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SWMU Assessment Report

Polynuclear Aromatic Hydrocarbon Detections near SWMU-24B

Fort Stewart, Georgia

EPA ID # GA9 210 020 872

June 24, 2011

DOCUMENT 5.10

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SWMU Assessment Report

Polynuclear Aromatic Hydrocarbon Detections near SWMU-24B

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GP08HAFS.F24C.QB0CR

GEORGIA REGISTERED PROFESSIONAL ENGINEERING CERTIFICATION

I certify that I am a qualified professional engineer who has received a baccalaureate or post-graduate degree in engineering and have sufficient training and experience in environmental engineering and related fields, as demonstrated by state registration and completion of accredited university courses, to enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction.

Name: Charles A. Bertz, P.E.

License Number: 029498

Expiration Date: December 31, 2012

Charles A. Bertz, P.E.

6.24.2011

Date

Acronyms

ARCADIS	ARCADIS U.S., Inc.
CAP	Corrective Action Plan
COCs	Constiuents of Concern
COPC	Constituent of Potential Concern
ft bgs	Feet Below Ground Surface
GAEPD	Georgia Environmental Protection Division
ILCR	Incremental Lifetime Cancer Risk
mg/kg	Milligrams per kilogram
PAHs	Polynuclear Aromatic Hydrocarbons
PBC	Performance Based Contract
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SAIC	Science Applications Internation Corporation
SAR	SWMU Assessment Report
SVOCs	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

1. Introduction

ARCADIS U.S. Inc. (ARCADIS) has been retained by the United States Army Environmental Command (USAEC) to perform investigation and remediation activities at Fort Stewart in accordance with the requirements of the Performance Based Contract (PBC) number W91ZLK-05-D-0015. Fort Stewart, originally known as Camp Stewart, was established in June 1940 as an anti-aircraft artillery training center. The current primary mission for Fort Stewart is a training and maneuver area, providing tank, field artillery, helicopter gunnery, and small arms training for regular Army and National Guard units. The 24th Infantry Division, which was reflagged as the 3rd Infantry Division in May 1996, was permanently stationed at Fort Stewart in 1975.

Fort Stewart is located in portions of Liberty, Bryan, Long, Tattnall, and Evans Counties, Georgia, approximately 40 miles west-southwest of Savannah, Georgia (Figure 1-1). The cantonment, or garrison area, is located within the Liberty County portion on the southern boundary of the reservation. Hinesville, Georgia, is the nearest city to the garrison area and is located immediately outside of the reservation boundary.

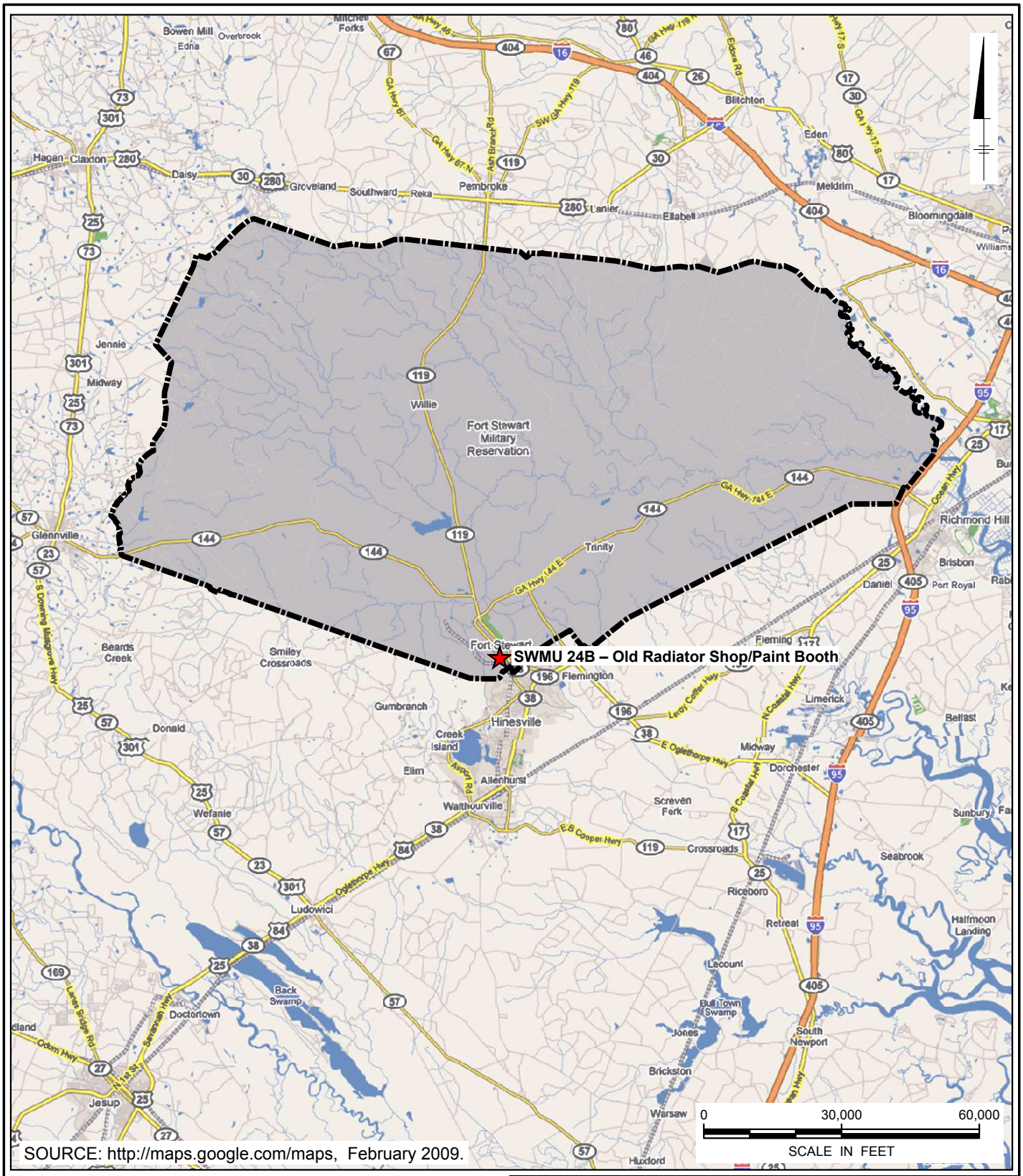
This Solid Waste Management Unit (SWMU) Assessment Report (SAR) has been prepared to assess polynuclear aromatic hydrocarbon (PAH) impacts detected in surface soil. The impacts were discovered during a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of the Old Radiator Shop/Paint Booth, identified as SWMU 24B. This SAR is prepared in accordance with the Fort Stewart Hazardous Waste Facility Permit No. HW-045 (S), Section III.B, issued by the Georgia Environmental Protection Division (GAEPD) in August 2007.

