected; however, none of the detected VOC concentrations exceeded the SSSLs.

Six SVOCs were detected in the subsurface/fill material samples collected at Landfill No. 1. One SVOC (bis[2-ethylhexyl]phthalate) was detected in all four samples collected; however, none of the detected SVOC concentrations exceeded the SSSLs.

Three pesticides were detected in the subsurface soil/fill material samples collected at Landfill No. 1, with one pesticide (4,4,4'-DDE) detected in all four samples collected. None of the detected pesticide concentrations exceeded the SSSLs. No herbicides, explosives, or PCBs were detected in the subsurface soil/fill material samples collected.

IT has estimated the vertical and horizontal extent of fill material at Landfill No. 1 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area at Landfill No. 1 covers an area of approximately 6.3 acres. The average depth of fill material estimated from the trench and boring log data is approximately 11.5 feet bgs.

4.1.3 Structures/Topography

The previous interpretation of the Landfill No. 1, Parcel 78(6) boundary was based on review of aerial photographs, available boring logs, and the results of geophysical surveys conducted by SAIC (SAIC; 1993, 1995, and 1999). IT completed additional geophysical surveys (Figure 4-2) and trenching studies to verify the lateral extent and depth of waste fill and to characterize the contents of the waste (IT, 2001a).

Based on results of the Fill Area definition study, described in Section 4.1.2.2, Landfill No. 1 acreage has been revised from 12 acres to approximately 6.3 acres. The landfill is adjacent to the floodplain of an unnamed intermittent stream that drains into a tributary of Remount Creek. Landfill No. 1 slopes steeply to the southeast toward 16th Avenue. Surface water runoff from Landfill No. 1 flows to the southeast toward a tributary of Remount Creek. The site is bounded on the north and east by roads, and on the south and west by densely wooded forest. Residential buildings and approximately 1.5 acres of maintained lawn make up the northern portion of the landfill area. The remainder of the site is densely wooded.

4.1.4 Hydrogeology

Four groundwater monitoring wells (LF1-G01 to LF1-G04) were installed around the boundary of Landfill No. 1, Parcel 78(6), during the 1995 remedial investigation (RI) study (SAIC, 1995). The boring depths ranged from 16 to 41.5 feet bgs and all borings encountered weathered shale at depths between 7 and 10 feet bgs. Monitoring well LF1-G01 was installed in the officers' housing area north (upgradient) of the landfill and encountered 10 feet of silt and clay soil overlying weathered shale. Monitoring wells LF1-G02 and LF1-G03 were installed southeast of the landfill and encountered weathered shale between 9 and 12 feet bgs. Monitoring well LF1-G04 was installed southwest of the landfill adjacent to a tributary stream and encountered weathered shale at 7 feet bgs. Three of the wells (LF1-G01, LF1-G03, and LF1-G04) monitor shallow intervals within the weathered shale underlying the landfill. Monitoring well LF1-G02 monitors the clay residuum and the upper portion of the weathered shale. The geology underlying Landfill No. 1 is shown on Figure 2-2.

Groundwater flow at the site is consistently to the southeast toward a stream tributary east of the site (Figure 2-3). Recorded depths to groundwater ranged from 0.2 to 30.8 feet bgs in March 2000. Water level measurements were performed in accordance with the *Installation-Wide Sampling and Analysis Plan* (IT, 2000c). Groundwater in well LF1-G02 was not observed under artesian conditions in March 2000. During RI activities in 1994 and 1995, SAIC (2000) reported that the groundwater conditions in this well were periodically artesian. The groundwater elevation measured at Landfill No. 1, Parcel 78(6), wells in March 2000 ranged between 765.2 and 737.4 feet above mean sea level (msl). The calculated average hydraulic gradient, based on the March 2000 data is 0.04 feet per feet (ft/ft). Hydraulic conductivity measurements were obtained in LFl-G02 (3.27×10^{-4} cm/sec) and LFl-G03 (4.08×10^{-5} cm/sec) (SAIC, 2000).

4.1.5 Surrounding Land Use and Populations

Landfill No. 1, Parcel 78(6), is currently adjacent to, and appears to extend beneath, a portion of the base residential housing area. These houses were built in 1958 according to *Asbestos Containing Building Materials Survey Miscellaneous Housing Units* (Reisz Engineering, 1998) and were used as residences for FTMC staff and their families from 1958 to approximately September 1999. Landfill No. 1 is shown as residential area in future reuse plans. House number 3335 appear to be located over actual fill material, and house number 3337 is located within 30 feet of the limits of waste fill. Future populations in this area are expected to be residents with families. Reuse scenarios that will be evaluated for Landfill No. 1 will include residential as a baseline value and recreational. None of Landfill No. 1 is compatible with building homes due to waste debris and potential subsidence issues.

4.1.6 Sensitive Ecosystems

The ecological setting of Landfill No. 1, Parcel 78(6), is greatly defined by its proximity to a residential area and the fact that it is surrounded by relatively heavily traveled roads. The original ecological setting has been altered through historical anthropogenic activities. Consequently, the topography and resultant habitat types are not characteristic of similar areas that have not been altered by man. The terrestrial habitat at Landfill No. 1 is comprised of two types; maintained lawns and mixed coniferous/deciduous forest. There are no permanent aquatic features or aquatic habitat at Landfill No. 1. A more complete discussion of the environmental setting at Landfill No. 1 is presented in Section 4.3.1.

4.1.7 Analytical Data

The summary tables for Landfill No. 1, Parcel 78(6), identify compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values, and PAH Background Summary Report* (IT, 2000c) and the *Final Background Metals Survey Report, FTMC, Alabama* (SAIC, 1998). Appendix A contains a summary of validated historical and recent data for detected compounds at Landfill No. 1 and compares analyte concentrations against metals background values, SSSL, and ESV for the various sample media collected at the site. Metals that exceed the background threshold limit (two times background) and compounds that exceed the SSSL are summarized for each sample medium in Table 4-1.

The elevated metals concentrations in groundwater samples appear to be directly attributable to high turbidity in groundwater samples. An evaluation of this problem was completed and is presented in Appendix E.

4.1.8 Potential Source of Contaminants

The location of the fill material in Landfill No. 1, Parcel 78(6), was interpreted from the geophysical data collected to date and from the trench excavations completed by IT in support of the EE/CA. The Detail Map, Figure 4-1, incorporates all of the historical and recent data in defining the extent of waste at Landfill No. 1.

The contents of the fill material directly observed in the trenches included glass bottles, coal, scrap metal, metal food containers, wood pieces, broken plates, melted glass, black to gray ash, newspaper, leather boots, brick, pieces of steel cable, glass medical bottles with septa, and one glass syringe (without needle). Groundwater was not encountered during the trenching operations at Landfill No. 1, Parcel 78(6). During trenching operations at trench T78-1 in Landfill No. 1 the on-site geologist identified what he thought to be a potential grenade within the trench excavation. The geologist recorded this event in the geologist's trench log shown in

Table 4-1

Site Investigation Analytical Data Summary
Landfill No. 1, Parcel 78(6)
Fort McClellan, Alabama

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	Al, Fe > BKG and SSSLs	ND	< SSSL	< SSSL	ND	ND	NS
Subsurface Soil	Al, Fe, Sb > BKG and SSSLs	ND	ND	< SSSL	ND	ND	ND
Sediments	< BKG and SSSLs	ND	< SSSL	< SSSL	ND	ND	ND
Fill Material	Al, As > BKG and SSSLs	< SSSL	< SSSL	< SSSL	ND	ND	ND
Groundwater	Al, Ba, Mn > BKG and SSSLs	< SSSL	< SSSL	< SSSL	ND	ND	ND
Surface Water	As > BKG and SSSLs	< SSSL	ND	ND	< SSSL	ND	ND

Al - aluminum
As - arsenic
Ba - barium
BKG - background
Fe - iron
Mn - manganese
NA - not analyzed
ND - not detected
NS - not sampled
PCB - polychlorinated biphenyl
Sb - antimony
SSSL - site-specific screening level
SVOC - semivolatile organic compound
VOC - volatile organic compound

Appendix I of the *Site Investigation and Fill Area Definition Report* (IT, 2001a). The field crew notified the IT site manager and requested UXO support at the trench site to examine the item. The UXO technician approached the trench site to make a positive identification of the item. Before the UXO technician was able to fully examine the item, the walls of the trench collapsed, burying the observed item and preventing positive identification. The item was buried at the trench bottom, approximately 8 feet bgs (IT, 2001a). Though the item was never positively identified as a grenade by the UXO technician and there is no documentation or history of ordnance and explosives (OE) and/or UXO disposal at Landfill No. 1, the onsite geologist noted its presence on the trench log as a MK-II grenade. Because the object was observed during excavation along the bottom of the trench, and was subsequently covered when the trench walls collapsed, future controls recommended for the site, which preclude access to the area, will mitigate potential hazards associated with the item. These controls may include, but are not limited to, a concrete boundary markers, land-use controls (LUC), and deed notices limiting future use, activity, and excavation at the property.

Ponding of surface water in depressions has been observed at the southern end of Landfill No. 1, Parcel 78(6). Although the infiltration of surface water is a likely mechanism of groundwater impacts because of the percolation of surface water into the waste fill and the release of leachate to groundwater, releases from the landfill have not been directly observed, nor are they indicated by the analytical data collected to date. This landfill is over 50 years old and is considered mature (over 30 years old) with regard to leachate or landfill gas generation. The apparent lack of these constituents supports the argument for no future impacts from Landfill No. 1. Groundwater monitoring has been discontinued at the site with the concurrence of the FTMC BRAC Cleanup Team (BCT). This agreement is documented in excerpts from the BCT meeting minutes of August 1998, presented in Appendix F.

4.2 Streamlined Human Health Risk Assessment

Surface soil, surface water, sediment, and groundwater are the media evaluated for Landfill No. 1. The receptor scenarios determined to be applicable to Landfill No. 1 include the recreational site-user and the resident. SRA tables and figures are included in Appendix C. Figure C-1 presents the CSEM for Landfill No. 1.

4.2.1 Surface Soil

Three surface soil samples, collected in April 1994, were utilized in the human health SRA (Table C1-1). These samples were analyzed for explosives, metals, pesticides, SVOCs, and VOCs. Several metals, SVOCs, and one pesticide, 4,4'-DDE, were detected. No explosives or VOCs were detected (Table C1-2).

After comparing the detected metals to background metal data and removing any metals that are considered to be essential nutrients, seven metals remained; aluminum, beryllium, boron, copper, iron, nickel, and zinc were determined to be site-related chemicals. No statistical comparison, such as the Mann-Whitney U Test, could be performed on these data sets to determine the differences between the population sets because there are an insufficient number of site samples (3); five samples are necessary for the statistical test. All of the organic chemicals detected at the site were assumed to be site-related and were carried forward to the soil SSSL screening to determine if they were COPC.

Table C1-3 presents those chemicals determined to be COPC; these include aluminum and iron for the resident only. All other site-related chemicals were not selected as COPC because their MDCs were below their respective soil SSSLs for the resident and recreational site-user. Both aluminum and iron were selected as COPC based on noncancer hazard only.

As shown in Table C1-4, the resulting noncancer HI for the resident from aluminum is 0.4, while the HI for iron is 3.41. Neither aluminum nor iron is considered to be a carcinogen. Because aluminum has an HI less than 1, it is not considered to be a COC in soil.

Iron would be considered a COC, however, due to concerns regarding the oral reference dose (RfD), iron is not selected as a COC. The appropriateness of the oral RfD for iron is controversial, especially for use with exposure to iron in soil. The oral RfD reflects estimates of iron intakes based on nutritional surveys, but identifies neither a NOAEL nor LOAEL for iron ingestion. As such, it is possible that a much higher level of dietary iron intake would be innocuous, although this possibility is not evaluated in the oral RfD documentation.

