Decision Documents for FST-13

EPD letter received approving CAP dated	February 27, 2006
Transmittal letter sent to GA EPD w/ RTC (No Replac. Pgs.)	February 8, 2006
Revised Final Corrective Action Plan for SWMU #13 dated	January 2006
EPD letter received w/ RTC dated	February 23, 2004
Transmittal letter sent to GA EPD dated	September 11, 2002
Corrective Action Plan for SWMU #13 dated	September 2002
EPD letter received approving RTC & Phase II RFI dated	April 4, 2001
Transmittal letter sent to GA EPD w/ RTC dated (No Replac. Pages)	May 30, 2000
Revised Final RCRA Facility Investigation Report dated	May 2000
EPD letter received w/ RTC dated	February 4, 2000
Transmittal letter sent to GA EPD dated	September 13, 1999
Decision Document dated	August 1996

Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive, S.E., Suite 1470, Atlanta, Georgia 30334
Noel Holcomb, Commissioner
Environmental Protection Division
Carol A. Couch, Ph.D., Director
404-656-2833

February 27, 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Michael W. Biering, P.E.
Director, Public Works
Headquarters, 3D Infantry Division (Mechanized) and Fort Stewart
Directorate of Public Works, Building 1137
Environmental Branch (ATTN: Algeana Stevenson)
1550 Frank Cochran Drive
Fort Stewart, GA 31314-4927

RE: Revised Corrective Action Plan (CAP) for the Former Fire Training Area (FTA) at Wright Army Airfield [Solid Waste Management Unit (SWMU) 13] dated January 2006; Fort Stewart; EPA ID No. GA9 210 020 872.

Dear Mr. Biering:

The Hazardous Waste Management Branch of the Georgia Environmental Protection Division (GA EPD) is in receipt of the above-referenced document submitted with correspondence (Biering to Causse) dated February 8, 2006. Based on our review, GA EPD:

1. has determined that Fort Stewart has sufficiently responded to our comments contained in GA EPD correspondence (Rabon to Biering) dated February 17, 2004 on the September 2002 version of this report; and

2. tentatively approves the Corrective Action Plan for SWMU 13 dated January 2006.

Please note that a final decision concerning the Corrective Action Plan for SWMU 13 will be made by GA EPD after completion of a forty-five (45) day public comment period by our issuance of a Notice of Decision documenting the next modification of your Hazardous Waste Facility Permit HW-045 (S&T). Should you have any questions concerning this correspondence, please contact Benoit Causse of my staff at 404-463-7513.

Sincerely,

Brent Rabon, Coordinator
DoD Remediation Unit
Hazardous Waste Management Branch

c: Darrell Crosby, Manager, GA EPD-Coastal District
Tressa Rutland, Fort Stewart (via facsimile)
Anita Shipley, EPA Region IV, RCRA Programs Branch
File: Fort Stewart (G)
R:\BCAUSSE\STEWART\SWMU 13\SWMU 13-CAP-Approval

DEPARTMENT OF THE ARMY
HEADQUARTERS, FORT STEWART
DIRECTORATE OF PUBLIC WORKS
1550 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4927

REPLY TO
ATTENTION OF

FEB 08 2006

Office of the Directorate

EXPRESS MAIL

Georgia Environmental Protection Division
Attention: Mr. Benoit Causse
2 Martin Luther King Jr. Drive, Southeast
Floyd Towers East, Suite 1470
Atlanta, Georgia 30334-9000

Dear Mr. Benoit:

Fort Stewart is pleased to receive the Georgia Environmental Protection Division's (GA EPD) correspondence dated February 17, 2004 regarding the Corrective Action Plan for the Former Fire Training Area (FTA) (Solid Waste Management Unit 13) at Fort Stewart Military Reservation, Fort Stewart, Georgia, dated September 2002.

In response to the comments received from GA EPD, Fort Stewart has enclosed two copies of the revised final Corrective Action Plan for the Former Fire Training Area (FTA) (Solid Waste Management Unit 13), Fort Stewart, Georgia, dated January 2006. In addition, a formal Response to Comments Table is provided. Please discard the appropriate existing reports and replace them with the revised ones.

In accordance with the Federal Code of Regulations, Section 270.11(d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact Ms. Algeana Stevenson at (912) 315-5227 or Ms. Tressa Rutland, Directorate of Public Works Environmental Division, at (912)767-2010, should questions arise regarding the enclosed report.

Sincerely,

Tressa M Rutland

Michael W. Biering, P.E.
Director, Public Works

Enclosure

REVISED FINAL

FORSCOM

CORRECTIVE ACTION PLAN

for the

3d Inf Div (Mech)

FORMER FIRE TRAINING AREA (FTA) AT WRIGHT ARMY AIRFIELD (SOLID WASTE MANAGEMENT UNIT 13) at FORT STEWART MILITARY RESERVATION FORT STEWART, GEORGIA

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0049

January 2006

05-245(E)/122205

EXECUTIVE SUMMARY

This report presents the Corrective Action Plan (CAP) for remediation of the former Fire Training Area (FTA) at Wright Army Airfield (WAAF), solid waste management unit (SWMU) 13, at Fort Stewart, Georgia. This CAP Report has been prepared by Science Applications International Corporation for the U. S. Army Corps of Engineers, Savannah District under Contract DACA21-95-D-0022, Delivery Order No. 0049.

Corrective action is required at SWMU 13 pursuant to Title 40, *Code of Federal Regulations*, Part 264.101(a), as referenced by the Rules of the Georgia Department of Natural Resources, Georgia Environmental Protection Division (GEPD), Chapter 391-3-11, Section 10. This CAP has been prepared in accordance with the recommendations in Section 9.5 of the revised final *Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for the FTA at WAAF (SWMU 13)* (SAIC 2000). This CAP addresses the requirements contained in the Fort Stewart Hazardous Waste Permit HW-045, as renewed August 1997.

Fort Stewart is located approximately 40 miles west-southwest of Savannah, Georgia, in portions of Liberty, Long, Bryan, Tattnall, and Evans counties and covers approximately 280,000 acres. FTA was located on the western edge of the WAAF runway system, which is in the southern portion of the Fort Stewart Military Reservation (FSMR). The FTA consisted of a 5,000-square-foot concrete pad with an integral berm that was used by fire-fighting personnel for training. An oil/water separator sump, underground piping, and an aboveground fuel [jet propellant (JP)-4] storage tank adjoined the main concrete pad and combined to make up the entire FTA. All of these structures and appurtenances were removed during an interim measure (IM) conducted in 1997 by CAPE Environmental. Also, as part of the IM, the top 4 feet of contaminated soil were excavated, removed, and replaced with clean soil. The IM was summarized in the *Final Interim Measures Report for SWMU 13*, dated May 1998, submitted to GEPD in August 1998.

Prior to the IM, three field investigations had been conducted at SWMU 13. Based on the analytical results obtained from these studies and confirmatory sampling done as part of the IM, the GEPD instructed the Fort Stewart Directorate of Public Works to conduct an RFI at the site.

Subsequent to the RFI, supplemental field investigations were performed in 2001/2002 and an interim removal action was conducted. During the interim removal action, a 20 feet by 8 feet, 8-inch-thick concrete pad was removed, along with 337 tons of soil and the groundwater monitoring well MW12.

The revised final Phase II RFI Report (SAIC 2000) concluded that surface soil was contaminated with benzo(*a*)pyrene; groundwater was contaminated with benzene, ethylbenzene, 2-methylnaphthalene, and naphthalene; and arsenic and chromium were listed as contaminant migration constituents of concern (CMCOCs) based on their potential to migrate (leach) to groundwater. Upon evaluation of new data from the supplemental investigations, benzene was also identified as a CMCOC.

This CAP evaluates the constituents of concern (COCs) and alternatives for achieving the remedial levels presented in this report for the COCs. The feasibility of applicable remedial technologies is analyzed, and then a conceptual design and implementation plan for the selected corrective action are presented.

RESULTS OF THE RFI

The RFI field investigations were conducted at the former FTA from November 2, 1998, through January 26, 1999. Chapter 5.0 of the revised final Phase II RFI Report (SAIC 2000) summarizes the results.

Contaminant Nature and Extent

Contamination is present in both soil and groundwater at SWMU 13. Site-related constituents (SRCs) were identified by comparing inorganic chemical concentrations to reference background concentrations. All organic chemicals that were detected were considered site-related.

SRCs for surface soil are benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, benzo(*a*)pyrene, chrysene, fluoranthene, pyrene, and barium. These chemicals were identified in only one of three surface soil samples taken during the Phase II RFI sampling. The location of this sample was adjacent to an area of weathered and corroded asphalt pavement. SRCs for subsurface soil identified as part of this RFI sampling include those listed above for surface soils plus anthracene, benzo(*g,h,i*)perylene, indeno(*1,2,3-cd*)pyrene, phenanthrene, chromium, and lead. Additional subsurface soil SRCs were identified from samples taken as part of the IM confirmatory sampling. These are acenaphthene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, arsenic, and mercury. SRCs for groundwater are benzene, toluene, ethylbenzene, and total xylenes (BTEX), fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

The areal extent of groundwater contamination determined during the RFI was limited to approximately 1 acre, and there was evidence that contaminant biodegradation is taking place in groundwater at the site.

Contaminant Fate and Transport

SRCs identified in surface and subsurface soil were compared to their respective U. S. Environmental Protection Agency (EPA) generic soil screening levels (GSSLs) to assess their potential migration pathways and transport mechanisms (i.e., the leachability of contaminants from soil to groundwater). Based on the soil screening analysis, benzene, 4-methyl-2-pentanone, benzo(*a*)anthracene, benzo(*b*)fluoranthene, dibenzo(*a,h*)anthracene, 2-methylnaphthalene, and arsenic exceeded their respective EPA GSSLs and were indicated as contaminant migration constituents of potential concern (CMCOPCs) in soil.

Fate and transport modeling was performed to quantitatively assess the risks associated with exposure to the CMCOPCs in soil. Only groundwater modeling was performed, as surface water is not present at this site and the nearest surface water receptor is located 2,500 feet from the site.

The Seasonal Soil Compartment (SESOIL) Model was used to predict the maximum groundwater concentration of the CMCOPCs based on contaminant migration from the site soil.

The following summarizes the conclusions from the SESOIL modeling:

- The five preliminary organic CMCOPCs identified in the revised final RFI [4-methyl-2-pentanone, benzo(*a*)anthracene, benzo(*b*)fluoranthene, dibenzo(*a,h*)anthracene, and 2-methylnaphthalene] either naturally attenuate before reaching the water table or the predicted groundwater concentrations do not exceed their respective risk-based concentrations (RBCs). However, benzene, an additional preliminary CMCOPC identified based on supplemental data, is predicted to reach the water table with concentrations exceeding its maximum contaminant level (MCL)/RBC. Therefore, benzene is identified as a CMCOC.

