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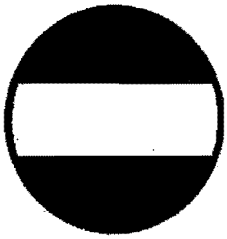

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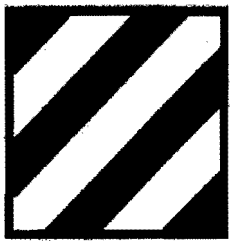
ADDENDUM FOR SWMU 24B: OLD RADIATOR SHOP/ PAINT BOOTH



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TO THE

REVISED FINAL PHASE II RCRA FACILITY INVESTIGATION REPORT FOR 16 SOLID WASTE MANAGEMENT UNITS AT FORT STEWART, GEORGIA

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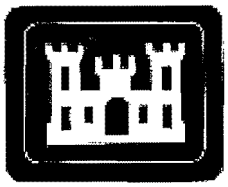

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
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June 2001

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ADDENDUM FOR SWMU 24B: OLD RADIATOR SHOP/PAINT BOOTH TO THE REVISED FINAL PHASE II RCRA FACILITY INVESTIGATION REPORT FOR 16 SOLID WASTE MANAGEMENT UNITS AT FORT STEWART, GEORGIA

REGULATORY AUTHORITY
Resource Conservation and Recovery Act
40 CFR 264, Title II, Subpart C, Section 3004;
42 USC 6901 et seq.

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Prepared by
Science Applications International Corporation
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

June 2001

The undersigned certifies that I am a qualified groundwater scientist who has received a baccalaureate or postgraduate degree in the natural sciences or engineering and have sufficient training and experience in groundwater hydrology 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 a subordinate working under my direction.

GEORGIA REGISTERED 22851 PROFESSIONAL ENGINEER P. A. STOLL

Patricia Stoll, P.E.
Technical Manager
SAIC

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

CONTENTS

TABLES

FIGURES

ACRONYMS

ADD	average daily dose
amsl	above mean sea level
AT123D	Analytical Transient 1-, 2-, 3-Dimensional
AUF	area use factor
bgs	below ground surface
CAP	Corrective Action Plan
CMCOC	contaminant migration constituent of concern
CMCOPC	contaminant migration contaminant of potential concern
COC	constituent of concern
COPC	contaminant of potential concern
CSF	cancer slope factor
DEH	Directorate of Engineering and Housing
DO	dissolved oxygen
DPT	direct-push technology
ECOPC	ecological contaminant of potential concern
EPA	U.S. Environmental Protection Agency
EPRE	ecological preliminary risk evaluation
ERA	ecological risk assessment
ESV	ecological screening value
FSMR	Fort Stewart Military Reservation
GEPD	Georgia Environmental Protection Division
GSSL	generic soil screening level
HHBRA	human health baseline risk assessment
HHCOC	human health constituent of concern
HHCOPC	human health contaminant of potential concern
HHPRE	human health preliminary risk evaluation
HI	hazard index
HQ	hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic
ILCR	incremental lifetime cancer risk
IWTP	Industrial Wastewater Treatment Plant
LOAEL	lowest observed adverse effect level
MCL	maximum contaminant level
NFA	no further action
NOAEL	no observed adverse effect level
NTU	nephelometric turbidity unit
ODAST	One-dimensional Analytical Solute Transport
PAH	polycyclic aromatic hydrocarbon
RBC	risk-based concentration
RBCA	Risk-based Corrective Action
RCRA	Resource Conservation and Recovery Act
Redox	oxidation-reduction potential
RfD	reference dose
RFI	RCRA Facility Investigation
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SDWA	Safe Drinking Water Act

SESOIL	Seasonal Soil Compartment
SRC	site-related contaminant
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TEF	toxicity equivalence factor
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
TRV	toxicity reference value
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

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1.0 INTRODUCTION

This addendum to the revised final Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for 16 Solid Waste Management Units (SWMUs) presents the results for the Phase II RFI for the Old Radiator Shop/Paint Booth (SWMU 24B) performed October 1999 [see Section 10.8 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000)] and the supplemental data collected November 2000. A Phase I RFI was performed at SWMU 24B in January 1998, and the results are presented in Section 10.8 of the revised final Phase II RFI Report (SAIC 2000). The results of the Phase I RFI indicated that additional investigation of the site was required to evaluate the nature and extent of potential soil and groundwater contamination.

This report has been prepared by Science Applications International Corporation (SAIC) for the U.S. Army Corps of Engineers (USACE), Savannah District under Contract DACA21-95-D-0022, Delivery Order No. 0009. The RFI was conducted in accordance with USACE Guidance EM 200-1-3.

1.1 OBJECTIVES AND SCOPE OF THE INVESTIGATION

The specific objectives of this Phase II RFI for SWMU 24B at Fort Stewart, Georgia, as defined in the conclusions and recommendations in Section 10.8.8 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000) and the Phase II RFI Sampling and Analysis Plan (SAP) (SAIC 1997) [approved by the Georgia Environmental Protection Division (GEPD) in October 1997] are listed below.

- Determine the horizontal and vertical extent of groundwater contamination.
- Determine whether soil and/or groundwater contaminants present a threat to human health or the environment.
- Determine the need for future action and/or no further action (NFA).
- Gather data necessary to support a Corrective Action Plan (CAP), if warranted.

The information provided in this addendum report is based upon data collected previously during the Phase I RFI (January 1998) and as part of the Phase II RFI (October 1999) field sampling and analysis. The scope of the fieldwork for the Phase II sites included the activities listed below.

- Collection of direct-push groundwater samples using a push probe.
- Collection of surface soil samples.
- Collection of soil samples during monitoring well installation.
- Installation of permanent groundwater monitoring wells both upgradient and downgradient of the site.
- Groundwater sampling at newly installed monitoring wells around the SWMUs.
- Surveying of the positions of all sample locations.

1.2 ADDENDUM REPORT ORGANIZATION

This report is an addendum to the revised final Phase II RFI Report for 16 SWMUs that was issued in April 2000. General procedures and/or methodology for field investigation, fate and transport analysis, human health risk assessment, and ecological risk assessment (ERA) are presented in the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000) and are referenced in the appropriate addendum sections. The revised final Phase II RFI Report for 16 SWMUs consists of three volumes: 12 chapters of text in Volume I, seven appendices in Volume II, and five appendices in Volume III. Chapter 1.0 describes the purpose of the investigation, summarizes the scope of work performed, and presents the organization of the report. General information is presented in Chapters 2.0 through 8.0. Chapter 2.0 describes the Fort Stewart Military Reservation (FSMR) Installation and discusses the history of the FSMR and the FSMR's regulator history. Chapter 3.0 presents the regional setting of the FSMR, including the demographics, topography, regional geology and hydrogeology, surface drainage, soil, and ecology. Chapter 4.0 summarizes the investigative activities and methodologies used in completing the Phase II RFI fieldwork. Chapter 5.0 describes the results of the background interpretation for surface soil, subsurface soil, groundwater, surface water, and sediment and their relationship to each site. Chapter 6.0 identifies general considerations affecting contaminant fate and transport. Chapter 7.0 presents the general methodology for the human health preliminary risk evaluation (HHPRE), and Chapter 8.0 presents the general methodology for the ecological preliminary risk evaluation (EPRE).

Chapter 9.0 designates, in sequential order, the SWMUs that are recommended for NFA and for which, therefore, additional investigation and/or evaluation is not required. Chapter 10.0, in which SWMU 24B is addressed (Section 10.8), designates, in sequential order, the SWMUs that are recommended for additional investigation or a CAP. Chapter 11.0 presents general conclusions and recommendations identifying the SWMUs that are recommended for NFA or SWMUs that indicated risk to human health or the environment and are recommended for additional investigation or a CAP. References are presented in Chapter 12.0.

Volume II of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000) contains seven appendices. Appendix A contains the direct-push technology (DPT) and boring logs. Appendix B contains monitoring well construction diagrams. Appendix C is the Quality Control Summary Report. Appendix D provides a comparison of metals data from the Phase I and Phase II RFIs. Appendix E contains the geotechnical laboratory test results. Appendix F is the background data summary. Appendix G contains the chain-of-custody forms.

Volume III of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000) contains five appendices. Appendix H provides the analytical data results. In addition, the analytical data are provided in electronic format (i.e., on a CD). Appendix I presents the methodology for the human health baseline risk assessment (HHBRA). Appendix J contains the toxicity profiles for contaminants of potential concern (COPCs). Appendix K presents fate and transport input data and model descriptions. Appendix L presents the revised responses to GEPD comments received on the final version of the Phase II RFI Report for 16 SWMUs submitted in February 1999 and the meeting minutes for the comment response meeting with GEPD held on September 14, 1999.

The results of the Phase I RFI for SWMU 24B are presented in Section 10.8 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). This addendum follows the same organization as that of the revised final Phase II RFI Report.

2.0 HISTORY AND DESCRIPTION OF SWMU 24B, OLD RADIATOR SHOP/PAINT BOOTH

SWMU 24B, the Old Radiator Shop/Paint Booth, is located in the southern portion of the garrison area on the eastern side of Tilton Avenue in Building 1056, which used to be the Radiator Shop (Figure 1). The operational history of the site is vague. The Paint Booth was located in Building 1056, and the area is currently used as an equipment repair and storage area (Figure 2). Prior to use as a paint booth, the area to be investigated at Building 1056 reportedly housed the old Radiator Shop. In 1993, long-time Building 1056 workers were interviewed regarding their knowledge of the history of former operations at this facility. One employee reported that an old paint booth had been located in the northern corner of the building, but had been out of use for approximately 18 years. Other employees indicated that they did not know what materials were used in the old paint booth and were not aware of a radiator shop having been located in the building.

Other research into former operations at Building 1056 has indicated that a drainpipe led from the building and discharged into a ditch. It is unknown whether the drainpipe originally discharged to a ditch running parallel to Building 1056 or to the ditch on the west side of Tilton Avenue. It was reported that the Directorate of Engineering and Housing (DEH) installed a pipe under Tilton Avenue that connected the drainpipe in Building 1056 to the industrial wastewater pipe located on the west side of Tilton Avenue (Geraghty and Miller 1992); therefore, discharge was no longer routed to the ditch. Neither the drainage ditch running parallel to Building 1056 nor the ditch west of Tilton Avenue presently exists. The Fort Stewart Plumbing/Mechanical and Electrical Department was not able to determine when the piping from Building 1056 was connected to the Industrial Wastewater Treatment Plant (IWTP) drainage system or where the connection was located. There is a visible cut in the asphalt across Tilton Avenue approximately 15 feet southeast of the northwestern corner of Building 1056. It is believed that this is the location of the connection. If the facility was previously used as a radiator repair shop, the wastes most likely to have been generated would be the same as those generated under current operations as an engine/equipment repair facility. These wastes include caustic-waste cleaning solution, sodium hydroxide, water-based fluorescein dye solution, and spent recirculation water from the wet-curtain spray paint booth.

No sampling was performed at the site prior to the Phase I RFI site characterization activities in 1993.

2.1 SUMMARY OF PHASE I RFI ACTIVITIES

Five surface soil, four subsurface soil, and six groundwater samples were collected using DPT techniques during the Phase I RFI at this site. All surface soil, subsurface soil, and groundwater samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and RCRA metals. Sample locations are illustrated in Figure 2.

2.1.1 Surface Soil

Five surface soil samples were collected from five DPT locations during the Phase I RFI. The results of the surface soil analyses are presented in Table 1 and Figure 3.

VOCs. Toluene was detected in three out of five surface soil samples at concentrations ranging from 0.101 mg/kg at SS1 to 0.142 mg/kg at SS2. Toluene was considered to be a site-related contaminant (SRC) in surface soil based on the Phase I RFI.

SVOCs. Ten SVOCs were detected in surface soil. The SVOCs were detected in only SS1, SS2, and SS3 soil samples. Benzo(*a*)anthracene concentrations ranged from 2.89 mg/kg at SS1 to 9.38 mg/kg at SS3. Benzo(*a*)pyrene concentrations ranged from 4.39 mg/kg at SS1 to 8.95 mg/kg at SS3. Benzo(*b*)fluoranthene concentrations ranged from 5.23 mg/kg at SS1 to 16 mg/kg at SS3. Benzo(*g,h,i*)perylene concentrations ranged from 3.07 mg/kg at SS2 to 4.69 mg/kg at SS3. Benzo(*k*)fluoranthene was detected in only SS1 at a concentration of 3.56 mg/kg. Chrysene concentrations ranged from 2.36 mg/kg at SS2 to 12.6 mg/kg at SS3. Fluoranthene concentrations ranged from 3.93 mg/kg at SS1 to 11.6 mg/kg at SS3. Indeno(*1,2,3-cd*)pyrene concentrations ranged from 3.25 mg/kg at SS2 to 4.57 mg/kg at SS3. Phenanthrene was detected in only SS3 at a concentration of 3.48 mg/kg. Pyrene concentrations ranged from 5.21 mg/kg at SS1 to 16.8 mg/kg at SS3. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, phenanthrene, and pyrene were considered to be SRCs in surface soil based on the Phase I RFI.

RCRA Metals. Arsenic, barium, cadmium, chromium, lead, and mercury were detected in surface soil samples at concentrations above reference background criteria. Barium was detected above the reference background criterion at SS1 and SS2 at concentrations of 230 mg/kg and 24 mg/kg, respectively. Cadmium was detected above the reference background criterion at SS1 and SS2 at concentrations of 6.1 mg/kg and 3 mg/kg, respectively. Lead was detected above the reference background criterion in three out of five surface soil samples at concentrations ranging from 25.8 mg/kg at SS3 to 690 mg/kg at SS1. Chromium was detected above the reference background criterion in three out of five surface soil samples at concentrations ranging from 6.9 mg/kg at GP2 to 18.3 mg/kg at SS1. Arsenic and mercury were detected in SS1 at concentrations of 2.7 mg/kg and 0.13 mg/kg, respectively. Arsenic, barium, cadmium, chromium, lead, and mercury were considered to be SRCs in surface soil based on the Phase I RFI.

2.1.2 Subsurface Soil

Four subsurface soil samples were collected using DPT techniques during the Phase I RFI. The results of the subsurface soil analyses are presented in Table 2 and Figure 4.

VOCs. Methylene chloride and toluene were detected in subsurface soil samples. Methylene chloride was detected in GP5 at a concentration of 0.0289 mg/kg. Toluene was detected at a concentration of 0.0442 mg/kg in GP5. Methylene chloride and toluene were considered to be SRCs in subsurface soil based on the Phase I RFI.

SVOCs. No SVOCs were detected in subsurface soil during the Phase I RFI.

RCRA Metals. Barium, cadmium, chromium, lead, and selenium were detected in subsurface soil. Barium, chromium, and lead were detected in three out of four subsurface soil samples. Cadmium was detected in two out of four subsurface soil samples. Selenium was detected in GP5 only. None of the subsurface soil concentrations were detected above the reference background criteria; therefore, RCRA metals were not considered to be SRCs in subsurface soil based on the Phase I RFI.

2.1.3 Groundwater

Six groundwater samples were collected using DPT techniques during the Phase I RFI. The groundwater samples were analyzed for VOCs, SVOCs, and total and dissolved RCRA metals. The results of the groundwater analyses are presented in Table 3 and Figure 5.

VOCs. Only one VOC, benzene, was detected in groundwater. Benzene was detected at a concentration of 2.4 µg/L at GP6. Benzene was considered to be an SRC in groundwater based on the Phase I RFI.

SVOCs. Eleven SVOCs were detected in groundwater: 1,2-dichlorobenzene; 4-chloro-3-methylphenol; benzo(*a*)anthracene; benzo(*a*)pyrene; benzo(*b*)fluoranthene; benzo(*g,h,i*)perylene; bis(2-ethylhexyl)phthalate; chrysene; fluoranthene; indeno(*1,2,3-cd*)pyrene; and pyrene. The highest occurrence of SVOCs (eight out of 11 samples) was in groundwater samples collected at GP4 and GP6; the same SVOCs were detected at both sampling locations. Benzo(*a*)anthracene was detected at concentrations of 13.7 µg/L at GP4 and 17.3 µg/L at GP6. Benzo(*a*)pyrene was detected at concentrations of 12.6 µg/L at GP4 and 14.3 µg/L at GP6. Benzo(*b*)fluoranthene was detected at concentrations of 23 µg/L at GP4 and 27.5 µg/L at GP6. Benzo(*g,h,i*)perylene was detected at concentrations of 7 µg/L at GP4 and 9.4 µg/L at GP6. Chrysene was detected at concentrations of 18.4 µg/L at GP4 and 22.8 µg/L at GP6. Fluoranthene was detected at concentrations of 18 µg/L at GP4 and 19 µg/L at GP6. Indeno(*1,2,3-cd*)pyrene was detected at concentrations of 6.5 µg/L at GP4 and 8.2 µg/L at GP6. Pyrene was detected at concentrations of 35 µg/L at GP6 and 41.7 µg/L at GP4. The remaining three SVOCs were detected in groundwater samples collected from three other locations: 4-chloro-3-methylphenol was detected at concentrations of 16 µg/L at GP1 and 18.2 µg/L at GP5; bis(2-ethylhexyl)phthalate at 22 µg/L at GP2; and 1,2-dichlorobenzene at 7.4 µg/L at GP3. Bis(2-ethylhexyl)phthalate and benzo(*a*)pyrene were detected at concentrations above their respective maximum contaminant levels (MCLs). These 11 SVOCs were considered to be SRCs in groundwater based on the Phase I RFI.

RCRA Metals. Barium, chromium, mercury, and selenium were detected in the groundwater; however, only mercury was detected above the reference background criterion. Mercury was detected at a concentration of 0.89 µg/L at GP5. Mercury was considered to be an SRC in groundwater based on the Phase I RFI.

2.1.4 Conclusions and Recommendations of the Phase I RFI

Toluene, 10 SVOCs, and six RCRA metals were identified as SRCs in surface soil. Of these, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, and lead were identified as human health contaminants of potential concern (HHCOPCs). Methylene chloride and toluene were identified as SRCs in subsurface soil. Of the SRCs in surface and subsurface soil, methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and lead exceeded their respective generic soil screening levels (GSSLs) and were identified as contaminant migration contaminants of potential concern (CMCOPCs) in soil. Benzene, 11 SVOCs, and mercury were identified as SRCs in groundwater. Bis(2-ethylhexyl)phthalate and benzo(*a*)pyrene were detected at concentrations above their respective MCLs. Benzene; 1,2-dichlorobenzene; bis(2-ethylhexyl)phthalate; benzo(*a*)anthracene; benzo(*a*)pyrene; benzo(*b*)fluoranthene; benzo(*g,h,i*)perylene; chrysene; indeno(*1,2,3,-cd*)pyrene; 4-chloro-3-methylphenol; and mercury were identified as HHCOPCs in groundwater. Mercury and nine SVOCs were identified as ecological contaminants of potential concern (ECOPCs) based on the potential hazards to aquatic biota if groundwater discharges to a nearby surface water body. Therefore, the Phase I RFI concluded [see page 10.8-8, Section 10.8.8.2 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000)] that the vertical and horizontal extent of potential soil and groundwater contamination had not been determined and recommended that additional soil and groundwater sampling be performed. The groundwater sampling consisted of additional screening and installation of shallow and deep groundwater monitoring wells (upgradient and downgradient).

3.0 SUMMARY OF PHASE II RCRA FACILITY INVESTIGATION

The extent of potential soil and groundwater contamination was not determined by the Phase I RFI; therefore, DPT techniques were used to collect eight groundwater screening samples to determine the horizontal and vertical extent of groundwater contamination. The DPT groundwater screening samples were analyzed for VOCs and SVOCs. Two vertical-profile borings were installed at the groundwater screening locations that indicated the highest levels of contamination to investigate the vertical extent of contamination. The vertical-profile samples were analyzed for only VOCs. The results of the groundwater screening were used to locate nine monitoring wells (six shallow and three deep) at the site. One shallow and one deep monitoring well were installed upgradient (background). Boring logs and monitoring well diagrams are presented in Appendices A (page A.9-1) and B (page B.7-1) of the revised final Phase II RFI Report (SAIC 2000), respectively. The Phase II RFI sampling locations are shown in Figure 6. Monitoring well construction details are presented in Table 4. Two soil samples were collected from each monitoring well location. In addition, six surface soil samples were collected in areas that indicated elevated surface soil contamination during the Phase I RFI. Two soil samples were collected at each well following the procedures outlined in the revised final SAP for Phase II RFIs of 16 SWMUs (SAIC 1997). Surface soil samples [0 foot to 2 feet below ground surface (bgs)] were collected at each monitoring well location and six additional locations to evaluate the potential risk to ecological receptors. The soil samples were analyzed for VOCs, SVOCs, and RCRA metals. Three of the surface soil samples (SS7, SS8, and SS9) received only RCRA metals analysis.

Geotechnical samples were collected from the monitoring wells, and the results are presented in Table 5. Monitoring well development data are presented in Table 6. Only three of the nine wells were developed until the turbidity was less than or equal to 10 nephelometric turbidity units (NTUs). The highest turbidities were associated with the deep well installations (MW2, MW7, and MW9). These deep well installations extended into the Hawthorn confining (clay) layer, and sandy/clay was being encountered at the time of the elevated readings. Slightly elevated turbidities (70.2 NTUs and 75.2 NTUs, respectively) were also indicated in shallow monitoring wells MW4 and MW5 (Table 6). The turbidities remained elevated and constant during well development. Groundwater samples collected from the monitoring wells were analyzed for VOCs, SVOCs, and RCRA metals. Conductivity, pH, temperature, dissolved oxygen (DO), oxidation-reduction potential (Redox), and turbidity were measured in the field during sampling, and the results are presented in Table 7. High turbidities were also associated with the groundwater samples collected from the three deep monitoring wells (MW2, MW7, and MW9) during groundwater sampling.

All wells were sampled using low-flow techniques. The sampling locations are presented in Figure 6. The soil and groundwater samples obtained during well installation were analyzed for VOCs, SVOCs, and RCRA metals.

4.0 PHYSICAL CHARACTERISTICS OF THE SITE

4.1 TOPOGRAPHY

The site is generally level and covered with concrete or gravel around Building 1056. The site is heavily congested with stored equipment (e.g., motors, metal boxes). The surface elevation of the site is approximately 85.5 feet above mean sea level (amsl).

4.2 SURFACE DRAINAGE

There are no surface water/sediment migration pathways at the site. Former drain lines from the facility might have discharged to a ditch alongside Building 1056 that is no longer present or a ditch alongside Tilton Avenue. The closest surface water feature is an approximately 6-foot-deep, man-made drainage ditch located approximately 500 feet to the west (see Figure 2). This ditch is capable of intercepting the shallow groundwater from the site. The drainage ditch ultimately discharges into Mill Creek, approximately 2,600 feet to the west. In addition, a tributary of Mill Creek is located approximately 1,200 feet to the south. The deep surficial groundwater may intercept this tributary. Therefore, based on current site conditions, a direct surface water/sediment pathway does not exist for SWMU 24B.

4.3 SOIL

The soil present across the site consists of alternating layers of sand and silty to clayey sands, as indicated in cross sections A-A' and B-B' (Figures 7 and 8, respectively).

4.4 HYDROGEOLOGY

Groundwater was encountered at approximately 6 feet to 8 feet bgs in the monitoring wells during the Phase II RFI. The shallow surficial groundwater flow direction across the site is to the west. The deep surficial groundwater flow direction is to the southwest to south. The hydraulic gradients of the shallow and deep surficial groundwater are 0.0098 foot/foot and 0.012 foot/foot, respectively. The shallow surficial groundwater flow may intercept the man-made drainage ditch located approximately 500 feet to the west. The deep surficial groundwater flow may intercept a tributary of Mill Creek, approximately 1,200 feet to the south. Potentiometric surface maps of the shallow and deep groundwater systems are provided as Figures 9 and 10.

4.5 ECOLOGY

As stated in Section 8.2 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000), SWMU 24B is classified as an "industrialized area." The site lies within an industrialized area of the garrison area (see Figure 2), and its ecological habitat consists of small patches of grasses amongst buildings and structures. The site is primarily surrounded by gravel and/or concrete/asphalt.

5.0 NATURE AND EXTENT OF CONTAMINATION

5.1 SURFACE SOIL

Fifteen surface soil samples were collected from the uppermost 1 foot to 2 feet of the monitoring well borings and from the top foot of soil at the surface sample locations. The results of these analyses are presented in Table 8 and Figure 11. Chain-of-custody forms and complete analytical results are presented in Appendix G (page G-175) and Appendix H (page H.10-1), respectively, of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

VOCs. 2-Butanone and acetone were detected in SS6 at concentrations of 0.0054 mg/kg and 0.045 mg/kg, respectively. Carbon disulfide was detected in three out of 12 surface soil samples at concentrations of 0.0044 mg/kg at MW8, 0.0074 mg/kg at MW6, and 0.0078 mg/kg at MW2 (the site-specific background location). 2-Butanone, acetone, and carbon disulfide are considered to be SRCs in surface soil based on the Phase II RFI.

SVOCs. Seventeen SVOCs were detected in 12 of the surface soil samples collected during the Phase II RFI (three samples were analyzed for RCRA metals only). Ten of the SVOCs identified during the Phase I investigation were also detected in the Phase II RFI samples at higher concentrations than those identified during the Phase I investigation.

2-Methylnaphthalene was detected at concentrations of 0.206 mg/kg at SS6 and 0.962 mg/kg at MW2 (the site-specific background location). Acenaphthene was detected at a concentration of 0.0196 mg/kg at SS5. Acenaphthylene was detected in six out of 12 samples at concentrations ranging from 0.0707 mg/kg at SS5 to 6.3 mg/kg at MW2 (the site-specific background location). Anthracene was detected in five out of the 12 samples at concentrations ranging from 0.0447 mg/kg at SS5 to 2.36 mg/kg at MW5. Benzo(*a*)anthracene was detected in five out of 12 samples at concentrations ranging from 0.268 mg/kg at SS5 to 38.8 mg/kg at MW5. Benzo(*a*)pyrene was detected in six out of 12 surface soil samples at concentrations ranging from 0.33 mg/kg at SS5 to 48.1 mg/kg at MW5. Benzo(*b*)fluoranthene was detected in five out of 12 surface soil samples at concentrations ranging from 0.699 mg/kg at SS5 to 30.2 mg/kg at MW5. Benzo(*g,h,i*)perylene was detected in four samples at concentrations ranging from 0.281 mg/kg at SS5 to 27.3 mg/kg at MW2 (the site-specific background location). Benzo(*k*)fluoranthene was detected at concentrations of 37.9 mg/kg at MW2 (the site-specific background location) and 49.3 mg/kg at MW5. Chrysene was detected in five samples at concentrations ranging from 0.422 mg/kg at SS5 to 51.4 mg/kg at MW5. Di-*N*-octyl phthalate was detected at a concentration of 0.22 mg/kg at SS5. Fluoranthene was detected in five samples at concentrations ranging from 0.549 mg/kg at SS5 to 44 mg/kg at MW5. Fluorene was detected at concentrations of 0.228 mg/kg and 0.943 mg/kg at SS6 and MW2 (the site-specific background location), respectively. Indeno(*1,2,3-cd*)pyrene was detected in five samples at concentrations ranging from 0.276 mg/kg at SS5 to 30.7 mg/kg at MW5. Naphthalene was detected at concentrations of 0.714 mg/kg at MW2 (the site-specific background location) and 0.443 mg/kg at SS6. Phenanthrene was detected in five out of 12 surface soil samples at concentrations ranging from 0.23 mg/kg at SS5 to 8.21 mg/kg at MW5. Pyrene was detected in six samples at concentrations ranging from 0.815 mg/kg at SS5 to 79.7 mg/kg at MW5. All ten of the SVOCs identified during the Phase I RFI were detected at higher concentrations during the Phase II investigation, and all of the maximum concentrations were detected in MW2 or MW5 during the Phase II investigation. 2-Methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, di-*N*-octyl phthalate, fluoranthene, fluorene, indeno(*1,2,3-cd*)pyrene, naphthalene, phenanthrene, and pyrene are considered to be SRCs in surface soil based on the Phase II RFI.

RCRA Metals. All 15 surface soil samples were analyzed for RCRA metals. Arsenic was not detected above the background reference criterion in the Phase II RFI samples. Barium, cadmium, chromium, lead, and mercury were detected above the reference background criteria in both Phase I and Phase II RFI samples. Barium was detected above its reference criterion (14.7 mg/kg) in seven out of the 15 surface soil samples at concentrations ranging from 19 mg/kg at SS6 to 111 mg/kg at SS7. Cadmium was detected in six surface soil samples above the reference background criterion at concentrations ranging from 0.39 mg/kg at SS6 to 2.7 mg/kg at SS8. Chromium was detected in every sample, but the concentrations in only two samples—7.6 mg/kg at SS8 and 9.1 mg/kg at MW1 (the site-specific background location)—exceeded the reference background criterion. Lead exceeded the reference background criterion in nine out of 15 surface soil samples at concentrations ranging from 10.8 mg/kg at MW5 to 64.3 mg/kg at SS8. Selenium was detected in only three out of 15 samples at concentrations that exceeded the background criterion: 0.6 mg/kg at SS5, 0.53 mg/kg at

SS7, and 0.43 mg/kg at SS8. Silver was detected twice at concentrations exceeding the reference background criterion: 0.16 mg/kg at SS8 and 0.3 mg/kg at MW1 (the site-specific background location). Barium, chromium, lead, and silver were detected above the reference background criteria at the site-specific background location (MW1 and/or MW2, a shallow and deep monitoring well pair). Elevated concentrations of metals in the background are the results of the highly industrialized nature of the entire area. Barium, cadmium, chromium, lead, mercury, selenium, and silver are considered to be SRCs in surface soil based on the Phase II RFI.

5.2 SUBSURFACE SOIL

Nine subsurface soil samples were collected during the installation of the monitoring wells. The results of the subsurface soil analyses are presented in Table 9 and Figure 12. Chain-of-custody forms and complete analytical results are presented in Appendix G (page G-175) and Appendix H (page H.10-1), respectively, of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

VOCs. 2-Butanone was detected at a concentration of 0.0144 mg/kg in MW1 (the site-specific background location). Acetone and benzene were also detected in MW1 at concentrations of 0.0534 mg/kg and 0.0036 mg/kg, respectively. Carbon disulfide was detected in two samples at concentrations of 0.0039 mg/kg at MW1 (the site-specific background location) and 0.0024 mg/kg at MW8. Ethylbenzene was detected at concentrations of 0.0698 mg/kg and 0.0043 mg/kg at MW1 and MW2 (the site-specific background locations), respectively. Tetrachloroethene, toluene, and trichloroethene were detected at concentrations of 0.004 mg/kg, 0.0369 mg/kg, and 0.0026 mg/kg at MW4, MW1 (the site-specific background location), and MW4, respectively. Total xylenes were detected at concentrations of 2.05 mg/kg and 0.0102 mg/kg at MW1 and MW2 (the site-specific background locations), respectively. Carbon disulfide, tetrachloroethene, and trichloroethene are considered to be SRCs in subsurface soil based on the Phase II RFI. Six additional VOCs were detected at only background location MW1 and are not considered to be SRCs. The detection of VOCs at the background location is the result of SWMU 24B being located in a heavily industrialized area.

SVOCs. Pyrene was detected at a concentration of 0.0392 mg/kg at MW3. Pyrene is considered to be an SRC in subsurface soil based on the Phase II RFI.

RCRA Metals. Mercury was detected in all nine subsurface soil samples and exceeded its reference background criterion (0.05 mg/kg) in seven samples, with concentrations ranging from 0.07 mg/kg at MW4 to 0.24 mg/kg at MW9. Selenium slightly exceeded its reference background criterion (1.12 mg/kg) in one sample, with a concentration of 1.2 mg/kg at MW7. Mercury and selenium are considered to be SRCs in subsurface soil based on the Phase II RFI.

5.3 GROUNDWATER

Eight groundwater screening samples were obtained using DPT techniques. The groundwater screening samples were analyzed for VOCs and SVOCs. In addition, two vertical-profile borings were installed at the groundwater screening locations that indicated the highest levels of VOC contamination to investigate the vertical extent of contamination. The vertical-profile groundwater samples were analyzed for only VOCs. Nine groundwater samples were collected from the monitoring wells and analyzed. The groundwater from the monitoring wells was analyzed for VOCs, SVOCs, and RCRA metals. The results of the groundwater analyses from Geoprobes and vertical profiles are presented in Table 10, and the results of the groundwater analysis from monitoring wells are presented in Table 11. All the groundwater results are summarized in Figure 13.

Chain-of-custody forms and complete analytical results are presented in Appendix G (page G-175) and Appendix H (page H.10-1), respectively, of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

5.3.1 Shallow Surficial Groundwater

The shallow surficial groundwater was evaluated using the results of the groundwater screening samples (GP7 through GP16), shallow vertical-profile samples [VP1 (11 feet to 15 feet bgs) and VP2 (7 feet to 11 feet bgs)], and the shallow monitoring well samples (MW1, MW3, MW4, MW5, MW6, and MW8).

VOCs. No VOCs were detected in shallow surficial groundwater during the Phase II RFI.

SVOCs. Twelve SVOCs were detected in shallow surficial groundwater. 1,2-Dichlorobenzene was detected at a concentration of 8.3 µg/L at GP9. Benzo(*b*)fluoranthene was detected in six of the DPT samples (but none of the monitoring well samples) at concentrations ranging from 2.4 µg/L at GP13 to 306 µg/L at GP10. Benzo(*k*)fluoranthene was detected in four DPT samples at concentrations ranging from 3 µg/L at GP7 to 109 µg/L at GP10. Dibenzo(*a,h*)anthracene was detected at a concentration of 7.6 µg/L at GP7. Indeno(*1,2,3-cd*)pyrene was detected in five DPT samples at concentrations ranging from 2.9 µg/L at GP14 to 243 µg/L at GP10. Naphthalene was detected in one DPT sample at a concentration of 6.8 µg/L at GP9. Pyrene was detected in four DPT samples at concentrations ranging from 3.8 µg/L at GP7 to 94.8 µg/L at GP10. A number of SVOCs were detected in the same two samples, GP14 and GP16. These two samples were found to contain benzo(*a*)anthracene at concentrations of 5.1 µg/L and 5.6 µg/L, benzo(*a*)pyrene at concentrations of 5.9 µg/L and 5.4 µg/L, benzo(*g,h,i*)perylene at concentrations of 3.3 µg/L and 3.6 µg/L, chrysene at concentrations of 6.1 µg/L and 6.6 µg/L, and fluoranthene at concentrations of 5.4 µg/L and 5.1 µg/L, respectively. No SVOCs were detected in any of the monitoring wells. 1,2-Dichlorobenzene; benzo(*a*)anthracene; benzo(*a*)pyrene; benzo(*b*)fluoranthene; benzo(*g,h,i*)perylene; benzo(*k*)fluoranthene; chrysene; dibenzo(*a,h*)anthracene; fluoranthene; indeno(*1,2,3-cd*)pyrene; naphthalene; and pyrene are considered to be SRCs in the shallow surficial groundwater based on the Phase II RFI.

RCRA Metals. Only chromium was detected above the reference background criterion in the shallow surficial groundwater. Chromium was detected at a concentration of 7.5 µg/L in MW8. Filtered metals analysis was also performed on groundwater collected from MW6, the only shallow surficial groundwater sample with a metal (chromium) indicated above the reference background criterion. The filtered concentration of chromium was nondetect, indicating that the elevated concentration was probably the result of particulates or colloids in the water. Chromium is considered to be an SRC in the shallow surficial groundwater.

5.3.2 Deep Surficial Groundwater

The deep surficial groundwater was evaluated using the results of the deep vertical-profile samples [VP1 (21 feet to 25 feet bgs)] and the deep monitoring well samples (MW2, MW7, and MW9).

VOCs. No VOCs were detected in the deep surficial groundwater during the Phase II RFI.

SVOCs. No SVOCs were detected in the deep surficial groundwater during the Phase II RFI.

RCRA Metals. Arsenic, barium, chromium, lead, and selenium were detected in the deep surficial groundwater. Arsenic, lead, and selenium were detected at only MW2, the deep site-specific background location, at concentrations of 15.8 µg/L, 43.6 µg/L, and 7.6 µg/L, respectively. Barium was detected at concentrations of 136 µg/L at MW2 (the site-specific background location) and 97 µg/L at MW9. Chromium was detected at concentrations of 89.4 µg/L at MW2 (the site-specific background location) and 10.7 µg/L at

MW9. The locations (MW2 and MW9) that indicated elevated metals constituents also had elevated turbidities (see Table 7) at the time of sampling. MW2 and MW9 had turbidities of 1,198 NTUs and 140 NTUs, respectively. The high turbidities are indicative of particulates or colloids in the groundwater that are probably the source of the elevated metals concentrations. Dissolved metals analysis was also preformed on groundwater from deep surficial monitoring wells MW2 and MW9, and the results are presented in Table 11. Except for barium at MW9, all of the filtered metals concentrations at these locations were either nondetect or below reference background criteria. Barium and chromium are considered to be SRCs in the deep surficial groundwater. The metals arsenic, lead, and selenium were detected above reference background criteria at only MW2, the deep groundwater background location; therefore, they are not considered to be SRCs in groundwater.

5.4 SURFACE WATER

No surface water samples were collected during the Phase II RFI because no surface water pathway exists at this site.

5.5 SEDIMENT

No sediment samples were collected during the Phase II RFI because no surface water/sediment pathway exists at this site.

5.6 SUPPLEMENTAL DATA EVALUATION (NOVEMBER 2000)

The final addendum for SWMU 24B dated August 2000 recommended that six additional surface soil samples be collected and that the groundwater monitoring wells (MW1 through MW9) be resampled using low-flow techniques. The surface soil was recommended for SVOC analysis only. The groundwater was recommended for only VOC and SVOC analyses. GEPD concurred with this recommendation and requested that the additional results be presented in the revised final addendum for SWMU 24B (this document). The results of the additional surface soil sampling and groundwater resampling, which was conducted in November 2000, are presented in the following sections.

5.6.1 Surface Soil

Six soil samples were collected from the uppermost 1 foot to 2 feet at locations farther from previously sampled locations. Figure 14 presents the locations of the additional sampling locations. The surface soil was analyzed for SVOCs only. Chain-of-custody forms and complete analytical results are presented in Attachment A of this revised final addendum report. The results of the laboratory analyses of the additional surface soil samples are summarized in Table 12 and Figure 14.

SVOCs. Fourteen SVOCs were detected in the six additional surface soil samples (SS10 through SS15). All of the SVOCs identified during the additional surface soil sampling were also detected in either the Phase I or Phase II investigation. Of these 14 SVOCs, seven were detected at higher concentrations than those identified during the Phase I or Phase II investigation.

Seven of the SVOCs were detected at all six sample locations. Benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, indeno(*1,2,3,-cd*)pyrene, and pyrene were detected at concentrations ranging from 1.1 mg/kg at SS12 to 9.56 mg/kg at SS14, 0.871 mg/kg at SS12 to 11.7 mg/kg

at SS14, 1.7 mg/kg at SS12 to 8.02 mg/kg at SS14, 1.33 mg/kg at SS12 to 9.86 mg/kg at SS12, 1.12 mg/kg at SS12 to 10.4 mg/kg at SS14, 1.06 mg/kg at SS12 to 6.32 mg/kg at SS14, and 1.06 at SS12 to 80.6 mg/kg at SS10, respectively. Three of the SVOCs were detected in five of the six surface soil locations. Acenaphthylene, benzo(*a*)anthracene, and fluoranthene were detected at concentrations ranging from 0.842 mg/kg at SS15 to 8.53 mg/kg at SS10, 2.73 mg/kg at SS11 to 34.6 mg/kg at SS10, and 2.38 mg/kg at SS11 to 35.8 mg/kg at SS10, respectively. Anthracene was detected at concentrations of 2.78 mg/kg at SS10 and 1.02 mg/kg at SS14. Fluorene was detected at a concentration of 0.825 mg/kg at SS10. Phenanthrene was detected in four of the six surface soil samples at concentrations ranging from 0.816 mg/kg at SS13 to 3.35 mg/kg at SS10. Naphthalene was detected at a concentration of 0.68 mg/kg at SS10. Acenaphthylene, anthracene, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, fluorene, indeno(*1,2,3,-cd*)pyrene, naphthalene, phenanthrene, and pyrene are considered to be SRCs based on the additional surface soil sampling.

5.6.2 Groundwater

Groundwater samples collected from the monitoring wells were analyzed for VOCs and SVOCs only. Conductivity, pH, temperature, DO, Redox, and turbidity were measured in the field during sampling, and the results are presented in Table 13. High turbidities were associated with the groundwater samples collected from two (MW7 and MW9) of the three deep monitoring wells during groundwater sampling.

In addition, water levels were collected at the monitoring wells, and the results are presented in Table 14. Potentiometric surface maps of the shallow and deep groundwater systems based on the water levels from the resampling are provided as Figures 15 and 16, respectively. The shallow surficial groundwater flow direction across the site is to the west. The deep surficial groundwater flow direction is to the southwest to south. The hydraulic gradients of the shallow and deep surficial groundwater are 0.009 foot/foot and 0.013 foot/foot, respectively. These values are similar to hydraulic gradients measured during the Phase II RFI (Section 4.4).

The analytical results of the groundwater analysis from the resampling of the monitoring wells are presented in Table 15 and Figure 14. Chain-of-custody forms and complete analytical results are presented in Attachment A of this revised final addendum report.

VOCs. Trichloroethene was detected at a concentration of 2.6 µg/L at MW4, a shallow monitoring well. No other VOCs were detected in groundwater. Trichloroethene is considered to be an SRC in groundwater based on the groundwater resampling.

SVOCs. No SVOCs were detected in groundwater from the resampling of the monitoring wells, As discussed in Section 10.3, all of the elevated levels of SVOCs during the Phase II RFI were detected in groundwater from DPT (screening) locations. The groundwater from the DPT locations was sampled immediately upon installation and without any development; therefore, the DPT groundwater samples were highly turbid. The elevated concentrations of SVOCs were believed to be the result of particulates in the groundwater, and resampling of the groundwater was recommended in the final addendum report for SWMU 24B dated August 2000. This resampling of the groundwater confirmed that the SVOCs detected in groundwater were the result of particulates in the groundwater samples collected using DPT; therefore, no SVOC is considered to be an SRC in groundwater.

5.7 SITE-RELATED CONTAMINANT SUMMARY

Soil samples collected during the Phase I RFI, Phase II RFI, and supplemental data collection dated November 2000 were used to determine the SRCs in surface and subsurface soil. SRCs for VOCs and SVOCs in groundwater were determined using only the most current groundwater characterization data (the groundwater resampling from November 2000). Because RCRA metals analysis was not performed during the resampling of November 2000, metal results from the Phase II RFI were used to determine metals SRCs in groundwater. The results for the shallow and deep surficial groundwater were combined to determine the SRCs. The SRCs by medium and the corresponding maximum concentrations are presented in Table 16.

6.0 FATE AND TRANSPORT CONSIDERATIONS

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs (Table 17).

Of the organic SRCs identified in soil, methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene exceeded their respective GSSLs and are considered to be CMCOPCs in soil based on leaching to groundwater. Of the metal SRCs, arsenic, barium, cadmium, chromium, lead, mercury, and selenium exceeded their respective GSSLs.

None of the VOCs or SVOCs that were identified as CMCOPCs were detected in groundwater from the monitoring wells. Of the metals that were identified as CMCOPCs, only barium and chromium were detected at concentrations above their reference background criteria. Methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, barium, cadmium, chromium, lead, mercury, and selenium are considered to be CMCOPCs in soil.

7.0 HUMAN HEALTH PRELIMINARY RISK EVALUATION, SWMU 24B

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

7.1 EXPOSURE EVALUATION

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors. This is a preliminary evaluation that is used to evaluate and select the appropriate screening values used in the HHPRE.

7.1.1 Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include the following:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

7.1.2 Migration and Exposure Pathway Analysis

The site is covered by concrete and structures, with a small weedy/grassy area to the north and northeast. To the west of the site is a gravel parking area between Building 1056 and Tilton Avenue.

Potential migration pathways for surface soil include leaching into groundwater and release of volatile compounds into the air. Given the concrete, gravel, and vegetative cover at the site, release of fugitive dust is not a significant exposure pathway. Bioaccumulation into wildlife is also not a viable migration pathway.

The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with Risk-based Corrective Action (RBCA) guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

7.2 RISK EVALUATION

The results of the human health risk screening are given below.

SRCs for surface soil include four VOCs, 17 SVOCs, and eight metals. The maximum concentrations of benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, and lead exceeded their respective screening values (Table 18). None of the remaining SRCs had concentrations that exceeded their respective screening concentrations for ingestion of soil.

The maximum concentration for benzo(*a*)pyrene (48.1 mg/kg) was more than two orders of magnitude greater than its screening value for soil ingestion (0.0875 mg/kg). The maximum concentrations for benzo(*b*)fluoranthene (40.9 mg/kg), benzo(*a*)anthracene (38.8 mg/kg), and indeno(*1,2,3-cd*)pyrene (30.7 mg/kg) were more than an order of magnitude greater than the applicable screening value for soil ingestion (0.875 mg/kg). The remaining compounds had maximum concentrations that were within an order of magnitude of their respective screening values. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, and lead are HHCOPCs in surface soil.

SRCs for subsurface soil include five VOCs, one SVOC (pyrene), and two metals (mercury and selenium). The maximum concentrations of all of these constituents were below their respective screening values (Table 18); therefore, there are no HHCOPCs in subsurface soil.

Trichloroethene was identified as an SRC in groundwater. The single detection of trichloroethene (2.6 µg/L) exceeded the screening value of 1.55 µg/L (Table 14). Trichloroethene is the only HHCOPC in groundwater.

7.3 UNCERTAINTIES

Not all of the polycyclic aromatic hydrocarbons (PAHs) had screening values; therefore, surrogate screening values (i.e., screening values for PAHs with similar structures) were used. For example, the screening value for anthracene was used for phenanthracene. The use of surrogate values introduces uncertainty into the assessment, given that minor differences in molecular structure can affect the toxicity of a compound; therefore, the actual screening value for the chemical might be greater or less than the value used. Additional uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0) of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

8.0 ECOLOGICAL PRELIMINARY RISK EVALUATION, SWMU 24B

The EPRE was conducted in accordance with GEPD (1996) guidance [see Chapter 8.0 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000)]. At sites where surface water, sediment, or groundwater was collected, an ecological screening value (ESV) comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

8.1 ECOLOGICAL SCREENING VALUE COMPARISON (STEP i)

There is no surface water or sediment at SWMU 24B.

Two RCRA metals—barium and chromium—were detected in groundwater at concentrations exceeding the reference background criteria. One VOC (trichloroethene) was detected in shallow surficial groundwater. The results of the ESV comparison for groundwater are presented in Table 19. The only ECOPC identified by the ESV comparison for groundwater was barium. Barium was detected only in deep surficial groundwater. Barium concentrations in shallow surficial groundwater were below the reference background criterion, and therefore, barium is not an SRC in shallow surficial groundwater and was not evaluated further in shallow surficial groundwater. The deep groundwater was evaluated in Steps ii through v.

The site is an industrial area with little vegetated or exposed surface soil. Only surface soil samples from vegetated or exposed soil sites (i.e., not under concrete/asphalt) were evaluated in the EPRE. The surface soil locations potentially impacting ecological receptors included SS1 and SS2 collected during the Phase I RFI (January 1998); SS4, SS5, SS6, SS7, and MW4 collected during the Phase II RFI (October 1999); and SS10, SS11, SS12, SS13, SS14, and SS15 collected during the supplemental sampling performed in November 2000 (see Section 5.6). The SRCs identified from this set of surface soil samples are presented in Table 20.

8.2 PRELIMINARY PROBLEM FORMULATION (STEP ii)

The ecological habitat for the site is described in Section 4.5 of this addendum. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

8.3 PRELIMINARY EFFECTS (STEP iii)

In the EPRE, toxicity reference values (TRVs) were required for shrews and robins ingesting biota exposed to surface soil, mink and green heron ingesting biota, and raccoons ingesting water in downgradient surface water bodies if deep groundwater discharges to downgradient surface water. The derivation of no observed adverse effect levels (NOAELs) for test species is shown in Table 21 for mammals and Table 22 for birds. The derivation of TRVs for surrogate species from the test species NOAELs is shown in Table 23 for raccoons, shrews, and mink and in Table 24 for American robins and green herons.

For the uncertainty discussion, the derivation of lowest observed adverse effect levels (LOAELs) for test species is shown in Table 25 for mammals and Table 26 for birds. The derivation of TRVs for surrogate species from the test species LOAELs is shown in Table 27 for raccoons, shrews, and mink and in Table 28 for robins and green herons.

8.4 PRELIMINARY EXPOSURE (STEP iv)

Ecological receptors at the site are probably exposed by ingestion of biota exposed to surface soil and ingestion of surface water and aquatic biota if deep groundwater discharges to downgradient surface water bodies. The exposure parameters for the surrogate species—shrews, raccoons, robins, mink, and green herons—are presented in Table 8-7 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

8.5 PRELIMINARY RISK CALCULATION (STEP v)

The preliminary risk calculation (Step v) uses hazard quotients (HQs), the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate a hazard index (HI). Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins potentially exposed to ECOPCs detected in surface soil at the site are presented in Table 29. This table shows the maximum detected concentrations, average daily doses (ADDs), TRVs, and HQs for the receptors. The ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species are benzo(*k*)fluoranthene, benzo(*a*)pyrene, and pyrene for shrews only; cadmium and lead for shrews and robins; and chromium and selenium for robins only. The benzo(*a*)pyrene, benzo(*k*)fluoranthene, and pyrene HQs for shrews are 1.04, 1.16, and 1.9, respectively. The cadmium HQs are 17.7 for shrews and 56 for robins. The lead HQs are 8.79 and 296 for shrews and robins, respectively. The chromium and selenium HQs for robins are 3.54 and 1.1, respectively. There are no TRVs for di-*N*-octyl phthalate, so this ECOPC is evaluated further using toxicity data for a surrogate, di-*N*-butyl phthalate, in the uncertainty discussion (see Section 8.6 of this addendum). The HI calculated for SVOCs for robins exceeds one (HI = 1.97); therefore, the eight PAHs with preliminary HQs for the robins greater than 0.1 are evaluated further in the uncertainty discussion.

Groundwater. The preliminary risk calculations for raccoons, mink, and green herons exposed to deep surficial groundwater potentially discharging to downgradient surface water bodies are presented in Table 30.

There are no ECOPCs in deep surficial groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species.

8.6 UNCERTAINTIES

The risks to ecological receptors from ECOPCs in surface soil and deep surficial groundwater at SWMU 24B are overestimated by the preliminary risk calculations.

The supplemental risk calculations for shrews and robins exposed to PAHs, di-*N*-octyl phthalate, cadmium, chromium, lead, and selenium in surface soil are presented in Tables 31 and 32, respectively. The TRVs for di-*N*-butyl phthalate and benzo(*a*)pyrene are used as surrogates for di-*N*-octyl phthalate and pyrene, respectively, because there are no TRVs for these SVOCs. The ADDs calculated using a realistic diet (EPA 1993), the site-specific area use factor (AUF), and the mean surface soil concentrations of ECOPCs do not exceed LOAEL–based TRVs (see Tables 27 and 28) (i.e., the HQs are less than one). In addition, the HI for SVOCs does not exceed 1.0. Therefore, ECOPCs in surface soil at SWMU 24B do not pose a risk to wildlife receptors.

Fate and transport modeling was performed to estimate the future concentrations of barium (ECOPC for aquatic biota) in deep surficial groundwater at the nearest surface water receptor, a tributary of Mill Creek located approximately 1,200 feet to the south. One-dimensional Analytical Solute Transport (ODAST) modeling (see Attachment B to this addendum) was performed to estimate the 70-year maximum exposure concentration of barium in surface water at the receptor. The modeling used the maximum concentration of barium and assumed a constant concentration at the source for 70 years. The ODAST modeling results are presented in Table B-5 of Attachment B to this addendum. The ODAST modeling estimated the barium concentration at the surface water receptor to be zero (0 µg/L); therefore, barium in deep groundwater at SWMU 24B does not pose a risk to aquatic biota.

9.0 HUMAN HEALTH BASELINE RISK ASSESSMENT, SWMU 24B

The purpose of the HHBRA is to quantify the potential risk associated with COPCs identified in the previous screening assessments (i.e., fate and transport analysis and human health preliminary risk assessment). If the estimated risk values for a receptor exceeded the target risk values, constituents of concern (COCs) were selected based on the risk value for that constituent. Remedial levels were derived for each of the COCs identified.

The HHPRE identified HHCOPCs in surface soil and groundwater that might present a potential risk to human health. The fate and transport analysis identified CMCOPCs that might leach into groundwater at concentrations that could present a significant risk to human health as a result of the use of groundwater as a source of residential drinking water. Based on GEPD (1996) and U.S. Environmental Protection Agency (EPA) Region IV (EPA 1995) guidance, an HHBRA is required for those constituents identified as COPCs, which include both HHCOPCs and CMCOPCs.

The HHBRA below quantifies the potential risk associated with constituents identified in the fate and transport analysis and the HHPRE as presenting a potential risk to human health. The potential risk for site-specific human receptor populations is quantified for those potential exposure pathways identified for each receptor population.

The HHBRA consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty. The discussion in the following sections presents the information required to evaluate the human health risks associated with COPCs at SWMU 24B. A detailed discussion of each of the five elements, including methodology, selection of exposure parameters, and analysis of inherent uncertainties, is provided in Appendix I of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

9.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Chapter 6.0) and the HHPRE (Chapter 7.0), respectively.

The preliminary CMCOPCs in soil include five PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene], seven metals (arsenic, barium, cadmium, chromium, lead, mercury, and selenium), and the VOC methylene chloride. Based on the results of the leachate modeling, cadmium, chromium, and lead are likely to migrate in concentrations that might present a significant risk to human health (see Section 9.2.3); therefore, the potential risks associated with these CMCOPCs leaching to groundwater were quantified. The remaining preliminary CMCOPCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, barium, mercury, selenium, and methylene chloride] were not considered to be CMCOPCs based on the results of the leachate modeling and were not evaluated further. The CMCOPCs and a summary of the leachate modeling results are presented in Table 33.

HHCOPCs have been identified for surface soil and groundwater. Surface soil HHCOPCs include six PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene] and two metals (arsenic and lead). Trichloroethene is the single groundwater HHCOPC. The HHCOPCs are listed in Table 34.

9.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

9.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

The Paint Booth was located in Building 1056, which is currently used as an equipment repair and storage area. The building is located in the southern portion of the garrison area on the eastern side of Tilton Avenue. Surface samples were collected from the area adjacent to the building. The site is covered by concrete and structures, with a small weedy/grassy area to the north and northeast. To the west of the site is a gravel parking area between the building and Tilton Avenue. A fence secures portions of the site, but the parking area next

to Tilton Avenue and the area along the southern portions of Building 1056 are not secured. The topography of the site is generally level and covered with concrete or gravel around the building. Runoff is not a likely migration pathway given the flat topography and absence of exposed surface soil.

Groundwater at this site migrates toward the west. A drainage ditch is located 500 feet to the west of the site. This drainage ditch is deep and is likely to receive groundwater discharge from the upper portions of the surficial groundwater aquifer. The drainage ditch ultimately discharges to Mill Creek. Constituents present in the upper portions of the groundwater aquifer might migrate to the drainage ditch.

9.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

Impacted environmental media at this site include surface soil and groundwater. Groundwater at this site migrates to a drainage ditch that feeds into Mill Creek.