1.1 Site Location and History

The area included in this assessment is located in the southern portion of the garrison area, on the eastern side of Tilton Avenue, near former Building 1056, also known as SWMU 24B. Limited information is available about the operational history of the site. Building 1056 was initially used as a radiator shop. The building was later used as a paint booth. The operational date for these activities is unknown. However, it is believed that the paint booth operations ceased around 1975. At some point following the operations of the paint booth, Building 1056 was used for equipment repair and storage. Building 1056 was partially demolished in 2005 as part of a military construction project involving upgrading of maintenance facilities in the area. Only the concrete floor slab and building foundation remain. Following demolition of Building

1056, a covered and fenced maintenance pad was constructed to the southeast of the former building. The former building 1056 concrete floor slab and the surrounding unpaved areas are currently used for staging Army vehicles. Photographs documenting the current site use and conditions are included in Appendix A. As shown in the photos, a large number of vehicles are routinely staged around the Site. Additionally, asphalt patches and debris were observed around Building 1056, indicating that parts of area were previously paved.

During the historical investigations at SWMU 24B, PAHs were detected in the surface soil near Building 1056. Initially, PAHs were detected and investigated as part of the Phase I and Phase II RFI for SWMU 24B and subsequently evaluated as part of the Corrective Action Plan (CAP). However, based on the historical activities at SWMU 24B and the area where the PAHs were detected, the surface soil impacts are not believed to be associated with the historical radiator shop and paint booth operations. Rather, the PAH impacts are believed to be ubiquitous and related to the industrial nature of the site and the current use of the site to stage Army vehicles. Following a site walk conducted at Ft Stewart on February 3rd, 2011, the GAEPD requested that a SAR be prepared to evaluate the PAH impacts in surface soil near Building 1056. This report summarizes the surface soil investigations completed to date as part of SWMU 24B Phase I RFI, Phase II RFI and CAP and provides a summary of available information on the historical operations performed in the area.



SOURCE: http://maps.google.com/maps, February 2009.

FORT STEWART MILITARY RESERVATION, GEORGIA

SWMU 24B – OLD RADIATOR SHOP/PAINT BOOTH
CORRECTIVE ACTION PLAN PROGRESS REPORT

Site Location Map

ARCADIS

FIGURE
1-1

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) LD:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.GIBBONS)
PROJECT: GP08HAFS.F24B.EHCAP PATH: G:\GIS\FtStewart\MapDocs\F24\2010 CAP PROGRESS\ F1-1 F24_PROG_REG.mxd SAVED: 13JUL2010

2. Historical Surface Soil Investigations at SWMU 24B

The following sub-sections summarize the investigations conducted as part of the SWMU 24B RFI and CAP implementation that relate to the PAH detections in soil around Building 1056. PAHs were only detected in surface soil, so the discussions will focus on the surface soil sample results.

2.1 Phase I RCRA Facility Investigation

A Phase I RFI was conducted in 1996 at SWMU 24B (Rust 1996). During the investigation, three surface soil samples were collected (24B-SS-01, 24B-SS-02, and 24-SS-03) from 0 to 1 foot below the ground surface (ft bgs) and two samples just below the surface soil (24B-GP2 and 24B-GP3) from 1 to 4 ft bgs. The samples were collected near the northern portion of former Building 1056 where the former paint booth was located. PAHs were not detected in the samples 24B-GP2 and 24B-GP3 collected from 1 to 4 ft bgs. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene were detected above the regional screening level (RSL) for residential soil (United States Environmental Protection Agency [USEPA] 2010) in the samples collected from 0 to 1 ft bgs. The PAH sample results are summarized in Table 2-1. Select PAH sample results are presented on Figure 2-1. Based on the results of the Phase I investigation, additional investigation was recommended.

2.2 Phase II RCRA Facility Investigation

A Phase II RFI was performed by Science Applications International Corporation (SAIC) between 1999 and 2000. The field effort was conducted in 2 separate events. During the first event, fifteen surface soil samples were collected (24B-SS-04, 24B-SS-05, 24B-SS-06, 24B-SS-7X, 24B-SS-8X, 24B-SS-9X, 24B-MW-01, 24B-MW-02, 24B-MW-03, 24B-MW-04, 24B-MW-05, 24B-MW-06, 24B-MW-07, 24B-MW-08, and 24B-MW-09). Surface soil samples 24B-SS-7X, 24B-SS-8X, and 24B-SS-9X were not analyzed for PAHs so they will not be discussed further in this report. During the second field effort, six surface soil samples were collected (24B-SS-10, 24B-SS-11, 24B-SS-12, 24B-SS-13, 24B-SS-14, and 24B-SS-15), The sample results are summarized in Table 2-1. The samples were collected in the area surrounding former Building 1056 to further delineate PAHs in the surface soil.