- Arsenic was identified as a CMCOC as its maximum predicted concentration at the surface of the groundwater table of 0.21 mg/L exceeded its groundwater target concentration (0.05 mg/L). The maximum groundwater concentration of arsenic is predicted to be reached after 135 years. Based on the groundwater velocity of 14 feet/year, arsenic will take over 15,000 years to migrate to the nearest potential surface water receptor (Peacock Creek).

The corrective action is to provide the technology necessary to minimize levels of contamination and to achieve the best overall results with respect to such factors as effectiveness, implementability, and cost.

SCREENING OF CORRECTIVE ACTION ALTERNATIVES

Several technologies for remediating petroleum-related contamination in groundwater were identified and screened. Technologies applicable to general response actions (no action, institutional controls, monitored natural attenuation, and active source remediation) were identified and evaluated with respect to their suitability in meeting the remedial response objectives. Technologies were screened using three evaluation criteria: effectiveness, implementability, and cost.

The "no action" alternative was not considered to be viable due to the need to ensure that the remedial levels for the site are being met. Institutional controls were not considered further as the sole remedial alternative because they are appropriate for this site only when combined with other technologies such as monitored natural attenuation.

Each of the following alternatives for petroleum-contaminated groundwater was considered to be applicable to the site, cost-effective, and implementable; therefore, two primary evaluation factors were used in the selection of the preferred corrective action alternative: time to implement and life-cycle cost. The time required to implement the action was an important evaluation factor for this site; the alternative would remediate the COCs to below the remedial levels in a reasonable time compared to the other alternatives. Life-cycle cost estimates are budget estimates based on conceptual design and are not adjusted to present worth costs or for escalation.

The following five corrective action alternatives were evaluated for the groundwater contamination at SWMU 13:

- Alternative 1: monitored natural attenuation,
- Alternative 2: air sparging,
- Alternative 3: oxygen injection,
- Alternative 4: air sparging and monitored natural attenuation, and
- Alternative 5: oxygen injection and monitored natural attenuation.

CONCEPTUAL DESIGN AND IMPLEMENTATION PLAN

Justification of Selection

Monitored natural attenuation, has been selected as the most appropriate corrective action for the groundwater COCs at SWMU 13 based on its reasonable time frame to achieve remedial levels (less than 7 years) and cost effectiveness. Historical groundwater results at the site show that concentrations of benzene in groundwater are decreasing. The site will be monitored during the 6-year natural attenuation period to ensure that concentrations of benzene and other COCs in the groundwater meet the remedial levels.

Conceptual Design

Baseline groundwater sampling would be conducted at the start of the remediation period and would consist of sampling seven monitoring wells (MW3, MW9, MW10, MW15, MW16, MW17, MW18, and MW19). The groundwater monitoring wells will be sampled and analyzed for VOCs, SVOCs, and natural

attenuation parameters (nitrate/nitrite, sulfate/sulfide, total iron, total phosphorous, carbon dioxide, and methane).

Performance monitoring will be performed annually during the natural attenuation period. Performance monitoring will involve sampling of seven existing groundwater monitoring wells (MW3, MW9, MW10, MW15, MW16, MW18, and MW19). The groundwater samples will be analyzed for VOCs, SVOCs, and natural attenuation parameters.

One year following the completion of the monitored natural attenuation period, confirmatory groundwater sampling will be conducted to verify that the remedial levels for benzene and other COCs have been met and maintained. The confirmatory groundwater sampling will be the same as the baseline groundwater sampling, and the same seven existing monitoring wells will be sampled.

The life-cycle cost to implement monitored natural attenuation is approximately $244,000. The alternative will take approximately 7 years to complete from the baseline sampling through the confirmatory sampling.

Implementation Plan

Upon approval of this CAP by GEPD, the Installation will request funding, procure a contractor to implement the corrective action, and implement the specified action. A Corrective Action Work Plan will be prepared to guide implementation of the corrective action but will not require GEPD review or approval. Any revisions required to the Operation and Maintenance Plan or the implementation schedule that become apparent during preparation of the Work Plan will be submitted to GEPD for concurrence. Substantive changes in the remediation approach or schedule will require that the public be provided with an opportunity for review and comment in accordance with the Fort Stewart Hazardous Waste Facility Permit. No other submittals will need to be provided to GEPD prior to implementation of the selected corrective action.

During the corrective action, Corrective Action Plan Progress Reports will be prepared and submitted to GEPD for review and approval. Upon completion of the corrective action, a Corrective Action Completion Report will be prepared and submitted to GEPD for review and approval.

Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive, S.E., 1470, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Environmental Protection Division
Carol A Couch, Ph.D., Director
404/463-0080

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
February 17, 2004

FEB 2 3 2004

Michael W. Biering, Colonel, U.S. Army
Director, Public Works
Headquarters, 3D Infantry Division (Mechanized) and Fort Stewart
Directorate of Public Works, Building 1137
Environmental Branch (ATTN: Tressa Rutland)
1550 Frank Cochran Drive
Fort Stewart, GA 31314-4927

RE: Corrective Action Plan (CAP) for the Former Fire Training Area (FTA) at Wright Army Airfield [Solid Waste Management Unit (SWMU) 13] at Fort Stewart Military Reservation, Fort Stewart, GA, dated September 2002; EPA ID No. GA9 210 020 872.

Dear Colonel Biering:

The Hazardous Waste Management Branch of the Georgia Environmental Protection Division (GA EPD) has completed its review of the above-referenced document and presents the following comments for your consideration and response:

1. **Inaccurate regulatory reference**--*Title Page, and Section 1.3 (Page 1-3):* The title page lists the regulatory authority as "Resource Conservation and Recovery Act 40 CFR 264 Title II, Subpart C, Section 3004; 42 USC 6901 et seq.", which contains the following minor inaccuracies:

- The Code of Federal Regulations (CFR) reference should appear at the end, after the statute reference, and

- "Subpart C" should read *Subtitle C.*

Therefore, the regulatory authority should read: Resource Conservation and Recovery Act, Title II, Subtitle C, Section 3004; 42 USC 6901 et seq.; 40 CFR Part 264. Please correct accordingly, and similarly revise the first sentence of Section 1.3.

2. **Missing map showing soil results**—*Section 2.7.1.1, and 2.7.1.2 (Page 2-10):* The RFI results summary does not contain a map depicting the final (post-excavation) extent of surface and subsurface soil contamination. For instance, although Figure 2-8 shows IRA soil sampling results, it does not depict any previous confirmation or delineation sample results. Please add to the CAP, a map or maps depicting all current and previous surface and subsurface soil analytical results, for delineation and confirmation samples. It is unnecessary to plot analytical results for

soils that were subsequently excavated. The goal is to have a map showing the current nature and extent of the remaining soil contamination, uncomplicated by the results of previous soil sampling conducted in soils now removed. Please revise the CAP accordingly.

3. **Missing dates**—*Section 2.7.1.3 (Page 2-10):* The narrative discusses the results of RFI sampling, but does not state the date of the groundwater-sampling event. Please revise the CAP accordingly.

4. **Table shows wrong sampling date**--*Table 2-5 (Page 2-20):* Table 2-5 lists the 1999 groundwater analytical results as 1996. Please revise CAP accordingly.

5. **June 2002 groundwater analytical results not plotted**—*Table 2-5 (Page 2-20):* The June 2002 groundwater analytical results listed in Table 2-5 are not plotted. Please add a figure to the CAP depicting the June 2002 results.

6. **Add sampling dates**—*Table 2-7 (Page 2-26):* Table 2-7 (Summary of Site-Related Contaminants) lists the maximum concentrations in surface soil, subsurface soil, and groundwater of site-related contaminants. However, it does not list the sampling dates or phases. Please revise the CAP to include a column (or notations) indicating the sampling date and/or phase for each result listed (i.e. 2001/2002 IRA confirmation sample, 2001 new monitoring well boring, or RFI sample with date).

7. **Errors on table**—*Table 2-8 (Page 2-27):*
   - Table 2-8 lists the maximum concentration in surface or subsurface soil as 240 μg/L for benzene. However, 210E μg/kg appears to be the highest benzene detection in soil, as listed in Table 2-6.
   - Table 2-8 lists the maximum concentration in surface or subsurface soil for carbon disulfide as 13 μg/kg. However, Figure 2-8 lists a concentration of 20 μg/kg for carbon disulfide in sample FTS-SWMU13-S-2-08.
   - Table 2-8 lists the maximum concentration in surface or subsurface soil as 980 μg/kg for toluene. However, Table 2-7 lists the concentration of toluene as 1,800 μg /kg (for subsurface soil).
   - The following constituents detected in post-RFI sampling (and not detected in the RFI) are listed in Table 2-7 (Summary of Site-Related Contaminants), but not in Table 2-8 (GSSL Screening of Site-Related Contaminants in Soil): bromomethane, chloroform, dibenzo (A,H) anthracene, diphenylamine, bis(2-ethylhexyl)phthalate, butyl benzyl phthalate, di-N-octylphthalate, dibenzofuran, and diphenylamine.

   Please correct, or provide clarification for these errors.

8. **Elimination of chromium as a contaminant migration constituent of concern (CMCOC) requires additional information**—*Section 2.9.3 (Page 2-28), Section 3.3 (Pages 3-1 and 3-3), Table 2-9 (Page 2-29), and Table 3-2 (Page 3-2):* Leachate modeling results based on the maximum subsurface soil concentration of chromium (40.4 mg/kg) in Table 2-9 indicate that the maximum groundwater concentration beneath the source is predicted to be 2.13 mg/L after 67 years, which exceeds the groundwater target concentration of 0.1 mg/L (the MCL) by an order of

magnitude. However, the CAP recommends no further investigation/remedial action for chromium in subsurface soils based on the following stated rationale.

- Table 3-2 states that no further investigation or remedial action is required for chromium, "due to its ubiquitous nature at this site and the fact that chromium is not expected to migrate to the nearest surface water."

- The third bullet of Section 2.9.3 states that chromium is predicted through fate and transport modeling to take over 15,000 years to migrate to the nearest potential surface water receptor, located 2,500 feet down-gradient.

However, these findings evoke the following comments:

A. The assertion that chromium is "ubiquitous" in soils at the site suggests that there is an elevated background concentration of chromium in subsurface soils in the site area. An expanded background soil investigation, or a report of pertinent existing soil analytical results from nearby areas, is necessary to justify this assertion. This is necessary to rule out the possibility that the existence of elevated concentration of chromium in subsurface soils throughout SWMU 13 is the result of chromium contamination throughout SWMU 13 from fire training activities. Please respond.