In addition, it is likely that the forms of iron present in the plant and animal products that comprise the diets evaluated in the nutritional survey are more bioavailable than those present in soil, sediment, or other non-aqueous environmental media. There are only two known instances of toxicity to iron following oral exposure. One involves acute ingestion of large quantities of soluble forms formulated to enhance bioavailability for their medicinal effects. The other is the occurrence of hemosiderosis in Bantu consuming Kaffir beer. It has been established, however, that the iron in the beer is present in a soluble form that is as bioavailable as the iron in ferric chloride. Presumably, high bioavailability is important in development of toxicity to ingested iron. Iron in soil would be subject to binding to other minerals (matrix effect), and the presence of other minerals would reduce the extent to which iron ingested in soil is absorbed.

For these reasons, EPA (1995) recommends not using the oral RfD to quantify risks; therefore, iron is not selected as a COC for surface soil at Landfill No. 1, Parcel 78(6). Therefore, there are no COC for surface soil at Landfill No. 1 for the recreational site-user or the resident.

4.2.2 Surface Water

Two surface water samples collected in June 1994 were utilized for the human health SRA for Landfill No. 1, Parcel 175(5) (Table C1-5). One of the surface water samples was analyzed for explosives, herbicides, metals, pesticides, SVOCs, and VOCs, while the other sample was only analyzed for explosives and SVOCs. Several metals, one explosive compound, and two VOCs were detected. Table C1-6 presents the results of the site-related background screening for metals. All metals were determined to be within background screening criteria; therefore, they are not site-related. 1,3-Dinitrobenzene, 1,1,1-trichlorethane, and chlorobenzene are determined to be site-related chemicals and are carried forward to the SSSL screening.

Table C1-7 presents the surface water SSSL screenings for the resident and recreational site-user. None of the site-related chemicals were determined to be COPC. All had MDCs less than their respective resident and recreational site-user SSSLs.

4.2.3 Sediment

Two sediment samples collected in 1994 were used in the human health SRA (Table C1-8). One sample was analyzed for explosives, metals, PCBs, pesticides, SVOCs, and VOCs, while the other sample was analyzed for only explosives and some SVOCs.

Table C1-9 presents the results of the background and essential nutrient screens. Only barium was determined to be site-related, no organics were detected in sediment. Barium was not selected as a COPC for either the resident or the recreational site-user (Table C1-10). Therefore, based upon these analytical data, sediment at Landfill No. 1, Parcel 78(6), is not anticipated to present a cancer risk or noncancer hazard to either a resident or recreational site-user.

4.2.4 Groundwater

Six groundwater samples, collected in 1994, 1995, 1997, and 1998, were used in the human health SRA (Table C1-11). One sample was analyzed only for metals, three samples were analyzed for explosives, metals, PCBs, pesticides, SVOCs, and VOCs, while two samples were analyzed for chemical warfare agent breakdown products, explosives, aromatics, herbicides, organosulfans, metals, SVOCs, pesticides, PCBs, and VOCs.

Eleven metals, one pesticide, one SVOC, and one VOC were detected in groundwater at the site (Table C1-12). After the background and essential nutrient screens, only one metal (barium) was determined to be site-related. All organics were carried forward to the COPC selection.

Table C1-13 presents the COPC selection for groundwater; barium is the only chemical selected as a COPC. However, the resulting HI for the resident exposed to barium in groundwater is 0.6, less than the threshold of 1. Therefore, based upon these analytical data, groundwater at Landfill No. 1, Parcel 78(6), is not anticipated to present a cancer risk or noncancer hazard to a resident (Table C1-14).

4.2.5 Uncertainty Analysis

Generally, the media evaluated at Landfill No. 1, Parcel 78(6), appear to be fairly clean. Aluminum was selected as a site-related chemical in surface soil (Table C1-2); however, aluminum is ubiquitous and the most abundant metal in the earth's crust (ATSDR, 1999). Furthermore, its MDC is within the range of background for the Main Post (SAIC, 1998). Similarly, barium was selected as a site-related chemical in groundwater (Table C1-12), but its MDC is also within the range of background for the Main Post (SAIC, 1998), and barium is among the metals whose concentration may be dramatically elevated when groundwater samples are contaminated with sediment as indicated by high turbidity. It seems likely that these two metals are actually present as background chemicals, and that their selection as site-related imparts a conservative bias to the SRA.

It should be noted that data from seven groundwater samples (six when a field duplicate is dismissed) from three wells associated with Landfill No. 1, Parcel 78(6), were not included in the SRA (data not shown). Examination of the data reveals that the samples were taken in 1994 and 1995; however, more recent data from these wells were included in the SRA. Also, examination of the data suggests that their inclusion would have no significant impact on the results or interpretation of the SRA.

Perhaps the most significant source of uncertainty regarding Landfill No. 1, Parcel 78(6), is the absence of subsurface soil data. This has the potential for imparting a non-conservative bias to the SRA should future development involve excavation. However, the proposed reuse scenarios for this site preclude excavation into a former landfill so that direct contact with subsurface soil is unlikely. Therefore, the absence of subsurface soil data is not deemed to represent a significant source of uncertainty in this evaluation. Nonetheless, should site reuse plans change, it may be necessary to take subsurface soil samples and re-visit the SRA.

4.2.6 SRA Conclusion

None of the media evaluated at Landfill No. 1, Parcel 78(6), surface soil, surface water, sediment, or groundwater poses a cancer risk or noncancer hazard to the resident or recreational site-user above acceptable ranges or thresholds (Table C1-15).

4.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for Parcel 78(6).

4.3.1 Environmental Setting

The ecological setting of Landfill No. 1, Parcel 78(6), is greatly defined by its close proximity to a residential area and the fact that it is surrounded by relatively heavily traveled roads. The original ecological setting has been altered through historical anthropogenic activities. As such, the topography and resultant habitat types are not characteristic of similar areas that have not been altered by man.

Landfill No. 1, Parcel 78(6), is located in the southwestern portion of the Main Post and encompasses a total area of approximately six acres. Three residential buildings and approximately one and one-half acres of maintained lawn make up the northern portion of the landfill area. The remainder of the site is comprised of mixed coniferous/deciduous forest. Landfill No. 1 is bounded on the north and south by asphalt roads, and on the east and west by mixed coniferous/deciduous forest. The topography of Landfill No. 1 is sloping from the northern portion to the south-southeast.

Terrestrial habitat at Landfill No. 1, Parcel 78(6), is comprised of two types; maintained lawns and mixed coniferous/deciduous forest. The maintained lawn area is in the northern portion of the site and surrounds the three residential buildings that are currently unoccupied. As stated previously, this maintained lawn area occupies approximately one and one-half acres.

The mixed coniferous/deciduous forest that occupies the remaining 4.8 acres of Landfill No. 1, Parcel 78(6), is best described as typic mesophytic forest. The canopy species characteristic of this area are tulip tree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and northern red *oak (Quercus rubra*). The dominant understory species of this area are red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginiana*), sweetgum (*Liquidambar styraciflua*), and sourwood (*Oxydendrum arboreum*). The shrub layer is dominated by mountain laurel (*Kalmia latifolia*), southern low blueberry (*Vaccinium pallidum*), southern wild raisin (*Viburnum nudum*), and yellowroot (*Xanthorhiza*

simplicissima). Numerous muscadine grape (*Vitis rotundifolia*) vines are also present in this area.

Although there are several drainage ditches at Landfill No. 1, Parcel 78(6); most notably along the southern and eastern boundaries, these ditches do not exhibit vegetation characteristic of prolonged inundation and in fact these ditches were completely dry during the on-site ecological investigation at the site. These ditches most likely only transmit water during periods of significant rainfall. Therefore, these ditches are not considered aquatic habitat. A concrete-lined drainage ditch is also present in the northeastern portion of the site; because it is concrete-lined it does not provide habitat for aquatic species. There are no other permanent aquatic features or aquatic habitat at Landfill No. 1.

Aquatic organisms are not present at Landfill No. 1, Parcel 78(6). In general, the terrain at FTMC supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area surrounding Landfill No. 1 are copperhead (*Agkistrodon contortix*), king snake *(Lampropeltis getulus*), black racer (*Coluber constrictor*), fence lizard (*Sceloporour undulatus*), and six-lined racerunner (*Cnemidophorous sexlineatus*) (Cline and Adams, 1997).

Terrestrial species that may inhabit the vicinity of Landfill No. 1, Parcel 78(6), include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at FTMC at least part of the year (ACOE, 1998). Common species expected to occur in the vicinity of Landfill No. 1 include northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottus*), warblers *(Dendroica spp.*), indigo bunting (*Passerina cyanea*), red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), bluejay (*Cyanocitta cristata*), several species of woodpeckers (*Melanerpes spp., Picoices spp.*), and Carolina chickadee (*Parus carolinensis*). Game birds present in the vicinity of Landfill No. 1 may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground, particularly the fringe area where the grasslands adjoin the forested areas.

4.3.2 Chemicals Detected

Chemicals detected in soil, sediment, and surface water at Landfill No. 1, Parcel 78(6), are summarized in Appendix A.

4.3.3 Chemicals of Potential Ecological Concern

COPECs are those constituents whose maximum detected concentrations exceed their respective ESVs. The COPECs that have been identified at Landfill No. 1, Parcel 78(6), are the following:

- Surface Soil – aluminum, barium, beryllium, copper, nickel, zinc, 4,4-DDE, fluoranthene, phenanthrene, and pyrene
- Surface Water – none
- Sediment – arsenic, calcium, magnesium, and 4,4-DDT.

4.3.4 SLERA Uncertainty Analysis

The following site-related constituents exceeded their respective ESVs in surface soil at Landfill No. 1, Parcel 78(6): aluminum, barium, beryllium, copper, iron, nickel, zinc, 4,4'-DDE, fluoranthene, phenanthrene, and pyrene (Table D-3). No constituents were detected in surface water samples at concentrations that exceeded their respective ESVs (Table D-4). Arsenic, calcium, magnesium, and 4,4'-DDT were detected in sediment samples at concentrations that exceeded their respective ESVs (Table D-5).

PAHs were only detected in a single soil sample collected at Landfill No. 1, Parcel 78(6), and their concentrations only slightly exceeded their respective ESVs (HQs range between 1.9 and 2.8). Additionally, all of the metals that exceeded their respective ESVs did so by less than an order of magnitude except for aluminum and iron, which could be argued, are indicative of weathering processes of the natural minerals present in the soil. Iron is also a macro-nutrient that can be regulated by many organisms, thus rendering it non-toxic. The metals also have a low potential for significant bioaccumulation, which means they will not be transferred significantly through the food chain. Although these constituents in surface soil exceeded their respective ESVs, there are no sensitive ecosystems present at or in the near vicinity of Landfill No. 1. Therefore, it could be concluded that these constituents do not pose significant ecological risks to the terrestrial habitats at Landfill No. 1.

As presented in the detailed description of the ecological setting at Landfill No. 1, Parcel 78(6), (Section 4.3.1), the original ecological setting at the site has been greatly altered by anthropogenic activities. Several man-made drainage ditches are present at Landfill No. 1 but

none of them exhibit vegetation characteristic of prolonged inundation and in fact these ditches are completely dry during significant portion of the year. Therefore, these ditches do not provide viable aquatic habitat for significant portions of the year and are not considered aquatic habitat for this assessment.

Based on the lines-of-evidence provided in the previous paragraphs and summarized in Table D-29, it could be concluded that there are no COPECs in surface soil, surface water, or sediment at Landfill No.1, Parcel 78(6).

4.3.5 SLERA Conclusions

Terrestrial habitat at Landfill No. 1, Parcel 78(6), exhibits characteristics of land that has been disturbed by man and the "aquatic habitat" consists of man-made drainage ditches that are dry during significant portions of the year. No sensitive or unique habitat exists at Landfill No. 1.

