

06.08-7/30/02-01578

SWMU CLOSEOUT PACKAGE

for

ALLEGANY BALLISTICS LABORATORY ROCKET CENTER, WEST VIRGINIA

SWMU 40 – LABORATORY EXHAUST FILTER

Contents:

SWMU Close-out Document

- 1.0 Description
- 2.0 Field Investigation and Removal Activities
- 3.0 Summary of Analytical Results
- 4.0 Constituent Comparison to Screening Criteria
- 5.0 Constituent Migration Pathways and Receptors
- 6.0 Conclusions
- 7.0 References

Figure 1: SWMU 40 Sampling Locations*

- Table 1: Analytical Results for SWMU 40 Soil (pre-removal) *
- Table 2: Waste Characterization Results for SWMU 40 *
- Table 3: Analytical Results for SWMU 40 Soil (post-removal) *
- Table 4: Groundwater Analytical Results for SWMU 40 *
- Table 5: Screening Comparison for SWMU 40 Groundwater *
- Table 6: Screening Comparison for SWMU 40 Soil *

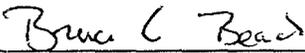
*Figure and tables are presented at the end of Section 7.0

Attachment A: 1995, 1997, 1999 and 2001 SWMU Photos

SWMU CLOSE-OUT DOCUMENT

SWMU 40, Laboratory Exhaust Filter

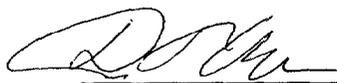
Based upon current conditions at Solid Waste Management Unit (SWMU) 40; a site visit; and a desktop evaluation performed by the Remedial Program Managers (RPMs), defined as the Department of Navy (DoN), the U. S. Environmental Protection Agency (USEPA) Region III, and the West Virginia Department of Environmental Protection (WVDEP), using the data presented in this document, it was determined that current conditions, including active groundwater remediation, are protective of human health and the environment for SWMU 40. As appropriate, constituent concentrations, pathways, and receptors were all evaluated using the most recent version of USEPA Region III Risk-Based Concentrations (RBC Tables) (USEPA, April 2002), soil screening levels (SSLs) (USEPA, April 2002), facility background concentrations, USEPA maximum contaminant levels (MCLs) (USEPA, Summer 2000), historical data, and best professional judgement. Based upon the above, it is the consensus of the RPMs that soil at SWMU 40 requires no further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, for residential land use. Because SWMU 40 is within CERCLA Site 10, for which there is an ongoing groundwater remedial action, groundwater contamination detected at SWMU 40 will be addressed as part of the Record of Decision for Site 10 groundwater.


Bruce Beach, EPA Region III RPM

7/17/2002
Date


Tom Bass, WVDEP RPM

7/17/02
Date


Dominic O'Connor, LANTDIV RPM

7/17/02
Date

SITE SUMMARY

SWMU 40 – Laboratory Exhaust Filter

1.0 Description

SWMU 40 is the former laboratory exhaust filter mechanism along the outside of the southern wall of the Strand Bomb Testing Laboratory in Building 12 (Figure 1). The unit is believed to have started operations during the 1960s, but may have started operation as early as the 1940s. Exhaust from tests conducted in the westernmost testing room of the building discharged through the unit to the outside. The unit managed explosives, propellants, and other combustion products. Filters from the unit were cleaned with acetone prior to disposal. In 1997, the exhaust filter was removed by OHM Remediation Services Corporation (OHM).

2.0 Field Investigation and Removal Activities

During the visual site inspection (VSI) conducted as part of the Phase II RCRA Facility Assessment (RFA), a black ash residue was observed on the ground and wall surface beneath the unit. The majority of the surrounding ground surface was covered with concrete; however, there was a 1-foot-wide area of gravel-covered ground approximately 18 inches to the west of the unit. The RFA determined that the potential for release from SWMU 40 to air was high based upon the discoloration of the concrete surface surrounding the unit. The RFA also determined that the potential for release to soil and groundwater was moderate because the unit discharged ashen residue to the surrounding area. Finally, the RFA determined that the potential for release to surface water was low because of the distance to any of the facility drainage ditches (A.T. Kearney, August 1993). The RFA recommended that samples be collected from the residues found in the vicinity of the unit to determine the constituents of the particulate releases to the air from the unit.

Based on consensus by the RPMs, one surface soil sample (i.e., 40-1-T and duplicate sample 40-1-T/DUP) and one subsurface soil sample were collected during the Phase I SWMU/AOC Investigation at the locations shown in Figure 1 (CH2M HILL, October 2001). Samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), explosives (i.e., trinitrotoluene [TNT], nitroglycerin [NG], pentaerythritol tetranitrate [PETN], and hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX]), and Target Analyte List (TAL) metals.

A removal action was performed at the unit in 1997 by OHM to remove the laboratory filter, adjacent sidewalk, and contaminated soil. For waste characterization purposes, one concrete block sample was obtained from the stained portion of the north wall (40-CWSW) and two additional concrete samples, 40-CWUW and 40-CSUW, were collected from the unstained portions of the west and south walls, respectively. In addition, three concrete core samples were collected from the sidewalk adjacent to the building. Two of these were obtained from unstained sections of the sidewalk (40-CSWU on the west side and 40-CSSU on the south side). The third sample, 40-CWS, was collected from a stained area located at the west corner of the sidewalk. All concrete samples were analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) parameters and reactivity, corrosivity, and ignitability (RCI). One surface soil sample (i.e., 40-S) was also collected from the visibly stained soil located between the sidewalk and the west side of the building and analyzed for full TCLP parameters.

Following building demolition and removal of the concrete sidewalk, two surface soil confirmatory soil samples (i.e., 40-S1 and 40-S2) were collected from the northwest corner of the building close to the former exhaust filter discharge point. Confirmatory soil samples were analyzed for TAL metals and RCI parameters.