The potential migration and exposure pathways for the various receptors are presented in Figure 17.

Current Land-use Populations. Given the current site conditions, potential receptor populations are not likely to be exposed to COPCs at the site. The site is currently within a secured area, which would limit current on-site receptors to occupational receptors. The soil is generally covered by either concrete or gravel, which would prevent migration of surface soil COPCs via wind erosion; however, occupational receptors may come in direct contact with the surface soil. An Installation worker may be exposed to constituents in surface soil via incidental ingestion and dermal contact.

Groundwater is not currently used for any purpose; therefore, direct exposure to groundwater is not likely to occur. Analysis of the hydrogeology of the site concluded that the maximum concentrations of COPCs in groundwater are not likely to migrate to surface water (see Attachment B); therefore, there are no current off-site receptor populations.

Future Land-use Receptor Populations. The potential on-site receptors for the future land-use scenario receptor populations include an on-site Installation worker, an on-site juvenile trespasser, an off-site juvenile wader, an off-site sportsman, and both an on-site and an off-site resident. Although no changes in land use are expected at this site, for the purposes of this risk assessment, it was assumed that groundwater drinking wells had been placed at the site and that the surface soil in the area had been exposed.

The on-site Installation worker might be exposed to COPCs in surface soil and groundwater. The potential exposure pathways include ingestion, dermal contact, and inhalation of fugitive dust. The exposure pathway for groundwater would be ingestion of drinking water.

The on-site juvenile trespasser might be exposed to COPCs in surface soil. The exposure pathways for surface soil include incidental ingestion, dermal contact, and inhalation of fugitive dust.

The on-site resident is presented for baseline purposes and is not considered to be a viable receptor population. The on-site resident might be exposed to COPCs in surface soil and groundwater. Potential exposure pathways for the on-site resident include incidental ingestion of soil, dermal contact with soil, inhalation of fugitive dust, ingestion of groundwater, and dermal contact with groundwater. The absence of volatile COPCs in

groundwater excludes inhalation as a potential exposure pathway. If the site was developed for residential purposes, it would be landscaped and vegetated; therefore, exposure via inhalation of fugitive dust is not a likely exposure pathway. However, as a conservative assumption, this pathway was evaluated.

Off-site migration includes fugitive dust and the migration of COPCs in groundwater. Future off-site receptor populations include an Installation worker, a resident, a juvenile wader, and a sportsman.

The off-site Installation worker might be exposed to COPCs in surface soil via inhalation of fugitive dust. This receptor might also be exposed to COPCs in groundwater via ingestion.

The off-site resident is likely to be exposed via inhalation of fugitive dust and exposure to COPCs in groundwater. Groundwater exposure pathways include ingestion, dermal contact, and inhalation of VOCs.

The off-site juvenile wader is representative of a juvenile playing in the drainage ditch, resulting in exposure to groundwater COPCs that have migrated to the surface water in the drainage ditch. Given the distance to the nearest surface water body from the site, exposure via inhalation of fugitive dust is not considered to be a viable exposure pathway. Exposure to COPCs in the surface water might occur via incidental ingestion and dermal contact.

The off-site sportsman represents an individual fishing in Mill Creek. This receptor might be exposed to COPCs in surface water via dermal contact and incidental ingestion. In addition, this receptor might be exposed via ingestion resulting from the bioaccumulation of COPCs in fish.

9.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to COPCs in groundwater is discussed in Appendix I, Section I.2.3 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). Exposure concentrations were calculated using either analytical results or environmental fate and transport models. The analytical results from the surface soil and groundwater samples were used to calculate the exposure concentrations in each of the respective environmental media. The exposure point concentrations were equal to 95 percent of the upper confidence limit of the mean, unless this value was greater than the maximum detected concentration. In that case, the exposure concentration defaulted to the maximum concentration. The values selected as the exposure concentrations for risk evaluation are presented in Table 34.

Exposure concentrations of fugitive dust in air were calculated using the formulas described in Appendix I, Section I.2.3 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). These values were based on the exposure concentrations for surface soil. For the purposes of estimating exposure of an off-site receptor to fugitive dust, it was assumed that no dilution of the air concentrations occurred and that the exposure concentrations for both on-site and off-site receptors were the same.

Similarly, the estimated concentrations for exposure of off-site receptors to COPCs in groundwater were assumed to be equal to the exposure concentrations for on-site receptors.

The off-site sportsman fishing in Mill Creek might be exposed to COPCs in groundwater that has migrated to the drainage ditch. The drainage ditch discharges directly into Mill Creek; however, this occurs only after major rain events. In addition, the drainage ditch receives effluent from several other sources before reaching Mill Creek. Modeling of the concentrations of COPCs migrating from the drainage ditch to Mill Creek is difficult because (1) migration is likely to take place only after a major rain event, when the concentrations of COPCs will be diluted by the precipitation; (2) the concentrations of COPCs in surface water will be diluted by other effluents before reaching Mill Creek; and (3) the COPC concentrations will be further diluted by

Mill Creek. As a conservative measure, it was assumed that the off-site receptor fishes in the drainage ditch. This is a very conservative assumption, given that fish populations are not found in this section of the drainage ditch, and the actual exposure concentrations for a sportsman fishing in Mill Creek are likely to be orders of magnitude less than the concentrations in the adjacent surface water. The concentrations of COPCs in fish were calculated by multiplying the surface water concentrations by the chemical-specific bioaccumulation factors.

Analysis of the hydrogeology of the area has concluded that COPCs in the upper portion of the surficial aquifer might migrate to a drainage ditch downgradient of the SWMU. Fate and transport modeling was performed for CMCOPCs in soil and for HHCOPCs in groundwater. The main purpose of the modeling was to estimate future groundwater concentrations from leachate beneath SWMU 24B and determine if COPCs in groundwater within the shallow portions of the surficial aquifer will migrate to the drainage ditch. The procedures used to estimate groundwater and surface water concentrations are discussed in Chapter 6.0 and Appendix K of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

Migration to Groundwater beneath the Source. The following constituents were identified as preliminary CMCOPCs: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and methylene chloride. The estimated groundwater concentrations resulting from the leaching of CMCOPCs from the soil above the water table were estimated using the Seasonal Soil Compartment (SESOIL) Model and a site-specific dilution factor. A discussion of the modeling parameters and application data used in SESOIL modeling is provided in Attachment B to this addendum.

The results of the SESOIL modeling are provided in Attachment B and summarized in Table 33. The modeling results indicated that benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, and methylene chloride will naturally attenuate before reaching the water table. The modeled concentration of arsenic (0.0193 mg/L) was below its MCL of 0.05 mg/L. In addition, the modeled concentrations of barium (1.15 mg/L), mercury (0.000764 mg/L), and selenium (0.024 mg/L) were below their MCLs of 2 mg/L, 0.002 mg/L, and 0.05 mg/L, respectively (see Table 33). These constituents are not considered to be CMCOPCs and are not assessed further in this risk assessment. The modeled concentrations of cadmium and chromium exceeded their respective MCLs (see Table 33). The modeled concentration of lead exceeded its action level. None of the PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene], methylene chloride, arsenic, barium, mercury, or selenium are considered to be CMCOPCs, so they are not addressed further in this HHBRA. The potential risks associated with the leaching of cadmium, chromium, and lead to groundwater were assessed.

Migration of Groundwater to Surface Water. Analysis of the hydrogeologic conditions at this site indicated that COPCs in the upper portion of the surficial aquifer might migrate to a drainage ditch located approximately 500 feet downgradient of the SWMU. The COPCs in the upper portion of the aquifer include groundwater HHCOPCs currently present within this portion of the aquifer and CMCOPCs that may leach to the upper aquifer in the future. For the purposes of evaluating the risk associated with exposure to groundwater COPCs in surface water, the groundwater data from the shallow portion of the surficial aquifer were screened. Trichloroethene was identified as an HHCOPC in the shallow surficial groundwater. The CMCOPCs (cadmium, chromium, and lead) were also evaluated.

The concentrations of groundwater COPCs were modeled to estimate concentrations of these COPCs in surface water in the drainage ditch. For the purposes of this HHBRA, potential surface water concentrations of COPCs in the drainage ditch under a future land-use scenario were assumed to be equal to the groundwater concentrations adjacent to the drainage ditch. This is a conservative assumption given that the groundwater is likely to be diluted upon discharge into the surface water. The concentrations of groundwater COPCs in fish

tissue were estimated by multiplying the estimated surface water concentrations by the constituent-specific bioconcentration factors.

The Analytical Transient 1-, 2-, 3-Dimensional (AT123D) Model was used to estimate the concentration of trichloroethene identified as an HHCOPC in groundwater adjacent to the drainage ditch (Table 35). A discussion of the modeling procedures and parameters used for the AT123D modeling is presented in Attachment B to this addendum. The modeling results indicated that trichloroethene will not migrate to the drainage ditch (Table 35); therefore, the risk associated with this constituent migrating to surface water is not addressed further in this HHBRA.

The ODAST Model was used to estimate the concentrations of the CMCOPCs (cadmium, chromium, and lead) in groundwater adjacent to the drainage ditch. A discussion of the modeling procedures and parameters used for the ODAST modeling is presented in Attachment B to this addendum. The results of the modeling are given in Table 36. The estimated lead concentration is 2.66×10^{-10} mg/L. This concentration is more than seven orders of magnitude below the action level for lead in drinking water, 0.015 mg/L. It is unlikely that lead at the estimated concentration will cause adverse health effects in exposed receptor populations; therefore, lead is not addressed further in this risk assessment. The modeled surface water concentrations for cadmium and chromium are within five orders of magnitude of their risk-based screening values (1.825 µg/L and 10.95 µg/L, respectively); therefore, cadmium and chromium are addressed as potential COPCs in surface water.

9.2.4 Quantification of Exposure

The equations used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). The default exposure factors for the current on-site trespasser assumed that the child spends all of his time on the site. The exposure parameter values used to estimate potential exposure are given in Table 37. Potential noncarcinogenic and carcinogenic intakes were estimated, when appropriate, for each receptor population for all applicable pathways.

Surface soil at SWMU 24B is currently covered by gravel, with scattered areas covered by grass, concrete, and asphalt. The current on-site receptor is represented by the Installation worker. Groundwater is not currently used for any purposes; therefore, the Installation worker may be exposed to COPCs in only surface soil. The estimated intakes for the Installation worker are given in Table 38. Given that the ground cover would prevent off-site migration of surface soil COPCs and the absence of current receptors for groundwater, there are no current off-site receptor populations.

Future on-site receptor populations include an Installation worker, a juvenile trespasser, and a resident. The estimated intakes for the Installation worker and the juvenile trespasser are given in Tables 39 and 40, respectively. The resident population is divided into a resident child and a resident adult because the differences in behavior, exposure duration, and physiology between an adult and a child result in different doses of constituents in various environmental media. The child has a higher incidental soil ingestion rate because of the increased amount of hand-to-mouth behavior in children. This factor, coupled with the child's lower body weight, results in the child's receiving a higher dose of constituents in surface soil relative to the adult. The resident child is more sensitive to noncarcinogens than the resident adult. The increased exposure duration for the adult resident relative to the child resident results in a higher carcinogenic dose to the resident adult relative to the resident child; therefore, the resident adult is more sensitive to carcinogens in groundwater. However, the resident adult is not always more sensitive to exposure to carcinogens because this sensitivity changes with different environmental media. For the purposes of this risk assessment, the systemic and carcinogenic risks were estimated for the resident child, and the resident adult was assessed for only carcinogenic risk. The estimated intakes for the resident child and the resident adult are given in Tables 41 and 42, respectively.

Lead is a COPC in surface soil and groundwater as a result of leaching to groundwater. Exposure to lead is not assessed based on the applied dose of the constituent, but on the blood-lead concentrations. The blood-lead concentration is estimated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model for lead in children (EPA 1994a), which is based on daily exposure to lead in various environmental media. This model can be used to estimate blood-lead levels in children 0.5 year to 7 years old.

Based on the results of the groundwater modeling, lead may leach into groundwater, resulting in concentrations that exceed the Safe Drinking Water Act (SDWA) action level for lead; however, these levels are not likely to reach elevated concentrations for approximately 900 years (see Attachment B to this addendum). Therefore, populations in the near future (i.e., less than 900 years into the future) are likely to be exposed to lead in surface soil, but the groundwater exposure concentrations are likely to be close to background concentrations. The estimation of risks associated with exposure to lead takes into account exposure via air, surface soil, dust, groundwater, and food. All of these media are likely to contribute to lead exposure, even if the exposure is only representative of background concentrations. For the purposes of this risk assessment, the assessment of lead exposure was conducted for both a near-future and a future receptor.

The calculated exposure concentration for lead in surface soil (441 mg/kg) was used as the surface soil exposure concentration for the near-future receptor. This value was also used to calculate the air concentration of lead as a result of wind erosion. The groundwater exposure concentration assumed that the groundwater concentration for lead was equal to the background reference concentration of 4.69 μg/L. This is a conservative measure given that the measured concentrations of lead were below the background reference value. The default intake values for lead in food given in the IEUBK Model were used in estimating the total uptake of lead (EPA 1994a). The calculated surface soil exposure concentration and estimated modeled groundwater concentration were used to estimate the blood-lead levels for the future receptor. The IEUBK Model default intake values were also used for this scenario. For the purposes of estimating the exposure of children for both exposure scenarios, the default exposure parameters given in the IEUBK Model were used to estimate lead intakes (Table 43). As a conservative measure, the default intake values for lead in food were used in estimating the total uptake of lead. The potential intakes for the near-future and future receptor populations are given in Tables 44 and 45, respectively.

Future off-site receptors include an Installation worker, a juvenile wader, a resident child, a resident adult, and a sportsman. The estimated intakes for the off-site Installation worker are given in Table 46. The estimated intakes for the off-site residential receptors (child and adult) are given in Tables 47 and 48, respectively. As previously discussed, the potential intake of lead for children ages 0.5 year to 7 years of age was estimated using the IEUBK Model (EPA 1994a). Exposure of children to lead in fugitive dust was addressed under the on-site resident scenario. The results of the IEUBK Model indicated that lead exposure via inhalation was not significant (i.e., it was below 0.01 μg of lead per day); therefore, exposure to this constituent is not addressed further in this risk assessment. The intakes for the off-site juvenile wader and the off-site sportsman are given in Tables 49 and 50, respectively.

9.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 24B was carried out as described in Appendix I, Section I.3 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). Toxicity values for the COPCs addressed in this risk assessment are shown in Table 51. Toxicity profiles for the COPCs are given in Attachment C to this addendum.

Cadmium has two reference doses (RfDs), one for exposure via food and the other for exposure via water. The cadmium RfDs are based on toxokinetic models that estimate the applied dose for food and water. The toxokinetic model assumed 2.5 percent absorption of cadmium from food and 5 percent from water. The RfD for water was used to quantify the risks associated with exposure to cadmium in groundwater. Given that EPA has derived an acceptable absorbed dose for cadmium (0.000025 mg/kg/day), this value was used for the evaluation of dermal exposure to cadmium (EPA 2000b).

Chromium may exist in two valence states, trivalent and hexavalent chromium. For the purposes of this risk assessment, it was assumed that all chromium was the more toxic, hexavalent chromium.

No suitable dose-response values exist for assessing the risks associated with exposure to lead in groundwater via any of the three identified exposure pathways. EPA has developed the IEUBK Model, which is used to estimate blood-lead levels in children 0.5 year to 7 years old following exposure to lead in surface water. EPA has identified a blood-lead level of 10 µg/dL as a concentration of concern that should be avoided (EPA 1994a). If the blood-lead levels for children are less than 10 µg/dL, it can be inferred that there is no substantial risk for older receptors.

An oral RfD has not been developed for benzo(*g,h,i*)perylene. A review of the scientific literature by the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) concluded that no toxicological data were available to develop an RfD for this constituent or any C_{22} to C_{35} aromatic compounds (TPHCWG 1997). The TPHCWG stated that the RfD value for pyrene (0.03 mg/kg/day) could be used as a conservative surrogate because, given that pyrene has a lower carbon number, it is likely to be more toxic. Benzo(*g,h,i*)perylene is a questionable carcinogen. Numerous studies have failed to show an increase in the incidence of tumors (EPA 2000a). Given the lack of data, neither a cancer slope factor (CSF) nor a toxicity equivalence factor (TEF) has been derived for benzo(*g,h,i*)perylene.

CSFs were not directly derived for all of the carcinogenic PAHs. The CSFs for benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene were derived using TEFs based on the carcinogenic potency of these PAHs relative to benzo(*a*)pyrene. The CSF for these carcinogenic PAHs was calculated by multiplying the CSF for benzo(*a*)pyrene [oral = 7.3 $(mg/kg/day)^{-1}$ and inhalation = 3.1 $(mg/kg/day)^{-1}$] by the TEF. The TEF for benzo(*k*)fluoranthene is 0.01 (EPA 1995). The remaining PAHs [benzo(*a*)anthracene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene] have a TEF of 0.1 (EPA 1995).

9.4 RISK CHARACTERIZATION RESULTS

The risk characterization followed the procedures outlined in Appendix I, Section I.4 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). Quantitative estimates of noncarcinogenic and carcinogenic risks were calculated for the COPCs for each potentially complete exposure pathway and are discussed in Section 9.4.1 of this addendum.

The total HI and incremental lifetime cancer risk (ILCR) were calculated for each receptor, and these values were compared to a target risk value of 1.0 for the HI and 1×10^{-6} for the ILCR. If the risk values for a receptor exceeded these target risk values, then COCs were identified based on either the HI (HI greater than or equal to 0.1) or ILCR (ILCR greater than or equal to 1.0×10^{-6}).

The risk characterization follows the procedures outlined in Appendix I, Section I.4 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). Quantitative estimates of systemic risks (i.e., noncarcinogenic risks) and carcinogenic risks are calculated for each potentially complete exposure pathway.

9.4.1 Current Land-use Scenarios

The current on-site receptor population is an Installation worker. There are no current off-site receptor populations. The potential risk for the Installation worker is discussed below.

On-Site Installation Worker. The calculated risk values for the current on-site Installation worker are given in Table 52.

The HI for this receptor is 4.97×10^{-3}, which is more than two orders of magnitude below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR for this receptor is 1.06×10^{-4}, which is two orders of magnitude above the target risk value of 1×10^{-6}. The primary risk drivers consist of PAHs: benzo(*a*)pyrene (ILCR = 7.93×10^{-5}), benzo(*b*)fluoranthene (ILCR = 7.13×10^{-6}), benzo(*a*)anthracene (ILCR = 6.35×10^{-6}), and indeno(*1,2,3-cd*)pyrene (ILCR = 1.21×10^{-5}). The remaining COPCs had carcinogenic risks below 1×10^{-6}.

9.4.2 Future Land-use Scenarios

Future potential on-site receptors include an Installation worker, a juvenile trespasser, and a resident (child and adult). Future off-site receptors include an Installation worker, a resident (child and adult), a juvenile wader, and a sportsman. The potential risks to each of these receptor populations are discussed below.

On-site Installation Worker. The calculated risk values for the future on-site Installation worker are given in Table 53.

The total HI for this receptor is 0.97, which is below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR for this receptor is 1.07×10^{-4}, which is more than an order of magnitude above the target risk value of 1×10^{-6}. The primary risk drivers consist of PAHs in soil: benzo(*a*)pyrene (ILCR = 7.94×10^{-5}) and indeno(*1,2,3-cd*)pyrene (ILCR = 1.21×10^{-5}). The other risk drivers include benzo(*b*)fluoranthene (ILCR = 7.13×10^{-6}) and benzo(*a*)anthracene (ILCR = 6.35×10^{-6}) in soil. The remaining carcinogenic COPCs [arsenic, benzo(*k*)fluoranthene, and trichloroethene] have carcinogenic risk values below 1×10^{-6}.

On-site Juvenile Trespasser. The calculated risk values for the future juvenile trespasser are given in Table 54.

The total HI for this receptor is 7.26×10^{-4}, which is more than three orders of magnitude below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR for this receptor is 8.78×10^{-6}, which exceeds the target risk value of 1×10^{-6}. The major risk driver for this receptor is benzo(*a*)pyrene (6.56×10^{-6}). The remaining COPCs have carcinogenic risks below 1×10^{-6}.

On-site Resident Child. The calculated risk values for the future on-site resident child are given in Table 55.

The total HI for this receptor is 6.97, which exceeds the target value of 1.0. The primary risk drivers are metals that potentially leach to groundwater. The primary risk drivers include chromium (HI = 4.75) and cadmium (HI = 2.14). The remaining COPCs have HIs below 0.1.

The estimated blood-lead level for the near-future receptor population ranges from 4.3 μg/dL for the 6-year-old to 7-year-old age group to 7.6 μg/dL for the 1-year-old to 2-year-old age group (Table 56). These values are below the target value of 10 μg/dL; therefore, adverse health effects are not expected for this receptor population.

The estimated blood-lead level for the future receptor population ranges from 33.5 μg/dL for the 0.5-year-old to 1-year-old age group to 47.9 μg/dL for the 5-year-old to 6-year-old age group (Table 57). These values exceed the target value of 10.0 μg/dL; therefore, children are at potential risk from exposure to lead that has leached into groundwater.

The total ILCR for this receptor is 1.64×10^{-4} (Table 55), which is more than two orders of magnitude above the target risk value of 1×10^{-6}. The risk drivers consist primarily of PAHs in surface soil. The primary risk driver is benzo(*a*)pyrene in surface soil (ILCR = 1.21×10^{-4}). The other primary risk drivers consist of benzo(*b*)fluoranthene (ILCR = 1.09×10^{-5}) and indeno(*1,2,3-cd*)pyrene (ILCR = 1.85×10^{-5}). The remaining risk drivers include: benzo(*a*)anthracene (ILCR = 9.71×10^{-6}), arsenic (ILCR = 2.01×10^{-6}), and benzo(*k*)fluoranthene (ILCR = 1.22×10^{-6}). The carcinogenic risk value for trichloroethene is below 1×10^{-6}.

On-site Resident Adult. The calculated risk values for the future on-site resident adult are given in Table 58.

The total HI for this receptor is 2.91, which exceeds the target value of 1.0. The primary risk drivers are metals that potentially leach to groundwater. The primary risk drivers include chromium (HI = 1.99) and cadmium (HI = 0.907). The remaining COPCs have HIs below 0.1.

The total ILCR for this receptor is 1.79×10^{-4} (Table 58), which is more than two orders of magnitude above the target risk value of 1×10^{-6}. The risk drivers consist primarily of PAHs in surface soil. The primary risk driver is benzo(*a*)pyrene in surface soil (ILCR = 1.33×10^{-4}). The other primary risk drivers consist of benzo(*b*)fluoranthene (ILCR = 1.20×10^{-5}), indeno(*1,2,3-cd*)pyrene (ILCR = 2.03×10^{-5}), and benzo(*a*)anthracene (ILCR = 1.07×10^{-5}). The remaining risk drivers include arsenic (ILCR = 1.19×10^{-6}), and benzo(*k*)fluoranthene (ILCR = 1.34×10^{-6}). The carcinogenic risk value for trichloroethene is below 1×10^{-6}.

Off-site Installation Worker. The calculated risk values for the future off-site Installation worker are given in Table 59.

The total HI for this receptor is 0.968, which is below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR for this receptor is 6.51×10^{-8}, which is more than an order of magnitude below the target risk value of 1×10^{-6}; therefore, carcinogenic risks are within an acceptable range for this receptor.

Off-site Resident Child. The calculated risk values for the future off-site resident child are given in Table 60.

The total HI for this receptor is 6.92, which exceeds the target value of 1.0. The primary risk drivers are metals that potentially leach to groundwater. The primary risk drivers include chromium (HI = 4.75) and cadmium (HI = 2.14). The remaining COPCs have HIs below 0.1.

The total ILCR for this receptor is 1.26×10^{-7}, which is below the target risk value of 1×10^{-6}; therefore, carcinogenic risks are within an acceptable range for this receptor.

Off-site Resident Adult. The calculated risk values for the future on-site resident adult are given in Table 61.

The total HI for this receptor is 2.90, which exceeds the target value of 1.0. The primary risk drivers are metals that potentially leach to groundwater. The primary risk drivers include chromium (HI = 1.98) and cadmium (HI = 0.907). The remaining COPC has an HI below 0.1.

The total ILCR for this receptor is 2.58×10^{-7}, which is below the target risk value of 1×10^{-6}; therefore, carcinogenic risks are within an acceptable range for this receptor.

Off-site Juvenile Wader. The calculated risk values for the future off-site juvenile wader are given in Table 62. CSFs have not been calculated for the CMCOPCs; therefore, carcinogenic risks could not be estimated for this receptor.

The total HI for this receptor is 0.014, which is more than an order of magnitude below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

Off-site Sportsman. The calculated risk values for the future off-site sportsman are given in Table 63. CSFs have not been calculated for the CMCOPCs; therefore, carcinogenic risks could not be estimated for this receptor.

The total HI for this receptor is 0.61, which is below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

9.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is provided in Appendix I, Section I.5 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

It was conservatively assumed that the off-site concentrations of COPCs in various environmental media were equal to the on-site concentrations. However, as COPCs migrate, the concentrations in environmental media generally decrease as a result of dilution, degradation, and other physicochemical processes. Assuming that the concentrations of COPCs remain constant is likely to result in an overestimation of the exposure of off-site receptors.

For the purposes of assessing the potential exposure of current on-site Installation worker to COPCs in surface soil, the exposure factors given are based primarily on uncovered soils. The surface soil present at the site is generally covered by gravel, which limits the exposure for a receptor. The estimated intakes for the current on-site Installation worker are likely to be overestimated as a result of using the conservative exposure values.

The exact chemical form of chromium was not known. As a conservative measure, it was assumed that chromium existed in the more toxic, hexavalent state, although this form of chromium is very unstable and readily oxidizes to the less toxic, trivalent state. The actual risks for exposure to chromium are likely to be less than the estimated values.

An RfD value has not been derived for benzo(*g,h,i*)perylene. The RfD value for pyrene was used as a surrogate value. Given the chemical structure of pyrene, however, this constituent is likely to be more toxic than benzo(*g,h,i*)perylene; therefore, the actual risks for exposure to benzo(*g,h,i*)perylene are likely to be less than the estimated values.

9.6 RISK SUMMARY

The purpose of the risk summary is to provide an overview of the risk assessment results, including identification of the COPCs assessed, receptor populations, and risk characterization results.

The HHCOPCs for this site consisted primarily of PAHs. The HHBRA addressed the risks associated with exposure to the following constituents: arsenic (surface soil), benzo(*a*)anthracene (surface soil), benzo(*a*)pyrene (surface soil), benzo(*b*)fluoranthene (surface soil), benzo(*g,h,i*)perylene (surface soil), benzo(*k*)fluoranthene (surface soil), indeno(*1,2,3-cd*)pyrene (surface soil), trichloroethene (groundwater), and lead (surface soil).

The CMCOPCs in soil included five PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene], seven metals (arsenic, barium, cadmium, chromium, lead, mercury, and selenium), and the VOC methylene chloride. Based on the results of the leachate modeling, cadmium, chromium, and lead are likely to migrate in concentrations that might present a significant risk to human health; therefore, the potential risks associated with these CMCOPCs leaching to groundwater were quantified.

Groundwater modeling and analysis concluded that the CMCOPCs cadmium and chromium might migrate to surface water, resulting in exposure of off-site receptors via surface water. Lead present in groundwater as a result of leaching is not likely to migrate to surface water in significant concentrations. Groundwater modeling also indicated that trichloroethene (an HHCOPC) in groundwater would not likely migrate to surface water.

The potential risks associated with exposure to lead were quantified based on the blood-lead levels resulting from exposure to lead in various media. The potential risks associated with exposure to lead were quantified using the IEUBK Model (EPA 1994a). Benzo(*g,h,i*)perylene does not have an RfD value, so the RfD for pyrene was used as a surrogate value (TPHCWG 1997). Given that a surrogate RfD value was used to assess the risk for benzo(*g,h,i*)perylene, the risk values for this constituent were addressed separately from those of other constituents, and the risk values were not used to estimate the total risk for the receptor populations.

The current on-site receptor is represented by an Installation worker. There are no current off-site receptor populations. Future receptor populations include an Installation worker and a resident. These receptors represent both on-site and off-site receptor populations and might be exposed to COPCs in surface soil and groundwater. In addition, other future off-site receptors include a juvenile wader and a sportsman. These receptors might be exposed to COPCs that have migrated to surface water.

The results of the quantitative risk characterization concluded that the following constituents are COCs: benzo(*a*)pyrene (surface soil), benzo(*a*)anthracene (surface soil), benzo(*b*)fluoranthene (surface soil), indeno(*1,2,3-cd*)pyrene (surface soil), benzo(*k*)fluoranthene (surface soil), arsenic (surface soil), cadmium (modeled groundwater), chromium (modeled groundwater), and lead (modeled groundwater).

Benzo(*a*)pyrene was identified as a COC in surface soil based on the current and future on-site Installation worker, future on-site juvenile trespasser, and both future on-site residential scenarios. The following PAHs were identified as COCs in surface soil based on both the current and future on-site Installation worker and both future on-site residential scenarios: benzo(*a*)anthracene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. Arsenic and benzo(*k*)fluoranthene were identified as COCs in surface soil based on exposure of the future on-site residents.

Cadmium and chromium were identified as CMCOCs for all of the future residential exposure scenarios. Lead was identified as a CMCOC based on the blood-lead levels in children.

Remedial levels were derived for all of the constituents identified as COCs. If a constituent was identified as a COC in more than one environmental medium, separate remedial levels were derived for each medium.

9.7 REMEDIAL LEVELS

The first step in determining the remedial levels for a site is to derive remedial levels for each human health constituent of concern (HHCOC) and CMCOC based on regulatory and risk-based criteria. These remedial levels are reviewed, and a final remedial level for each COC is recommended. Remedial levels were derived for each HHCOC and CMCOC for all applicable environmental media at SWMU 24B.

9.7.1 Derivation of Remedial Levels

Remedial levels were derived for the following HHCOCs in surface soil: arsenic, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. Remedial levels for CMCOCs, which are derived based on the protection of groundwater, were derived for cadmium, chromium, and lead. The development of remedial levels followed the protocols given in Appendix I, Section I.6 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

Risk-based remedial values were derived for the most sensitive receptor population. By protecting the most sensitive receptor, other less sensitive receptor populations will also be protected. If the most sensitive receptor population was not well defined, then remedial levels were derived for those populations considered to be representative of the sensitive receptors.

The resident adult and the resident child were the most sensitive receptor populations for HHCOPCs in surface soil. Risk-based remedial levels were derived for the remaining surface soil HHCOPCs (Table 67). The resident child was the most sensitive receptor for arsenic, and the resident adult was the most sensitive receptor for the PAHs. Arsenic and the PAHs in surface soil were identified as COCs based on their carcinogenic risk for the residential receptor. The HIs for these constituents were all below the target risk value of 0.1; therefore, the risk-based remedial levels were calculated based on the carcinogenic risks (Table 64).

The remedial level for a CMCOC represents that soil concentration that is unlikely to leach into groundwater or migrate to surface water in concentrations that present a significant threat to human health. The potential risk associated with CMCOCs is not direct exposure to soil, but exposure to these constituents in either groundwater or surface water; therefore, the remedial levels in soil are based upon target groundwater concentrations. These values are the concentrations of CMCOCs in either groundwater or surface water that present a defined risk to a receptor. For example, if the target groundwater concentration is based on an HI of 1.0, the risk value of 1.0 represents the potential risk to a receptor population exposed to the risk-based target concentration of the CMCOC in groundwater. The corresponding risk-based soil remedial value would represent the concentration of the CMCOC in soil that is likely to leach into groundwater, resulting in a CMCOC groundwater concentration equal to the target groundwater concentration.

The CMCOCs were identified based on the systemic risk to a residential receptor. The most sensitive receptor population for CMCOCs in groundwater is the resident child. This receptor was used to calculate risk-based remedial levels based on noncarcinogenic risks.

The target groundwater concentrations for CMCOCs are given in Table 65.

9.7.2 Remedial Level Recommendations

The selection of a remedial level must take into consideration the following factors:

- regulatory standards,
- target risk values for risk-based remedial levels,
- background concentrations of inorganic COCs, and
- project quantitation limits.

Regulatory standards that are considered for remedial levels must be derived based on the potential risk to receptors. If regulatory standards are not used for the recommended remedial level, then risk-based remedial values are recommended based on a target risk value for the receptor population. The background concentrations of inorganic COCs must be taken into consideration because the remedial actions cannot reduce the concentrations of a constituent to levels below the background concentrations. Finally, the project quantitation limits represent the limitations of the analytical procedures. If a remedial level is below the project quantitation limit, then the achievement of the remedial levels cannot be verified due to the limitations of the analytical procedures; therefore, the project quantitation limit represents the lowest concentration that can be established as a remedial level.

9.7.2.1 Regulatory standards

The selection of a target groundwater concentration for a CMCOC based on an on-site resident must take into consideration the MCL, if available, and the potential risks associated with the presence of all CMCOCs and groundwater HHCOCs. The MCL takes into consideration both the potential human health risks associated with exposure to the contaminant in drinking water and the technological limitations in removing that contaminant from water. An MCL that is derived based on the acceptable human health risks as defined in the SDWA may be more stringent than the possible target risk values allowed under the current GEPD RCRA guidance (GEPD 1996); therefore, the recommended target groundwater concentration will not exceed the MCL, if available.

9.7.2.2 Target risk values for risk-based remedial levels

The selection of a target risk value for remedial levels must take into account the total risk for that receptor population from all of the potential COCs present at the site. The total potential risks associated with the COCs should not result in a cumulative HI that exceeds 3.0 or an ILCR of greater than 1×10^{-4} (GEPD 1996). The recommended target risk values for the derivation of the risk-based remedial levels for the on-site resident are discussed below.

On-site Resident. The on-site resident may be exposed to carcinogens in surface soil and groundwater. The resident may be exposed to six carcinogens in surface soil: arsenic, benzo(*a*)pyrene, benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. It is recommended that the risk-based remedial values for carcinogens be based upon an ILCR of 1×10^{-5}. The total risk associated with exposure to the remedial levels of the COCs would be 6.0×10^{-5}, which is below the maximum total acceptable ILCR of 1×10^{-4}.

Two constituents were identified as COCs based on the potential systemic risk. These constituents are the CMCOCs cadmium and chromium. The risk-based remedial values should be based on an HI of 1.0. The total HI associated with exposure to COCs would be 2.0, which is below the maximum acceptable total HI of 3.0.

9.7.2.3 Background concentrations of inorganic constituents of concern

The recommended remedial levels for inorganic COCs were compared to the reference background concentrations. If the remedial level was lower than the reference background concentration, then the remedial level defaulted to background. The recommended remedial levels for CMCOCs in soils were compared to the reference background level for subsurface soil. Given the comparative thickness of subsurface soil and its proximity to groundwater relative to surface soil, the amount of a constituent leaching to groundwater from the subsurface soil is likely to be much greater than the contribution from surface soil. The concentration of a CMCOC should be evaluated relative to the soil stratum that contributes the greatest amount of an inorganic to groundwater; therefore, the subsurface soil reference background concentrations may be used as the remedial levels for CMCOCs.

9.7.2.4 Recommended remedial levels for the constituents of concern

The selection of the recommended remedial level takes into consideration the MCLs and other regulatory values, risk-based remedial levels, and reference background concentrations of inorganics. The recommended remedial level for each COC is discussed in the following paragraphs.

Arsenic. Arsenic was identified as an HHCOC in surface soil based on its carcinogenic risk. The recommended risk-based remedial value is 5.96 mg/kg, based on an ILCR of 1.0×10^{-5} (see Table 64).

Given that the recommended remedial value for arsenic (5.96 mg/kg) is higher than the maximum detected value of 2.7 mg/kg, no further study is required for this constituent.

Benzo(*a*)anthracene. Benzo(*a*)anthracene was identified as an HHCOC in surface soil. This COC does not have an RfD; therefore, the recommended risk-based remedial values were derived for surface soil based on an ILCR of 1.0×10^{-5}. The risk-based remedial value for surface soil is 8.93 mg/kg (see Table 64).

Benzo(*a*)pyrene. Benzo(*a*)pyrene was identified as an HHCOC in surface soil. This COC does not have an RfD; therefore, the recommended risk-based remedial value for surface soil is 0.89 mg/kg, based on an ILCR of 1.0×10^{-5} (see Table 64).

Benzo(*b*)fluoranthene. Benzo(*b*)fluoranthene was identified as an HHCOC in surface soil. This COC does not have an RfD; therefore, the recommended risk-based remedial values were derived for surface soil based on an ILCR of 1.0×10^{-5}. The recommended risk-based remedial value for surface soil is 8.93 mg/kg (see Table 64).

Benzo(*k*)fluoranthene. Benzo(*k*)fluoranthene was identified as an HHCOC in surface soil. This COC does not have an RfD; therefore, the recommended risk-based remedial values were derived for surface soil based on an ILCR of 1.0×10^{-5}. The recommended risk-based remedial value for surface soil is 89.3 mg/kg (see Table 64).

Given that the recommended remedial level for benzo(*k*)fluoranthene (89.3 mg/kg) is higher than the maximum detected value of 49.3 mg/kg, no further study is required for this constituent in surface soil.

Cadmium. Cadmium in soil was identified as a CMCOC for groundwater. Cadmium is not a carcinogen; therefore, the recommended target groundwater concentrations are based on an HI of 1.0. The target groundwater concentration is 7.5 μg/L for exposure of a resident child; however, this value exceeds the MCL of 5 μg/L (Table 65). The recommended risk-based remedial level for soil, based on the MCL, is 1.9 mg/kg (see Table 66).

Chromium. Chromium was identified as a CMCOC for groundwater. Chromium is not a carcinogen; therefore, the recommended target groundwater concentrations are based on an HI of 1.0. The target groundwater concentration is 42 μg/L for exposure of a resident child. The risk-based remedial level for soil, based on this target groundwater concentration, is 3.8 mg/kg; however, this value is below the background concentration of 11.6 mg/kg (see Table 66). Therefore, the recommended remedial value for chromium in soil is 11.6 mg/kg.

Indeno(*1,2,3-cd*)pyrene. Indeno(*1,2,3-cd*)pyrene was identified as an HHCOC in surface soil. This COC does not have an RfD; therefore, the recommended risk-based remedial values were derived for surface soil and groundwater based on an ILCR of 1.0×10^{-5}. The recommended risk-based remedial value for surface soil is 8.93 mg/kg (see Table 64).

Lead. Lead was identified as a CMCOC. The remedial value for protection of groundwater is 7.6 mg/kg, based on a target groundwater concentration of 15 μg/L, the action level for lead. This risk-based value is below the background concentration of 11.1 mg/kg (Table 66); therefore, the recommended remedial value for lead in soil is 11.1 mg/kg.

9.7.2.5 Summary of recommended remedial levels

The recommended remedial levels for HHCOCs in surface soil and CMCOCs in soil are given in Tables 64 and 66, respectively. The following remedial levels are recommended:

- benzo(*a*)pyrene in surface soil: 0.89 mg/kg,
- benzo(*a*)anthracene in surface soil: 8.93 mg/kg,
- benzo(*b*)fluoranthene in surface soil: 8.93 mg/kg,
- indeno(*1,2,3-cd*)pyrene in surface soil: 8.93 mg/kg,
- lead in soil: 11.1 mg/kg,
- cadmium in soil: 1.9 mg/kg, and
- chromium in soil: 11.6 mg/kg.

The maximum concentrations of arsenic and benzo(*k*)fluoranthene in surface soil were below their recommended remedial levels; therefore, no further investigation is required for these constituents.

10.0 CONCLUSIONS AND RISK MANAGEMENT AND SITE RECOMMENDATIONS, SWMU 24B

10.1 SUMMARY OF FINDINGS

The Phase II RFI and the supplemental data evaluation presented in this addendum report was conducted to collect additional analytical data for determining the nature and extent of contamination in environmental media and the potential adverse effects to human health and the environment in the vicinity of SWMU 24B. The data were derived from a series of screening and primary samples collected from surface soil, subsurface soil, and groundwater in the study area during the Phase I and Phase II RFIs. The samples collected were analyzed for VOCs, SVOCs, and RCRA metals. Supplemental data were collected that included six additional surface soil samples and resampling of the monitoring wells. With the concurrence of GEPD, the surface soil was analyzed for SVOCs only, while the groundwater was analyzed for VOCs and SVOCs.

The following section summarizes the significant findings of the Phase I (January 1998) and Phase II RFI (October 1999) sampling and analysis activities.

10.1.1 Surface and Subsurface Soil

Low levels of organics and metals constituents were detected in surface and subsurface soil across the area, including at the site background locations.

- Four VOCs (2-butanone, acetone, carbon disulfide, and toluene) and 17 SVOCs were detected in surface soil. Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver were detected above reference background criteria and are considered to be SRCs in surface soil.

- Five VOCs (carbon disulfide, methylene chloride, tetrachloroethene, toluene, and trichloroethene) and pyrene (an SVOC) were detected in subsurface soil samples. Mercury and selenium were detected above reference background criteria in subsurface soil samples and are considered to be SRCs.

10.1.2 Groundwater

Groundwater was encountered at approximately 6 feet to 8 feet bgs in the monitoring wells during the Phase II RFI. The shallow surficial groundwater flow direction across the site is to the west. The deep surficial groundwater flow direction is southwest to south. The hydraulic gradients of the shallow and deep surficial groundwater are 0.0098 foot/foot and 0.012 foot/foot, respectively. The shallow surficial groundwater flow may intercept the man-made drainage ditch located approximately 500 feet to the west. The deep surficial groundwater flow may intercept a tributary of Mill Creek located approximately 1,200 feet to the south.

- Twelve SVOCs were detected in groundwater during the Phase II RFI. All of the elevated levels of SVOCs detected in groundwater during the Phase II RFI were from DPT (screening) locations. The groundwater from the DPT locations was sampled immediately upon installation and without any development; therefore, the DPT groundwater samples were highly turbid. The elevated concentrations of SVOCs were believed to be the result of particulates in the groundwater. The groundwater was resampled as part of the supplemental investigation (Section 5.6) for VOCs and SVOCs using low-flow techniques. No SVOCs were detected in groundwater during the resampling. However, trichloroethene was detected in the groundwater at a concentration of 2.6 µg/L at one location and is considered to be an SRC in groundwater.

- Barium and chromium were detected above reference background criteria and are considered to be SRCs in groundwater. At two of the locations [MW2 (deep background location) and MW9], the elevated metals concentrations were associated with groundwater collected from deep monitoring well locations that were installed to approximately 43 feet bgs, extending just into the Hawthorn confining (clay) layer. Except for that of barium at one location (MW9), all the filtered metals concentrations at the locations indicate that elevated metals were either nondetect or below reference background criteria. Elevated turbidities were also associated with two of these groundwater samples (MW2 and MW9). These results indicate that the elevated levels of metals were more than likely the result of particulates or colloids in the groundwater.

10.2 CONCLUSIONS

Several assessments were conducted to determine the significance of the contaminant concentrations found at SWMU 24B with respect to their impact on human health and the environment. The assessments included those listed below.

- An analysis of contaminant fate and transport (Chapter 6.0) evaluated the potential for SRCs to migrate from one environmental medium to another (e.g., leaching of constituents from soil into groundwater), resulting in a potential risk to human health and the environment.

- An HHPRE (Chapter 7.0), which used a Step 1 risk screening, identified HHCOPCs.

- An EPRE (Chapter 8.0) was performed for terrestrial and aquatic receptors in the study area.

- An HHBRA (Chapter 9.0) was performed for CMCOPCs identified in the fate and transport analysis and HHCOPCs identified in the HHPRE.

10.2.1 Fate and Transport Analysis

Below are the conclusions regarding contaminant fate and transport.

- Of the organic SRCs identified in soil, methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene exceeded their respective GSSLs and are considered to be CMCOPCs in soil based on leaching to groundwater.

- Of the metal SRCs, arsenic, barium, cadmium, chromium, lead, mercury, and selenium exceeded their respective GSSLs are considered to be CMCOPCs in soil based on leaching to groundwater.

10.2.2 Human Health Preliminary Risk Evaluation

Based on the results of the screening and the weight-of-evidence analysis, potential HHCOPCs have been identified for surface soil and groundwater. The results of the HHPRE are summarized below.

- HHCOPCs for surface soil include the following compounds: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, and lead.

- None of the SRCs indicated in subsurface soil exceeded their respective screening values; therefore, there are no HHCOPCs in subsurface soil.

- Trichloroethene is considered to be an HHCOPC for groundwater.

10.2.3 Ecological Preliminary Risk Evaluation

Based on the results of the EPRE screening analysis, ECOPCs were identified in groundwater and surface soil. No direct sediment or surface water pathway exists at SWMU 24B. Those constituents identified as ECOPCs were further evaluated using realistic exposure factors, mean site concentrations or predicted maximum groundwater discharge concentrations at downgradient surface water bodies, and LOAEL–based TRVs, as compared to NOAEL–based TRVs. The results of the EPRE are summarized below.

- There are no ECOPCs in shallow surficial groundwater.

- Barium in deep surficial groundwater is an ECOPC for aquatic biota if groundwater discharges to nearby surface water bodies because it was detected at a concentration exceeding the ESV. Barium is unlikely to pose a hazard to aquatic biota if groundwater discharges to downgradient surface water bodies because the predicted maximum discharge concentration (0 µg/L) is less than the ESV.

- There are no ECOPCs for terrestrial receptors in deep surficial groundwater.

- Benzo(*a*)pyrene, benzo(*k*)fluoranthene, pyrene, cadmium, chromium, lead, and selenium are ECOPCs in surface soil at SWMU 24B because their preliminary HQs exceeded one. There is no TRV for di-*N*-octyl phthalate, so it is an ECOPC by default. PAHs in surface soil are ECOPCs for birds because the HI exceeds one. The supplemental risk calculations for these ECOPCs, using the di-*N*-butyl phthalate TRV as a surrogate for di-*N*-octyl phthalate and the benzo(*a*)pyrene as a surrogate for pyrene, resulted in HQs and HIs less than one. Therefore, cadmium, chromium, lead, selenium, benzo(*k*)fluoranthene, benzo(*a*)pyrene, pyrene, di-*N*-octyl phthalate, and other PAHs are unlikely to pose a risk to terrestrial wildlife receptors.

10.2.4 Human Health Baseline Risk Assessment

An HHBRA was performed to assess the CMCOPCs identified in soil in the fate and transport analysis and HHCOPCs identified in surface soil and groundwater in the HHPRE. The CMCOPCs in soil included five PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(k)fluoranthene, and indeno(*1,2,3-cd*)pyrene], seven metals (arsenic, barium, cadmium, chromium, lead, mercury, and selenium), and the VOC methylene chloride. Based on the results of the leachate modeling, cadmium, chromium, and lead are likely to migrate in concentrations that might present a significant risk to human health; therefore, the potential risks associated with these CMCOPCs leaching to groundwater were quantified. The remaining CMCOPCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, indeno(*1,2,3-cd*)pyrene, arsenic, barium, mercury, selenium, and methylene chloride] were not considered to be CMCOPCs based on the results of the leachate modeling and were not evaluated further.

HHCOPCs were identified for surface soil and groundwater. Surface soil HHCOPCs included six PAHs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene] and two metals (arsenic and lead). Trichloroethene was identified as an HHCOPC in groundwater. The bullets below present the conclusions of the HHBRA.

- HHCOPCs and CMCOPCs in groundwater may potentially migrate to nearby surface water, a drainage ditch approximately 500 feet west of the site that ultimately discharges into Mill Creek. Modeling results indicated that trichloroethene, the PAHs, and lead will not migrate to surface water in significant concentrations; therefore, these constituents were not addressed as COPCs in surface water. Cadmium and chromium were addressed as potential COPCs in surface water as a result of groundwater migration. The potential risk associated with exposure to these constituents was evaluated based on a juvenile wader playing in the drainage ditch and a sportsman fishing in the drainage ditch. The exposures to cadmium and chromium in surface water were below the target risk values; therefore, no adverse systematic health risks are expected for either receptor population. No further evaluation and/or investigation is required.

- HHCOPCs in surface soil consisted primarily of PAHs; however, arsenic and lead were identified as HHCOPCs in surface soil. In addition, chromium, cadmium, and lead were identified as CMCOPCs. Trichloroethene was the only HHCOPC in groundwater. The site is currently secured; therefore, the current on-site receptor is represented by an Installation worker. Groundwater is not currently used for any purpose. Given that groundwater is not used, current receptor populations may be exposed to surface soil HHCOPCs. There are no current off-site receptors or current on-site receptors for groundwater HHCOPCs or CMCOPCs. The future land-use scenarios assumed that all of the surface soil was exposed and that groundwater drinking wells had been placed within the shallow aquifer. Future land-use populations include an Installation worker, a juvenile trespasser, and a resident. The Installation worker and the resident represent both on-site and off-site receptors. The juvenile trespasser is an on-site receptor only. The residential population was divided into an adult and a child because the adult receptor is generally at greater risk from exposure to carcinogens, while the child is at greater risk from exposure to noncarcinogens.

- The results of the quantitative risk characterization concluded that the following constituents are COCs: benzo(*a*)pyrene (surface soil), benzo(*a*)anthracene (surface soil), benzo(*b*)fluoranthene (surface soil), indeno(*1,2,3-cd*)pyrene (surface soil), benzo(*k*)fluoranthene (surface soil), arsenic (surface soil), cadmium (modeled groundwater), chromium (modeled groundwater), and lead (modeled groundwater). There are no COCs in groundwater. Benzo(*a*)pyrene was identified as a COC in surface soil based on the current and future on-site Installation worker, future on-site juvenile trespasser, and both child and adult future on-site residential scenarios. The following PAHs were identified as COCs in surface soil based on the current and future on-site Installation worker and both future on-site residential scenarios: benzo(*a*)anthracene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. Arsenic and benzo(*k*)fluoranthene were identified as COCs in surface soil based on exposure of the on-site residents. Cadmium and chromium were identified as CMCOCs for all of the future residential exposure scenarios. Lead was identified as a CMCOC based on the blood-lead levels in children. Remedial levels were developed for the COCs and CMCOCs.

- The development of the remedial levels took into the account regulatory values, target risk values, background reference values for inorganic COCs, and project quantitation limits. Regulatory standards that were considered for remedial levels had to have been derived based on the potential risk to receptors. If regulatory standards were not used for the recommended remedial levels, then risk-based remedial values were recommended based on a target risk value for the receptor population. Risk-based remedial values were derived for the most sensitive receptor population. By protecting the most sensitive receptor, other less sensitive receptor populations will also be protected. Finally, the background concentrations

of inorganic COCs had to be taken into consideration because the remedial actions cannot reduce the concentration of a constituent to levels below the background concentrations. Risk-based remedial values were derived for the remaining surface soil COCs. The COCs in surface soil were identified as COCs based on their carcinogenic risk; therefore, the risk-based remedial levels were calculated based on only the carcinogenic risks. The remedial levels were calculated based on an ILCR of 1×10^{-5} for an on-site resident adult (the most sensitive receptor population for the PAHs) and an on-site resident child (the most sensitive receptor population for arsenic). The remedial level for a CMCOC represents that soil concentration that is unlikely to leach into groundwater or migrate to surface water at concentrations that present a significant threat to human health; therefore, the remedial levels in soil were based upon target groundwater concentrations (i.e., they represent a defined risk to a receptor). The CMCOCs—cadmium, chromium, and lead—were identified as COCs based on their systemic risk; therefore, the risk-based remedial levels were calculated based on only the noncarcinogenic risks. The target groundwater value represents either the MCL or the RBC based on an HI of 0.5 for an on-site resident child (the most sensitive receptor population). Lead has a risk-based action level, which was used for the target groundwater concentration. As a conservative measure, the lower of the two values (i.e., the MCL/action level or the risk-based value) was selected as the target groundwater concentration. If the soil remedial level was lower than the reference background concentration, then the remedial level defaulted to background. The recommended remedial levels for CMCOCs in soil were compared to the reference background level for subsurface soil. Given the comparative thickness of subsurface soil and its proximity to groundwater relative to surface soil, the amount of a constituent leaching to groundwater from the subsurface soil is likely to be much greater than the contribution from surface soil. The concentration of a CMCOC should be evaluated relative to the soil stratum that contributes the greatest amount of an inorganic to groundwater; therefore, the subsurface soil reference background concentrations may be used as the remedial levels for CMCOCs. The project quantitation limits represent the lowest possible recommended remedial levels. If a remedial level is below the project quantitation limit, then the achievement of the remedial levels cannot be verified due to the limitations of the analytical procedures; therefore, the project quantitation limits represent the lowest concentration that can be established as a remedial level.

- The recommended risk-based remedial soil levels for cadmium (2.9 mg/kg), chromium (3.8 mg/kg), and lead (7.6 mg/kg) were based on the protection of groundwater. The risk-based remedial levels for chromium and lead exceeded their respective background reference concentrations. The background reference concentrations for chromium (11.6 mg/kg) and lead (11.1 mg/kg) were recommended as remedial levels for these CMCOPCs.

- The recommended risk-based remedial level for surface soil was 8.93 mg/kg for the following PAHs: benzo(*a*)anthracene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. The recommended risk-based remedial level for benzo(*a*)pyrene in surface soil is 0.89 mg/kg. The maximum concentrations of arsenic (2.7 mg/kg) and benzo(*k*)fluoranthene (49.3 mg/kg) in surface soil were below their recommended remedial levels of 5.96 mg/kg and 89.3 mg/kg, respectively; therefore, no further investigation is required for these constituents.

10.3 RISK MANAGEMENT AND SITE RECOMMENDATIONS

- The nature and extent of groundwater contamination at the site was determined during the Phase II RFI and supplemental data collection activities, and the information gathered is sufficient for development of a CAP.

- The extent of surface soil contamination around SWMU 24B was not fully defined. Additional soil samples were taken to evaluate the extent of HHCOCs in soil (SVOCs), and elevated levels of these constituents (see Figure 18) were identified in areas unlikely to have been contaminated from any operations at the paint booth. The building is located in a highly industrialized portion of the garrison area, and SVOCs are typically endemic to highly industrialized areas. For the purposes of this study, SWMU 24B will be defined as the area bounded by Tilton Avenue to the southeast and the fence bordering the remaining three sides of the area. The CAP will address contamination within this area and evaluate institutional controls, surface soil removal, capping (i.e., asphalt or concrete cover) of the area to prevent potential migration and exposure to surface soil, and environmental monitoring (groundwater) alternatives.

- Fort Stewart recommends that a CAP be developed for SWMU 24B and submitted to GEPD in accordance with a schedule to be determined by the Director [in accordance with Condition IV.E.2 of Fort Stewart's Hazardous Waste Facility Permit #HW-045 (S&T)] if this recommendation is approved. The purpose of the CAP will be to determine the appropriate corrective action(s) to remediate the identified soil contamination to the proposed remedial levels presented in Table 67. If this recommendation is approved by GEPD, Fort Stewart respectfully requests that the Installation's Subpart B permit be amended to reflect the change in investigative status. It is anticipated that the CAP will be submitted to GEPD in the first fiscal quarter (October through December 2001) of 2002. The potential abandonment or use of the monitoring wells will be evaluated in the CAP.