Based on the surface soil laboratory analytical results, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were

determined to be human health constituents of concern (COCs). Remedial levels were calculated for five PAHs as part of the Revised Final Phase II RFI Report. The calculated remedial levels are protective of hypothetical future residential exposure and are based on an Incremental Lifetime Cancer Risk (ILCR)of 1 x 10^{-5} (SAIC 2001). The following is a summary of the remedial levels calculated for PAHs in surface soils as part of the Phase II RFI (SAIC 2001):

- benzo(a)pyrene – 0.89 milligrams per kilogram (mg/kg)
- benzo(a)anthracene – 8.93 mg/kg
- benzo(b)fluoranthene – 8.93 mg/kg
- benzo(k)fluoranthene – 89.3 mg/kg
- indeno(1,2,3-cd)pyrene – 8.93 mg/kg

Because the maximum detected concentration of benzo(k)fluoranthene was below the calculated remedial level, no further action was required for that constituent (SAIC 2001). Figure 2-1 presents the surface soil sample results for the four remaining PAHs and compares them with the established remedial levels.

2.3 Corrective Action Plan

In accordance with the recommendations of the Phase II RFI, a CAP was developed for SWMU 24B to evaluate potential remedial alternatives to address soil impacts that exceeded the approved remedial levels. (SAIC 2002).

During the development of the CAP, Building 1056 was scheduled to be demolished. The selection of a corrective action alternative for impacts to surface soil was recommended to be delayed until the soil from beneath Building 1056 could be evaluated. The temporary corrective action alternative proposed in the CAP to address surface soil impacts was Institutional Controls and Groundwater Monitoring. It was recommended that institutional controls be implemented to restrict access to surface soil. The CAP proposed an Addendum be prepared once the soil below Building 1056 could be evaluated. The CAP was approved by the GAEPD in a letter dated November 18, 2004.

2.4 2005 CAP Implementation

As part of the planning for the Building 1056 demolition, it was decided to sample the surface soils beneath the building prior to the demolition to allow earlier coordination with the construction plans for the area. The soil sampling was performed in

August 2004. Eight soil borings, 24B-SB-01 through 24B-SB-08, were installed through the concrete slab as shown on Figure 2-1. Soil samples were collected from each boring from the 0.5 to 2.0 ft and 3.0 to 5.0 ft depth intervals under the slab.

No PAHs were detected in any of the soil samples collected from either depth interval (SAIC 2005). The results of soil sampling from underneath the slab at Building 1056 supports the hypothesis that the SVOCs detected in surface soils around the building are not from an industrial process that resulted in systematic and routine releases, but rather, due to activities occurring in the general area (SAIC 2005). SVOCs (including PAHs) are a common soil constituent in heavily industrialized areas because of the large number of activities that can generate them (SAIC 2005). These activities include asphalt paving, equipment lubricants, dust suppression, and combustion processes (SAIC 2005). Since the low concentration detections of PAHs in surface soil were not believed to be associated with a systematic or routine release from SWMU 24B, the institutional controls proposed in the 2002 CAP were not implemented (SAIC 2005).

2.5 2007 CAP Implementation

In accordance with the CAP, confirmation surface soil samples were collected in December 2007 at four locations where PAHs had previously been detected at elevated concentrations during the Phase II RFI. The purpose of the confirmatory samples was to evaluate if the PAHs were naturally attenuating. As part of the 2002 CAP, attenuation of benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene was evaluated using both SESOIL and AT123D models (SAIC 2002). Confirmatory PAH samples were only collected for the four COCs evaluated as part of the 2002 CAP.

Low concentrations of all four PAHs were detected in all four of the confirmatory surface soil samples. Only benzo(a)pyrene in was detected at a concentration (1.47 mg/kg) above the established remedial goal (0.89 mg/kg) in sample 24B-SS-17. The reported concentration of 1.47 mg/kg had significantly decreased from the 2000 sample result of 9.56 mg/kg. In general, all of the 2007 surface soil sample results were below the 1999/2000 sample results. The 2007 confirmatory sample results are summarized in Table 2-1 and depicted on Figure 2-1. The CAP Progress Report (SAIC 2008) recommended a second confirmation sample be collected in December 2008 to evaluate if the concentration continued to attenuate below the established remedial levels.

2.6 2009 Confirmation Sample Activities

In February 2009, confirmation soil sample 24B-SS-55 was collected near the previous soil sample 24B-SS-17 (Figure 2-1). The location of the soil sample was based on GPS coordinates provided by the contractor responsible for collecting sample 24B-SS-17. The soil sample was analyzed for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene. Similar to the 2007 confirmatory sample results, benz(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were all detected in the surface soil sample. Benzo(a)pyrene was detected at 5.4 mg/kg, which continued to exceed the established soil remedial level of 0.89 mg/kg (ARCADIS 2010). A summary of the analytical data is included in Table 2-1.

2.7 2010 Corrective Action Activities

In January 2010, a small excavation was conducted to remove benzo(a)pyrene impacts in the surface soil near 24B-SS-17 and 24B-SS-55 (Figure 2-1). Using sample location 24B-SS-17 as the center, a 10 foot by 10 foot area was excavated to a depth of 1 foot. The excavated soil was placed in a roll-off pending characterization and disposal. No groundwater was encountered during the excavation.

Three confirmation soil samples were collected from the excavation area. One sample was collected from the bottom of the exaction (B-1) and two samples were collected from the sidewalls of the excavation (SW-1 and SW-2). Confirmatory soil samples were submitted for laboratory analysis of benzo(a)pyrene by USEPA Method 8270C. Soil below the established remedial level of 0.89 mg/kg was considered clean (ARCADIS 2010).

