RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

Solid Waste Management Unit 45 (RAAP-24)
Site Screening Process Report

FINAL
JANUARY 2010

PREPARED BY:

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

received
4-1-10
10-42

March 29, 2010

Commander,
Radford Army Ammunition Plant
Attn: SJMRF-OP-EQ (Jim McKenna)
P.O. Box 2
Radford, VA 24141-0099

P.W. Holt
Environmental Manager
Alliant Techsystems, Inc.
Radford Army Ammunition Plant
P.O. Box 1
Radford, VA 24141-0100

Re: Radford Army Ammunition Plant, Va.
Review of Army's Final Site Screening Process (SSP) Report for
Solid Waste Management Unit (SWMU) 45

Dear Mr. McKenna and Ms. Holt:

The U.S. Environmental Protection Agency (EPA) and Virginia Department of Environmental Quality (VDEQ) have reviewed the U.S. Army's (Army's) January 2010 Final SSP Report for SWMU 45, located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia. Based upon our review, the report is approved, and in accordance with Part II. (E) (5) of RFAAP's Corrective Action Permit, it can now be considered final.

If you have any questions, please call me at 215-814-3413. Thanks.

Sincerely,

William Geiger
RCRA Project Manager
Office of Remediation (3LC20)

cc: James Cutler, VDEQ

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February 3, 2010

Mr. William Geiger
RCRA General Operations Branch, Mail Code: 3WC23
Waste and Chemicals Management Division
U. S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 24143-0100

Subject: With Certification, Solid Waste Management Unit 45 (RAAP-024), Site Screening Process Report, Final January 2010
EPA ID# VA1 210020730

Dear Mr. Geiger and Mr. Cutler:

Enclosed is the certification for the subject document that was sent to you on February2, 2010. Also enclosed is the 02 February 2010 transmittal email.

Please coordinate with and provide any questions or comments to myself at (540) 639-8658, Jerry Redder ATK staff (540) 639-7536 or Jim McKenna, ACO Staff (540) 731-5782.

Sincerely,

P.W. Holt, Environmental Manager
Alliant Techsystems Inc.

c: Karen Sismour
Virginia Department of Environmental Quality
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10-815-23
JMcKenna

Rich Mendoza
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Rock Island, Illinois 61299

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Corps of Engineers, Baltimore District
ATTN: CENAB-EN-HM
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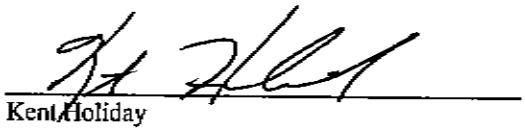
Baltimore, MD 21201

Concerning the following:

Radford Army Ammunition Plant
Solid Waste Management Unit 45 (RAAP-024)
Site Screening Process Report
Final January 2010

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

SIGNATURE:
PRINTED NAME: Antonio Munera
TITLE: LTC, CM
Commanding

SIGNATURE: 
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10-815-23
JMcKenna

Greene, Anne

From: McKenna, Jim
Sent: Tuesday, February 02, 2010 1:43 PM
To: Greene, Anne; Cutler,Jim; dennis.druck@us.army.mil; diane.wisbeck@arcadis-us.com; durwood willis2; Geiger.William@epamail.epa.gov; Redder, Jerome; jim spencer; Llewellyn, Tim; Lohman,Elizabeth; Mendoza, Rich; Meyer, Tom NAB02; Parks, Jeffrey N; Sismour,Karen; Timothy.Leahy@shawgrp.com; Tina_MacGillivray@URSCorp.com; Ryan, Susan M CIV USA IMCOM
Subject: SWMU 45 SSP Report Final (UNCLASSIFIED)
Attachments: SWMU 45 RTC USEPA Comments 11_12_2009.pdf

Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO <<SWMU 45 RTC USEPA Comments 11_12_2009.pdf>>

All:

Note the contractor will ship the subject document with a copy of this email to the POCs and tracking numbers below.

A certification letter will follow.

Attached are RFAAP responses to EPA and DEQ comments on the draft report sent via email on 07/28/2009.

Thank you for your support of the Radford Army Ammunition Plant Installation Restoration Program.

Jim McKenna

FedEx tracking numbers for the Final SWMU 45 SSP Report:

James McKenna 7932 3306 8423 2 Paper copies Will Geiger 7932 3307 2573 1 Paper copy/1 CD Jim Cutler 7983 5418 2455 1 Paper copy/1 CD Tom Meyer
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4692 1 CD Susan Ryan 7983 5419 7388 1 CD

Classification: UNCLASSIFIED
Caveats: FOUO

Response to Comments (November 12, 2009)
Comments on the *Draft Solid Waste Management Unit 45 (RAAP-24) Site Screening Process Report*, Radford Army Ammunition Plant (RAAP), Radford, Virginia, dated January 2009 (SSP Report). Received July 28, 2009.