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Table 1. Summary of Phase I RFI Analytes Detected in Surface Soil, SWMU 24B

Station	Reference Background Criteria	24B-GP2	24B-GP3	24B-SS1	24B-SS2	24B-SS3
Sample ID		241211	241311	247111	247211	247311
Date		01/20/98	01/20/98	02/24/98	02/24/98	02/24/98
Depth (feet)		1 to 4	1 to 4	0 to 1	0 to 1	0 to 1
Sample Type		Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)						
Toluene	0.00			**0.101**	**0.142**	**0.126**
Semivolatile Organic Compounds (mg/kg)						
Benzo(*a*)anthracene	0.00			**2.89**	**3.03**	**9.38**
Benzo(*a*)pyrene	0.00			**4.39**	**4.54**	**8.95**
Benzo(*b*)fluoranthene	0.00			**5.23**	**9.01**	**16**
Benzo(*g,h,i*)perylene	0.00			**3.78**	**3.07**	**4.69**
Benzo(*k*)fluoranthene	0.00			**3.56**		
Chrysene	0.00			**2.58**	**2.36**	**12.6**
Fluoranthene	0.00			**3.93**	**4.26**	**11.6**
Indeno(*1,2,3-cd*)pyrene	0.00			**3.48**	**3.25**	**4.57**
Phenanthrene	0.00					**3.48**
Pyrene	0.00			**5.21**	**6.82**	**16.8**
Metals (mg/kg)						
Arsenic	2.10			**2.7**	0.87	0.34
Barium	14.70	9.5		**230**	**24**	7
Cadmium	0.18			**6.1**	**3**	0.18
Chromium	6.21	**6.9**		**18.3**	**15**	3.1
Lead	8.81	2.6	1.1	**690**	**154**	**25.8**
Mercury	0.03			**0.13**		

Bold indicates concentrations above background criteria.

Table 2. Summary of Phase I RFI Analytes Detected in Subsurface Soil, SWMU 24B

Station	Reference Background Criteria	24B-GP1	24B-GP4	24B-GP5	24B-GP6
Sample ID		241111	241411	241511	241611
Date		01/16/98	01/20/98	01/06/98	01/20/98
Depth (feet)		2 to 4	2 to 4	2 to 4	3 to 5
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Methylene chloride	0.00			**0.0289**	
Toluene	0.00			**0.0442**	
Metals (mg/kg)					
Barium	17.00	2.6	4.2	5.5	
Cadmium	0.24		0.11	0.07	
Chromium	11.60	1.5	2.8	1.1	
Lead	11.10	1.7	1.6	10.9	
Selenium	1.12			0.23	

Bold indicates concentrations above reference background criteria.

Table 3. Summary of Phase I RFI Analytes Detected in Groundwater, SWMU 24B

Station	Reference Background Criteria	MCL	24B-GP1	24B-GP2	24B-GP3	24B-GP4	24B-GP5	24B-GP6
Sample ID			244111	244211	244311	244411	244511	244611
Date			01/16/98	01/20/98	01/20/98	01/20/98	01/16/98	01/20/98
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)								
Benzene	0.00	5						**2.4**
Semivolatile Organic Compounds (µg/L)								
1,2-Dichlorobenzene	0.00	600			**7.4**			
4-Chloro-3-methylphenol	0.00		**16**				**18.2**	
Benzo(*a*)anthracene	0.00					**13.7**		**17.3**
Benzo(*a*)pyrene	0.00	0.2				***12.6***		***14.3***
Benzo(*b*)fluoranthene	0.00					**23**		**27.5**
Benzo(*g,h,i*)perylene	0.00					**7**		**9.4**
Bis(2-ethylhexyl)phthalate	0.00	6		***22***				
Chrysene	0.00					**18.4**		**22.8**
Fluoranthene	0.00					**18**		**19**
Indeno(*1,2,3-cd*)pyrene	0.00					**6.5**		**8.2**
Pyrene	0.00					**41.7**		**35**
Metals (µg/L)								
Barium	71.72	2,000	45.2		6.5	8.8	29	18.4
Chromium	3.56	100	1.4	0.76	0.75	0.75		2.7
Mercury	0.14	2					**0.89**	
Selenium	1.90	50						1.9

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 4. Monitoring Well Construction Summary, SWMU 24B

Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
24B-MW1	10/06/99	2-inch PVC	N677689.93 E827118.20	15.0	4.00 to 14.00	2.5	87.40
24B-MW2	10/08/99	2-inch PVC	N677687.07 E827115.03	47.0	35.50 to 45.50	32.2	87.20
24B-MW3	10/07/99	2-inch PVC	N677746.89 E826940.91	15.0	3.40 to 13.40	2.5	86.19
24B-MW4	10/07/99	2-inch PVC	N677698.43 E826915.81	15.0	3.60 to 13.60	2.0	86.20
24B-MW5	10/08/99	2-inch PVC	N677757.80 E826901.51	15.0	2.80 to 12.80	2.0	85.48
24B-MW6	10/08/99	2-inch PVC	N677619.73 E826923.68	15.0	3.90 to 13.90	2.0	86.82
24B-MW7	10/07/99	2-inch PVC	N677621.69 E826925.71	45.0	34.30 to 44.30	32.0	86.83
24B-MW8	10/08/99	2-inch PVC	N677703.71 E826847.89	15.0	3.75 to 13.75	2.5	86.42
24B-MW9	10/10/99	2-inch PVC	N677705.38 E826849.53	45.0	33.65 to 43.65	29.2	86.22

Note: All elevations are National Geodetic Vertical Datum 1988.
PVC = Polyvinyl chloride.

Table 5. Summary of Geotechnical Analyses, SWMU 24B

Station	24B-MW1	24B-MW2	24B-MW3	24B-MW4	24B-MW5	24B-MW6	24B-MW7	24B-MW8	24B-MW9
Sample ID	**241173**	**241273**	**241373**	**241473**	**241573**	**241673**	**241773**	**241873**	**241973**
Depth (feet)	**10.0 to 12.0**	**43.0 to 45.0**	**4.0 to 14.0**	**4.0 to 14.0**	**5.0 to 15.0**	**5.0 to 15.0**	**35.0 to 45.0**	**8.0 to 10.0**	**38.0 to 40.4**
Moisture content (%)	42.95	25.52	25.07	22.06	20.36	23.18	24.58	7.42	18.10
Liquid limit (%)	NP	NP	NP	NP	NP	NP	NP	NP	NP
Plastic limit (%)	NP	NP	NP	NP	NP	NP	NP	NP	NP
Plasticity index (%)	NP	NP	NP	NP	NP	NP	NP	NP	NP
Gravel (%)	0.0	0.3	0.0	0.0	0.0	0.0	0.13	0.0	0.0
Sand (%)	98.5	94.68	96.45	84.25	93.27	89.16	95.64	91.42	96.80
Fines (%)	1.50	5.02	3.55	15.75	6.73	10.84	4.23	8.58	3.20
Specific gravity	2.64	NA	NA	NA	NA	NA	NA	NA	NA
Soil porosity	0.90	NA	NA	NA	NA	NA	NA	NA	NA
Bulk density (pcf)	95.75	NA	NA	NA	NA	NA	NA	NA	NA
Permeability (cm/sec)	8.00E-04	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (mg/kg)	11,900	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not analyzed.
NP = Non-plastic.
pcf = Pounds per cubic foot.

Table 6. Well Development Summary, SWMU 24B

Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
24B-MW1	10/09/99	3 hours, 38 minutes	275	6.5	14.30
24B-MW2	10/14/99	6 hours	300	>400[a]	45.82
24B-MW3	10/14/99	8 hours, 20 minutes	170	9.9	13.16
24B-MW4	10/14/99	8 hours, 25 minutes	90	70.2	13.24
24B-MW5	10/14/99	6 hours, 40 minutes	90	75.2	12.60
24B-MW6	10/13/99	5 hours, 15 minutes	185	9.8	13.78
24B-MW7	10/14/99	10 hours, 35 minutes	490	337[a]	44.15
24B-MW8	10/13/99	9 hours, 10 minutes	96	14.1	14.25
24B-MW9	10/13/99	9 hours, 10 minutes	240	187[a]	44.25

[a]Turbidities were elevated in MW2, MW7, and MW9 because they are deep monitoring wells and were extended into the Hawthorn confining (clay) layer.

Table 7. Field Parameter Measurements during Groundwater Sampling, SWMU 24B

Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
24B-MW1[a]	10/31/99	4.99	53.0	26.55	9.7	5.72	153.1
24B-MW2[a]	11/02/99	5.68	70.0	18.05	1,198[b]	3.76	37.3
24B-MW3	11/01/99	4.85	33.0	24.36	4.17	2.37	172.2
24B-MW4	11/01/99	4.31	48.0	25.88	9.74	1.16	172.3
24B-MW5	11/01/99	4.67	27.0	26.09	8.44	2.34	264.0
24B-MW6	10/30/99	4.50	137.0	25.20	3.84	2.48	187.3
24B-MW7	10/31/99	4.81	11.0	24.89	107[b]	6.81	171.1
24B-MW8	10/30/99	4.94	92.0	27.26	9.87	2.54	96.4
24B-MW9	10/31/99	4.70	101.0	24.34	140[b]	6.49	166.7
Average[c]		4.68					

[a]Site-specific background location.
[b]Turbidities were elevated in MW2, MW7, and MW9 because they are deep monitoring wells and were extended into the Hawthorn confining (clay) layer.
[c]Site-specific background not included in average.

Table 8. Summary of Phase II RFI Analytes Detected in Surface Soil, SWMU 24B

Station	Reference Background Criteria	24B-MW1[a]	24B-MW2[a]	24B-MW3	24B-MW4	24B-MW5	24B-MW6	24B-MW7	24B-MW8
Sample ID		241171	241271	241371	241471	241571	241671	241771	241871
Date		10/06/99	10/08/99	10/07/99	10/07/99	10/08/99	10/08/99	10/07/99	10/08/99
Depth (feet)		0 to 1	0 to 1	1 to 2	0 to 1	1 to 2	1 to 2	1 to 2	1 to 2
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)									
2-Butanone	0.00	R[b]		R[b]	R[b]	R[b]		R[b]	R[b]
Acetone	0.00			R[b]	R[b]			R[b]	
Carbon disulfide	0.00		**0.0078**				**0.0074**		**0.0044**
Semivolatile Organic Compounds (mg/kg)									
2-Methylnaphthalene	0.00		**0.962**						
Acenaphthene	0.00								
Acenaphthylene	0.00		**6.3**		**0.193**	**5.8**			
Anthracene	0.00		**1.73**			**2.36**			
Benzo(*a*)anthracene	0.00		**25.6**			**38.8**			
Benzo(*a*)pyrene	0.00		**38.7**		**0.607**	**48.1**			
Benzo(*b*)fluoranthene	0.00		**28.2**			**30.2**			
Benzo(*g,h,i*)perylene	0.00		**27.3**						
Benzo(*k*)fluoranthene	0.00		**37.9**			**49.3**			
Chrysene	0.00		**33.6**			**51.4**			
Di-*N*-octyl phthalate	0.00								
Fluoranthene	0.00		**22.6**			**44**			
Fluorene	0.00		**0.943**						
Indeno(*1,2,3-cd*)pyrene	0.00		**23.7**			**30.7**			
Naphthalene	0.00		**0.714**						
Phenanthrene	0.00		**1.23**			**8.21**			
Pyrene	0.00		**61.2**		**0.954**	**79.7**			
Metals (mg/kg)									
Arsenic	2.10	1.1	0.55	0.31					
Barium	14.70	**32.7**	10.6	2.6	2	6.9	5.8	11.5	1.5
Cadmium	0.18		0.1			0.04			0.04
Chromium	6.21	**9.1**	1.5	2.6	0.55	2.2	0.79	0.48	2.2
Lead	8.81	**61.7**	**50**	1.4	2	**10.8**	2.5	2.8	2.6
Mercury	0.03	0.01			0.01	0.02	0.01		0.03
Selenium	0.41								
Silver	0.15	**0.3**							

Note: Footnotes appear on page 48.

Table 8. Summary of Phase II RFI Analytes Detected in Surface Soil, SWMU 24B (continued)

Station	Reference Background Criteria	24B-MW9	24B-SS4	24B-SS5	24B-SS6	24B-SS7X	24B-SS8X	24B-SS9X
Sample ID		241971	247411	247511	247611	2477X1	2478X1	2479X1
Date		10/10/99	09/22/99	09/22/99	09/22/99	09/22/99	09/22/99	09/22/99
Depth (feet)		1 to 2	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)								
2-Butanone	0.00	R[b]	R[b]	R[b]	**0.0054**	NA	NA	NA
Acetone	0.00				**0.045**	NA	NA	NA
Carbon disulfide	0.00					NA	NA	NA
Semivolatile Organic Compounds (mg/kg)								
2-Methylnaphthalene	0.00				**0.206**	NA	NA	NA
Acenaphthene	0.00			**0.0196**		NA	NA	NA
Acenaphthylene	0.00		**0.422**	**0.0707**	**1.08**	NA	NA	NA
Anthracene	0.00		**0.146**	**0.0447**	**0.462**	NA	NA	NA
Benzo(*a*)anthracene	0.00		**0.874**	**0.268**	**4.4**	NA	NA	NA
Benzo(*a*)pyrene	0.00		**1.51**	**0.33**	**4.68**	NA	NA	NA
Benzo(*b*)fluoranthene	0.00		**2.78**	**0.699**	**8.22**	NA	NA	NA
Benzo(*g,h,i*)perylene	0.00		**1.41**	**0.281**	**3.68**	NA	NA	NA
Benzo(*k*)fluoranthene	0.00					NA	NA	NA
Chrysene	0.00		**1.94**	**0.422**	**5.96**	NA	NA	NA
Di-*N*-octyl phthalate	0.00			**0.22**		NA	NA	NA
Fluoranthene	0.00		**1.45**	**0.549**	**7.7**	NA	NA	NA
Fluorene	0.00				**0.228**	NA	NA	NA
Indeno(*1,2,3-cd*)pyrene	0.00		**1.22**	**0.276**	**3.38**	NA	NA	NA
Naphthalene	0.00				**0.443**	NA	NA	NA
Phenanthrene	0.00		**0.406**	**0.23**	**5.2**	NA	NA	NA
Pyrene	0.00		**2.88**	**0.815**	**12.5**	NA	NA	NA

Note: Footnotes appear on page 48.

Table 8. Summary of Phase II RFI Analytes Detected in Surface Soil, SWMU 24B (continued)

Station	Reference Background Criteria	24B-MW9	24B-SS4	24B-SS5	24B-SS6	24B-SS7X	24B-SS8X	24B-SS9X
Sample ID		241971	247411	247511	247611	2477X1	2478X1	2479X1
Date		10/10/99	09/22/99	09/22/99	09/22/99	09/22/99	09/22/99	09/22/99
Depth (feet)		1 to 2	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Metals (mg/kg)								
Arsenic	2.10		0.58	1.1	0.44	1.2	1.3	0.52
Barium	14.70	1.5	**42.3**	**50.7**	**19**	**47.2**	**111**	**25.3**
Cadmium	0.18		**0.94**	**1.4**	**0.39**	**0.52**	**2.7**	**1.8**
Chromium	6.21	0.48	4.7	5.5	3.5	4.9	**7.6**	5.4
Lead	8.81	0.9	**34.7**	**11**	**17.3**	**28.2**	**64.3**	**31.7**
Mercury	0.03	0.01	R[c]	R[c]	R[c]	R[c]	0.02	R[c]
Selenium	0.41			**0.6**		**0.53**	**0.43**	
Silver	0.15						**0.16**	

[a]Site-specific background location.

[b]R = Acetone and 2-butanone values were qualified as nondetected by the laboratory. The nondetect values were rejected during validation due to poor initial or continuing instrument response factors for these compounds during their analyses.

[c]R = The mercury value was qualified as nondetected by the laboratory. The nondetect values were rejected during validation because associated continuing calibration blank values had negative results more than twice the instrument detection limit.

NA = Not analyzed.

Bold indicates concentrations above reference background criteria.

Table 9. Summary of Phase II RFI Analytes Detected in Subsurface Soil, SWMU 24B

Station	Reference Background Criteria	24B-MW1[a]	24B-MW2[a]	24B-MW3	24B-MW4	24B-MW5	24B-MW6	24B-MW7	24B-MW8	24B-MW9
Sample ID		241172	241272	241372	241472	241572	241672	241772	241872	241972
Date		10/06/99	10/08/99	10/07/99	10/07/99	10/08/99	10/08/99	10/07/99	10/08/99	10/10/99
Depth (feet)		6 to 7	7 to 8	2 to 4	8 to 10	8 to 10	8 to 9	8 to 10	3 to 5	5 to 8
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)										
2-Butanone	0.00	**0.0144**		R	R	R		R	R	R
Acetone	0.00	**0.0534**		R						
Benzene	0.00	**0.0036**								
Carbon disulfide	0.00	**0.0039**							**0.0024**	
Ethylbenzene	0.00	**0.0698**	**0.0043**							
Tetrachloroethene	0.00				**0.004**					
Toluene	0.00	**0.0369**								
Trichloroethene	0.00				**0.0026**					
Xylenes, total	0.00	**2.05**	**0.0102**							
Semivolatile Organic Compounds (mg/kg)										
Pyrene	0.00			**0.0392**						
Metals (mg/kg)										
Arsenic	8.04									0.43
Barium	17.00	0.57	0.33	2.7	0.85	1.9	1.2	1.2	5.7	0.92
Cadmium	0.24		0.13							
Chromium	11.60	3.5	4	1.4	4.8	6.9	10.2	10.9	4.3	7.4
Lead	11.10	3	1.6	2.4	4.3	5.9	7.4	6.5	2.6	4
Mercury	0.05	**0.1**	0.04	0.02	**0.07**	**0.12**	**0.15**	**0.09**	**0.11**	**0.24**
Selenium	1.12					0.59	1.1	**1.2**		
Silver	0.45	0.35								

[a]Site-specific background location.

NA = Not analyzed.

R = Acetone and 2-butanone values were qualified as nondetected by the laboratory. The nondetect values were rejected during validation due to poor initial or continuing instrument response factors for these compounds during their analyses.

Bold indicates concentrations above reference background criteria.

Table 10. Summary of Phase II RFI Analytes Detected in Groundwater in Geoprobes/Vertical Profiles, SWMU 24B

Station	Reference Background Criteria	MCL	24B-GP7	24B-GP8	24B-GP9	24B-GP10	24B-GP13	24B-GP14
Sample ID			244751	244851	244951	244A51	244D51	244E51
Date			09/22/99	09/22/99	09/22/99	09/23/99	09/28/99	09/28/99
Screened Interval (feet bgs)			0.0 to 11	0.0 to 10	0.0 to 11	0.0 to 9.4	0.0 to 14.1	0.0 to 14.0
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)								
1,2-Dichlorobenzene	0.00	600			**8.3**			
Benzo(*a*)anthracene	0.00							**5.1**
Benzo(*a*)pyrene	0.00	0.2						**5.9**
Benzo(*b*)fluoranthene	0.00		**7.8**		**7.3**	**306**	**2.4**	**6**
Benzo(*g,h,i*)perylene	0.00							**3.3**
Benzo(*k*)fluoranthene	0.00		**3**			**109**		**5.7**
Chrysene	0.00							**6.1**
Dibenzo(*a,h*)anthracene	0.00		**7.6**					
Fluoranthene	0.00							**5.4**
Indeno(*1,2,3-cd*)pyrene	0.00		**6.1**		**5.8**	**243**		**2.9**
Naphthalene	0.00				**6.8**			
Pyrene	0.00		**3.8**			**94.8**		**11.8**

Station	Reference Background Criteria	MCL	24B-GP15	24B-GP16	24B-VP1	24B-VP1	24B-VP2
Sample ID			244F51	244G51	244B51	244B52	244C51
Date			09/28/99	09/28/99	09/27/99	09/27/99	09/28/99
Screened Interval (feet bgs)			0.0 to 10	0.0 to 12	11 to 15	21 to 25	7 to 11
Sample Type			Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)							
1,2-Dichlorobenzene	0.00	600			NA	NA	NA
Benzo(*a*)anthracene	0.00			**5.6**	NA	NA	NA
Benzo(*a*)pyrene	0.00	0.2		**5.4**	NA	NA	NA
Benzo(*b*)fluoranthene	0.00			**6.6**	NA	NA	NA
Benzo(*g,h,i*)perylene	0.00			**3.6**	NA	NA	NA
Benzo(*k*)fluoranthene	0.00			**6**	NA	NA	NA
Chrysene	0.00			**6.6**	NA	NA	NA
Dibenzo(*a,h*)anthracene	0.00				NA	NA	NA
Fluoranthene	0.00			**5.1**	NA	NA	NA
Indeno(*1,2,3-cd*)pyrene	0.00			**3.1**	NA	NA	NA
Naphthalene	0.00				NA	NA	NA
Pyrene	0.00			**9.1**	NA	NA	NA

NA = Not analyzed. **Bold** indicates concentrations above reference background criteria.

Table 11. Summary of Phase II RFI Analytes Detected in Groundwater in Monitoring Wells, SWMU 24B

Station	Reference Background Criteria	MCL	24B-MW1[a]	24B-MW3	24B-MW4	24B-MW5	24B-MW6	24B-MW6	24B-MW8
Sample ID			244171	244371	244471	244571	244671	F244671	244871
Date			10/31/99	11/01/99	11/01/99	11/01/99	10/31/99	10/31/99	10/30/99
Screened Interval (feet bgs)			4 to 14	3.4 to 13.4	3.6 to 13.6	2.8 to 12.8	3.9 to 13.9	3.9 to 13.9	3.75 to 13.75
Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Filtered			Total	Total	Total	Total	Total	Filtered	Total
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab	Grab
Metals (µg/L)									
Arsenic	3.02	50							
Barium	71.72	2,000	10.7	17.2	27.8	21.7	29.1	16.3	
Cadmium	0.43	5	0.43						
Chromium	3.56	100					**7.5**		
Lead	4.69	15	1.6		2	1.6			
Selenium	1.90	50							

Station	Reference Background Criteria	MCL	24B-MW2[a]	24B-MW2[a]	24B-MW7	24B-MW9	24B-MW9
Sample ID			244271	F244271	244771	244971	F244971
Date			11/02/99	11/02/99	10/30/99	10/31/99	10/31/99
Screened Interval (feet bgs)			35.5 to 45.5	35.5 to 45.5	34.3 to 44.3	33.65 to 43.65	33.65 to 43.65
Depth			Deep	Deep	Deep	Deep	Deep
Filtered			Total	Filtered	Total	Total	Filtered
Sample Type			Grab	Grab	Grab	Grab	Grab
Metals (µg/L)							
Arsenic	3.02	50	**15.8**				
Barium	71.72	2,000	**136**	4.5	42.1	**97**	**80.9**
Cadmium	0.43	5					
Chromium	3.56	100	**89.4**	2.9		**10.7**	
Lead	4.69	15	**43.6**	1.8		1.2	
Selenium	1.90	50	**7.6**				

[a]Site-specific background location.
Bold indicates concentrations above reference background criteria.

Table 12. Summary of Analytes Detected in Surface Soil from Supplemental Sampling (November 2000), SWMU 24B

Station	Reference Background Criteria	24B-SS10	24B-SS11	24B-SS12	24B-SS13	24B-SS14	24B-SS15
Sample ID		247011	247A11	247B11	247C11	247D11	247E11
Date		11/01/00	11/01/00	11/01/00	11/01/00	11/01/00	11/01/00
Depth (feet)		0 to 2	0 to 2	0 to 2	0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (mg/kg)							
Acenaphthylene	0.00	**8.53**	**1.2**		**1.45**	**1.99**	**0.842**
Anthracene	0.00	**2.78**				**1.02**	
Benzo(*a*)anthracene	0.00	**34.6**	**2.73**		**5.06**	**7.38**	**2.98**
Benzo(*a*)pyrene	0.00	**44.1**	**3.89**	**1.1**	**6.63**	**9.56**	**3.86**
Benzo(*b*)fluoranthene	0.00	**40.9**	**3.08**	**0.871**	**5.47**	**11.7**	**4.03**
Benzo(*g,h,i*)perylene	0.00	**29.5**	**4.29**	**1.7**	**4.25**	**8.02**	**2.58**
Benzo(*k*)fluoranthene	0.00	**49.1**	**4.29**	**1.33**	**6.67**	**9.86**	**4.44**
Chrysene	0.00	**40.4**	**3.82**	**1.12**	**6.8**	**10.4**	**4.84**
Fluoranthene	0.00	**35.8**	**2.38**		**5.82**	**7.91**	**3.27**
Fluorene	0.00	**0.825**					
Indeno(*1,2,3-cd*)pyrene	0.00	**22.4**	**2.39**	**1.06**	**3.56**	**6.32**	**2.09**
Naphthalene	0.00	**0.68**					
Phenanthrene	0.00	**3.35**			**0.816**	**2.94**	**0.857**
Pyrene	0.00	**80.6**	**4.78**	**1.06**	**12.4**	**11.2**	**6.07**

Bold indicates concentrations above reference background criteria.

Table 13. Field Parameter Measurements during Groundwater Sampling (November 2000), SWMU 24B

Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
24B-MW1[a]	11/01/00	4.83	51.3	28.25	9.8	0.32	217
24B-MW2[a]	11/02/00	5.08	70.0	27.35	>400	0.00	52.7
24B-MW3	13/31/00	4.82	74.0	27.44	3.8	NR	NR
24B-MW4	11/01/00	5.21	113.0	23.32	9.9	0.56	195
24B-MW5	10/31/00	4.66	52.9	27.10	8.9	NR	NR
24B-MW6	10/31/00	4.58	79.8	24.28	1.6	9.65	421
24B-MW7	10/31/00	4.85	27.9	24.21	33.8	5.22	209
24B-MW8	11/01/00	4.77	73.0	25.98	8.7	0.73	161.5
24B-MW9	10/31/00	4.26	265	25.51	216	2.42	119
Average[b]		4.74					

[a]Site-specific background location.
[b]Site-specific background not included in average.
NR = Not recorded.

Table 14. Water Level Data for Monitoring Wells (November 2000), SWMU 24B

Well	Screened Interval (feet bgs)	Depth to Water (feet below MP)	Elevation of Measuring Point (feet amsl)	Elevation of Potentiometric Surface (feet amsl)
24B-MW1	4.00 to 14.00	6.83	87.40	80.57
24B-MW2	35.50 to 45.50	7.69	87.20	79.51
24B-MW3	3.40 to 13.40	7.28	86.19	78.91
24B-MW4	3.60 to 13.60	7.34	86.20	78.86
24B-MW5	2.80 to 12.80	6.85	85.48	78.63
24B-MW6	3.90 to 13.90	8.02	86.82	78.80
24B-MW7	34.30 to 44.30	9.28	86.83	77.55
24B-MW8	3.75 to 13.75	8.26	86.42	78.16
24B-MW9	33.65 to 43.65	8.24	86.22	77.98

amsl = Above mean sea level.
bgs = Below ground surface.
MP = Measuring point (top of casing).

Table 15. Summary of Analytes Detected in Groundwater (November 2000), SWMU 24B

Station	Reference Background Criteria	24B-MW1[a]	24B-MW2[a]	24B-MW3	24B-MW4	24B-MW5	24B-MW6	24B-MW7	24B-MW8	24B-MW9
Sample ID		244172	244272	244372	244472	244572	244672	244772	244872	244972
Date		11/01/00	11/02/00	10/31/00	11/01/00	10/31/00	10/31/00	10/31/00	11/01/00	10/31/00
Filtered		Total	Total	Total	Total	Total	Total	Total	Total	Total
Depth (feet)		4 to 14	35.5 to 45.5	3.4 to 13.4	3.6 to 13.6	2.8 to 12.8	3.9 to 13.9	34.3 to 44.3	3.75 to 13.75	33.65 to 43.65
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)										
Trichloroethene	0.00				**2.6**					
Semivolatile Organic Compounds (µg/L)										
No constituents detected.										

[a]Site-specific background location.

Bold indicates concentrations above reference background criteria.

Table 16. Summary of Site-related Contaminants, SWMU 24B

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil[a]	Subsurface Soil[a]	Sediment	Groundwater[a,b]	Surface Water
Volatile Organic Compounds					
2-Butanone	0.0054	ND	NP	ND	NP
Acetone	0.045	ND	NP	ND	NP
Carbon disulfide	0.0074	0.0024	NP	ND	NP
Methylene chloride	ND	0.0289[c]	NP	ND	NP
Tetrachloroethene	ND	0.004	NP	ND	NP
Toluene	0.142[c]	0.0442[c]	NP	ND	NP
Trichloroethene	ND	0.0026	NP	2.60	NP
Semivolatile Organic Compounds					
2-Methylnaphthalene	0.206	ND	NP	ND	NP
Acenaphthene	0.0196	ND	NP	ND	NP
Acenaphthylene	8.53	ND	NP	ND	NP
Anthracene	2.78	ND	NP	ND	NP
Benzo(*a*)anthracene	38.8	ND	NP	ND	NP
Benzo(*a*)pyrene	48.1	ND	NP	ND	NP
Benzo(*b*)fluoranthene	40.9	ND	NP	ND	NP
Benzo(*g,h,i*)perylene	29.5	ND	NP	ND	NP
Benzo(*k*)fluoranthene	49.3	ND	NP	ND	NP
Chrysene	51.4	ND	NP	ND	NP
Di-*N*-octyl phthalate	0.22	ND	NP	ND	NP
Fluoranthene	44	ND	NP	ND	NP
Fluorene	0.825	ND	NP	ND	NP
Indeno(*1,2,3-cd*)pyrene	30.7	ND	NP	ND	NP
Naphthalene	0.68	ND	NP	ND	NP
Phenanthrene	8.21	ND	NP	ND	NP
Pyrene	80.6	0.0392	NP	ND	NP
Metals					
Arsenic	2.7[c]	BRBC	NP	ND	NP
Barium	230[c]	BRBC	NP	97	NP
Cadmium	6.1[c]	BRBC	NP	ND	NP
Chromium	18.3[c]	BRBC	NP	10.7	NP
Lead	690[c]	BRBC	NP	BRBC	NP
Mercury	0.13[c]	0.24	NP	ND	NP
Selenium	0.6	1.2	NP	ND	NP
Silver	0.16	BRBC	NP	ND	NP

[a]Constituents detected at the background location (MW1 or MW2) are not considered to be SRCs.

[b]Groundwater from the November 2000 sampling event was sampled for only VOCs and SVOCs because no metals were determined to be COCs from the Phase II RFI; therefore, SRCs were determined using November 2000 data for VOCs and SVOCs, and Phase II RFI results were used to determine metals SRCs.

[c]Phase I RFI data.

BRBC = Below reference background criteria.

ND = Not detected.

NP = No pathway exists.

Table 17. GSSL Screening of Site-related Contaminants in Soil, SWMU 24B

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.0054	7.685	No
Acetone	0.045	16	No
Carbon disulfide	0.0074	32	No
Methylene chloride	0.0289[c]	0.02	Yes
Tetrachloroethene	0.004	0.06	No
Toluene	0.142[c]	12	No
Trichloroethene	0.0026	0.06	No
Semivolatile Organic Compounds (mg/kg)			
2-Methylnaphthalene[b]	0.206	22.574	No
Acenaphthene	0.0196	570	No
Acenaphthylene[b,d]	8.53	111	No
Anthracene	2.78	12,000	No
Benzo(*a*)anthracene	38.8	2	Yes
Benzo(*a*)pyrene	48.1	8	Yes
Benzo(*b*)fluoranthene	40.9	5	Yes
Benzo(*g,h,i*)perylene[b,e]	29.5	394	No
Benzo(*k*)fluoranthene	49.3	49	Yes
Chrysene	51.4	160	No
Di-*N*-octyl phthalate	0.22	10,000	No
Fluoranthene	44	4,300	No
Fluorene	0.825	560	No
Indeno(*1,2,3-cd*)pyrene	30.7	14	Yes
Naphthalene	0.68	84	No
Phenanthrene[b,f]	8.21	80.4	No
Pyrene	80.6	4,200	No
Metals (mg/kg)			
Arsenic	2.7[c]	1	Yes
Barium	230[c]	82	Yes
Cadmium	6.1[c]	0.4	Yes
Chromium	18.3[c]	2	Yes
Lead[g]	690[c]	400	Yes
Mercury	0.24	0.1	Yes
Selenium	0.6	0.3	Yes
Silver	0.16	2	No

[a]GSSL = EPA GSSL with a dilution attenuation factor (DAF) of 1 for inorganics and a DAF of 20 for volatile and semivolatile organics. A DAF of 1 for inorganics was used because average pH of groundwater is less than 5 (Tables 7 and 14); unless otherwise indicated, GSSL was taken from *Soil Screening Guidance: Technical Background Document* (EPA 1996b).

[b]EPA–suggested GSSL is not available; GSSL was calculated following *Soil Screening Guidance: Technical Background Document* (EPA 1996b). GSSLs were back-calculated from MCL, if available; otherwise, GSSLs were back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 2000).

[c]Phase I RFI data.

[d]RBC of acenaphthene was used to derive GSSL of acenaphthylene.

[e]RBC of benzo(*g,h,i*)perylene was taken from benzo(*k*)fluoranthene, assuming a TEF of 0.01.

[f]RBC of pyrene was used to derive GSSL of phenanthrene.

[g]A screening level of 400 mg/kg was used for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (EPA 1994b).

Table 18. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Groundwater, SWMU 24B

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/4	0.0054	0.0054	4,693	No	Max Detect < Risk Criteria
Acetone	1/9	0.045	0.045	782.1	No	Max Detect < Risk Criteria
Carbon disulfide	2/15	0.0044	0.0074	782.1	No	Max Detect < Risk Criteria
Toluene	3/15	0.101	0.142	1,564	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
2-Methylnaphthalene	1/21	0.206	0.206	156.4	No	Max Detect < Risk Criteria
Acenaphthene	1/21	0.0196	0.0196	469.3	No	Max Detect < Risk Criteria
Acenaphthylene[a]	10/21	0.0707	8.53	234.6	No	Max Detect < Risk Criteria
Anthracene	6/21	0.0447	2.78	2,346	No	Max Detect < Risk Criteria
Benzo(*a*)anthracene	12/21	0.268	38.8	0.875	Yes	Max Detect > Risk Criteria
Benzo(*a*)pyrene	14/21	0.33	48.1	0.0875	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	13/21	0.699	40.9	0.875	Yes	Max Detect > Risk Criteria
Benzo(*g,h,i*)perylene[b]	12/21	0.281	29.5	8.75	Yes	Max Detect > Risk Criteria
Benzo(*k*)fluoranthene	8/21	3.56	49.3	8.75	Yes	Max Detect > Risk Criteria
Chrysene	13/21	0.422	51.4	87.5	No	Max Detect < Risk Criteria
Di-*N*-octyl phthalate	1/21	0.22	0.22	156.4	No	Max Detect < Risk Criteria
Fluoranthene	12/21	0.549	44	312.9	No	Max Detect < Risk Criteria
Fluorene	2/21	0.228	0.825	312.9	No	Max Detect < Risk Criteria
Indeno(*1,2,3-cd*)pyrene	13/21	0.276	30.7	0.875	Yes	Max Detect > Risk Criteria
Naphthalene	2/21	0.443	0.68	156.4	No	Max Detect < Risk Criteria
Phenanthrene[a]	9/21	0.23	8.21	234.6	No	Max Detect < Risk Criteria
Pyrene	14/21	0.815	80.6	234.6	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Arsenic	10/17	0.31	2.7	0.4258	Yes	Max Detect > Risk Criteria
Barium	17/17	1.5	230	547.5	No	Max Detect < Risk Criteria
Cadmium	11/17	0.04	6.1	7.821	No	Max Detect < Risk Criteria
Chromium	17/17	0.48	18.3	23.46	No	Max Detect < Risk Criteria
Lead	18/18	0.9	690	400	Yes	Max Detect > Risk Criteria
Mercury[c]	7/12	0.01	0.13	2.346	No	Max Detect < Risk Criteria
Selenium	3/16	0.43	0.6	39.11	No	Max Detect < Risk Criteria
Silver	1/17	0.16	0.16	39.11	No	Max Detect < Risk Criteria

Note: Footnotes appear on page 58.

Table 18. Human Health Risk Screening for Surface Soil, Surface Soil, and Groundwater, SWMU 24B (continued)

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Carbon disulfide	1/11	0.0024	0.0024	782.1	No	Max Detect < Risk Criteria
Methylene chloride	1/11	0.0289	0.0289	85.16	No	Max Detect < Risk Criteria
Tetrachloroethene	1/11	0.004	0.004	12.28	No	Max Detect < Risk Criteria
Toluene	1/11	0.0442	0.0442	1,564	No	Max Detect < Risk Criteria
Trichloroethene	1/11	0.0026	0.0026	58.07	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Pyrene	1/11	0.0392	0.0392	234.6	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Mercury[c]	7/10	0.02	0.24	61.32	No	Max Detect < Risk Criteria
Selenium	4/9	0.23	1.2	39.11	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Trichloroethene	1/7	2.6	2.6	1.55	Yes	Max Detect > Risk Criteria
Metals (µg/L)						
Barium	6/7	17.2	97	255.5	No	Max Detect < Risk Criteria
Chromium	2/7	7.5	10.7	10.95	No	Max Detect < Risk Criteria

[a]The RBC for pyrene was used for acenaphthylene and phenanthrene.
[b]An RBC was not available for benzo(*g,h,i*)perylene; therefore, an RBC was calculated based on a TEF of 0.01 for benzo(*a*)pyrene [see Section 7.3 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000)].
[c]The RBC for mercuric chloride was used for mercury.

Table 19. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 24B

Analyte	SWMU 24B Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Trichloroethene	2.6[a]	47[b]	No	Max Detect < ESV
Metals (µg/L)				
Barium	97[c]	4[b]	Yes	Max Detect > ESV
Chromium	10.7	11[d]	No	Max Detect < ESV

[a]Maximum concentration detected in shallow surficial groundwater (not detected in deep surficial groundwater).

[b]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

[c]Maximum concentration detected in deep surficial groundwater. Remaining concentrations below reference background concentration.

[d]Assumes hexavalent chromium.

ESV = EPA Region IV ESVs (EPA 1996a) and, where indicated, alternative values for analytes without ESVs.

Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 20. Surface Soil Site-related Contaminants Potentially Impacting Ecological Receptors, SWMU 24B

Analyte	Results > Detection Limit[a]	Maximum Detect
Volatile Organic Compounds (mg/kg)		
2-Butanone	1/1	0.0054
Acetone	1/3	0.045
Toluene	2/6	0.142
Semivolatile Organic Compounds (mg/kg)		
2-Methylnaphthalene	1/12	0.206
Acenaphthene	1/12	0.0196
Acenaphthylene	9/12	8.53
Anthracene	5/12	2.78
Benzo(*a*)anthracene	10/12	34.6
Benzo(*a*)pyrene	12/12	44.1
Benzo(*b*)fluoranthene	11/12	40.9
Benzo(*g,h,i*)perylene	11/12	29.5
Benzo(*k*)fluoranthene	7/12	49.1
Chrysene	11/12	40.4
Di-*N*-octyl phthalate	1/12	0.22
Fluoranthene	10/12	35.8
Fluorene	2/12	0.825
Indeno(*1,2,3-cd*)pyrene	11/12	22.4
Naphthalene	2/12	0.68
Phenanthrene	7/12	5.2
Pyrene	12/12	80.6
Metals (mg/kg)		
Arsenic	6/7	2.7
Barium	7/7	230
Cadmium	6/7	6.1
Chromium	7/7	18.3
Lead	7/7	690
Mercury	2/3	0.13
Selenium	2/7	0.6

[a]Surface soil locations potentially impacting ecological receptors included SS1 and SS2 from Phase I RFI (see Table 1); SS4, SS5, SS6, SS7, and MW4 from Phase II RFI (see Table 8); and SS10, SS11, SS12, SS13, SS14, and SS15 from the additional surface soil sampling performed November 2000 (see Table 12).

Table 21. Derivation of NOAELs for Mammal Test Species, SWMU 24B

ECOPC	Test Species	Test Species Body Weight (kg) BW_t	Benchmark (mg/kg/day)	Test Duration	Endpoint	Effect	Source	Duration Conversion Factor (DCF)	Endpoint Conversion Factor (ECF)	NOAEL (mg/kg/day) Benchmark × DCF × ECF
INORGANICS										
Arsenic	Mouse	3.00E-02	1.26E-00	Chronic	LOAEL	Reproduction	Schroeder and Mitchner (1971) in [1]	1.0	0.1	1.26E-01
Barium	Rat	4.35E-01	5.06E-00	Chronic	NOAEL	Growth	Perry et al. (1983) in [1]	1.0	1.0	5.06E-00
Cadmium	Rat	3.03E-01	1.00E-00	Chronic	NOAEL	Reproduction	Sutou et al. (1980b) in [1]	1.0	1.0	1.00E-00
Chromium	Rat	3.50E-01	2.74E+03	Chronic	NOAEL	Reproduction	Ivankovic and Preussmann (1975) in [1]	1.0	1.0	2.74E+03
Lead[a]	Rat	3.50E-01	8.00E-00	Chronic	NOAEL	Reproduction	Azar et al. (1973) in [1]	1.0	1.0	8.00E-00
Mercury	Mink	1.00E-00	1.01E-00	Chronic	NOAEL	Reproduction	Aulerich et al. (1974) in [1]	1.0	1.0	1.01E-00
Selenium	Rat	3.50E-01	2.00E-01	Chronic	NOAEL	Reproduction	Rosenfeld and Beath (1954) in [1]	1.0	1.0	2.00E-01
ORGANICS										
Volatile Organic Compounds										
Acetone	Rat	3.50E-01	1.00E+02	Subchronic	NOAEL	Reproduction	EPA (1986c) in [1]	0.1	1.0	1.00E+01
2-Butanone	Rat	3.50E-01	1.77E+03	Chronic	NOAEL	Reproduction	Cox et al. (1975) in [1]	1.0	1.0	1.77E+03
Toluene	Mouse	3.00E-02	2.60E+02	Chronic	LOAEL	Reproduction	Nawrot and Staples (1979) in [1]	1.0	0.1	2.60E+01
Semivolatile Organic Compounds										
Acenaphthene	Mouse	3.00E-02	1.75E+02	Chronic	NOAEL	None	ATSDR (1997) in [2]	1.0	1.0	1.75E+02
Acenaphthylene	Mouse	3.00E-02	1.00E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.00E+01
Anthracene	Mouse	3.00E-02	1.00E+03	Chronic	LOAEL	None	ATSDR (1997) in [2]	1.0	0.1	1.00E+02
Benzo(*a*)anthracene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
Benzo(*a*)pyrene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Mackenzie and Angevine (1981) in [1]	1.0	0.1	1.00E-00
Benzo(*b*)fluoranthene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
Benzo(*g,h,i*)perylene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
Benzo(*k*)fluoranthene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Opresko (1995) in [2]	1.0	0.1	1.00E-00
Chrysene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
Dibenzo(*a,h*)anthracene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
Di-*N*-octyl phthalate	None	None	None	None	None	None	None	None	None	No NOAEL
Fluoranthene	Mouse	3.00E-02	5.00E+02	Chronic	LOAEL	None	ATSDR (1997) in [2]	1.0	0.1	5.00E+01
Fluorene	Mouse	3.00E-02	1.25E+02	None	None	None	US EPA (1989) in [3]	0.1	0.1	1.25E+00
Indeno(*1,2,3-cd*)pyrene	Mouse	3.00E-02	1.33E+01	Chronic	NOAEL	None	Neal and Rigdon (1967) in [2]	1.0	1.0	1.33E+01
2-Methylnaphthalene	Rat	3.50E-01	5.00E+01	Chronic	LOAEL	None	ATSDR (1997) in [2]	1.0	0.1	5.00E-00
Naphthalene	Rat	3.50E-01	5.00E+01	Chronic	LOAEL	None	ATSDR (1997) in [2]	1.0	0.1	5.00E-00
Phenanthrene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Opresko (1995) in [2]	1.0	0.1	1.00E-00
Pyrene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Opresko (1995) in [2]	1.0	0.1	1.00E-00

[a] = Lead acetate.
ATSDR = Agency for Toxic Substances and Disease Registry.
DCF = 1 if chronic, 0.1 if subchronic (Sample, Opresko, and Suter 1996).
ECF = 1 if NOAEL, 0.1 if LOAEL (Sample, Opresko, and Suter 1996).
IRIS = Integrated Risk Information System.
[1] = Sample, Opresko, and Suter (1996).
[2] = QST (1997); all values assumed to be chronic.
[3] = IRIS (EPA 2000b).

Table 22. Derivation of NOAELs for Bird Test Species, SWMU 24B

ECOPC	Test Species	Test Species Body Weight (kg) BW_t	Benchmark (mg/kg/day)	Test Duration	Endpoint	Effect	Source	Duration Conversion Factor (DCF)	Endpoint Conversion Factor (ECF)	NOAEL (mg/kg/day) Benchmark × DCF × ECF
INORGANICS										
Arsenic	Mallard duck	1.00E+00	5.14E+00	Chronic	NOAEL	Mortality	USFWS (1997) in [1]	1.0	1.0	5.14E+00
Barium	Chick (14 days old)	1.21E-01	2.08E+02	Subchronic	NOAEL	Mortality	Johnson et al. (1960) in [1]	0.1	1.0	2.08E+01
Cadmium	Mallard duck	1.15E+00	1.45E+00	Chronic	NOAEL	Reproduction	White and Finley (1978) in [1]	1.0	1.0	1.45E+00
Chromium	Black duck	1.25E+00	1.00E+00	Chronic	NOAEL	Reproduction	Haseltine et al. (unpubl.) in [1]	1.0	1.0	1.00E+00
Lead[a]	Quail	1.50E-01	1.13E+00	Chronic	NOAEL	Reproduction	Edens et al. (1976) in [1]	1.0	1.0	1.13E+00
Mercury	Quail	1.50E-01	4.50E-01	Chronic	NOAEL	Reproduction	Hill and Schaffner (1976) in [1]	1.0	1.0	4.50E-01
Selenium	Mallard duck	1.00E+00	5.00E-01	Chronic	NOAEL	Reproduction	Heinz et al. (1989) in [1]	1.0	1.0	5.00E-01
ORGANICS										
Volatile Organic Compounds										
Acetone	None	None	None	None	None	None	None	None	None	No NOAEL
2-Butanone	None	None	None	None	None	None	None	None	None	No NOAEL
Toluene	None	None	None	None	None	None	None	None	None	No NOAEL
Semivolatile Organic Compounds										
Acenaphthene	Composite bird	8.50E-01	8.78E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	8.78E+01
Acenaphthylene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	9.97E+00
Anthracene	Composite bird	8.50E-01	3.30E+02	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	3.30E+02
Benzo(*a*)anthracene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
Benzo(*a*)pyrene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	9.97E+00
Benzo(*b*)fluoranthene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
Benzo(*g,h,i*)perylene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
Benzo(k)fluoranthene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	9.97E+00
Chrysene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
Dibenzo(*a,h*)anthracene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
Di-*N*-octyl phthalate	None	None	None	None	None	None	None	None	None	No NOAEL
Fluoranthene	Composite bird	8.50E-01	1.95E+02	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.95E+02
Fluorene	Composite bird	8.50E-01	6.80E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	6.80E+01
Indeno(*1,2,3-cd*)pyrene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	1.24E+01
2-Methylnaphthalene	Composite bird	8.50E-01	3.39E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	3.39E+01
Naphthalene	Composite bird	8.50E-01	3.39E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	3.39E+01
Phenanthrene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	9.97E+00
Pyrene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	1.0	9.97E+00

[a] = Lead acetate.

DCF = 1 if chronic, 0.1 if subchronic (Sample, Opresko, and Suter 1996).

ECF = 1 if NOAEL, 0.1 if LOAEL (Sample, Opresko, and Suter 1996).

[1] = Sample, Opresko, and Suter 1996.

[2] = QST (1997).

Table 23. Derivation of NOAELs and Screening Toxicity Reference Values for Mammal Receptors, SWMU 24B

Analyte	Test Species	Test Species Body Weight (kg) BW_t	Test Species $NOAEL_t$ (mg/kg/day)	Raccoon		Short-tailed Shrew		Mink	
				Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	NOAEL (mg/kg/day) $NOAEL_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	NOAEL (mg/kg/day) $NOAEL_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	NOAEL (mg/kg/day) $NOAEL_t \times BW_{conv}$
INORGANICS									
Arsenic	Mouse	3.00E-02	1.26E-01	2.66E-01	3.35E-02	1.19E+00	1.50E-01	4.16E-01	5.24E-02
Barium	Rat	4.35E-01	5.06E+00	5.19E-01	2.63E+00	2.32E+00	1.17E+01	8.12E-01	4.11E+00
Cadmium	Rat	3.03E-01	1.00E+00	4.74E-01	4.74E-01	2.12E+00	2.12E+00	7.42E-01	7.42E-01
Chromium	Rat	3.50E-01	2.74E+03	4.92E-01	1.35E+03	2.20E+00	6.02E+03	7.69E-01	2.11E+03
Lead	Rat	3.50E-01	8.00E+00	4.92E-01	3.93E+00	2.20E+00	1.76E+01	7.69E-01	6.15E+00
Mercury	Mink	1.00E+00	1.01E+00	6.39E-01	6.46E-01	2.86E+00	2.89E+00	1.00E+00	1.01E+00
Selenium	Rat	3.50E-01	2.00E-01	4.92E-01	9.84E-02	2.20E+00	4.40E-01	7.69E-01	1.54E-01
ORGANICS									
Volatile Organic Compounds									
Acetone	Rat	3.50E-01	1.00E+01	4.92E-01	4.92E+00	2.20E+00	2.20E+01	7.69E-01	7.69E+00
2-Butanone	Rat	3.50E-01	1.77E+03	4.92E-01	8.71E+02	2.20E+00	3.89E+03	7.69E-01	1.36E+03
Toluene	Mouse	3.00E-02	2.60E+01	2.66E-01	6.91E+00	1.19E+00	3.09E+01	4.16E-01	1.08E+01
Semivolatile Organic Compounds									
Acenaphthene	Mouse	3.00E-02	1.75E+02	2.66E-01	4.66E+01	1.19E+00	2.08E+02	4.16E-01	7.28E+01
Acenaphthylene	Mouse	3.00E-02	1.00E+01	2.66E-01	2.66E+00	1.19E+00	1.19E+01	4.16E-01	4.16E+00
Anthracene	Mouse	3.00E-02	1.00E+02	2.66E-01	2.66E+01	1.19E+00	1.19E+02	4.16E-01	4.16E+01
Benzo(*a*)anthracene	Mouse	3.00E-02	1.33E+01	2.66E-01	3.54E+00	1.19E+00	1.58E+01	4.16E-01	5.54E+00
Benzo(*a*)pyrene	Mouse	3.00E-02	1.00E+00	2.66E-01	2.66E-01	1.19E+00	1.19E+00	4.16E-01	4.16E-01
Benzo(*b*)fluoranthene	Mouse	3.00E-02	1.33E+01	2.66E-01	3.54E+00	1.19E+00	1.58E+01	4.16E-01	5.54E+00
Benzo(*g,h,i*)perylene	Mouse	3.00E-02	1.33E+01	2.66E-01	3.54E+00	1.19E+00	1.58E+01	4.16E-01	5.54E+00
Benzo(*k*)fluoranthene	Mouse	3.00E-02	1.00E+00	2.66E-01	2.66E-01	1.19E+00	1.19E+00	4.16E-01	4.16E-01
Chrysene	Mouse	3.00E-02	1.33E+01	2.66E-01	3.54E+00	1.19E+00	1.58E+01	4.16E-01	5.54E+00
Dibenzo(*a,h*)anthracene	Mouse	3.00E-02	1.33E+01	2.66E-01	3.54E+00	1.19E+00	1.58E+01	4.16E-01	5.54E+00
Di-*N*-octyl phthalate	None	None	No NOAEL	None	No NOAEL	None	No NOAEL	None	No NOAEL
Fluoranthene	Mouse	3.00E-02	5.00E+01	2.66E-01	1.33E+01	1.19E+00	5.95E+01	4.16E-01	2.08E+01
Fluorene	Mouse	3.00E-02	1.25E+00	2.66E-01	3.33E-01	1.19E+00	1.49E+00	4.16E-01	5.20E-01
2-Methylnaphthalene	Rat	3.50E-01	5.00E+00	4.92E-01	2.46E+00	2.20E+00	1.10E+01	7.69E-01	3.85E+00
Naphthalene	Rat	3.50E-01	5.00E+00	4.92E-01	2.46E+00	2.20E+00	1.10E+01	7.69E-01	3.85E+00
Phenanthrene	Mouse	3.00E-02	1.00E+00	2.66E-01	2.66E-01	1.19E+00	1.19E+00	4.16E-01	4.16E-01
Pyrene	Mouse	3.00E-02	1.00E+00	2.66E-01	2.66E-01	1.19E+00	1.19E+00	4.16E-01	4.16E-01

BW (kg) Raccoon = 5.98. BW (kg) Shrew = 0.015. BW (kg) Mink = 1.0.

Table 24. Derivation of NOAELs and Screening Toxicity Reference Values for Bird Receptors, SWMU 24B

Analyte	Test Species	Test Species Body Weight (kg) BW_t	Test Species $NOAEL_t$ (mg/kg/day)	American Robin		Green Heron	
				Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^0$	NOAEL (mg/kg/day) $NOAEL_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^0$	NOAEL (mg/kg/day) $NOAEL_t \times BW_{conv}$
INORGANICS							
Arsenic	Mallard duck	1.00E+00	5.14E+00	1.00E+00	5.14E+00	1.00E+00	5.14E+00
Barium	Chick (14 days old)	1.21E-01	2.08E+01	1.00E+00	2.08E+01	1.00E+00	2.08E+01
Cadmium	Mallard duck	1.15E+00	1.45E+00	1.00E+00	1.45E+00	1.00E+00	1.45E+00
Chromium	Black duck	1.25E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Lead	Quail	1.50E-01	1.13E+00	1.00E+00	1.13E+00	1.00E+00	1.13E+00
Mercury	Quail	1.50E-01	4.50E-01	1.00E+00	4.50E-01	1.00E+00	4.50E-01
Selenium	Mallard duck	1.00E+00	5.00E-01	1.00E+00	5.00E-01	1.00E+00	5.00E-01
ORGANICS							
Volatile Organic Compounds							
Acetone	None	None	No NOAEL	None	No NOAEL	None	No NOAEL
2-Butanone	None	None	No NOAEL	None	No NOAEL	None	No NOAEL
Toluene	None	None	No NOAEL	None	No NOAEL	None	No NOAEL
Semivolatile Organic Compounds							
Acenaphthene	Composite bird	8.50E-01	8.78E+01	1.00E+00	8.78E+01	1.00E+00	8.78E+01
Acenaphthylene	Composite bird	8.50E-01	9.97E+00	1.00E+00	9.97E+00	1.00E+00	9.97E+00
Anthracene	Composite bird	8.50E-01	3.30E+02	1.00E+00	3.30E+02	1.00E+00	3.30E+02
Benzo(*a*)anthracene	Composite bird	8.50E-01	1.24E+01	1.00E+00	1.24E+01	1.00E+00	1.24E+01
Benzo(*a*)pyrene	Composite bird	8.50E-01	9.97E+00	1.00E+00	9.97E+00	1.00E+00	9.97E+00
Benzo(*b*)fluoranthene	Composite bird	8.50E-01	1.24E+01	1.00E+00	1.24E+01	1.00E+00	1.24E+01
Benzo(*g,h,i*)perylene	Composite bird	8.50E-01	1.24E+01	1.00E+00	1.24E+01	1.00E+00	1.24E+01
Benzo(*k*)fluoranthene	Composite bird	8.50E-01	9.97E+00	1.00E+00	9.97E+00	1.00E+00	9.97E+00
Chrysene	Composite bird	8.50E-01	1.24E+01	1.00E+00	1.24E+01	1.00E+00	1.24E+01
Dibenzo(*a,h*)anthracene	Composite bird	8.50E-01	1.24E+01	1.00E+00	1.24E+01	1.00E+00	1.24E+01
Di-*N*-octyl phthalate	None	None	No NOAEL	None	No NOAEL	None	No NOAEL
Fluoranthene	Composite bird	8.50E-01	1.95E+02	1.00E+00	1.95E+02	1.00E+00	1.95E+02
Fluorene	Composite bird	8.50E-01	6.80E+01	1.00E+00	6.80E+01	1.00E+00	6.80E+01
2-Methylnaphthalene	Composite bird	8.50E-01	3.39E+01	1.00E+00	3.39E+01	1.00E+00	3.39E+01
Naphthalene	Composite bird	8.50E-01	3.39E+01	1.00E+00	3.39E+01	1.00E+00	3.39E+01
Phenanthrene	Composite bird	8.50E-01	9.97E+00	1.00E+00	9.97E+00	1.00E+00	9.97E+00
Pyrene	Composite bird	8.50E-01	9.97E+00	1.00E+00	9.97E+00	1.00E+00	9.97E+00

BW (kg) Robin = 0.08.
BW (kg) Green heron = 0.25.