Benzo(a)pyrene was detected in all three confirmatory soil samples; however, only sidewall confirmation sample SW-2 exceeded the established benzo(a)pyrene remedial level of 0.89 mg/kg. Benzo(a)pyrene was detected in SW-2 at 11 mg/kg (Figure 2-1).

Table 2-1
Historic Soil Analytical Results
SWMU 24B - Old Radiator Shop/Paint Booth
Fort Stewart, Georgia

		Location ID	24B-SS-01	24B-SS-02	24B-SS-03	24B-SS-04	24B-SS-05	24B-SS-06	24B-SS-7X	24B-SS-8X	24B-SS-9X	24B-SS-10
		Sample Depth (ft bgs)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		Sample Date	2/24/1998	2/24/1998	2/24/1998	9/22/1999	9/22/1999	9/22/1999	9/22/1999	9/22/1999	9/22/1999	11/1/2000
Chemical Name	Remedial Level [1]	Residential Soil RSL [2]										
PAHs - USEPA Method SW8270 (mg/kg)												
Acenaphthene		3,400	BDL	BDL	BDL	BDL	**0.0196**	BDL	NA	NA	NA	**8.53**
Anthracene		17,000	BDL	BDL	BDL	**0.146**	**0.0447**	**0.462**	NA	NA	NA	**2.78**
Benz(a)anthracene	8.93	0.15	**2.89**	**3.03**	**9.38**	**0.874**	**0.268**	**4.4**	NA	NA	NA	**34.6**
Benzo(a)pyrene	0.89	0.015	**4.39**	**4.54**	**8.95**	**1.51**	**0.33**	**4.68**	NA	NA	NA	**44.1**
Benzo(b)fluoranthene	8.93	0.15	**5.23**	**9.01**	**16**	**2.78**	**0.699**	**8.22**	NA	NA	NA	**40.9**
Benzo(k)fluoranthene	89.3	1.5	**3.56**	BDL	BDL	BDL	BDL	BDL	NA	NA	NA	**49.1**
Chrysene		15	**2.58**	**2.36**	**12.6**	**1.94**	**0.422**	**5.96**	NA	NA	NA	**40.4**
Dibenz(a,h)anthracene		0.015	BDL	BDL	BDL	NA	NA	NA	NA	NA	NA	NA
Fluoranthene		2,300	**3.93**	**4.26**	**11.6**	**1.45**	**0.549**	**7.7**	NA	NA	NA	**35.8**
Fluorene		2,300	BDL	BDL	BDL	BDL	BDL	**0.228**	NA	NA	NA	**0.825**
Indeno(1,2,3-cd)pyrene	8.93	0.15	**3.48**	**3.25**	**4.57**	**1.22**	**0.276**	**3.38**	NA	NA	NA	**22.4**
Methylnaphthalene, 2-		310	BDL	BDL	BDL	BDL	BDL	**0.206**	NA	NA	NA	NA
Naphthalene		3.6	BDL	BDL	BDL	BDL	BDL	**0.443**	NA	NA	NA	**0.68**
Pyrene		1700	**5.21**	**6.82**	**16.8**	**2.88**	**0.815**	**12.5**	NA	NA	NA	**80.6**

Notes:

	Indicates the analyte was detected above the established remedial level
	Indicates the analyte was detected above the residential soil RSL where no remedial level has been established.
[1]	Remedal level for soil developed during Phase II RFI and are summarized in the Addendum for SWMU 24B Old Radiator Shop/Paint Booth to the Revised Final Phase II RFI Report for 16 SWMUs at Fort Stewart (SAIC 2001)
[2]	U.S. EPA Residential RSL for soil as of November 2010
BOLD	Indicate the analyte was detected
BDL	Below Detection Limit
RSL	Regional Screening Level
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
PAH	Polynuclear Aromatic Hydrocarbons
NA	Not analyzed

Table 2-1
Historic Soil Analytical Results
SWMU 24B - Old Radiator Shop/Paint Booth
Fort Stewart, Georgia

		Location ID	24B-SS-11	24B-SS-12	24B-SS-13	24B-SS-14	24B-SS-15	24B-SS-16	24B-SS-17	24B-SS-18	24B-SS-19	24B-GP2
		Sample Depth (ft bgs)	0-1	0-1	0-1	0 - 0.5	0-1	0-1	0 - 1	0-1	0-1	1-4
		Sample Date	11/1/2000	11/1/2000	11/1/2000	11/1/2000	11/1/2000	12/10/2007	12/10/2007	12/10/2007	12/10/2007	1/20/1998
Chemical Name	Remedial Level [1]	Residential Soil RSL [2]										
PAHs - USEPA Method SW8270												
Acenaphthene		3,400	**1.2**	BDL	**1.45**	**1.99**	**0.842**	NA	NA	NA	NA	BDL
Anthracene		17,000	BDL	BDL	BDL	**1.02**	BDL	NA	NA	NA	NA	BDL
Benz(a)anthracene	8.93	0.15	**2.73**	BDL	**5.06**	**7.38**	**2.98**	**0.075**	**1.27**	**0.669**	**0.19**	BDL
Benzo(a)pyrene	0.89	0.015	**3.89**	**1.1**	**6.63**	**9.56**	**3.86**	**0.0918**	**1.47**	**0.6**	**0.268**	BDL
Benzo(b)fluoranthene	8.93	0.15	**3.08**	**0.871**	**5.47**	**11.70**	**4.03**	**0.173**	**2.36**	**1.02**	**0.417**	BDL
Benzo(k)fluoranthene	89.3	1.5	**4.29**	**1.33**	**6.67**	**9.86**	**4.44**	NA	NA	NA	NA	BDL
Chrysene		15	**3.82**	**1.12**	**6.8**	**10.4**	**4.84**	NA	NA	NA	NA	BDL
Dibenz(a,h)anthracene		0.015	NA	NA	NA	NA	NA	NA	NA	NA	NA	BDL
Fluoranthene		2,300	**2.38**	BDL	**5.82**	**7.91**	**3.27**	NA	NA	NA	NA	BDL
Fluorene		2,300	BDL	BDL	BDL	BDL	BDL	NA	NA	NA	NA	BDL
Indeno(1,2,3-cd)pyrene	8.93	0.15	**2.39**	**1.06**	**3.56**	**6.32**	**2.09**	**0.144**	**0.87**	**0.342**	**0.182**	BDL
Methylnaphthalene, 2-		310	NA	NA	NA	NA	NA	NA	NA	NA	NA	BDL
Naphthalene		3.6	BDL	BDL	BDL	BDL	BDL	NA	NA	NA	NA	BDL
Pyrene		1700	**4.78**	**1.06**	**12.4**	**11.20**	**6.07**	NA	NA	NA	NA	BDL