GENERAL COMMENTS

1. The selection of chemicals of potential concern (COPCs) in Section 4.0, SSP Data Evaluation and Pre-Remedial Risk Screening, and Section 5.0, Human Health Risk Assessment is based on comparison of maximum contaminant concentrations to the October 2007 EPA Region 3 risk-based screening concentrations (RBCs) for soil and tap water. It should be noted, however, that Region 3 now relies on "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). The website was developed with DOE's Oak Ridge National Laboratory (ORNL) under an Interagency Agreement as an update of the EPA Region 3 RBC Table, Region 6 HHMSSL Table and the Region 9 PRG Table. It is suggested that future evaluations use the Regional Screening Levels (SLs), since a number of toxicity values have been updated and a number of the screening levels have changed.

   The Regional SLs may substantially differ from the RBCs since they address dermal, oral, and inhalation exposure while the RBCs only address ingestion exposure. In addition, the SLs no longer support route-to-route extrapolation and the most current toxicity data are reflected in the SL Table. Please revise the SSP Report to include a discussion in the uncertainty analysis regarding the impact of using outdated screening values, or revise the pre-remedial risk screening and human health risk assessment (HHRA) to utilize these updated values.

   Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #1): Per agreements reached in partnering meetings in June 2008 and October 2008, it was approved to utilize the October 2007 RBC table for HHRAs completed or substantially complete as of that time. The revised Regional Screening Table was not released to the public until September 2008. The results of the HHRAs for SWMU 45 and RAAP 10 (SWMUs 35, 37, 38, and AOC Q) were presented at the October 2008 meeting and will therefore utilize the April 2007 RBC table. During the October 2008 partnering meeting, it was also agreed that regardless of what toxicity data is used for the HHRA for a site, the new toxicity data would be used to calculate remedial goals. For URS, the new regional screening levels will be used starting with the Study Area at SWMU 13 RFI Report in compliance with previous agreements. If an updated value changed significantly so that it would impact the conclusions for the site, an analysis of the effects of this change will be conducted. A discussion of the use of the October 2007 RBC values versus the 2008 RSLs will be added to the uncertainties section of the report.

2. Potential subsurface soil and groundwater exposures to ecological receptors were not evaluated since these pathways were considered incomplete. However, given the

location of SWMU 45 within the New River floodplain, a potential exists for underlying waste to become exposed and site groundwater to recharge the New River. As such, the SLERA should address these two potential exposure media, or provide justification for not addressing them.

Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #2): The site was assessed in accordance with the approved work plan (Work Plan Addendum 022). The following text will be added to Section 4: "As stated in the work plan (Section 1.5.2) "While site groundwater discharge may be hydraulically connected to the New River, the completeness of this pathway is unknown. If site-related groundwater impacts are identified, an assessment of the potential impacts to the New River will be conducted via screening the groundwater data for COPCs against Virginia Water Quality Criteria and EPA Region III freshwater ecological screening values." Site-related releases from the SWMU to groundwater were not identified for the site; therefore, assessment of the New River was not required. In addition, the assessment of subsurface soil with respect to ecological receptors has not been completed for the site since the exposure (via erosion, etc.) and transport of subsurface soil COPECs to surface soil or to the New River is highly unlikely and is not considered a complete exposure pathway. Typical storm water erosion or flooding in the area would not expose subsurface soils (defined as a depth greater than 1 ft bgs). As the site is not located adjacent to high energy water features such as a coastal area with direct wave action, quantification of the subsurface pathway is not necessary.

3. The SLERA used Steps 1, 2, and 3a described in the *1997 USEPA Ecological Risk Assessment Guidance for Superfund*. However, Step 3a is not a step that can be used in a SLERA because it is the first step of a Baseline Ecological Risk Assessment (BERA). Combining Steps 1 and 2 of the SLERA with Step 3a of the BERA precludes the Scientific/Management Decision Point (SMDP) which is supposed to occur at the end of Step 2. A SMDP represents a point where the risk assessor, risk managers, and stakeholders reach consensus on the elements of the risk assessment, including risk management objectives, endpoint selection, and decision criteria before proceeding to BERA, if necessary. Combining these three distinct steps resulted in an unconventional SLERA which did not follow EPA's Ecological Risk Assessment (ERA) guidelines. Removing the consensus-based SMDP also diminished the defensibility of the risk conclusions, which were based on only two surface water and two sediment samples. Please revise the SLERA accordingly.