Although the maximum detected concentrations of a number of constituents exceed their respective ESVs in surface soil (Table D-3) and sediment (Table D-5) at Landfill No. 1, Parcel 78(6), additional lines-of-evidence suggest that these COPECs may not pose significant risks to the terrestrial or aquatic ecosystems at Fort McClellan. These COPECs (Table D-28) have been identified through a very conservative screening process that utilizes ESVs based largely on NOAELs from the scientific literature and maximum detected constituent concentrations. If additional lines-of-evidence are considered, it could be concluded that there are no COPECs present at Landfill No. 1, Parcel 78(6). If, based on a risk management decision, the potential ecological risks at Landfill No. 1, Parcel 78(6), are determined to be "unacceptable" at this screening-level stage, then a baseline ecological risk assessment (BERA) is appropriate. The goal of the baseline ecological risk assessment, if deemed necessary, will be to reduce the levels of uncertainty and conservatism in the assessment process and to determine the potential for ecological risk at Landfill No. 1, Parcel 78(6), through a number of lines of evidence.

4.4 Recommended Actions

Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for Landfill No. 1, Parcel 78(6), the recommended remedy under CERCLA is No Further Action.

To facilitate reuse of the property, the Army proposes, but is not limited to, several non-CERCLA actions for this site. Those proposals are presented in Attachment 2.

5.0 Landfill No. 2, Parcel 79(6)

5.1 Site Location

Landfill No. 2, Parcel 79(6), is located in the central portion of the Main Post at the southern base of Cemetery Hill, between 2nd Avenue and 10th Street, north of the Ammunition Supply Point (ASP) and is shown on Figure 2-1. The landfill boundary reflects the changes to the waste fill area based on the investigation and fill area definition studies. The landfill area is approximately 5.6 acres, as shown on Figure 5-1.

5.1.1 Facility Type and Operational Status

Although the dates of operation for this landfill are not known, an incinerator built northeast of this location in 1927 suggests that Landfill No. 2, Parcel 79(6), may have been operating at that time (ESE, 1998). Weston found that ash is a component of the waste fill (Weston, Roy F., 1990). A crescent-shaped area marked as "Refuse Dump" appears on a 1937 map of Landfill No. 2. Reportedly, the landfill was used to dispose of construction debris. Aerial photographs dated 1944, 1954, 1957, 1961, and 1969 indicate that portions of the area were cleared for possible trench and fill operations. Landfill No. 2 operated as the Main Post sanitary landfill following closure of Landfill No. 1, Parcel 78(6), in 1947 and was active for an undetermined period (SAIC, 2000). Figure 5-1 shows details including groundwater sampling, boring, surface soil, and trenching locations for Landfill No. 2.

A site walk by IT in August 1999 indicated the presence of fill material northwest of the extent of fill defined by SAIC. A map of the current geophysical survey on Figure 5-2 shows the extent of waste at Landfill No. 2, Parcel 79(6). Recent trenching data has confirmed the extent of waste shown in the figure.

5.1.2 Previous Work

Previous environmental work conducted at Landfill No. 2, Parcel 79(6) includes the following:

- Enhanced Preliminary Assessment (Weston, 1990)
- Site Investigation (SAIC, 1993)
- Remedial Investigation (SAIC, 1995)
- Remedial Investigation Baseline Risk Assessment (SAIC, 2000)
- Site Investigation and Fill Area Definition Report (IT, 2001a).

5.1.2.1 Investigation

Landfill No. 2 was identified in the preliminary site assessment as an area requiring environmental evaluation (Weston, 1990). The site area has been identified as the former

672500 673000 673500

1175500 1175000

T79-11 T79-10 T79-10 T79-9 T79-5 FA-79-SS04 T79-4A T79-4 T79-2 T79-6 FA-79-SS03 T79-1 Landfill #2 5.6 acres LF2-G01 T79-3 LF2-W02/D02 FA-79-SS05 T79-7 FA-79-SS02 FA-79-SB01 FA-79-SS01 LF2-G03 LF2-G02 T79-8 LF2-W01/D01

4410 4409 4408 4406

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Figure 5-1

Detail Map Landfill No. 2 Parcel 79(6)

- Surface Water/Sediment Sample Location
- Proposed Concrete Monument
- Surface and Subsurface Soil Sample Location
- Bedrock Monitoring Well Location
- Fill Boundary Observed within Trench Excavations
- Residuum Monitoring Well Location
- Subsurface Soil Sample Location
- Surface Soil Sample Location
- Sewer Utility
- Gas Utility
- Telephone Utility
- Water Utility
- Electric Utility
- Exploratory Trench
- Improved Roads
- 5' Topographic Contours
- Surface Drainage/Creek w/ Flow Direction
- Landfill Boundary Inferred by Surface Geophysics and Trenches
- Buildings
- Wooded
- Lawn/Cleared Area

0 100 200

State Plane feet, NAD83

N

August 2001

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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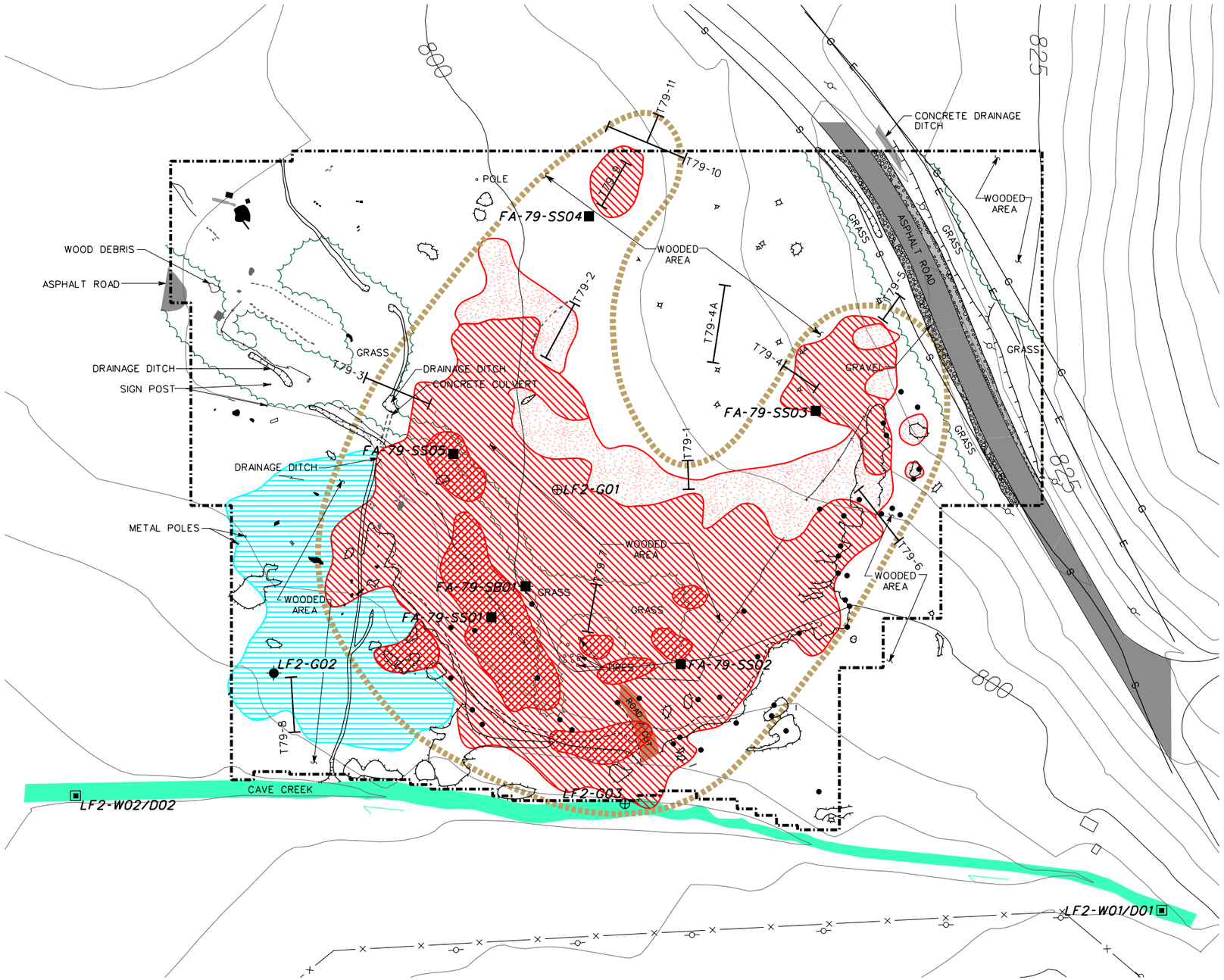

LEGEND

- GEOPHYSICAL SURVEY BOUNDARY
- LANDFILL BOUNDARY INFERRED BY SURFACE GEOPHYSICS AND TRENCHES
- LOW CONCENTRATION OF BURIED METAL
- MODERATE CONCENTRATION OF BURIED METAL
- HIGH CONCENTRATION OF BURIED METAL
- HIGH CONDUCTIVITY ANOMALY
- CONCRETE/REINFORCED CONCRETE
- SURFACE METAL OBJECT
- TRENCH EXCAVATION
- MOUND
- DEPRESSION
- CREST OF SLOPE
- TOE OF SLOPE
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- SURFACE WATER FLOW
- FENCE
- TREE/ TREELINE
- SEWER UTILITY
- GAS UTILITY
- ELECTRIC UTILITY
- UTILITY POLE
- RESIDUUM MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- SURFACE WATER/SEDIMENT SAMPLE LOCATION

FIGURE 5-2
GEOPHYSICAL INTERPRETATION MAP
LANDFILL NO.2
PARCEL 79(6)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

SCALE
0 120 240 FEET

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DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
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PROJ. NO.: 796886
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STARTING DATE: 02/14/01
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location of an incinerator that was operated as early as 1927. A crescent-shaped "refuse dump" was also identified on a 1937 map of the Main Post of the FTMC (ESE, 1998). The landfill reportedly was used to dispose of unspecified "waste" during deactivation of the installation (USAEHA, 1986). Rusted drums, metal, small containers (5-gallon cans and bottles), assorted building materials, and machinery parts were observed at the site in October 1991. Demolition debris (asphalt, concrete, and glass) was exposed at the landfill by road-building operations during the site investigation in 1992 (SAIC, 1993).

SAIC acquired reconnaissance geophysical profile data from March 1994 to February 1995 over approximately 3.5 acres of the site and found geophysical anomalies attributable to buried metal. SAIC sampled the three existing monitoring wells (LF2-G01, LF2-G02, and LF2-G03) at Landfill No. 2 in June 1992, July 1994, January 1995, and October 1997. The results of these sampling events were summarized in previously published reports (SAIC, 1993, 1995, 1999). Additional groundwater sampling was conducted by IT personnel in February 1998 to determine if groundwater quality had been impacted from historical landfilling practices. The results were previously summarized in the *Long-Term Monitoring Report – First Quarterly Report for Landfills 1, 2, and 3* (IT, 1999). Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and explosives. The analytical data indicated that all detected compounds were present in trace concentrations, within site background values, and at levels below risk-based concentrations (IT, 1998b).

IT conducted an SI at Landfill No. 2 from January through March 2000. A geophysical survey was conducted to determine the boundary of the fill area and to identify anomalies within the fill area that would require further characterization. The total area surveyed was approximately 497,800 square feet (11.4 acres) (Figure 5-2). Several anomalies were identified at Landfill No. 2. These anomalies were caused by large-scale disposal areas, landfill pits, anomalous high conductivity areas, isolated buried metal objects, and areas of surface metal debris.

Surface soil samples were collected from five locations at Landfill No. 2. Twenty-three metals were detected in the surface soil samples collected. The concentrations of aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, thallium, vanadium, and zinc exceeded the background screening values and ESVs in most samples. Antimony, barium, chromium, copper, lead, manganese, and thallium were detected at concentrations that exceeded the SSSLs in most of the surface soil samples. Concentrations of aluminum, arsenic, and iron exceeded the SSSLs in all surface soil samples. All surface soil samples collected had concentrations of aluminum, chromium, iron, lead, manganese, vanadium, and zinc that exceeded the ESVs.