Based upon the above information, the RPMs determined that an evaluation of groundwater was necessary for SWMU 40 during the Phase II SWMU/AOC Investigation. Therefore, groundwater data generated from monitoring well sampling at SWMU 37C were used to evaluate potential impacts from the former laboratory exhaust filter. Monitoring wells GGW11 and GGW12, which were installed as part of the investigation at SWMU 37C, were sampled for low-concentration (LC) VOCs, explosives (i.e., PETN and NG), and TAL metals analyses. A secondary confirmatory sample was collected from GGW11 (37C-GGW11-2) and analyzed for LC VOCs only.

3.0 Summary of Analytical Results

The analytical results of sampling conducted during previous investigations and the removal action are discussed below.

3.1 Phase I SWMU/AOC Investigation

Table 1 presents the analytical results for the soil samples collected at SWMU 40 during the Phase I SWMU/AOC Investigation. As shown in the table, no VOCs were detected in the surface or subsurface soil at the unit. PETN (5,900 µg/kg) was detected in surface soil sample 40-1-T. However, PETN was not detected in the duplicate of the sample (i.e., 40-1-T/DUP) nor in the subsurface soil.

Twenty-one inorganics were detected in the surface soil; lead was detected at 11,800 mg/kg, which is significantly above the action level of 400 mg/kg (USEPA, December 1996). Eighteen inorganics were detected in the subsurface soil; lead was detected at 14.6 mg/kg.

3.2 Removal Action Analytical Results

Table 2 presents a summary of the analytical results for waste characterization samples collected at SWMU 40 during the removal action. As shown in Table 2, barium, cadmium, chromium, and lead were the only constituents detected by TCLP analysis, and all detected concentrations were below TCLP limits. In addition, the RCI parameters were below or within their characterization limits. Therefore, SWMU 40 wastes were characterized as non-hazardous and disposed of accordingly.

Table 3 presents a summary of the analytical results for confirmatory soil samples collected at SWMU 40 during the removal action. The table shows that nineteen inorganic constituents were detected in the confirmatory samples. Inorganics not detected (i.e., "U" flagged) were antimony, cadmium, silver, and thallium. The concentrations of all constituents detected in the confirmatory soil samples were evaluated using a formal screening process. This process is discussed in Section 4.0.

3.3 Phase II SWMU/AOC Investigation

Table 4 presents a summary of the analytical results for the groundwater samples collected at and upgradient of SWMU 40 during the Phase II SWMU/AOC Investigation of SWMU 37C.

The analytical results in Table 4 show that six VOCs (i.e., 1,2-dichloroethene [1,2-DCE], carbon disulfide, carbon tetrachloride, chloroform, tetrachloroethene [PCE], and trichloroethene [TCE]) were detected in groundwater samples collected from the two monitoring wells. However, carbon tetrachloride was the only VOC detected at a concentration above the EPA maximum contaminant limit (MCL). In monitoring well GGW11, carbon tetrachloride was detected in the initial and confirmatory samples at concentrations of 7.2 µg/l and 9.9 µg/l, respectively. One explosive, tetryl (0.13 µg/l), was detected in the sample collected from well GGW11.

Fifteen inorganics were detected in the sample collected from well GGW11. Inorganics not detected (i.e., "U" flagged) or those detected but qualified with a "B" flag, indicating similar concentrations to those detected in quality control/quality assurance (QA/QC) blanks, are antimony, arsenic, beryllium, chromium, cyanide, mercury, selenium, silver, and thallium.

The concentrations of all constituents detected in SWMU 37C/40 groundwater samples were evaluated using a formal screening process. This process is presented and discussed in Section 4.0. For the purposes of this discussion, only the data from well GGW11 are evaluated because this well is located downgradient of the former sump. The data from well GGW12 are not included because this well is located approximately 75 feet upgradient of the former sump; therefore, its constituent concentrations are not believed to be representative of potential releases from SWMU 40.

4.0 Constituent Comparison to Screening Criteria

The general screening process for SWMU sample data is enumerated below. Following the general description of each step, the process as applied to SWMU 40 is described. It should be noted that post-removal action surface data and Phase I SWMU/AOC Investigation subsurface data were used to evaluate current potential risk from soil. The results of the screening process for SWMU 40 groundwater and soil are summarized in tables 5 and 6, respectively.

1. For each detected constituent type (e.g., inorganics, explosives, etc.):

Groundwater

The maximum concentration of each detected constituent is compared to its USEPA MCL to identify any constituents that should be considered for remediation. Next, the maximum concentration is compared to its tap water RBC at a hazard quotient (HQ) of 0.1.

As noted in Section 3.0, six VOCs (i.e., 1,2-DCE, carbon disulfide, carbon tetrachloride, chloroform, PCE, and TCE) and one explosive constituent (i.e., tetryl) were detected in SWMU 40 groundwater. Of these, the maximum concentration of carbon tetrachloride (i.e., 9.9 µg/l) exceeds the MCL (i.e., 5 µg/l) and the tap water RBC at an HQ of 0.1 (i.e., 0.16 µg/l). These exceedances are designated in the "Max" column of Table 5 with a superscripted letter "a" for MCL exceedance and "b" for RBC exceedance. The maximum concentrations of chloroform, PCE, and TCE also exceed their respective tap water RBCs at an HQ of 0.1. These exceedances are designated in the "Max" column of Table 5 with a superscripted letter "b."

None of the detected explosives or inorganics concentrations exceeds its respective RBC at an HQ of 0.1.

Soil

The maximum concentration of each detected constituent is compared to its residential RBC for soil at an HQ of 0.1.

As shown in Table 6, no VOCs or explosives were detected in the confirmatory soil samples nor the Phase I SWMU/AOC Investigation subsurface soil sample. Of the inorganics detected in SWMU 40 soil, the maximum concentrations of five surface soil constituents (i.e., aluminum, arsenic, iron, mercury, and manganese) exceed their respective RBCs at an HQ of 0.1. In addition, the maximum concentrations of four subsurface constituents (i.e., aluminum, arsenic, iron, and thallium) exceed their respective RBCs at an HQ of 0.1. These exceedances are designated in the "Max" column in Table 6 with a superscripted letter "a."

2. For each constituent whose concentration exceeds its RBC at an HQ of 0.1, an apparent hazard index (AHI) is calculated by dividing the constituent concentration by the RBC at an HQ of 1.