Table 25. Derivation of LOAEL Toxicity Reference Values for Mammal Test Species, SWMU 24B

ECOPC	Test Species	Test Species Body Weight (kg) BW_t	Benchmark (mg/kg/day)	Test Duration	Endpoint	Effect	Source	Duration Conversion Factor (DCF)	Endpoint Conversion Factor (ECF)	TRV (mg/kg/day) Benchmark × DCF × ECF
INORGANICS										
Cadmium	Rat	3.03E-01	1.00E+01	Chronic	LOAEL	Reproduction	Sutou et al. (1980b) in [1]	1.0	1.0	1.00E+01
Chromium	Rat	3.50E-01	2.74E+03	Chronic	NOAEL	Reproduction	Ivankovic and Preussmann (1975) in [1]	1.0	10.0	2.74E+04
Lead	Rat	3.50E-01	8.00E+01	Chronic	LOAEL	Reproduction	Azar et al. (1973) in [1]	1.0	1.0	8.00E+01
Selenium	Rat	3.50E-01	3.30E-01	Chronic	LOAEL	Reproduction	Rosenfeld and Beath (1954) in [1]	1.0	1.0	3.30E-01
ORGANICS										
Semivolatile Organic Compounds										
Benzo(*a*)pyrene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	MacKenzie and Angevine (1981) in [1]	1.0	1.0	1.00E+01
Benzo(*k*)fluoranthene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Opresko (1995) in [2]	1.0	1.0	1.00E+01
Di-*N*-butyl phthalate	Mouse	3.00E-02	1.83E+03	Chronic	LOAEL	Reproduction	Lamb et al. (1987) in [1]	1.0	1.0	1.83E+03
Di-*N*-octyl phthalate	Mouse	3.00E-02	1.83E+03	Chronic	LOAEL	Reproduction	Surrogate from di-*N*-butyl phthalate	1.0	1.0	1.83E+03
Pyrene	Mouse	3.00E-02	1.00E+01	Chronic	LOAEL	Reproduction	Surrogate from benzo(*a*)pyrene	1.0	1.0	1.00E+01

DCF = 1 if chronic, 0.1 if subchronic (Sample, Opresko, and Suter 1996).
ECF = 10 if NOAEL, 1.0 if LOAEL (Sample, Opresko, and Suter 1996).
[1] = Sample, Opresko, and Suter (1996).
[2] = QST (1997); all values assumed to be chronic.

Table 26. Derivation of LOAEL Toxicity Reference Values for Bird Test Species, SWMU 24B

ECOPC	Test Species	Test Species Body Weight (kg) BW_t	Benchmark (mg/kg/day)	Test Duration	Endpoint	Effect	Source	Duration Conversion Factor (DCF)	Endpoint Conversion Factor (ECF)	TRV (mg/kg/day) Benchmark × DCF × ECF
INORGANICS										
Cadmium	Mallard duck	1.15E-00	2.00E+01	Chronic	LOAEL	Reproduction	White and Finley (1978) in [1]	1.0	1.0	2.00E+01
Chromium	Black duck	1.25E-00	5.00E-00	Chronic	LOAEL	Reproduction	Haseltine et al. (unpubl.) in [1]	1.0	1.0	5.00E-00
Lead	Quail	1.50E-01	1.13E+01	Chronic	LOAEL	Reproduction	Edens et al. (1976) in [1]	1.0	1.0	1.13E+01
Selenium	Mallard duck	1.00E+00	1.00E+00	Chronic	LOAEL	Reproduction	Heinz et al. (1987) in [1]	1.0	1.0	1.00E+00
ORGANICS										
Semivolatile Organic Compounds										
Benzo(*a*)anthracene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	1.24E+02
Benzo(*a*)pyrene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	9.97E+01
Benzo(*b*)fluoranthene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	1.24E+02
Benzo(*g,h,i*)perylene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	1.24E+02
Benzo(*k*)fluoranthene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	9.97E+01
Chrysene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	1.24E+02
Di-*N*-butyl phthalate	Ringed dove	1.55E-01	1.11E+00	Chronic	LOAEL	Reproduction	Peakall (1974) in [1]	1.0	1.0	1.11E+00
Di-*N*-octyl phthalate	Ringed dove	1.55E-01	1.11E+00	Chronic	LOAEL	Reproduction	Surrogate from di-*N*-butyl phthalate	1.0	1.0	1.11E+00
Indeno(1,2,3-cd) pyrene	Composite bird	8.50E-01	1.24E+01	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	0.1	1.0	1.24E+00
Pyrene	Composite bird	8.50E-01	9.97E+00	Chronic	NOAEL	None	Shortelle et al. (1997) in [2]	1.0	10.0	9.97E+01

DCF = 1 if chronic, 0.1 if subchronic (Sample, Opresko, and Suter 1996).
ECF = 10 if NOAEL, 1.0 if LOAEL (Sample, Opresko, and Suter 1996).
[1] = Sample, Opresko, and Suter (1996).
[2] = QST (1997).

Table 27. Derivation of LOAEL Toxicity Reference Values for Mammal Receptors, SWMU 24B

ECOPC	Test Species	Test Species Body Weight BW_t (kg)	TRV_t (mg/kg/day)	Raccoon		Short-tailed Shrew		Mink	
				Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	TRV (mg/kg/day) $TRV_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	TRV (mg/kg/day) $TRV_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^{0.25}$	TRV (mg/kg/day) $TRV_t \times BW_{conv}$
INORGANICS									
Cadmium	Rat	3.03E-01	1.00E+01	5.64E-01	5.64E-00	2.12E-00	2.12E+01	7.42E-01	7.42E-00
Chromium	Rat	3.50E-01	2.74E+04	5.84E-01	1.60E+04	2.20E-00	6.02E+04	7.69E-01	2.11E+04
Lead	Rat	3.50E-01	8.00E+01	5.84E-01	4.68E+01	2.20E-00	1.76E+02	7.69E-01	6.15E+01
Selenium	Rat	3.50E-01	3.30E-01	5.84E-01	1.93E-01	2.20E+00	7.25E-01	7.69E-01	2.54E-01
ORGANICS									
Semivolatile Organic Compounds									
Benzo(*a*)pyrene	Mouse	3.00E-02	1.00E+01	3.16E-01	3.16E+00	1.19E+00	1.19E+01	4.16E-01	4.16E+00
Benzo(*k*)fluoranthene	Mouse	3.00E-02	1.00E+01	3.16E-01	3.16E+00	1.19E+00	1.19E+01	4.16E-01	4.16E+00
Di-*N*-butyl phthalate	Mouse	3.00E-02	1.83E+03	3.16E-01	5.80E+02	1.19E+00	2.18E+03	4.16E-01	7.63E+02
Di-*N*-octyl phthalate	Mouse	3.00E-02	1.83E+03	3.16E-01	5.80E+02	1.19E+00	2.18E+03	4.16E-01	7.63E+02
Pyrene	Mouse	3.00E-02	1.00E+01	3.16E-01	3.16E+00	1.19E+00	1.19E+01	4.16E-01	4.16E+00

BW (kg) Raccoon = 3 per Rod Stafford (GEPD), September 1999.
BW (kg) Short-tailed shrew = 0.015 per Sample, Opresko, and Suter (1996), Table B.1.
BW (kg) Mink = 1 per Sample, Opresko, and Suter (1996), Table B.1.

Table 28. Derivation of LOAEL Toxicity Reference Values for Bird Receptors, SWMU 24B

ECOPC	Test Species	Test Species Body Weight BW_t (kg)	TRV_t (mg/kg/day)	American Robin		Green Heron	
				Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^0$	TRV (mg/kg/day) $TRV_t \times BW_{conv}$	Body-weight Conversion Factor BW_{conv} $(BW_t / BW)^0$	TRV (mg/kg/day) $TRV_t \times BW_{conv}$
INORGANICS							
Cadmium	Mallard duck	1.15E-00	2.00E+01	1.00E-00	2.00E+01	1.00E-00	2.00E+01
Chromium	Black duck	1.25E-00	5.00E-00	1.00E-00	5.00E-00	1.00E-00	5.00E-00
Lead	Quail	1.50E-01	1.13E+01	1.00E-00	1.13E+01	1.00E-00	1.13E+01
Selenium	Mallard duck	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
ORGANICS							
Semivolatile Organic Compounds							
Benzo(*a*)anthracene	Composite bird	8.50E-01	1.24E+02	1.00E+00	1.24E+02	1.00E+00	1.24E+02
Benzo(*a*)pyrene	Composite bird	8.50E-01	9.97E+01	1.00E+00	9.97E+01	1.00E+00	9.97E+01
Benzo(*b*)fluoranthene	Composite bird	8.50E-01	1.24E+02	1.00E+00	1.24E+02	1.00E+00	1.24E+02
Benzo(*g,h,i*)perylene	Composite bird	8.50E-01	1.24E+02	1.00E+00	1.24E+02	1.00E+00	1.24E+02
Benzo(*k*)fluoranthene	Composite bird	8.50E-01	9.97E+01	1.00E+00	9.97E+01	1.00E+00	9.97E+01
Chrysene	Composite bird	8.50E-01	1.24E+02	1.00E+00	1.24E+02	1.00E+00	1.24E+02
Di-*N*-butyl phthalate	Ringed dove	1.55E-01	1.11E+00	1.00E+00	1.11E+00	1.00E+00	1.11E+00
Di-*N*-octyl phthalate	Ringed dove	1.55E-01	1.11E+00	1.00E+00	1.11E+00	1.00E+00	1.11E+00
Indeno(*1,2,3-cd*)pyrene	Composite bird	8.50E-01	1.24E+00	1.00E+00	1.24E+00	1.00E+00	1.24E+00
Pyrene	Composite bird	8.50E-01	9.97E+01	1.00E+00	9.97E+01	1.00E+00	9.97E+01

BW (kg) American robin = 0.077 (Sample, Opresko, and Suter 1996; Table B.1).
BW (kg) Green heron = 0.241 (*Birds of North America*, No. 129, 1994).

Table 29. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 24B

ECOPC	C_{Max} (mg/kg)	BAF_i[a]	Short-tailed Shrew: ADD (mg/kg/day) = $C_{Max} \times BAF_i \times IR_S$	Short-tailed Shrew: TRV (mg/kg/day)	Short-tailed Shrew: HQ = ADD/TRV	American Robin: ADD (mg/kg/day) = $C_{Max} \times BAF_i \times IR_R$	American Robin: TRV (mg/kg/day)	American Robin: HQ = ADD/TRV
Volatile Organic Compounds								
2-Butanone	0.0054	5.00E-02	1.51E-04	3.89E+03	3.88E-08	3.27E-04	No TRV	No HQ
Acetone	0.045	5.00E-02	1.26E-03	2.20E+01	5.73E-05	2.72E-03	No TRV	No HQ
Toluene	0.142	5.00E-02	3.98E-03	3.09E+01	1.29E-04	8.59E-03	No TRV	No HQ
				HI =	**1.86E-04**		**HI =**	**0.00E+00**
Semivolatile Organic Compounds								
2-Methylnaphthalene	0.206	5.00E-02	5.77E-03	1.10E+01	5.25E-04	1.25E-02	3.39E+01	3.68E-04
Acenaphthene	0.0196	5.00E-02	5.49E-04	2.08E+02	2.64E-06	1.19E-03	8.78E+01	1.35E-05
Acenaphthylene	8.53	5.00E-02	2.39E-01	1.19E+01	2.01E-02	5.16E-01	9.97E+00	5.18E-02
Anthracene	2.78	5.00E-02	7.78E-02	1.19E+02	6.55E-04	1.68E-01	3.30E+02	5.10E-04
Benzo(*a*)anthracene	34.6	5.00E-02	9.69E-01	1.58E+01	6.13E-02	2.09E+00	1.24E+01	1.69E-01
Benzo(*a*)pyrene	44.1	5.00E-02	1.23E+00	1.19E+00	1.04E+00	2.67E+00	9.97E+00	2.68E-01
Benzo(*b*)fluoranthene	40.9	5.00E-02	1.15E+00	1.58E+01	7.24E-02	2.47E+00	1.24E+01	2.00E-01
Benzo(*g,h,i*)perylene	29.5	5.00E-02	8.26E-01	1.58E+01	5.22E-02	1.78E+00	1.24E+01	1.44E-01
Benzo(*k*)fluoranthene	49.1	5.00E-02	1.37E+00	1.19E+00	1.16E+00	2.97E+00	9.97E+00	2.98E-01
Chrysene	40.4	5.00E-02	1.13E+00	1.58E+01	7.15E-02	2.44E+00	1.24E+01	1.97E-01
Di-*N*-octyl phthalate	0.22	5.00E-02	6.16E-03	No TRV	No HQ	1.33E-02	No TRV	No HQ
Fluoranthene	35.8	5.00E-02	1.00E+00	5.95E+01	1.69E-02	2.17E+00	1.95E+02	1.11E-02
Fluorene	0.825	5.00E-02	2.31E-02	1.49E+00	1.55E-02	4.99E-02	6.80E+01	7.34E-04
Indeno(*1,2,3-cd*)pyrene	22.4	5.00E-02	6.27E-01	1.58E+01	3.97E-02	1.36E+00	1.24E+01	1.09E-01
Naphthalene	0.68	5.00E-02	1.90E-02	1.10E+01	1.73E-03	4.11E-02	3.39E+01	1.21E-03
Phenanthrene	5.2	5.00E-02	1.46E-01	1.19E+00	1.22E-01	3.15E-01	9.97E+00	3.16E-02
Pyrene	80.6	5.00E-02	2.26E+00	1.19E+00	1.90E+00	4.88E+00	9.97E+00	4.89E-01
				HI =	**4.57E+00**		**HI =**	**1.97E+00**

Note: Footnotes appear on page 70.

Table 29. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 24B (continued)

ECOPC	C_{Max} (mg/kg)	BAF_i[a]	Short-tailed Shrew			American Robin		
			ADD (mg/kg/day) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/day)	HQ = ADD/TRV	ADD (mg/kg/day) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/day)	HQ = ADD/TRV
Metals								
Arsenic	2.7	6.60E-03[b]	9.98E-03	1.50E-01	6.66E-02	2.16E-02	5.14E+00	4.20E-03
Barium	230	7.50E-03[c]	9.66E-01	1.17E+01	8.23E-02	2.09E+00	2.08E+01	1.00E-01
Cadmium	6.1	1.10E+01[d]	3.76E+01	2.12E+00	1.77E+01	8.12E+01	1.45E+00	5.60E+01
Chromium	18.3	1.60E-01[d]	1.64E+00	6.02E+03	2.73E-04	3.54E+00	1.00E+00	3.54E+00
Lead	690	4.00E-01[e]	1.55E+02	1.76E+01	8.79E+00	3.34E+02	1.13E+00	2.96E+02
Mercury	0.13	3.40E-01[f]	2.48E-02	2.89E+00	8.58E-03	5.35E-02	4.50E-01	1.19E-01
Selenium	0.6	7.60E-01[b]	2.55E-01	4.40E-01	5.81E-01	5.52E-01	5.00E-01	1.10E+00

[a]Beyer, W.N., 1990, "Evaluating Soil Contamination," *U.S. Fish Wildlife Service Biol. Rep.* **90**(2), unless otherwise noted.

[b]Beyer, W.N., and E.J. Cromartie 1987, "A survey of Pb, Cu, Zn, Cd, Cr, As, and Se in earthworms and soils from diverse sites," *Environ. Monit. Assessment* **8**: 27–36.

[c]Ingestion-to-beef transfer coefficient (day/kg) from Baes et al. (1984) multiplied by ingestion rate of cattle (50 kg/day). Baes, C.F., III, R.D. Sharp, A.L. Sjoreen, and R.W. Shor 1984, *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*, ORNL-5786, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

[d]Diercxsens, P., D. deWeck, N. Borsinger, B. Rosset, and J. Tarradellas 1985, "Earthworm Contamination by PCBs and Heavy Metals," *Chemosphere* **14**(5): 511–522.

[e]Calcium-dependent BAF for lead (Corp and Morgan 1991); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration >1 mg/kg. Corp, N., and A.J. Morgan 1991, "Accumulation of Heavy Metals from Polluted Soils by the Earthworm," *Environ. Pollution* **74**: 39–52.

[f]U.S. Environmental Protection Agency 1986, *Environmental Profiles and Hazard Indices for Constituents of Municipal Sludge: Mercury*, Office of Water Regulations and Standards, Washington, D.C.

ADD = Average daily dose (mg/kg/day).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

IR_R = Robin food ingestion rate (kg/kg/day) = 1.21.

IR_S = Shrew food ingestion rate (kg/kg/day) = 0.56.

TRV = Toxicity reference value = NOAEL (mg/kg/day); see Tables 23 and 24.

Cells with double borders indicate HQ > 1.

Table 30. Preliminary Risk Calculations for ECOPCs in Deep Groundwater, SWMU 24B

			Raccoon			Mink			Green Heron		
ECOPC	C_{max} (µg/L)	BCF	ADD (mg/kg/day) = C_{max} × 0.001× IR_w	TRV (mg/kg/day)	HQ = ADD/TRV	ADD (mg/kg/day) = C_{Max} × 0.001 × BCF × IR_M	TRV (mg/kg/day)	HQ = ADD/TRV	ADD (mg/kg/day) = C_{Max} × 0.001 × BCF × IR_H	TRV (mg/kg/day)	HQ = ADD/TRV
Metals											
Barium	97	4.00E+00	7.76E-03	2.63E+00	2.95E-03	5.32E-02	4.11E+00	1.29E-02	7.45E-02	2.08E+01	3.58E-03

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/day).
BCF = Water-to-fish bioconcentration factor; Barnthouse, L.W., J.E. Breck, T.D. Jones, G.W. Suter, and C. Easterly 1988, *Relative Toxicity Estimates and Bioaccumulation Factors for the Defense Priority Model*, ORNL-6416, Oak Ridge National Laboratory, Environmental Sciences Division, Oak Ridge, Tennessee.
C_{max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient.
IR_H = Heron food ingestion rate (kg/kg/day) = 0.192.
IR_M = Mink food ingestion rate (kg/kg/day) = 0.137.
IR_w = Raccoon water ingestion rate (L/kg/day) = 0.08.
TRV = Toxicity reference value = NOAEL (mg/kg/day); see Tables 23 and 24.

Table 31. Supplemental Risk Calculations for ECOPCs in Surface Soil for Short-tailed Shrew, SWMU 24B

ECOPC	Site Concentration Mean (mg/kg)	SP_v[a]	Short-tailed Shrew						
			ADD_P (mg/kg/day) = Mean × SP_r × I_P × AUF	BAF_i[c]	ADD_A (mg/kg/day) = Mean × BAF_i × I_A × AUF	ADD_S (mg/kg/day) = Mean × I_S × AUF	ADD_{total} (mg/kg/day) = ADD_P + ADD_A + ADD_S	LOAEL TRV (mg/kg/day)	HQ = ADD_{total}/TRV
Semivolatile Organic Compounds									
Benzo(*a*)pyrene	7.10E+00	2.60E-03	3.43E-04	5.00E-02	4.41E-02	1.32E-01	1.76E-01	1.19E+01	1.48E-02
Benzo(*k*)fluoranthene	7.03E+00	2.30E-03	3.00E-04	5.00E-02	4.37E-02	1.31E-01	1.74E-01	1.19E+01	1.47E-02
Di-*N*-octyl phthalate	4.01E+00	3.70E-05	2.75E-06	5.00E-02	2.49E-02	7.44E-02	9.94E-02	2.18E+03	4.56E-05
Pyrene	1.21E+01	6.70E-03	1.50E-03	5.00E-02	7.52E-02	2.25E-01	3.01E-01	1.19E+01	2.53E-02
Metals									
Cadmium	1.77E+00	1.10E-01[b]	3.61E-03	1.10E+01[d]	2.42E+00	3.29E-02	2.46E+00	2.12E+01	1.16E-01
Lead	1.34E+02	9.00E-03[b]	2.24E-02	4.00E-01[e]	6.66E+00	2.49E+00	9.17E+00	1.76E+02	5.21E-02

[a]Travis, C.C., and A.D. Arms 1988, "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environmental Science Technology* **22**(3): 271–274, unless otherwise noted.
[b]Soil-to-plant concentration factor (B_v) from Baes et al. (1984) multiplied by 0.2 to represent 80 percent water composition of plants. Baes, C.F., III, R.D. Sharp, A.L. Sjoreen, and R.W. Shor 1984, *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*, ORNL-5786, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
[c]Beyer, W.N., 1990, "Evaluating Soil Contamination," *U.S. Fish Wildlife Service Biol. Rep.* **90**(2), unless otherwise noted.
[d]Diercxsens, P., D. deWeck, N. Borsinger, B. Rosset, and J. Tarradellas 1985, "Earthworm Contamination by PCBs and Heavy Metals," *Chemosphere* **14**(5): 511–522.
[e]Calcium-dependent BAF for lead (Corp and Morgan 1991); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration >1 mg/kg. Corp, N., and A.J. Morgan 1991, "Accumulation of Heavy Metals from Polluted Soils by the Earthworm," *Environ. Pollution* **74**: 39–52.

ADD_A = Average daily dose; animal.
ADD_P = Average daily dose; plant.
ADD_S = Average daily dose; soil.
ADD_{total} = Average daily dose; total.
AF = Animal fraction.
AUF = 2.38E-01; SWMU area (0.093 ha) ÷ shrew home range (0.39 ha).
BAF_i = Soil-to-animal bioaccumulation factor; invertebrates.
HQ = Hazard quotient.
I = Average daily dose ingested: S = soil, P = plant, A = animal.
$I_A = TUF \times IR_f \times AF$.
I_A (kg/kg/day) = 5.22E-01.
$I_P = TUF \times IR_f \times PF$.
I_P (kg/kg/day) = 7.80E-02.
$I_S = TUF \times IR_f \times SF$.
I_S (kg/kg/day) = 7.80E-02.
IR_f = Food ingestion rate.
PF = Plant fraction.
SF = Soil fraction.
SP_v = Soil-to-plant bioaccumulation factor; vegetative.
TUF = Temporal use factor = 1.
TRV = Toxicity reference value = LOAEL (mg/kg/day); see Table 27.

Table 32. Supplemental Risk Calculations for ECOPCs in Surface Soil for American Robin, SWMU 24B

ECOPC	Site Concentration Mean (mg/kg)	SP_r[a]	American Robin ADD_P (mg/kg/day) = Mean × SP_r × I_P × AUF	BAF_i[c]	American Robin ADD_A (mg/kg/day) = Mean × BAF_i × I_A × AUF	American Robin ADD_S (mg/kg/day) = Mean × I_S × AUF	American Robin ADD_{total} (mg/kg/day) = ADD_P + ADD_A + ADD_S	LOAEL TRV (mg/kg/day)	HQ = ADD_{total}/TRV
Semivolatile Organic Compounds									
Benzo(*a*)anthracene	5.47E+00	3.90E-03	1.47E-03	5.00E-02	1.88E-02	7.84E-02	9.87E-02	1.24E+02	7.96E-04
Benzo(*a*)pyrene	7.10E+00	2.60E-03	1.27E-03	5.00E-02	2.45E-02	1.02E-01	1.27E-01	9.97E+01	1.28E-03
Benzo(*b*)fluoranthene	7.73E+00	2.30E-03	1.22E-03	5.00E-02	2.66E-02	1.11E-01	1.39E-01	1.24E+02	1.12E-03
Benzo(*g,h,i*)perylene	5.27E+00	1.20E-03	4.36E-04	5.00E-02	1.81E-02	7.55E-02	9.41E-02	1.24E+02	7.59E-04
Benzo(*k*)fluoranthene	7.03E+00	2.30E-03	1.11E-03	5.00E-02	2.42E-02	1.01E-01	1.26E-01	9.97E+01	1.26E-03
Chrysene	6.78E+00	3.90E-03	1.82E-03	5.00E-02	2.34E-02	9.71E-02	1.22E-01	1.24E+02	9.86E-04
Di-*N*-octyl phthalate	4.01E+00	3.70E-05	1.02E-05	5.00E-02	1.38E-02	5.75E-02	7.13E-02	1.11E+00	6.42E-02
Indeno(*1,2,3-cd*)pyrene	4.18E+00	1.20E-03	3.46E-04	5.00E-02	1.44E-02	5.99E-02	7.46E-02	1.24E+00	6.02E-02
Pyrene	1.21E+01	6.70E-03	5.58E-03	5.00E-02	4.17E-02	1.73E-01	2.21E-01	9.97E+01	2.21E-03
								HI =	**1.33E-01**
Metals									
Cadmium	1.77E+00	3.00E-02[b]	3.66E-03	1.10E+01[d]	1.34E+00	2.54E-02	1.37E+00	2.00E+01	6.85E-02
Chromium	7.49E+00	9.00E-04[b]	4.64E-04	1.60E-01[d]	8.25E-02	1.07E-01	1.90E-01	5.00E+00	3.81E-02
Lead	1.34E+02	1.80E-03[b]	1.66E-02	4.00E-01[e]	3.69E+00	1.92E+00	5.63E+00	1.13E+01	4.98E-01
Selenium	2.62E-01	5.00E-03[b]	9.02E-05	7.60E-01[f]	1.37E-02	3.75E-03	1.76E-02	1.00E+00	1.76E-02

[a]Travis, C.C., and A.D. Arms 1988, "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environmental Science Technology* **22**(3): 271–274, unless otherwise noted.

[b]Soil-to-plant concentration factor (B_r) from Baes et al. (1984) multiplied by 0.2 to represent 80 percent water composition of plants. Baes, C.F., III, R.D. Sharp, A.L. Sjoreen, and R.W. Shor 1984, *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*, ORNL-5786, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

[c]Beyer, W.N., 1990, "Evaluating Soil Contamination," *U.S. Fish Wildlife Service Biol. Rep.* **90**(2), unless otherwise noted.

[d]Diercxsens, P., D. deWeck, N. Borsinger, B. Rosset, and J. Tarradellas 1985, "Earthworm Contamination by PCBs and Heavy Metals," *Chemosphere* **14**(5): 511–522.

[e]Calcium-dependent BAF for lead (Corp and Morgan 1991); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration >1 mg/kg. Corp, N., and A.J. Morgan 1991, "Accumulation of Heavy Metals from Polluted Soils by the Earthworm," *Environ. Pollution* **74**: 39–52.

[f]Beyer, W.N., and E.J. Cromartie 1987, "A survey of Pb, Cu, Zn, Cd, Cr, As, and Se in earthworms and soils from diverse sites," *Environ. Monit. Assessment* **8**: 27–36.

ADD_A = Average daily dose; animal.
ADD_P = Average daily dose; plant.
ADD_S = Average daily dose; soil.
ADD_{total} = Average daily dose; total.
AF = Animal fraction.
AUF = 1.15E-01; SWMU area (0.093 ha) ÷ robin home range (0.81 ha).
BAF_i = Soil-to-animal bioaccumulation factor; invertebrates.
HQ = Hazard quotient.
I = Average daily dose ingested: S = soil, P = plant, A = animal.
I_A = TUF × IR_f × AF.
I_A (kg/kg/day) = 6.00E-01.
I_P = TUF × IR_f × PF.
I_P (kg/kg/day) = 6.00E-01.
I_S = TUF × IR_f × SF.
I_S (kg/kg/day) = 1.25E-01.
IR_f = Food ingestion rate.
PF = Plant fraction.
SF = Soil fraction.
SP_r = Soil-to-plant bioaccumulation factor; reproductive.
TRV = Toxicity reference value (mg/kg/day) = LOAEL; see Table 28.
TUF = Temporal use factor = 1.

Table 33. Summary of Leachate Modeling Results, SWMU 24B

Preliminary CMCOPCs[a]	Modeled Maximum Groundwater Concentration at the Source (mg/L)	Groundwater Target Concentration (mg/L)	Source[b]	CMCOPC?
ORGANICS				
Methylene chloride	1.32E-05	0.005	M	No
Benzo(*a*)anthracene	0.00	0.092	R	No
Benzo(*a*)pyrene	0.00	0.0002	M	No
Benzo(*b*)fluoranthene	0.00	0.092	R	No
Benzo(*k*)fluoranthene	0.00	0.92	R	No
Indeno(*1,2,3-cd*)pyrene	0.00	0.092	R	No
INORGANICS				
Arsenic	0.019	0.05	M	No
Barium	1.149	2	M	No
Cadmium	0.016	0.005	M	Yes
Chromium	0.20	0.1	M	Yes
Lead	1.364	0.015	M[c]	Yes
Mercury	0.001	0.002	M	No
Selenium	0.024	0.05	M	No

[a]These constituents were selected for SESOIL modeling from this site.
[b]M = Maximum contaminant level; R = risk-based concentration.
[c]Lead action level = 0.015 mg/L.
NA = Not applicable.

Table 34. Exposure Concentrations for Human Health Contaminants of Potential Concern, SWMU 24B

Medium/Units	Analyte	Maximum Detected Concentration	95 Percent Upper Confidence Limit
Surface soil (mg/kg)	Benzo(*a*)anthracene	38.8	**9.53**
Surface soil (mg/kg)	Benzo(*a*)pyrene	48.1	**11.9**
Surface soil (mg/kg)	Benzo(*b*)fluoranthene	40.9	**10.7**
Surface soil (mg/kg)	Benzo(*g,h,i*)perylene	29.5	**4.6**
Surface soil (mg/kg)	Benzo(*k*)fluoranthene	49.3	**12.0**
Surface soil (mg/kg)	Indeno(*1,2,3-cd*)pyrene	30.7	**18.1**
Surface soil (mg/kg)	Arsenic	2.7	**1.2**
Surface soil (mg/kg)	Lead	690	**441**
Groundwater (µg/L)	Trichloroethene	2.6	**1.67**

Bold indicates selected exposure concentration.

Table 35. Groundwater Migration Modeling Results for Contaminants of Potential Concern, SWMU 24B

Analyte	Source Concentration[a] (mg/L)	Receptor	Receptor Point Groundwater Concentration (mg/L)	COPC in Surface Water?
Benzo(*a*)anthracene	0.0026	Drainage ditch (500 feet)	0.00E+00	No

[a]Maximum observed groundwater concentration.

Table 36. Groundwater Migration Modeling Results for Contaminant Migration Contaminants of Potential Concern, SWMU 24B

COPC	Source Concentration[a] (mg/L)	Receptor	Receptor Point Groundwater Concentration (mg/L)	COPC in Surface Water?
Cadmium	0.016	Drainage ditch (500 feet)	1.40E-03	Yes
Chromium	0.2	Drainage ditch (500 feet)	2.21E-02	Yes
Lead	1.364	Drainage ditch (500 feet)	2.66E-10	No

[a]CMCOPCs modeled to water table.

Table 37. Exposure Parameters for Potential Receptor Populations, SWMU 24B

Parameter	Units	On-site Installation Worker	On-site Juvenile Trespasser	On-site Resident Adult	On-site Resident Child	Off-site Installation Worker	Off-site Resident Adult	Off-site Resident Child	Off-site Juvenile Wader	Off-site Sportsman
SURFACE SOIL										
Incidental Ingestion										
Soil ingestion rate	g/day	0.1	0.1	0.1	0.2	NA	NA	NA	NA	NA
Fraction ingested from area	unitless	1	0.38	1	1	NA	NA	NA	NA	NA
Exposure frequency	days/year	250	52	350	350	NA	NA	NA	NA	NA
Exposure duration	years	25	10	30	6	NA	NA	NA	NA	NA
Body weight	kg	70	45	70	15	NA	NA	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	NA	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	10,950	2,190	NA	NA	NA	NA	NA
Dermal Contact										
Skin area	cm^2/event	5,000	4,000	5,000	1,700	NA	NA	NA	NA	NA
Adherence factor	mg/cm^2	1	1	1	1	NA	NA	NA	NA	NA
Exposure frequency	events/year	250	52	350	350	NA	NA	NA	NA	NA
Exposure duration	years	25	10	30	6	NA	NA	NA	NA	NA
Body weight	kg	70	45	70	15	NA	NA	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	NA	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	10,950	2,190	NA	NA	NA	NA	NA
Inhalation of Dust										
Inhalation rate	m^3/hour	2.5	1.90	0.80	0.68	2.5	0.80	0.68	NA	NA
Exposure time	hours/day	8	6	18.4	18.4	8	18.4	18.4	NA	NA
Exposure frequency	days/year	250	52	350	350	250	350	350	NA	NA
Exposure duration	years	25	10	30	6	25	30	6	NA	NA
Body weight	kg	70	45	70	15	70	70	15	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	25,550	25,550	25,550	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	10,950	2,190	9,125	10,950	2,190	NA	NA
GROUNDWATER										
Drinking Water Ingestion										
Drinking water ingestion	L/day	1	NA	2	1	1	2	1	NA	NA
Fraction ingested from area	unitless	1	NA	1	1	1	1	1	NA	NA
Exposure frequency	days/year	250	NA	350	350	250	350	350	NA	NA
Exposure duration	years	25	NA	30	6	25	30	6	NA	NA
Body weight	kg	70	NA	70	15	70	70	15	NA	NA

Note: Footnotes appear on page 78.

Table 37. Exposure Parameters for Potential Receptor Populations, SWMU 24B (continued)

Parameter	Units	On-site Installation Worker	On-site Juvenile Trespasser	On-site Resident Adult	On-site Resident Child	Off-site Installation Worker	Off-site Resident Adult	Off-site Resident Child	Off-site Juvenile Wader	Off-site Sportsman
Carcinogen averaging time	days	25,550	NA	25,550	25,550	25,550	25,550	25,550	NA	NA
Noncarcinogen averaging time	days	9,125	NA	10,950	2,190	9,125	10,950	2,190	NA	NA
Inhalation of VOCs										
Inhalation rate	m^3/hour	NA	NA	0.4	NA	NA	0.4	NA	NA	NA
Exposure time	hours/day	NA	NA	0.17	NA	NA	0.17	NA	NA	NA
Exposure frequency	days/year	NA	NA	350	NA	NA	350	NA	NA	NA
Exposure duration	years	NA	NA	30	NA	NA	30	NA	NA	NA
Body weight	kg	NA	NA	70	NA	NA	70	NA	NA	NA
Carcinogen averaging time	days	NA	NA	25,550	NA	NA	25,550	NA	NA	NA
Noncarcinogen averaging time	days	NA	NA	10,950	NA	NA	10,950	NA	NA	NA
Dermal Contact while Bathing										
Skin area	m^2	NA	NA	2	1,700	NA	2	1,700	NA	NA
Exposure time	hours/day	NA	NA	0.17	0.2	NA	0.17	0.2	NA	NA
Exposure frequency	days/year	NA	NA	350	350	NA	350	350	NA	NA
Exposure duration	years	NA	NA	30	6	NA	30	6	NA	NA
Body weight	kg	NA	NA	70	15	NA	70	15	NA	NA
Carcinogen averaging time	days	NA	NA	25,550	25,500	NA	25,550	25,500	NA	NA
Noncarcinogen averaging time	days	NA	NA	10,950	2,190	NA	10,950	2,190	NA	NA
SURFACE WATER										
Incidental Ingestion										
Water ingestion rate	L/hour	NA	NA	NA	NA	NA	NA	NA	0.05	0.01
Exposure time	hours/day	NA	NA	NA	NA	NA	NA	NA	2	4
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	NA	52	52
Exposure duration	years	NA	NA	NA	NA	NA	NA	NA	10	30
Body weight	kg	NA	NA	NA	NA	NA	NA	NA	45	70
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	25,550	25,550
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	3,650	10,950
Dermal Contact while Wading										
Skin area	m^2	NA	NA	NA	NA	NA	NA	NA	0.4	0.41
Exposure time	hours/day	NA	NA	NA	NA	NA	NA	NA	2	4
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	NA	52	52
Exposure duration	years	NA	NA	NA	NA	NA	NA	NA	10	30

Note: Footnotes appear on page 78.

Table 37. Exposure Parameters for Potential Receptor Populations, SWMU 24B (continued)

Parameter	Units	On-site Installation Worker	On-site Juvenile Trespasser	On-site Resident Adult	On-site Resident Child	Off-site Installation Worker	Off-site Resident Adult	Off-site Resident Child	Off-site Juvenile Wader	Off-site Sportsman
Body weight	kg	NA	NA	NA	NA	NA	NA	NA	45	70
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	25,550	25,550
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	3,650	10,950
BIOTA										
Ingestion of Fish										
Ingestion rate	kg/day	NA	NA	NA	NA	NA	NA	NA	NA	0.027
Fraction ingested from area	unitless	NA	NA	NA	NA	NA	NA	NA	NA	1
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	NA	NA	365
Exposure duration	years	NA	NA	NA	NA	NA	NA	NA	NA	30
Body weight	kg	NA	NA	NA	NA	NA	NA	NA	NA	70
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	NA	25,550
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	NA	NA	10,950

NA = Not applicable.

Table 38. Estimated Intakes for Current On-site Installation Worker, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	1.17E-06	4.19E-07	5.87E-08	2.10E-08
Surface soil	Benzo(*a*)anthracene	9.53E+00	mg/kg	ND	3.33E-06	ND	1.67E-06
Surface soil	Benzo(*a*)pyrene	1.19E+01	mg/kg	ND	4.16E-06	ND	2.08E-06
Surface soil	Benzo(*b*)fluoranthene	1.07E+01	mg/kg	ND	3.74E-06	ND	1.87E-06
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	4.50E-06	ND	2.25E-06	ND
Surface soil	Benzo(*k*)fluoranthene	1.20E+01	mg/kg	ND	4.19E-06	ND	2.10E-06
Surface soil	Indeno(*1,2,3-cd*)pyrene	1.81E+01	mg/kg	ND	6.33E-06	ND	3.16E-06
Surface soil	Lead	4.41E+02	mg/kg	NA	ND	NA	ND

[a]The equations used to calculate oral and dermal exposures in surface soil are presented in Appendix I, Section I.2.4.2 of the revised final Phase II RFI Report (SAIC 2000).

NA = Not applicable; lead intake is estimated for the resident child only.

ND = Toxicity data are not available.

Table 39. Estimated Intakes for Future On-site Installation Worker, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	1.17E-06	4.19E-07	5.87E-08	2.10E-08	ND	1.56E-11
Surface soil	Benzo(*a*)anthracene	9.53E+00	mg/kg	ND	3.33E-06	ND	1.67E-06	ND	1.24E-10
Surface soil	Benzo(*a*)pyrene	1.19E+01	mg/kg	ND	4.16E-06	ND	2.08E-06	ND	1.54E-10
Surface soil	Benzo(*b*)fluoranthene	1.07E+01	mg/kg	ND	3.74E-06	ND	1.87E-06	ND	1.39E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	4.50E-06	ND	2.25E-06	ND	1.67E-10	ND
Surface soil	Benzo(*k*)fluoranthene	1.20E+01	mg/kg	ND	4.19E-06	ND	2.10E-06	ND	8.89E-11
Surface soil	Indeno(*1,2,3-cd*)pyrene	1.81E+01	mg/kg	ND	6.33E-06	ND	3.16E-06	ND	1.56E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	ND	NA[b]	ND	NA[b]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	1.63E-05	5.84E-06	NA[c]	NA[c]	NA[c]	NA[c]
Modeled groundwater	Cadmium	1.60E-02	mg/L	1.57E-04	ND	NA[c]	NA[c]	NA[c]	NA[c]
Modeled groundwater	Chromium	2.00E-01	mg/L	1.96E-03	ND	NA[c]	NA[c]	NA[c]	NA[c]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[b]	ND	NA[c]	NA[c]	NA[c]	NA[c]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).

[b]NA = Not applicable; lead intake was estimated for the resident child only.

[c]NA = Not applicable; this pathway was not assessed for this receptor.

ND = Toxicity data are not available.

Table 40. Estimated Intakes for Future On-site Juvenile Trespasser, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	1.44E-07	2.06E-08	1.52E-08	2.17E-09	ND	1.15E-12
Surface soil	Benzo(*a*)anthracene	9.53E+00	mg/kg	ND	1.64E-07	ND	1.72E-07	ND	9.13E-12
Surface soil	Benzo(*a*)pyrene	1.19E+01	mg/kg	ND	2.05E-07	ND	2.15E-07	ND	1.14E-11
Surface soil	Benzo(*b*)fluoranthene	1.07E+01	mg/kg	ND	1.84E-07	ND	1.94E-07	ND	1.02E-11
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	5.53E-07	ND	5.83E-07	ND	3.08E-11	NA
Surface soil	Benzo(*k*)fluoranthene	1.20E+01	mg/kg	ND	2.06E-07	ND	2.17E-07	ND	6.56E-12
Surface soil	Indeno(*1,2,3-cd*)pyrene	1.81E+01	mg/kg	ND	3.11E-07	ND	3.27E-07	ND	1.15E-11
Surface soil	Lead	4.41E+02	mg/kg	NA	ND	NA	ND	NA	ND

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil are presented in Appendix I, Section I.2.4.2 of the revised final Phase II RFI Report (SAIC 2000).

NA = Not applicable; lead intake was estimated for the resident child only.

ND = Toxicity data are not available.

Table 41. Estimated Intakes for Future On-site Resident Child, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	1.44E-07	2.06E-08	1.52E-08	2.17E-09	ND	1.53E-11
Surface soil	Benzo(*a*)anthracene	9.53E+00	mg/kg	ND	1.64E-07	ND	1.72E-07	ND	1.21E-10
Surface soil	Benzo(*a*)pyrene	1.19E+01	mg/kg	ND	2.05E-07	ND	2.15E-07	ND	1.52E-10
Surface soil	Benzo(*b*)fluoranthene	1.07E+01	mg/kg	ND	1.84E-07	ND	1.94E-07	ND	1.36E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	5.88E-05	ND	5.00E-06	ND	6.83E-10	ND
Surface soil	Benzo(*k*)fluoranthene	1.20E+01	mg/kg	ND	2.06E-07	ND	2.17E-07	ND	1.53E-10
Surface soil	Indeno(*1,2,3-cd*)pyrene	1.81E+01	mg/kg	ND	3.11E-07	ND	3.27E-07	ND	2.30E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	ND	NA[b]	ND	NA[b]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	1.07E-04	9.15E-06	3.95E-06	3.38E-07	NA[c]	NA[c]
Modeled groundwater	Cadmium	1.60E-02	mg/L	1.02E-03	ND	2.36E-06	ND	NA[c]	NA[c]
Modeled groundwater	Chromium	2.00E-01	mg/L	1.28E-02	ND	2.95E-05	ND	NA[c]	NA[c]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[b]	ND	NA[b]	ND	NA[c]	NA[c]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).

[b]NA = Not applicable; lead intake was estimated using IEUBK Model (EPA 1994a).

[c]NA = Not applicable; this pathway was not assessed for this receptor.

ND = Toxicity data are not available.

Table 42. Estimated Intakes for Future On-site Resident Adult, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	1.64E-06	7.05E-07	8.22E-08	3.52E-08	ND	1.93E-11
Surface soil	Benzo(*a*)anthracene	9.53E+00	mg/kg	ND	5.59E-06	ND	2.80E-06	ND	1.53E-10
Surface soil	Benzo(*a*)pyrene	1.19E+01	mg/kg	ND	6.99E-06	ND	3.49E-06	ND	1.91E-10
Surface soil	Benzo(*b*)fluoranthene	1.07E+01	mg/kg	ND	6.28E-06	ND	3.14E-06	ND	1.72E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	6.30E-06	ND	3.15E-06	ND	1.72E-10	ND
Surface soil	Benzo(*k*)fluoranthene	1.20E+01	mg/kg	ND	7.05E-06	ND	3.52E-06	ND	1.93E-10
Surface soil	Indeno(*1,2,3-cd*)pyrene	1.81E+01	mg/kg	ND	1.06E-05	ND	5.31E-06	ND	2.90E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	ND	NA[b]	ND	NA[b]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	4.58E-05	1.96E-05	1.24E-06	5.33E-07	7.78E-07	3.33E-07
Modeled groundwater	Cadmium	1.60E-02	mg/L	4.38E-04	ND	7.45E-07	ND	NA[c]	NA[c]
Modeled groundwater	Chromium	2.00E-01	mg/L	5.48E-03	ND	9.32E-06	ND	NA[c]	NA[c]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[b]	ND	NA[b]	ND	NA[c]	NA[c]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).

[b]NA = Not applicable; lead intake was estimated for the resident child only.

[c]NA = Not applicable; inhalation exposure is not a viable pathway for this constituent.

ND = Toxicity data are not available.

Table 43. Default Exposure Parameters for the Integrated Exposure Uptake Biokinetic Model, SWMU 24B

Age Group	Inhalation Exposure				Lead Exposure via Diet (µg lead/day)	Water Ingestion (L/day)	Soil Ingestion (g/day)
	Time Outdoors (hours)	Inhalation Rate (m^3/day)	Lung Absorption (percent)	Concentration of Lead in Indoor Air (percent outdoor conc.)			
0.5 to 1	1	2	32	30	5.53	0.2	0.085
1 to 2	2	3	32	30	5.78	0.5	0.135
2 to 3	3	5	32	30	6.49	0.52	0.135
3 to 4	4	5	32	30	6.24	0.53	0.135
4 to 5	4	5	32	30	6.01	0.55	0.100
5 to 6	4	7	32	30	6.34	0.58	0.090
6 to 7	4	7	32	30	7.00	0.59	0.085

Table 44. Estimated Uptakes of Lead for Near-future Receptor Population, SWMU 24B

Age Group	Units	Uptake Inhalation Dust	Uptake Ingestion of Soil	Uptake Ingestion of Groundwater	Uptake Diet[a]	Total Uptake
0.5 to 1	µg/day	0.00	5.16	0.41	5.53	12.53
1 to 2	µg/day	0.00	6.50	0.99	5.78	18.57
2 to 3	µg/day	0.00	6.80	1.05	6.49	19.29
3 to 4	µg/day	0.00	7.16	1.10	6.24	19.59
4 to 5	µg/day	0.00	5.55	1.18	6.01	16.04
5 to 6	µg/day	0.00	5.13	1.26	6.34	15.25
6 to 7	µg/day	0.00	4.98	1.29	7.00	15.08

[a]Uptake via diet represents default values given in IEUBK Model (EPA 1994a).

Table 45. Estimated Uptakes of Lead for Future Receptor Population, SWMU 24B

Age Group	Units	Uptake Inhalation Dust	Uptake Ingestion of Soil	Uptake Ingestion of Groundwater	Uptake Diet[a]	Total Uptake
0.5 to 1	µg/day	0.00	5.16	62.41	5.53	68.84
1 to 2	µg/day	0.00	6.50	123.68	5.78	131.22
2 to 3	µg/day	0.00	6.80	134.53	6.49	142.56
3 to 4	µg/day	0.00	7.16	144.40	6.24	152.81
4 to 5	µg/day	0.00	5.55	157.00	6.01	163.82
5 to 6	µg/day	0.00	5.13	170.00	6.34	176.59
6 to 7	µg/day	0.00	4.98	177.70	7.00	184.23

[a]Uptake via diet represents default values given in IEUBK Model (EPA 1994a).

Table 46. Estimated Intakes for Future Off-site Installation Worker, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	NA[b]	NA[b]	ND	1.56E-11
Surface soil	Benzo(*a*)anthracene	8.65E+00	mg/kg	NA[b]	NA[b]	ND	1.24E-10
Surface soil	Benzo(*a*)pyrene	1.05E+01	mg/kg	NA[b]	NA[b]	ND	1.54E-10
Surface soil	Benzo(*b*)fluoranthene	8.79E+00	mg/kg	NA[b]	NA[b]	ND	1.39E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	4.50E-06	ND	1.67E-10	ND
Surface soil	Benzo(*k*)fluoranthene	9.81E+00	mg/kg	NA[b]	NA[b]	ND	8.89E-11
Surface soil	Indeno(*1,2,3-cd*)pyrene	6.81E+00	mg/kg	NA[b]	NA[b]	ND	1.56E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	NA[b]	NA[c]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	1.63E-05	5.84E-06	NA[b]	NA[b]
Modeled groundwater	Cadmium	1.60E-02	mg/L	1.57E-04	ND	NA[b]	NA[b]
Modeled groundwater	Chromium	2.00E-01	mg/L	1.96E-03	ND	NA[b]	NA[b]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[c]	ND	NA[b]	NA[b]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this pathway was not assessed for this receptor.
[c]NA = Not applicable; lead intake was estimated for the resident child only.
ND = Toxicity data are not available.

Table 47. Estimated Intakes for Future Off-site Resident Child, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.53E-11
Surface soil	Benzo(*a*)anthracene	8.65E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.21E-10
Surface soil	Benzo(*a*)pyrene	1.05E+01	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.52E-10
Surface soil	Benzo(*b*)fluoranthene	8.79E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.36E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	6.83E-10	ND
Surface soil	Benzo(*k*)fluoranthene	9.81E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.53E-10
Surface soil	Indeno(*1,2,3-cd*)pyrene	6.81E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	2.30E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	1.07E-04	9.15E-06	3.95E-06	3.38E-07	NA[b]	NA[b]
Modeled groundwater	Cadmium	1.60E-02	mg/L	1.02E-03	ND	2.36E-06	ND	NA[b]	NA[b]
Modeled groundwater	Chromium	2.00E-01	mg/L	1.28E-02	ND	2.95E-05	ND	NA[b]	NA[b]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[c]	ND	NA[c]	ND	NA[b]	NA[b]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this pathway was not assessed for this receptor.
[c]NA = Not applicable; lead intake was estimated using IEUBK Model (EPA 1994a).
ND = Toxicity data are not available.

Table 48. Estimated Intakes for Future Off-site Resident Adult, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface soil	Arsenic	1.20E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.93E-11
Surface soil	Benzo(*a*)anthracene	8.65E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.53E-10
Surface soil	Benzo(*a*)pyrene	1.05E+01	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.91E-10
Surface soil	Benzo(*b*)fluoranthene	8.79E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.72E-10
Surface soil	Benzo(*g,h,i*)perylene	4.60E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	1.72E-10	ND
Surface soil	Benzo(*k*)fluoranthene	9.81E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	1.93E-10
Surface soil	Indeno(*1,2,3-cd*)pyrene	6.81E+00	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	ND	2.90E-10
Surface soil	Lead	4.41E+02	mg/kg	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	ND
Groundwater	Trichloroethene	1.67E-03	mg/L	4.58E-05	1.96E-05	1.24E-06	5.33E-07	7.78E-07	3.33E-07
Modeled groundwater	Cadmium	1.60E-02	mg/L	4.38E-04	ND	7.45E-07	ND	NA[d]	NA[d]
Modeled groundwater	Chromium	2.00E-01	mg/L	5.48E-03	ND	9.32E-06	ND	NA[d]	NA[d]
Modeled groundwater	Lead	1.36E+00	mg/L	NA[c]	ND	NA[c]	ND	NA[d]	NA[d]

[a]The equations used to calculate oral, dermal, and inhalation exposures in surface soil and groundwater are presented in Appendix I, Sections I.2.4.2 and I.2.4.3, respectively, of the revised final Phase II RFI Report (SAIC 2000).

[b]NA = Not applicable; this pathway was not assessed for this receptor.

[c]NA = Not applicable; lead intake was estimated for the resident child only.

[d]NA = Not applicable; inhalation exposure is not a viable pathway for this constituent.

ND = Toxicity data are not available.

Table 49. Estimated Intakes for Future Off-site Juvenile Wader, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface water (modeled)	Cadmium	1.40E-03	mg/L	4.43E-07	6.33E-08	3.55E-08	5.07E-09
Surface water (modeled)	Chromium	2.21E-02	mg/L	7.00E-06	1.00E-06	5.60E-07	8.00E-08

[a]The equations used to calculate oral and dermal exposures in surface water are presented in Appendix I, Section I.2.4.4 of the revised final Phase II RFI Report (SAIC 2000).

Table 50. Estimated Intakes for Future Off-site Sportsman, SWMU 24B

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)	Average Daily Dose for Noncarcinogens (mg/kg/day)	Average Daily Dose for Carcinogens (mg/kg/day)
Surface water (modeled)	Cadmium	1.40E-03	mg/L	1.14E-07	4.88E-08	4.67E-08	2.00E-08
Surface water (modeled)	Chromium	2.21E-02	mg/L	1.80E-06	7.71E-07	7.38E-07	3.16E-07
Fish	Cadmium	7.00E-02	mg/kg	2.70E-05	1.16E-05	NA	NA
Fish	Chromium	4.42E+00	mg/kg	1.70E-03	7.31E-04	NA	NA

[a]The equations used to calculate oral and dermal exposures in surface water and fish are presented in Appendix I, Sections I.2.4.4 and I.2.4.6, respectively, of the revised final Phase II RFI Report (SAIC 2000).

NA = Not applicable; this pathway was not assessed for this environmental medium.

Table 51. Toxicity Values for Contaminants of Potential Concern, SWMU 24B

Chemical	Oral Reference Dose (mg/kg/day)	Ref[a]	Oral Cancer Slope Factor $(mg/kg/day)^{-1}$	Ref[a]	Gastrointestinal Absorption Factor[b]	Dermal Reference Dose[c] (mg/kg/day)	Ref[a]	Dermal Cancer Slope Factor[d] $(mg/kg/day)^{-1}$	Inhalation Reference Dose (mg/kg/day)	Ref[a]	Inhalation Cancer Slope Factor $(mg/kg/day)^{-1}$	Ref[a]
Arsenic	3.00E-04	I	1.50E+00	I	0.41	1.23E-04		3.66E+00			1.51E+01	I
Benzo(*a*)anthracene			7.30E-01	E	0.31			2.35E+00			3.10E-01	E
Benzo(*a*)pyrene			7.30E+00	I	0.31			2.35E+01			3.10E+00	E
Benzo(*b*)fluoranthene			7.30E-01	E	0.31			2.35E+00			3.10E-01	E
Benzo(*g,h,i*)perylene	3.00E-02	E			0.31	9.30E-03						
Benzo(*k*)fluoranthene			7.30E-02	E	0.31			2.35E-01			3.10E-02	E
Cadmium—water	5.00E-04	I				2.50E-05	D		5.70E-05	E	6.30E+00	I
Cadmium—food	1.00E-03	I				2.50E-05	D		5.70E-05	E	6.30E+00	I
Chromium	3.00E-03	I			0.02	6.00E-05			2.29E-06	I	4.10E+01	H
Indeno(*1,2,3-cd*)pyrene			7.30E-01	E	0.31			2.35E+00			3.10E-01	E
Lead												
Trichloroethene	6.00E-03	X	1.10E-02	E	0.15	9.00E-04		7.33E-02			6.00E-03	E

[a]References:
D = Section I.3.4, "Dermal Evaluation of Constituents" (SAIC 2000).
E = EPA National Center for Environmental Assessment (EPA 2000a).
H = Health Effects Assessment Summary Tables (EPA 1997).
I = Integrated Risk Information System (EPA 2000b).
X = Withdrawn.