Six VOCs were detected in surface soil samples collected from three locations. None of the detected VOC concentrations exceeded the SSSLs or ESVs. Fifteen SVOCs were detected in the surface soil sample collected from location FA-79-SS01. Benzo(a)anthracene and benzo(a)pyrene were detected at concentrations that exceeded both the SSSLs and the ESVs. Benzo(a)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded the SSSLs. Five other SVOCs detected (anthracene, chrysene, fluoranthene, phenanthrene, and pyrene) were present at concentrations exceeding the ESVs. No other surface soil samples collected contained detectable concentrations of SVOCs.

No pesticides or PCBs were detected in the surface soil samples collected. Analytical data for Landfill No. 2 can be found in Appendix A.

5.1.2.2 EE/CA Fill Area Definition

Field activities were conducted by IT personnel from January through March 2000, for the delineation of the fill area at Landfill No. 2. These activities included a geophysical site survey, exploratory trenches, one soil boring, and a site walk. Eight trenches were excavated to determine the horizontal and vertical extent of fill material. Four additional trenches were excavated to determine the cause of anomalies identified previously (in 1993) by SAIC. One soil boring was advanced to determine the vertical extent of the fill material and collect samples for laboratory analysis. A site walk was conducted by IT to search for leachate seeps along the toe of the landfill; however, none were observed.

Eight exploratory trenches were excavated to determine the extent of waste fill at Landfill No. 2, and to characterize the fill material. Four additional exploratory trenches were excavated to determine the cause of anomalies identified during the geophysical survey conducted by SAIC in 1992. Trenches were excavated to depths ranging from 3 to 18 feet bgs. Trench logs do not indicate the presence of groundwater in the trenches.

Trenches T79-9 and T79-10, which were located north of the initial delineation of the Landfill No. 2 area, both contained large quantities of metal at depths ranging from 0.2 to 2.5 feet bgs. This material included piping, sheet metal, cable, and miscellaneous metal pieces. Other fill material in these areas included ash, glass, and brick. Items found in trench T79-7 include a 100-pound bomb steel casing and the additional fill material. The fill material described in trench T79-7 between the depths of 3 and 18 feet bgs included a metal pipe, burned wood, concrete, numerous scrap metal pieces, coal, ash, glass, and rounded chert cobbles. Approximately half of the glass detected in this trench was melted.

Fill material associated with trenches T79-1 through T79-11 typically included ash, brick, glass, melted glass, wood pieces, concrete, pieces of broken plates, and scrap metal. Trench T79-3 also contained a 55-gallon drum lid, rounded stones (4- to 10-inch diameter), and stone tile pieces. Wire and nails were also found in Trenches T79-4 and T79-5. Steel cable, tin roofing, and a large amount of twisted or bent steel were found in Trench T79-6. Chert or sandstone cobbles and/or stones were found in several of the trenches (T79-2, T79-4A, T79-8, T79-10, and T79-11) and appear to be native materials. Trench T79-8 contained only native sand, clay, and chert and sandstone cobbles. No fill material was encountered in this trench.

The presence of ash and construction-type materials detected in many of the excavated trenches is consistent with the historical usage of the site as both an incinerator location and, later, as a construction-debris landfill. Based on the results of the trenching activities, the estimated extent of fill material at Landfill No. 2 was increased from approximately 3.4 to 5.6 acres. One soil boring (FA-79-SB01) was advanced in the middle of Landfill No. 2 to determine the vertical extent of the fill material. The termination depth of the boring was 14 feet bgs.

Twenty-two metals were detected in the subsurface soil sample collected. Sixteen of these metals had detectable concentrations exceeding background screening values. A total of ten metals (aluminum, antimony, arsenic, barium, chromium, iron, lead, manganese, thallium, and zinc) exceeded the SSSLs. Of these, seven metals (antimony, arsenic, barium, chromium, iron, lead, and zinc) exceeded both the background screening values and the SSSLs.

Five VOCs were detected in the subsurface soil sample collected; however, none of the detected VOC concentrations exceeded the SSSLs. Ten SVOCs were detected in the subsurface soil sample collected; however, none of the detected SVOC concentrations exceeded the SSSLs.

One pesticide was detected in the soil boring sample collected; however, the concentration did not exceed the SSSL. No herbicides, explosives, or PCBs were detected in the fill material sample collected. Analytical data for Landfill No. 2 can be found in Appendix A.

IT has estimated the vertical and horizontal extent of fill material at Landfill No. 2 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area at Landfill No. 2 covers an area of approximately 5.6 acres. The average depth of fill material estimated from the trench and boring log data is approximately 8 feet bgs.

5.1.3 Structures/Topography

The landfill covers approximately 5.6 heavily wooded acres of which a portion is within the floodplain of Cave Creek, which flows to the southwest. A floodplain map is illustrated on Figure 2-5. Landfill No. 2, Parcel 79(6), is relatively flat with a slight grade to the south towards Cave Creek, which flows to the southwest along its southeastern border.

Other than existing groundwater monitoring wells, there are no structures on or near Landfill No. 2. Refuse and other evidence of past disposal practices are prevalent along the northern boundary of the cleared landfill area. Numerous mounds are present in the northern and eastern portions of Landfill No. 2, Parcel 79(6): evidence of previous landfilling activities. A geologic map of the fill area and the surrounding area is presented on Figure 2-2.

5.1.4 Hydrogeology

Three groundwater monitoring wells (LF2-G01, LF2-G02, and LF2-G03) were installed at Landfill No. 2, Parcel 79(6), during the 1992 site investigation (SAIC, 1993). Monitoring well LF2-G01 was installed upgradient (north) of the inferred landfill boundary and encountered 15 feet of silty sand and clayey soil. Downgradient wells LF2-G02 and LF2-G03 were installed southwest and southeast of the landfill, respectively, adjacent to the northern bank of Cave Creek. A potentiometric surface map based on March 2000 water levels is presented on Figure 2-3. In March 2000, groundwater elevations at wells across Landfill No. 2 ranged from 789.8 feet above msl in well LF2-G03 to 784.3 feet above msl in well LF2-G02. The horizontal hydraulic gradient ranged from 0.001 to 0.01 ft/ft during measurements in March 2000. A hydraulic conductivity measurement was obtained in LF2-G02 (2.89×10^{-5} cm/sec) (SAIC, 2000). The direction of groundwater flow trended south-southwest, which follows Cave Creek drainage.

5.1.5 Surrounding Land Use and Populations

The area surrounding Landfill No. 2, Parcel 79(6), is primarily woodlands designated for passive recreational use in the current reuse plan. The primary reuse scenario for the site will be as a recreational site-user, but a residential exposure scenario will also be provided for comparison. This area is located within the floodplain of Cave Creek and is thus unlikely to be used for any developed purpose.

5.1.6 Sensitive Ecosystems

The landfill area was cleared and has since been colonized by early successional weeds, grasses, and sedges. The surrounding area is mixed coniferous/deciduous forest characteristic of a typic mesophytic forest. The original ecological setting has been altered through significant anthropogenic activities. Consequently, the topography and resultant habitat types are not

characteristic of similar areas that have not been altered by man. Terrestrial habitat at Landfill No. 2, Parcel 79(6), is entirely made up of two general types; grasslands and typic mesophytic forest. Although there are no aquatic features within the area of Landfill No. 2, Cave Creek flows along the southeastern boundary of the site. The area is not defined as a sensitive ecosystem, although the area lies within the floodplain for Cave Creek. A more complete discussion of the Landfill No. 2 environmental setting is included in Section 5.3.1. Base maps indicate that portions of this landfill area occur within a larger wetland area; although, physical inspection of the site has shown that wetlands are not present in this area, with the possible exception of the area immediately adjacent to Cave Creek.

5.1.7 Analytical Data

The summary table for Landfill No. 2, Parcel 79(6), identifies compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values, and PAH Background Summary Report* (IT, 2000c) and the *Final Background Metals Survey Report, FTMC, Alabama* (SAIC, 1998). Appendix A includes a summary of validated historical and recent data for detected compounds in subsurface soil, fill material, sediments, groundwater, surface soil, and surface water samples collected at Landfill No. 2. The detected values are compared to metals background concentrations, SSSL, and ESV for the various sample media collected at the site. Metals that exceed the background threshold limit (two times background) and SSSL and organic compounds that exceed the SSSL are summarized for each sample medium in Table 5-1.

The elevated metals concentrations in groundwater samples appear to be directly attributable to high turbidity in groundwater samples. An evaluation of this problem was completed and is presented in Appendix E.

5.1.8 Potential Source of Contaminants

The location of the fill material in Landfill No. 2, Parcel 79(6), was interpreted from the geophysical data collected to date and from the trench excavations completed by IT in support of the EE/CA.

The Landfill No. 2, Parcel 79(6), detail map on Figure 5-1 incorporates all of the historical and recent data in defining the extent of waste at the site.

The contents of the fill material directly observed in the trenches included ash, brick, glass, melted glass, wood pieces, concrete, pieces of broken plates, and scrap metal. Wire, nails, steel cable, tin roofing, and bent steel were also found. The presence of ash and construction-type

Table 5-1

Site Investigation Analytical Data Summary
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	Al, Sb, As, Ba, Cr, Cu, Fe, Pb, Mn, Zn > BKG and SSSLs	< SSSLs	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene > SSSLs and BKG	NS	NS	NS	NS
Sediments	< BKG and SSSLs	ND	< SSSLs	ND	ND	ND	ND
Fill Material & Subsurface	As, Ba, Cr, Fe, Pb, Sb, Zn > BKG and SSSLs	< SSSLs	< SSSLs	< SSSLs	ND	ND	ND
Groundwater	Al, Be, Fe, Mn, Pb, Tl > BKG and SSSLs	< SSSLs	< SSSLs	Aldrin > SSSL	< SSSLs	ND	ND
Surface Water	< BKG and SSSLs	ND	ND	ND	ND	ND	ND

Al - aluminum
As - arsenic
Ba - barium
Be - beryillium
BKG - background
Cr - chromium
Cu - copper
Fe - iron
Pb - lead
Mn - manganese
ND - not detected
NS - not sampled
Sb - Antimony
SSSL - site-specific screening level
SVOC - semivolatile organic compound
Tl - thallium
VOC - volatile organic compound
Zn - Zinc

materials detected in many of the trenches is consistent with the historic usage of Landfill No. 2, Parcel 79(6), as both an incinerator location and, later, as a construction-debris landfill (IT, 2001a). Groundwater was not encountered during trenching operations at Landfill No. 2.

The detail map on Figure 5-1 shows the current interpretation of the landfill boundary and, thus, the lateral extent of the potential source area for any releases from the landfill. To date, chemical evidence of a release from the landfill have not been observed. Metals have exceeded background values and SSSLs in some subsurface soils and groundwater. One pesticide, aldrin, has been reported above the SSSL in groundwater. Surface soil samples collected contained concentrations of 11 metals above SSSL values. One surface soil sample out of the five samples indicated five VOCs above SSSLs. These samples were collected from within the landfill area.

Releases from the landfill have not been directly observed, nor are they indicated by the analytical data collected to date. This landfill is apparently over 50 years old and consequently should be mature with regard to leachate or landfill gas generation. The apparent lack of these constituents, or indicator parameters, supports the argument for no future impacts from Landfill No. 2, Parcel 79(6). Groundwater monitoring has been discontinued at Landfill No. 2 with the concurrence of the FTMC BCT. This agreement is documented in excerpts from the BCT meeting minutes of August 1998, presented in Appendix F.

5.2 Streamlined Human Health Risk Assessment

Media evaluated at Landfill 2, Parcel 79(6), include surface soil, surface water, sediment, and groundwater. The receptor scenarios applicable to Parcel 79 include the recreational site-user and the resident. SRA tables and figures are included in Appendix C. Figure C-2 presents the CSEM for Parcel 79.