Notes:

	Indicates the analyte was detected above the established remedial level
	Indicates the analyte was detected above the residential soil RSL where no remedial level has been established.
[1]	Remedal level for soil developed during Phase II RFI and are summarized in the Addendum for SWMU 24B Old Radiator Shop/Paint Booth to the Revised Final Phase II RFI Report for 16 SWMUs at Fort Stewart (SAIC 2001)
[2]	U.S. EPA Residential RSL for soil as of November 2010
BOLD	Indicate the analyte was detected
BDL	Below Detection Limit
RSL	Regional Screening Level
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
PAH	Polynuclear Aromatic Hydrocarbons
NA	Not analyzed

Table 2-1
Historic Soil Analytical Results
SWMU 24B - Old Radiator Shop/Paint Booth
Fort Stewart, Georgia

		Location ID	24B-GP3	24B-MW-01	24B-MW-02	24B-MW-03	24B-MW-04	24B-MW-05	24B-MW-06	24B-MW-07	24B-MW-08	24B-MW-09
		Sample Depth (ft bgs)	1-4	0-1	0-1	1-2	0-1	0-1	0-2	0-2	0-2	0-2
		Sample Date	1/20/1998	10/8/1999	10/8/1999	10/8/1999	10/8/1999	10/8/1999	10/8/1999	10/8/1999	10/8/1999	10/8/1999
Chemical Name	Remedial Level [1]	Residential Soil RSL [2]										
PAHs - USEPA Method SW8270 (mg/kg)												
Acenaphthene		3,400	BDL	BDL	BDL	BDL	BDL	**2.36**	BDL	BDL	BDL	BDL
Anthracene		17,000	BDL	BDL	**1.73**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benz(a)anthracene	8.93	0.15	BDL	BDL	**25.6**	BDL	**0.607**	**38.8**	BDL	BDL	BDL	BDL
Benzo(a)pyrene	0.89	0.015	BDL	BDL	**38.7**	BDL	BDL	**48.1**	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	8.93	0.15	BDL	BDL	**28.2**	BDL	BDL	**30.2**	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	89.3	1.5	BDL	BDL	**37.9**	BDL	BDL	**49.3**	BDL	BDL	BDL	BDL
Chrysene		15	BDL	BDL	**33.6**	BDL	BDL	**51.4**	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene		0.015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene		2,300	BDL	BDL	**22.6**	BDL	BDL	**44**	BDL	BDL	BDL	BDL
Fluorene		2,300	BDL	BDL	**0.943**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	8.93	0.15	BDL	BDL	**23.7**	BDL	BDL	**30.7**	BDL	BDL	BDL	BDL
Methylnaphthalene, 2-		310	BDL	BDL	**0.962**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Naphthalene		3.6	BDL	BDL	**0.714**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyrene		1700	BDL	BDL	**61.2**	BDL	**0.954**	**79.7**	BDL	BDL	BDL	BDL

Notes:

	Indicates the analyte was detected above the established remedial level
	Indicates the analyte was detected above the residential soil RSL where no remedial level has been established.
[1]	Remedal level for soil developed during Phase II RFI and are summarized in the Addendum for SWMU 24B Old Radiator Shop/Paint Booth to the Revised Final Phase II RFI Report for 16 SWMUs at Fort Stewart (SAIC 2001)
[2]	U.S. EPA Residential RSL for soil as of November 2010
BOLD	Indicate the analyte was detected
BDL	Below Detection Limit
RSL	Regional Screening Level
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
PAH	Polynuclear Aromatic Hydrocarbons
NA	Not analyzed

Table 2-1
Historic Soil Analytical Results
SWMU 24B - Old Radiator Shop/Paint Booth
Fort Stewart, Georgia

		Location ID	24B-SS-55	EX-SW-1	EX-SW-2	EX-B1	24B-SB-01	24B-SB-02	24B-SB-03	24B-SB-04	24B-SB-05	24B-SB-06
		Sample Depth (ft bgs)	0 - 1	0-1	0-1	0-1	0.5-2	0.5-1.9	0.5-2.2	0.5-2	0.5-2.2	0.5-2.2
		Sample Date	2/26/2009	7/20/2004	1/16/2005	7/17/2005	8/24/2004	8/24/2004	8/24/2004	8/24/2004	8/24/2004	8/24/2004
Chemical Name	Remedial Level [1]	Residential Soil RSL [2]										
PAHs - USEPA Method SW8270												
Acenaphthene		3,400	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Anthracene		17,000	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Benz(a)anthracene	8.93	0.15	**3.4**	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Benzo(a)pyrene	0.89	0.015	**5.4**	**0.12**	**11**	**0.27**	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Benzo(b)fluoranthene	8.93	0.15	**6.9**	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Benzo(k)fluoranthene	89.3	1.5	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Chrysene		15	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Dibenz(a,h)anthracene		0.015	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Fluoranthene		2,300	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Fluorene		2,300	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Indeno(1,2,3-cd)pyrene	8.93	0.15	**2.0**	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Methylnaphthalene, 2-		310	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene		3.6	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351
Pyrene		1700	NA	NA	NA	NA	< 0.0351	< 0.0351	<0.0363	< 0.0355	< 0.036	< 0.0351