B. Even if the chromium concentrations in subsurface soil do not threaten the surface water receptor (i.e. 15,000 years predicted migration time to surface water), and do not pose an excessive risk to human health through direct exposure, the concentration predicted for chromium in groundwater beneath the source significantly exceeds (by an order of magnitude) the target concentration for chromium in groundwater. Therefore, unless an expanded background study shows that the existing subsurface soil concentrations of chromium do not exceed local background levels, or the facility shows that the predicted chromium concentration in groundwater (2.13 mg/L after 67 years) would not pose an excessive risk to human health, the CAP should retain chromium as a CMCOC, and consider appropriate corrective action to address it. Note that groundwater use controls (and possibly groundwater monitoring) would have to remain in effect throughout the period for which modeling predicts the groundwater concentration of chromium to remain above the target concentration of 0.1 mg/L. Please respond.

9. **Table ES-3** indicates that 2-methylnaphthalene was not sampled and analyzed for, in either the December 2000 or June 2002 groundwater sampling events. Although the maximum concentration in the RFI sampling event was below the Remedial Level for 2-methylnaphthalene, it is possible that the concentration in groundwater could be increasing, similarly to Napthalene groundwater concentrations, as indicated in Table ES-3. Additional sampling and analysis of groundwater to determine the trend of 2-methylnaphthalene concentration at SWMU 13 is needed to validate the recommendation for "No Further investigation/remedial action" for 2-methylnaphthalene contamination of groundwater. Please respond.

10. **Table F-1, Soil Remediation (page F-4)** lists naphthalene as a Compound of Concern (COC) in soil at SWMU 13, whereas other parts of the CAP report list naphthalene as a COC in groundwater only. Please clarify.

11. **Monitoring well** sampling dates as reported in the CAP report indicate that, the old and new wells were not sampled in the same sampling events, i.e. they were sampled in different years respectively. Please complete a comprehensive sampling of all the SWMU-13 wells, in one sampling event, and submit groundwater sample analysis data for VOCs, SVOCs and metals in the revised CAP report.

The revisions for the SWMU 13 CAP, appropriately addressing the comments above, must be submitted within ninety (90) days of receipt of this correspondence in the form of revised/new pages or a totally revised plan. Should Fort Stewart decide to submit revised or new pages, please number with appropriate page numbers and the date revised, e.g., Page 6 (Revised 04/23/2004). GA EPD requests two (2) copies of the revised/new pages or totally revised plan be submitted to our agency and also requests that a Response To Comments (RTC) Summary be provided in the submittal. This RTC Summary should include all of GA EPD's original comments with your responses appended sequentially to each respective comment. Feel free to contact Larry Papetti or Albert Wilson of my staff at 404-463-0080 if you have questions regarding this letter.

Sincerely,

Brent Rabon, Coordinator
DoD Remediation Unit
Hazardous Waste Management Branch

c: Narindar M. Kumar, EPA Region IV
Tressa Rutland, Fort Stewart and Hunter Army Airfield
LeAnn Taylor, Fort Stewart and Hunter Army Airfield

File: Fort Stewart(G)
R:\ALBERTW\DSMOA\FORT STEWART\SWMU –13 CAP Comments Letter

DEPARTMENT OF THE ARMY
HEADQU. .TE 3D INFANTRY DIVISION (MECHANIZED) A. . F. STEWART
DIRECTORATE OF PUBLIC WORKS
1550 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4927

REPLY TO
ATTENTION OF

SEP 11 2002

Office of the Directorate

EXPRESS MAIL

Georgia Environmental Protection Division
Attention: Mr. Bruce Khaleghi
205 Butler Street, Southeast
Suite 1154
Atlanta, Georgia 30303

Dear Mr. Khaleghi:

Fort Stewart is pleased to submit two copies of the Final Corrective Action Plan for the Former Fire Training Area (FTA) at Wright Army Airfield (Solid Waste Management Unit 13) at Fort Stewart Military Reservation, Fort Stewart, Georgia, dated September 2002, for your review and approval.

In accordance with the Federal Code of Regulations, Section 270.11(d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact Ms. LeAnn Taylor or Ms. Tressa Rutland, Directorate of Public Works Environmental Branch, at (912)767-2010 should questions arise regarding the enclosed report.

Sincerely,

for Thomas C. Fry
Gregory V. Stanley
Colonel, U.S., Army
Director, Public Works

Enclosures

PCDR \ PCDR3 \
FORT STEWART \
032509 \ FST090035

FINAL

FORSCOM

CORRECTIVE ACTION PLAN

for the

3d Inf Div (Mech)

FORMER FIRE TRAINING AREA (FTA) AT WRIGHT ARMY AIRFIELD (SOLID WASTE MANAGEMENT UNIT 13) at FORT STEWART MILITARY RESERVATION FORT STEWART, GEORGIA

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0049

September 2002

01-014(doc)/090302

EXECUTIVE SUMMARY

This report presents the Corrective Action Plan (CAP) for remediation of the former Fire Training Area (FTA) at Wright Army Airfield (WAAF), solid waste management unit (SWMU) 13, at Fort Stewart, Georgia. This CAP Report has been prepared by Science Applications International Corporation for the U.S. Army Corps of Engineers, Savannah District under Contract DACA21-95-D-0022, Delivery Order No. 0049.

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Contaminant Nature and Extent

Contamination is present in both soil and groundwater at SWMU 13. Site-related constituents (SRCs) were identified by comparing inorganic chemical concentrations to reference background concentrations. All organic chemicals that were detected were considered site-related.

SRCs for surface soil are benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, benzo(*a*)pyrene, chrysene, fluoranthene, pyrene, and barium. These chemicals were identified in only one of three surface soil samples taken during the Phase II RFI sampling. The location of this sample was adjacent to an area of weathered and corroded asphalt pavement. SRCs for subsurface soil identified as part of this RFI sampling include those listed above for surface soils plus anthracene, benzo(*g,h,i*)perylene, indeno(*1,2,3-cd*)pyrene, phenanthrene, chromium, and lead. Additional subsurface soil SRCs were identified from samples taken as part of the IM confirmatory sampling. These are acenaphthene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, arsenic, and mercury. SRCs for groundwater are benzene, toluene, ethylbenzene, and total xylenes (BTEX), fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene.

The areal extent of groundwater contamination determined during the RFI was limited to approximately 1 acre, and there was evidence that contaminant biodegradation is taking place in groundwater at the site.

Contaminant Fate and Transport

SRCs identified in surface and subsurface soil were compared to their respective U.S. Environmental Protection Agency (EPA) generic soil screening levels (GSSLs) to assess their potential migration pathways and transport mechanisms (i.e., the leachability of contaminants from soil to groundwater). Based on the soil screening analysis, benzene, 4-methyl-2-pentanone, benzo(*a*)anthracene, benzo(*b*)fluoranthene, dibenzo(*a,h*)anthracene, 2-methylnaphthalene, arsenic, and chromium exceeded their respective EPA GSSLs and were indicated as contaminant migration constituents of potential concern (CMCOPCs) in soil.

Fate and transport modeling was performed to quantitatively assess the risks associated with exposure to the CMCOPCs in soil. Only groundwater modeling was performed, as surface water is not present at this site and the nearest surface water receptor is located 2,500 feet from the site.

The Seasonal Soil Compartment (SESOIL) Model was used to predict the maximum groundwater concentration of the CMCOPCs based on contaminant migration from the site soil.

The following summarizes the conclusions from the SESOIL modeling:

- The five preliminary organic CMCOPCs identified in the revised final RFI [4-methyl-2-pentanone, benzo(*a*)anthracene, benzo(*b*)fluoranthene, dibenzo(*a,h*)anthracene, and 2-methylnaphthalene] either naturally attenuate before reaching the water table or the predicted groundwater concentrations do not exceed their respective risk-based concentrations (RBCs). However, benzene, an additional preliminary CMCOPC identified based on supplemental data, is predicted to reach the water table with concentrations exceeding its maximum contaminant level (MCL)/RBC. Therefore, benzene is identified as a CMCOC.

- Arsenic and chromium were identified as CMCOCs as their maximum predicted concentrations at the surface of the groundwater table of 0.21 mg/L and 2.13 mg/L, respectively, exceeded their respective groundwater target concentrations (0.05 mg/L and 0.1 mg/L). These maximum groundwater concentrations of arsenic and chromium are predicted to be reached after 135 years and 67 years,

respectively. Based on the groundwater velocity of 14 feet/year, arsenic and chromium will take over 15,000 years to migrate to the nearest potential surface water receptor (Peacock Creek).

SUPPLEMENTAL SOIL AND GROUNDWATER CHARACTERIZATION

December 2000

Based on the results of the revised final RFI report, supplemental characterization of the groundwater at the former FTA (SWMU 13) was performed in December 2000 in support of this CAP. The scope of work included sampling of the eight existing on-site monitoring wells (MW3, MW4, MW8, MW9, MW10, MW11, MW12, and MW13) and analyzing the samples for BTEX and PAHs.

The results of the supplemental groundwater investigation were as follows:

1. Benzene (9.5 μg/L in MW11 and 418 μg/L in MW12) and ethylbenzene (952 μg/L in MW12) were the only BTEX compounds that continued to exceed their respective MCLs of 5 μg/L and 700 μg/L, respectively, in the shallow aquifer near the source. The presence of benzene and the other BTEX compounds is consistent with the results of the November 1998 sampling event. The December 2000 sampling event indicated that the dissolved benzene groundwater plume covers an area of approximately 10,992 square feet, which is smaller than the 30,225-square-foot area observed in November 1998.

2. Naphthalene continued to be detected in MW11, MW12, and MW13. The naphthalene concentration of 304J μg/L in MW12 exceeded the remedial level of 149 μg/L. Other PAHs, including fluorene and phenanthrene, were also reported during the December 2000 sampling event.

April 2001

Six groundwater monitoring wells (MW14 through MW19) were installed at the former FTA in April 2001. During well installation activities, subsurface soil samples were collected from each of the six well locations and were analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). None of the VOCs or SVOCs detected exceeded EPA's Region III Industrial or Residential risk-based criteria.

June 2002

In June 2002, SAIC sampled five groundwater monitoring wells (MW13, MW15, MW16, MW18, and MW19) to determine the current concentrations of benzene. The groundwater samples were analyzed for BTEX parameters. Benzene concentrations ranged from 3.6 μg/L at MW13 (compared to 120 μg/L detected during the RFI) to 120 μg/L at MW16, a new groundwater monitoring well.

INTERIM ACTIONS

In 1997, CAPE Environmental performed interim measures (IMs) at the former FTA (SWMU 13). The intent of the IM was to remove and properly dispose of the fire training facilities, which included the aboveground storage tank (AST), the mock aircraft with associated foundations and piping, the concrete fire training pad and cover soils, the concrete oil/water separator sump and appurtenances, and soil and sediments which exceeded the Preliminary Cleanup Targets (PCTs). Approximately 2,450 tons of contaminated soil was excavated. After removing the fire training facilities and contaminated soil [to

approximately 4 feet below ground surface (bgs)] and completing the confirmatory sampling, the excavated area was backfilled with clean soil and seeded.