5.2.1 Surface Soil

Five surface soil samples were evaluated in the SRA (Table C2-1 in Appendix C). The samples were collected in March 2001 from 0 to 1 foot bgs. All samples were analyzed for metals, organophosphorous pesticides, polychlorinated biphenyls (PCB), SVOCs, and VOCs. Twenty-three metals, 15 SVOCs (all PAHs), and 3 VOCs were detected (Table C2-2). Thirteen metals exceed their background screening criteria or UTLs and were selected as site-related chemicals. These metals and all organic compounds were carried forward to the COPC selection step.

Eight metals and 5 PAHs were selected as COPC for the resident (Table C2-3). Only arsenic, lead and benzo(a)pyrene were selected as COPC for the recreational site-user (Table C2-3).

The HI for the resident of 11 is largely due to arsenic (HI = 2.24) and iron (HI = 6.82) (Table C2-4). Arsenic was detected in all five samples. Furthermore, the arsenic data set was determined to be normal (Table C2-3), suggesting that the concentrations identified are reasonably consistent with one another; i.e., the MDC does not appear to be an outlier. Therefore, arsenic is identified as a legitimate COC for the resident. Iron could also be selected as a COC; however, EPA Region IV takes the position that the oral RfD for iron is not a sufficient basis for selecting iron as a COC, especially in soil. The oral RfD reflects estimates of iron intakes based on nutritional surveys, but identifies neither a threshold nor a toxic effect level for ingestion. It is likely that a much higher level of iron intake would be innocuous, although this possibility is not evaluated in the oral RfD documentation. The total HI from exposure to surface soil and groundwater for the resident of 11 is segregated by target organ in Table C2-5. The target organ analysis confirms that arsenic is the only COC that contributes to an unacceptable HI. RGOs are presented for the resident for lead and arsenic in surface soil (Table C2-6).

The ILCR for the resident of 2E-4, clearly above the risk management range, is largely due to arsenic, with significant contributions from the PAHs as well (Table C2-4). RGOs based upon target ILCR values of 1E-6, 1E-5 and 1E-4 were calculated for arsenic and the PAHs in soil (Table C2-7).

No HI was estimated for the recreational site-user because no COPC were selected in surface soil for noncancer effects (Table C2-8). The total ILCR for the recreational site-user of 2E-6, due to arsenic and benzo(a)pyrene, is near the low end of the risk management range. COCs based on cancer are not identified and RGOs are not estimated.

It should be noted that lead was selected as a noncancer COPC in surface soil for both the resident and recreational site-user because the site MDC exceeds the SSSL of 400 mg/kg (Table C2-3). However, lead is not evaluated in the same manner as other COPC because there is no oral RfD for this metal or its compounds. The SSSL of 400 mg/kg reflects a screening level in soil for residential use. A recent reevaluation for a similar FTMC site confirms the 400 mg/kg level as a cleanup level for lead in soil for residential use (IT, 2001b). However, the SSSL of 400 mg/kg for lead in soil is unnecessarily restrictive for recreational site use. A cleanup level for lead of 7,600 mg/kg was developed for soil for recreational site use (IT, 2001b), which is adopted as the RGO for the recreational site-user for this site.

5.2.2 Surface Water

The surface water samples evaluated in the human health SRA are presented in Table C2-9. Two surface water samples, collected in 1994, were used in the SRA. One sample was analyzed for explosives, herbicides, PCBs, pesticides, metals, SVOCs, and VOCs. The other surface water sample was analyzed for explosives and SVOCs.

Only metals were detected in surface water (Table C2-10). No metals were determined to be site-related after the comparison with background; thus no chemicals in surface water were carried through the SRA.

5.2.3 Sediment

The two sediment samples evaluated in the human health SRA, collected in June 1994, are presented in Table C2-11. Only metals and one SVOC (benzyl alcohol) were detected in sediment at Parcel 79 (Table C2-12). Comparison with background revealed that none of the metals were site-related. Benzyl alcohol is the only chemical determined to be site-related and carried forward to the COPC selection step. The MDC for benzyl alcohol, however is less than the SSSL for benzyl alcohol in sediment for the resident or the recreational site-user (Table C2-13). Therefore, benzyl alcohol is not selected as a COPC in sediment.

5.2.4 Groundwater

Thirty groundwater samples, collected in 1992, 1994, 1995, 1997, and 1998, were used to evaluate a resident's exposure to groundwater from the site (Table C2-14). All groundwater data for this site were collected and analyzed by SAIC. SAIC provided this data to IT electronically, with no hard copy back-up. The electronic data set provided by SAIC included two sets of analytical results for some parameters for sample numbers UC00354, UC00355, and UC00372. The IT Data Acquisition and Management Group theorizes that the two sets present results before and after dilution during the analytical process. The Data Group recommends using the lower set of values because dilution usually improves both the accuracy and precision of the analytical methods and results in lower values. The original laboratory data packages are not available for further clarification.

Sixteen metals, one SVOC, six pesticides, two VOCs, and two explosives were detected in groundwater at the site (Table C2-15). After background screening and essential nutrient removal, only metals beryllium, boron, chromium, and lead were determined to be site-related. All organic chemicals detected in groundwater at the site were also selected as site-related chemicals and carried forward to the COPC selection.

Table C2-16 presents the COPC selection; four metals and one pesticide (aldrin) were selected as COPC for the resident. The metals were selected for their noncancer effects, while aldrin was selected as a COPC only based upon its cancer risk.

Table C2-17 presents the HI and ILCR for the resident exposed to the COPC in groundwater. The resulting HI (0.6) and ILCR (4E-6) are either below or well within the acceptable range/threshold for human health. COPC contributing an HI greater than 0.1 are included in the target organ table analysis (Table C2-5) because a resident would be simultaneously exposed to surface soil and groundwater.

Although no HI is calculated for lead, lead is considered to be a COC and an RGO is presented for lead in groundwater. Lead was determined to be a COC at the site using the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (EPA, 1994). Using the average lead concentrations for surface soil and groundwater at the site, it was determined that 32 percent of children aged 0 to 84 months would have blood lead concentrations greater than 10 µg lead per deciliter of blood (Appendix C, Attachment C-4). Lead, however, is among the metals that were not detected in groundwater samples that had low turbidity (IT, 2000b).

5.2.5 Uncertainty Analysis

Perhaps the most significant source of uncertainty regarding Landfill No. 2, Parcel 79(6), is the presence of lead in groundwater. It is unclear the extent to which elevated turbidity at the time of sample collection may have inflated the apparent concentration of lead.

Another source of uncertainty is the absence of subsurface soil data. This has the potential for imparting a non-conservative bias to the SRA should future development involve excavation. However, as explained for Landfill No. 1, Parcel 78(6), this does not represent a significant source of uncertainty in this evaluation. Nonetheless, should site reuse plans change, it may be necessary to take subsurface soil samples and re-visit the SRA.

5.2.6 SRA Conclusion

Total HI and ILCR estimates for the resident and recreational site-user summed across all media are presented in Table C2-18. The total HI and ILCR for the resident for exposure to surface soil are above acceptable limits; therefore, both cancer and noncancer RGOs were developed. Furthermore, lead in surface soil was selected as a COPC for residential exposure, and shown to be present at concentrations above the cleanup level for residential exposure. It is concluded that lead, arsenic, and several PAHs in surface soil pose unacceptable health risks should the site be developed for residential purposes. Groundwater at the site was determined to not pose a

noncancer hazard nor cancer risk to the resident. However, the residential exposure scenario is evaluated only to capture the upper bound on risk and to provide useful information to risk managers.

The total ILCR for the recreational site-user was near the low end of the risk management range. Noncancer-based COPC were not identified for the recreational site-user; therefore, an HI was not estimated. It is concluded that the level of contamination in the media at Landfill No. 2, Parcel 79(6), does not pose an unacceptable risk or hazard should the site be used for passive recreation as currently anticipated.

5.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for Parcel 79(6).

5.3.1 Environmental Setting

The ecological setting at Landfill No. 2, Parcel 79(6), is defined by the fact Landfill No. 2 was historically cleared of native vegetation and has subsequently been colonized by early successional weeds, grasses, and sedges. The original ecological setting has been altered through significant anthropogenic activities. As such, the topography and resultant habitat types are not characteristic of similar areas that have not been altered by man.

Landfill No. 2, Parcel 79(6), is located in the north-central portion of the Main Post and encompasses a total area of approximately 5.6 acres. Landfill No. 2 is relatively flat with a slight grade to the south towards Cave Creek, which flows along the southeast border of the site. The landfill area itself was cleared and has since been colonized by early successional weeds, grasses, and sedges. The surrounding area is mixed coniferous/deciduous forest characteristic of a typic mesophytic forest.

Refuse and other evidence of past disposal practices are prevalent along the northern boundary of the cleared landfill area. Numerous mounds are present in the northern and eastern portions of Landfill No. 2, Parcel 79(6), which are the result of historical landfilling activities that have taken place at the site.

Terrestrial habitat at Landfill No. 2, Parcel 79(6), is entirely made up of two general types; grasslands and typic mesophytic forest. The grasslands are comprised of areas that have historically been cleared and landfilled, and have since been colonized by early successional weeds, grasses, and sedges. The area surrounding the landfill itself is characteristic of a typic mesophytic forest.

The canopy species characteristic of this area are tulip tree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and northern red *oak (Quercus rubra*). The dominant understory species of this area are red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginiana*), sweetgum (*Liquidambar styraciflua*), and sourwood (*Oxydendrum arboreum*). The shrub layer is dominated by mountain laurel (*Kalmia latifolia*), southern low blueberry *(Vaccinium pallidum*), southern wild raisin (*Viburnum nudum*), and yellowroot (*Xanthorhiza simplicissima*). Numerous muscadine grape (*Vitis rotundifolia*) vines, greenbriar (*Smilax rotundifolia*) and poison ivy (*Toxicodendron radicans*) are also present in this area.

Although there are no aquatic features within the area of Landfill No. 2, Parcel 79(6), itself, Cave Creek flows along the southeastern boundary of the site in a southwesterly direction. The substrate of Cave Creek is mostly bedrock with small areas of sand and gravel. The stream banks are approximately six feet high and the width of Cave Creek in this area is approximately two feet. The canopy above Cave Creek in this area is relatively high. Base maps also show that there may be wetlands associated with Cave Creek that adjoin this site, although physical inspection has not identified these areas.

In general, the terrain at FTMC supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area surrounding Landfill No. 2, Parcel 79(6), are copperhead (*Agkistrodon contortix*), king snake *(Lampropeltis getulus*), black racer (*Coluber constrictor*), fence lizard (*Sceloporour undulatus*), and six-lined racerunner (*Cnemidophorous sexlineatus*).

Terrestrial species that may inhabit the vicinity of Landfill No. 2, Parcel 79(6), include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at FTMC at least part of the year (ACOE, 1998). Common species expected to occur in the vicinity of Landfill No. 2 include northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottus*), warblers *(Dendroica spp.*), indigo bunting (*Passerina cyanea*), red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), bluejay

(*Cyanocitta cristata*), several species of woodpeckers (*Melanerpes spp., Picoices spp.*), and Carolina chickadee (*Parus carolinensis*). Game birds present in the vicinity of Landfill No. 2 may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground. Because of the presence of Cave Creek, piscivorous bird species may also be present in the vicinity of Landfill No. 2. These piscivorous birds may include great blue heron (*Ardea herodias*), green-backed heron (*Butorides striatus*), and belted kingfisher (*Ceryle alcyon*).

Although shallow (less than one foot deep) and relatively narrow, Cave Creek has the potential to support a variety of amphibious species and some small fish species. Bullfrog *(Rana catesbeiana*) and leopard frog (*Rana sphenocephala*) are examples of amphibians that may be found in Cave Creek in the vicinity of Landfill No. 2, Parcel 79(6). Fish species that may be found in Cave Creek in the vicinity of the site include blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), stoneroller (*Campostoma anomalum*), striped shiner (*Luxilus chrysocephalus*), and various darters (*Etheostoma spp.*).