Groundwater

For each of the three constituents in groundwater listed in Step 1 for SWMU 40, an AHI was calculated and is shown in the adjacent "AHI" column of Table 5.

Soil

For each of the inorganic constituents listed in Step 1 for SWMU 40 soil, an AHI was calculated and is shown in the adjacent "AHI" columns of Table 6.

3. Following this calculation, the individual AHIs for non-cancer and cancer risks are summed separately and designated the "Cumulative AHI," or "CAHI." The CAHI for cancer risk is then multiplied by 10^{-6} . If the CAHI for the non-cancer risk is less than the screening criterion of 1 and the CAHI for cancer risk is less than the screening criterion of 1×10^{-6} , no potential constituents of concern (PCOCs) are identified and the screening process advances to Step 6. If one or both criteria are exceeded, the screening process advances to Step 4.

Groundwater

There are no non-cancer risk constituents identified, so no non-cancer CAHI is calculated. The calculated CAHI for cancer risk (i.e., carbon tetrachloride, chloroform, PCE, and TCE) for groundwater is presented below the AHI column in Table 5. The cancer risk CAHI (i.e., 1.6×10^{-4}) exceeds the screening criterion of 1×10^{-6} . This exceedance is designated in the "Max" column of Table 5 with a superscripted letter "c."

Soil

The calculated CAHIs for non-cancer (i.e., aluminum, arsenic, iron, mercury, manganese, and thallium) and cancer risk (i.e., arsenic) are presented below the AHI columns in Table 6. The non-cancer risk (i.e., 2.02) and cancer risk (i.e., 10.5×10^{-6}) CAHIs for surface soil exceed their respective screening criterion. Similarly, the non-cancer risk (i.e., 1.22) and cancer risk (i.e., 8.6×10^{-6}) CAHI for subsurface soil exceed their respective screening criterion. These exceedances are designated in the "Max" columns of Table 6 with a superscripted letter "b."

4. For each AHI group that exceeds (i.e., non-cancer and/or cancer risks), the mean SWMU concentration of each AHI constituent is calculated and these means are compared to the mean facility background concentrations. Also, the maximum constituent concentration is

compared to the maximum background concentration for each of these constituents. If the maximum constituent concentration is greater than the maximum background concentration, then the constituent is retained as a PCOC and the screening process advances to Step 5. If not, the constituent is no longer considered a PCOC from an RBC standpoint and the screening process advances to Step 6.

Groundwater

For groundwater, the maximum constituent concentrations were compared to the maximum concentrations in alluvial well GGW03. The maximum concentrations of all four constituents (i.e., carbon tetrachloride, chloroform, PCE, and TCE) are greater than their respective facility background concentrations; therefore, these four VOCs are retained as PCOCs for Step 5.

Soil

For surface soil, the mean concentrations of only aluminum, iron, mercury, and manganese exceed the mean background concentrations. These exceedances are designated in the "Mean" column of Table 6 with a superscripted letter "c." However, the maximum concentration of only mercury exceeds its maximum background concentration. This exceedance is designated in the "Max" column of Table 6 with a superscripted letter "d." Therefore, mercury is the only surface soil constituent carried into Step 5 of the screening process as a PCOC.

For subsurface soil, the mean concentration of only aluminum exceeds the mean facility background concentration. This exceedance is designated in the "Mean" column of Table 6 with a superscripted letter "c." However, the maximum concentrations of none of the inorganics exceeds its respective screening criterion. Therefore, there are no PCOCs identified for subsurface soil at SWMU 40.

5. For all constituents considered PCOCs, the CAHIs for non-cancer and cancer risks are recalculated separately. If the recalculated non-cancer CAHI is less than 1, the constituents included in the CAHI calculation are no longer considered PCOCs. If the recalculated cancer CAHI is in the acceptable risk range of 10^{-4} to 10^{-6} , the constituents included in the CAHI calculation are no longer considered PCOCs. If no PCOCs are retained, the screening process advances to Step 6. If PCOCs are retained, further evaluation of the data by the RPMs is necessary (Step 7) and the screening process advances to Step 6.

Groundwater

The recalculated cancer CAHI (1.6×10^{-4}) comprises the AHIs for carbon tetrachloride, chloroform, PCE, and TCE. The recalculated cancer CAHI is slightly higher than the screening criterion and, therefore, all four constituents are retained as PCOCs from an RBC standpoint.

Soil

As noted above, mercury in surface soil is the only PCOC carried into Step 5 of the screening process. Therefore, the recalculated non-cancer risk CAHI (0.12) comprises the AHI for mercury alone and is below the screening value of 1. Therefore, mercury is eliminated as a PCOC from an RBC standpoint.

6. For each detected constituent in soil, the maximum concentration is compared to the soil screening level (SSL) at a dilution attenuation factor (DAF) of 20. If the maximum constituent concentration exceeds the SSL and the maximum facility background concentration, the constituent may be considered a PCOC and the screening process advances to Step 7.

Soil

As shown in Table 6, none of the constituents detected in SWMU 40 soil exceed both the maximum facility background concentration and the SSL at a DAF of 20. Therefore, no PCOCs are identified from a potential leaching standpoint.

7. The RPMs then review the screening results and make a decision on final closure.

This step is summarized in Section 6.0 of this closeout document.

The screening processes employ several rules for data reporting. These rules are:

1. If all the data for a particular constituent are non-detect (i.e., "U" flagged), the constituent is not considered further in the screening process.
2. For constituent data that are "B" flagged, the "B" flagged data are used for maximum and mean reporting unless there are duplicate data that are not "B" flagged.
3. For constituent data that are "R" flagged, the "R" flagged data are used for maximum and mean reporting unless there are duplicate data that are not "R" or "B" flagged.
4. For duplicate samples, the mean of the duplicate samples are used in the mean computation for the sample set.