[b]ORNL 2000.

[c]Dermal reference dose calculated by multiplying the oral reference dose by the gastrointestinal absorption factor.

[d]Dermal cancer slope factor calculated by dividing the oral cancer slope factor by the gastrointestinal absorption factor.

ND = No data.

Table 52. Hazard Indices and Carcinogenic Risks for Current On-site Installation Worker, SWMU 24B

Chemical	Surface Soil[a]			Total Hazard Index[a]
	Ingestion HI	Dermal HI	Total	
Arsenic	3.91E-03	4.77E-04	4.39E-03	4.39E-03
Benzo(*a*)anthracene	ND	ND	ND	—
Benzo(*a*)pyrene	ND	ND	ND	—
Benzo(*b*)fluoranthene	ND	ND	ND	—
Benzo(g,h,i)perylene	2.23E-04	3.60E-04	5.83E-04	5.84E-04
Benzo(*k*)fluoranthene	ND	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	ND	ND	ND	—
Lead	NA	NA	NA	—
Pathway Total	**4.13E-03**	**8.37E-04**	**4.97E-03**	**4.97E-03**

Chemical	Surface Soil[b]			Total Cancer Risk[b]
	Ingestion ILCR	Dermal ILCR	Total	
Arsenic	6.29E-07	7.67E-08	7.06E-07	7.06E-07
Benzo(*a*)anthracene	2.43E-06	3.92E-06	6.35E-06	6.35E-06
Benzo(*a*)pyrene	3.04E-05	4.90E-05	7.94E-05	7.94E-05
Benzo(*b*)fluoranthene	2.73E-06	4.40E-06	7.13E-06	7.13E-06
Benzo(g,h,i)perylene	ND	ND	ND	—
Benzo(*k*)fluoranthene	3.06E-07	4.94E-07	8.00E-07	8.00E-07
Indeno(*1,2,3-cd*)pyrene	4.62E-06	7.45E-06	1.21E-05	1.21E-05
Lead	ND	ND	ND	—
Pathway Total	**4.11E-05**	**6.53E-05**	**1.06E-04**	**1.06E-04**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).

[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).

NA = Not applicable; lead toxicity is assessed for the resident child only.

ND = The toxicity data required to quantify the risk are not available.

— = No sum value could be calculated.

Table 53. Hazard Indices and Carcinogenic Risks for Future On-site Installation Worker, SWMU 24B

Chemical	Surface Soil[a]				Groundwater Measured Concentrations[a]		Groundwater Modeled Concentrations[a]		Total Hazard Index[a]
	Ingestion HI	Dermal HI	Inhalation HI	Total	Ingestion HI	Total	Ingestion HI	Total	
Arsenic	3.91E-03	4.77E-04	ND	4.39E-03	NA[b]	NA[b]	NA[b]	NA[b]	4.39E-03
Benzo(*a*)anthracene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	2.23E-04	3.60E-04	ND	5.83E-04	NA[b]	NA[b]	NA[b]	NA[b]	5.83E-04
Benzo(*k*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	3.13E-01	3.13E-01	3.13E-01
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	6.52E-01	6.52E-01	6.52E-01
Indeno(*1,2,3-cd*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[d]	NA[d]	NA[d]	NA[d]	NA[c]	NA[c]	NA[d]	NA[d]	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	2.72E-03	2.72E-03	NA[e]	NA[e]	2.72E-03
Pathway Total	**4.13E-03**	**8.37E-04**	—	**4.97E-03**	**2.72E-03**	**2.72E-03**	**9.65E-01**	**9.65E-01**	**9.73E-01**

Note: Footnotes appear on page 92.

Table 53. Hazard Indices and Carcinogenic Risks for Future On-site Installation Worker, SWMU 24B (continued)

Chemical	Surface Soil[f]				Groundwater Measured Concentrations[f]		Groundwater Modeled Concentrations[f]		Total Cancer Risk[f]
	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	Ingestion ILCR	Total	Ingestion HI	Total	
Arsenic	6.29E-07	7.67E-08	2.34E-10	7.06E-07	NA[b]	NA[b]	NA[b]	NA[b]	7.06E-07
Benzo(*a*)anthracene	2.43E-06	3.92E-06	3.83E-11	6.35E-06	NA[b]	NA[b]	NA[b]	NA[b]	6.35E-06
Benzo(*a*)pyrene	3.04E-05	4.90E-05	4.79E-10	7.94E-05	NA[b]	NA[b]	NA[b]	NA[b]	7.94E-05
Benzo(*b*)fluoranthene	2.73E-06	4.40E-06	4.31E-11	7.13E-06	NA[b]	NA[b]	NA[b]	NA[b]	7.13E-06
Benzo(*g,h,i*)perylene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	3.06E-07	4.94E-07	4.83E-12	8.00E-07	NA[b]	NA[b]	NA[b]	NA[b]	8.00E-07
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	ND	ND	—
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	4.62E-06	7.45E-06	7.28E-11	1.21E-05	NA[b]	NA[b]	NA[b]	NA[b]	1.21E-05
Lead	ND	ND	ND	ND	NA[c]	NA[c]	ND	ND	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	6.42E-08	6.42E-08	NA[d]	NA[d]	6.42E-08
Pathway Total	**4.11E-05**	**6.53E-05**	**8.72E-10**	**1.06E-04**	**6.42E-08**	**6.42E-08**	—	—	**1.07E-04**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA = Not applicable; constituent has only a measured concentration.
[d]NA = Not applicable; lead toxicity was assessed for the resident child only.
[e]NA = Not applicable; constituent has only a modeled concentration.
[f]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 54. Hazard Indices and Carcinogenic Risks for Future On-site Juvenile Trespasser, SWMU 24B

Chemical	Surface Soil[a]				Total Hazard Index[a]
	Ingestion HQ	Dermal HI	Inhalation HI	Total	
Arsenic	4.81E-04	1.24E-04	ND	6.05E-04	6.05E-04
Benzo(*a*)anthracene	ND	ND	ND	ND	—
Benzo(*a*)pyrene	ND	ND	ND	ND	—
Benzo(*b*)fluoranthene	ND	ND	ND	ND	—
Benzo(*k*)fluoranthene	2.75E-05	9.33E-05	ND	1.21E-04	1.21E-04
Benzo(g,h,i)perylene	ND	ND	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	ND	ND	ND	ND	—
Lead	NA	NA	NA	NA	—
Pathway Total	**5.09E-04**	**2.17E-04**	—	**7.26E-04**	**7.26E-04**

Chemical	Surface Soil[b]				Total Cancer Risk[b]
	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	
Arsenic	3.09E-08	7.94E-09	1.73E-11	3.89E-08	3.89E-08
Benzo(*a*)anthracene	1.20E-07	4.06E-07	2.83E-12	5.26E-07	5.26E-07
Benzo(*a*)pyrene	1.49E-06	5.07E-06	3.53E-11	6.56E-06	6.56E-06
Benzo(*b*)fluoranthene	1.34E-07	4.56E-07	3.18E-12	5.90E-07	5.90E-07
Benzo(*k*)fluoranthene	ND	ND	ND	ND	—
Benzo(g,h,i)perylene	1.51E-08	5.11E-08	3.56E-13	6.62E-08	6.62E-08
Indeno(*1,2,3-cd*)pyrene	2.27E-07	7.71E-07	5.37E-12	9.98E-07	9.98E-07
Lead	ND	ND	ND	ND	—
Pathway Total	**2.02E-06**	**6.76E-06**	**6.43E-11**	**8.78E-06**	**8.78E-06**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).

[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).

NA = Not applicable; lead toxicity was assessed for the resident child only.

ND = The toxicity data required to quantify the risk are not available

— = No sum value could be calculated

Table 55. Hazard Indices and Carcinogenic Risks for Future On-site Resident Child, SWMU 24B

Chemical	Surface Soil[a]				Groundwater Measured Concentrations[a]			Groundwater Modeled Concentrations[a]			Total Hazard Index[a]
	Ingestion HI	Dermal HI	Inhalation HI	Total	Ingestion HI	Dermal HI	Total	Ingestion HI	Dermal HI	Total	
Arsenic	5.11E-02	1.06E-03	ND	5.22E-02	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	5.22E-02
Benzo(*a*)anthracene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	2.92E-03	8.00E-04	ND	3.72E-03	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	3.72E-03
Benzo(*k*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	2.05E+00	9.45E-02	2.14E+00	2.14E+00
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	4.26E+00	4.92E-01	4.75E+00	4.75E+00
Indeno(*1,2,3-cd*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[d]	NA[d]	NA[d]	NA[d]	NA[c]	NA[c]	NA[c]	NA[d]	NA[d]	NA[d]	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	1.78E-02	4.38E-03	2.22E-02	NA[e]	NA[e]	NA[e]	2.22E-02
Pathway Total	**5.40E-02**	**1.86E-03**	—	**5.59E-02**	**1.78E-02**	**4.38E-03**	**2.22E-02**	**6.31E+00**	**5.87E-01**	**6.90E+00**	**6.97E+00**

Note: Footnotes appear on page 95.

Table 55. Hazard Indices and Carcinogenic Risks for Future On-site Resident Child, SWMU 24B (continued)

Chemical	Surface Soil[f]				Groundwater Measured Concentrations[f]			Groundwater Modeled Concentrations[f]			Total Cancer Risk[f]
	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Total	Ingestion ILCR	Dermal ILCR	Total	
Arsenic	1.97E-06	4.09E-08	2.30E-10	2.01E-06	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	2.01E-06
Benzo(*a*)anthracene	7.62E-06	2.09E-06	3.76E-11	9.71E-06	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	9.71E-06
Benzo(*a*)pyrene	9.52E-05	2.61E-05	4.70E-10	1.21E-04	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.21E-04
Benzo(*b*)fluoranthene	8.56E-06	2.35E-06	4.22E-11	1.09E-05	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.09E-05
Benzo(*g,h,i*)perylene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	9.60E-07	2.63E-07	4.74E-12	1.22E-06	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.22E-06
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	1.45E-05	3.97E-06	7.14E-11	1.85E-05	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.85E-05
Lead	ND	ND	ND	ND	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	1.01E-07	2.48E-08	1.26E-07	NA[e]	NA[e]	NA[e]	1.26E-07
Pathway Total	**1.29E-04**	**3.48E-05**	**8.56E-10**	**1.64E-04**	**1.01E-07**	**2.48E-08**	**1.26E-07**	—	—	—	**1.64E-04**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA= Not applicable; constituent has only a measured concentration.
[d]NA = Not applicable; lead toxicity was assessed based on blood-lead concentrations.
[e]NA = Not applicable; constituent has only a modeled concentration.
[f]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 56. Blood-lead Levels for Resident Child, SWMU 24B

Age Group	Blood Lead Level (µg/dL)
0.5 to 1	6.7
1 to 2	7.6
2 to 3	7.1
3 to 4	6.8
4 to 5	5.7
5 to 6	4.8
6 to 7	4.3

Table 57. Blood-lead Levels for Future Resident Child, SWMU 24B

Age Group	Blood Lead Level (µg/dL)
0.5 to 1	33.5
1 to 2	47.0
2 to 3	47.2
3 to 4	47.4
4 to 5	47.8
5 to 6	47.9
6 to 7	46.6

Table 58. Hazard Indices and Carcinogenic Risks for Future On-site Resident Adult, SWMU 24B

Chemical	Surface Soil[a]				Groundwater Measured Concentrations[a]				Groundwater Modeled Concentrations[a]				Total Hazard Index[a]
	Ingestion HI	Dermal HI	Inhalation HI	Total	Ingestion HI	Dermal HI	Inhalation HI	Total	Ingestion HI	Dermal HI	Inhalation HI	Total	
Arsenic	5.48E-03	6.68E-04	ND	6.15E-03	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	6.15E-03
Benzo(*a*)anthracene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	3.13E-04	5.04E-04	ND	8.17E-04	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	8.17E-04
Benzo(*k*)fluoranthene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	8.77E-01	2.98E-02	NA[d]	9.07E-01	9.07E-01
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	1.83E+00	1.55E-01	NA[d]	1.99E+00	1.99E+00
Indeno(*1,2,3-cd*)pyrene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[e]	NA[e]	NA[e]	NA[e]	NA[c]	NA[c]	NA[c]	NA[c]	NA[e]	NA[e]	NA[e]	NA[e]	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	7.63E-03	1.38E-03	ND	9.01E-03	NA[f]	NA[f]	NA[f]	NA[f]	9.01E-03
Pathway Total	**5.79E-03**	**1.17E-03**	—	**6.97E-03**	**7.63E-03**	**1.38E-03**	—	**9.01E-03**	**2.71E+00**	**1.85E-01**	—	**2.89E+00**	**2.91E+00**

Note: Footnotes appear on page 98.

Table 58. Hazard Indices and Carcinogenic Risks for Future On-site Resident Adult, SWMU 24B (continued)

Chemical	Surface Soil[g]				Groundwater Measured Concentrations[g]				Groundwater Modeled Concentrations[g]				Total Cancer Risk[g]
	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	
Arsenic	1.06E-06	1.29E-07	2.90E-10	1.19E-06	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.19E-06
Benzo(*a*)anthracene	4.08E-06	6.59E-06	4.74E-11	1.07E-05	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.07E-05
Benzo(*a*)pyrene	5.10E-05	8.23E-05	5.92E-10	1.33E-04	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.33E-04
Benzo(*b*)fluoranthene	4.59E-06	7.40E-06	5.32E-11	1.20E-05	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.20E-05
Benzo(*g,h,i*)perylene	ND	ND	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	5.14E-07	8.29E-07	5.97E-12	1.34E-06	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	1.34E-06
Cadmium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	ND	ND	NA[d]	ND	—
Chromium	NA[b]	NA[b]	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	ND	ND	NA[d]	ND	—
Indeno(*1,2,3-cd*)pyrene	7.76E-06	1.25E-05	9.01E-11	2.03E-05	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	2.03E-05
Lead	ND	ND	ND	ND	NA[e]	NA[e]	NA[e]	ND	ND	ND	ND	ND	—
Trichloroethene	NA[b]	NA[b]	NA[b]	NA[b]	2.16E-07	3.91E-08	2.00E-09	2.57E-07	NA[f]	NA[f]	NA[f]	NA[f]	2.57E-07
Pathway Total	**6.90E-05**	**1.10E-04**	**1.08E-09**	**1.79E-04**	**2.16E-07**	**3.91E-08**	**2.00E-09**	**2.57E-07**	—	—	—	—	**1.79E-04**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA = Not applicable; constituent has only a modeled concentration.
[d]NA = Not applicable; inhalation exposure is not a viable pathway for this constituent.
[e]NA = Not applicable; lead toxicity was assessed for only the resident child.
[f]NA = Not applicable; constituent has only a measured concentration.
[g]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 59. Hazard Indices and Carcinogenic Risks for Future Off-site Installation Worker, SWMU 24B

Chemical	Surface Soil[a]		Groundwater Measured Concentrations[a]		Groundwater Modeled Concentrations[a]		Total Hazard Index[a]
	Inhalation HI	Total	Ingestion HI	Total	Ingestion HI	Total	
Arsenic	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)anthracene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	3.13E-01	3.13E-01	3.13E-01
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	6.52E-01	6.52E-01	6.52E-01
Indeno(*1,2,3-cd*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[d]	NA[d]	NA[c]	NA[c]	NA[d]	NA[d]	—
Trichloroethene	NA[b]	NA[b]	2.72E-03	2.72E-03	NA[e]	NA[e]	2.72E-03
Pathway Total	—	—	**2.72E-03**	**2.72E-03**	**9.65E-01**	**9.65E-01**	**9.68E-01**

Note: Footnotes appear on page 100.

Table 59. Hazard Indices and Carcinogenic Risks for Future Off-site Installation Worker, SWMU 24B (continued)

Chemical	Surface Soil[f]		Groundwater Measured Concentrations[f]		Groundwater Modeled Concentrations[f]		Total Cancer Risk[f]
	Inhalation ILCR	Total	Ingestion ILCR	Total	Ingestion ILCR	Total	
Arsenic	2.34E-10	2.34E-10	NA[b]	NA[b]	NA[b]	NA[b]	2.34E-10
Benzo(*a*)anthracene	3.83E-11	3.83E-11	NA[b]	NA[b]	NA[b]	NA[b]	3.83E-11
Benzo(*a*)pyrene	4.79E-10	4.79E-10	NA[b]	NA[b]	NA[b]	NA[b]	4.79E-10
Benzo(*b*)fluoranthene	4.31E-11	4.31E-11	NA[b]	NA[b]	NA[b]	NA[b]	4.31E-11
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	4.83E-12	4.83E-12	NA[b]	NA[b]	NA[b]	NA[b]	4.83E-12
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	ND	ND	—
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	7.28E-11	7.28E-11	NA[b]	NA[b]	NA[b]	NA[b]	7.28E-11
Lead	ND	ND	NA[c]	NA[c]	ND	ND	—
Trichloroethene	NA[b]	NA[b]	6.42E-08	6.42E-08	NA[e]	NA[e]	6.42E-08
Pathway Total	**8.72E-10**	**8.72E-10**	**6.42E-08**	**6.42E-08**	—	—	**6.51E-08**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA = Not applicable; constituent has only a modeled concentration.
[d]NA = Not applicable; lead toxicity was assessed for only the resident child.
[e]NA = Not applicable; constituent has only a measured concentration.
[f]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 60. Hazard Indices and Carcinogenic Risks for Future Off-site Resident Child, SWMU 24B

Chemical	Surface Soil[a]		Groundwater Measured Concentrations[a]			Groundwater Modeled Concentrations[a]			Total Hazard Index[a]
	Inhalation HI	Total	Ingestion HI	Dermal HI	Total	Ingestion HI	Dermal HI	Total	
Arsenic	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)anthracene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	2.05E+00	9.45E-02	2.14E+00	2.14E+00
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	4.26E+00	4.92E-01	4.75E+00	4.75E+00
Indeno(*1,2,3-cd*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[d]	NA[d]	NA[c]	NA[c]	NA[c]	NA[d]	NA[d]	NA[d]	—
Trichloroethene	NA[b]	NA[b]	1.78E-02	4.38E-03	2.22E-02	NA[e]	NA[e]	NA[e]	2.22E-02
Pathway Total	—	—	**1.78E-02**	**4.38E-03**	**2.22E-02**	**6.31E+00**	**5.87E-01**	**6.90E+00**	**6.92E+00**

Note: Footnotes appear on page 102.

Table 60. Hazard Indices and Carcinogenic Risks for Future Off-site Resident Child, SWMU 24B (continued)

Chemical	Surface Soil[f]		Groundwater Measured Concentrations[f]			Groundwater Modeled Concentrations[f]			Total Cancer Risk[f]
	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Total	Ingestion ILCR	Dermal ILCR	Total	
Arsenic	2.30E-10	2.30E-10	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	2.30E-10
Benzo(*a*)anthracene	3.76E-11	3.76E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	3.76E-11
Benzo(*a*)pyrene	4.70E-10	4.70E-10	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	4.70E-10
Benzo(*b*)fluoranthene	4.22E-11	4.22E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	4.22E-11
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	4.74E-12	4.74E-12	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	4.74E-12
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Indeno(*1,2,3-cd*)pyrene	7.14E-11	7.14E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	7.14E-11
Lead	ND	ND	NA[c]	NA[c]	NA[c]	ND	ND	ND	—
Trichloroethene	NA[b]	NA[b]	1.01E-07	2.48E-08	1.26E-07	NA[e]	NA[e]	NA[e]	1.26E-07
Pathway Total	**8.56E-10**	**8.56E-10**	**1.01E-07**	**2.48E-08**	**1.26E-07**	—	—	—	**1.26E-07**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA = Not applicable; constituent has only a modeled concentration.
[d]NA = Not applicable; lead toxicity was assessed based on blood-lead concentrations.
[e]NA = Not applicable; constituent has only a measured concentration.
[f]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 61. Hazard Indices and Carcinogenic Risks for Future Off-site Resident Adult, SWMU 24B

Chemical	Surface Soil[a]		Groundwater Measured Concentrations[a]				Groundwater Modeled Concentrations[a]				Total Hazard Index[a]
	Inhalation HI	Total	Ingestion HI	Dermal HI	Inhalation HI	Total	Ingestion HI	Dermal HI	Inhalation HI	Total	
Arsenic	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)anthracene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*a*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*b*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	8.77E-01	2.98E-02	NA[d]	9.07E-01	9.07E-01
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	1.83E+00	1.55E-01	NA[d]	1.99E+00	1.99E+00
Indeno(*1,2,3-cd*)pyrene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Lead	NA[e]	NA[e]	NA[c]	NA[c]	NA[c]	NA[c]	NA[e]	NA[e]	NA[e]	NA[e]	—
Trichloroethene	NA[b]	NA[b]	7.63E-03	1.38E-03	ND	9.01E-03	NA[f]	NA[f]	NA[f]	NA[f]	9.01E-03
Pathway Total	—	—	**7.63E-03**	**1.38E-03**	—	**9.01E-03**	**2.71E+00**	**1.85E-01**	—	**2.89E+00**	**2.90E+00**

Note: Footnotes appear on page 104.

Table 61. Hazard Indices and Carcinogenic Risks for Future Off-site Resident Adult, SWMU 24B (continued)

Chemical	Surface Soil[g]		Groundwater Measured Concentrations[g]				Groundwater Modeled Concentrations[g]				Total Cancer Risk[g]
	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	Ingestion ILCR	Dermal ILCR	Inhalation ILCR	Total	
Arsenic	2.90E-10	2.90E-10	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	2.90E-10
Benzo(*a*)anthracene	4.74E-11	4.74E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	4.74E-11
Benzo(*a*)pyrene	5.92E-10	5.92E-10	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	5.92E-10
Benzo(*b*)fluoranthene	5.32E-11	5.32E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	5.32E-11
Benzo(*g,h,i*)perylene	ND	ND	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	—
Benzo(*k*)fluoranthene	5.97E-12	5.97E-12	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	5.97E-12
Cadmium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	ND	ND	NA[d]	ND	—
Chromium	NA[b]	NA[b]	NA[c]	NA[c]	NA[c]	NA[c]	ND	ND	NA[d]	ND	—
Indeno(*1,2,3-cd*)pyrene	9.01E-11	9.01E-11	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	9.01E-11
Lead	ND	ND	NA[c]	NA[c]	NA[c]	ND	ND	ND	ND	ND	—
Trichloroethene	NA[b]	NA[b]	2.16E-07	3.91E-08	2.00E-09	2.57E-07	NA[f]	NA[f]	NA[f]	NA[f]	2.57E-07
Pathway Total	**1.08E-09**	**1.08E-09**	**2.16E-07**	**3.91E-08**	**2.00E-09**	**2.57E-07**	—	—	—	—	**2.58E-07**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]NA = Not applicable; this constituent is not present in this medium.
[c]NA = Not applicable; constituent has only a modeled concentration.
[d]NA = Not applicable; inhalation exposure is not a viable pathway for this constituent.
[e]NA = Not applicable; lead toxicity was assessed based on blood-lead concentrations.
[f]NA = Not applicable; constituent has only a measured concentration.
[g]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
ND = The toxicity data required to quantify the risk are not available.
— = No sum value could be calculated.

Table 62. Hazard Indices and Carcinogenic Risks for Future Off-site Juvenile Wader, SWMU 24B

Chemical	Surface Water Modeled Concentrations[a]			Total Hazard Index[a]
	Ingestion HQ	Dermal HQ	Total	
Cadmium	8.86E-04	1.42E-03	2.30E-03	2.31E-03
Chromium	2.33E-03	9.33E-03	1.17E-02	1.17E-02
Pathway Total	**3.22E-03**	**1.08E-02**	**1.40E-02**	**1.40E-02**

Chemical	Surface Water Modeled Concentrations[b]			Total Cancer Risk[b]
	Ingestion ILCR	Dermal ILCR	Total	
Cadmium	ND	ND	ND	—
Chromium	ND	ND	ND	—
Pathway Total	—	—	—	—

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
— = No sum value could be calculated.

Table 63. Hazard Indices and Carcinogenic Risks for Future Off-site Sportsman, SWMU 24B

Chemical	Surface Water Modeled Concentrations[a]			Fish Tissue Modeled Concentrations[a]		Total Hazard Index[a]
	Ingestion HQ	Dermal HQ	Total	Ingestion HQ	Total	
Cadmium	2.28E-04	1.87E-03	2.10E-03	2.70E-02	2.70E-02	2.91E-02
Chromium	6.00E-04	1.23E-02	1.29E-02	5.68E-01	5.68E-01	5.81E-01
Pathway Total	**8.28E-04**	**1.42E-02**	**1.50E-02**	**5.95E-01**	**5.95E-01**	**6.10E-01**

Chemical	Surface Water Modeled Concentrations[b]			Fish Tissue Modeled Concentrations[b]		Total Cancer Risk[b]
	Ingestion ILCR	Dermal ILCR	Total	Ingestion ILCR	Total	
Cadmium	ND	ND	ND	ND	ND	—
Chromium	ND	ND	ND	ND	ND	—
Pathway Total	—	—	—	—	—	—

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section I.4.2 of the revised final Phase II RFI Report (SAIC 2000).
[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1 of the revised final Phase II RFI Report (SAIC 2000).
— = No sum value could be calculated.

Table 64. Remedial Levels for Surface Soil, SWMU 24B

COC	Units	Maximum Detected Concentration	Risk-based Remedial Levels ILCR		Quantification Limit	Surface Soil Background Concentration
			1×10^{-6}	1×10^{-5}		
Arsenic	mg/kg	2.7	0.60	**5.96**	0.5	2.1
Benzo(*a*)anthracene	mg/kg	38.8	0.89	**8.93**	0.33	NA
Benzo(*a*)pyrene	mg/kg	48.1	0.09	**0.89**	0.33	NA
Benzo(*b*)fluoranthene	mg/kg	40.9	0.89	**8.93**	0.33	NA
Benzo(*k*)fluoranthene	mg/kg	49.3	8.93	**89.30**	0.33	NA
Indeno(*1,2,3-cd*)pyrene	mg/kg	30.7	0.89	**8.93**	0.33	NA

NA = Not applicable; organic background concentrations were not taken into consideration.
Bold indicates recommended remedial levels.

Table 65. Target Groundwater Concentrations for Contaminant Migration Constituents of Concern, SWMU 24B

CMCOC	Units	Estimated Groundwater Concentration	MCL	Target Groundwater Concentration HI		
				0.1	0.5	1
Cadmium	µg/L	16	**5**	0.7	3.7	7.5
Chromium	µg/L	200	100	4.2	21	**42**
Lead	µg/L	1,364	**15**[a]	NA	NA	NA

[a]SWDA technical action level.
NA = Not applicable; a reference dose is not available.
Bold indicates recommended target groundwater values.

Table 66. Remedial Levels for Contaminant Migration Constituents of Concern, SWMU 24B

CMCOC	Units	Maximum Soil Concentration	Risk-based Remedial Levels HI			Remedial Level Based on MCL	Subsurface Soil Background Concentration	Quantification Limit
			0.1	0.5	1			
Cadmium	mg/kg	6.1	0.3	1.4	2.9	**1.9**	0.2	0.5
Chromium	mg/kg	18.3	0.4	1.9	3.8	9.2	**11.6**	1
Lead	mg/kg	690	NA	NA	NA	7.6	**11.1**	0.3

NA = Not applicable; toxicological information is not available to calculate these values.
Bold indicates recommended remedial levels.

Table 67. Recommended Final and Interim Remedial Levels for Soil, SWMU 24B

COC	Soil	
	Maximum Detected Concentration (mg/kg)	Remedial Level (mg/kg)
Benzo(*a*)anthracene	38.8	8.93
Benzo(*a*)pyrene	48.1	0.89
Benzo(*b*)fluoranthene	40.9	8.93
Cadmium	6.1	1.9[a]
Chromium	18.3	11.6[a]
Indeno(*1,2,3-cd*)pyrene	30.7	8.93
Lead	690	11.1[a]

[a]Remedial level given for the protection of groundwater.
NA = Not applicable.

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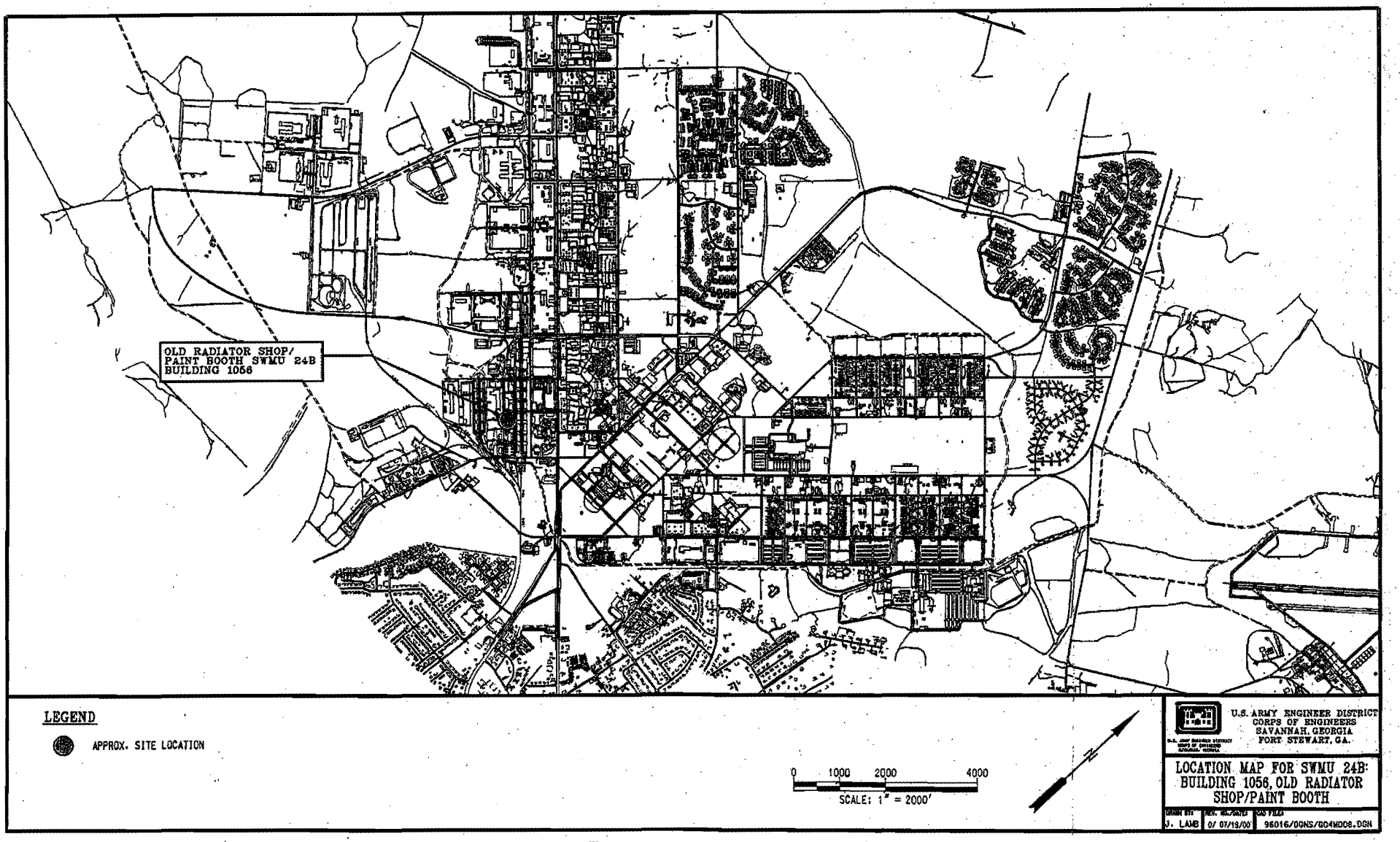


Figure 1. Location Map for SWMU 24B

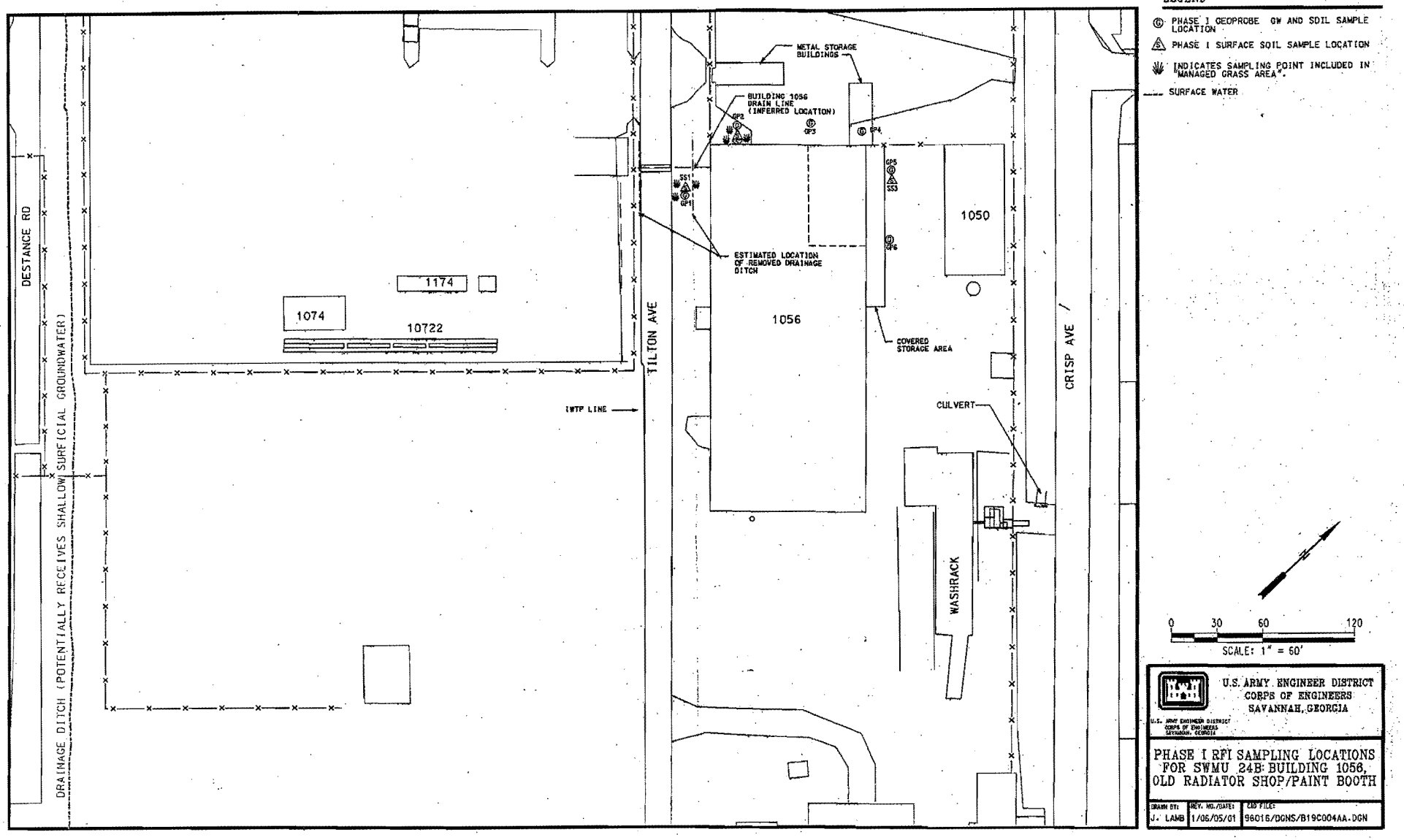


Figure 2. Phase I RFI Sampling Locations, SWMU 24B

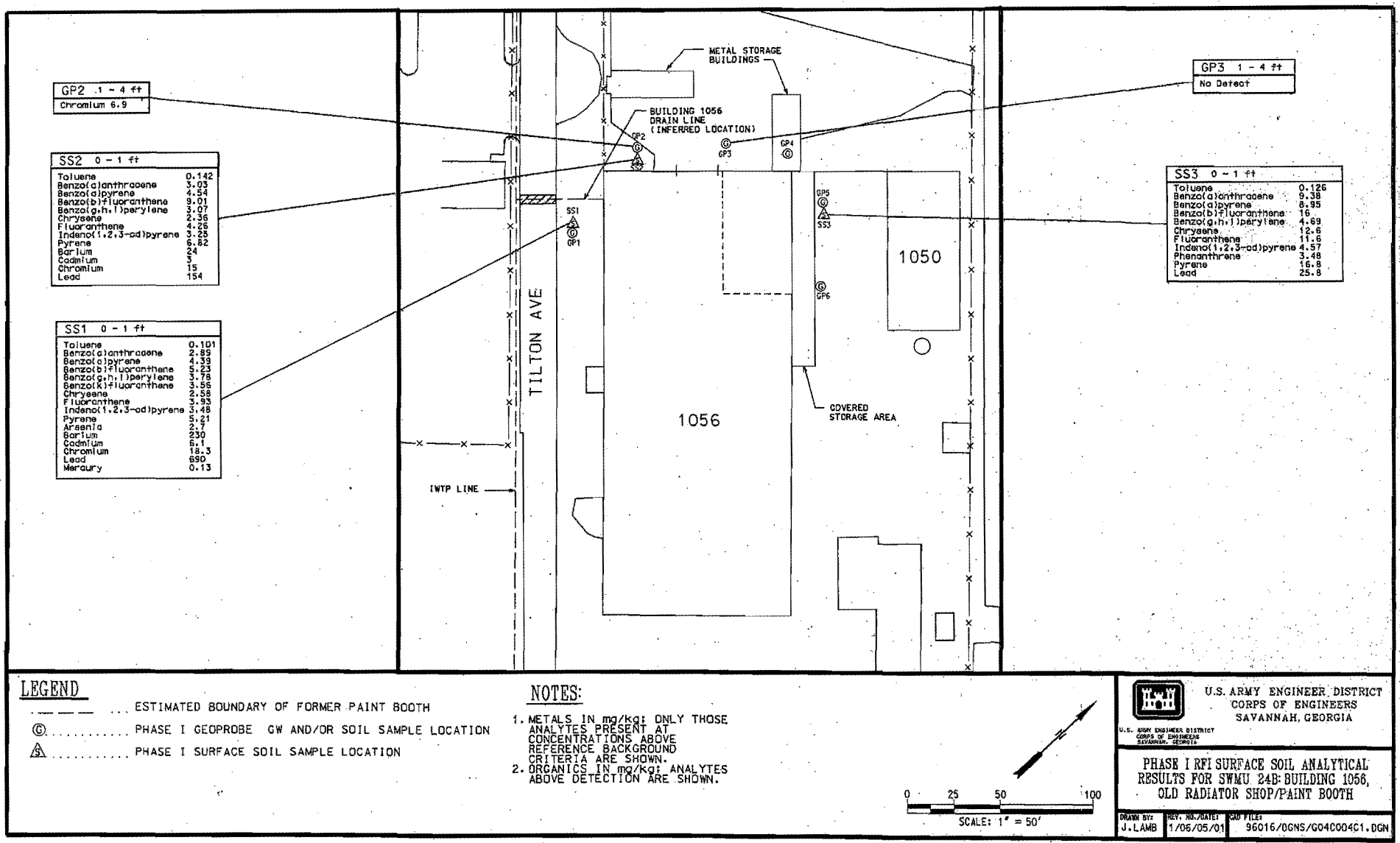


Figure 3. Summary of Phase I RFI Analytical Results in Surface Soil, SWMU 24B.

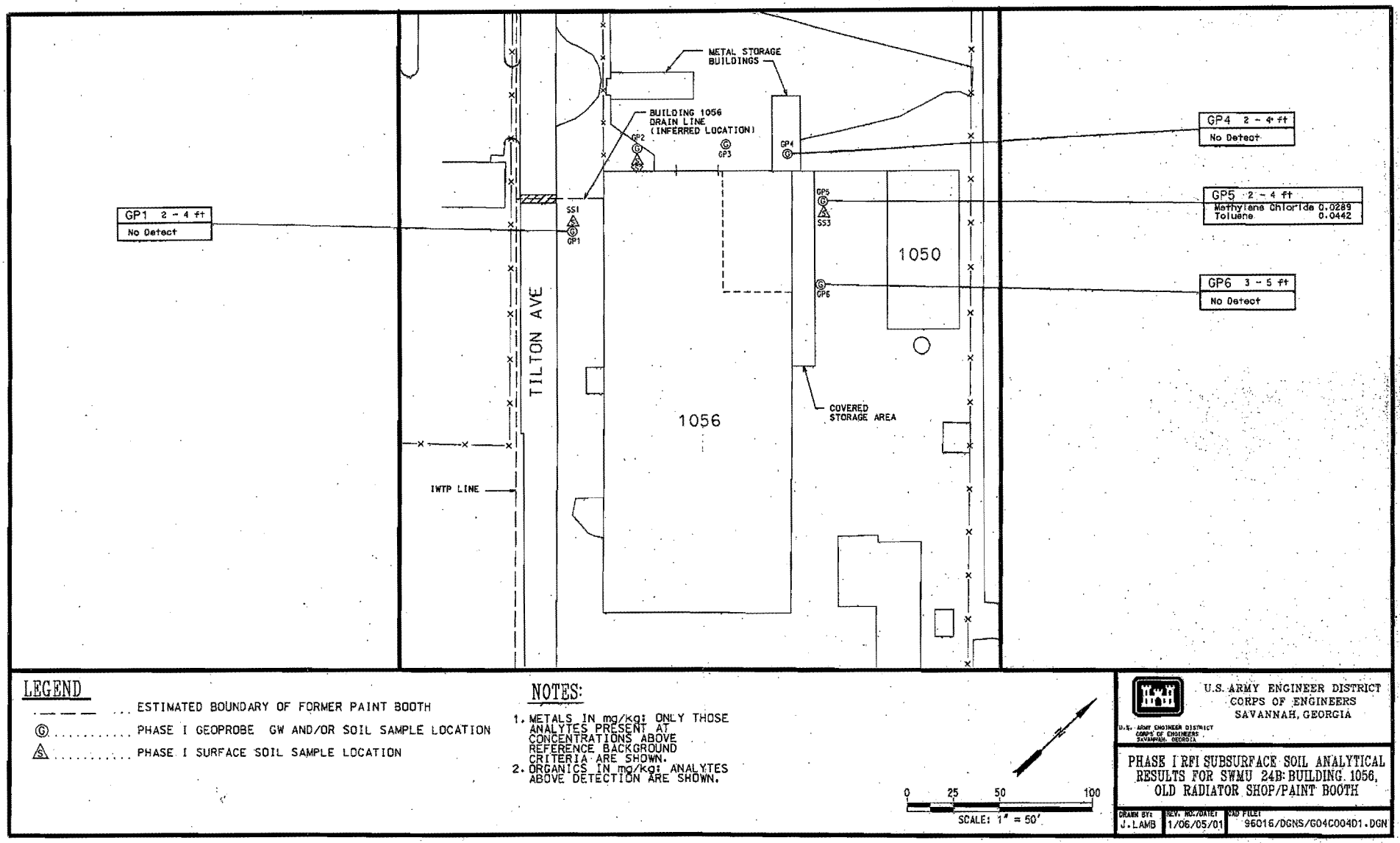


Figure 4. Summary of Phase I RFI Analytical Results in Subsurface Soil, SWMU 24B

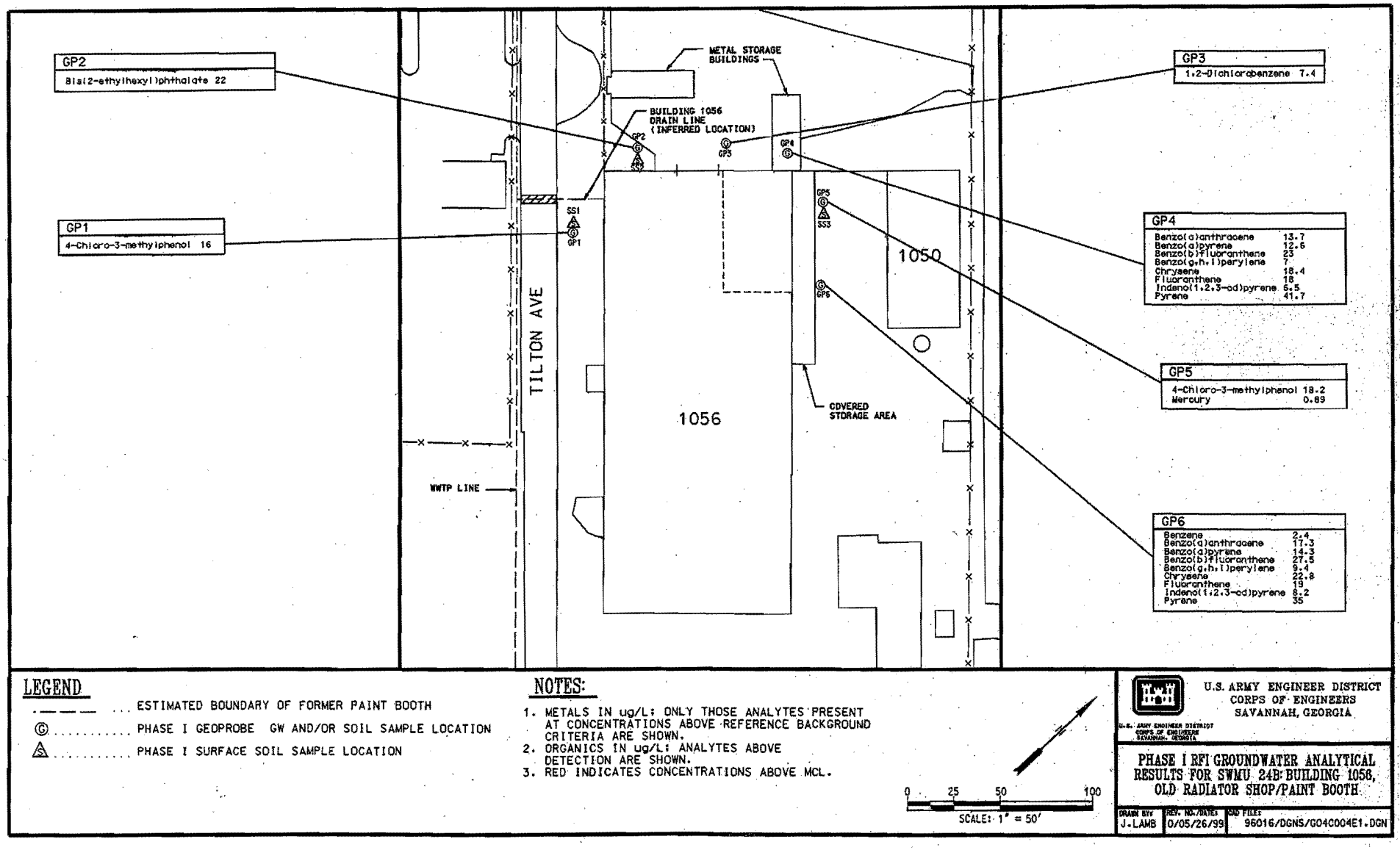


Figure 5. Summary of Phase I RFI Analytical Results in Groundwater, SWMU 24B

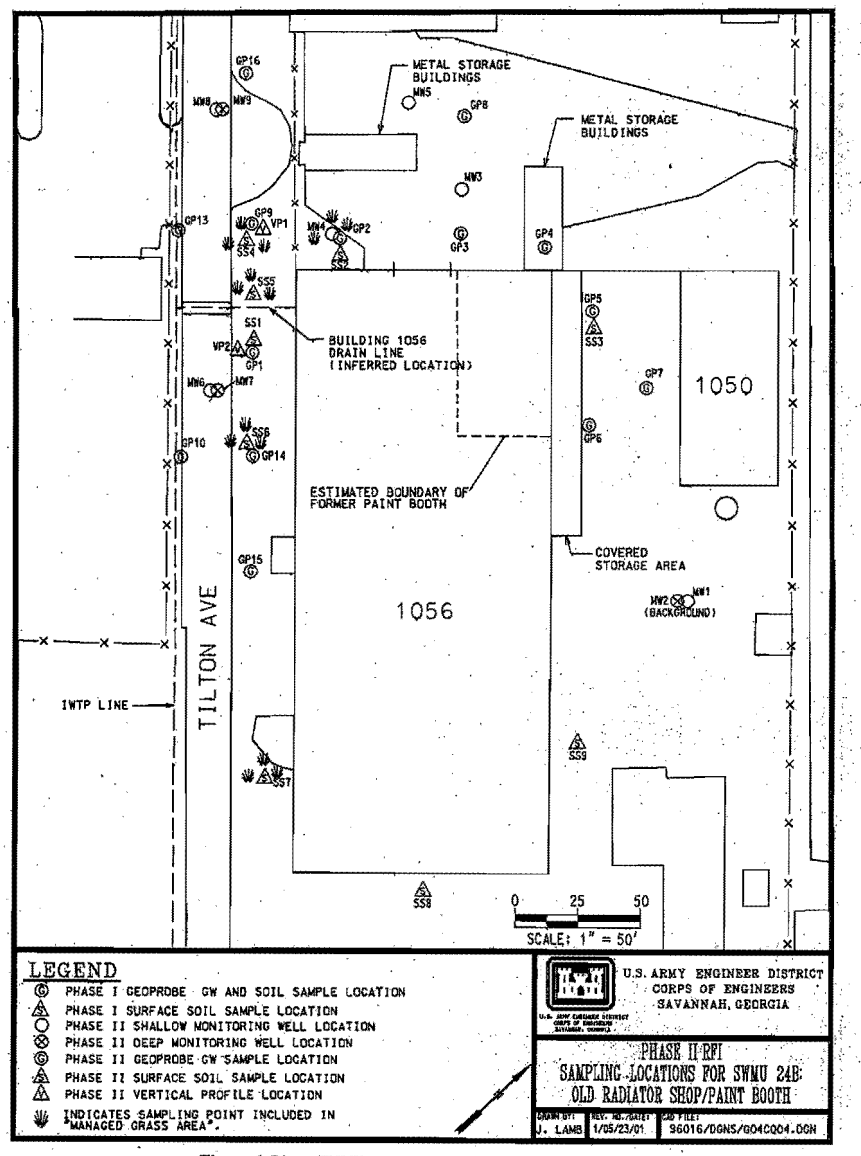
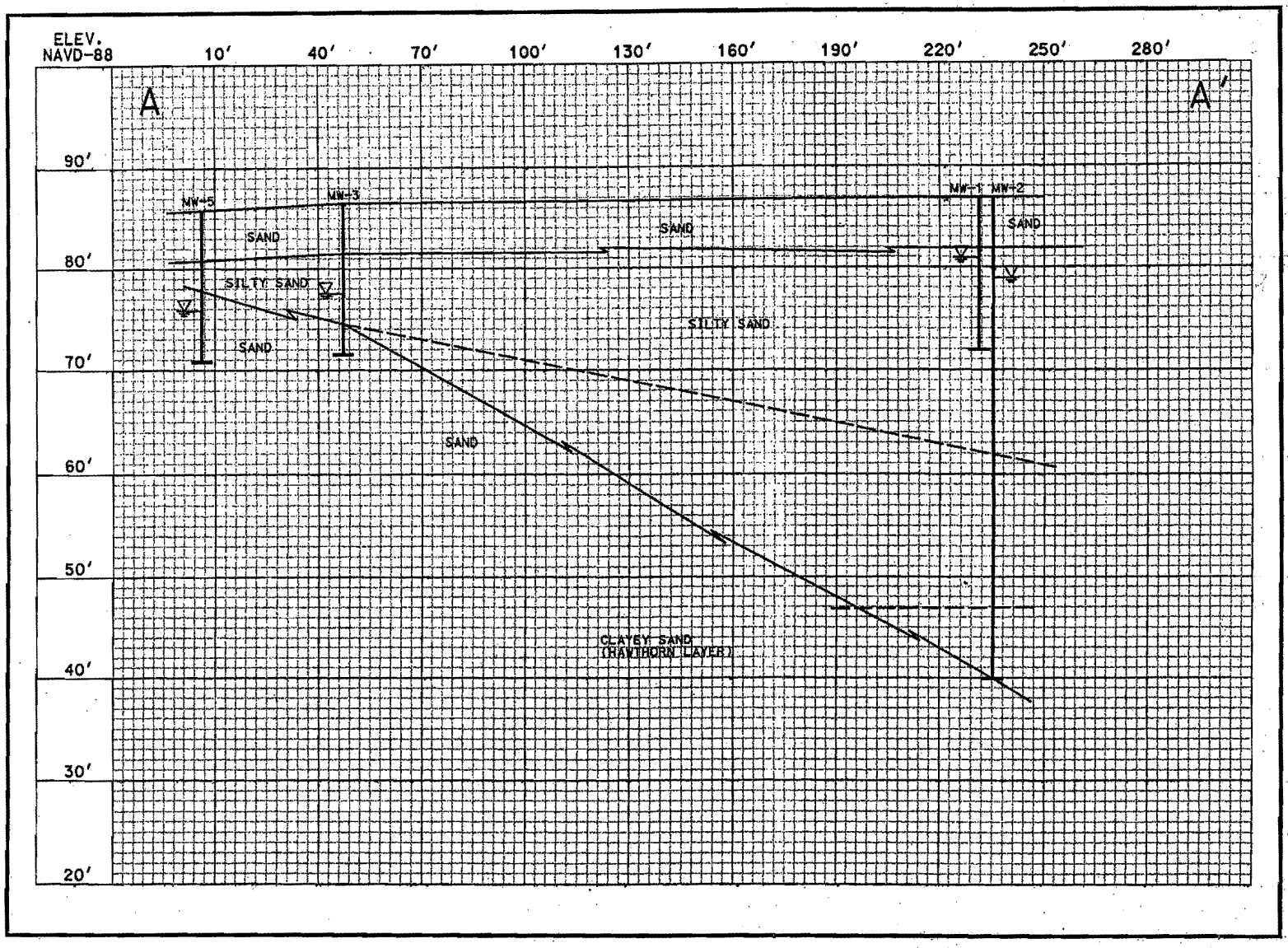
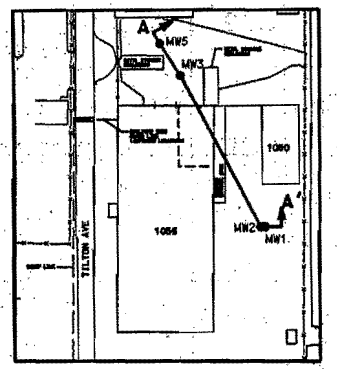


Figure 6. Phase II RFI Sampling Locations, SWMU 24B



LEGEND



KEY PLAN
NTS

0 15 30 60
HORIZONTAL SCALE: 1" = 30'

0 5 10 20
VERTICAL SCALE: 1" = 10'