Based on field observations, Cave Creek in the vicinity of the site provides low quality gray bat foraging habitat. Two major requirements for gray bat foraging habitat are contiguous forest cover and habitat for aquatic insects (one of the gray bat's preferred dietary items). These two requirements are met by Cave Creek in this area; therefore, gray bats could be expected to forage in this area.

5.3.2 Chemicals Detected

Chemicals detected in soil, sediment, and surface water at Landfill No. 2, Parcel 79(6), are summarized in Appendix A.

5.3.3 Chemicals of Potential Ecological Concern

COPECs are those constituents whose maximum detected concentrations exceed their respective ESVs. The COPECs that have been identified at Landfill No.2, Parcel 79(6), are the following:

- Surface Soil – aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, lead, manganese, mercury, nickel, silver, zinc, anthracene, benzo(a)anthracene, benzo(a)pyrene, carbazole, chrysene, dibenzofuran, fluoranthene, phenanthrene, and pyrene

- Surface Water – none

- Sediment – none.

5.3.4 SLERA Uncertainty Analysis

The following site-related constituents exceeded their respective ESVs in surface soil at Landfill No. 2, Parcel 79(6), as presented in Table D-6: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, zinc, anthracene, benzo(a)anthracene, benzo(a)pyrene, carbazole, chrysene, dibenzofuran, fluoranthene, phenanthrene, and pyrene. No site-related constituents were detected in surface water and none of the site-related constituents in sediment exceeded their ESVs (Tables D-7 and D-8).

A number of the metals detected in soil had HQs less than 10 and do not bioaccumulate significantly (aluminum, antimony, arsenic, barium, beryllium, and nickel); therefore, they may not be considered COPECs. Calcium is a macro-nutrient that can be regulated by many organisms, thus rendering it non-toxic. Additionally, PAHs detected in surface soil at the site were detected infrequently (one out of five samples). Although the maximum concentrations of a number of constituents in surface soil exceed their respective ESVs, the terrestrial habitat at the site exhibits characteristics of disturbed land and cannot be classified as a unique or sensitive ecosystem. Therefore, it could be concluded that none of the constituents detected in surface soil at Landfill No. 2 would be expected to pose adverse ecological risk to terrestrial populations at FTMC.

5.3.5 SLERA Conclusions

Terrestrial habitat at Landfill No. 2, Parcel 79(6), exhibits characteristics of land that has been disturbed by man. Cave Creek flows along the southeastern boundary of Landfill No. 2 and potentially provides low quality foraging habitat for the gray bat, a federally-listed endangered species. The potential exists for erosion of contaminated soil into this sensitive habitat.

The following site-related constituents exceeded their respective ESVs in surface soil at Landfill No. 2, Parcel 79(6) as presented in Table D-6 and are considered COPECs: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, zinc, anthracene, benzo(a)anthracene, benzo(a)pyrene, carbazole, chrysene, dibenzofuran, fluoranthene, phenanthrene, and pyrene. No site-related constituents were detected in surface water and none of the site-related constituents in sediment exceeded their ESVs (Tables D-7 and D-8). These COPECs (Table D-28) have been identified through a very conservative screening process that utilizes ESVs based largely on NOAELs from

the scientific literature and maximum detected constituent concentrations. If additional lines-of-evidence are considered, it could be concluded that none of the constituents detected in surface soil are likely to pose adverse ecological risks to terrestrial populations at FTMC. If, based on a risk management decision, the potential ecological risks at Landfill No. 2, Parcel 79(6), are determined to be "unacceptable" at this screening-level stage, then a BERA is appropriate. The goal of the baseline ecological risk assessment, if deemed necessary, will be to reduce the levels of uncertainty and conservatism in the assessment process and to determine the potential for ecological risk at Landfill No. 2, Parcel 79(6), through a number of lines-of-evidence.

5.4 Remedial Action Objectives

The potential CERCLA risk to human health at Landfill No. 2 is associated with surface soils. To address this risk, the Army has evaluated remedial action alternatives including No Action, LUCs, soil cover, and onsite disposal (consolidation into a secure landfill).

5.5 Scope of Remedial Action

The specific goals of remedial actions are to mitigate or eliminate any potential threat to public health, welfare, or the environment (posed by the presence of constituents of concern identified within the respective fill areas [see Appendix A] under CERCLA guidance for remedial actions). The Army's objective is to reduce or eliminate future potential for adverse public impacts consistent with anticipated base reuse plans through land-use controls, physical barriers, and deed notices.

Upon selection of the most appropriate remedial action alternative, the scope of the remedial action will be detailed in a work plan. The scope for the work plan will include the details of the specific remedial action proposed by this EE/CA.

5.6 Applicable or Relevant and Appropriate Requirements

CERCLA specifies that remedial actions for the cleanup of hazardous substances must comply with the requirements under federal or more stringent state environmental laws that are applicable, or relevant and appropriate to the hazardous substances or particular circumstances at a site to the extent practicable. The assumption that human health and the environment are protected is inherent in the interpretation of applicable or relevant and appropriate requirements (ARAR). Action- and location-specific ARARs were identified for each alternative (Tables 5-2 and 5-3 respectively).

5.7 Site-Specific Description of Alternatives

Based on current Landfill No. 2 data, surface soil presents an unacceptable CERCLA risk to a potential resident. Although several chemicals exceeded their respective ESVs, the SLERA

presented several additional lines-of-evidence that would address potential ecological risks. Because metals in soil do not tend to migrate and no groundwater impacts have been observed at Landfill No. 2, groundwater remedies are not necessary. Surface water and sediment samples did not exceed SSSLs, and the SRA does not indicate any noncancer hazards to humans.

The alternatives developed in this EE/CA are intended to mitigate risks through prevention of exposure to the surface soils. This objective is compatible with section 300.430(a)(iii)(13) of the NCP that contains the expectation that engineering controls, such as containment, will be used for a waste that poses relatively low threat where treatment is impractical. The NCP identifies municipal landfills as a type of site where treatment of waste may be impractical due to the size and heterogeneity of the contents (55 FR 8704). Because treatment is usually impractical, EPA generally considers containment to be the appropriate response action, or "presumptive remedy" for landfills (EPA 1996a).

A description of each alternative and how it would be applied at Landfill No. 2, Parcel 79(6), is presented in the following sections.

5.7.1 No Action Alternative (Alternative 1)

The No Action Alternative maintains the present conditions at the site with no additional effort to reduce potential exposure. The No Action general response provides no remediation, monitoring, or security activities at the site to reduce risk to human health or the environment. The NCP (40 CFR 300.415) requires that the No Action response be carried through the detailed analysis as a baseline for comparison with other remedial action alternatives.

5.7.2 Land-Use Controls (Alternative 2)

This alternative consists of a land-use control (LUC) to restrict future residential reuse of the property. As part of any property transfer, the Army would develop transfer documentation that would impose restrictions to prevent residential reuse within property boundaries. The transfer documentation would also restrict peripheral activities to avoid onflow of stormwater runoff. This alternative includes 5-yr reviews for a period of 30 years. There is no long-term groundwater monitoring included in this alternative.

5.7.3 Soil Cover with LUCs (Alternative 3)

This alternative would include the installation of a soil cover and the implementation of LUCs. All brush, timber, stumps, and vegetation would be cleared from Landfill No. 2, Parcel 79(6), to provide a clear base over which soil would be placed. Any required drainage features would be constructed to meet design requirements. An evaluation of wetland impact would be made prior

Table 5-2

Potential Action-Specific Federal and State ARARs
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	Comment
Open dumping	State: ADEM Administrative Code Chapter 420-3-5.09	Unauthorized open dumps or any activity causing the creation or maintenance of such dumps constitutes a nuisance menacing public health and is subject to abatement by the Environmental Department.	1,2,3,4			Basis for DOD action at former disposal sites to address potential nuisance to public health.
Closing or upgrading open dumps	Federal: 40 CFR 256.23	The State shall provide for classification of existing solid waste disposal facilities. For open dumps, the State shall take steps to close or upgrade the facility. Evidence of that action shall be made publicly available. In providing for closure of open dumps, the State shall take steps necessary to eliminate health hazards and minimize potential health hazards. These steps shall include requirements for long-term monitoring or contingency plans where necessary.		1,2,3		Basis for DOD action at former disposal sites to minimize potential health hazards. No Action does not meet these criteria if there are potential health hazards.
OSWER Directive 9355.0-67FS	Guidance: Application of the CERCLA Municipal Landfill Presumptive Remedy for Military Landfills	The volume of landfill contents, types of wastes, hydrogeology and safety must be considered when assessing the practicality of excavation and consolidation or treatment of wastes. Although no set volume limits exists, landfills with a content of more than 100,000 cubic yards would normally not be considered for excavation. If military wastes are present, safety considerations may be important in determining the practicality of excavation.			1,2,3,4	The presumptive remedy would exclude excavation.
On-Site Waste Generation	State: ADEM Admin Code 335-14-3-.01(2)	Person who generates waste shall determine if that waste is a hazardous waste. Including whether waste is excluded from regulation under ADEM Admin Code 335-14-2.01(4) or whether waste is listed under 335-14-2-.04.	4			Hazardous waste is not generated unless the waste is excavated.
Sampling and Analysis	State: ADEM Administrative Code Chapter 335-14-2-Appendix I, II, and III implementing 40 CFR 136, Appendix A (SW-846 sampling methods)	Specific requirements for identifying hazardous wastes. Establishes sampling and analytical requirements for collecting, testing and evaluating wastes.	4	2,3		Potentially applicable for identifying suspicious (potentially hazardous) waste encountered during implementation of Alternatives 2, 3 and 4.

Table 5-2

Potential Action-Specific Federal and State ARARs
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	Comment
Management and Disposal of Medical and Petroleum Contaminated Waste	State: ADEM 335-13-4.26	Generators of a special waste may be required to provide an analysis and certification that the waste is nonhazardous waste or treated medical waste. Waste types for which specific rules and regulations have not been developed shall be managed and disposed of in a manner determined by the Department to be consistent with the intent of this Division. Small quantities of petroleum contaminated waste maybe disposed of without testing if it contains < 25 gallons of petroleum, and the total material is <5 cubic yards per occurrence.		2,3,4		Applicable to Municipal Solid Waste Disposal Facilities. Relevant and appropriate due to a similar action at the DOD Landfill site.
Landfill Design to Assure Groundwater Resources Protection	State: ADEM ADMIN. Code 335-13-4-14	Groundwater resources in the vicinity of the landfill unit shall be determined as a basis for facility design, groundwater protection and groundwater monitoring required under 335-13-4.27. Groundwater in the first saturated zone below the landfill unit shall be evaluated with a minimum of one hydraulically upgradient monitoring well for background data and two hydraulically downgradient monitoring well. Monitoring wells should be installed prior to facility opening to provide undisputed background water quality sample.		3,4		These standards are only applicable for establishing a landfill unit. For an existing landfill unit they are potentially relevant and appropriate. Contamination of groundwater associated with the Landfill has not been clearly established. Groundwater remediation is not within the scope of this analysis and it will be addressed as a separate action.
Drainage	State: ADEM Admin Code 335-13-4.17	Owners and operators of all facilities must design, construct and maintain a run-on control system to prevent flow onto the active and or closed portions of the landfill during the peak discharge from a 25-year storm; and a run-off control system to collect and control water volume resulting from 24-hour 25-year storm. The site must also have drainage structures to carry away rain from the disposal site and minimize generation of leachate, erosion and sedimentation.	4	2,3		Applicable for modification of Landfill 4 design after consolidation; relevant and appropriate for design of drainage systems after cover modification at Landfill.
Runoff Management	State: ADEM Admin. Code 335-13-4.01(2) (a)&(b)	Runoff management must protect wetlands and surface water quality consistent with NPDES and any applicable Alabama Water Quality Management Plan.	2,3,4			Compliance with substantive requirements of NPDES Stormwater Discharge General Permit requirements is necessary for any construction excavation.