In December 2001/February 2002, Earth Tech, Inc., conducted an interim removal action (IRA) at SWMU 13. The purpose of the IRA was to remove an 8-inch concrete pad, which covered a 20 feet by 8 feet area. The IRA also included the removal of approximately 337 tons of soil and the removal of monitoring well MW12.

HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment performed during the Phase II RFI included a human health preliminary risk evaluation (HHPRE) and a baseline human health risk assessment (BHHRA).

The HHPRE in the revised final Phase II RFI Report (SAIC 2000) identified human health constituents of potential concern (HHCOPCs) as those constituents present at concentrations higher than their reference background criteria and higher than their respective risk-based or applicable or relevant and appropriate requirement-based screening criteria. New data have become available as a result of supplemental investigations since the RFI; therefore, the selection of HHCOPCs was conducted for this CAP using the same method and screening criteria presented in the RFI. Based on this screening, the following HHCOPCs were identified for SWMU 13:

Surface Soil COPCs	Subsurface Soil COPCs	Soil CMCOPCs	Groundwater COPCs
Benzo(*a*)pyrene	Arsenic Benzo(*a*)anthracene Benzo(*a*)pyrene Benzo(*b*)fluoranthene Benzo(*g,h,i*)perylene Dibenzo(*a,h*)anthracene Phenanthrene	Arsenic Chromium Benzene	Benzene Ethylbenzene Toluene Xylenes, total 2-Methylnaphthalene Naphthalene Phenanthrene

COPC = Constituent of potential concern.

A BHHRA was performed to assess the HHCOPCs in soil and groundwater and CMCOPCs in soil in the revised final Phase II RFI Report (SAIC 2000). Benzo(*a*)pyrene was identified as a COC in surface soil with a remedial level of 0.98 mg/kg. Arsenic, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, and dibenzo(*a,h*)anthracene were identified in the revised final RFI Report as constituents of potential concern in subsurface soil; however, SESOIL modeling results indicate that most of the constituents [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and dibenzo(*a,h*)anthracene] will naturally attenuate before reaching the water table. Toxicity data were not available for benzo(*g,h,i*)perylene; therefore, it was not included in the BHHRA.

Of the HHCOPCs in groundwater, benzene, ethylbenzene, 2-methylnaphthalene, and naphthalene in groundwater were identified as human health constituents of concern. The MCLs for benzene and ethylbenzene of 0.005 mg/L and 0.7 mg/L, respectively, were recommended as the remedial levels for these constituents. MCLs were not available for 2-methylnaphthalene or naphthalene; therefore, remedial levels for these constituents were recommended based on risk-based criteria (142 µg/L and 149 µg/L, respectively). (Refer to Section 7.0, of the revised final Phase II RFI report.)

Arsenic and chromium were identified as CMCOCs in the revised final RFI Report, and remedial levels for soil for protection of groundwater were developed. Based upon a review of supplemental data, benzene was added as a CMCOC, and remedial levels for soil for protection of groundwater are developed in this CAP. The remedial levels for CMCOCs were developed based on the soil concentration

that was unlikely to leach into groundwater or migrate to surface water in concentrations that would present a significant threat to human health. Because there are no surface water bodies at SWMU 13, the remedial levels in soil were based on target groundwater concentrations. These target groundwater concentrations were based on MCLs or RBCs if no MCL was available. These target groundwater concentrations are the concentrations of a CMCOC in groundwater, as a result of leaching from soil, that would present a defined risk (carcinogenic and/or noncarcinogenic) to the most sensitive receptor (e.g., on-site resident or resident child). For the two metals, the preliminary remedial levels calculated were below the reference background concentrations (8.04 mg/kg for arsenic and 40.4 mg/kg for chromium); therefore, the reference background concentration for each constituent was recommended as the remedial level. The remedial level for benzene in soil (0.014 mg/kg) was back-calculated based on the groundwater MCL for benzene.

ECOLOGICAL RISK ASSESSMENT

An ecological preliminary risk evaluation was conducted during the Phase II RFI. Barium was detected above reference background criteria in surface soil at SWMU 13 but was below the ecological screening values (ESVs) and was, therefore, not retained as an ecological constituent of potential concern (ECOPC) in surface soil. Benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, fluoranthene, and pyrene were detected in surface soil above reference background criteria. However, there is uncertainty as to whether these six polynuclear aromatic hydrocarbons (PAHs) are ECOPCs in surface soil, because toxicity data specific to these constituents were not available. These six PAHs were detected in only one surface soil sample that was adjacent to weathered and eroded asphalt. It is likely that this lone sample incorporated some of the asphalt, which resulted in the reported concentrations. All PAHs detected were at low concentrations and are unlikely to pose a risk to ecological receptors given the low concentrations relative to their proposed toxicity reference values (TRVs), which are one-tenth the TRV for benzo(*a*)pyrene. Therefore, no organic ECOPCs were identified in surface soil.

Based on preliminary risk calculations, ethylbenzene, total xylenes, and naphthalene were identified as ECOPCs in groundwater. The risk to ecological receptors from ECOPCs in groundwater at SWMU 13 are overestimated by the ESV comparison and preliminary risk calculations. The nearest surface water to SWMU 13 is Peacock Creek, which is 2,500 feet away. If dilution and degradation, before or after discharge, reduces the concentration of ECOPCs by a factor of 10, none of the maximum concentrations would exceed the ESVs for surface water. Supplemental risk calculations performed to evaluate ecological receptors exposed to ethylbenzene, total xylenes, and naphthalene in groundwater showed that these constituents are unlikely to pose a risk to wildlife receptors. The revised final Phase II RFI Report (SAIC 2000) concluded that there was no present ecological risk at SWMU 13 and that the site was unlikely to pose an ecological risk in the future.

SUPPLEMENTAL MODELING FOR EVALUATING NATURAL ATTENUATION MODELING

Fate and transport modeling was performed for the identified COCs to predict their concentration with distance from the source and also the time to achieve the remedial levels.

Benzene was selected as the surrogate chemical from the COCs benzene and ethylbenzene in groundwater because benzene has a slower degradation rate and higher mobility than ethylbenzene. The results of this modeling indicate that the benzene concentration in groundwater does not exceed its remedial level of 5 μg/L beyond 100 feet from the source. Therefore, benzene from the SWMU 13 site is not expected to be of potential concern at the nearest receptor location [i.e., Peacock Creek (2,500 feet from the source)]. In

addition, the modeling shows that benzene concentrations at the source will be reduced to less than its remedial level by natural attenuation processes within 5 years from the time of sampling (June 2002).

The modeling shows that the time frame for natural attenuation of benzene to the MCL decreases from approximately 5 years to less than 3 years if the benzene source in the groundwater is reduced to 50 µg/L.

The other groundwater COC, ethylbenzene, could be remediated by natural attenuation alone. The benzene (considered as the surrogate chemical for ethylbenzene) concentration is expected to be reduced to half of its original concentration in 2 years. If ethylbenzene were reduced to half of its maximum detected concentration of 952 µg/L, it would be below its remedial level of 700 µg/L within 2 years (from June 2002). Therefore, monitoring alone is recommended for ethylbenzene.

Modeling results for naphthalene (considered as the surrogate chemical for 2-methylnaphthalene) indicate that the concentration in groundwater is not expected to exceed its remedial level (149 µg/L) beyond 55 feet of the source. Additionally, the source will be reduced to its remedial level within 3 years from December 2000 (or 1.5 years from June 2002).

JUSTIFICATION AND PURPOSE OF CORRECTIVE ACTION

The purpose of corrective action is to (1) protect human health and the environment, (2) attain remedial levels, (3) control the source of the releases, (4) comply with any applicable waste management standards, and (5) address other factors.

COCs were identified in the revised final RFI Report for surface soil, subsurface soil, and groundwater (SAIC 2000). New data have become available as a result of supplemental investigations performed after the RFI. One new CMCOC in soil (benzene) was identified as a result of the supplemental investigations. The remedial levels presented in the RFI remain applicable; however, an additional remedial level has been derived in this CAP for the new CMCOC, benzene. The COCs and their respective remedial levels are discussed in the following paragraphs and are shown in Tables ES-1 through ES-3.

Surface Soil

Benzo(*a*)pyrene was identified as a COC for surface soil based on direct exposure. Benzo(*a*)pyrene was detected in only one sample at a concentration of 390 µg/kg. This sample was collected from an area adjacent to weathered and eroded asphalt pavement. It is reasonable to expect that some asphalt fragments eroded from the weathered pavement could have been incorporated into the sample during the collection and, thus, biased the sample results. Based on the low frequency of detection of benzo(*a*)pyrene in surface soil, the likely biased nature of the one detectable result, and the fact that the maximum detected concentration of benzo(*a*)pyrene in surface soil is less than the remedial level (Table ES-1), no remediation for surface soil is recommended.

Table ES-1. Remedial Levels for COCs in Surface Soil at the Former Fire Training Area (SWMU 13)

Analyte	Surface Soil Remedial Level (µg/kg)	Maximum Soil Concentration (µg/kg)	Recommendation
Benzo(*a*)pyrene	980	390	No further investigation/action is required as the maximum concentration is less than the remedial level.

Subsurface Soil

Arsenic and chromium were identified as CMCOCs based on the exposure of the future on-site groundskeeper, future off-site installation worker, future on-site resident child, and future on-site resident adult being exposed to leaching from soils to groundwater.

Arsenic was detected in 43 of 64 samples ranging from 1.1 mg/kg to 10.4 mg/kg with an average result of 2.46 mg/kg. The reference background concentration of 8.04 mg/kg exceeded the RBC of 3.8 mg/kg and indicates that arsenic naturally occurs at levels greater than its RBC throughout the FSMR. None of the RFI samples had arsenic concentrations that exceeded its remedial level. From the IM data, two samples from the same borehole exceeded the remedial level [location SA-21 at 2 feet bgs (10.4 mg/kg) and at 3 feet bgs (9 mg/kg)]. At this location, soils to a depth of 2 feet bgs were excavated during the IM. Due to the ubiquitousness of arsenic at the FSMR, and the fact that none of the RFI samples exceeded the reference background concentration, remediation of subsurface soil for arsenic is not recommended.

Table ES-2. Remedial Levels for CMCOCs in Subsurface Soil at the Former Fire Training Area (SWMU 13)

Analyte	Subsurface Soil Remedial Level (mg/kg)	Maximum Soil Concentration (mg/kg)	Recommendation
Arsenic	8.04	10.4	No further investigation/remedial action is recommended due to its ubiquitous nature at this site and the fact that none of the RFI samples had concentrations exceeding the remedial level (background concentration).
Chromium	11.6	40.4	No further investigation/remedial action is recommended due to its ubiquitous nature at this site and the fact that chromium is not expected to migrate to the nearest surface water.
Benzene	0.014	0.24	No further investigation/remedial action is recommended. Based on the modeling results, it can be concluded that the concentration of benzene in the subsurface soil will be reduced to its soil remedial level through natural attenuation before the groundwater concentration is reduced to its groundwater remedial level for benzene.