5.0 Constituent Migration Pathways and Receptors

Exposure to constituents occurs at a site when contaminated media is accessible to receptors via an exposure pathway. An exposure pathway is a description of the means by which a chemical moves from a source to a receptor. For a complete exposure pathway to exist five elements must be present:

- A constituent of concern
- A mechanism for constituent release
- An environmental transport medium
- An exposure point (or receptor location)
- A route of intake

The following summary tables were prepared to assist in the risk management decision making process by identifying the pathways of migration and the presence of receptors. An evaluation and discussion of potential risks at the site are presented in Section 6.

5.1 Migration Pathways

Based on site history and evaluation, analytical data, and professional judgment, the following pathway scenario is predicted for potential constituents at the site:

Pathway	Evident	Potential	Confirmed	Not Applicable
Groundwater		X		
Surface water/ Sediment				X
Subsurface and Surface Soil		X		

5.2 Receptors

Based on site history and evaluation, analytical data, and professional judgment, the following receptor scenario is predicted for environmental media at the site:

	Receptors Identified	Potential Receptors	Limited Receptors	Not Applicable
Groundwater		X		
Surface water/ Sediment				X
Subsurface and Surface Soil		X		

6.0 Conclusions

Based upon the information presented herein, four VOCs (i.e, carbon tetrachloride, chloroform, PCE, and TCE) are identified as PCOCs in SWMU 40 groundwater. Although carbon tetrachloride was detected in groundwater (i.e., in well GGW11) above the EPA MCL and tap water RBC and the other three constituents were detected above their respective tap water RBCs, the constituents were not detected in the soil at SWMU 40. This suggests the VOC contamination detected in the groundwater below SWMU 40 is likely from another source. Additionally, groundwater in the vicinity of SWMU 40 is within the capture zone boundary of the Site 10 groundwater extraction system and the treatment process associated with Site 10 is appropriate for treating this type of groundwater contamination.

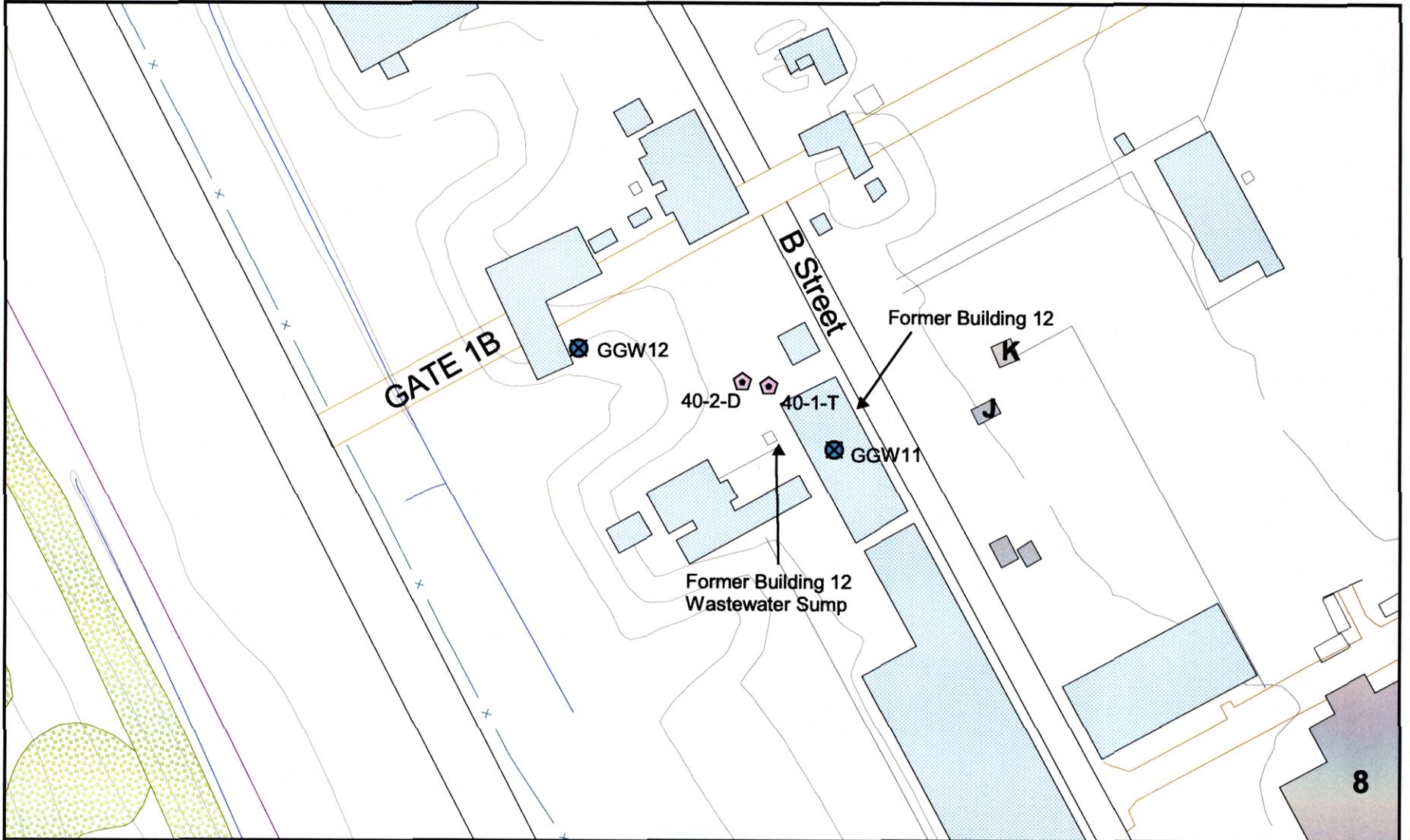
Historic subsurface soil data and post-removal confirmatory soil data were evaluated via a process whereby constituent concentrations are compared to residential RBCs, SSLs, and facility background criteria. The results of the screening process indicate that no constituents are present in soil at SWMU 40 at levels that pose an unacceptable risk to human health. In addition, as noted in Section 4.0, the potential that leaching of soil constituents at SWMU 40 to groundwater will produce unacceptable constituent concentrations is not greater than that for the facility background constituents.