Table 5-2

Potential Action-Specific Federal and State ARARs
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	Comment
Landfill Cover Design	State: ADEM Admin. Code 335-13-4.20(2)(b)	Final cover system must be comprised of an infiltration layer of at least 18 inches of earthen material and/or a synthetic layer with permeability < or = to permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1 x 10[-5] cm/sec, whichever is less. The infiltration layer for a construction/demolition landfill must be a minimum of 18 inches of compacted earthen materials excluding sands. The erosion layer must be a minimum of 6 inches of earthen material capable of sustaining native plant growth. Alternative designs must achieve an equivalent level of protection.	4	3		Relevant and appropriate standard to guide design of Landfill cover. Applicable to final cover at consolidation landfill.
Final Soil Cover Construction	State: ADEM Admin. Code 335-13-4.20 (2)(c)	Cover shall be graded to prevent ponding, and not exceed 25%. Slopes longer than 25 feet shall require horizontal terraces for every 20 foot rise or utilize other erosion control measures. The minimum final grade shall not be <5%. Deep rooted vegetation penetrating >6 feet below cover is prohibited.	4	3		Relevant and appropriate standard to guide design of Landfill cover. Applicable to final cover at consolidation landfill.
Postclosure	State: ADEM Administrative Code Chapter 335-13-4-.30	Requires 30 years post-closure care for permitted facilities, or a minimum of 5 years if closed prior to 10/9/1993. Specific requirements for landfill post-closure including: 1) maintaining the cover on eroded areas; 2) filling and grading areas where ponding may occur; 3) correcting any surface cracks in the landfill soil cover; 4) maintaining an appropriate cover at all times; 5) establishing and maintaining access control structures and signs; 6) removing any waste disposed following closure; 7) maintaining monitoring devices and pollution control equipment.	4	1,2,3		Relevant and appropriate to all alternatives because the regulations address locations where wastes have been deposited and are to remain in place. The regulation protects potential human and ecological receptors from adverse impacts resulting from exposure to materials in the landfill. Applicable to final closure of consolidation landfill.
Deed Restrictions	State: ADEM 335-13-4.20(i)	Upon final closure, facility owner shall record a notation onto the land deed for the property used for disposal (or other instrument normally accessed by title search) that will in perpetuity, notify any potential purchaser of the land that it has been used as a solid waste landfill and must include a survey plat, is subject to post closure monitoring and maintenance, and a certification of closure with a detailed design drawing showing final contour and drainage plan.	4	2,3		Not applicable to closure of a non-permitted facility. Relevant and appropriate for a capped unit being closed. Closure will be certified as part of the final remedy for the entire site.

Table 5-2

Potential Action-Specific Federal and State ARARs
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	Comment
Stormwater Runoff to Surface Water from Construction Excavation Activities	Federal: 40 CFR 122.26 implemented by ADEM Administrative Code Chapter 335-6-6-.03 and .23	Requirements for a storm water discharge permit. Requirements ensure that storm water discharges from construction activities (clearing, grading, and excavating) do not violate surface water quality standards	2,3,4			Substantive requirements are applicable. For construction activities, a Stormwater Pollution Prevention Plan identifying Best Management Practices to be used to control storm water runon and contamination of stormwater runoff must be identified.
Construction Stormwater Discharge Permit Conditions	State: ADEM NPDES General Permit No. ALG610000	Authorizes the discharge of storm water from construction sites and other activities involving land disturbances (i.e., construction, excavation, land clearing). Requires Best Management Practices as provided in the Alabama Nonpoint Source Management Program Document and EPA Storm Water Pollution Prevention for Construction Activities. All materials used as fill for construction purposes must be non-toxic, non-acid forming and free of solid waste or other debris unless approved by the Department. Include a diagram of the facility showing locations where storm water exits the facility, location or structures or other measures to prevent pollution of stormwater or remove pollutants from storm water and locations of collection and handling systems. A copy of the BMP shall be maintained at the facility, along with a log of inspections required by Part IVB of the Permit. Documentation of training must also be kept on site. Training must be performed prior to implementation of the permit.			2,3,4	Substantive requirements are applicable. For construction activities, a Stormwater Pollution Prevention Plan identifying Best Management Practices to be used to control storm water runon and contamination of stormwater runoff must be identified.
Off-Site Disposal of Hazardous Waste	State: Subparts A through E ADEM Administrative Code Chapter 335-14-9	Identifies hazardous wastes that are restricted from land disposal and defines treatment standards for waste, soil and debris. Excavated wastes must be treated to Land Disposal Restriction (LDR) treatment standards prior to disposal, and the disposal facility must be permitted under RCRA to accept hazardous wastes.			4	Excavated waste that is hazardous not be disposed of on site. The Off-site disposal facility will have to be RCRA permitted and waste characterized as Land Disposal Restricted.

Table 5-2

Potential Action-Specific Federal and State ARARs
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	Comment
Packaging, Labeling, and Storage	Federal: USDOT Hazardous Materials Transportation Regulations: 49 CFR 171 to 173 and 177 to 180	Establishes classification, packaging, and labeling requirements for shipments of hazardous materials on publicly accessible roads.	4			Potentially applicable if hazardous waste is encountered during relocation of the waste fill under Alternative 4.
Transportation of Hazardous Waste	State: ADEM Administrative Code Chapter 335-14-4	Requires RCRA manifesting of hazardous waste shipments, waste characterization, labeling, and packaging; reporting of LDR status; transporter placarding compliance; reporting requirements for transporter, disposal facility and generator, record keeping, and training requirements for off-site transport of and hazardous waste.	4, 3			Potentially applicable if hazardous waste is encountered during relocation of the waste fill under Alternative 4.
Medical Waste	State: ADEM Administrative Code Chapter 335-13-7	Defines medical waste, including "sharps," such as hypodermic needles, IV tubing with needles attached, scalpels, syringes, glassware, blood vials, pipettes and similar items. Establishes guidelines for storage, treatment, and disposal of untreated medical waste.	4			Potentially applicable if medical waste is encountered during relocation of the waste fill under Alternative 4.

A – applicable
ADEM – Alabama Department of Environmental Management
ARAR – applicable or relevant and appropriate requirement
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFR – Code of Federal Regulations
NPDES – National Pollutant Discharge Elimination System
R&A – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
TBC – to be considered
USC – United States Code
UXO – unexploded ordnance
1, 2, 3, and 4 represent the alternatives for this site

Table 5-3

Potential Location-Specific Federal and State ARARs, Landfill No. 2, Parcel 79(6) Fort McClellan, Alabama

Location	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	ARAR/TBC Status
Floodplain	State: ADEM Administrative Code Chapter 335-13-4-.01	Establishes Permit Requirements and location standards for new disposal facilities in floodplains. A facility located in a floodplain shall not restrict the flow of the 100-year flood, reduce temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. A facility shall not result in the destruction of adverse modifications of critical habitats protected under the Federal Endangered Species Act of 1973, or of threatened or endangered species.		1,2,3,4		Not applicable to existing facilities. Substantive requirements are potentially relevant and appropriate because the standards are intended to identify conditions that could either result in an increased potential for a release from a landfill or would be particularly sensitive if a release occurred. Regulation is appropriate since releases from this landfill would be similar to the types of releases that could occur at a permitted municipal solid waste landfill.
Location Protective of Water Quality	State: ADEM Administrative Code Chapter 335-13-4-.02	Requires that a facility will not be located so as to adversely impact water quality by causing a discharge of pollutants into or degradation of waters of the State. A facility shall not cause non-point pollution of waters of the State that violates any requirement of a water quality management plan that has been approved under the Alabama Water Pollution Control Act.		1,2,3,4		Potentially relevant and appropriate because the standards are intended to identify conditions that could either result in an increased potential for a release from a landfill or would be particularly sensitive if a release occurred. Regulation is appropriate since releases from this landfill would be similar to the types of releases that could occur at a permitted municipal solid waste landfill.
Surface Water	40 CFR 122.41(d) and 122.44(d)	Specifies that reasonable steps must be taken to minimize or prevent discharges that have a reasonable likelihood of causing adverse impacts on surface-water quality (40 CFR 122.41[d]).	2,3,4			Adverse impacts on surface water quality should be minimized through use of drainage controls.
Surface Water	ADEM 335-6-10.04 Antidegradation Policy ADEM 335-6-10.07 Toxic Pollutant Criteria Applicable to State Waters	Specifies that discharges into surface water must achieve Federal and State water-quality standards (40 CFR 122.44[d]).		2,3,4		Relevant and Appropriate for ponded surface water if present.

Table 5-3

Potential Location-Specific Federal and State ARARs, Landfill No. 2, Parcel 79(6) Fort McClellan, Alabama

A – applicable
ADEM – Alabama Department of Environmental Management
ARAR – applicable or relevant and appropriate requirement
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFR – Code of Federal Regulations
CoA – Code of Alabama
NPDES – National Pollutant Discharge Elimination System
OSHA – Occupational Safety and Health Act
R & A – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
TBC – to be considered
USC – United States Code
UXO – unexploded ordnance
1, 2, 3, and 4 refer to the respective alternatives at each site

to the start of any activity. The Army would pull back (excavate) the leading edge of the waste encroaching onto the wetlands and place this waste onto the existing waste, if wetland mitigation is required for any encroachment into the wetlands. Cover soil would then be placed over the original footprint so as not to intrude into the wetland area.

Under this alternative, clean soil would be imported from the borrow area south of Landfill No. 4, Parcel 81(5) (approximately 1.2 miles away). The soil cover would have an area of 5.6 acres; thus, approximately 18,100 cubic yards of soil would be transported to Landfill No. 2, Parcel 79(6). The soil cover would be sloped to prevent ponding on the waste fill area. Seeding of light vegetation (e.g., grass, forbs, and shrubs) will be conducted to promote growth of vegetation on the soil cover in order to minimize erosion. This alternative would also include decommissioning of three existing site monitoring wells in accordance with ADEM requirements.

Concrete monuments would be installed around the perimeter of Landfill No. 2. As part of any property transfer, the Army would develop transfer documentation to impose restrictions preventing residential reuse within the boundary area and also restricting peripheral activities to avoid onflow of storm water runoff. Additionally, a protective rip-rap and bedding layer would be placed along the slope of the landfill that is adjacent to Cave Creek. The rip-rap and bedding layer would be placed to protect the landfill from a flood washing out the toe of the landfill. Due to the site's proximity to Cave Creek, monitoring of the site after flood events would be recommended.

This alternative provides for 30 years of site maintenance, which includes periodic inspections, and maintenance for erosion control and maintenance of the shallow-rooted vegetative cover. Long-term groundwater monitoring is not included under this alternative.

5.7.4 On-Site Disposal in a Secure Landfill (Alternative 4)

This alternative would consist of disposal of all contaminated soil and waste debris to a waste consolidation cell at Landfill No. 4, Parcel 81(5). The total fill area covers 5.6 acres to an average depth of 8 feet bgs. An estimated 75 percent of the total fill area consists of the waste fill. The remaining 25 percent is native soil that would be segregated and used as backfill. Thus, approximately 54,200 cubic yards of fill would be transported from Landfill No. 2, Parcel 79(6), to Landfill No. 4. Prior to excavation, all brush, timber, and vegetation would be cleared from Landfill No. 2 (debris would be placed in the Industrial Landfill, Parcel 175[5]). The excavated area would be backfilled with soil from the borrow area just south of Landfill No. 4 as needed, and Landfill No. 2 grade would be restored to preexisting conditions. This alternative would

also include decommissioning of three existing site monitoring wells in accordance with ADEM requirements. Long-term groundwater monitoring is not required for this site per previous agreements with BCT (Appendix F).