Chromium was detected in all 64 subsurface soil samples ranging from 2.7 mg/kg to 40.4 mg/kg with an average result of 13.3 mg/kg. Chromium exceeded its remedial level (reference background criteria) of 11.6 mg/kg in 31 of the 64 samples, all of which were from the IM data set. Based on the slow groundwater movement at the site (14 feet/year) and the high retardation factors, chromium and arsenic are not expected to migrate to the nearest surface water receptor, Peacock Creek, located 2,500 feet downgradient from the site. Due to the ubiquitousness of chromium at the FSMR and the fact that it is not expected to migrate to the nearest surface water receptor, remediation of subsurface soils for chromium is also not recommended.

Based on a review of data generated from supplemental investigations, benzene was also identified as a CMCOC as it is predicted to reach the water table with concentrations exceeding its respective MCL. The maximum predicted concentration of benzene based on leaching to groundwater will be reduced to its

MCL within 4 years from January 2002 (i.e., 3.5 years from June 2002). Therefore, it may be concluded that the soil concentration of benzene will be reduced to its soil remedial level before the groundwater concentration is reduced to its groundwater remedial level at the site. Based on this information, no remediation of subsurface soil for benzene is recommended.

Groundwater

Remedial levels were developed in the revised final RFI Report for four groundwater COCs. These remedial levels are based on MCLs and RBCs, which take into consideration both human health and technological limitations. No new COCs for groundwater were identified as a result of the supplemental investigations; therefore, the remedial levels derived in the revised final RFI remain applicable. These remedial levels shown in Table ES-3 are protective of direct exposure to residents by hazardous constituents in groundwater. However, it is recognized that groundwater is not used at this site as a source of drinking water and that it will take approximately 178 years for groundwater to reach the nearest receptor at Peacock Creek, which is 2,500 feet from SWMU 13. These constituents will naturally attenuate in groundwater through retardation and biodegradation before reaching Peacock Creek. As the maximum detected concentration of 2-methylnaphthalene in the RFI samples was below the recommended remedial level; no further investigation or study is required to address this constituent in groundwater.

Table ES-3. Remedial Levels for COCs in Groundwater at the Former Fire Training Area (SWMU 13)

Analyte	Groundwater Remedial Level (µg/L)	Maximum Concentration in RFI Sampling (µg/L)	Maximum Concentration in December 2000 Sampling (µg/L)	Maximum Concentration in June 2002 Sampling (µg/L)	Recommendation
Benzene	5	440	418	120	Corrective measures are recommended
Ethylbenzene	700	940	952	486	Corrective measures are recommended
2-Methylnaphthalene	142	72	NA	NA	No further investigation/remedial action is recommended as the maximum detected concentration is below the remedial level
Naphthalene	149	140	304 J	NA	Corrective measures are recommended

J = Indicates compound was positively identified; the numerical value is the approximate concentration of the compound in the sample.
COC = Constituent of concern.
NA = Not analyzed.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
SWMU = Solid waste management unit.

The remedial response objectives for SWMU 13 are to reduce the present concentrations of the site COCs (benzene, ethylbenzene, and naphthalene) in groundwater to the remedial levels presented in this CAP. The corrective action is to provide the technology necessary to minimize levels of contamination and to achieve the best overall results with respect to such factors as effectiveness, implementability, and cost.

SCREENING OF CORRECTIVE ACTION ALTERNATIVES

Several technologies for remediating petroleum-related contamination in groundwater were identified and screened. Technologies applicable to general response actions (no action, institutional controls, monitored natural attenuation, and active source remediation) were identified and evaluated with respect to their suitability in meeting the remedial response objectives. Technologies were screened using three evaluation criteria: effectiveness, implementability, and cost.

The "no action" alternative was not considered to be viable due to the need to ensure that the remedial levels for the site are being met. Institutional controls were not considered further as the sole remedial alternative because they are appropriate for this site only when combined with other technologies such as monitored natural attenuation.

Each of the following alternatives for petroleum-contaminated groundwater was considered to be applicable to the site, cost-effective, and implementable; therefore, two primary evaluation factors were used in the selection of the preferred corrective action alternative: time to implement and life-cycle cost. The time required to implement the action was an important evaluation factor for this site; the alternative would remediate the COCs to below the remedial levels in a reasonable time compared to the other alternatives. Life-cycle cost estimates are budget estimates based on conceptual design and are not adjusted to present worth costs or for escalation.

The following five corrective action alternatives were evaluated for the groundwater contamination at SWMU 13:

- Alternative 1: monitored natural attenuation,
- Alternative 2: air sparging,
- Alternative 3: oxygen injection,
- Alternative 4: air sparging and monitored natural attenuation, and
- Alternative 5: oxygen injection and monitored natural attenuation.

CONCEPTUAL DESIGN AND IMPLEMENTATION PLAN

Justification of Selection

Monitored natural attenuation, has been selected as the most appropriate corrective action for the groundwater COCs at SWMU 13 based on its reasonable time frame to achieve remedial levels (less than 7 years) and cost effectiveness. Historical groundwater results at the site show that concentrations of benzene in groundwater are decreasing. The site will be monitored during the 6-year natural attenuation period to ensure that concentrations of benzene and other COCs in the groundwater meet the remedial levels.

Conceptual Design

Baseline groundwater sampling would be conducted at the start of the remediation period and would consist of sampling seven monitoring wells (MW3, MW9, MW10, MW15, MW16, MW17, MW18, and MW19). The groundwater monitoring wells will be sampled and analyzed for VOCs, SVOCs, and natural attenuation parameters (nitrate/nitrite, sulfate/sulfide, total iron, total phosphorous, carbon dioxide, and methane).

Performance monitoring will be performed annually during the natural attenuation period. Performance monitoring will involve sampling of seven existing groundwater monitoring wells (MW3, MW9, MW10, MW15, MW16, MW18, and MW19). The groundwater samples will be analyzed for VOCs, SVOCs, and natural attenuation parameters.

One year following the completion of the monitored natural attenuation period, confirmatory groundwater sampling will be conducted to verify that the remedial levels for benzene and other COCs have been met and maintained. The confirmatory groundwater sampling will be the same as the baseline groundwater sampling, and the same seven existing monitoring wells will be sampled.

The life-cycle cost to implement monitored natural attenuation is approximately $244,000. The alternative will take approximately 7 years to complete from the baseline sampling through the confirmatory sampling.

Implementation Plan

Upon approval of this CAP by GEPD, the Installation will request funding, procure a contractor to implement the corrective action, and implement the specified action. A Corrective Action Work Plan will be prepared to guide implementation of the corrective action but will not require GEPD review or approval. Any revisions required to the Operation and Maintenance Plan or the implementation schedule that become apparent during preparation of the Work Plan will be submitted to GEPD for concurrence. Substantive changes in the remediation approach or schedule will require that the public be provided with an opportunity for review and comment in accordance with the Fort Stewart Hazardous Waste Facility Permit. No other submittals will need to be provided to GEPD prior to implementation of the selected corrective action.

During the corrective action, Corrective Action Plan Progress Reports will be prepared and submitted to GEPD for review and approval. Upon completion of the corrective action, a Corrective Action Completion Report will be prepared and submitted to GEPD for review and approval.

Georgia Departr ' of Natural Resources
205 Butler Street, S.E., Suite 1162, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Environmental Protection Division
Harold F. Reheis, Director
404/656-2833

April 4, 2001

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Gregory V. Stanley, Colonel, U.S. Army
Director, Public Works
Headquarters, 3D Infantry Division (Mechanized) and Fort Stewart
Directorate of Public Works, Building 1137
Environmental Branch (ATTN: Melanie Little)
1550 Frank Cochran Drive
Fort Stewart, GA 31314-4927

RE: Phase II RCRA Facility Investigation (RFI) Report for the Fire Training Area at Wright Army Airfield [Solid Waste Management Unit (SWMU) 13] dated May 2000; Fort Stewart; EPA ID No. GA9 210 020 872.

Dear Colonel Stanley:

The Hazardous Waste Management Branch of the Georgia Environmental Protection Division (GA EPD) has reviewed the above-referenced document and determined that:

1. Fort Stewart has sufficiently responded to our comments on the September 1999 version of this report which were forwarded in correspondence (Khaleghi to Stanley) dated February 4, 2000;

2. The Phase II RFI Report for SWMU 13 dated May 2000 is complete; and

3. Corrective action is required at SWMU 13 pursuant to 40 CFR §264.101(a), as referenced by the Rules of Georgia Department of Natural Resources Environmental Protection Division Chapter 391-3-11 Section .10.

In accordance with Conditions IV.E.1 and IV.E.2 in your Hazardous Waste Facility Permit #HW-045(S&T), Fort Stewart must submit a Corrective Action Plan for SWMU 13 to GA EPD within one hundred and eighty (180) days from receipt of this correspondence. Should you have any questions concerning this correspondence, please contact Brent Rahon of my staff at (404)656-2833.

Sincerely,

Bruce Khaleghi

Bruce Khaleghi, Unit Coordinator
Hazardous Waste Management Branch

c: Mr. Larry Rogers, GA EPD-Southeast Regional Office
File: Fort Stewart(R)
R:\BRENTR\STEWART\SWMU13\PHASEIIRFIREPORTAPPROVAL

DEPARTMENT OF THE ARMY
HEADQUARTERS, 3D INFANTRY DIVISION (MECHANIZED) AND FORT STEWART
DIRECTORATE OF PUBLIC WORKS
1550 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4927

REPLY TO
ATTENTION OF

May 30,2000

Office of the Directorate

EXPRESS MAIL

Georgia Environmental Protection Division
Attention: Mr. Bruce Khaleghi
205 Butler Street, Southeast
Suite 1154
Atlanta, Georgia 30334

Dear Mr. Khaleghi:

Fort Stewart is pleased to receive the Georgia Environmental Protection Division's (GA EPD) correspondence dated February 4, 2000, in reference to the RCRA Facility Investigation (RFI) Report for the Fire Training Area at Wright Army Airfield (Solid Waste Management Unit (SWMU) 13), dated September 1999; Fort Stewart; EPA ID No. GA9 210 020 872.

In response to the comments received from GA EPD, Fort Stewart has enclosed four copies of the Revised Final RCRA Facility Investigation Report for the Fire Training Area at Wright Army Airfield (SWMU 13), Fort Stewart, Georgia, dated May 2000. Fort Stewart agrees to comply with the comments listed in the correspondence referenced above and a formal response to comments table is provided as an enclosure (i.e., within the front of each Revised Final Report).