Notes:

	Indicates the analyte was detected above the established remedial level
	Indicates the analyte was detected above the residential soil RSL where no remedial level has been established.
[1]	Remedal level for soil developed during Phase II RFI and are summarized in the Addendum for SWMU 24B Old Radiator Shop/Paint Booth to the Revised Final Phase II RFI Report for 16 SWMUs at Fort Stewart (SAIC 2001)
[2]	U.S. EPA Residential RSL for soil as of November 2010
BOLD	Indicate the analyte was detected
BDL	Below Detection Limit
RSL	Regional Screening Level
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
PAH	Polynuclear Aromatic Hydrocarbons
NA	Not analyzed

Table 2-1
Historic Soil Analytical Results
SWMU 24B - Old Radiator Shop/Paint Booth
Fort Stewart, Georgia

		Location ID	24B-SB-07	24B-SB-08
		Sample Depth (ft bgs)	0.5-1.9	0.5-1.9
		Sample Date	8/24/2004	8/24/2004
Chemical Name	Remedial Level [1]	Residential Soil RSL [2]		
PAHs - USEPA Method SW8270				
Acenaphthene		3,400	< 0.0362	< 0.0362
Anthracene		17,000	< 0.0362	< 0.0362
Benz(a)anthracene	8.93	0.15	< 0.0362	< 0.0362
Benzo(a)pyrene	0.89	0.015	< 0.0362	< 0.0362
Benzo(b)fluoranthene	8.93	0.15	< 0.0362	< 0.0362
Benzo(k)fluoranthene	89.3	1.5	< 0.0362	< 0.0362
Chrysene		15	< 0.0362	< 0.0362
Dibenz(a,h)anthracene		0.015	< 0.0362	< 0.0362
Fluoranthene		2,300	< 0.0362	< 0.0362
Fluorene		2,300	< 0.0362	< 0.0362
Indeno(1,2,3-cd)pyrene	8.93	0.15	< 0.0362	< 0.0362
Methylnaphthalene, 2-		310	NA	NA
Naphthalene		3.6	< 0.0362	< 0.0362
Pyrene		1700	< 0.0362	< 0.0362

Notes:

	Indicates the analyte was detected above the established remedial level
	Indicates the analyte was detected above the residential soil RSL where no remedial level has been established.
[1]	Remedal level for soil developed during Phase II RFI and are summarized in the Addendum for SWMU 24B Old Radiator Shop/Paint Booth to the Revised Final Phase II RFI Report for 16 SWMUs at Fort Stewart (SAIC 2001)
[2]	U.S. EPA Residential RSL for soil as of November 2010
BOLD	Indicate the analyte was detected
BDL	Below Detection Limit
RSL	Regional Screening Level
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
PAH	Polynuclear Aromatic Hydrocarbons
NA	Not analyzed

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(C.SMITH) LD:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.GIBBONS) TM:(A.FANG)
PROJECT: GP08HAFS.F24C.EHCAP PATH: G:\GIS\FtStewart\MapDocs\F24\2011 SWMU Assess\F2-1 S24_ASSESS HIST PAHs.mxd - 6/23/2011 @ 10:37:22 AM

	24B-MW-08
1-2 ft bls	10/8/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-MW-09
1-2 ft bls	10/10/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-MW-04
0-1 ft bls	10/7/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	0.607
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-SS-02
0-1 ft bls	2/24/1998
Benzo(a)anthracene	3.03
Benzo(a)pyrene	4.54
Benzo(b)fluoranthene	9.01
Indeno(1,2,3-cd)pyrene	3.25

	24B-SS-04
0-1 ft bls	9/22/1999
Benzo(a)anthracene	0.874
Benzo(a)pyrene	1.51
Benzo(b)fluoranthene	2.78
Indeno(1,2,3-cd)pyrene	1.22

	24B-SS-05
0-1 ft bls	9/22/1999
Benzo(a)anthracene	0.268
Benzo(a)pyrene	0.33
Benzo(b)fluoranthene	0.699
Indeno(1,2,3-cd)pyrene	0.276

	24B-SS-01
0-1 ft bls	2/24/1998
Benzo(a)anthracene	2.89
Benzo(a)pyrene	4.39
Benzo(b)fluoranthene	5.23
Indeno(1,2,3-cd)pyrene	3.48

	24B-MW-06
1-2 ft bls	10/8/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-MW-07
1-2 ft bls	10/7/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-SS-06
0-1 ft bls	9/22/1999
Benzo(a)anthracene	4.4
Benzo(a)pyrene	4.68
Benzo(b)fluoranthene	8.22
Indeno(1,2,3-cd)pyrene	3.38

	24B-SS-15
0-1 ft bls	11/1/2000
Benzo(a)anthracene	2.98
Benzo(a)pyrene	3.86
Benzo(b)fluoranthene	4.03
Indeno(1,2,3-cd)pyrene	2.09

	24B-MW-05	24B-SS-16
0-1 ft bls	10/8/1999	12/10/2007
Benzo(a)anthracene	38.8	0.075
Benzo(a)pyrene	48.1	0.0918
Benzo(b)fluoranthene	30.2	0.173
Indeno(1,2,3-cd)pyrene	30.7	0.144