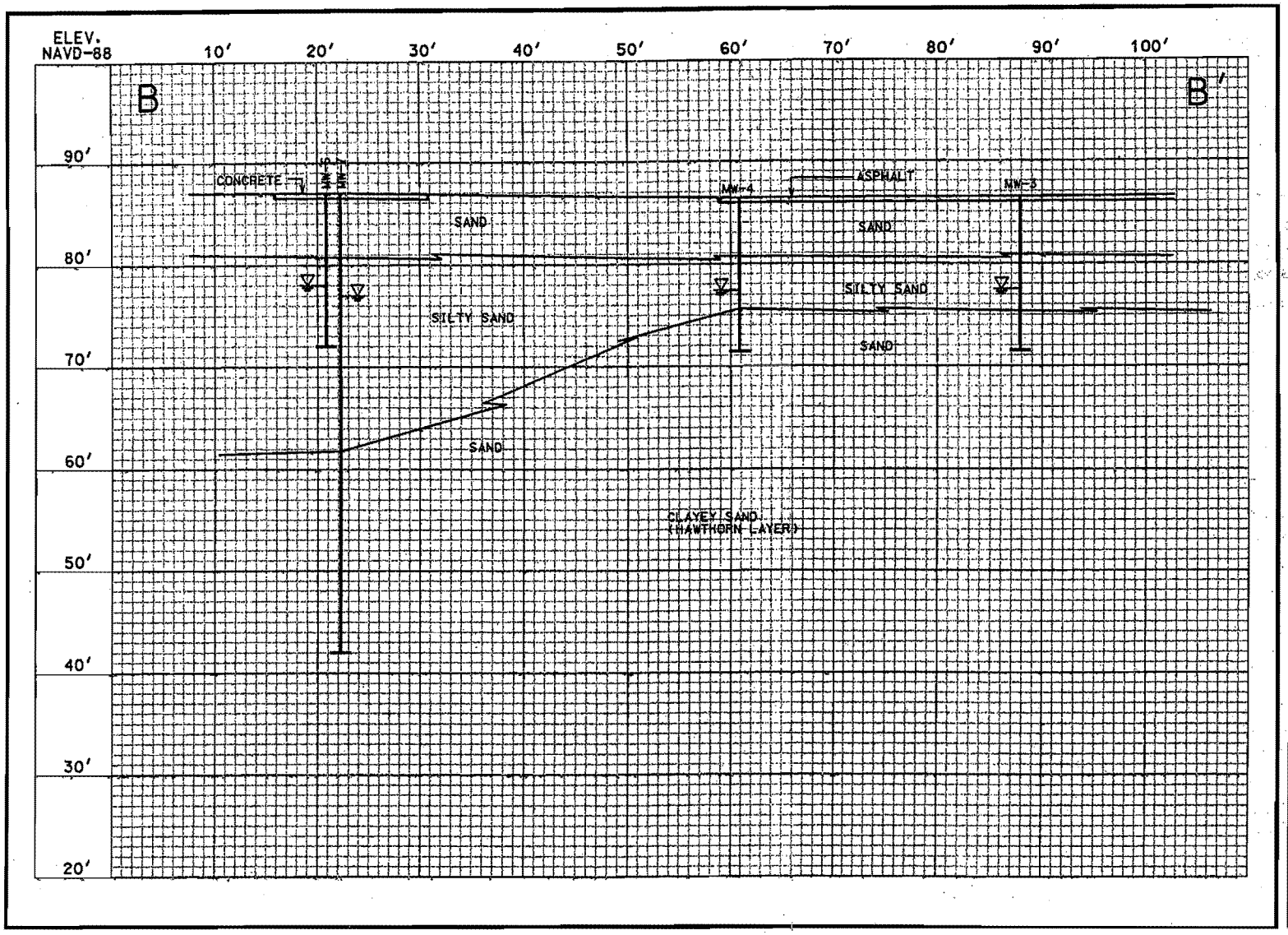
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

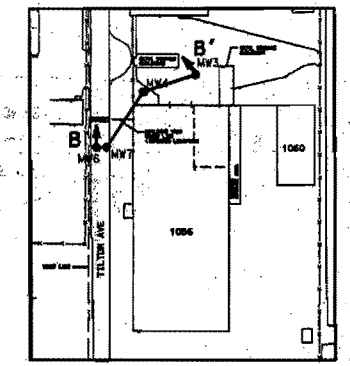
CROSS SECTION A-A'
FOR SWMU 24B OLD RADIATOR
SHOP/PAINT BOOTH

DRAWN BY:	REV. NO./DATE:	CAD FILE:
J. LAMB	0/02/24/00	96016/DGNS/G04CS004A.DGN

Figure 7. Phase II RFI Cross Section A-A', SWMU 24B



LEGEND



KEY PLAN
NTS

0 10 20 40
HORIZONTAL SCALE: 1" = 20'

0 5 10 20
VERTICAL SCALE: 1" = 10'

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

CROSS SECTION B-B'
FOR SWMU 24B:OLD RADIATOR
SHOP/PAINT BOOTH

DRAWN BY:	REV. NO./DATE:	CAD FILE:
J. LAMB	0/02/23/00	96016/DGNS/604CS004B.DGN

Figure 8. Phase II RFI Cross Section B-B', SWMU 24B

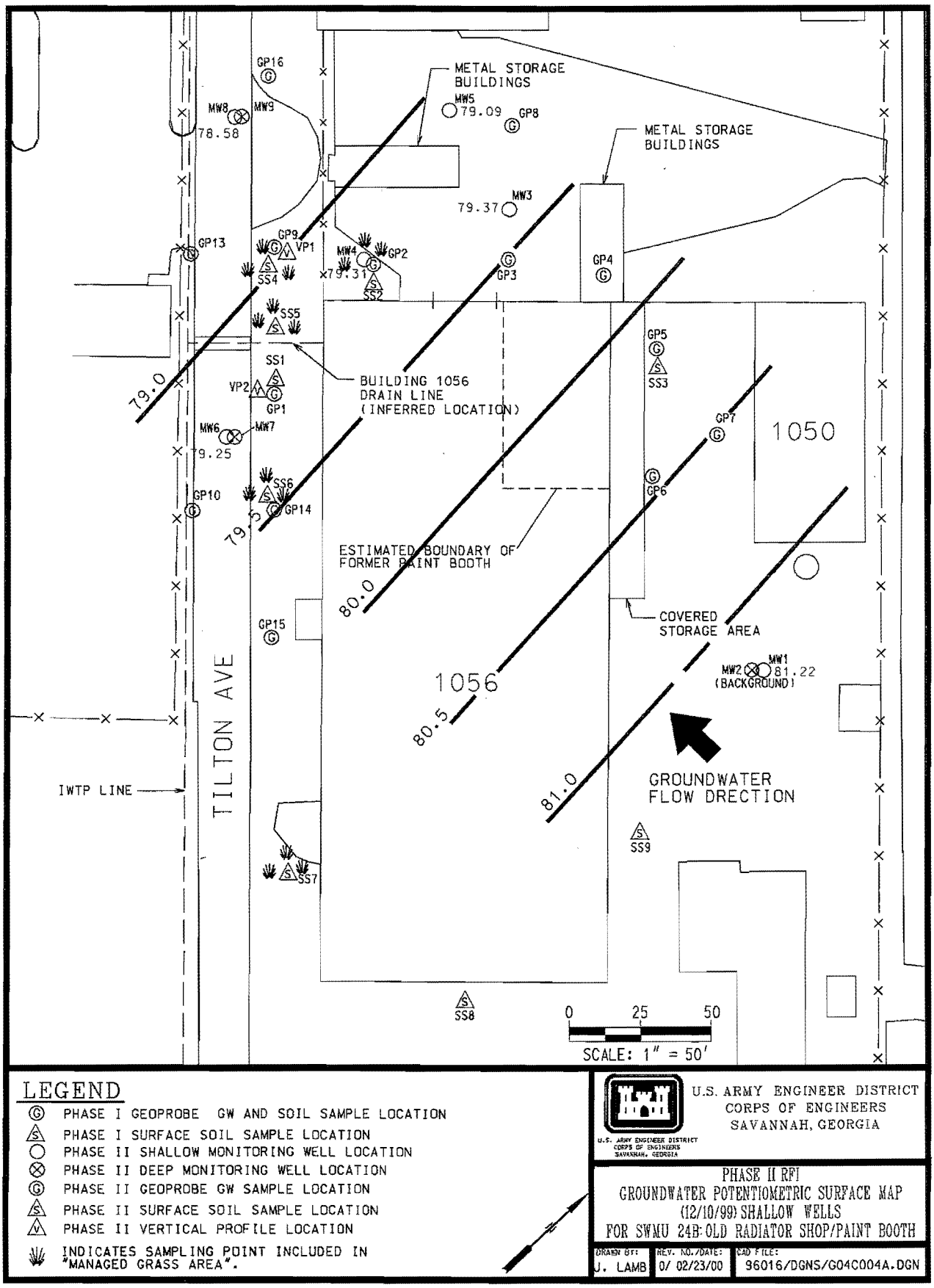


Figure 9. Phase II RFI Shallow Groundwater Potentiometric Surface Map, SWMU 24B

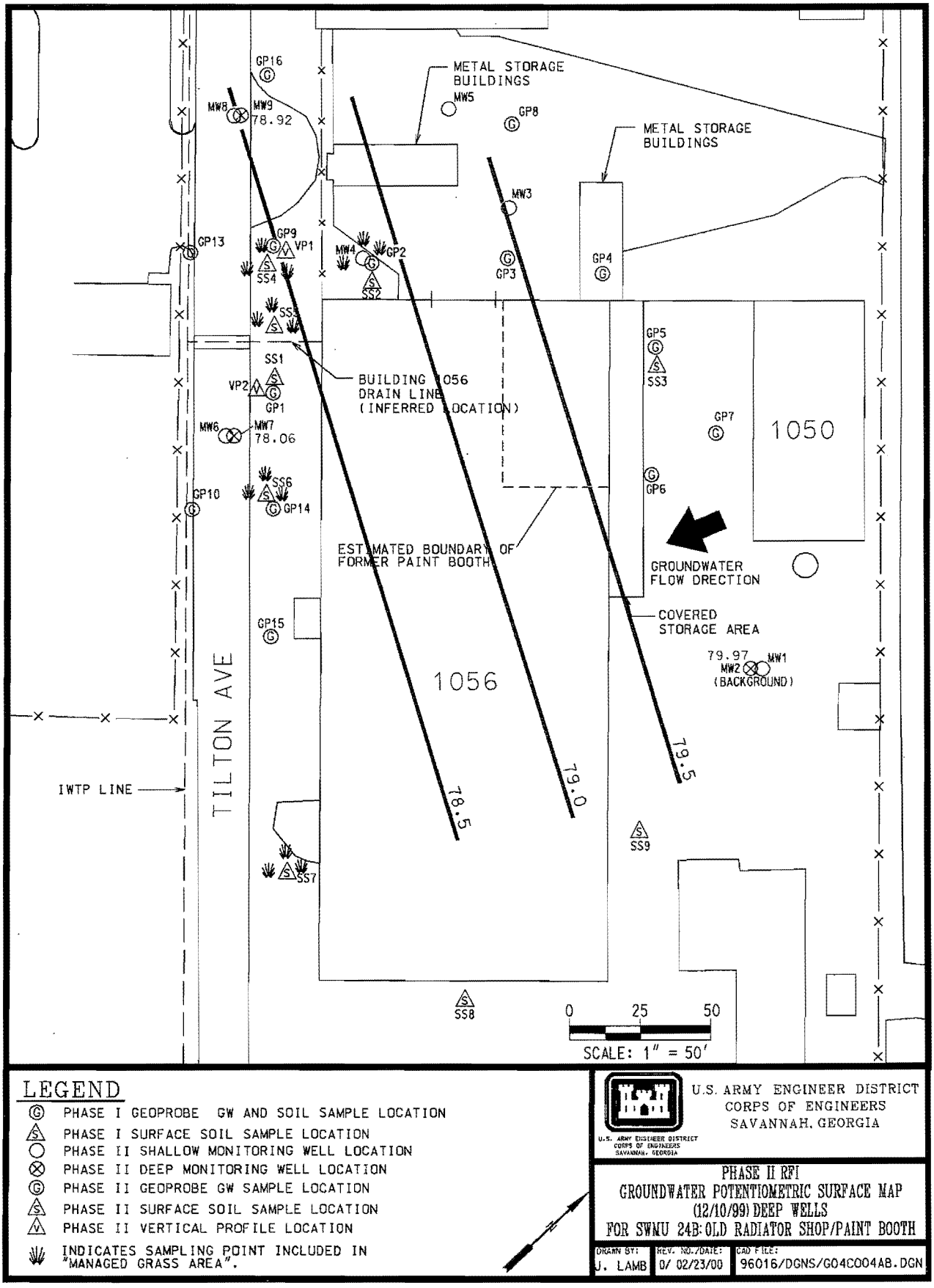


Figure 10. Phase II RFI Deep Groundwater Potentiometric Surface Map, SWMU 24B

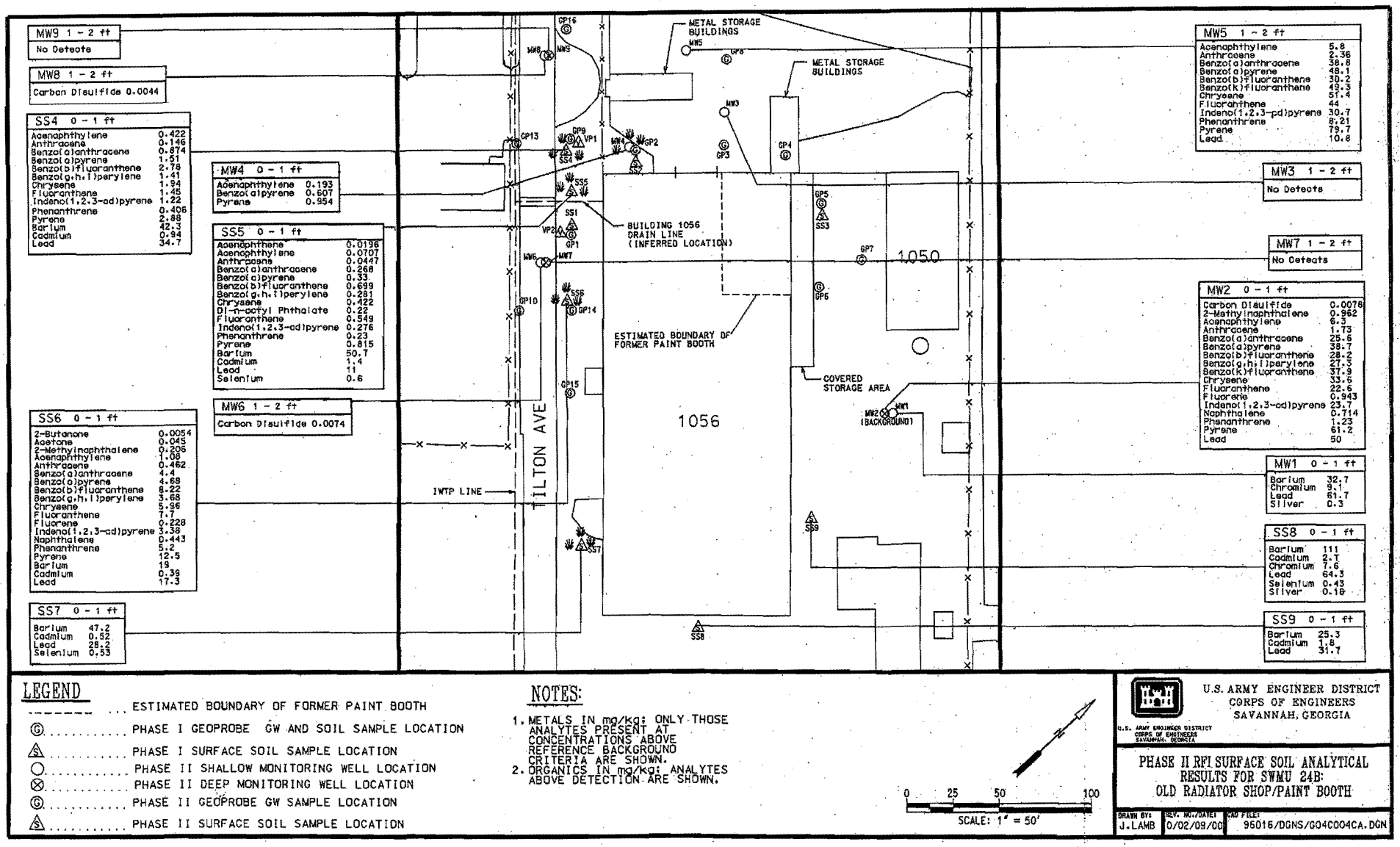
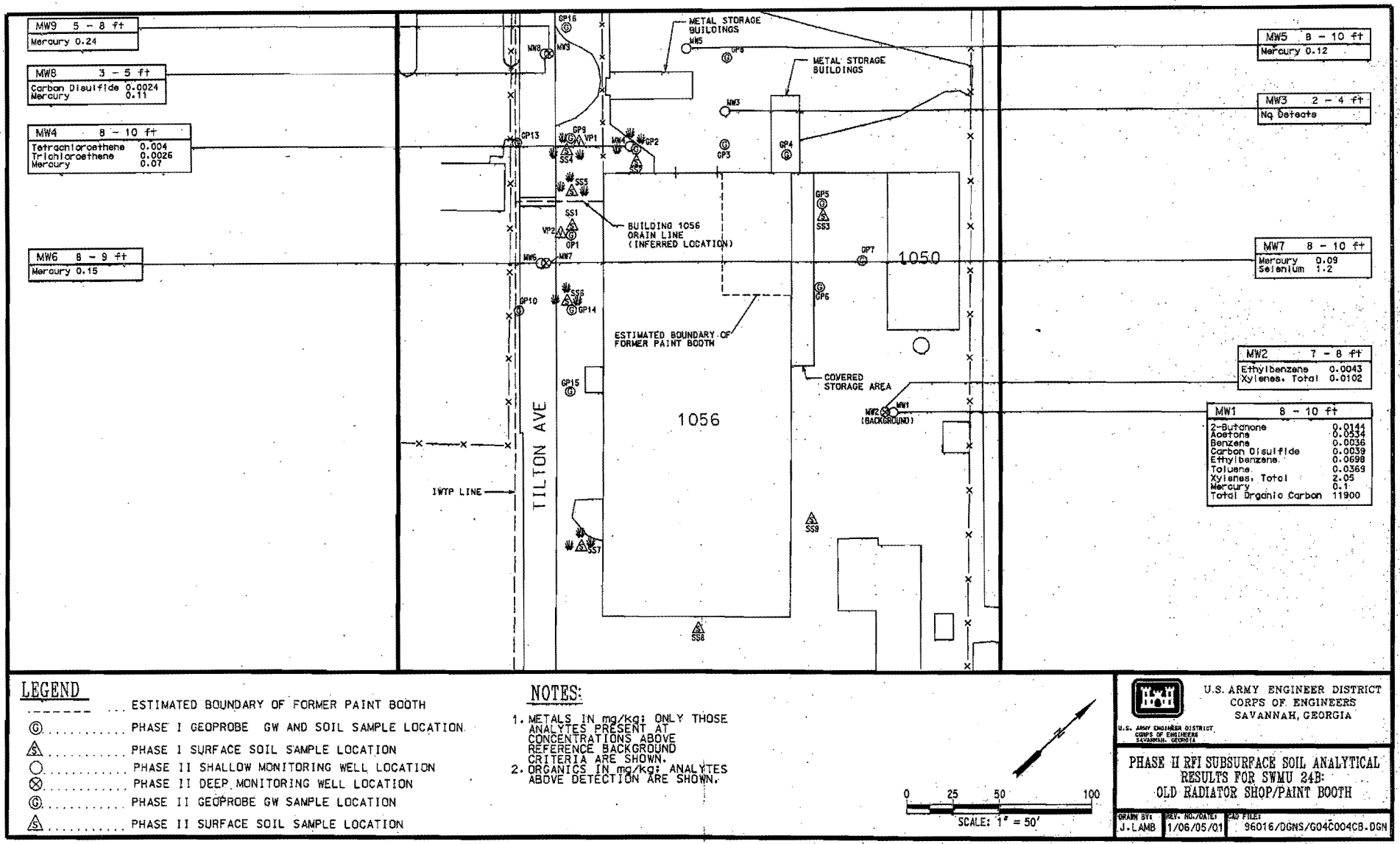


Figure 11. Summary of Phase II RFI Analytical Results in Surface Soil, SWMU 24B



LEGEND

- ESTIMATED BOUNDARY OF FORMER PAINT BOOTH
- PHASE I GEOPROBE GW AND SOIL SAMPLE LOCATION
- PHASE I SURFACE SOIL SAMPLE LOCATION
- PHASE II SHALLOW MONITORING WELL LOCATION
- PHASE II DEEP MONITORING WELL LOCATION
- PHASE II GEOPROBE GW SAMPLE LOCATION
- PHASE II SURFACE SOIL SAMPLE LOCATION

NOTES:

1. METALS IN mg/kg; ONLY THOSE ANALYTES PRESENT AT CONCENTRATIONS ABOVE REFERENCE BACKGROUND CRITERIA ARE SHOWN.
2. ORGANICS IN mg/kg; ANALYTES ABOVE DETECTION ARE SHOWN.

0 25 50 100
SCALE: 1" = 50'

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PHASE II RFI SUBSURFACE SOIL ANALYTICAL RESULTS FOR SWMU 24B: OLD RADIATOR SHOP/PAINT BOOTH

DRAWN BY:	REV. NO./DATE:	CAD FILE:
J.LAMB	1/06/05/01	96016/DGNS/G04C004CB.DGN

Figure 12. Summary of Phase II RFI Analytical Results in Subsurface Soil, SWMU 24B

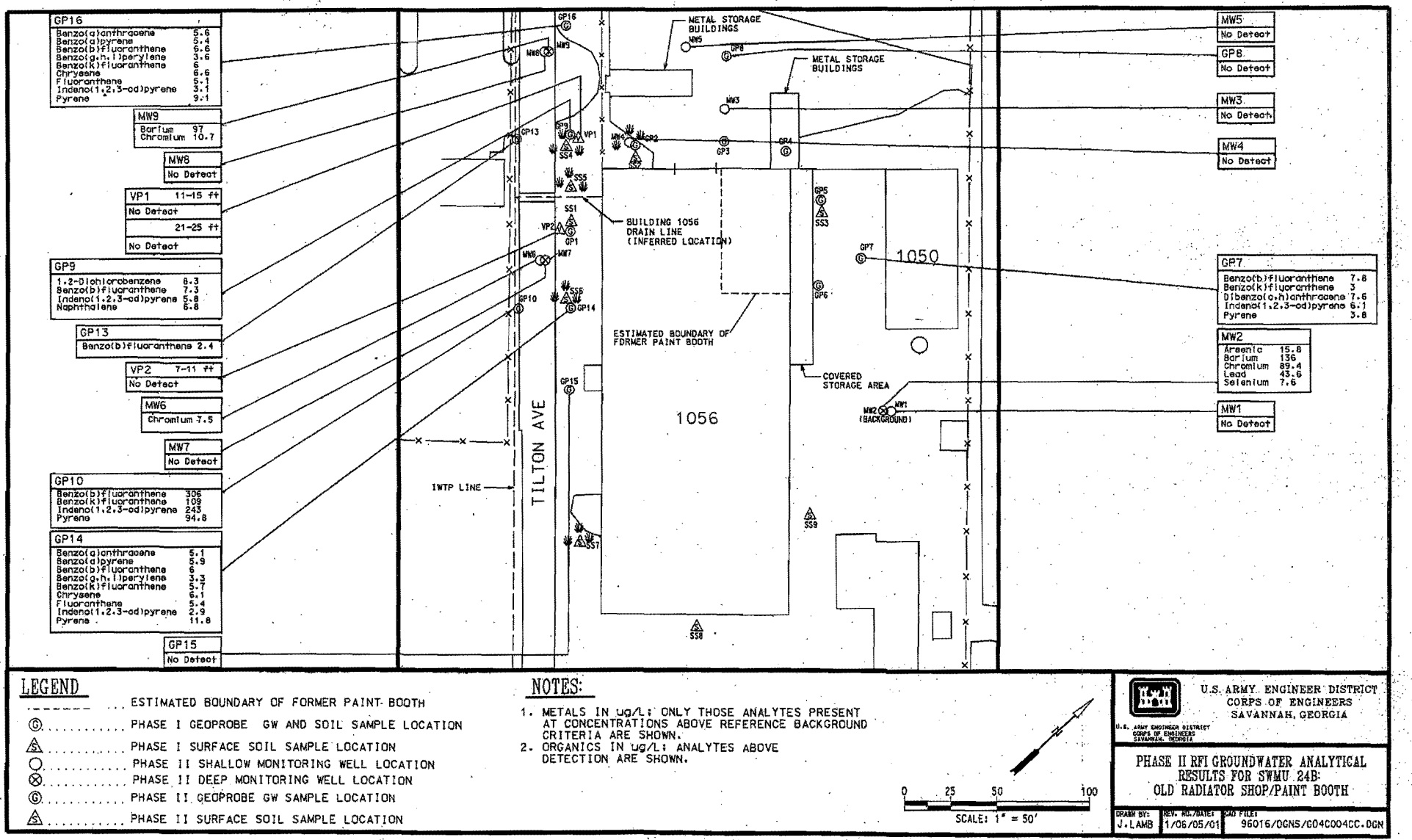


Figure 13. Summary of Phase II RFI Analytical Results in Groundwater, SWMU 24B

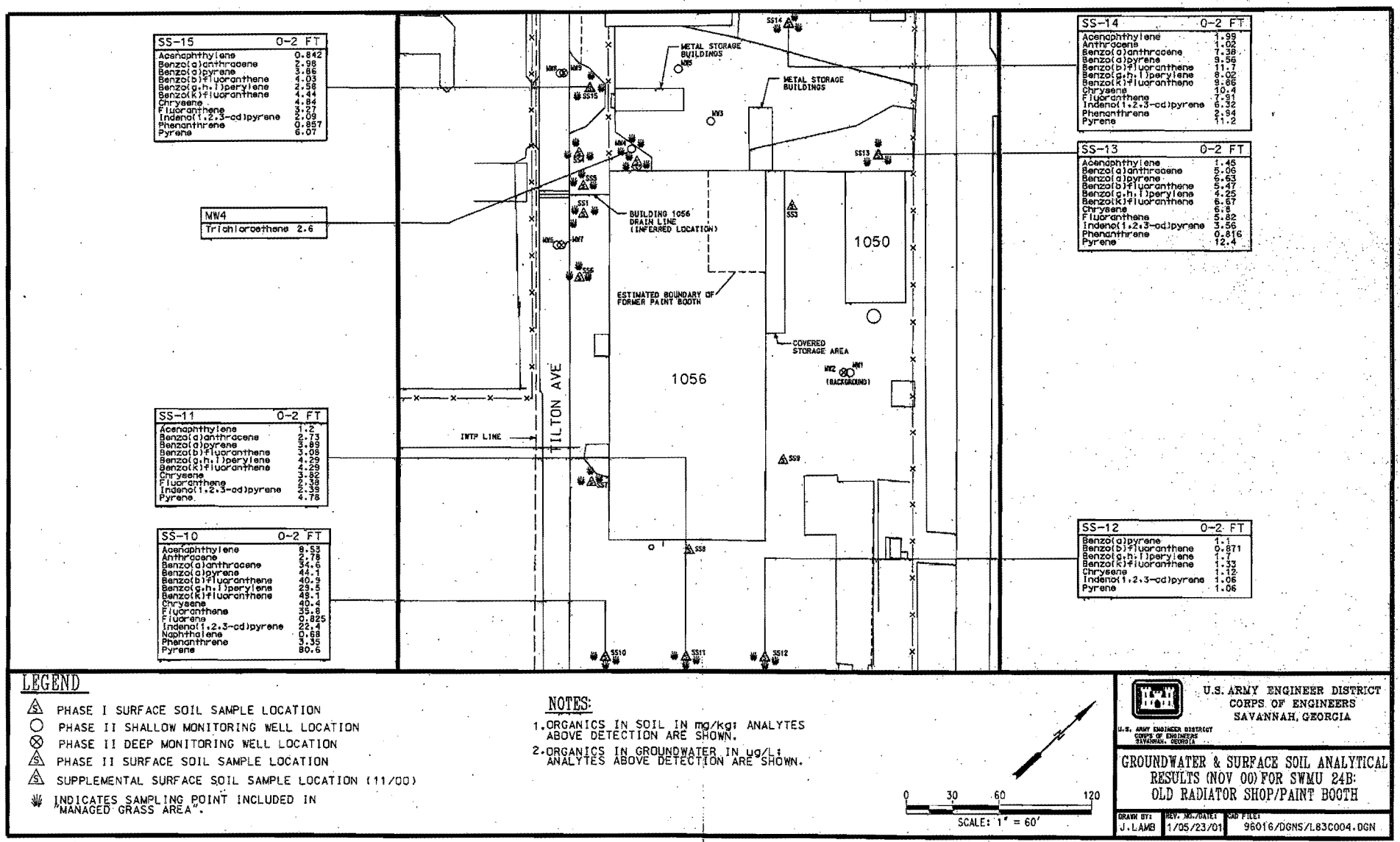


Figure 14. Summary of Supplemental Phase II RFI (11/01/00) Analytical Results in Surface Soil and Groundwater, SWMU 24B

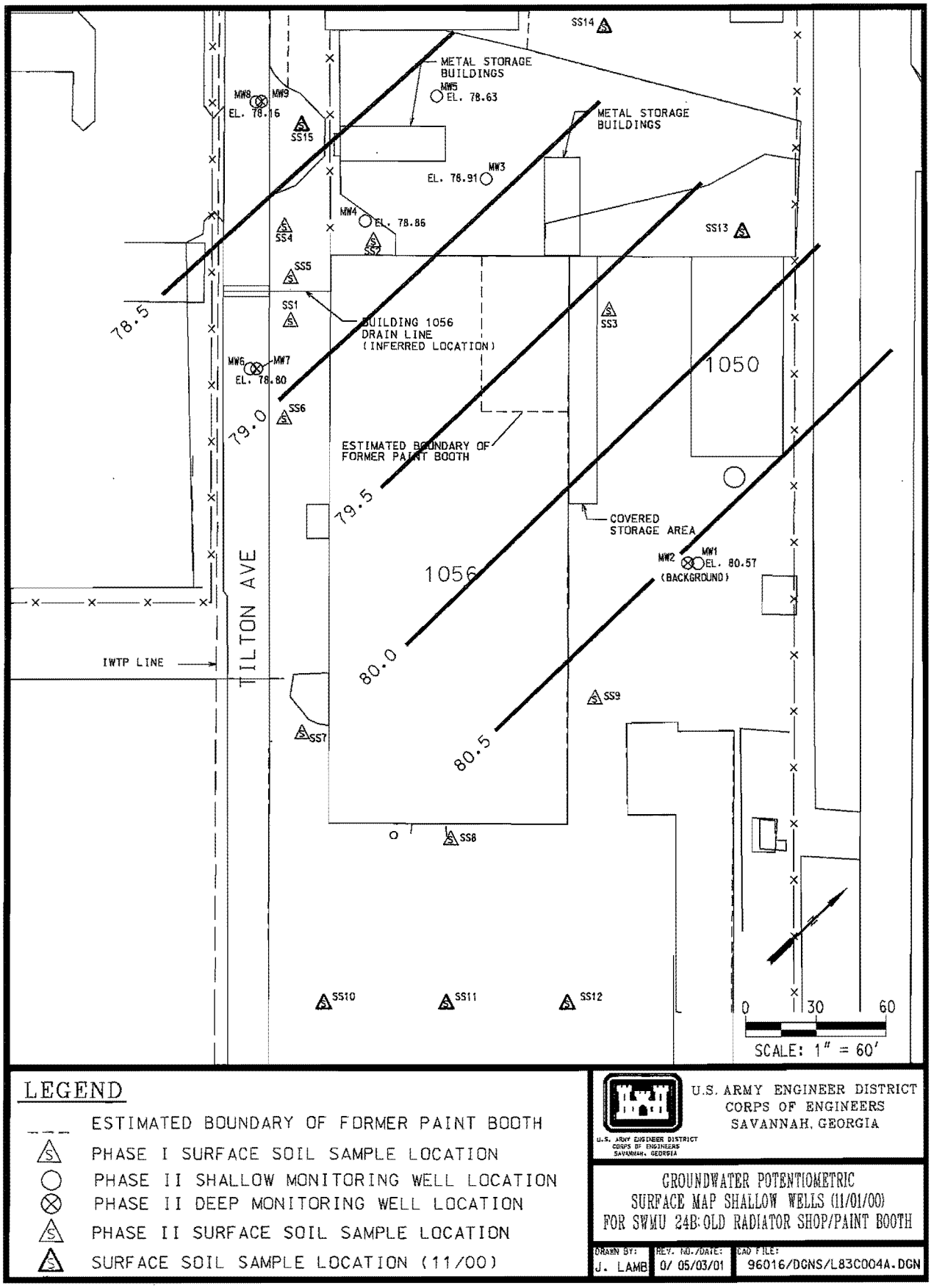


Figure 15. Groundwater Potentiometric Surface Map for Shallow Wells (11/01/00), SWMU 24B

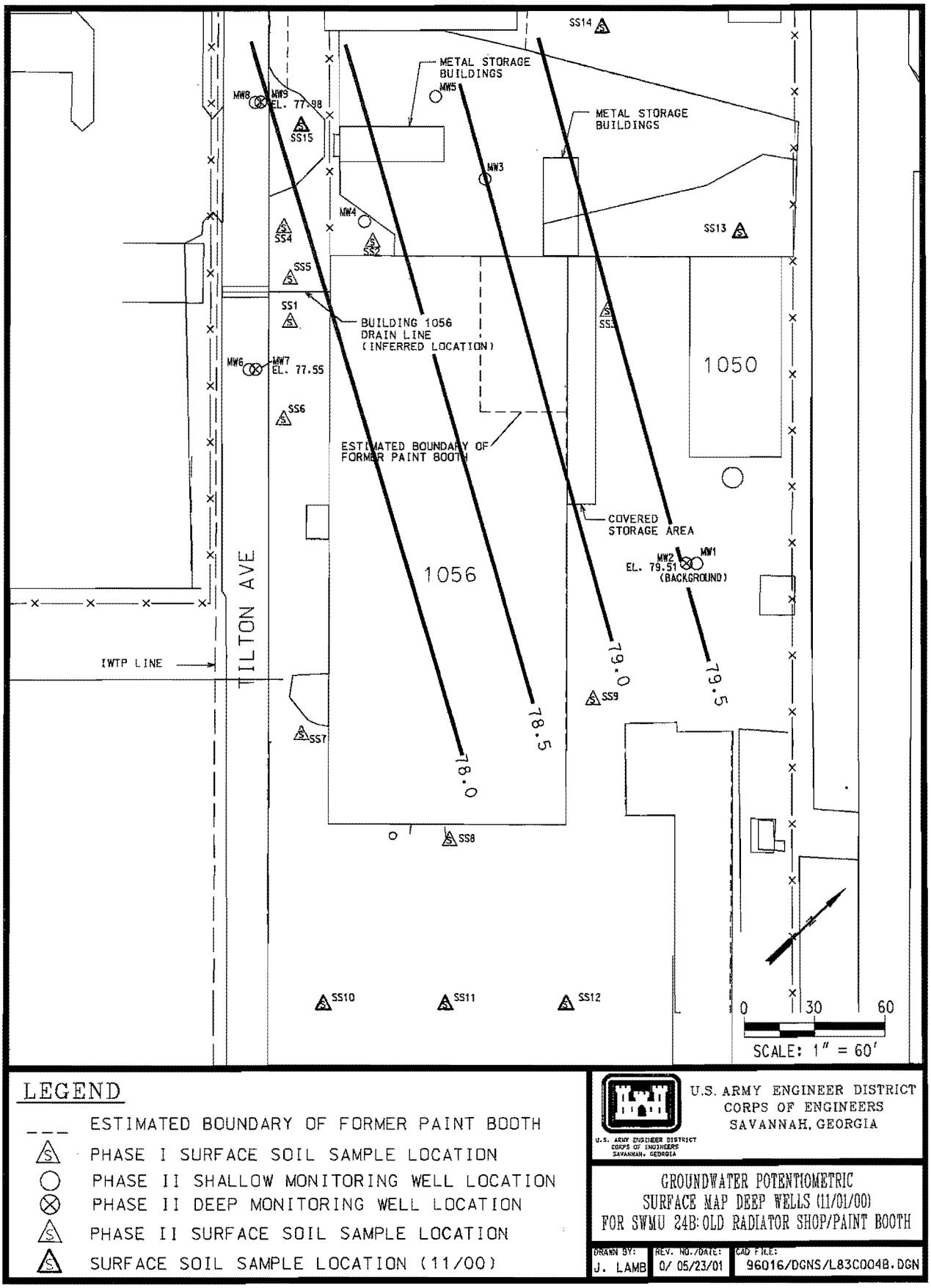


Figure 16. Groundwater Potentiometric Surface Map for Deep Wells (11/01/00), SWMU 24B

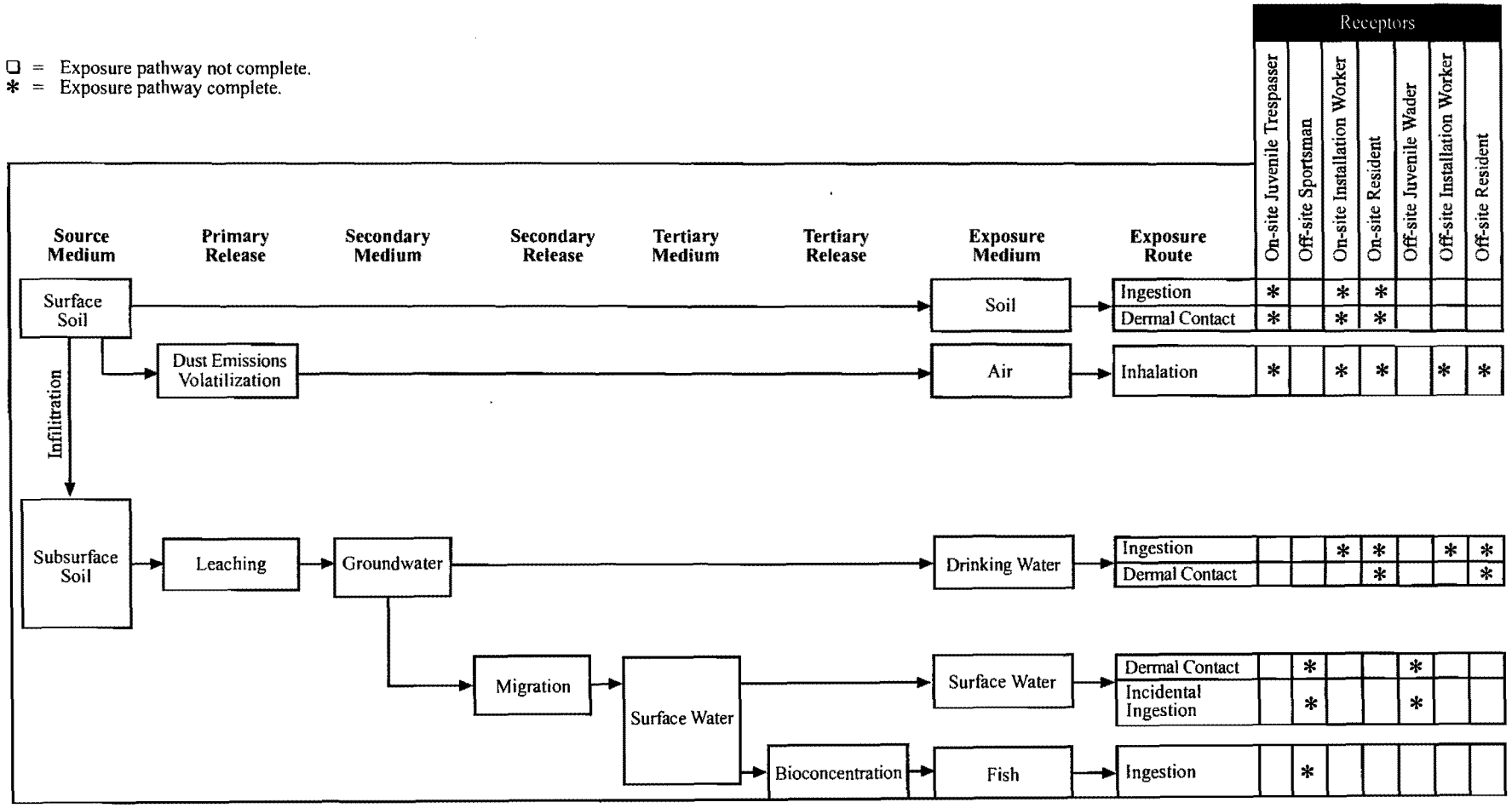


Figure 17. Phase II RFI Potential Migration and Exposure Pathways, SWMU 24B

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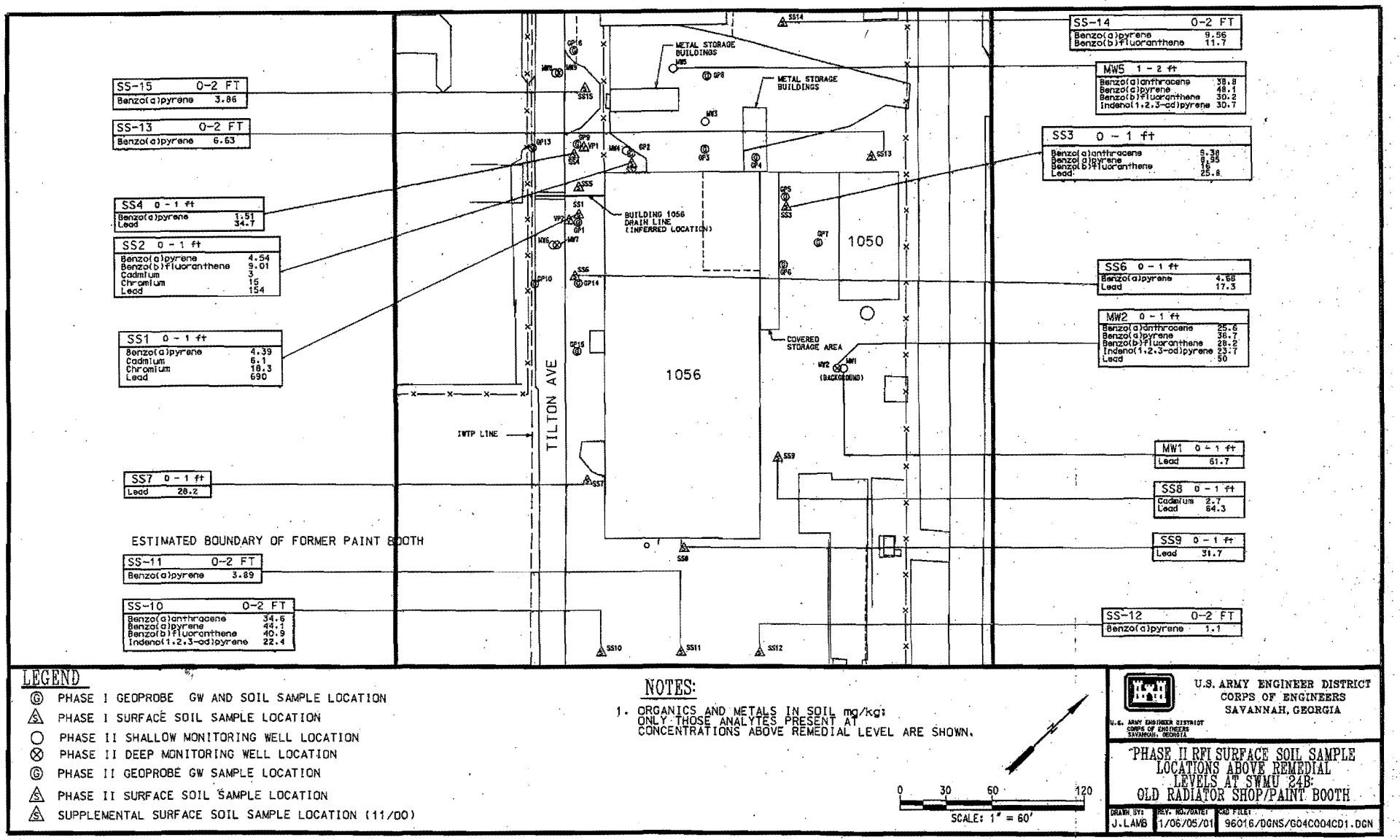

Figure 18. Phase II RFI Sample Locations above Remedial Levels, SWMU 24B

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ATTACHMENT A
TO SWMU 24B
TO THE
REVISED FINAL PHASE II RCRA FACILITY INVESTIGATION REPORT
FOR
16 SOLID WASTE MANAGEMENT UNITS
AT
FORT STEWART, GEORGIA

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY FORMS
FOR
SUPPLEMENTAL DATA EVALUATION

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ANALYTICAL RESULTS FOR SUPPLEMENTAL DATA EVALUATION

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Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-01

244172 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	9.6	UG/L	U	U	
REG	1,2-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,3-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,4-Dichlorobenzene	9.6	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	9.6	UG/L	U	U	
REG	2,4,5-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4,6-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dimethylphenol	9.6	UG/L	U	U	
REG	2,4-Dinitrophenol	19.2	UG/L	U	U	
REG	2,4-Dinitrotoluene	9.6	UG/L	U	U	
REG	2,6-Dinitrotoluene	9.6	UG/L	U	U	
REG	2-Chloronaphthalene	0.96	UG/L	U	U	
REG	2-Chlorophenol	9.6	UG/L	U	U	
REG	2-Methylnaphthalene	0.96	UG/L	U	U	
REG	2-Methylphenol	9.6	UG/L	U	U	
REG	2-Nitroaniline	9.6	UG/L	U	U	
REG	2-Nitrophenol	9.6	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	9.6	UG/L	U	U	
REG	3-Nitroaniline	9.6	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	9.6	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	9.6	UG/L	U	U	
REG	4-Chloroaniline	9.6	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	9.6	UG/L	U	U	
REG	4-Methylphenol	9.6	UG/L	U	U	
REG	4-Nitroaniline	9.6	UG/L	U	U	
REG	4-Nitrophenol	9.6	UG/L	U	U	
REG	4-chloro-3-methylphenol	9.6	UG/L	U	U	
REG	Acenaphthene	0.96	UG/L	U	U	
REG	Acenaphthylene	0.96	UG/L	U	U	
REG	Anthracene	0.96	UG/L	U	U	
REG	Benzo(a)anthracene	0.96	UG/L	U	U	
REG	Benzo(a)pyrene	0.96	UG/L	U	U	
REG	Benzo(b)fluoranthene	0.96	UG/L	U	U	
REG	Benzo(g,h,i)perylene	0.96	UG/L	U	U	
REG	Benzo(k)fluoranthene	0.96	UG/L	U	U	
REG	Benzoic Acid	9.6	UG/L	U	U	
REG	Benzyl Alcohol	9.6	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	9.6	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	9.6	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	9.6	UG/L	U	U	
REG	Butyl Benzyl Phthalate	9.6	UG/L	U	U	
REG	Carbazole	9.6	UG/L	U	U	
REG	Chrysene	0.96	UG/L	U	U	
REG	Di-n-butyl Phthalate	9.6	UG/L	U	U	
REG	Di-n-octyl Phthalate	9.6	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	0.96	UG/L	U	U	
REG	Dibenzofuran	9.6	UG/L	U	U	
REG	Diethyl Phthalate	9.6	UG/L	U	U	
REG	Dimethyl Phthalate	9.6	UG/L	U	U	
REG	Diphenylamine	9.6	UG/L	U	U	
REG	Fluoranthene	0.96	UG/L	U	U	
REG	Fluorene	0.96	UG/L	U	U	
REG	Hexachlorobenzene	9.6	UG/L	U	U	
REG	Hexachlorobutadiene	9.6	UG/L	U	U	
REG	Hexachlorocyclopentadiene	9.6	UG/L	U	U	
REG	Hexachloroethane	9.6	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	0.96	UG/L	U	U	
REG	Isophorone	9.6	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	9.6	UG/L	U	U	
REG	Naphthalene	0.96	UG/L	U	U	
REG	Nitrobenzene	9.6	UG/L	U	U	
REG	Pentachlorophenol	9.6	UG/L	U	U	
REG	Phenanthrene	0.96	UG/L	U	U	
REG	Phenol	9.6	UG/L	U	U	
REG	Pyrene	0.96	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-01

244172 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/01/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	1.5	UG/L	J	J	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-02

244272 **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/02/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	10.0	UG/L	U	U	
REG	1,2-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,3-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,4-Dichlorobenzene	10.0	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	10.0	UG/L	U	U	
REG	2,4,5-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4,6-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dimethylphenol	10.0	UG/L	U	U	
REG	2,4-Dinitrophenol	20.0	UG/L	U	U	
REG	2,4-Dinitrotoluene	10.0	UG/L	U	U	
REG	2,6-Dinitrotoluene	10.0	UG/L	U	U	
REG	2-Chloronaphthalene	1.0	UG/L	U	U	
REG	2-Chlorophenol	10.0	UG/L	U	U	
REG	2-Methylnaphthalene	1.0	UG/L	U	U	
REG	2-Methylphenol	10.0	UG/L	U	U	
REG	2-Nitroaniline	10.0	UG/L	U	U	
REG	2-Nitrophenol	10.0	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	10.0	UG/L	U	U	
REG	3-Nitroaniline	10.0	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	10.0	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	10.0	UG/L	U	U	
REG	4-Chloroaniline	10.0	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	10.0	UG/L	U	U	
REG	4-Methylphenol	10.0	UG/L	U	U	
REG	4-Nitroaniline	10.0	UG/L	U	U	
REG	4-Nitrophenol	10.0	UG/L	U	U	
REG	4-chloro-3-methylphenol	10.0	UG/L	U	U	
REG	Acenaphthene	1.0	UG/L	U	U	
REG	Acenaphthylene	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-02

244272 **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/02/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Anthracene	1.0	UG/L	U	U	
REG	Benzo(a)anthracene	1.0	UG/L	U	U	
REG	Benzo(a)pyrene	1.0	UG/L	U	U	
REG	Benzo(b)fluoranthene	1.0	UG/L	U	U	
REG	Benzo(g,h,i)perylene	1.0	UG/L	U	U	
REG	Benzo(k)fluoranthene	1.0	UG/L	U	U	
REG	Benzoic Acid	10.0	UG/L	U	U	
REG	Benzyl Alcohol	10.0	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	10.0	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	10.0	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	10.0	UG/L	U	U	
REG	Butyl Benzyl Phthalate	10.0	UG/L	U	U	
REG	Carbazole	10.0	UG/L	U	U	
REG	Chrysene	1.0	UG/L	U	U	
REG	Di-n-butyl Phthalate	10.0	UG/L	U	U	
REG	Di-n-octyl Phthalate	10.0	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	1.0	UG/L	U	U	
REG	Dibenzofuran	10.0	UG/L	U	U	
REG	Diethyl Phthalate	10.0	UG/L	U	U	
REG	Dimethyl Phthalate	10.0	UG/L	U	U	
REG	Diphenylamine	10.0	UG/L	U	U	
REG	Fluoranthene	1.0	UG/L	U	U	
REG	Fluorene	1.0	UG/L	U	U	
REG	Hexachlorobenzene	10.0	UG/L	U	U	
REG	Hexachlorobutadiene	10.0	UG/L	U	U	
REG	Hexachlorocyclopentadiene	10.0	UG/L	U	U	
REG	Hexachloroethane	10.0	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	1.0	UG/L	U	U	
REG	Isophorone	10.0	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	10.0	UG/L	U	U	
REG	Naphthalene	1.0	UG/L	U	U	
REG	Nitrobenzene	10.0	UG/L	U	U	
REG	Pentachlorophenol	10.0	UG/L	U	U	
REG	Phenanthrene	1.0	UG/L	U	U	
REG	Phenol	10.0	UG/L	U	U	
REG	Pyrene	1.0	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-02

244272 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 11/02/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-03

244372 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	9.6	UG/L	U	U	
REG	1,2-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,3-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,4-Dichlorobenzene	9.6	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	9.6	UG/L	U	U	
REG	2,4,5-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4,6-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dimethylphenol	9.6	UG/L	U	U	
REG	2,4-Dinitrophenol	19.2	UG/L	U	U	
REG	2,4-Dinitrotoluene	9.6	UG/L	U	U	
REG	2,6-Dinitrotoluene	9.6	UG/L	U	U	
REG	2-Chloronaphthalene	0.96	UG/L	U	U	
REG	2-Chlorophenol	9.6	UG/L	U	U	
REG	2-Methylnaphthalene	0.96	UG/L	U	U	
REG	2-Methylphenol	9.6	UG/L	U	U	
REG	2-Nitroaniline	9.6	UG/L	U	U	
REG	2-Nitrophenol	9.6	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	9.6	UG/L	U	U	
REG	3-Nitroaniline	9.6	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	9.6	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	9.6	UG/L	U	U	
REG	4-Chloroaniline	9.6	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	9.6	UG/L	U	U	
REG	4-Methylphenol	9.6	UG/L	U	U	
REG	4-Nitroaniline	9.6	UG/L	U	U	
REG	4-Nitrophenol	9.6	UG/L	U	U	
REG	4-chloro-3-methylphenol	9.6	UG/L	U	U	
REG	Acenaphthene	0.96	UG/L	U	U	
REG	Acenaphthylene	0.96	UG/L	U	U	
REG	Anthracene	0.96	UG/L	U	U	
REG	Benzo(a)anthracene	0.96	UG/L	U	U	
REG	Benzo(a)pyrene	0.96	UG/L	U	U	
REG	Benzo(b)fluoranthene	0.96	UG/L	U	U	
REG	Benzo(g,h,i)perylene	0.96	UG/L	U	U	
REG	Benzo(k)fluoranthene	0.96	UG/L	U	U	
REG	Benzoic Acid	9.6	UG/L	U	U	
REG	Benzyl Alcohol	9.6	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	9.6	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	9.6	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	9.6	UG/L	U	U	
REG	Butyl Benzyl Phthalate	9.6	UG/L	U	U	
REG	Carbazole	9.6	UG/L	U	U	
REG	Chrysene	0.96	UG/L	U	U	
REG	Di-n-butyl Phthalate	9.6	UG/L	U	U	
REG	Di-n-octyl Phthalate	9.6	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	0.96	UG/L	U	U	
REG	Dibenzofuran	9.6	UG/L	U	U	
REG	Diethyl Phthalate	9.6	UG/L	U	U	
REG	Dimethyl Phthalate	9.6	UG/L	U	U	
REG	Diphenylamine	9.6	UG/L	U	U	
REG	Fluoranthene	0.96	UG/L	U	U	
REG	Fluorene	0.96	UG/L	U	U	
REG	Hexachlorobenzene	9.6	UG/L	U	U	
REG	Hexachlorobutadiene	9.6	UG/L	U	U	
REG	Hexachlorocyclopentadiene	9.6	UG/L	U	U	
REG	Hexachloroethane	9.6	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	0.96	UG/L	U	U	
REG	Isophorone	9.6	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	9.6	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-03

244372 Field Sample Type: Grab Matrix: Groundwater Collected: 10/31/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Naphthalene	0.96	UG/L	U	U	
REG	Nitrobenzene	9.6	UG/L	U	U	
REG	Pentachlorophenol	9.6	UG/L	U	U	
REG	Phenanthrene	0.96	UG/L	U	U	
REG	Phenol	9.6	UG/L	U	U	
REG	Pyrene	0.96	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-04