In addition to the absence of unacceptable human-health risks from exposure to soil, the potential risks to the environment at SWMU 40 are considered to be acceptable. The SWMU is no longer active and a remedial action was conducted in 1997 to remove the unit and potentially contaminated soil. Finally, constituent concentrations remaining in soil and groundwater are below the ground surface and not readily available to biota.

Based upon the above, it is the consensus of the RPMs that soil at SWMU 40 requires no further action under CERCLA for residential land use. It is also the consensus of the RPMs that groundwater contamination detected at SWMU 40 is not attributable to potential releases from the former unit and will be managed in accordance to with the Record of Decision for Site 10 groundwater.

7.0 References

- A. T. Kearney, Inc. *Phase II RCRA Facility Assessment for Allegany Ballistics Laboratory, Rocket Center, West Virginia*. August 1993.
- CH2M HILL. *Final Phase I Investigation of Solid Waste Management Units and Areas of Concern at Allegany Ballistics Laboratory Superfund Site*. October 2001.
- CH2M HILL. *Draft Phase II Investigation of Solid Waste Management Units and Areas of Concern at Allegany Ballistics Laboratory Superfund Site*. June 2001.
- OHM Remediation Services Corp. *Final Closeout Report for Removal Action for Solid Waste Management Units, Allegany Ballistics Laboratory, Volume I*. May 1999.
- USEPA, Region III. Memorandum - "Risk-Based Concentration Table." April 2, 2002.
- USEPA. Drinking Water Regulations and Health Advisories. EPA 822-B-00-001. Summer 2000.
- USEPA, Technical Review Workgroup for Lead. "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil." December 1996.



LEGEND

-  Phase I SWMU/AOC Investigation Soil Sample Location
-  Alluvial Monitoring Well

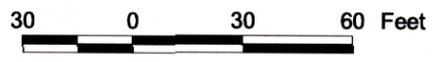


Figure 1
SWMU 40 - Sampling Stations
Allegany Ballistics Laboratory

01578 A014

Table 1			
Analytical Results for SWMU 40 Soil (pre-removal)			
Sample ID	40-1-T	40-1-T/DUP	40-2-D
Sample Date	10/25/95	10/25/95	10/27/95
Chemical Name			
Volatile Organic Compounds (UG/KG)			
1,1,1-Trichloroethane	14 UJ	NA	12 U
1,1,2,2-Tetrachloroethane	14 UJ	NA	12 U
1,1,2-Trichloroethane	14 UJ	NA	12 U
1,1-Dichloroethane	14 UJ	NA	12 U
1,1-Dichloroethene	14 UJ	NA	12 U
1,2-Dichloroethane	14 UJ	NA	12 U
1,2-Dichloroethene (total)	14 UJ	NA	12 U
1,2-Dichloropropane	14 UJ	NA	12 U
2-Butanone	14 UJ	NA	12 U
2-Hexanone	14 UJ	NA	12 U
4-Methyl-2-pentanone	14 UJ	NA	12 U
Acetone	14 UJ	NA	12 U
Benzene	14 UJ	NA	12 U
Bromodichloromethane	14 UJ	NA	12 U
Bromoform	14 UJ	NA	12 U
Bromomethane	14 UJ	NA	12 U
Carbon disulfide	14 UJ	NA	12 U
Carbon tetrachloride	14 UJ	NA	12 U
Chlorobenzene	14 UJ	NA	12 U
Chloroethane	14 UJ	NA	12 U
Chloroform	14 UJ	NA	12 U
Chloromethane	14 UJ	NA	12 U
Dibromochloromethane	14 UJ	NA	12 U
Ethylbenzene	14 UJ	NA	12 U
Methylene chloride	14 UJ	NA	12 U
Styrene	14 UJ	NA	12 U
Tetrachloroethene	14 UJ	NA	12 U
Toluene	14 UJ	NA	12 U
Trichloroethene	14 UJ	NA	12 U
Vinyl chloride	14 UJ	NA	12 U
Xylene, total	14 UJ	NA	12 U
cis-1,3-Dichloropropene	14 UJ	NA	12 U
trans-1,3-Dichloropropene	14 UJ	NA	12 U
Explosives (UG/KG)			
2,4,6-Trinitrotoluene	64 U	66 U	42 U
Nitroglycerin	64 U	66 U	42 U
PETN	5,900	66 U	42 U
RDX	64 U	66 U	42 U
Total Metals (MG/KG)			
Aluminum	13,900	NA	17,800
Antimony	86.1 J	NA	9.80 U
Arsenic	7.80 J	NA	3.70
Barium	132	NA	156
Beryllium	0.600 B	NA	1.30
Cadmium	0.640 U	NA	0.700 U
Calcium	14,600 J	NA	4,640
Chromium	3,020	NA	21.2
Cobalt	47.7	NA	17.4
Copper	409 J	NA	20.9

NA - Not analyzed
 B - Analyte not detected above associated blank
 J - Reported value is estimated
 U - Analyte not detected
 UJ - Not detected, quantitation limit may be inaccurate

Table 1			
Analytical Results for SWMU 40 Soil (pre-removal)			
Sample ID	40-1-T	40-1-T/DUP	40-2-D
Sample Date	10/25/95	10/25/95	10/27/95
Chemical Name			
Iron	65,600	NA	14,200
Lead	11,800	NA	14.6
Magnesium	2,770 J	NA	2,780
Manganese	289 J	NA	109
Mercury	6.60	NA	0.0500 U
Nickel	3,210 J	NA	22.8
Potassium	464 B	NA	2,150
Selenium	1.5	NA	0.700 U
Silver	5.40	NA	0.930 U
Sodium	233 B	NA	91.6 B
Thallium	3.5	NA	1 J
Vanadium	0.430 U	NA	20.4
Zinc	983	NA	49.4

NA - Not analyzed
 B - Analyte not detected above associated blank
 J - Reported value is estimated
 U - Analyte not detected
 UJ - Not detected, quantitation limit may be inaccurate