	24B-MW-03
1-2 ft bls	10/7/1999
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-GP2
1-4 ft bls	1/20/1998
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-GP3
1-4 ft bls	1/20/1998
Benzo(a)anthracene	BDL
Benzo(a)pyrene	BDL
Benzo(b)fluoranthene	BDL
Indeno(1,2,3-cd)pyrene	BDL

	24B-SB-04
0.5-2 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0355
Benzo(a)pyrene	< 0.0355
Benzo(b)fluoranthene	< 0.0355
Indeno(1,2,3-cd)pyrene	< 0.0355

	24B-SB-08
0.5-1.9 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0362
Benzo(a)pyrene	< 0.0362
Benzo(b)fluoranthene	< 0.0362
Indeno(1,2,3-cd)pyrene	< 0.0362

	24B-SS-13
0-1 ft bls	11/1/2000
Benzo(a)anthracene	5.06
Benzo(a)pyrene	6.63
Benzo(b)fluoranthene	5.47
Indeno(1,2,3-cd)pyrene	3.56

	24B-SS-03
0-1 ft bls	2/24/1998
Benzo(a)anthracene	9.38
Benzo(a)pyrene	8.95
Benzo(b)fluoranthene	16
Indeno(1,2,3-cd)pyrene	4.57

	24B-SB-03
0.5-2.2 ft bls	8/24/2004
Benzo(a)anthracene	<0.0363
Benzo(a)pyrene	<0.0363
Benzo(b)fluoranthene	<0.0363
Indeno(1,2,3-cd)pyrene	<0.0363

	24B-SB-07
0.5-1.9 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0362
Benzo(a)pyrene	< 0.0362
Benzo(b)fluoranthene	< 0.0362
Indeno(1,2,3-cd)pyrene	< 0.0362

	24B-SB-02
0.5-1.9 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0351
Benzo(a)pyrene	< 0.0351
Benzo(b)fluoranthene	< 0.0351
Indeno(1,2,3-cd)pyrene	< 0.0351

	24B-SB-06
0.5-2.2 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0351
Benzo(a)pyrene	< 0.0351
Benzo(b)fluoranthene	< 0.0351
Indeno(1,2,3-cd)pyrene	< 0.0351

	24B-SB-01
0.5-2 ft bls	8/24/2004
Benzo(a)anthracene	< 0.0351
Benzo(a)pyrene	< 0.0351
Benzo(b)fluoranthene	< 0.0351
Indeno(1,2,3-cd)pyrene	< 0.0351

	24B-SB-05
0.5-2.2 ft bls	8/24/2004
Benzo(a)anthracene	< 0.036
Benzo(a)pyrene	< 0.036
Benzo(b)fluoranthene	< 0.036
Indeno(1,2,3-cd)pyrene	< 0.036

	24B-MW-02	24B-SS-18	24B-MW-01
0-1 ft bls	10/8/1999	12/10/2007	10/6/1999
Benzo(a)anthracene	25.6	0.669	BDL
Benzo(a)pyrene	38.7	0.6	BDL
Benzo(b)fluoranthene	28.2	1.02	BDL
Indeno(1,2,3-cd)pyrene	23.7	0.342	BDL

	24B-SS-10	24B-SS-19
0-1 ft bls	11/1/2000	12/10/2007
Benzo(a)anthracene	34.6	0.19
Benzo(a)pyrene	44.1	0.268
Benzo(b)fluoranthene	40.9	0.417
Indeno(1,2,3-cd)pyrene	22.4	0.182

	24B-SS-12
0-1 ft bls	11/1/2000
Benzo(a)anthracene	BDL
Benzo(a)pyrene	1.1
Benzo(b)fluoranthene	0.871
Indeno(1,2,3-cd)pyrene	1.06

	24B-SS-11
0-1 ft bls	11/1/2000
Benzo(a)anthracene	2.73
Benzo(a)pyrene	3.89
Benzo(b)fluoranthene	3.08
Indeno(1,2,3-cd)pyrene	2.39

	24B-SS-14	24B-SS-17	24B-SS-55
0-1 ft bls	11/1/2000	12/10/2007	2/26/2009
Benzo(a)anthracene	7.38	1.27	3.4
Benzo(a)pyrene	9.56	1.47	5.4
Benzo(b)fluoranthene	11.7	2.36	6.9
Indeno(1,2,3-cd)pyrene	6.32	0.866	2

SEE EXCAVATION AREA INSERT

BUILDING 1056 DRAIN LINE (INFERRED LOCATION)

ESTIMATED BOUNDARY OF OLD PAINT BOOTH

BUILDING 1056 FOUNDATION

FENCE

TILTON

SHED

COVERED MAINTENANCE PAD

1057

1052

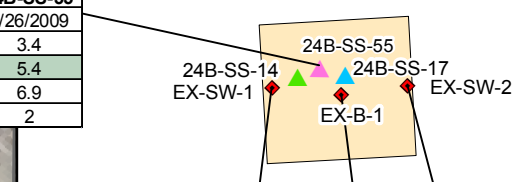
1020

1019

0 60 120

SCALE IN FEET

EXCAVATION AREA



EX-SW-1	Jan-10
Benzo(a)pyrene	0.12

EX-B-1	Jan-10
Benzo(a)pyrene	0.27

EX-SW-2	Jan-10
Benzo(a)pyrene	11

LEGEND

- Monitor Well (shallow)
- Monitor Well (deep)
- Surface Soil Sample (Phase I, RFI, February 1998)
- Surface Soil Sample (Phase II, RFI, September 1999)
- Surface Soil Sample (Supplemental Phase II, RFI, November 2000)
- Surface Soil Sample (Confirmation Sampling, December 2007)
- Surface Soil Sample (Confirmation Sampling, February 2009)
- Soil Boring Sample (August 2004)

PROJECTION: NAD_1983_StatePlane_Georgia_East_FIPS_1001_Feet
AERIAL SOURCE: ARMY (2008).