244472 Field Sample Type: Grab Matrix: Groundwater Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	10.0	UG/L	U	U	
REG	1,2-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,3-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,4-Dichlorobenzene	10.0	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	10.0	UG/L	U	U	
REG	2,4,5-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4,6-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dimethylphenol	10.0	UG/L	U	U	
REG	2,4-Dinitrophenol	20.0	UG/L	U	U	
REG	2,4-Dinitrotoluene	10.0	UG/L	U	U	
REG	2,6-Dinitrotoluene	10.0	UG/L	U	U	
REG	2-Chloronaphthalene	1.0	UG/L	U	U	
REG	2-Chlorophenol	10.0	UG/L	U	U	
REG	2-Methylnaphthalene	1.0	UG/L	U	U	
REG	2-Methylphenol	10.0	UG/L	U	U	
REG	2-Nitroaniline	10.0	UG/L	U	U	
REG	2-Nitrophenol	10.0	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	10.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-04

244472 **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	3-Nitroaniline	10.0	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	10.0	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	10.0	UG/L	U	U	
REG	4-Chloroaniline	10.0	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	10.0	UG/L	U	U	
REG	4-Methylphenol	10.0	UG/L	U	U	
REG	4-Nitroaniline	10.0	UG/L	U	U	
REG	4-Nitrophenol	10.0	UG/L	U	U	
REG	4-chloro-3-methylphenol	10.0	UG/L	U	U	
REG	Acenaphthene	1.0	UG/L	U	U	
REG	Acenaphthylene	1.0	UG/L	U	U	
REG	Anthracene	1.0	UG/L	U	U	
REG	Benzo(a)anthracene	1.0	UG/L	U	U	
REG	Benzo(a)pyrene	1.0	UG/L	U	U	
REG	Benzo(b)fluoranthene	1.0	UG/L	U	U	
REG	Benzo(g,h,i)perylene	1.0	UG/L	U	U	
REG	Benzo(k)fluoranthene	1.0	UG/L	U	U	
REG	Benzoic Acid	10.0	UG/L	U	U	
REG	Benzyl Alcohol	10.0	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	10.0	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	10.0	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	10.0	UG/L	U	U	
REG	Butyl Benzyl Phthalate	10.0	UG/L	U	U	
REG	Carbazole	10.0	UG/L	U	U	
REG	Chrysene	1.0	UG/L	U	U	
REG	Di-n-butyl Phthalate	10.0	UG/L	U	U	
REG	Di-n-octyl Phthalate	10.0	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	1.0	UG/L	U	U	
REG	Dibenzofuran	10.0	UG/L	U	U	
REG	Diethyl Phthalate	10.0	UG/L	U	U	
REG	Dimethyl Phthalate	10.0	UG/L	U	U	
REG	Diphenylamine	10.0	UG/L	U	U	
REG	Fluoranthene	1.0	UG/L	U	U	
REG	Fluorene	1.0	UG/L	U	U	
REG	Hexachlorobenzene	10.0	UG/L	U	U	
REG	Hexachlorobutadiene	10.0	UG/L	U	U	
REG	Hexachlorocyclopentadiene	10.0	UG/L	U	U	
REG	Hexachloroethane	10.0	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	1.0	UG/L	U	U	
REG	Isophorone	10.0	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	10.0	UG/L	U	U	
REG	Naphthalene	1.0	UG/L	U	U	
REG	Nitrobenzene	10.0	UG/L	U	U	
REG	Pentachlorophenol	10.0	UG/L	U	U	
REG	Phenanthrene	1.0	UG/L	U	U	
REG	Phenol	10.0	UG/L	U	U	
REG	Pyrene	1.0	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-04

244472 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 11/01/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.4	UG/L		=	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	2.6	UG/L		=	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-05

244572 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	9.7	UG/L	U	U	
REG	1,2-Dichlorobenzene	9.7	UG/L	U	U	
REG	1,3-Dichlorobenzene	9.7	UG/L	U	U	
REG	1,4-Dichlorobenzene	9.7	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	9.7	UG/L	U	U	
REG	2,4,5-Trichlorophenol	9.7	UG/L	U	U	
REG	2,4,6-Trichlorophenol	9.7	UG/L	U	U	
REG	2,4-Dichlorophenol	9.7	UG/L	U	U	
REG	2,4-Dimethylphenol	9.7	UG/L	U	U	
REG	2,4-Dinitrophenol	19.4	UG/L	U	U	
REG	2,4-Dinitrotoluene	9.7	UG/L	U	U	
REG	2,6-Dinitrotoluene	9.7	UG/L	U	U	
REG	2-Chloronaphthalene	0.97	UG/L	U	U	
REG	2-Chlorophenol	9.7	UG/L	U	U	
REG	2-Methylnaphthalene	0.97	UG/L	U	U	
REG	2-Methylphenol	9.7	UG/L	U	U	
REG	2-Nitroaniline	9.7	UG/L	U	U	
REG	2-Nitrophenol	9.7	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	9.7	UG/L	U	U	
REG	3-Nitroaniline	9.7	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	9.7	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	9.7	UG/L	U	U	
REG	4-Chloroaniline	9.7	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	9.7	UG/L	U	U	
REG	4-Methylphenol	9.7	UG/L	U	U	
REG	4-Nitroaniline	9.7	UG/L	U	U	
REG	4-Nitrophenol	9.7	UG/L	U	U	
REG	4-chloro-3-methylphenol	9.7	UG/L	U	U	
REG	Acenaphthene	0.97	UG/L	U	U	
REG	Acenaphthylene	0.97	UG/L	U	U	
REG	Anthracene	0.97	UG/L	U	U	
REG	Benzo(a)anthracene	0.97	UG/L	U	U	
REG	Benzo(a)pyrene	0.97	UG/L	U	U	
REG	Benzo(b)fluoranthene	0.97	UG/L	U	U	
REG	Benzo(g,h,i)perylene	0.97	UG/L	U	U	
REG	Benzo(k)fluoranthene	0.97	UG/L	U	U	
REG	Benzoic Acid	9.7	UG/L	U	U	
REG	Benzyl Alcohol	9.7	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	9.7	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	9.7	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	9.7	UG/L	U	U	
REG	Butyl Benzyl Phthalate	9.7	UG/L	U	U	
REG	Carbazole	9.7	UG/L	U	U	
REG	Chrysene	0.97	UG/L	U	U	
REG	Di-n-butyl Phthalate	9.7	UG/L	U	U	
REG	Di-n-octyl Phthalate	9.7	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	0.97	UG/L	U	U	
REG	Dibenzofuran	9.7	UG/L	U	U	
REG	Diethyl Phthalate	9.7	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-05

244572 Field Sample Type: Grab Matrix: Groundwater Collected: 10/31/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Dimethyl Phthalate	9.7	UG/L	U	U	
REG	Diphenylamine	9.7	UG/L	U	U	
REG	Fluoranthene	0.97	UG/L	U	U	
REG	Fluorene	0.97	UG/L	U	U	
REG	Hexachlorobenzene	9.7	UG/L	U	U	
REG	Hexachlorobutadiene	9.7	UG/L	U	U	
REG	Hexachlorocyclopentadiene	9.7	UG/L	U	U	
REG	Hexachloroethane	9.7	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	0.97	UG/L	U	U	
REG	Isophorone	9.7	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	9.7	UG/L	U	U	
REG	Naphthalene	0.97	UG/L	U	U	
REG	Nitrobenzene	9.7	UG/L	U	U	
REG	Pentachlorophenol	9.7	UG/L	U	U	
REG	Phenanthrene	0.97	UG/L	U	U	
REG	Phenol	9.7	UG/L	U	U	
REG	Pyrene	0.97	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-06

244672 Field Sample Type: Grab Matrix: Groundwater Collected: 10/31/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	9.7	UG/L	U	U	
REG	1,2-Dichlorobenzene	9.7	UG/L	U	U	
REG	1,3-Dichlorobenzene	9.7	UG/L	U	U	
REG	1,4-Dichlorobenzene	9.7	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	9.7	UG/L	U	U	
REG	2,4,5-Trichlorophenol	9.7	UG/L	U	U	
REG	2,4,6-Trichlorophenol	9.7	UG/L	U	U	
REG	2,4-Dichlorophenol	9.7	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-06

244672 **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	2,4-Dimethylphenol	9.7	UG/L	U	U	
REG	2,4-Dinitrophenol	19.4	UG/L	U	U	
REG	2,4-Dinitrotoluene	9.7	UG/L	U	U	
REG	2,6-Dinitrotoluene	9.7	UG/L	U	U	
REG	2-Chloronaphthalene	0.97	UG/L	U	U	
REG	2-Chlorophenol	9.7	UG/L	U	U	
REG	2-Methylnaphthalene	0.97	UG/L	U	U	
REG	2-Methylphenol	9.7	UG/L	U	U	
REG	2-Nitroaniline	9.7	UG/L	U	U	
REG	2-Nitrophenol	9.7	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	9.7	UG/L	U	U	
REG	3-Nitroaniline	9.7	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	9.7	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	9.7	UG/L	U	U	
REG	4-Chloroaniline	9.7	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	9.7	UG/L	U	U	
REG	4-Methylphenol	9.7	UG/L	U	U	
REG	4-Nitroaniline	9.7	UG/L	U	U	
REG	4-Nitrophenol	9.7	UG/L	U	U	
REG	4-chloro-3-methylphenol	9.7	UG/L	U	U	
REG	Acenaphthene	0.97	UG/L	U	U	
REG	Acenaphthylene	0.97	UG/L	U	U	
REG	Anthracene	0.97	UG/L	U	U	
REG	Benzo(a)anthracene	0.97	UG/L	U	U	
REG	Benzo(a)pyrene	0.97	UG/L	U	U	
REG	Benzo(b)fluoranthene	0.97	UG/L	U	U	
REG	Benzo(g,h,i)perylene	0.97	UG/L	U	U	
REG	Benzo(k)fluoranthene	0.97	UG/L	U	U	
REG	Benzoic Acid	9.7	UG/L	U	U	
REG	Benzyl Alcohol	9.7	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	9.7	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	9.7	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	9.7	UG/L	U	U	
REG	Butyl Benzyl Phthalate	9.7	UG/L	U	U	
REG	Carbazole	9.7	UG/L	U	U	
REG	Chrysene	0.97	UG/L	U	U	
REG	Di-n-butyl Phthalate	9.7	UG/L	U	U	
REG	Di-n-octyl Phthalate	9.7	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	0.97	UG/L	U	U	
REG	Dibenzofuran	9.7	UG/L	U	U	
REG	Diethyl Phthalate	9.7	UG/L	U	U	
REG	Dimethyl Phthalate	9.7	UG/L	U	U	
REG	Diphenylamine	9.7	UG/L	U	U	
REG	Fluoranthene	0.97	UG/L	U	U	
REG	Fluorene	0.97	UG/L	U	U	
REG	Hexachlorobenzene	9.7	UG/L	U	U	
REG	Hexachlorobutadiene	9.7	UG/L	U	U	
REG	Hexachlorocyclopentadiene	9.7	UG/L	U	U	
REG	Hexachloroethane	9.7	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	0.97	UG/L	U	U	
REG	Isophorone	9.7	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	9.7	UG/L	U	U	
REG	Naphthalene	0.97	UG/L	U	U	
REG	Nitrobenzene	9.7	UG/L	U	U	
REG	Pentachlorophenol	9.7	UG/L	U	U	
REG	Phenanthrene	0.97	UG/L	U	U	
REG	Phenol	9.7	UG/L	U	U	
REG	Pyrene	0.97	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-06

244672 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.4	UG/L		=	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-07

244772 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	10.0	UG/L	U	U	
REG	1,2-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,3-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,4-Dichlorobenzene	10.0	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	10.0	UG/L	U	U	
REG	2,4,5-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4,6-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dimethylphenol	10.0	UG/L	U	U	
REG	2,4-Dinitrophenol	20.0	UG/L	U	U	
REG	2,4-Dinitrotoluene	10.0	UG/L	U	U	
REG	2,6-Dinitrotoluene	10.0	UG/L	U	U	
REG	2-Chloronaphthalene	1.0	UG/L	U	U	
REG	2-Chlorophenol	10.0	UG/L	U	U	
REG	2-Methylnaphthalene	1.0	UG/L	U	U	
REG	2-Methylphenol	10.0	UG/L	U	U	
REG	2-Nitroaniline	10.0	UG/L	U	U	
REG	2-Nitrophenol	10.0	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	10.0	UG/L	U	U	
REG	3-Nitroaniline	10.0	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	10.0	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	10.0	UG/L	U	U	
REG	4-Chloroaniline	10.0	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	10.0	UG/L	U	U	
REG	4-Methylphenol	10.0	UG/L	U	U	
REG	4-Nitroaniline	10.0	UG/L	U	U	
REG	4-Nitrophenol	10.0	UG/L	U	U	
REG	4-chloro-3-methylphenol	10.0	UG/L	U	U	
REG	Acenaphthene	1.0	UG/L	U	U	
REG	Acenaphthylene	1.0	UG/L	U	U	
REG	Anthracene	1.0	UG/L	U	U	
REG	Benzo(a)anthracene	1.0	UG/L	U	U	
REG	Benzo(a)pyrene	1.0	UG/L	U	U	
REG	Benzo(b)fluoranthene	1.0	UG/L	U	U	
REG	Benzo(g,h,i)perylene	1.0	UG/L	U	U	
REG	Benzo(k)fluoranthene	1.0	UG/L	U	U	
REG	Benzoic Acid	10.0	UG/L	U	U	
REG	Benzyl Alcohol	10.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-07

244772 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Bis(2-chloroethoxy)methane	10.0	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	10.0	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	10.0	UG/L	U	U	
REG	Butyl Benzyl Phthalate	10.0	UG/L	U	U	
REG	Carbazole	10.0	UG/L	U	U	
REG	Chrysene	1.0	UG/L	U	U	
REG	Di-n-butyl Phthalate	10.0	UG/L	U	U	
REG	Di-n-octyl Phthalate	10.0	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	1.0	UG/L	U	U	
REG	Dibenzofuran	10.0	UG/L	U	U	
REG	Diethyl Phthalate	10.0	UG/L	U	U	
REG	Dimethyl Phthalate	10.0	UG/L	U	U	
REG	Diphenylamine	10.0	UG/L	U	U	
REG	Fluoranthene	1.0	UG/L	U	U	
REG	Fluorene	1.0	UG/L	U	U	
REG	Hexachlorobenzene	10.0	UG/L	U	U	
REG	Hexachlorobutadiene	10.0	UG/L	U	U	
REG	Hexachlorocyclopentadiene	10.0	UG/L	U	U	
REG	Hexachloroethane	10.0	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	1.0	UG/L	U	U	
REG	Isophorone	10.0	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	10.0	UG/L	U	U	
REG	Naphthalene	1.0	UG/L	U	U	
REG	Nitrobenzene	10.0	UG/L	U	U	
REG	Pentachlorophenol	10.0	UG/L	U	U	
REG	Phenanthrene	1.0	UG/L	U	U	
REG	Phenol	10.0	UG/L	U	U	
REG	Pyrene	1.0	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-08

244872 **Field Sample Type: Grab** **Matrix: Groundwater** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	9.6	UG/L	U	U	
REG	1,2-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,3-Dichlorobenzene	9.6	UG/L	U	U	
REG	1,4-Dichlorobenzene	9.6	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	9.6	UG/L	U	U	
REG	2,4,5-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4,6-Trichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dichlorophenol	9.6	UG/L	U	U	
REG	2,4-Dimethylphenol	9.6	UG/L	U	U	
REG	2,4-Dinitrophenol	19.2	UG/L	U	U	
REG	2,4-Dinitrotoluene	9.6	UG/L	U	U	
REG	2,6-Dinitrotoluene	9.6	UG/L	U	U	
REG	2-Chloronaphthalene	0.96	UG/L	U	U	
REG	2-Chlorophenol	9.6	UG/L	U	U	
REG	2-Methylnaphthalene	0.96	UG/L	U	U	
REG	2-Methylphenol	9.6	UG/L	U	U	
REG	2-Nitroaniline	9.6	UG/L	U	U	
REG	2-Nitrophenol	9.6	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	9.6	UG/L	U	U	
REG	3-Nitroaniline	9.6	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	9.6	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	9.6	UG/L	U	U	
REG	4-Chloroaniline	9.6	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	9.6	UG/L	U	U	
REG	4-Methylphenol	9.6	UG/L	U	U	
REG	4-Nitroaniline	9.6	UG/L	U	U	
REG	4-Nitrophenol	9.6	UG/L	U	U	
REG	4-chloro-3-methylphenol	9.6	UG/L	U	U	
REG	Acenaphthene	0.96	UG/L	U	U	
REG	Acenaphthylene	0.96	UG/L	U	U	
REG	Anthracene	0.96	UG/L	U	U	
REG	Benzo(a)anthracene	0.96	UG/L	U	U	
REG	Benzo(a)pyrene	0.96	UG/L	U	U	
REG	Benzo(b)fluoranthene	0.96	UG/L	U	U	
REG	Benzo(g,h,i)perylene	0.96	UG/L	U	U	
REG	Benzo(k)fluoranthene	0.96	UG/L	U	U	
REG	Benzoic Acid	9.6	UG/L	U	U	
REG	Benzyl Alcohol	9.6	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	9.6	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	9.6	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	9.6	UG/L	U	U	
REG	Butyl Benzyl Phthalate	9.6	UG/L	U	U	
REG	Carbazole	9.6	UG/L	U	U	
REG	Chrysene	0.96	UG/L	U	U	
REG	Di-n-butyl Phthalate	9.6	UG/L	U	U	
REG	Di-n-octyl Phthalate	9.6	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	0.96	UG/L	U	U	
REG	Dibenzofuran	9.6	UG/L	U	U	
REG	Diethyl Phthalate	9.6	UG/L	U	U	
REG	Dimethyl Phthalate	9.6	UG/L	U	U	
REG	Diphenylamine	9.6	UG/L	U	U	
REG	Fluoranthene	0.96	UG/L	U	U	
REG	Fluorene	0.96	UG/L	U	U	
REG	Hexachlorobenzene	9.6	UG/L	U	U	
REG	Hexachlorobutadiene	9.6	UG/L	U	U	
REG	Hexachlorocyclopentadiene	9.6	UG/L	U	U	
REG	Hexachloroethane	9.6	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	0.96	UG/L	U	U	
REG	Isophorone	9.6	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	9.6	UG/L	U	U	
REG	Naphthalene	0.96	UG/L	U	U	
REG	Nitrobenzene	9.6	UG/L	U	U	
REG	Pentachlorophenol	9.6	UG/L	U	U	
REG	Phenanthrene	0.96	UG/L	U	U	
REG	Phenol	9.6	UG/L	U	U	
REG	Pyrene	0.96	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-08

244872 | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 11/01/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	.53	UG/L	J	J	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-09

244972 **0.0 - 0.0 FT** | **Field Sample Type: Grab** | **Matrix: Groundwater** | **Collected: 10/31/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	10.0	UG/L	U	U	
REG	1,2-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,3-Dichlorobenzene	10.0	UG/L	U	U	
REG	1,4-Dichlorobenzene	10.0	UG/L	U	U	
REG	2,2'-oxybis (1-chloropropane)	10.0	UG/L	U	U	
REG	2,4,5-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4,6-Trichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dichlorophenol	10.0	UG/L	U	U	
REG	2,4-Dimethylphenol	10.0	UG/L	U	U	
REG	2,4-Dinitrophenol	20.0	UG/L	U	U	
REG	2,4-Dinitrotoluene	10.0	UG/L	U	U	
REG	2,6-Dinitrotoluene	10.0	UG/L	U	U	
REG	2-Chloronaphthalene	1.0	UG/L	U	U	
REG	2-Chlorophenol	10.0	UG/L	U	U	
REG	2-Methylnaphthalene	1.0	UG/L	U	U	
REG	2-Methylphenol	10.0	UG/L	U	U	
REG	2-Nitroaniline	10.0	UG/L	U	U	
REG	2-Nitrophenol	10.0	UG/L	U	U	
REG	3,3'-Dichlorobenzidine	10.0	UG/L	U	U	
REG	3-Nitroaniline	10.0	UG/L	U	U	
REG	4,6-Dinitro-o-Cresol	10.0	UG/L	U	U	
REG	4-Bromophenyl-phenyl Ether	10.0	UG/L	U	U	
REG	4-Chloroaniline	10.0	UG/L	U	U	
REG	4-Chlorophenyl-phenylether	10.0	UG/L	U	U	
REG	4-Methylphenol	10.0	UG/L	U	U	
REG	4-Nitroaniline	10.0	UG/L	U	U	
REG	4-Nitrophenol	10.0	UG/L	U	U	
REG	4-chloro-3-methylphenol	10.0	UG/L	U	U	
REG	Acenaphthene	1.0	UG/L	U	U	
REG	Acenaphthylene	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-09

244972 0.0 - 0.0 FT Field Sample Type: Grab Matrix: Groundwater Collected: 10/31/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Anthracene	1.0	UG/L	U	U	
REG	Benzo(a)anthracene	1.0	UG/L	U	U	
REG	Benzo(a)pyrene	1.0	UG/L	U	U	
REG	Benzo(b)fluoranthene	1.0	UG/L	U	U	
REG	Benzo(g,h,i)perylene	1.0	UG/L	U	U	
REG	Benzo(k)fluoranthene	1.0	UG/L	U	U	
REG	Benzoic Acid	10.0	UG/L	U	U	
REG	Benzyl Alcohol	10.0	UG/L	U	U	
REG	Bis(2-chloroethoxy)methane	10.0	UG/L	U	U	
REG	Bis(2-chloroethyl)ether	10.0	UG/L	U	U	
REG	Bis(2-ethylhexyl)phthalate	10.0	UG/L	U	U	
REG	Butyl Benzyl Phthalate	10.0	UG/L	U	U	
REG	Carbazole	10.0	UG/L	U	U	
REG	Chrysene	1.0	UG/L	U	U	
REG	Di-n-butyl Phthalate	10.0	UG/L	U	U	
REG	Di-n-octyl Phthalate	10.0	UG/L	U	U	
REG	Dibenzo(a,h)anthracene	1.0	UG/L	U	U	
REG	Dibenzofuran	10.0	UG/L	U	U	
REG	Diethyl Phthalate	10.0	UG/L	U	U	
REG	Dimethyl Phthalate	10.0	UG/L	U	U	
REG	Diphenylamine	10.0	UG/L	U	U	
REG	Fluoranthene	1.0	UG/L	U	U	
REG	Fluorene	1.0	UG/L	U	U	
REG	Hexachlorobenzene	10.0	UG/L	U	U	
REG	Hexachlorobutadiene	10.0	UG/L	U	U	
REG	Hexachlorocyclopentadiene	10.0	UG/L	U	U	
REG	Hexachloroethane	10.0	UG/L	U	U	
REG	Indeno(1,2,3-cd)pyrene	1.0	UG/L	U	U	
REG	Isophorone	10.0	UG/L	U	U	
REG	N-Nitroso-di-n-propylamine	10.0	UG/L	U	U	
REG	Naphthalene	1.0	UG/L	U	U	
REG	Nitrobenzene	10.0	UG/L	U	U	
REG	Pentachlorophenol	10.0	UG/L	U	U	
REG	Phenanthrene	1.0	UG/L	U	U	
REG	Phenol	10.0	UG/L	U	U	
REG	Pyrene	1.0	UG/L	U	U	

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-MW-09

244972 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Groundwater** **Collected:** 10/31/2000

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-10

247011 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected:** 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13600	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13600	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13600	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dimethylphenol	13600	UG/KG	U	U	
REG	2,4-Dinitrophenol	27100	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13600	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13600	UG/KG	U	U	
REG	2-Chloronaphthalene	1360	UG/KG	U	U	
REG	2-Chlorophenol	13600	UG/KG	U	U	
REG	2-Methylnaphthalene	1360	UG/KG	U	U	
REG	2-Methylphenol	13600	UG/KG	U	U	
REG	2-Nitroaniline	13600	UG/KG	U	U	
REG	2-Nitrophenol	13600	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13600	UG/KG	U	U	
REG	3-Nitroaniline	13600	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13600	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13600	UG/KG	U	U	
REG	4-Chloroaniline	13600	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13600	UG/KG	U	U	
REG	4-Methylphenol	13600	UG/KG	U	U	
REG	4-Nitroaniline	13600	UG/KG	U	U	
REG	4-Nitrophenol	13600	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13600	UG/KG	U	U	
REG	Acenaphthene	1360	UG/KG	U	U	
REG	Acenaphthylene	8530	UG/KG		=	
REG	Anthracene	2780	UG/KG		=	
REG	Benzo(a)anthracene	34600	UG/KG		=	
REG	Benzo(a)pyrene	44100	UG/KG		=	
REG	Benzo(b)fluoranthene	40900	UG/KG		=	
REG	Benzo(g,h,i)perylene	29500	UG/KG		=	
REG	Benzo(k)fluoranthene	49100	UG/KG		=	
REG	Benzoic Acid	13600	UG/KG	U	U	
REG	Benzyl Alcohol	13600	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13600	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13600	UG/KG	U	U	
REG	Bis(2-ethylhexyl)phthalate	13600	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13600	UG/KG	U	U	
REG	Carbazole	13600	UG/KG	U	U	
REG	Chrysene	40400	UG/KG		=	
REG	Di-n-butyl Phthalate	13600	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13600	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1360	UG/KG	U	U	
REG	Dibenzofuran	13600	UG/KG	U	U	
REG	Diethyl Phthalate	13600	UG/KG	U	U	
REG	Dimethyl Phthalate	13600	UG/KG	U	U	
REG	Diphenylamine	13600	UG/KG	U	U	
REG	Fluoranthene	35800	UG/KG		=	
REG	Fluorene	825	UG/KG	J	J	
REG	Hexachlorobenzene	13600	UG/KG	U	U	
REG	Hexachlorobutadiene	13600	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13600	UG/KG	U	U	
REG	Hexachloroethane	13600	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	22400	UG/KG		=	
REG	Isophorone	13600	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13600	UG/KG	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-10

247011 | 0.0 - 0.0 FT | Field Sample Type: Grab | Matrix: Surface Soil | Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Naphthalene	680	UG/KG	J	J	
REG	Nitrobenzene	13600	UG/KG	U	U	
REG	Pentachlorophenol	13600	UG/KG	U	U	
REG	Phenanthrene	3350	UG/KG		=	
REG	Phenol	13600	UG/KG	U	U	
REG	Pyrene	80600	UG/KG		=	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-11

247A11 | 0.0 - 0.0 FT | Field Sample Type: Grab | Matrix: Surface Soil | Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13600	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13600	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13600	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dimethylphenol	13600	UG/KG	U	U	
REG	2,4-Dinitrophenol	27200	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13600	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13600	UG/KG	U	U	
REG	2-Chloronaphthalene	1360	UG/KG	U	U	
REG	2-Chlorophenol	13600	UG/KG	U	U	
REG	2-Methylnaphthalene	1360	UG/KG	U	U	
REG	2-Methylphenol	13600	UG/KG	U	U	
REG	2-Nitroaniline	13600	UG/KG	U	U	
REG	2-Nitrophenol	13600	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13600	UG/KG	U	U	
REG	3-Nitroaniline	13600	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13600	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13600	UG/KG	U	U	
REG	4-Chloroaniline	13600	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13600	UG/KG	U	U	
REG	4-Methylphenol	13600	UG/KG	U	U	
REG	4-Nitroaniline	13600	UG/KG	U	U	
REG	4-Nitrophenol	13600	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13600	UG/KG	U	U	
REG	Acenaphthene	1360	UG/KG	U	U	
REG	Acenaphthylene	1200	UG/KG	J	J	
REG	Anthracene	1360	UG/KG	U	U	
REG	Benzo(a)anthracene	2730	UG/KG		=	
REG	Benzo(a)pyrene	3890	UG/KG		=	
REG	Benzo(b)fluoranthene	3080	UG/KG		=	
REG	Benzo(g,h,i)perylene	4290	UG/KG		=	
REG	Benzo(k)fluoranthene	4290	UG/KG		=	
REG	Benzoic Acid	13600	UG/KG	U	U	
REG	Benzyl Alcohol	13600	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13600	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13600	UG/KG	U	U	
REG	Bis(2-ethylhexyl)phthalate	13600	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13600	UG/KG	U	U	
REG	Carbazole	13600	UG/KG	U	U	
REG	Chrysene	3820	UG/KG		=	
REG	Di-n-butyl Phthalate	13600	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13600	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1360	UG/KG	U	U	
REG	Dibenzofuran	13600	UG/KG	U	U	
REG	Diethyl Phthalate	13600	UG/KG	U	U	
REG	Dimethyl Phthalate	13600	UG/KG	U	U	
REG	Diphenylamine	13600	UG/KG	U	U	
REG	Fluoranthene	2380	UG/KG		=	
REG	Fluorene	1360	UG/KG	U	U	
REG	Hexachlorobenzene	13600	UG/KG	U	U	
REG	Hexachlorobutadiene	13600	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13600	UG/KG	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-11

247A11 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Hexachloroethane	13600	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	2390	UG/KG		=	
REG	Isophorone	13600	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13600	UG/KG	U	U	
REG	Naphthalene	1360	UG/KG	U	U	
REG	Nitrobenzene	13600	UG/KG	U	U	
REG	Pentachlorophenol	13600	UG/KG	U	U	
REG	Phenanthrene	1360	UG/KG	U	U	
REG	Phenol	13600	UG/KG	U	U	
REG	Pyrene	4780	UG/KG		=	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-12

247B11 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13700	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13700	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13700	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13700	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13700	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13700	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13700	UG/KG	U	U	
REG	2,4-Dichlorophenol	13700	UG/KG	U	U	
REG	2,4-Dimethylphenol	13700	UG/KG	U	U	
REG	2,4-Dinitrophenol	27400	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13700	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13700	UG/KG	U	U	
REG	2-Chloronaphthalene	1370	UG/KG	U	U	
REG	2-Chlorophenol	13700	UG/KG	U	U	
REG	2-Methylnaphthalene	1370	UG/KG	U	U	
REG	2-Methylphenol	13700	UG/KG	U	U	
REG	2-Nitroaniline	13700	UG/KG	U	U	
REG	2-Nitrophenol	13700	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13700	UG/KG	U	U	
REG	3-Nitroaniline	13700	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13700	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13700	UG/KG	U	U	
REG	4-Chloroaniline	13700	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13700	UG/KG	U	U	
REG	4-Methylphenol	13700	UG/KG	U	U	
REG	4-Nitroaniline	13700	UG/KG	U	U	
REG	4-Nitrophenol	13700	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13700	UG/KG	U	U	
REG	Acenaphthene	1370	UG/KG	U	U	
REG	Acenaphthylene	1370	UG/KG	U	U	
REG	Anthracene	1370	UG/KG	U	U	
REG	Benzo(a)anthracene	1370	UG/KG	U	U	
REG	Benzo(a)pyrene	1100	UG/KG	J	J	
REG	Benzo(b)fluoranthene	871	UG/KG	J	J	
REG	Benzo(g,h,i)perylene	1700	UG/KG		=	
REG	Benzo(k)fluoranthene	1330	UG/KG	J	J	
REG	Benzoic Acid	13700	UG/KG	U	U	
REG	Benzyl Alcohol	13700	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13700	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13700	UG/KG	U	U	
REG	Bis(2-ethylhexyl)phthalate	13700	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13700	UG/KG	U	U	
REG	Carbazole	13700	UG/KG	U	U	
REG	Chrysene	1120	UG/KG	J	J	
REG	Di-n-butyl Phthalate	13700	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13700	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1370	UG/KG	U	U	
REG	Dibenzofuran	13700	UG/KG	U	U	
REG	Diethyl Phthalate	13700	UG/KG	U	U	
REG	Dimethyl Phthalate	13700	UG/KG	U	U	
REG	Diphenylamine	13700	UG/KG	U	U	
REG	Fluoranthene	1370	UG/KG	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-12

247B11 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Fluorene	1370	UG/KG	U	U	
REG	Hexachlorobenzene	13700	UG/KG	U	U	
REG	Hexachlorobutadiene	13700	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13700	UG/KG	U	U	
REG	Hexachloroethane	13700	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	1060	UG/KG	J	J	
REG	Isophorone	13700	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13700	UG/KG	U	U	
REG	Naphthalene	1370	UG/KG	U	U	
REG	Nitrobenzene	13700	UG/KG	U	U	
REG	Pentachlorophenol	13700	UG/KG	U	U	
REG	Phenanthrene	1370	UG/KG	U	U	
REG	Phenol	13700	UG/KG	U	U	
REG	Pyrene	1060	UG/KG	J	J	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-13

247C11 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13900	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13900	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13900	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13900	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13900	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13900	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13900	UG/KG	U	U	
REG	2,4-Dichlorophenol	13900	UG/KG	U	U	
REG	2,4-Dimethylphenol	13900	UG/KG	U	U	
REG	2,4-Dinitrophenol	27800	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13900	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13900	UG/KG	U	U	
REG	2-Chloronaphthalene	1390	UG/KG	U	U	
REG	2-Chlorophenol	13900	UG/KG	U	U	
REG	2-Methylnaphthalene	1390	UG/KG	U	U	
REG	2-Methylphenol	13900	UG/KG	U	U	
REG	2-Nitroaniline	13900	UG/KG	U	U	
REG	2-Nitrophenol	13900	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13900	UG/KG	U	U	
REG	3-Nitroaniline	13900	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13900	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13900	UG/KG	U	U	
REG	4-Chloroaniline	13900	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13900	UG/KG	U	U	
REG	4-Methylphenol	13900	UG/KG	U	U	
REG	4-Nitroaniline	13900	UG/KG	U	U	
REG	4-Nitrophenol	13900	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13900	UG/KG	U	U	
REG	Acenaphthene	1390	UG/KG	U	U	
REG	Acenaphthylene	1450	UG/KG		=	
REG	Anthracene	1390	UG/KG	U	U	
REG	Benzo(a)anthracene	5060	UG/KG		=	
REG	Benzo(a)pyrene	6630	UG/KG		=	
REG	Benzo(b)fluoranthene	5470	UG/KG		=	
REG	Benzo(g,h,i)perylene	4250	UG/KG		=	
REG	Benzo(k)fluoranthene	6670	UG/KG		=	
REG	Benzoic Acid	13900	UG/KG	U	U	
REG	Benzyl Alcohol	13900	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13900	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13900	UG/KG	U	U	
REG	Bis(2-ethylhexyl)phthalate	13900	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13900	UG/KG	U	U	
REG	Carbazole	13900	UG/KG	U	U	
REG	Chrysene	6800	UG/KG		=	
REG	Di-n-butyl Phthalate	13900	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13900	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1390	UG/KG	U	U	
REG	Dibenzofuran	13900	UG/KG	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-13

247C11 0.0 - 0.0 FT Field Sample Type: Grab Matrix: Surface Soil Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Diethyl Phthalate	13900	UG/KG	U	U	
REG	Dimethyl Phthalate	13900	UG/KG	U	U	
REG	Diphenylamine	13900	UG/KG	U	U	
REG	Fluoranthene	5820	UG/KG		=	
REG	Fluorene	1390	UG/KG	U	U	
REG	Hexachlorobenzene	13900	UG/KG	U	U	
REG	Hexachlorobutadiene	13900	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13900	UG/KG	U	U	
REG	Hexachloroethane	13900	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	3560	UG/KG		=	
REG	Isophorone	13900	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13900	UG/KG	U	U	
REG	Naphthalene	1390	UG/KG	U	U	
REG	Nitrobenzene	13900	UG/KG	U	U	
REG	Pentachlorophenol	13900	UG/KG	U	U	
REG	Phenanthrene	816	UG/KG	J	J	
REG	Phenol	13900	UG/KG	U	U	
REG	Pyrene	12400	UG/KG		=	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-14

247D11 0.0 - 0.0 FT Field Sample Type: Grab Matrix: Surface Soil Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13800	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13800	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13800	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13800	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13800	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13800	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13800	UG/KG	U	U	
REG	2,4-Dichlorophenol	13800	UG/KG	U	U	
REG	2,4-Dimethylphenol	13800	UG/KG	U	U	
REG	2,4-Dinitrophenol	27600	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13800	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13800	UG/KG	U	U	
REG	2-Chloronaphthalene	1380	UG/KG	U	U	
REG	2-Chlorophenol	13800	UG/KG	U	U	
REG	2-Methylnaphthalene	1380	UG/KG	U	U	
REG	2-Methylphenol	13800	UG/KG	U	U	
REG	2-Nitroaniline	13800	UG/KG	U	U	
REG	2-Nitrophenol	13800	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13800	UG/KG	U	U	
REG	3-Nitroaniline	13800	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13800	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13800	UG/KG	U	U	
REG	4-Chloroaniline	13800	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13800	UG/KG	U	U	
REG	4-Methylphenol	13800	UG/KG	U	U	
REG	4-Nitroaniline	13800	UG/KG	U	U	
REG	4-Nitrophenol	13800	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13800	UG/KG	U	U	
REG	Acenaphthene	1380	UG/KG	U	U	
REG	Acenaphthylene	1990	UG/KG		=	
REG	Anthracene	1020	UG/KG	J	J	
REG	Benzo(a)anthracene	7380	UG/KG		=	
REG	Benzo(a)pyrene	9560	UG/KG		=	
REG	Benzo(b)fluoranthene	11700	UG/KG		=	
REG	Benzo(g,h,i)perylene	8020	UG/KG		=	
REG	Benzo(k)fluoranthene	9860	UG/KG		=	
REG	Benzoic Acid	13800	UG/KG	U	U	
REG	Benzyl Alcohol	13800	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13800	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13800	UG/KG	U	U	
REG	Bis(2-ethylhexyl)phthalate	13800	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13800	UG/KG	U	U	
REG	Carbazole	13800	UG/KG	U	U	
REG	Chrysene	10400	UG/KG		=	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-14

247D11 0.0 - 0.0 FT Field Sample Type: Grab Matrix: Surface Soil Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Di-n-butyl Phthalate	13800	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13800	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1380	UG/KG	U	U	
REG	Dibenzofuran	13800	UG/KG	U	U	
REG	Diethyl Phthalate	13800	UG/KG	U	U	
REG	Dimethyl Phthalate	13800	UG/KG	U	U	
REG	Diphenylamine	13800	UG/KG	U	U	
REG	Fluoranthene	7910	UG/KG		=	
REG	Fluorene	1380	UG/KG	U	U	
REG	Hexachlorobenzene	13800	UG/KG	U	U	
REG	Hexachlorobutadiene	13800	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13800	UG/KG	U	U	
REG	Hexachloroethane	13800	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	6320	UG/KG		=	
REG	Isophorone	13800	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13800	UG/KG	U	U	
REG	Naphthalene	1380	UG/KG	U	U	
REG	Nitrobenzene	13800	UG/KG	U	U	
REG	Pentachlorophenol	13800	UG/KG	U	U	
REG	Phenanthrene	2940	UG/KG		=	
REG	Phenol	13800	UG/KG	U	U	
REG	Pyrene	11200	UG/KG		=	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-15

247E11 0.0 - 0.0 FT Field Sample Type: Grab Matrix: Surface Soil Collected: 11/01/2000

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,2,4-Trichlorobenzene	13600	UG/KG	U	U	
REG	1,2-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,3-Dichlorobenzene	13600	UG/KG	U	U	
REG	1,4-Dichlorobenzene	13600	UG/KG	U	U	
REG	2,2'-oxybis (1-chloropropane)	13600	UG/KG	U	U	
REG	2,4,5-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4,6-Trichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dichlorophenol	13600	UG/KG	U	U	
REG	2,4-Dimethylphenol	13600	UG/KG	U	U	
REG	2,4-Dinitrophenol	27300	UG/KG	U	U	
REG	2,4-Dinitrotoluene	13600	UG/KG	U	U	
REG	2,6-Dinitrotoluene	13600	UG/KG	U	U	
REG	2-Chloronaphthalene	1360	UG/KG	U	U	
REG	2-Chlorophenol	13600	UG/KG	U	U	
REG	2-Methylnaphthalene	1360	UG/KG	U	U	
REG	2-Methylphenol	13600	UG/KG	U	U	
REG	2-Nitroaniline	13600	UG/KG	U	U	
REG	2-Nitrophenol	13600	UG/KG	U	U	
REG	3,3'-Dichlorobenzidine	13600	UG/KG	U	U	
REG	3-Nitroaniline	13600	UG/KG	U	U	
REG	4,6-Dinitro-o-Cresol	13600	UG/KG	U	U	
REG	4-Bromophenyl-phenyl Ether	13600	UG/KG	U	U	
REG	4-Chloroaniline	13600	UG/KG	U	U	
REG	4-Chlorophenyl-phenylether	13600	UG/KG	U	U	
REG	4-Methylphenol	13600	UG/KG	U	U	
REG	4-Nitroaniline	13600	UG/KG	U	U	
REG	4-Nitrophenol	13600	UG/KG	U	U	
REG	4-chloro-3-methylphenol	13600	UG/KG	U	U	
REG	Acenaphthene	1360	UG/KG	U	U	
REG	Acenaphthylene	842	UG/KG	J	J	
REG	Anthracene	1360	UG/KG	U	U	
REG	Benzo(a)anthracene	2980	UG/KG		=	
REG	Benzo(a)pyrene	3860	UG/KG		=	
REG	Benzo(b)fluoranthene	4030	UG/KG		=	
REG	Benzo(g,h,i)perylene	2580	UG/KG		=	
REG	Benzo(k)fluoranthene	4440	UG/KG		=	
REG	Benzoic Acid	13600	UG/KG	U	U	
REG	Benzyl Alcohol	13600	UG/KG	U	U	
REG	Bis(2-chloroethoxy)methane	13600	UG/KG	U	U	
REG	Bis(2-chloroethyl)ether	13600	UG/KG	U	U	

Location: SWMU 24B, Radiator Shop/Paint Booth
Station : 24B-SS-15

247E11 0.0 - 0.0 FT **Field Sample Type: Grab** **Matrix: Surface Soil** **Collected: 11/01/2000**

Sample Type	Semi-Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Bis(2-ethylhexyl)phthalate	13600	UG/KG	U	U	
REG	Butyl Benzyl Phthalate	13600	UG/KG	U	U	
REG	Carbazole	13600	UG/KG	U	U	
REG	Chrysene	4840	UG/KG		=	
REG	Di-n-butyl Phthalate	13600	UG/KG	U	U	
REG	Di-n-octyl Phthalate	13600	UG/KG	U	U	
REG	Dibenzo(a,h)anthracene	1360	UG/KG	U	U	
REG	Dibenzofuran	13600	UG/KG	U	U	
REG	Diethyl Phthalate	13600	UG/KG	U	U	
REG	Dimethyl Phthalate	13600	UG/KG	U	U	
REG	Diphenylamine	13600	UG/KG	U	U	
REG	Fluoranthene	3270	UG/KG		=	
REG	Fluorene	1360	UG/KG	U	U	
REG	Hexachlorobenzene	13600	UG/KG	U	U	
REG	Hexachlorobutadiene	13600	UG/KG	U	U	
REG	Hexachlorocyclopentadiene	13600	UG/KG	U	U	
REG	Hexachloroethane	13600	UG/KG	U	U	
REG	Indeno(1,2,3-cd)pyrene	2090	UG/KG		=	
REG	Isophorone	13600	UG/KG	U	U	
REG	N-Nitroso-di-n-propylamine	13600	UG/KG	U	U	
REG	Naphthalene	1360	UG/KG	U	U	
REG	Nitrobenzene	13600	UG/KG	U	U	
REG	Pentachlorophenol	13600	UG/KG	U	U	
REG	Phenanthrene	857	UG/KG	J	J	
REG	Phenol	13600	UG/KG	U	U	
REG	Pyrene	6070	UG/KG		=	

Location: 16 SWMUS
Station : QC

TB1666 Field Sample Type: Trip Blank Matrix: Quality Control Collected: 10/31/2000

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

TB1667 Field Sample Type: Trip Blank Matrix: Quality Control Collected: 11/01/2000

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	

Location: 16 SWMUS
Station : QC

TB1667 — **Field Sample Type: Trip Blank** — **Matrix: Quality Control** — **Collected: 11/01/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	Xylenes, Total	3.0	UG/L	U	U	

TB1668 — **Field Sample Type: Trip Blank** — **Matrix: Quality Control** — **Collected: 11/02/2000**

Sample Type	Volatile Organics	Result	Units	Qualifiers Lab	Qualifiers Data	Validation Code
REG	1,1,1-Trichloroethane	1.0	UG/L	U	U	
REG	1,1,2,2-Tetrachloroethane	1.0	UG/L	U	U	
REG	1,1,2-Trichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethane	1.0	UG/L	U	U	
REG	1,1-Dichloroethene	1.0	UG/L	U	U	
REG	1,2-Dichloroethane	1.0	UG/L	U	U	
REG	1,2-Dichloroethene	2.0	UG/L	U	U	
REG	1,2-Dichloropropane	1.0	UG/L	U	U	
REG	1,3-cis-Dichloropropene	1.0	UG/L	U	U	
REG	1,3-trans-Dichloropropene	1.0	UG/L	U	U	
REG	2-Butanone	5.0	UG/L	U	U	
REG	2-Hexanone	5.0	UG/L	U	U	
REG	4-Methyl-2-pentanone	5.0	UG/L	U	U	
REG	Acetone	5.0	UG/L	U	U	
REG	Benzene	1.0	UG/L	U	U	
REG	Bromodichloromethane	1.0	UG/L	U	U	
REG	Bromoform	1.0	UG/L	U	U	
REG	Bromomethane	1.0	UG/L	U	U	
REG	Carbon Disulfide	5.0	UG/L	U	U	
REG	Carbon Tetrachloride	1.0	UG/L	U	U	
REG	Chlorobenzene	1.0	UG/L	U	U	
REG	Chloroethane	1.0	UG/L	U	U	
REG	Chloroform	1.0	UG/L	U	U	
REG	Chloromethane	1.0	UG/L	U	U	
REG	Dibromochloromethane	1.0	UG/L	U	U	
REG	Ethylbenzene	1.0	UG/L	U	U	
REG	Methylene Chloride	5.0	UG/L	U	U	
REG	Styrene	1.0	UG/L	U	U	
REG	Tetrachloroethene	1.0	UG/L	U	U	
REG	Toluene	1.0	UG/L	U	U	
REG	Trichloroethene	1.0	UG/L	U	U	
REG	Vinyl Chloride	1.0	UG/L	U	U	
REG	Xylenes, Total	3.0	UG/L	U	U	

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CHAIN-OF-CUSTODY FORMS FOR SUPPLEMENTAL DATA EVALUATION

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CHAIN OF CUSTODY RECORD

COC NO.: G16048

PROJECT NAME: Ft. Stewart ~~SWMU 18~~ 16 SWMUs

PROJECT NUMBER: 01-1624-04-1041-~~200~~ 400

PROJECT MANAGER: Jeff Longaker

Sampler (Signature) (Printed Name) Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod Charleston, SC 29417

PHONE NO: (843) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	VOC	SVOC	RCRA Metals	SVOC, RCRA Metals	TCLP VOC	TCLP Lead	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
244172	11/1/00	1505	water		2					2		33601 001
244872	11/1/00	1045			2					2		002
244472	11/1/00	1010			2					2		003
244572	10/31/00	1520			2					2		004
244372	10/31/00	1015			2					2		005
244772	10/31/00	1410	↓		2					2		006

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LLB 11/2/00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 12	Cooler Temperature: 6°
Laura Lumley	11/2/00 1140	Vicki Kinslow	11-2-00 1530	Cooler ID: #425	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: GEL			
RECEIVED BY: B. Locke	11/2/00 1140	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			
RELINQUISHED BY: B. Locke	11/2/00 1450	RECEIVED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			

2000119734

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10/2

CHAIN OF CUSTODY RECORD

COC NO.: G16049

PROJECT NAME: Ft. Stewart-SWMU 18

PROJECT NUMBER: 01-1624-04-1041-200

PROJECT MANAGER: Jeff Longaker

Sampler (Signature) (Printed Name)
Laura Lumley Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod, Charleston, SC 29417

PHONE NO: (843) 556-8171

Sample ID	Date Collected	Time Collected	Matrix	VOC	SVOC	RCRA Metals	SVOC, RCRA Metals	TCLP VOC	TCLP Lead	1,1 dichloroethene	No. of Bottles/ Vials	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
244672	10/31/00	1000	Water	2	2						4		33601 007
244972	10/31/00	1730		2	2						4		↓ 008
244572	10/31/00	1520		2							2		33601 009
244472	11/1/00	1010		2							2		010
244172	11/1/00	1505		2							2		011
244672	11/1/00	1045		2							2		012
244772	10/31/00	1910		2							2		013
244372	10/31/00	1615		2							2		014
TB16066	10/31/00	0450		2							2		015
TB16067	11/1/00	0740		2							2		016
7N4172	11/1/00	1120								2	2		33606 001
7N4672	11/1/00	1215								2	2		002
7N4772	11/1/00	1335								2	2		003

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RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature:
Laura Lumley	11/2/00	Mike Kinslow	11-2-00		6°
COMPANY NAME: SAIC	1140	COMPANY NAME: GEL	15:30	Cooler ID: #10	FEDEX NUMBER:
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL	11/2/00 1140	COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME: GEL	11/2/00 1440	COMPANY NAME:			

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2092

CHAIN OF CUSTODY RECORD

COC NO.: G16049

PROJECT NAME: Ft. Stewart-~~SWMU 18~~ 16 SWMUs

PROJECT NUMBER: 01-1624-04-1041-~~200~~ 900

PROJECT MANAGER: Jeff Longaker

Sampler (Signature) (Printed Name)

Laura Lumley Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod, Charleston, SC 29417

PHONE NO: (843) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	VOC	SVOC	RCRA Metals	SVOC, RCRA Metals	TCLP VOC	TCLP Lead	1,1 dichloroethene	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
7N4472	10/31/00	1020	water							Z	2		33606 004
7N4572	10/31/00	1105								N	2		005
7N4372	10/31/00	1245								N	2		006
7N4672	10/31/00	0935								N	2		007
7N4272	10/31/00	1150								N	2		008
A-33 47A11	11/1/00	1210	sediment		1						1		33610 001
47B11	11/1/00	1225			1						1		002
247C11	11/1/00	1245			1						1		003
247D11	11/1/00	1250			1						1		004
247E11	11/1/00	1310			1						1		005
247Q11	11/1/00	1200			1						1		006

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME: SAIC	11/2/00 1140	COMPANY NAME: GEL	11-2-00 15:30
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME: GEL	11/2/00 1140	COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME: GEL	11/2/00 1450	COMPANY NAME:	

TOTAL NUMBER OF CONTAINERS: 46

Cooler ID: #10 1

Cooler Temperature: 6°

FEDEX NUMBER:

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CHAIN OF CUSTODY RECORD

COC NO.: G16050

PROJECT NAME: Ft. Stewart-SWMU 18

PROJECT NUMBER: 01-1624-04-1041-200

PROJECT MANAGER: Jeff Longaker

Sampler (Signature) Laura Lumley (Printed Name) Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod Charleston, SC 29417

PHONE NO: (843) 556-8171

200149782

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	VOC	SVOC	RCRA Metals	SVOC, RCRA Metals	TCLP VOC	TCLP Lead	Oil & Grease	Total Phenols	pH	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
244272	11/2/00	1430	water	2	2								4		33650 001
IDW024	11/2/00	1400	↓	2						2	2	1	7		2 002
TB16686	11/2/00	0700	↓	2									2		003

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RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 13	Cooler Temperature: 5°
Laura Lumley	11/3/00	Mike Kinslow	11-4-00		
COMPANY NAME: SAIC	1300	COMPANY NAME: GEL	0900	Cooler ID: #24	FEDEX NUMBER: 820609360627
RECEIVED BY: 820609360627	Date/Time 11/3/00	RELINQUISHED BY:	Date/Time		
COMPANY NAME: FedEx	1300	COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

ATTACHMENT B
TO SWMU 24B
TO THE
REVISED FINAL PHASE II RCRA FACILITY INVESTIGATION REPORT
FOR
16 SOLID WASTE MANAGEMENT UNITS
AT
FORT STEWART, GEORGIA

FATE AND TRANSPORT ANALYSIS

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Fate and transport modeling was performed for the preliminary contaminant migration contaminants of potential concern (CMCOPCs) in soil and human health contaminants of potential concern (HHCOPCs) and ecological contaminants of potential concern (ECOPCs) in groundwater. The preliminary CMCOPCs were identified in Table 17 of this addendum and included arsenic, barium, cadmium, chromium, lead, mercury, selenium, methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. Trichloroethene was the only HHCOPC in groundwater (see Table 18 of this addendum). Barium was identified as an ECOPC in the deep surficial groundwater (see Table 19 of this addendum). The main purpose of the modeling was to estimate both future groundwater concentrations from the leachate beneath Solid Waste Management Unit (SWMU) 24B and future surface water concentrations at the receptor locations.

The shallow surficial groundwater may discharge to a man-made drainage ditch located approximately 500 feet northwest of the site (see Figure 2 of this addendum). The concentrations of the contaminants of potential concern (COPCs) (CMCOPCs, HHCOPCs, and ECOPCs) in shallow surficial groundwater were modeled to this man-made drainage ditch. This drainage ditch ultimately discharges into Mill Creek approximately 2,600 feet to the west.

The deep surficial groundwater potentially discharges to a tributary to Mill Creek located approximately 1,200 feet southwest of the site. No HHCOPCs were identified in deep groundwater at SWMU 24B; however, barium was identified as an ECOPC in the deep surficial groundwater. The modeling procedures used to estimate groundwater and surface water concentrations are discussed below.

Migration to Groundwater beneath the Source

The estimated groundwater concentrations resulting from the leaching of the preliminary CMCOPCs—arsenic, barium, cadmium, chromium, lead, mercury, selenium, methylene chloride, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene (see Table 17 of this addendum)—from the soil above the water table were estimated using the Seasonal Soil Compartment (SESOIL) Model. A detailed discussion of the SESOIL Model is presented in Chapter 6.0 and Appendix K of the revised final Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for 16 SWMUs (SAIC 2000). Chemical and climatic parameters used in SESOIL modeling are presented in Table 6-2 and Appendix K, Table K-1 of the revised final Phase II RFI Report (SAIC 2000), respectively. The hydrogeological parameters and application data used in SESOIL for SWMU 24B are presented in Tables B-1 and B-2, respectively. SESOIL modeling results are presented in Table B-3 and Figures B-1 through B-3. The estimated groundwater concentrations were calculated by dividing the SESOIL leachate concentration by a dilution factor (DF) of 4.83. The DF was developed by using the hydraulic analysis method (EPA 1996), which involves calculating the rate of flow through the aquifer system and the rate of rainwater percolation into the aquifer. The parameters used in the development of the DF are presented in Tables B-1 and B-6. The thickness of the zone of mixing in the groundwater aquifer was calculated to be 22.9 feet using the formula for depth of mixing presented in the U.S. Environmental Protection Agency's soil screening guidance (EPA 1996). The modeling results indicated that benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, and indeno(*1,2,3-cd*)pyrene will naturally attenuate before reaching the water table (Table B-3). SESOIL modeling predicted that the maximum groundwater concentrations of arsenic, barium, mercury, selenium, and methylene chloride will not exceed their respective maximum contaminant levels (MCLs)/risk-based concentrations (RBCs) (Table B-3). SESOIL modeling predicted that the concentrations of cadmium, chromium, and lead will exceed their respective MCLs/RBCs (Table B-3), and these constituents were identified as CMCOPCs for further evaluation in the baseline risk assessment. SESOIL–predicted maximum concentrations of CMCOPCs were used as groundwater exposure concentrations in the baseline risk assessment.