Table 2								
Waste Characterization Results for SWMU 40								
	EPA Hazardous Waste Regulatory Limit ^a	40-CWCW	40-CWSW	40-CSUW	40-CSSU	40-CSWU	40-CWS	40-S
Sample Date		11/20/1997	11/20/1997	11/20/1997	11/19/1997	11/19/1997	11/19/1997	11/19/1997
Chemical Name								
TCLP Volatile Organic Compounds (UG/L)								
1,1-Dichloroethene	0.7	50 U						
1,2-Dichloroethane	0.5	50 U						
1,4-Dichlorobenzene	7.5	50 U						
2-Butanone	200	100 U						
Benzene	0.5	50 U						
Carbon tetrachloride	0.5	50 U						
Chlorobenzene	100	50 U						
Chloroform	6.0	50 U						
Tetrachloroethene	0.7	50 U						
Trichloroethene	0.5	50 U						
Vinyl chloride	0.2	100 U						
TCLP Semi-volatile Organic Compounds (UG/L)								
1,4-Dichlorobenzene	7.5	25 U						
2,4,5-Trichlorophenol	400	10 U						
2,4,6-Trichlorophenol	2.0	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2,4-Dinitrotoluene	0.13	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Methylphenol	200	10 U						
4-Methylphenol	200	15 U						
Hexachlorobenzene	0.13	10 U						
Hexachlorobutadiene	0.5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Hexachloroethane	3.0	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Nitrobenzene	2.0	10 U						
Pentachlorophenol	100	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Pyridine	5.0	10 U						
TCLP Pesticides/PCEs (UG/L)								
Chlordane	0.03	12 U						
Endrin	0.02	0.25 U						
Gamma-BHC (Lindane)	0.4	0.25 U						
Heptachlor	0.008	0.25 U						
Heptachlor epoxide	0.008	0.25 U						
Methoxychlor	10.0	12 U						
Toxaphene	0.5	25 U						
TCLP Herbicides (UG/L)								
2,4,5-TP	1.0	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,4-D	10.0	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TCLP Metals (MG/L)								
Arsenic	5.0	0.1 U						
Barium	100	0.36	0.34	0.31	0.34	0.28	0.49	0.43
Cadmium	1.0	0.01 U	0.043					
Chromium	5.0	0.01 U	0.02	0.01 U				
Lead	5.0	0.09 U	0.21					
Mercury	0.2	0.005 U						
Selenium	1.0	0.1 U						
Silver	5.0	0.1 U						
Wet Chemistry								

Table 2

Waste Characterization Results for SWMU 40

	EPA Hazardous Waste Regulatory Limit ^a	40-CWCW	40-CWSW	40-CSUW	40-CSSU	40-CSWU	40-CWS	40-S
Sample Date		11/20/1997	11/20/1997	11/20/1997	11/19/1997	11/19/1997	11/19/1997	11/19/1997
Chemical Name								
Flash Point	140	NI						
pH	<2 to <12.5	9.36	9.5	9.62	11.69	11.4	11.38	11.38
Reactive Cyanide (mg/kg)	500	0.5 U						
Reactive Sulfid e (mg/kg)	500	250 U						

Table 3		
Analytical Results for SWMU 40 Soil (post-removal)		
	40-S1	40-S2
Sample Date	02/20/1998	02/20/1998
Chemical Name		
Total Metals (MG/KG)		
Aluminum	7,100	8,890
Antimony	3.8 U	3.9 U
Arsenic	3.1 U	4.5
Barium	131	110
Beryllium	0.77	0.83
Cadmium	0.5 U	0.51 U
Calcium	12,200	13,600
Chromium	14.7	20.5
Cobalt	11.4	12.6
Copper	18.9	22.8
Iron	21,400	25,800
Lead	43	64
Magnesium	2,270	1,830
Manganese	744	716
Mercury	2.8	0.2
Nickel	16.7	23.3
Potassium	768	907
Selenium	3.7	3.4 U
Silver	0.44 U	0.45 U
Sodium	96.6	78.7
Thallium	4.7 U	4.8 U
Vanadium	14.2	17.4
Zinc	76.7	77.8
Wet Chemistry		
Flash Point (°F)	NI	NI
pH (SU)	8.7	8.2
Reactive Cyanide (mg/Kg)	0.5 U	0.5 U
Reactive Sulfide (mg/Kg)	24 U	24 U