Remedial Levels for CVOCs/PAHs in Soil (mg/kg)	
Benzo(a)anthracene	8.93
Benzo(a)pyrene	0.89
Benzo(b)fluoranthene	8.93
Indeno(1,2,3-cd)pyrene	8.93

NOTE: All concentrations reported in milligrams per kilogram (mg/kg).

FORT STEWART MILITARY RESERVATION, GEORGIA

SWMU 24B – OLD RADIATOR SHOP/PAINT BOOTH
SWMU ASSESSMENT REPORT

Historical Soil Concentrations for Select PAHs In Surface Soil

ARCADIS

FIGURE
2-1

3. Conclusions and Recommendation

The results of historical soil investigations performed around former Building 1056 as part of the SWMU 24B RFI and CAP indicate that PAHs are present in surface soils. Four PAHs, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene have been detected at concentrations exceeding remedial levels developed in the SWMU 24B Phase II RFI (SAIC 2001). The calculated remedial levels are protective of hypothetical future residential exposure and are based on an ILCR of 1×10^{-5} (SAIC 2001).

SWMU 24B is associated with the Old Radiator Shop/Paint Booth that was located in the northern corner of Building 1056. Waste generated at the radiator shop was related to the maintenance and cleaning of radiators. It is assumed that the wastes included a caustic waste cleaning solution, sodium hydroxide, a water-based fluorescein dye solution, and spent recirculation water from the wet curtain spray paint booth (SAIC 2000). The most likely pathway for releases to have occurred from the historical radiator shop and paint booth operations was through leakage onto the concrete slab and subsequent migration through expansion joints, cracks, or around edges of the pad. Pre-demolition soil samples that were collected from beneath Building 1056 concrete slab in August 2004 indicated that no PAHs were detected in either the surface or shallow subsurface soil samples. The absence of PAHs below the Building 1056 concrete slab is a strong indicator that the PAH detections in surface soils around the building are not related to the historical radiator shop and paint booth operations.

Former Building 1056 is located in an industrial area and is currently used as a staging area for Army vehicles. Based on the historical activities at SWMU 24B and the area where the PAHs were detected, the surface soil impacts are not believed to be associated with the historical radiator shop and paint booth operations. Rather, the PAH impacts are believed to be ubiquitous and related to the industrial nature of the site and the current use of the site. PAHs are a common soil constituent in heavily industrialized areas because of the large number of activities that can generate them. These activities include asphalt paving, equipment lubricants, dust suppression, and combustion processes. Recent photographs taken in the area surrounding Building 1056 (Appendix A) show numerous vehicles parked around the Site with drip pans placed beneath them. Additionally, asphalt patches and debris were observed around Building 1056, indicating that parts of area were previously paved. The current use of this area as a motor pool coupled with the evidence of previous asphalt paving in the area are believed to be the cause of the low level PAH detections in surface soil

surrounding Building 1056. The general industrial nature of the site and current use as a motor pool are not expected to change in the foreseeable future. Consequently, Fort Stewart recommends that no further investigation or remediation of the PAHs in surface soil be required in the area surrounding former Building 1056.

4. References

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Rust 1996. Phase I RCRA Facility Investigation Report for 24 Solid Waste Management Units at Fort Stewart. Georgia, Vols. I-III, May 1996.

Science Applications International Corporation (SAIC) 2000. SAIC 2000. Phase II RCRA Facility Investigation Report for 16 Solid Waste Management Units at Fort Stewart, Georgia, Revised Final, April 2000.

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SAIC 2005. Corrective Action Plan Progress Report for Calendar Year 2005 for Solid Waste Management Unit 24B, Old Radiator Shop/Paint Booth at Fort Stewart, Georgia, September 2005.

SAIC 2008. Corrective Action Plan Progress Report for Calendar Year 2007 for Solid Waste Management Unit 24B, Old Radiator Shop/Paint Booth at Fort Stewart, Georgia, May 2008.

United States Environmental Protection Agency (USEPA) 2010. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, U.S. Environmental Protection Agency, Oak Ridge National Laboratories. May 2010.

Appendix A

Site Photographs

Appendix A
Area Surrounding Former Building 1056
Fort Stewart, Georgia

Site: Near SWMU 24B

Photo: 100_1371.jpg

Date: 03/21/2011

Description: Staged Army Vehicles. Looking northwest towards the 2010 surface soil excavation location.

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Site: Near SWMU 24B

Photo: 100_1378.jpg

Date: 03/21/2011

Description: Staged Army Vehicles. Looking southeast towards the covered maintenance pad located southeast of former Building 1056.

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Appendix A
Area Surrounding Former Building 1056
Fort Stewart, Georgia

Site: Near SWMU 24B

Photo: 100_1384.jpg

Date: 03/21/2011

Description: Staged Army Vehicles. Looking southeast towards the covered maintenance pad located southeast of former Building 1056.

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Site: Near SWMU 24B

Photo: 100_1386.jpg

Date: 03/21/2011

Description: Patches of asphalt below soil near vehicle tires.

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Appendix A
Area Surrounding Former Building 1056
Fort Stewart, Georgia

Site: Near SWMU 24B

Photo: 100_1387.jpg

Date: 03/21/2011

Description: Patch of asphalt below soil near vehicle tires.

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Site: Near SWMU 24B

Photo: 100_1390.jpg

Date: 03/21/2011

Description: Staged Army Vehicles. Looking northeast toward former Building 1052, located north of former Building 1056. Next to the 2010 shallow excavation area.

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