5.8 Comparative Analysis

This chapter consists of the analysis and presentation of the relevant information needed to permit the selection of a site response action. During this analysis, each alternative is assessed against nine evaluation criteria. A comparison of the four alternatives considered for Landfill No. 2, Parcel 79(6), and their evaluation under the nine evaluation criteria is presented in Table 5-4. The SRA (Section 5.2) presented a cancer risk associated with surface soils to a potential resident, but acceptable risk for the proposed reuse. Data shows no impacts to groundwater at Landfill No. 2.

5.8.1 Overall Protection of Human Health and the Environment

The overall protection of human health and the environment analysis provides a summary of how each alternative reduces, eliminates, or controls the risk from potential exposure pathways, through use of land-use controls, treatment, or engineering controls. Any short-term or cross-media impacts posed by the alternative are also considered.

Alternative 1 would not provide any protection of human health and the environment, and Alternative 2 would provide limited protection. Alternative 3 would provide an additional protective barrier. Alternative 4 provides the greatest protection of human health and the environment.

5.8.2 Compliance with ARARs

Under this criterion, the alternative is evaluated on how completely it will comply with ARARs, and if there will be further action required to comply with the ARARs. The need to justify a waiver from the ARARs is also evaluated. Action- and location-specific ARARs have been identified for the site and are discussed in Section 5.6.

A summary of the ARARs for all of the alternatives is presented in Tables 5-2 and 5-3. There are no location- or action-specific ARARs associated with Alternative 1 as no actions are taken under this alternative. Alternatives 2, 3, and 4 would be designed to comply with all action- and location-specific ARARs. These alternatives entail actions to prevent contact with surface soils, thereby eliminating an exposure pathway to potential contaminants. Alternative 4 is anticipated to provide the greatest protection, followed by Alternative 3.

Table 5-4

Summary of Detailed Alternative Analysis
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Soil Cover with Land Use Controls	Alternative 4 On-site Disposal in Secure Landfill
Overall Protection of Human Health and the Environment	Although no chemical human health or ecological risk was identified at this site, this alternative does not provide protection from physical hazards (waste debris).	This alternative provides adequate human health and environmental protection through the use of land use controls.	This alternative provides adequate human health and environmental protection through the use of land use controls and physical barriers to waste.	This alternative provides more than adequate human health and environmental protection through removal of the waste. Disposal in a contained waste cell at Landfill No. 4 would be protective of human health and the environment.
Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)	Meets the requirements of the ARARs.	Meets the requirements of the ARARs.	Meets the requirements of the ARARs.	Meets the requirements of the ARARs.
Long-Term Effectiveness and Permanence	Provides no long-term permanent controls to physical hazards.	This alternative maintains physical access controls and provides for long-term site management but does not create a physical barrier to exposed waste.	This alternative maintains potential exposure controls and provides for long-term site management.	This alternative provides for long-term effectiveness and permanence by clean closing source waste area.
Reduction of Toxicity, Mobility, or Volume Through Treatment	No Chemicals of Potential Concern (COPC) have been identified at this site. Thus, toxicity, mobility, and volume will not be affected by this alternative.	No COPCs have been identified at this site. Thus, toxicity, mobility, and volume will not be affected by this alternative.	No COPCs have been identified at this site. Thus, toxicity, mobility, and volume will not be affected by this alternative.	The lined waste containment cell (at Landfill No. 4) could potentially immobilize any hazardous constituents that may exist in the waste fill.

Table 5-4

Summary of Detailed Alternative Analysis
Landfill No. 2, Parcel 79(6)
Fort McClellan, Alabama

Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Soil Cover with Land Use Controls	Alternative 4 On-site Disposal in Secure Landfill
Short-Term Effectiveness	No short-term risks will be posed during implementation of this alternative.	Minimal short-term risks will be posed during implementation of this alternative; these risks can be easily mitigated. No risks will be posed to the community.	Potential short-term risks will be posed during grading; can be reduced/mitigated with proper procedures. Minimal risks will be posed to the community through increased traffic.	Some short-term risks will be posed during implementation of this alternative; exposure to contaminated soil and transportation traffic; can be reduced/mitigated with proper procedures. Additional risks will be posed to the community through increased traffic and dust.
Implementability	No implementing difficulty.	Little implementing difficulty.	Little implementing difficulty.	Some degree of implementing difficulty in removing slopes.
Community Acceptance	The community may accept this alternative because there is no chemical risk. Physical and attractive nuisance hazards may limit public acceptance.	The community may accept this alternative because it would still pose an attractive nuisance.	This alternative is more likely to be acceptable to community.	The community is likely to accept this alternative but may not like increase in Landfill No. 4.
State Acceptance	This alternative may be acceptable to the State because there is no chemical risk at the site.	The State would likely accept this alternative because there is no chemical risk at the site, but the alternative provides a barrier to physical waste and deed restrictions.	The State is likely to accept this alternative. This alternative is defined as a presumptive remedy for military landfills.	The State will accept this alternative. This alternative provides for clean closure of the site. The placement of the waste at Landfill No. 4 may require regulatory review, but would likely be accepted.
Cost (Net Present Worth)	$0	$857,000	$1,018,000	$1,915,000

5.8.3 Long-Term Effectiveness and Permanence

The analysis of the long-term effectiveness and permanence provides an evaluation of the magnitude of residual risk and the adequacy and reliability of controls used to manage the remaining wastes (untreated waste and treatment residuals) on-site.

Alternative 1 will have no long-term effectiveness. Alternative 4 will have the greatest long-term effectiveness and permanence. Alternative 3 has a slightly greater degree of long-term effectiveness and permanence than Alternative 2.

5.8.4 Reduction of Toxicity, Mobility or Volume

The evaluation of the reduction of toxicity, mobility, or volume through treatment discusses the anticipated performance of the treatment option an alternative utilizes. These criteria are evaluated due to the statutory preference for selecting a remedial action that employs treatment as a means to reduce the toxicity, mobility, or volume of materials. Aspects of this assessment include the amount of materials treated or destroyed; the degree of expected reduction in toxicity, mobility, or volume, the degree of irreversibility, and the type and quantity of residuals remaining on-site after treatment.

The toxicity and volume of waste is not reduced under any of the four alternatives, and the mobility is not affected by Alternatives 1 and 2. However, under Alternative 3 the mobility of contaminants will be reduced by the soil cover, which will limit surface water infiltration. The mobility of the waste will be greatly reduced under Alternative 4 because the waste will be placed in an appropriate containment cell.

5.8.5 Short-Term Effectiveness

Short-term effectiveness relates to the protection of the community and workers during remedial actions, and environmental impacts that would occur during the implementation of remedial actions.

Alternative 1 will have no short-term or long-term effectiveness. Alternative 4 will have the greatest long-term effectiveness and permanence, but the least short-term effectiveness due to risks posed to workers, the community, and the environment during the remedial action. Alternatives 2 and 3 have the same level of long-term effectiveness and permanence, but Alternative 3 has a slightly lower level of short-term effectiveness than Alternative 2 because some risks are posed to the workers, community, and the environment from truck traffic, site clearing, ecological impacts from the activity, and potential dust. Risks to workers and the community will be mitigated through appropriate health and safety measures. Minor impacts to

the ecological ecological community at Fort McClellan will be of relatively short duration and the area will be returned to a useable condition following completion of the remedial actions.

5.8.6 Implementability

The discussion of implementability details the technical and administrative feasibility of implementing an alternative as well as the availability of the necessary materials, and technology; the reliability of the technology; the ability to obtain the necessary equipment, specialists, services and capacities; the ability to monitor the remedial performance and effectiveness; and the ability to obtain agency approval and any necessary permits.

Alternatives 1 and 2 are readily implementable. Some degree of complexity may be involved during implementation of Alternatives 3 and 4 associated with parcel clearance. Alternative 4 has more complexity due to excavation of all of the waste. These actions may mobilize more compounds into the environment.

5.8.7 Community Acceptance

The assessment of community acceptance evaluates the concerns and issues the public may have regarding each alternative. This assessment tries to evaluate the intended reuse option with the final site condition based on the action.

The community is not likely to accept Alternative 1, but may accept Alternatives 2, 3, and 4. The likelihood of residential reuse at this site is slim due to the floodplain issue. Therefore the risk under the probable reuse scenario is acceptable, and Alternatives 2, 3, and 4 will likely be acceptable to the community.

5.8.8 State Agency Acceptance

State agency acceptance evaluation assesses the technical and administrative issues and concerns the state may have regarding each alternative.

The state is not likely to accept Alternative 1, but may accept Alternatives 2, 3, and 4. The COCs for a residential exposure scenario for human health risk at Landfill No. 2 are associated with surface soils, and Alternatives 2, 3, and 4 eliminate the exposure pathway to potential contaminants, thereby reducing or eliminating risks. Alternatives 3 and 4 meet ARARs. Alternative 2 may provide enough site control to mitigate impacts from the site. Potential ecological risks may be acceptable based on the uncertainty analysis and conservative nature of the SLERA.

5.8.9 Cost

The cost estimates presented are based on a variety of information including quotes from vendors and local suppliers, generic unit costs, conventional cost estimating guides, and previous experience. The cost estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The actual costs will depend on true labor and material costs, actual site conditions, competitive market conditions, final project scope, the implementation schedule, government regulatory fees and charges, and other variable factors. The cost evaluations are designed to determine relative cost impacts for each alternative.

Annual operation and maintenance (O&M) costs are post-construction expenses necessary to maintain the remedial action. These expenses include operating labor, maintenance materials and labor, energy, purchased services, periodic site reviews, and performance monitoring. The estimates include those costs that may have been incurred even after the initial remedial activity is complete.

A present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, typically the current year. The present worth costs were determined based on a 5 percent interest rate, for a 30-year time frame. The engineering and design cost is assumed to be 10 percent of the total worth of capital cost.

The estimated costs are used for comparison of alternatives, and are expected to provide an accuracy of +50 percent to –30 percent. The costs are presented in Table 5-4. Cost calculation sheets are provided in Appendix G.

5.8.10 Summary of Comparative Analysis of Alternatives

Each alternative was compared against nine evaluation criteria. The alternative was assigned a point value under each evaluation criteria. The point value ranges from 0 to 3. A description of the point rating system for each criterion is provided in Appendix H. The points for each alternative are added, resulting in a total point value for each alternative, thus providing a simple comparison of the alternatives. Table 5-4 provides a summary of the criteria and costs for the four alternatives. The following costs and evaluation scores were determined for each alternative:

- Alternative 1: NPW = $0, Score = 13.5
- Alternative 2: NPW = $189,000, Score = 17.2
- Alternative 3: NPW = $1,018,000, Score = 17.7

- Alternative 4: NPW = $1,915,000, Score = 20.3.

Although Alternative 1 has the lowest NPW, it may not be accepted by the community and State agency as an acceptable alternative. Alternatives 3 and 4 have the highest point scores; however, the costs are not justified by the slight increase in the score. Thus, Alternative 2 is proposed as the best and most cost-effective alternative. The uncertainty analysis supports the conservative nature of the ecological risk analysis and demonstrates that existing Landfill No. 2, Parcel 79(6), conditions may be factors that justify current conditions as an acceptable ecological risk level. The human health risks for a residential exposure scenario also are very conservative. Based on unacceptable risk levels associated with the proposed reuse, Alternative 2 should be acceptable and cost effective.

5.9 Recommendations

At Landfill No. 2, Parcel 79(6) the streamlined risk assessment indicates human health risks associated with chemical constituents exists in surface soils under a residential reuse scenario. The ecological risk assessment indicated potential ecological risk associated with Landfill No. 2. The uncertainty analysis for the ecological risk assessment identified several factors that could mitigate the potential ecological risks. The human health risk for the proposed reuse scenario was acceptable. Because the residential scenario is not a likely reuse as a result of floodplain issues and waste debris on site, there is no reason for large mitigation efforts. Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for Landfill No. 2, Parcel 79(6), the recommended remedy under CERCLA are LUCs. The LUCs to be taken are to place a deed notice that will prevent residential reuse of the property.

To facilitate reuse of the property, the Army also proposes, but is not limited to, several non-CERCLA actions for this site. These proposals are presented in Attachment 2.