In accordance with the Federal Code of Regulations, Section 270.11(d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact Ms. Melanie Little or Ms. Tressa Rutland, Directorate of Public Works Environmental Branch, at (405) 364-8461 or (912) 767-7919, respectively, should questions arise regarding the response to comments and/or the Revised Final RFI Report.

Sincerely,

for Thomas C. Fry
Gregory V. Stanley
Colonel, U.S., Army
Director, Public Works

Enclosures

REVISED FINAL

FORSCOM

3d Inf Div (Mech)

RCRA FACILITY INVESTIGATION REPORT

FOR THE

FIRE TRAINING AREA AT WRIGHT ARMY AIRFIELD (SWMU 13) FORT STEWART, GEORGIA

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0049

May 2000

EXECUTIVE SUMMARY

This report summarizes the results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for the Fire Training Area at Wright Army Airfield (WAAF), Solid Waste Management Unit (SWMU) 13, at Fort Stewart, Georgia. This report has been prepared by Science Applications International Corporation (SAIC) and Earth Tech, Inc. (formerly Rust Environment & Infrastructure) for the U.S. Army Corps of Engineers (USACE), Savannah District, under Contract DACA21-95-D-0022, Delivery Order No. 0049. The RFI sampling was conducted in accordance with USACE guidance EM200-1-3 and the Georgia Environmental Protection Division (GA EPD) approved RFI Work Plan.

The Fire Training Area was located on the western edge of the WAAF runway system, which is in the southern portion of the Fort Stewart Military Reservation (FSMR). The Fire Training Area consisted of a 5,000-square-foot concrete pad with an integral berm that was used by fire-fighting personnel for training. An oil/water separator sump, underground piping, and an above ground fuel (JP-4) storage tank adjoined the main concrete pad and combined to make up the entire Fire Training Area. All of these structures and appurtenances were removed during the Interim Measures (IM) conducted in 1997 by CAPE Environmental. Also as part of the IM, the top four feet of contaminated soil was excavated, removed, and replaced with clean soil. The IM was summarized in the Final Interim Measures Report for SWMU 13, dated May 1998, submitted to GA EPD in August 1998.

The Fire Training Area was used as a training area for the airfield's firefighters from its construction, prior to 1982, until 1992. During training exercises, fuel [water contaminated jet fuel (JP-4), diesel fuel, or waste oil] was pumped onto the surface of a simulated aircraft and ignited. The fires were then extinguished with water and foam.

Prior to the IM, three field investigations had been conducted at SWMU 13. Based on the analytical results obtained from these studies and confirmatory sampling done as part of the IM, the GA EPD instructed the Fort Stewart Directorate of Public Works (DPW) to conduct an RFI at the site.

The objectives of the RFI for SWMU 13, as defined in the Work Plan (August 1998) and approved by GA EPD, are as follows:

- Determine the horizontal and vertical extent of contamination at SWMU 13.
- Determine whether contaminants present constitute a threat to human health or the environment.
- Determine the need for further actions and/or no further action, and gather necessary data to support development of a Corrective Action Plan (CAP), if warranted.

Summary of Investigation Activities

The information provided in this report is based upon data collected as part of the RFI field sampling and analysis. The scope of the RFI field work included the following activities:

- Collecting direct-push technology (DPT) soil samples using a push probe at a total of 12 locations. Direct-push soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and RCRA metals.

- Collecting direct-push groundwater screening samples using a push probe at a total of 23 locations, including 3 vertical profiles. Direct-push groundwater samples were analyzed for VOCs and SVOCs.

- Installing six permanent groundwater monitoring wells. One soil sample was collected from each well borehole and analyzed for VOCs, SVOCs, and RCRA metals.

- Collecting groundwater samples from the new and existing monitoring wells for a total of ten groundwater samples. Groundwater samples were analyzed for VOCs, SVOCs, and RCRA metals.

- Collecting surface soil samples at a total of three locations at the site for VOC, SVOC, and RCRA metals analyses.

Physical Characteristics of the Site

The FSMR occupies a low-lying, flat region on the coastal plain of Georgia. The Fire Training Area (SWMU 13) is situated in the southern portion of the FSMR and is approximately 45 feet above mean sea level (amsl).

The soils at SWMU 13 are essentially similar and generally a dark yellowish orange to light brown silty sand interbedded with sandy clay and clayey silty sand layers. A deep boring at the site showed silty clayey sand to 4-foot depth, followed by a sandy clay layer to 8 feet, underlain by silty clayey sand to 27 feet below ground surface (bgs). At this depth, a dense greenish gray silty sand was encountered and extended to the completion depth of 55 feet bgs.

Geotechnical analyses were conducted on various samples for grain size distribution, Atterberg limits, moisture content, specific gravity, porosity, and permeability. Results of the geotechnical analyses indicate that tested soils are non-plastic silty sands.

The uppermost hydrogeologic unit is the surficial aquifer that consists of widely varying amounts of sand, silt, and clay ranging from 55 to 150 feet in thickness. This aquifer is primarily utilized for domestic lawn and agricultural irrigation with wells typically yielding 2 to 180 gallons per minute. The top of the water table ranges from 2 to 10 feet below ground level. Groundwater flow within the water table at SWMU 13 is to the southeast, ultimately discharging to Peacock Creek. The hydraulic gradient within the water table is approximately 0.004 foot/foot at the site.

Contaminant Nature and Extent

Results of this investigation indicate that there is contamination present in both soil and groundwater at the site. Site-related contaminants (SRCs) were identified by comparing inorganic chemical concentrations to reference background concentrations. All organic chemicals that were detected were considered site-related.

SRCs for surface soil are benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, fluoranthene, pyrene, and barium. These chemicals were identified in only one of three surface soil samples taken for this investigation. The location of this sample was adjacent to a weathered and corroded asphalt pavement. SRCs for subsurface soil identified as part of this RFI sampling include those listed above for surface soils plus anthracene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, phenanthrene, chromium, and lead. Additional subsurface soil SRCs were identified from samples taken as part of the IM confirmatory sampling. These are acenaphthene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, arsenic, and mercury. SRCs for groundwater are benzene, toluene, ethylbenzene, xylenes, naphthalene, and 2-methylnaphthalene.

The areal extent of groundwater contamination is limited to approximately one acre, and there is evidence that contaminant biodegradation is taking place in groundwater at the site. The groundwater contaminant plume is not increasing in size nor moving from the source area.

Contaminant Fate and Transport

A soil leachability analysis was performed for surface and subsurface soil SRCs that exceeded U.S. Environmental Protection Agency (EPA) suggested generic soil screening levels (GSSLs). One volatile SRC, four semi-volatile SRCs, and two RCRA metals had concentrations that exceeded their respective GSSLs (Table 6.3) and were identified as preliminary contaminant migration chemicals of potential concern (CMCOPCs).

The SESOIL leachate model was used to estimate maximum groundwater concentrations of preliminary CMCOPCs beneath the source. SESOIL modeling results indicated that the predicted groundwater concentration of volatile and semi-volatile organic preliminary CMCOPCs did not exceed their respective groundwater target concentration. Therefore, there are no organic CMCOPCs for SWMU 13.

SESOIL predicted groundwater concentrations of inorganic preliminary CMCOPCs, arsenic and chromium, exceeded their respective groundwater target concentration (Table 6.4). SESOIL predicted maximum groundwater concentrations for arsenic and chromium are 0.21 mg/L [maximum contaminant level (MCL) 0.05 mg/L] and 2.13 mg/L (MCL 0.1 mg/L), respectively. Due to slow groundwater movement at the site (14 feet/year) and retardation of arsenic and chromium, arsenic and chromium would take more than 15,000 years to reach the nearest surface water receptor, Peacock Creek [Section 6.4.4]. Both inorganic CMCOPCs (arsenic and chromium) were evaluated in the baseline risk assessment for their potential to leach into the groundwater`.

The organics detected in the groundwater include both VOCs and SVOCs. However, groundwater movement off-site is very slow (14 feet/year) and may take 178 years to reach the nearest receptor location (i.e., Peacock Creek).

Human Health Preliminary Risk Evaluation

Human health contaminants of potential concern (COPCs) were identified in surface soils, subsurface soils, and groundwater. These COPCs are listed below.

Surface Soil COPCs	Subsurface Soil COPCs	Soil CMCOPCs	Groundwater COPCs
Benzo(a)pyrene	Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(g,h,i)perylene Dibenzo(a,h)anthracene	Arsenic Chromium	Benzene Ethylbenzene Toluene Xylenes, Total 2-Methylnaphthalene Naphthalene

Benzo(a)pyrene was detected above its risk-based concentration (RBC) in surface soils at one location. This one location was adjacent to weathered asphalt, so it is likely this lone sample incorporated some of the asphalt and resulted in the reported concentration.

Arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, and dibenzo(a,h)anthracene were reported at concentrations above their respective RBCs in subsurface soil.

Six human health COPCs for groundwater (benzene, ethylbenzene, toluene, xylenes, 2-methlynaphthalene, and naphthalene) were identified because they present a potential threat to human health as a result of using groundwater as a source of drinking water. It should be noted that given the shallow depth of the surficial aquifer and the presence of the deeper Principal Artesian aquifer, a common source of drinking water throughout the region, the use of the surficial aquifer is not considered to be a viable exposure scenario.

Because COPCs are identified in various media at SWMU 13, a HHBRA was conducted for the site and is presented in Appendix H.

Ecological Preliminary Risk Evaluation

At SWMU 13, the nearest perennial surface water body, Peacock Creek, is 2,500 feet downgradient of the site and there are no other features nearby to receive groundwater discharges. Specifically, the four drainage swales located around the perimeter of the site are approximately 5 to 6 feet above the surficial aquifer, and only retain water during heavy rain events. The ponded water then percolates down into the surficial aquifer, clearly indicating that none of the swales receive water from the surficial aquifer. Therefore, aquatic biota are not exposed by surface water. The "sediment" in the bottom of each swale is considered as surface soil in the Ecological Preliminary Risk Evaluation (EPRE). In addition, surface soil is also evaluated.

Barium was the only metal detected above reference background criteria in surface soil at SWMU 13, but the maximum detected concentration was below its Ecological Screening Value (ESV). Therefore, no metals are identified as ecological COPCs.

The EPRE provided a Phase 1 Preliminary Risk Evaluation for terrestrial receptors potentially exposed at the site. Preliminary risk calculations included a comparison of detected concentrations to Toxicity Reference Values (TRVs) for surrogate species representing ecological receptors for the seven polyaromatic hydrocarbons (PAHs) evaluated. Based on the comparison, none of the PAHs were identified as ecological COPCs.