NA - Not analyzed
U - Analyte not detected

Table 4				
Analytical Results for SWMU 40 Groundwater				
Sample ID	37C-GGW11-1	37C-GGW11-1/DUP	37C-GGW11-2	37C-GGW12-1
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	1 U	NS	10 U	1 U
1,1,2,2-Tetrachloroethane	1 U	NS	10 U	1 U
1,1,2-Trichloroethane	1 U	NS	10 U	1 U
1,1-Dichloroethane	1 U	NS	10 U	1 U
1,1-Dichloroethene	1 U	NS	10 U	1 U
1,2-Dichloroethane	1 U	NS	10 U	1 U
1,2-Dichloroethene (total)	0.71 J	NS	10 U	1 U
1,2-Dichloropropane	1 U	NS	10 U	1 U
2-Butanone	5 R	NS	10 U	5 R
2-Hexanone	5 U	NS	10 U	5 U
4-Methyl-2-pentanone	1 U	NS	10 U	1 U
Acetone	5 R	NS	3 JB	5 R
Benzene	1 U	NS	10 U	1 U
Bromodichloromethane	1 U	NS	10 U	1 U
Bromoform	1 U	NS	10 U	1 U
Bromomethane	1 U	NS	10 U	1 U
Carbon disulfide	1 U	NS	10 U	0.13 J
Carbon tetrachloride	7.2	NS	9.9 J	1 U
Chlorobenzene	1 U	NS	10 U	1 U
Chloroethane	1 U	NS	10 U	1 U
Chloroform	2.3	NS	3.6 J	1 U
Chloromethane	0.18 B	NS	10 U	0.19 B
Dibromochloromethane	1 U	NS	10 U	1 U
Ethylbenzene	1 U	NS	10 U	1 U
Methylene chloride	7.2 B	NS	2.8 JB	7.7 B
Styrene	1 U	NS	10 U	1 U
Tetrachloroethene	0.95 J	NS	10 U	1 U
Toluene	1 U	NS	10 U	0.14 B
Trichloroethene	1.8	NS	1.6 J	1 U
Vinyl chloride	1 U	NS	10 U	1 U
Xylene, total	1 U	NS	10 U	1 U
cis-1,3-Dichloropropene	1 U	NS	10 U	1 U
trans-1,3-Dichloropropene	1 U	NS	10 U	1 U
Explosives (UG/L)				
1,3,5-Trinitrobenzene	0.2 U	NS	NS	NS
1,3-Dinitrobenzene	0.2 U	NS	NS	NS
2,4,6-Trinitrotoluene	0.2 U	NS	NS	NS
2,4-Dinitrotoluene	0.2 U	NS	NS	NS
2,6-Dinitrotoluene	0.2 U	NS	NS	NS
2-Amino-4,6-dinitrotoluene	0.2 U	NS	NS	NS
2-Nitrotoluene	0.2 U	NS	NS	NS
3-Nitrotoluene	0.2 U	NS	NS	NS
4-Amino-2,6-dinitrotoluene	0.2 U	NS	NS	NS
4-Nitrotoluene	0.2 U	NS	NS	NS
HMX	0.5 U	NS	NS	NS
Nitrobenzene	0.2 U	NS	NS	NS
PETN	2.5 U	2.5 U	NS	2.5 U
RDX	0.5 U	NS	NS	NS
Tetryl	0.13 J	NS	NS	NS
Total Metals (UG/L)				
Aluminum	582 J	186 B	NS	4,520 J
Antimony	4.3 U	4.3 U	NS	4.3 U
Arsenic	3.6 U	3.6 U	NS	3.6 U
Barium	28.3 B	27.4 B	NS	147 J
Beryllium	0.2 U	0.2 U	NS	1.2 B
Cadmium	0.4 U	0.4 U	NS	0.69 J
Calcium	107,000	126,000	NS	131,000
Chromium	2 U	2 U	NS	9.3 B
Cobalt	2.2 U	2.2 U	NS	24.1 J

NS - Not sampled
 B - Analyte not detected above associated blank
 J - Reported value is estimated
 L - Reported value may be biased low
 R - Unreliable result

Table 4				
Analytical Results for SWMU 40 Groundwater				
Sample ID	37C-GGW11-1	37C-GGW11-1/DUP	37C-GGW11-2	37C-GGW12-1
Chemical Name				
Copper	3.2 B	1.9 U	NS	55.9
Cyanide	1.7 B	2.2 B	NS	4.1 B
Iron	985 J	149 B	NS	11,800 J
Lead	1.3 U	1.3 U	NS	16.9
Magnesium	7,210	8,300	NS	17,400
Manganese	57.8 J	33.4 J	NS	4,730 J
Mercury	0.1 UL	0.1 UL	NS	0.1 UL
Nickel	2.8 B	2.1 B	NS	28.5 L
Potassium	1,980 J	1,880 J	NS	55,600
Selenium	4.3 UL	4.3 UL	NS	4.3 UL
Silver	3.1 U	3.1 U	NS	3.1 U
Sodium	7,500	7,010	NS	18,100
Thallium	5.3 UL	5.3 UL	NS	8 B
Vanadium	1.4 U	1.4 U	NS	10.4 J
Zinc	11.7 B	6.5 B	NS	203

NS - Not sampled
 B - Analyte not detected above associated blank
 J - Reported value is estimated
 L - Reported value may be biased low
 R - Unreliable result

Table 5 Screening Comparison for SWMU 40 Groundwater						
	Background Groundwater (GGW03)	Tapwater RBC (HQ=0.1)	USEPA MCL	SWMU Samples		
				Well GGW11		
				Max (Steps 1, 4, 6)	AHI (Step 2)	PCOC? (Steps 4, 5)
Volatile Organic Compounds (ug/l)						
1,2-Dichloroethene (total)	ND	5.5	70	0.71		
Carbon disulfide	ND	100	N/A	ND		
Carbon tetrachloride	ND	0.16	5	9.9 ^{abcd}	61.9	Yes
Chloroform	1	0.15	80	3.6 ^{bcd}	24	Yes
Tetrachloroethene	ND	0.63	5	0.95 ^{bcd}	1.5	Yes
Trichloroethene	ND	0.026	5	1.8 ^{bcd}	69.2	Yes
Explosives (ug/l)						
Tetryl	ND	37	N/A	0.13		
Total Metals (ug/l)						
Aluminum	(Al)	21400	3700	N/A	582	
Barium	(Ba)	264	260	2000	28.3	
Cadmium	(Cd)	ND	1.8	5	ND	
Calcium	(Ca)	104000	N/A	N/A	126000	
Cobalt	(Co)	25.1	73	N/A	ND	
Copper	(Cu)	57.2	150	1300	3.2	
Iron	(Fe)	57600	1100	N/A	985	
Lead	(Pb)	24.5	15	15	ND	
Magnesium	(Mg)	19600	N/A	N/A	8300	
Manganese	(Mn)	1330	73	N/A	57.8	
Nickel	(Ni)	50.4	73	N/A	2.8	
Potassium	(K)	5500	N/A	N/A	1980	
Sodium	(Na)	9110	N/A	N/A	7500	
Vanadium	(V)	39.7	26	N/A	ND	
Zinc	(Zn)	132	1100	N/A	11.7	
Step 3: Non-Cancer Risk CAHI (none)					N/A	
Step 3: Cancer Risk CAHI (carbon tetrachloride, chloroform, PCE, TCE)					1.6 x10 ⁻⁴	
Step 5: Recalculated Non-Cancer Risk CAHI for PCOCs (none)					N/A	
Step 5: Recalculated Cancer Risk CAHI for PCOCs (carbon tetrachloride, chloroform, PCE, TCE)					1.6 x10 ⁻⁴	

Notes:

RBC = Risk Based Concentration; HQ = Hazard Quotient; MCL = Maximum Contaminant Level
 Max = Maximum Concentration; AHI = Apparent Hazard Index; CAHI = Cumulative Apparent Hazard Index
 PCOC = Potential Constituent of Concern; N/A = Not Applicable; ND = Constituent Not Detected Above Instrument Quantitation Limit

Bolded value indicates "B" flagged or "R" flagged result reported

- ^a MCL exceedance
- ^b RBC (at HQ=0.1) exceedance
- ^c CAHI exceeds screening criterion (1 for non-cancer risk, 1x10⁻⁶ for cancer risk)
- ^d Recalculated CAHI exceeds screening criterion (1 for non-cancer risk, 1x10⁻⁶ for cancer risk)

	Facility Background				Residential RBC (HQ=0.1)	SSL (DAF=20)	SWMU Samples							
	Surface Soil		Subsurface Soil				SWMU Removal Confirmatory Surface Soil				Phase I SWMU/AOC Investigation Subsurface Soil			
	Max	Mean	Max	Mean			Max (Steps 1, 4, 6)	AHI (Step 2)	Mean (Step 4)	PCOC? (Steps 4, 5)	Max (Steps 1, 4, 6)	AHI (Step 2)	Mean (Step 4)	PCOC? (Steps 4, 5)
Volatile Organic Compounds (ug/kg)														
No detections														
Explosives (mg/kg)														
No detections														
Inorganics (mg/kg)														
Aluminum (Al)	11250	7182	22500	13128	7800	N/A	8890 ^{ab}	0.11	7990 ^c	No ^a	17800 ^{ab}	0.23	17800 ^c	No ^d
Arsenic (C) (As)	11.5	6.42	13.1	8.15	0.43	0.026	4.5 ^{ab}	10.5	4.5	No ^a	3.7 ^{ab}	8.6	3.7	No ^d
Arsenic (N) (As)	11.5	6.42	13.1	8.15	2.3	0.026	4.5 ^{ab}	0.2	4.5	No ^a	3.7 ^{ab}	0.20	3.7	No ^d
Barium (Ba)	120	66.9	220	108	550	2100	131				156			
Beryllium (Be)	1.2	0.3	1.5	0.85	16	1200	0.83				1.3			
Calcium (Ca)	292000	63404	67000	14647	N/A	N/A	13600				4640			
Cobalt (Co)	22.0	8.6	19	12.7	160	N/A	12.6				17.4			
Chromium (Cr)	20.5	11.5	24	16.4	23	42	20.5				21.2			
Copper (Cu)	24.4	17.3	31.6	24.6	310	11000	22.8				20.9			
Iron (Fe)	28700	20594	41300	30215	2300	N/A	25800 ^{ab}	1.12	23600 ^c	No ^a	14200 ^{ab}	0.62	14200	No ^d
Mercury (Hg)	0.17	0.043	0.050	0.020	2.3	N/A	2.8 ^{ab}	0.12	1.5 ^c	No ^a	ND			
Potassium (K)	1850	892	1880	1430	N/A	N/A	907				2150			
Magnesium (Mg)	14100	4436	2730	2108	N/A	N/A	2270				2780			
Manganese (Mn)	1070	495	1240	585	160	950	743 ^{ab}	0.46	730 ^c	No ^a	109			
Selenium (Se)	2.4	0.42	0.48	0.20	39	19	3.7				ND			
Nickel (Ni)	27.6	17.5	27.0	22.3	160	N/A	23.3				22.8			
Lead (Pb)	41.5	24.6	23.2	15.2	400	N/A	64				14.6			
Thallium (Tl)	1.0	0.21	2.9	1.45	0.55	3.6	ND				1 ^{ab}	0.18	1	No ^d
Vanadium (V)	25.5	17.9	33.4	20.9	55	5100	17.4				20.4			
Zinc (Zn)	107	63.3	87	52.5	2300	14000	77.8				48.4			
Step 3: Non-Cancer Risk CAHI (Al, As, Fe, Hg, Mn, and Tl)								2.02				1.22		
Step 3: Cancer Risk CAHI (As)								10.5 x10 ⁻⁶				8.6 x10 ⁻⁶		
Step 5: Recalculated Non-Cancer Risk CAHI (Hg)								0.12				N/A		
Step 5: Recalculated Cancer Risk CAHI (None)								N/A				N/A		

Notes:

RBC = Risk Based Concentration; HQ = Hazard Quotient; SSL = Soil Screening Level; DAF = Dilution Attenuation Factor

Max = Maximum Concentration; Mean = Mean Concentration; AHI = Apparent Hazard Index; CAHI = Cumulative Apparent Hazard Index; PCOC = Potential Constituent of Concern

N/A = Not Applicable; ND = Constituent Not Detected Above Instrument Quantitation Limit; (C) = cancer risk screening criteria; (N) = non-cancer risk screening criteria

^a RBC (at HQ=0.1) exceedance

^b CAHI exceeds screening criterion (1 for non-cancer risk, 1x10⁻⁶ for cancer risk)

^c Mean constituent concentration exceeds mean background concentration

^d Maximum constituent concentration exceeds maximum background concentration

^e Eliminated as a PCOC via background comparison in Step 4

^f Eliminated as a PCOC via recalculated CAHI in Step 5

ATTACHMENT A: 1995, 1997 1999, and 2001 SWMU PHOTOS



Photograph No.: 1
Date: October 23, 1995

Direction: SE

Description: A view of the Phase I SWMU/AOC Investigation sample locations for the former laboratory exhaust filter (SWMU 40) at Building 12.



Photograph No.: 2
Date: November 19, 1997

Direction: --

Description: A view of concrete block sampling during removal of the former laboratory exhaust filter (SWMU 40) at Building 12.

01578AB2Y



Photograph No.: 3
Date: August 31, 1999

Direction: W

Description: A view of the former location of Building 12, following building demolition and site restoration. Monitoring well GGW11 is visible in the foreground; upgradient monitoring well GGW12 is visible in the background.



Photograph No.: 4
Date: August 9, 2001

Direction: W

Description: A view of the former location of Building 12 following building demolition and site restoration. Monitoring well GGW12 is visible in the background.