Migration of Shallow Surficial Groundwater to Surface Water

The HHCOPC (trichloroethene based on the most recent groundwater sampling event, November 2000) identified in the shallow surficial groundwater and the groundwater (modeled) concentrations of CMCOPCs (cadmium, chromium, and lead) in soil were modeled to the drainage ditch located approximately 500 feet south of the site. The One-dimensional Analytical Solute Transport (ODAST) Model was used to predict the surface water concentrations of inorganic COPCs, while the Analytical Transient 1-, 2-, 3-Dimensional (AT123D) Model was used for organic COPCs. A detailed discussion of the ODAST and AT123D models is presented in Chapter 6.0 and Appendix K of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

ODAST modeling parameters for SWMU 24B are presented in Table B-4. ODAST modeling of chromium assumed a constant concentration at the source for a period of 70 years. ODAST modeling for chromium was simulated for a period of 1,000 years. The ODAST modeling results are presented in Table B-5. ODAST predicted groundwater concentrations of cadmium, chromium, and lead are presented in Table B-5. ODAST–predicted groundwater concentrations at the receptor location were conservatively assumed as surface water exposure concentrations.

AT123D modeling input parameters are presented in Table B-6. The biodegradation rates of the constituents used in the modeling are presented in Table 6-2 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). The AT123D models were calibrated to the maximum observed groundwater concentration of the HHCOPC at the source. No organic CMCOPCs were identified at SWMU 24B. AT123D modeling assumed a steady-state, constant concentration at the source. A typical AT123D Model output file (i.e., for trichloroethene) is presented at the back of this attachment. AT123D modeling results are presented in Table B-7 and Figure B-4. The AT123D modeling results indicated that trichloroethene (HHCOPC) will not reach the receptor location; therefore, the predicted surface water exposure concentrations from trichloroethene due to migration in shallow surficial groundwater is zero.

Migration of Deep Surficial Groundwater to Surface Water

Barium was identified as an ECOPC in the deep surficial groundwater. Constituents in the deep surficial groundwater may migrate to a tributary of Mill Creek located approximately 1,200 feet from the site (see Figure 2 of this addendum). ODAST modeling was used to predict the barium concentrations in surface water. A detailed discussion of the ODAST Model is presented in Chapter 6.0 and Appendix K of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000). The ODAST modeling parameters for SWMU 24B are presented in Table B-4. ODAST modeling of barium assumed a constant concentration at the source for a period of 70 years. ODAST models were simulated for a period of 1,000 years. The ODAST modeling results are presented in Table B-5. ODAST modeling results indicated that barium in deep groundwater will not migrate to the tributary of Mill Creek through the deep groundwater pathway.

REFERENCES

EPA (U.S. Environmental Protection Agency) 1996. *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128, Office of Solid Waste and Emergency Response, May.

Mills, W. B., D. B. Porcella, M. J. Ungs, S. A. Gherini, K. V. Summers, G. L. Rupp, and G. L. Bowie 1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants: Parts 1, 2, and 3*, EPA/600/6-85/002, EPA Environmental Research Laboratory, Office of Research and Development, Athens, Georgia.

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

Table B-1. Hydrogeological Parameters Used for SESOIL Modeling, SWMU 24B

Parameter Value	Parameter Type	Source
Soil type	Silty sand	SWMU 24B specific
Bulk density (gm/cm^3)	1.53	Laboratory analysis
Percolation rate (cm/year)	9.27	From HELP model
Intrinsic permeability (cm^2)	2.76E-10	Calibrated
Disconnectedness index	9	Calibrated
Porosity	0.42	Laboratory analysis
Depth to water table (feet)	8	Site specific
Organic carbon content (%)	1.19	Laboratory analysis
Frendlich equation exponent	1	SESOIL default value
DF	4.83	Calculated
Area of source (m^2)	5.00E+03	Estimated from soil contamination area

DF = Dilution factor.
HELP = Hydrologic Evaluation of Landfill Performance.

Table B-2. SESOIL Application Data, SWMU 24B

COPCs	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (µg/g)
Methylene chloride	4	1	2	1	1	0
		2	3	3	1	0.0289
					2	0.0289
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Benzo(*a*)anthracene	4	1	2	1	1	38.8
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Benzo(*a*)pyrene	4	1	2	1	1	48.1
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Benzo(*b*)fluoranthene	4	1	2	1	1	40.9
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0

Table B-2. SESOIL Application Data, SWMU 24B (continued)

COPCs	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (µg/g)
Benzo(*k*)fluoranthene	4	1	2	1	1	49.3
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Indeno(*1,2,3-cd*)pyrene	4	1	2	1	1	30.7
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Arsenic	4	1	2	1	1	2.7
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Barium	4	1	2	1	1	230
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0

Table B-2. SESOIL Application Data, SWMU 24B (continued)

COPCs	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (µg/g)
Cadmium	4	1	2	1	1	6.1
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Chromium	4	1	2	1	1	18.3
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Lead	4	1	2	1	1	690
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0
Mercury	4	1	2	1	1	0.13
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0.24
					2	0.24
					3	0.24
		4	0.25	1	1	0

Table B-2. SESOIL Application Data, SWMU 24B (continued)

COPCs	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (µg/g)
Selenium	4	1	2	1	1	0.6
		2	3	3	1	0
					2	0
					3	0
		3	3	3	1	0
					2	0
					3	0
		4	0.25	1	1	0

Table B-3. Summary of Leachate Modeling Results, SWMU 24B

Preliminary CMCOPCs[a]	Maximum Concentration (mg/kg)	Predicted $C_{leachate,max}$ beneath the Source (mg/L)	Predicted T_{max} (years)	Predicted $C_{gw,max}$ at the Source[b] (mg/L)	Maximum Observed Groundwater Concentration (mg/L)	Groundwater Target Concentration (mg/L)	Source[c]	CMCOPC?
Inorganics								
Arsenic	2.7	0.093	357	0.019	ND	0.05	M	No
Barium	230	5.55	503	1.149	0.097	2	M	No
Cadmium	6.1	0.079	920	0.016	ND	0.005	M	Yes
Chromium	18.3	0.97	236	0.200	0.011	0.1	M	Yes
Lead	690	6.59	1219	1.364	BRBC	0.015	M[d]	Yes
Mercury	0.24	0.0037	105	0.001	ND	0.002	M	No
Selenium	0.6[e]	0.118	64	0.024	ND	0.05	M	No
Organics								
Methylene chloride	0.0289	6.36E-05	3	1.32E-05	ND	0.005	M	No
Benzo(*a*)anthracene	38.8	0	NA	0.000	0.0056	0.092	R	No
Benzo(*a*)pyrene	48.1	0	NA	0.000	0.0059	0.0002	M	No
Benzo(*b*)fluoranthene	40.9	0	NA	0.000	0.306	0.092	R	No
Benzo(*k*)fluoranthene	49.3	0	NA	0.000	0.109	0.92	R	No
Indeno(*1,2,3-cd*)pyrene	30.7	0	NA	0.000	0.243	0.092	R	No

[a]These constituents were selected for SESOIL modeling from this site.

[b]The predicted maximum concentration in groundwater ($C_{gw,max}$) at the source was calculated by applying a dilution factor to the predicted maximum leachate concentration ($C_{leachate,max}$).

[c]M = Maximum contaminant level.

[d]Lead action level = 0.015 mg/L.

[e]Maximum soil concentration above the water table.

NA = Not applicable.

ND = Not detected.

Table B-4. Parameters Used for ODAST Modeling, SWMU 24B

Parameter Type	Parameter Value	Source
Bulk density (gm/cm^3)	1.53	Laboratory analysis
Effective porosity	0.2	Mills et al. (1985) for sandy silt
Hydraulic conductivity (cm/s)	8.00E-04	Site specific
Hydraulic gradient (shallow)	0.0098	Site specific
Hydraulic gradient (deep)	0.012	Site specific
Groundwater velocity (feet/day) (shallow)	0.136	Calculated
Groundwater velocity (feet/day) (deep)	0.118	Calculated
Dispersion coefficient (feet^2/day) (shallow)	6.8	Calculated assuming dispersivity = 0.1 × distance to receptor
Dispersion coefficient (feet^2/day) (deep)	5.9	Calculated assuming dispersivity = 0.1 × distance to receptor
Distance to receptor (feet) (shallow)	500	Drainage ditch to Mill Creek
Distance to receptor (feet) (deep)	1200	Tributary to Mill Creek
Distribution coefficient for barium (L/kg)	11	Corresponding to pH = 4.9 (EPA 1996)
Distribution coefficient for cadmium (L/kg)	15	Corresponding to pH = 4.9 (EPA 1996)
Distribution coefficient for chromium (L/kg)	31	Corresponding to pH = 4.9 (EPA 1996)
Distribution coefficient for lead (L/kg)	100	Lowest value presented in Table 6-1 of SAIC 2000

Table B-5. ODAST Modeling Results, SWMU 24B

Constituent	CMCOPC?[a]	ECOPC?	Source Concentration[a] (mg/L)	Dilution Factor[b]	Receptor	Receptor Point Groundwater Concentration (mg/L)
Barium[c]	No	Yes	0.097	2.88E+09	Tributary to Mill Creek (1,200 feet)	0.00E+00
Cadmium[a]	Yes	No	0.016	11.4	Drainage ditch (500 feet)	1.40E-03
Chromium[a]	Yes	No	0.2	9.04	Drainage ditch (500 feet)	2.21E-02
Lead[a]	Yes	No	1.364	5.13E+09	Drainage ditch (500 feet)	2.66E-10

[a]CMCOPCs modeled to water table.
[b]Dilution factor represents (maximum concentration at the source) ÷ (maximum predicted concentration at the receptor in 1,000-year simulation).
[c]ECOPCs in deep surficial groundwater.

Table B-6. Key Hydrogeological Parameters Used for AT123D Modeling, SWMU 24B

Parameter Type	Parameter Value	Source
Bulk density (kg/m^3)	1,530	Laboratory analysis
Effective porosity	0.2	Mills et al. (1985) for sandy clay type
Hydraulic conductivity (m/hour)	2.88E-02	Site specific
Hydraulic gradient	0.0098	Site specific
Dispersivity (m)	15.24	Calculated assuming dispersivity = 0.1 × distance to receptor
Density of water (kg/m^3)	1,000	Assumed
fraction of organic carbon (unitless)	0.0119	Laboratory analysis
Distance to receptor (feet)	500	Approximate distance to the Canoochee Creek
Source area length (m)	61	Conservative estimate
Source area width (m)	82	Conservative estimate
Aquifer depth (m)	15.24	Conservative estimate

Table B-7. AT123D Modeling Results, SWMU 24B

COPC	HHCOPC?	ECOPC?[a]	Source Concentration[b] (mg/L)	Dilution Factor[c]	Receptor	Receptor Point Groundwater Concentration (mg/L)
Trichloroethene	Yes	No	0.0026	Infinite	Drainage ditch (500 feet)	0.00E+00

[a]ECOPCs in shallow surficial groundwater.
[b]Maximum observed groundwater concentrations.
[c]Dilution factor represents (maximum concentration at the source) ÷ (maximum predicted concentration at the receptor).

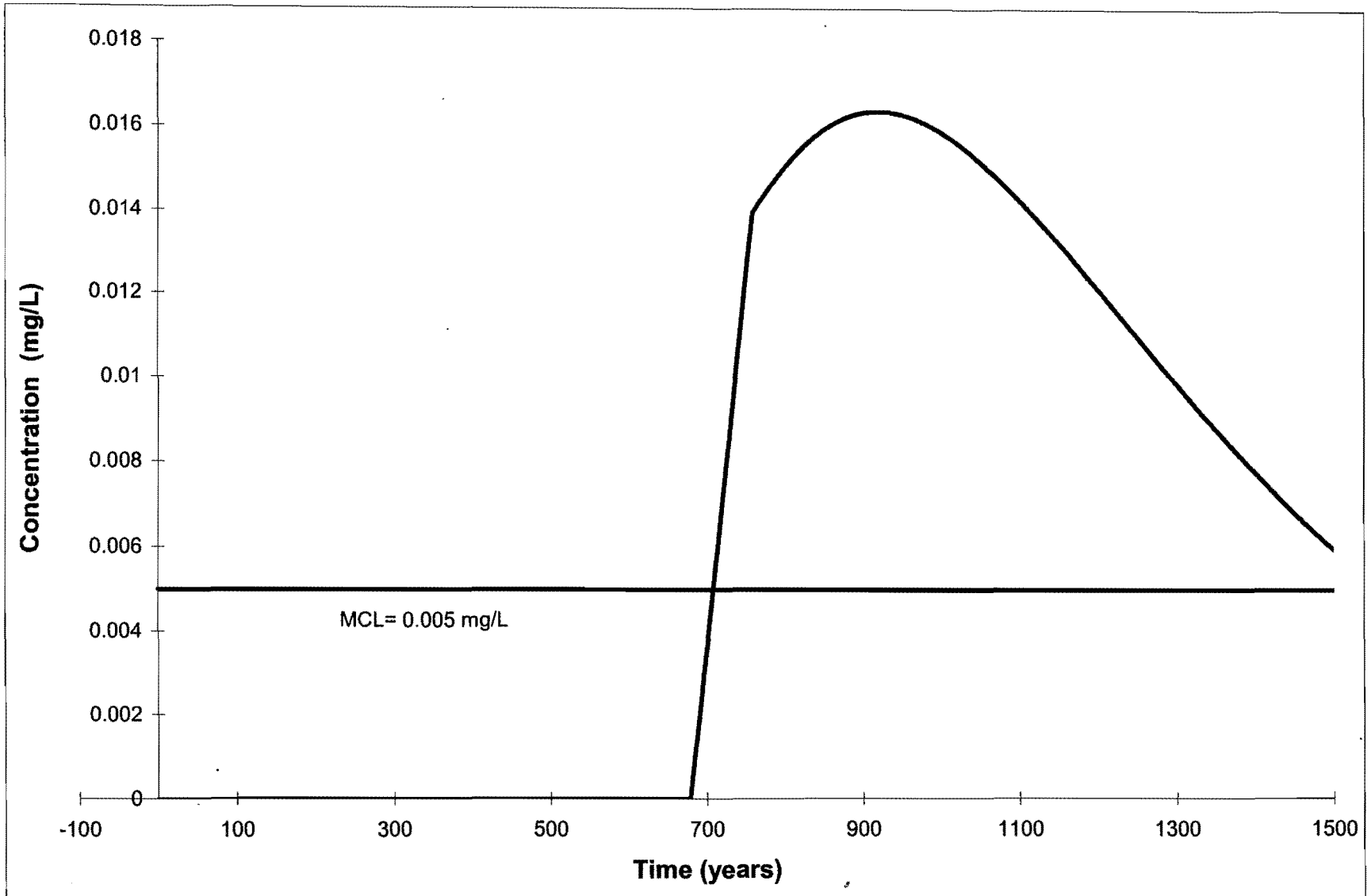

Figure B-1. Predicted Concentration of Cadmium in Groundwater Based on Leachate Modeling Using SESOIL, SWMU 24B

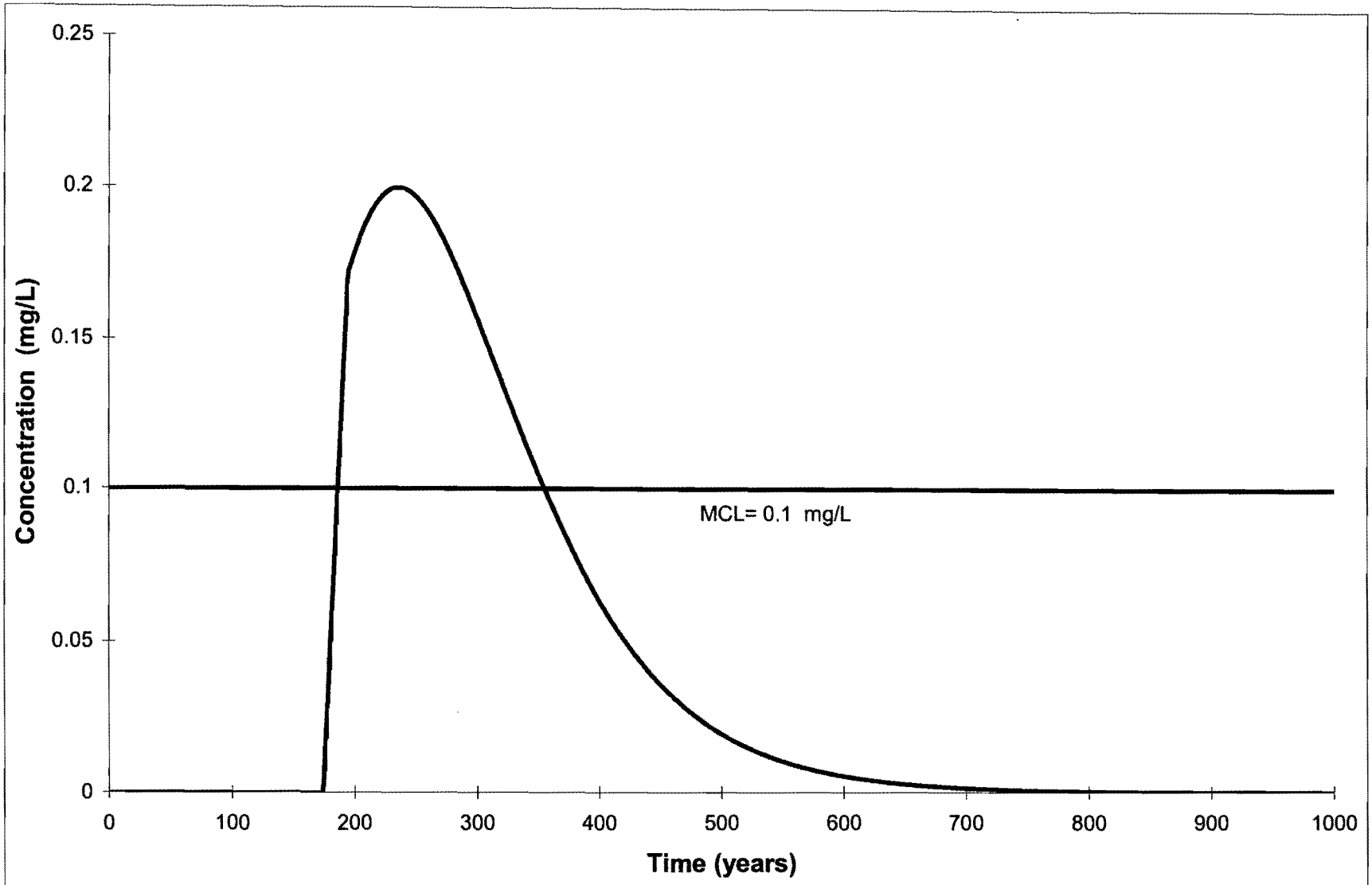

Figure B-2. Predicted Concentration of Chromium in Groundwater Based on Leachate Modeling Using SESOIL, SWMU 24B

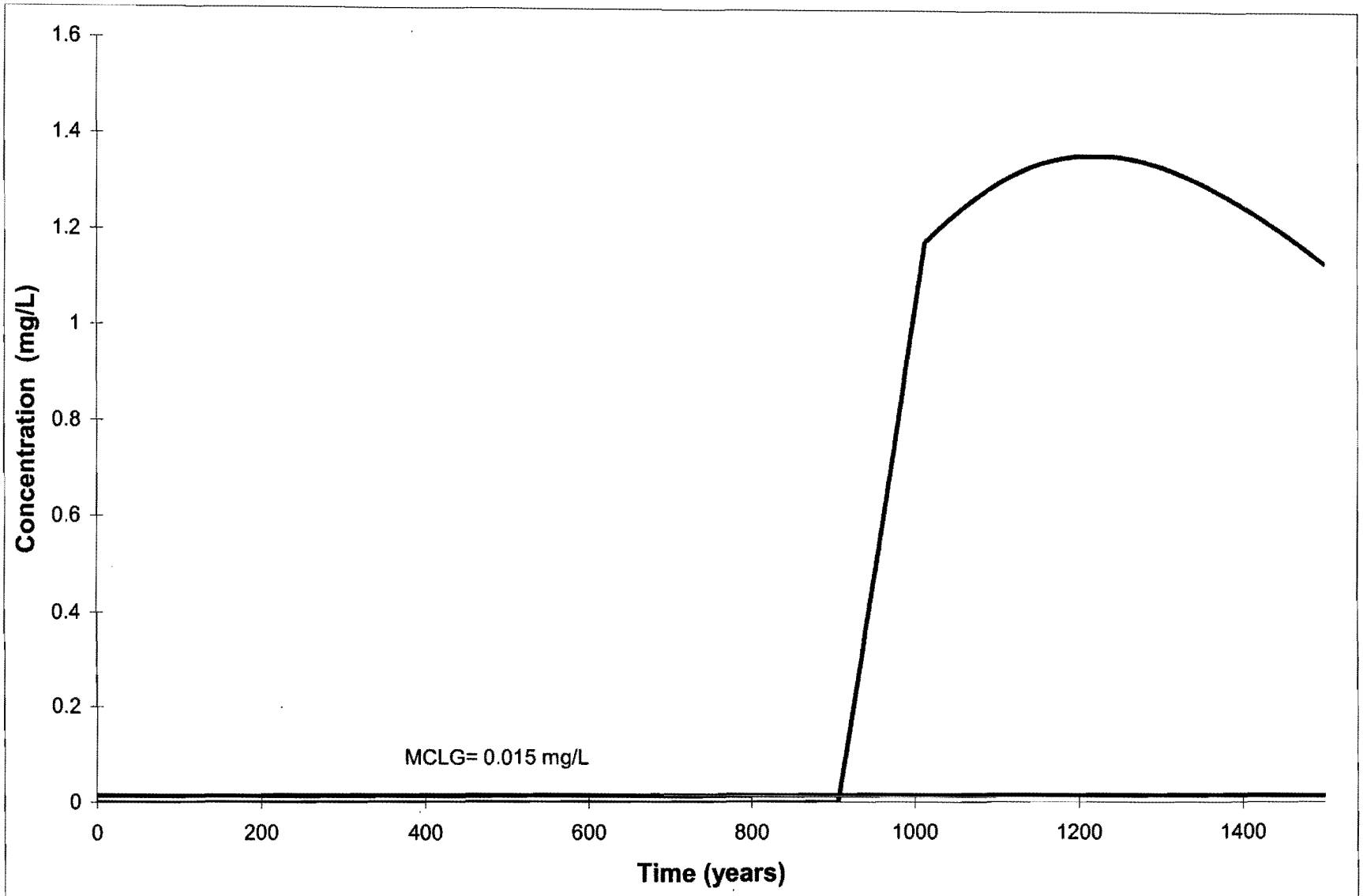

Figure B-3. Predicted Concentration of Lead in Groundwater Based on Leachate Modeling Using SESOIL, SWMU 24B

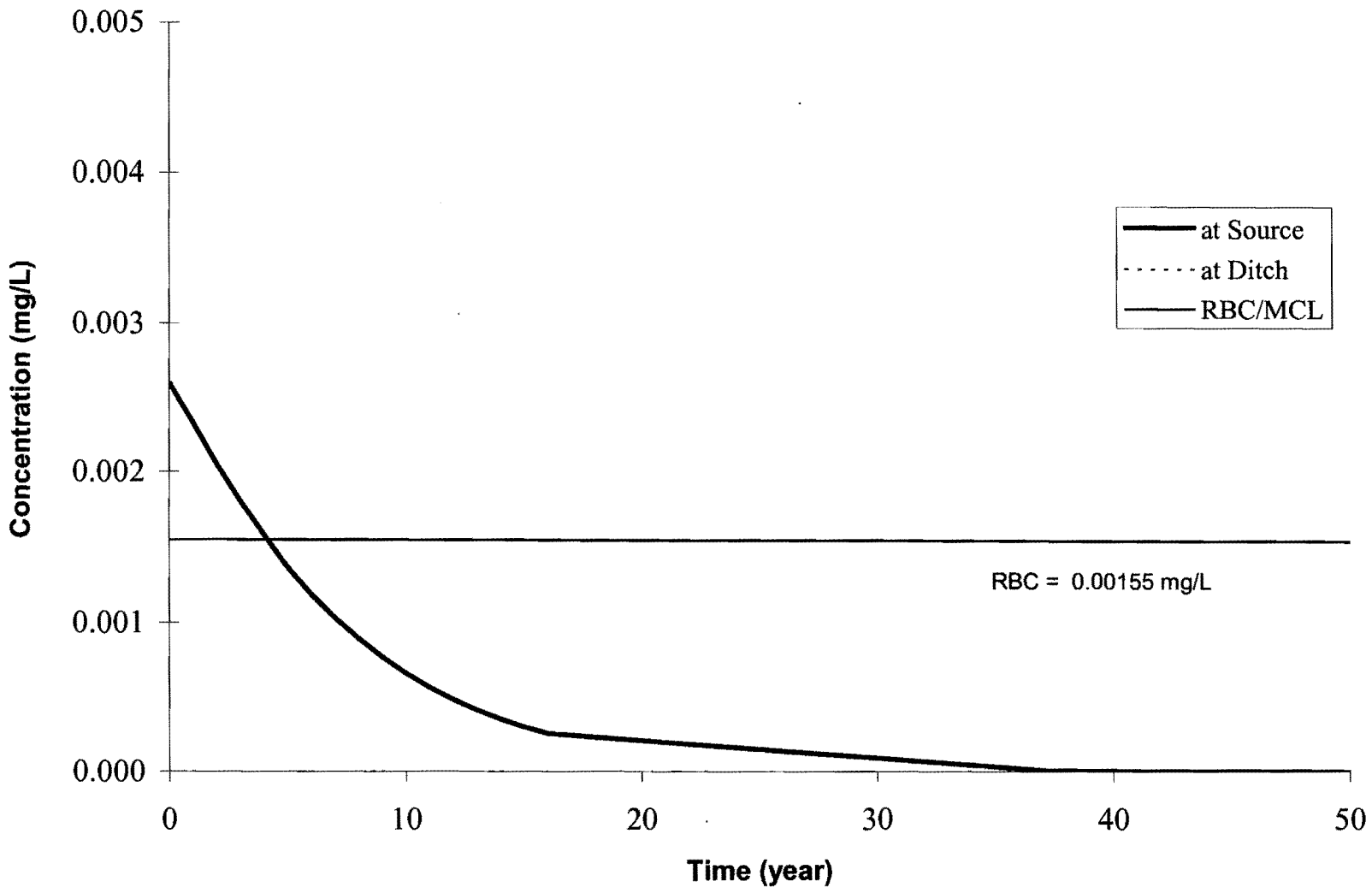

Figure B-4. Predicted Concentration of Trichloroethene in Groundwater Using AT123D, SWMU 24B

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AT123D OUTPUT FILE FOR SWMU 24B

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SWMU 24B Trichloroethene

NO. OF POINTS IN X-DIRECTION 5
NO. OF POINTS IN Y-DIRECTION 1
NO. OF POINTS IN Z-DIRECTION 1
NO. OF ROOTS: NO. OF SERIES TERMS 400
NO. OF BEGINNING TIME STEP 325
NO. OF ENDING TIME STEP 553
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION 12
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT 1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE 0
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT 1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 2

AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ..... 0.1524E+02
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ..... 0.0000E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS) ..... -0.6100E+02
END POINT OF X-SOURCE LOCATION (METERS) ..... 0.0000E+00
BEGIN POINT OF Y-SOURCE LOCATION (METERS) ..... -0.4100E+02
END POINT OF Y-SOURCE LOCATION (METERS) ..... 0.4100E+02
BEGIN POINT OF Z-SOURCE LOCATION (METERS) ..... -0.1000E+01
END POINT OF Z-SOURCE LOCATION (METERS) ..... 0.0000E+00

POROSITY ..... 0.2000E+00
HYDRAULIC CONDUCTIVITY (METER/HOUR) 0.2880E-01
HYDRAULIC GRADIENT 0.9800E-02
LONGITUDINAL DISPERSIVITY (METER) ..... 0.1524E+02
LATERAL DISPERSIVITY (METER) ..... 0.1524E+01
VERTICAL DISPERSIVITY (METER) ..... 0.1000E+01
DISTRIBUTION COEFFICIENT, KD (M**3/KG) 0.1122E-02
HEAT EXCHANGE COEFFICIENT (KCAL/HR-M**2-DEGREE C ..... 0.0000E+00

MOLECULAR DIFFUSION MULTIPLY BY POROSITY (M**2/HR) 0.3276E-05
DECAY CONSTANT (PER HOUR) 0.1746E-04
BULK DENSITY OF THE SOIL (KG/M**3) ..... 0.1530E+04
ACCURACY TOLERANCE FOR REACHING STEADY STATE 0.1000E-02
DENSITY OF WATER (KG/M**3) ..... 0.1000E+04
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (HR) ..... 0.7300E+03
DISCHARGE TIME (HR) ..... 0.2540E+06
WASTE RELEASE RATE (KCAL/HR), (KG/HR), OR (CI/HR) 0.2450E-05

RETARDATION FACTOR ..... 0.9583E+01
RETARDED DARCY VELOCITY (M/HR) 0.1473E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/HR) 0.2246E-02
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/HR) 0.2261E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/HR) 0.1490E-03

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.0000E+00 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2365E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.260E-02	0.999E-03	0.442E-03	0.449E-04	0.167E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2453E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.260E-02	0.100E-02	0.444E-03	0.459E-04	0.230E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2540E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.260E-02	0.100E-02	0.446E-03	0.468E-04	0.307E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2628E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.233E-02	0.113E-02	0.486E-03	0.493E-04	0.406E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2716E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.205E-02	0.117E-02	0.535E-03	0.520E-04	0.526E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2803E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.180E-02	0.113E-02	0.569E-03	0.549E-04	0.667E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2891E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.158E-02	0.106E-02	0.579E-03	0.583E-04	0.830E-08

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.2978E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.137E-02	0.968E-03	0.570E-03	0.623E-04	0.102E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3066E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.119E-02	0.876E-03	0.547E-03	0.665E-04	0.122E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3154E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.103E-02	0.785E-03	0.515E-03	0.706E-04	0.145E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3241E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.893E-03	0.698E-03	0.477E-03	0.742E-04	0.170E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3329E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.770E-03	0.617E-03	0.437E-03	0.768E-04	0.197E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3416E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.662E-03	0.543E-03	0.397E-03	0.784E-04	0.226E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3504E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.568E-03	0.476E-03	0.357E-03	0.788E-04	0.257E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3592E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.486E-03	0.415E-03	0.320E-03	0.781E-04	0.289E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3679E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.416E-03	0.361E-03	0.285E-03	0.764E-04	0.323E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3767E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.355E-03	0.313E-03	0.252E-03	0.738E-04	0.358E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3854E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.302E-03	0.271E-03	0.222E-03	0.705E-04	0.395E-07

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.3942E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.257E-03	0.234E-03	0.195E-03	0.668E-04	0.432E-07

STEADY STATE SOLUTION HAS NOT BEEN REACHED BEFORE FINAL SIMULATING TIME

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.4030E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.1122E+01 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

X					
Y	0.	10.	20.	50.	152.
0.	0.218E-03	0.201E-03	0.171E-03	0.626E-04	0.471E-07

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ATTACHMENT C
TO SWMU 24B
TO THE
REVISED FINAL PHASE II RCRA FACILITY INVESTIGATION REPORT
FOR
16 SOLID WASTE MANAGEMENT UNITS
AT
FORT STEWART, GEORGIA

TOXICITY PROFILES FOR CONTAMINANTS OF POTENTIAL CONCERN

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This appendix contains the toxicity profiles for human health contaminants of potential concern (HHCOPCs). The toxicity profiles provide pertinent information concerning the uptake, mechanisms of toxicity, and toxicity values for the HHCOPCs. In addition to the toxicity profiles, a toxicity summary (Table C-1) is given for all of the site-related contaminants. The toxicity summary consists of the essential data used to derive toxicity values [reference doses (RfDs) and cancer slope factors] obtained from U.S. Environmental Protection Agency (EPA) toxicity databases [Integrated Risk Information System (IRIS; EPA 2000) and Health Effects Assessment Summary Tables (HEAST; EPA 1997)].

Arsenic. Arsenic is a metallic, steel-gray, crystalline, brittle, trivalent and pentavalent, solid, poisonous element that is commonly used in pesticides (Opresko 1992).

Water-soluble inorganic arsenic compounds are absorbed through the gastrointestinal tract and lungs. Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. In addition, dermatitis, muscle cramps, cardiac abnormalities, hepatoxicity, bone marrow suppression and hematologic abnormalities, vascular lesions, and peripheral neuropathy have also been reported. Severe exposures can result in acute encephalopathy, congestive heart failure, stupor, convulsions, paralysis, coma, and death. Possible reproductive effects include a high frequency of spontaneous abortions and reduced birth weights. Occupational exposure studies show a clear correlation between exposure to arsenic and lung cancer mortality (Opresko 1992).

The RfD for chronic oral exposures (0.0003 mg/kg-day) is based on a no observed adverse effect level (NOAEL) of 0.0008 mg/kg-day for hyperpigmentation, keratosis, and possible vascular complications in a human population consuming arsenic-contaminated drinking water (EPA 2000). No chronic reference concentrations (RfCs) have been derived for arsenic (EPA 2000; EPA 1997). EPA has placed inorganic arsenic in weight-of-evidence classification Group A, human carcinogen. The oral slope factor is 1.5/(mg/kg-day), and the inhalation unit risk is $0.0043/(\mu g/m^3)$ (EPA 2000).

Benzo(*a*)anthracene. Benzo(*a*)anthracene is a polycyclic aromatic hydrocarbon (PAH) with four aromatic rings, two of which share carbons with only one other ring. No commercial production or use of this compound is known. Benzo(*a*)anthracene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion. It is found in various kinds of smoke and flue gases; tobacco smoke; automobile exhaust; roasted coffee; and charcoal-broiled, barbecued, or smoked meats. It is also found in creosote, coal tar, petroleum asphalt, and a variety of foods, including vegetable oils and baker's yeast (Francis 1992).

No absorption data for benzo(*a*)anthracene are available; however, analogy to structurally related PAHs, primarily benzo(*a*)pyrene, suggests that it would be absorbed from the gastrointestinal tract, lungs, and skin (Francis 1992).

Benzo(*a*)anthracene is considered to be a carcinogenic PAH, but little is know about the systemic toxicity of this chemical. The toxic effects of benzo(*a*)anthracene and similar PAHs are primarily directed toward tissues that contain proliferating cells such as the hematopoietic system, lymphoid system, and reproductive tissues (Francis 1992). Neither an oral RfD nor an inhalation RfC has been derived for benzo(*a*)anthracene in either IRIS or HEAST (EPA 2000; EPA 1997). Benzo(*a*)anthracene is classified by EPA in weight-of-evidence Group B2, probable human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Benzo(*b*)fluoranthene. Benzo(*b*)fluoranthene, a crystalline solid, is a PAH with one five-membered ring and four six-membered rings. No commercial production or use of this compound is known. Benzo(*b*)fluoranthene is found in fossil fuels and occurs ubiquitously in products of incomplete

combustion. It has been detected in cigarette smoke, urban air, gasoline engine exhaust, emissions from burning coal and from oil-fired heating, broiled and smoked food, oils, and margarine (Faust 1994a).

No absorption data are available for benzo(*b*)fluoranthene; however, by analogy to structurally related PAHs, primarily benzo(*a*)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin. Major metabolites of benzo(*b*)fluoranthene formed *in vitro* in the livers of rats include dihydrodiols and monohydroxy derivatives and monohydroxy derivatives in mouse epidermis (Faust 1994a).

Benzo(*b*)fluoranthene is considered to be a carcinogenic PAH, but little is know about the systemic toxicity of this chemical. Neither an oral RfD nor an inhalation RfC has been derived for benzo(*b*)fluoranthene in either IRIS or HEAST (EPA 2000; EPA 1997). Benzo(*b*)fluoranthene is classified by EPA in weight-of-evidence Group B2, probable human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Benzo(*k*)fluoranthene. Benzo(*k*)fluoranthene, a crystalline solid, is a PAH with one five-membered ring and four six-membered rings. No commercial production or use of this compound is known. Benzo(*b*)fluoranthene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion. It has been detected in cigarette smoke, gasoline engine exhaust, emissions from burning coal and from oil-fired heating, lubricating oils, used motor oils, and crude oils (Faust 1994b).

No absorption data are available for benzo(*b*)fluoranthene; however, by analogy to structurally related PAHs, primarily benzo(*a*)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin (Faust 1994b).

There are few toxicological data concerning the systemic effects of exposure to benzo(*k*)fluoranthene (Faust 1994b; TPHCWG 1997). Benzo(*k*)fluoranthene has not been specifically linked to human cancers, but it is a component of mixtures (e.g., coal tar, soots, and coke oven emissions) that have been demonstrated to cause cancers in humans (Faust 1994b).

Benzo(*k*)fluoranthene is considered to be a carcinogenic PAH, but little is know about the systemic toxicity of this chemical. Neither an oral RfD nor an inhalation RfC has been derived for benzo(*k*)fluoranthene in either IRIS or HEAST (EPA 2000; EPA 1997). Benzo(*k*)fluoranthene is classified by EPA in weight-of-evidence Group B2, probable human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Benzo(*a*)pyrene. Benzo(*a*)pyrene is a PAH that can be derived from coal tar. It occurs ubiquitously in products of incomplete combustion of fossil fuels and has been identified in ambient air, surface water, drinking water, wastewater, and charbroiled foods. Benzo(*a*)pyrene is primarily released to the air and removed from the atmosphere by photochemical oxidation and dry deposition to land or water. Biodegradation is the most important transformation process in soil or sediment (Faust 1994c).

Benzo(*a*)pyrene is readily absorbed after inhalation, ingestion, and dermal contact. After inhalation exposure, benzo(*a*)pyrene is rapidly distributed to several tissues in rats. The metabolism of the compound is complex and includes the formation of a proposed ultimate carcinogen, benzo(*a*)pyrene 7,8 diol-9,10-epoxide. The major route of excretion is hepatobiliary followed by elimination in the feces (Faust 1994c).

Numerous epidemiologic studies have shown a clear association between exposure to various mixtures of PAHs containing benzo(*a*)pyrene (e.g., coke oven emissions, roofing tar emissions, and cigarette smoke) and increased risk of lung cancer and other tumors. However, each of the mixtures also contained other potentially carcinogenic PAHs; therefore, distinguishing the contribution of benzo(*a*)pyrene to the carcinogenicity of these mixtures is not possible. An extensive database is available for the carcinogenicity of benzo(*a*)pyrene in experimental animals. Dietary administration of the compound has produced papillomas and carcinomas of the forestomach in mice, and treatment by gavage has produced mammary tumors in rats and pulmonary adenomas in mice. Exposure by inhalation and intratracheal instillation has resulted in benign and malignant tumors of the respiratory and upper digestive tracts of hamsters. Numerous topical application studies have shown that benzo(*a*)pyrene induces skin tumors in several species, although mice appear to be the most sensitive species. Benzo(*a*)pyrene is a complete carcinogen and also an initiator of skin tumors. It has been reported to induce tumors in animals when administered by other routes, such as intravenous, intraperitoneal, subcutaneous, intrapulmonary, and transplacental (Faust 1994c).

No oral RfD or inhalation RfC has been calculated for this chemical (EPA 1997; EPA 2000). Benzo(*a*)pyrene is classified as a Group B2 carcinogen, probable human carcinogen, with an oral slope factor of 7.30/(mg/kg-day) (EPA 2000).

See also toxicity profile for PAHs.

Benzo(*g,h,i*)perylene. Benzo(*g,h,i*)perylene is a PAH with six aromatic rings. There is no known commercial production or use of benzo(*g,h,i*)perylene. It occurs naturally in crude oils and is present ubiquitously in products of incomplete combustion and in coal tar (Faust 1994d).

No absorption data are available for benzo(*g,h,i*)perylene; however, by analogy to structurally related PAHs, primarily benzo(*a*)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin (Faust 1994d).

There are few toxicological data concerning the systemic effects of exposure to benzo(*g,h,i*)perylene (Faust 1994d; TPHCWG 1997). Carcinogenic studies using benzo(*g,h,i*)perylene have been inconclusive or have given questionable results. Skin painting studies using benzo(*g,h,i*)perylene failed to show significant increases in skin tumors; however, cocarcinogenic activity was demonstrated when administered in conjunction with benzo(*a*)pyrene (Faust 1994d). A lifetime study using lung implants in rats demonstrated that benzo(*g,h,i*)perylene caused epidermoid carcinomas; however, the International Agency for Research on Cancer (IARC 1983) indicated that the observed tumors in the treated groups may be attributable to impurities in the test compound (Faust 1994d). Subcutaneous injections of benzo(*g,h,i*)perylene failed to produce injection site tumors. Although several noncarcinogenic PAHs have been shown to reduce the ability of benzo(*a*)pyrene to produce site sarcomas, benzo(*g,h,i*)perylene had no such inhibiting effects (Faust 1994d).

Given the lack of toxicological data, neither an oral RfD nor an inhalation RfC has been derived for benzo(*g,h,i*)perylene in either IRIS or HEAST (EPA 2000; EPA 1997). Benzo(*g,h,i*)perylene is classified by EPA in weight-of-evidence Group D, not classifiable as to human carcinogenicity (EPA 2000).

No oral RfD or inhalation RfC has been calculated for this chemical (EPA 1997; EPA 2000). Benzo(*a*)pyrene is classified as a Group B2 carcinogen, probable human carcinogen, with an oral slope factor of 7.30/(mg/kg-day) (EPA 2000).

See also toxicity profile for PAHs.

Dibenzo(*a,h*)anthracene. Dibenzo(*a,h*)anthracene is a PAH with five six-membered rings. No commercial production or use of this compound is known. Dibenzo(*a,h*)anthracene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion. It has been detected in cigarette smoke, urban air, gasoline engine exhaust, emissions from burning coal and from oil-fired heating, broiled and smoked food, oils, and margarine (Faust 1995).

No absorption data are available for dibenzo(*a,h*)anthracene; however, by analogy to structurally related PAHs, primarily benzo(*a*)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin (Faust 1995).

There are few data on the toxicity of this PAH in humans. Toxicity studies with laboratory animals have shown depressed immune responses, kidney lesions, and increased development of arteriosclerotic plaques (Faust 1995).

Dibenzo(*a,h*)anthracene is considered to be a carcinogenic PAH, but little is known about the systemic toxicity of this chemical. Neither an oral RfD nor an inhalation RfC has been derived for benzo(*b*)fluoranthene in either IRIS or HEAST (EPA 2000; EPA 1997). Benzo(*b*)fluoranthene is classified by EPA in weight-of-evidence Group B2, probable human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Indeno(*1,2,3-cd*)pyrene. Indeno(*1,2,3-cd*)pyrene is a crystalline solid. No commercial production or use of this compound is known. It is found in fossil fuels; occurs ubiquitously in products of incomplete combustion; and has been identified in soil, groundwater, and surface water at hazardous waste sites. No commercial production or use of this compound is known (Faust 1994e).

No absorption data for indeno(*1,2,3-cd*)pyrene are available; however, by analogy to structurally related PAHs, primarily benzo(*a*)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin. *In vivo* metabolites identified in mouse skin include the *trans*-1,2-dihydrodiol and 8- and 9-hydroxy forms of indeno(*1,2,3-cd*)pyrene. Similar metabolites were formed *in vitro* in rat liver microsomes (Faust 1994e).

Indeno(*1,2,3-cd*)pyrene is considered to be a carcinogenic PAH, but little is know about the systemic toxicity of this chemical. Neither an oral RfD nor an inhalation RfC has been derived for indeno(*1,2,3-cd*)pyrene in either IRIS or HEAST (EPA 2000; EPA 1997). Indeno(*1,2,3-cd*)pyrene is classified by EPA in weight-of-evidence Group B2, probable human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Lead. Humans have used lead for thousands of years because of its malleability, resistance to corrosion, and abundance. This metal can be a component of solder, paint, and gasoline, but these uses have declined dramatically in recent years as awareness of the toxicity associated with lead exposure has increased. Currently, in the United States the predominant use of lead is in batteries. Lead occurs at an average concentration of 10 mg/kg in soil, but soil levels are substantially elevated in many areas exposed to emissions from smelters and automobiles or in areas where lead-containing paint chips have fallen onto soil (Davidson 1994).

EPA has not derived inhalation and oral RfD values for lead because it has not been possible to establish the NOAEL or lowest observed adverse effect level for this metal. Health effects have tentatively been associated with blood-lead levels as low as 10 μg/dL (Davidson 1994).

In the absence of an oral or inhalation RfD for lead, EPA has developed an uptake/biokinetic model to estimate blood-lead levels on the basis of total lead uptake from exposures via diet, drinking water, air, soil, and paint. Application of this model to potential exposures is not discussed in this report; however, further information can be obtained from EPA (Davidson 1994).

At blood-lead levels greater than 40 μg/dL, lead can cause miscarriage, sterility in males, anemia, and damage to the central nervous system and kidneys. Lead exposure resulting in these high blood-lead levels is rare today. Blood-lead levels of 30 μg/dL and higher have been associated with defects in vitamin D metabolism and with lowered intelligence quotient scores in children. At blood-lead levels of 20 μg/dL and lower, the effects become more difficult to define. Some studies report a dose-related increase in blood pressure in adult males starting at blood-lead levels of about 10 μg/dL. Additionally, fetuses and young children are particularly sensitive to lead toxicity; even low-level lead exposure during pregnancy and early childhood can cause reduced birth weight, premature birth, and delayed development (Davidson 1994).

Lead can cause varied toxicological effects, depending on the level of exposure. From studies on rats and mice, EPA has classified lead in weight-of-evidence Group B2, probable human carcinogen (EPA 2000). However, the doses that induce cancer are higher than those associated with other health effects of lead, such as reproductive toxicity, developmental toxicity, and increased blood pressure (Davidson 1994).

Naphthalene. Naphthalene also belongs to the group of chemicals called PAHs that are found in various types of fossil fuel, including coal, oil, gas, and other organic substances (ATSDR 1989a).

Humans exposed via inhalation, combined inhalation and dermal exposure, and combined inhalation and oral exposure have developed hemolytic anemia (lowered hemoglobin, hematocrit, and erythrocyte values). In severe cases, the hemolytic anemia was accompanied by jaundice, high serum levels of bilirubin, cyanosis, and kernicterus with pronounced neurological signs (EPA 1998). In laboratory experiments, the target organs appeared to be the kidneys, thymus, liver, and spleen (EPA 1998).

EPA has calculated an oral RfD of 0.02 mg/kg-day based on decreased mean body weight in exposed laboratory animals (EPA 2000). The RfC for naphthalene is 0.003 mg/m^3 based on respiratory effects in exposed rats (EPA 2000). EPA classifies naphthalene in weight-of-evidence Group C, possible human carcinogen (EPA 2000).

See also toxicity profile for PAHs.

Polycyclic Aromatic Hydrocarbons. The PAHs are a group of chemicals that are formed during the incomplete burning of wood and fuel, including coal, oil, gas, and other organic substances (ATSDR 1989a). Exposure to PAHs may occur via inhalation, ingestion, and dermal contact. In any medium, PAHs most often exist as complex mixtures of compounds, and these compounds have been divided into (1) carcinogenic PAHs and (2) noncarcinogenic PAHs.

Carcinogenic Polycyclic Aromatic Hydrocarbons. Available data indicate that benzo(*a*)pyrene is one of the most potent of the carcinogenic PAHs. Other PAHs considered to be carcinogenic are benzo(*a*)anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, dibenzo(*a,h*)anthracene, and indeno(*1,2,3-cd*)pyrene.

The arrangement of aromatic rings in the benzo(*a*)pyrene molecule and other PAHs gives it a "bay-region" that is often correlated with carcinogenic properties. In general, bay-region PAHs and some of their metabolites are known to react with cellular macromolecules, including DNA, which may account

for the toxicity and carcinogenicity of these compounds (Francis 1992). The primary toxicological concern about exposure to this group of PAHs is carcinogenicity. No case reports or epidemiological studies on the significance of human exposure to individual PAHs are available. Coal tar and other materials known to be carcinogenic to humans, however, contain PAHs (Francis 1992). Lung and skin cancers in humans have been associated with chronic exposure by inhalation and dermal contact, respectively, to mixtures of compounds that include carcinogenic PAHs (ATSDR 1989a). Several individual PAHs administered to different animal species by various routes have been found to be carcinogenic at both local and systemic sites. Long-term experimental studies resulted in tumors in the liver, mammary gland, respiratory and gastrointestinal tracts, and skin (ATSDR 1989a). Carcinogenic PAHs are also reported to be mutagenic in a variety of test systems.

Although reproductive effects in mice fed benzo(*a*)pyrene and adverse effects in their offspring, including birth defects and decreased body weight, have been reported, no reproductive toxicity from PAH exposure has been demonstrated in humans (ATSDR 1989a). Toxic effects have also been observed in rapidly dividing cells of the intestinal epithelium, testes, and ovaries (oocytes). Animal studies also indicate that exposure to bay-region PAHs can damage the hematopoietic system, leading to progressive anemia as well as agranulocytosis. The lymphoid system can also be affected, resulting in lymphopenia.

Not all of the carcinogenic PAHs appear to be as potent as benzo(*a*)pyrene (ICF-Clement 1988; EPA 1993). Recent guidance published by EPA (1993) recommended that a series of relative potency values (orders of magnitude) be used for the risk assessment of oral exposure to PAHs, with carcinogenic potency being compared to that of benzo(*a*)pyrene.

Noncarcinogenic Polycyclic Aromatic Hydrocarbons. PAHs not considered to be carcinogenic include acenaphthene, benzo(*g,h,i*)perylene, naphthalene, and phenanthrene.

PAHs are toxic to the skin. For example, naphthalene is a primary skin irritant and causes erythema and dermatitis on repeated contact (Sittig 1981), and acenaphthene is irritating to the skin and mucous membranes of humans and animals (Faust 1994f). Other noncarcinogenic effects of PAHs have been observed in animals; however, of these, only effects of the blood and blood-forming system and of the skin have also been reported in humans (ATSDR 1989a). Animal studies indicate that PAHs may adversely affect the gastrointestinal tract, liver, kidneys, lungs, and hematopoietic system and may suppress the immune system after both short- and long-term exposure. Oral exposure of animals to acenaphthene caused reproductive effects, including decreased ovary weights, decreased ovarian and uterine activity, and fewer and smaller corpora lutea (Faust 1991; Faust 1994f). No mutagenic or carcinogenic effects of the noncarcinogenic PAHs have been reported.

Pyrene. Pyrene, a crystalline solid, is a PAH with four aromatic rings. No commercial production or use of this compound is known. Pyrene from coal tar has been used as the starting material for the synthesis of benzo(*a*)pyrene. Pyrene is ubiquitous in the environment as a product of incomplete combustion (Faust 1993a).

Pyrene can be absorbed following oral, inhalation and dermal exposure. Absorption from the gastrointestinal tract appears to be relatively poor; approximately 50 percent of the administered pyrene is present in the gastrointestinal tract 24 hours after gavage administration to rats (Faust 1993a).

The kidney appears to be the major target organ for pyrene. Subchronic oral toxicity studies have shown nephropathy and decreased kidney weights in mice. Other target organs include the liver and blood. Subchronic oral exposures of laboratory animals have produced increased liver weights and fatty liver changes in rats and slight hematological effects in mice.

There is an oral RfD for pyrene of 0.03 mg/kg/day, based on a NOAEL of 25 mg/kg/day in rats. The toxicity endpoints include changes in the renal tubular pathology and decreased kidney weights (EPA 2000). Pyrene is classified by EPA in weight-of-evidence Group D, not classifiable as to human carcinogenicity (EPA 2000).

See also toxicity profile for PAHs.

Trichloroethene. Trichloroethene, also known as trichloroethylene and ethylene trichloride, is a common industrial solvent and metal degreaser that is also used in the manufacture of organic chemicals. In the past, trichloroethene was used in food extraction processes such as decaffeination of coffee and spice flavor extractions and as a human anesthetic in surgical and obstetrical procedures (ATSDR 1989b).

The principal routes of exposure to trichloroethene are inhalation and ingestion, but it is also absorbed by the skin. Human inhalation exposures to trichloroethene result in depression of the central nervous system, with signs of drowsiness, dizziness, and headaches; however, these neurological symptoms appear to be reversible when exposures are not extreme (EPA 1985). Other neurologic effects reported in occupationally exposed humans include fatigue, light-headedness, vision distortion, abnormal reflexes, tumors, and ataxia (Faust 1993b). Additional documented effects in humans are eye and skin irritation, dermatitis, and cardiac effects (ATSDR 1989b; IARC 1979). Cardiovascular effects include tachycardia, EKG abnormalities, and precordial pain. Cardiac arrhythmias were noted during use of trichloroethene as an anesthetic (Faust 1993b). Although severe liver damage and kidney damage in humans after acute exposures to trichloroethene have been reported, these effects have not been associated with long-term occupational exposures (Faust 1993b).

Several experimental studies in laboratory animals have also produced effects in the kidney and liver, as well as hematological effects and immunosuppression (Faust 1993b). Rat inhalation studies indicate that trichloroethene has produced effects consistent with delayed maturation, such as skeletal ossification (Dorfmueller et al. 1979; Healy, Poole, and Hopper 1982; NTP 1985; NTP 1986; Faust 1993b). Epidemiological studies have not established an association between exposure to trichloroethene and increased cancer risk at any site (Fukuda, Takemoto, and Tsuruta 1983; Maltoni et al. 1988; Faust 1993b). The carcinogenic potential of trichloroethene in the liver, kidney, and lungs has been reported in some, but not all, studies of rats and mice. The metabolic conversion of trichloroethene to active intermediates in laboratory animals may be responsible for some of the reported carcinogenic effects.

Neither IRIS nor HEAST lists an oral RfD or inhalation RfC (EPA 2000; EPA 1997). This chemical has not been classified in a weight-of-evidence group based on its carcinogenicity (EPA 2000; EPA 1997).

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Table C-1. Summary of Toxicity Data for Chemicals of Potential Concern

Chemical	CSF_o (1/mg/kg/day)	Ref	CSF_i (1/mg/kg/day)	Ref	WOE	RfD_o (mg/kg/day)	Ref	UF-MF	Target Organs	RfD_i (mg/kg/day)	Ref	UF-MF	Target Organs
Arsenic	1.50E+00	I	1.51E+01	I	A	3.00E-04	I	3	Skin				
Benzo(*a*)anthracene	7.30E-01	E	3.10E-01	E	B2								
Benzo(*a*)pyrene	7.30E+00	I	3.10E+00	E	B2								
Benzo(*b*)fluoranthene	7.30E-01	E	3.10E-01	E	B2								
Benzo(*k*)fluoranthene	7.30E-02	E	3.10E-02	E	B2								
Benzo(*g,h,i*)perylene					D								
Dibenzo(*a,h*)anthracene	7.30E+00	I	3.10E+00	E	B2								
Indeno(*1,2,3-c,d*)pyrene	7.30E-01	E	3.10E-01	E	B2								
Lead					B2								
Naphthalene					C	2.00E-02	I	3,000	Clinical	9.00E-04	I	3,000	Resp
Pyrene					D	3.00E-02	I	3,000	Kidney				
Trichloroethene	1.10E-02	E	6.00E-03	E	NA	6.00E-03	E		Unknown				

CSF_i = Inhalation cancer slope factor.
CSF_o = Oral cancer slope factor.
Ref = Source of information: E = EPA's National Center for Environmental Assessment; I = Integrated Risk Information System, on-line database, <www.epa.gov/IRIS>.
RfD_i = Inhalation reference dose.
RfD_o = Oral reference dose.
UF-MF = Product of the uncertainty and modifying factors.
Target Organs = Primary organ systems affected by noncarcinogenic chemicals.
Clinical = Endpoints included clinical effects such as change in body weight, enzyme levels, etc. Effects cannot be associated with any specific organ system.
Resp = Respiratory system.
WOE = Cancer weight-of-evidence classification.

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