There is uncertainty about whether benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, and pyrene are ecological COPCs in surface soil, because no TRVs could be derived for these substances. These six SVOCs were detected in only one surface soil sample, A-GP-9-0s, south of the former Fire Training Area. This sample was collected from an area adjacent to a weathered and eroded asphalt pavement. It is reasonable to expect that some of the asphalt fragments eroded from the weathered pavement that could have been incorporated into the sample during collection and biased the sample. All PAHs detected were at low concentrations, and are unlikely to pose a risk to ecological receptors given the low concentrations relative to their proposed TRVs, which are one-tenth the TRV for benzo(a)pyrene. There are, therefore, no organic ecological COPCs in surface soil.

The EPRA provided a Preliminary Risk Evaluation for aquatic and terrestrial receptors potentially exposed to groundwater at the site. Risk calculations for the four VOCs and one SVOC detected in groundwater indicated no exposures of terrestrial receptors exceed TRVs associated with adverse effect. Mean concentrations of VOCs and SVOCs do not exceed screening values for freshwater biota with the exception of xylenes. These VOCs and SVOCs are not expected to be present in groundwater migrating to Peacock Creek 2500 feet away. Based on these results neither the VOCs nor the SVOC were identified as ecological COPCs

There are no ecological COPCs in either soil, sediment, surface water, or groundwater at SWMU 13 site. Therefore, no remedial levels are required to be developed for ecological receptors, and additional ecological assessment is not warranted for this site.

Conclusions and Recommendations

Estimated hazards and risks were calculated for exposure of two current (on-site groundskeeper, off-site FSMR worker) and three hypothetical future (on-site groundskeeper, off-site FSMR worker, on-site resident) exposure scenarios.

Surface Soil

All of the estimated hazard quotient (HQ) and hazard index (HI) values for surface soil exposures are less than one. Estimated risks to the current and future workers are all below the *deminimis* level of 1×10^{-6}. Estimated risks to a hypothetical future resident exceed 1×10^{-6} due to ingestion of benzo(a)pyrene.

Benzo(a)pyrene is identified as a contaminant of concern (COC) for surface soil. Remedial levels derived for this site address the potential risk to a hypothetical future resident exposed to constituents in surface soil via ingestion, inhalation, and dermal contact. Given that benzo(a)pyrene is the only COC in surface soil, a remedial level of 0.98 mg/kg is recommended see (Table ES.1). This remedial level corresponds to a total residential cancer risk of 1×10^{-5}.

Table ES.1
Proposed Remediation Levels for Chemicals of Concern
SWMU 13, Fort Stewart, Georgia

Site-Related Contaminants (SRCs)	units	Maximum Detect	Federal MCL	RBC	Proposed RL[1]
Surface Soil					
Benzo(a)pyrene	mg/kg	390	NA	0.0875	0.98
Subsurface Soil					
Arsenic	mg/kg	10.4	NA	8.04	8.04
Chromium	mg/kg	40.4	NA	11.6	11.6
Groundwater					
Benzene	µg/l	440	5	—	5
Ethylbenzene	µg/l	940	700	—	700
2 - Methylnaphthalene	µg/l	72	—	142	142
Naphthalene	µg/l	140	—	149	149

[1]See HHBRA contained in Appendix H.
Notes:
µg/l = micrograms per liter
MCL = maximum contaminant level
RBC = USEPA Region III risk-based concentration
RL = remedial level

Subsurface Soil

Estimated hazards and risks were calculated for exposure to subsurface soil by a hypothetical future construction worker. All of the estimated HQ and HI values are less than one. Estimated risks to the future worker are all below the *deminimis* level of 1×10^{-6}. No COCs are identified for subsurface soil.

Estimated hazards and risks were calculated for exposure to groundwater containing CMCOPCs leached from overlying soil. Estimated hazards and risks exceed target levels for all receptors exposed to arsenic and chromium, therefore, these two metals are identified as CMCOCs. Soil remedial levels for CMCOCs are derived based on the concentration of constituents in soil that will not leach into groundwater at unacceptable levels. Acceptable (target) groundwater concentrations are used to back-calculate acceptable soil concentrations using the leachate model (SESOIL).

The hypothetical residential exposure scenarios provide the most conservative remedial levels. Target groundwater concentrations for a residential receptor include risk-based values and MCLs. Potential remedial levels corresponding to both MCLs and a range of risk levels for residential exposure were calculated. All of the calculated remedial levels are below the reference background concentrations for

these two metals. Therefore, the background concentrations for arsenic (8.04 mg/kg) and chromium (11.6 mg/kg) are recommended as their respective remedial levels (see Table ES.1).

Groundwater

Estimated hazards and risks were calculated for exposure to groundwater by three hypothetical future exposure scenarios (on-site groundskeeper, off-site FSMR worker, on-site resident). For the worker exposures, all of the estimated HI values are less than one. Total estimated cancer risk exceeds 1×10^{-6} due to ingestion of benzene. Estimated HIs for the hypothetical future residential scenario are 2.0 for the adult and 4.4 for the child receptor. Estimated HQ values for benzene are 1.7 (adult) and 3.7 (child). Three other COPCs (2-methylnaphthalene, ethylbenzene, and naphthalene) have HQ values greater than 0.1. Therefore, all four of these constituents are identified as COCs for groundwater.

Remedial levels for groundwater may include both risk-based concentrations and regulatory levels such as MCLs. Given that MCLs take into consideration both human health and the limitations of technology to remove constituents from water, these regulatory levels have been selected for remedial levels for groundwater when available. Benzene and ethylbenzene have MCLs of 0.005 mg/L and 0.7 mg/L, respectively. These MCL values are recommended as the remedial levels for these constituents.

MCL values are not available for naphthalene or 2-methylnaphthalene. The remedial levels for COCs in groundwater should not exceed a cumulative HI of 3.0 (GA EPD 1996). Given the number of potential COCs identified for groundwater, the recommended target groundwater concentration is based on HQs of 0.5 for each constituent. The recommended remedial levels for 2-methylnaphthalene and naphthalene are 0.142 mg/L and 0.149 mg/L, respectively (see Table ES.1).

To address the identified HHCOCs and CMCOCs, a CAP will be prepared for SWMU 13. It is anticipated that the CAP will be submitted to the GAEPD in the first quarter of fiscal year 2001 (October–December).

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Georgia Departmen' ,, Natural Resources
205 Butler Street, S.E., Suite 1162, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Environmental Protection Division
Harold F. Rehels, Director
404/656-2833

February 4, 2000

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Gregory Stanley, Colonel, U.S. Army
Director, Public Works
ATTN: AFZP-DEV (Melanie Little)
Department of the Army
Headquarters, 3D Infantry Division (Mechanized) and Fort Stewart
1557 Frank Cochran Drive
Fort Stewart, GA 31314-4928

RE: RCRA Facility Investigation (RFI) Report for the Fire Training Area at Wright Army Airfield [Solid Waste Management Unit (SWMU) 13] dated September 1999; Fort Stewart; EPA ID No. GA9 210 020 872.

Dear Colonel Stanley:

The Hazardous Waste Management Branch of the Georgia Environmental Protection Division (GA EPD) has reviewed the above-referenced document and generated the following comments.

GENERAL COMMENT

1. Fort Stewart may calculate Remedial Levels (RLs) in accordance with Section III.1.c (page 6), III.2.c (page 9) and III.3 (page 11) of the *GA EPD Guidance for Selecting Media Remediation Levels at RCRA Solid Waste Management Units Dated November 1996.* Please note the following.

   a. Fort Stewart is not required to default to Environmental Protection Agency (EPA) Region III Risk-Based Concentration (RBC) values when proposing RLs. Per your discretion and in accordance with the guidance referenced above, Fort Stewart may modify the proposed groundwater RLs for naphthalene and 2-methylnapthalene in the revised SWMU 13 RFI Report. In addition, Fort Stewart may also modify the text (and associated Tables) which are contained in the *Identification of Proposed Remedial Levels* Section on pages ES-5 & ES-6, Section 7.6 (page 7-11) and Section 9.6 (pages 9-5) in a manner which is consistent with the first sentence of this paragraph.

b. All *"groundwater is considered a potential source of drinking water"*[1] in the State of Georgia, and the evaluation of the groundwater at Fort Stewart must reflect this policy. Specifically, please note that GA EPD will not approve an RL for a hazardous constituent in groundwater which exceeds its respective Maximum Contaminant Level (MCL) listed in the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, as amended. In this SWMU 13 RFI Report, Fort Stewart has appropriately proposed MCLs as the RLs for applicable detected hazardous constituents in groundwater.

SPECIFIC COMMENTS

Site History and Contaminants (Section 2.0)

2. In Section 2.3 (page 2-6), Fort Stewart reports that Monitoring Well Nos. MW01 & MW03 were destroyed by heavy army equipment subsequent to the RFI field work completed in January 1999. Please note that GA EPD concurs with your recommendation to evaluate the need to replace these wells in the SWMU 13 Corrective Action Plan [Also see Section 9.5 (page 9-5)].

Human Health Preliminary Risk Evaluation (Section 7.0)

3. The argument proposed, in Section 7.2.3 (page 7-5), to human receptor exposure to groundwater (for both on- and off-site scenarios) overlooks the policy in Georgia that states that all groundwater is considered a potential drinking water source[1]. Therefore, the future resident (both adult and child receptor) and base worker ingestion of groundwater should be included in the revised human health risk assessment text.

4. Please revise the Human Health Preliminary Risk Evaluation, where applicable, to include values from the most recent version of the EPA Region III RBC Table[2] (Specifically see Sections 7.3.1 & 7.3.2 on pages 7-6 & 7-7, respectively).

5. The Industrial Soil RBC value for 4-methyl-2-pentanone is 16,350,000 μg/mg. Please revise the Table 7-1 accordingly.

---

[1] 1996. Georgia Environmental Protection Division Guidance for Selecting Media Remediation Levels at RCRA Solid Waste Management Units, www.georgianet.org/dnr

[2] http://www.epa.gov/reg3hwmd/risk/riskmenu.htm

6. Based upon our review of the Section 7.5 (pages 7-10 & 7-11), GA EPD (1) has determined that a Baseline Risk Assessment (BRA) is warranted for SWMU 13 and (2) requests that the assessment be contained in a stand-alone section within the revised SWMU 13 RFI Report. Please specifically note that the future residential scenario needs to be evaluated in the BRA. The future residential scenario gives GA EPD perspective on the possible risks involved with residents contacting contaminants in all applicable environmental media (e.g., groundwater, soils, sediments and surface water).

   In general, please note that once the preparer of the report has determined the chemicals of potential concern (COPCs) for each affected medium, a baseline risk assessment is performed with all applicable exposure pathways for current and future exposure scenarios. The resulting list of chemicals of concern (chemicals with carcinogenic risk exceeding 1×10^{-6} or a Hazard Quotient exceeding 0.1) of the baseline risk assessment will be utilized to determine the remedial levels for each affected medium. The application of the MCL of a hazardous constituent as the RL for groundwater is a decision made by the risk manager and should be recommended at the conclusion of the baseline risk assessment[1].

7. Information on the toxicity of the Constituents of Concern (COCs) needs to be gathered and summarized in a toxicity profiles subsection within the stand-alone BRA Section (See Comment No. 6 above). Information such as the weight of evidence for carcinogens, toxicity endpoints, how the numerical toxicity factors were developed, and a list of literature references (e.g., IRIS, HEAST, etc.) should be included in the Toxicity Profile for each chemical.

Ecological Preliminary Risk Evaluation (Section 8.0)

8. Groundwater data should be included in the ecological screening value comparison. Because there is potential that groundwater contamination may reach the downgradient creek, groundwater data should be directly compared to surface water screening values. For those groundwater contaminants that are not screened out in the initial screen a dilution factor of ten (10) may be used to estimate the dilution/attenuation that would be expected to occur between SWMU 13 and Peacock Creek appromiately twenty-five hundred (2500) feet downgradient. Please modify Section 8.0 accordingly.

9. Please provide the rationale for dividing the benzo(a)pyrene toxicity reference value (TRV) by ten (10) to derive TRVs for the other Polynuclear Aromatic Hydrocarbons (PAHs) detected at SWMU 13 (See the last sentence on page 8-6). It is possible that the TRVs for the other PAHs are less than one tenth the benzo(a)pyrene TRV.

10. Please provide the body weight of the test species that was used to derive the mammal No Observed Adverse Effect Level (NOAEL) in Table 8-2 (page 8-7). The dietary limit for the

shrew cannot be verified without this information.

11. Please modify the Earthworm Bioaccumulation Factor (BAF) reference, in Table 8.2 (page 8-7), to read as follows.

> Beyer, W.N. 1990. Evaluating Soil Contamination. U.S. Fish Wildl. Serv. Biol. Rep 90(2)

Fort Stewart should note that GA EPD obtained the reference listed above from the Loring Air Force Base Risk Assessment Methodology dated August 1994 which was, in turn, referenced in the Revised Final Phase II RCRA RFI Report for the Former 724th Tanker Purging Station (SWMU 26) dated November 1998, as amended.

The revisions for the above-referenced report, appropriately addressing the comments above, should be submitted within sixty (60) days of receipt of this correspondence in the form of revised/new pages or a totally revised report. Note that four (4) copies of the revised report are required to be submitted to GA EPD in accordance with Condition IV.G.2 of your Permit. Should Fort Stewart decide to submit revised or new pages, please number with appropriate page numbers and the date revised, e.g., Page 6 (Revised 3/10/2000). Should you have any questions concerning this correspondence, please contact Brent Rabon or Madeleine Kellam of my staff at (404)656-2833.

Sincerely,

Bruce Khaleghi, Unit Coordinator
Hazardous Waste Management Branch

c: Mr. Larry Rogers, GA EPD-Southeast Regional Office
File: Fort Stewart(R)
R:\BRENTR\STEWART\SWMU13\RFIRPT.COM

DEPARTMENT OF THE ARMY
HEAD ERS, 3D INFANTRY DIVISION (MECHANIZED) ORT STEWART
DIRECTORATE OF PUBLIC WORKS
1557 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4928

REPLY TO
ATTENTION OF

SEP 13 1999

Office of the Directorate

EXPRESS MAIL

Georgia Environmental Protection Division
Attention: Mr. Bruce Khaleghi
205 Butler Street, Southeast
Suite 1154
Atlanta, Georgia 30334

Dear Mr. Khaleghi:

Fort Stewart is pleased to submit four copies of the Final RCRA Facility Investigation Report for the Fire Training Area at Wright Army Airfield (SWMU 13), Fort Stewart, Georgia, dated September 1999.

In accordance with the Federal Code of Regulations, Section 270.11(d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact Ms. Melanie Little or Ms. Tressa Rutland, Directorate of Public Works Environmental Branch, at (405) 364-8461 or (912) 767-2010, respectively, should questions arise regarding the enclosed documents.

Sincerely,

for Thomas C. Fry 09/13/99
Ovidio E. Perez
Colonel, U.S. Army
Director, Public Works

Enclosures

DECISION DOCUMENT FOR INTERIM REMEDIAL ACTION AT SWMU FST 13, THE FIRE TRAINING AREA, FORT STEWART, GA

AUGUST 1996

DECISION DOCUMENT FOR INTERIM REMEDIAL ACTION AT THE FIRE TRAINING AREA WRIGHT ARMY AIRFIELD, GEORGIA

PURPOSE OF INTERIM REMEDIAL ACTION

This decision document describes the selected interim remedial action for the Fire Training Area (FST-13) at Fort Stewart, Georgia.

The Fire Training Area is located on the northwestern side of Wright Army Airfield and was used until 1991 to train firefighters in a live fire situation. Training sessions took place approximately eight times per year, and fuel for the training fires was supplied from an aboveground storage tank. Approximately 300 to 500 gallons of waste oil, solvents, and waste fuels (AVGAS and JP-4) were used per session. The fire training area consists of a 5,000 square foot concrete pad, bermed on all sides. The concrete pad contains POL contaminated soil, and soil on the south side of the pit is visibly stained from overflow resulting from training activities. The concrete pad is cracked in several locations which has resulted in soil contamination beneath the pad. Reports completed in 1990, 1993, and 1995, indicate that the training area has been impacted by past activities. The reports concluded that the soil at the site poses a risk to human health through inhalation and/or ingestion. Based on these findings, an interim remedial action is required and necessary as outlined in this decision document.

The interim remedial action involves excavation and removal of contaminated soil from the source area and disposing of this soil in an approved State disposal facility. Specifically, the contaminated soil will be taken to an asphalt plant where the soil will be incinerated and reused in the asphalt process. Also, further groundwater monitoring and investigation will be conducted for a period of five (5) years to determine if further actions are required to address possible groundwater contamination.

This decision document was developed by the Department of Pubic Works at Fort Stewart, with support form the U.S. Army Corps of Engineers.

SUMMARY OF SITE RISK

A quantitative risk evaluation has not been completed for the site, however, the analytical results from the three investigations has been reviewed and a qualitative risk evaluation completed. Potential risks to human health and the environment do exist, based on the constituents detected during investigation activities, for both soil and groundwater. The risk of exposure to subsurface soils is dependent upon the disturbance and contact with those soils. Metals (lead, barium,

chromium, arsenic, and selenium, methylene chloride, and toluene were detected at significant concentrations in on-site soils. Metals(barium, chromium, arsenic, and selenium), naphthalene, benzene, ethylbenzene, and xylene were detected in the groundwater samples. Under the installation's RCRA Part B permit, this site must be remediated to maximum contaminant levels (MCLs) or site specific background levels, which ever are higher. Therefore, under State of Georgia regulations, the site must be remediated to 5 ppm of benzene in the soil. The remedial design has been prepared to meet all State of Georgia requirements.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on the previous studies, to include field work conducted for development of the removal design, the options considered for interim remedial action alternatives for the treatment of the soil and clean-up of the source area are as follows:

	DESCRIPTION	COST
1.	No action	$0
2.	Source Removal-Excavate and Offsite Disposal	$400,000

Alternative number 1 does not satisfy the requirements of corrective action under the installation's Subpart B permit. This alternative would not remove the source of contamination and would not allow for the site to be remediated to 5 mg/kg of benzene in the soil. Instead, the potential for further impact on the groundwater at the site is increased if the source is not removed. In addition, the risk to human health and the environment is not considered by this alternative.

Alternative number 2 would entail removal and disposal of the contaminated soil in an approved State disposal facility. This alternative would allow the contaminated soil to be reused once it has been incinerated, and would reduce the risk of future contamination at the site. Alternative #2 would provide the best balance of reducing both the potential of further contamination at the site and/or remediation, and will ultimately minimize costs and liability. Alternative #2 will also significantly reduce the risk of human exposure from soil (ie. ingestion and/or inhalation). The current cost of this alternative is $400,000.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this interim remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment to reduce the mobility of toxic material as a principal element.

Due to the fact that the selected course of action is a source removal, and further remedial action may be required to address groundwater contamination, the five-year review will not apply to this interim remedial action. The chosen course of action is consistent with any future remedies needed to address possible groundwater contamination at this site.

John H. Spears 8/19/96

JOHN H. SPEARS
Chief, Environmental Branch

Dale F. Keifer

DALE F. KEIFER
Chief, Environmental and
Natural Resources Division

CAREY W. BROWN
LTC, EN
Director, Public Works

DECISION DOCUMENT FOR INTERIM REMEDIAL ACTION AT THE FIRE TRAINING AREA WRIGHT ARMY AIRFIELD, GEORGIA

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The interim remedial action involves excavation and removal of contaminated soil from the source area and disposing of this soil in an approved State disposal facility. Specifically, the contaminated soil will be taken to an asphalt plant where the soil will be incinerated and reused in the asphalt process. Also, further groundwater monitoring and investigation will be conducted for a period of five (5) years to determine if further actions are required to address possible groundwater contamination.

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chromium, arsenic, and selenium, methylene chloride, and toluene were detected at significant concentrations in on-site soils. Metals(barium, chromium, arsenic, and selenium), naphthalene, benzene, ethylbenzene, and xylene were detected in the groundwater samples. Under the installation's RCRA Part B permit, this site must be remediated to maximum contaminant levels (MCLs) or site specific background levels, which ever are higher. Therefore, under State of Georgia regulations, the site must be remediated to 5 ppm of benzene in the soil. The remedial design has been prepared to meet all State of Georgia requirements.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on the previous studies, to include field work conducted for development of the removal design, the options considered for interim remedial action alternatives for the treatment of the soil and clean-up of the source area are as follows:

	DESCRIPTION	COST
1.	No action	$0
2.	Source Removal-Excavate and Offsite Disposal	$400,000

Alternative number 1 does not satisfy the requirements of corrective action under the installation's Subpart B permit. This alternative would not remove the source of contamination and would not allow for the site to be remediated to 5 mg/kg of benzene in the soil. Instead, the potential for further impact on the groundwater at the site is increased if the source is not removed. In addition, the risk to human health and the environment is not considered by this alternative.

Alternative number 2 would entail removal and disposal of the contaminated soil in an approved State disposal facility. This alternative would allow the contaminated soil to be reused once it has been incinerated, and would reduce the risk of future contamination at the site. Alternative #2 would provide the best balance of reducing both the potential of further contamination at the site and/or remediation, and will ultimately minimize costs and liability. Alternative #2 will also significantly reduce the risk of human exposure from soil (ie. ingestion and/or inhalation). The current cost of this alternative is $400,000.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this interim remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment to reduce the mobility of toxic material as a principal element.

Due to the fact that the selected course of action is a source removal, and further remedial action may be required to address groundwater contamination, the five-year review will not apply to this interim remedial action. The chosen course of action is consistent with any future remedies needed to address possible groundwater contamination at this site.

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