   Response: As discussed on the August 13, 2009 Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #3): the SLERA was completed in accordance with the approved RFAAP SLERA Framework (Revised 9/17/07). Per Ruth Prince (USEPA), the question of combining Steps 1, 2, and 3a is somewhat different. First, the EPA- approved SLERA framework allows for this. But secondly, this particular comment is a true process-only comment. We gain in streamlining and timeliness by combining the steps for often what will be a complete ecological risk assessment, and lose nothing. If there is anything inaccurate or unsatisfactory about any of the steps, including the transition from 2 to 3a, the Agencies are free to object and comment, and revisions can be made. In fact,

combining steps 1, 2, and 3a is becoming a much more common practice in general for the reasons given.
The portion of the comment relating to the basis of conclusions on two surface water and sediment samples appears to be a hold-over comment from another report. No surface water or sediment samples were assessed as part of the SSP report.

4. The SLERA uses a 'back calculation' method to evaluate the food chain exposure scenarios. This method introduces a confusing use of terms and methods that are not entirely consistent with standard EPA SLERA guidance methods. The SSP Report should be thoroughly edited to omit the use of 'dose modeling' and 'toxicity reference value' (TRVs) terms, when in reality the equations provided in section 4 generate back-calculated soil benchmarks for food chain receptors based on specific endpoints (No Observed Adverse Effect Level [NOAEL] or Lowest Observed Adverse Effect Level [LOAEL] TRVs (see section 4.5.3 on page 4-12 of the SSP Report). Also, the consistent use of benchmark versus dose should be clarified in the Assessment and Measurement Endpoints (page 4-12) for the terrestrial wildlife populations. The information indicates that modeled dose values are used as part of the measurement of risk. However, in reality, the back-calculated NOAEL or LOAEL exposure concentration (mg/kg or ug/kg) is used as the measurement tool. Please review all the SLERA portions of the document to clarify that the food chain modeling back calculates NOAEL and LOAEL soil benchmarks for use in risk characterization, and remove the inappropriate use of 'dose' terminology.

   Response: The SLERA process as presented in this SSP report is formatted in the same manner as previous SLERA submitted for review and accepted by the USEPA. The calculations are conducted in accordance with the methodology used to calculate Eco SSLs as provided in the Guidance for Developing Ecological Soil Screening Levels (OSWER Directive 9285.7-55, November 2003, Revised February 2005). The calculations are based on an HQ of 1.0 which is the condition where the exposure and the dose associated with no observed adverse effects or lowest observed adverse effects levels are equal, indicating adverse effects levels at or below this soil concentration are unlikely. Therefore, the assessment is dose based with the toxicity reference value having been calculated using the dose based NOAEL or LOAEL.

SPECIFIC COMMENTS

5. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1**: It does not appear that soil samples were analyzed for all of the analytes required by the *Site Screening Process Guidance Document*, dated October 2001 (SSP Guide), included as Appendix B. The Soil Sampling and Analysis for SWMU 45 table presented on Page 3-1 indicates that soil samples were analyzed for target analyte list (TAL) metals, target compound list (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), TCL pesticides, and explosives. Dioxins, which are required analytes on Page 3-1 of the SSP Guide, appear to have been excluded. Please revise the SSP Report to note this deviation from the SSP Guide, and provide

justification for not sampling for dioxins. Additionally, please address any impact this may have on the outcome of the SSP Report.

Response: As presented in WPA 022 (Section 1.6.5), "If evidence of burned material (i.e., ash) is apparent at one or more test pit locations, then surface soil and subsurface soil samples from up to two locations and groundwater will be submitted for analysis of TCL dioxin/furan by SW-846 Method 8290." No burned material was noted during test pit excavation; therefore, soil and groundwater samples were not submitted for dioxin/furan analysis. The following text will be added to sections 3.1.1 and 3.1.2: "Per WPA 022, since burned material (i.e., ash) was not encountered during test pit excavation, soil and groundwater samples were not submitted for dioxin/furan analysis."

6. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1:** It is noted that test pits and soil borings were completed within the site area to a maximum depth of 11 feet (ft) below ground surface (bgs). The 2007 geophysical investigation suggested that fill material may be as deep as 20 ft (Page 2-7). The rationale for not extending the borings and test pits to a depth of 20 feet has not been provided. Additional information should be included in the SSP Report which explains why the borings/trenches were terminated at a shallower depth than necessary to define the limits of the fill material. Please revise the SSP Report to include additional details explaining how the completion depths selected are representative of the site conditions and why continuing the soil investigation to define the full extent of the fill material is not warranted.

   Response: The geophysics report only provides a potential estimate of the depth of fill material at the site. During excavation of the test pits, fill material was encountered at shallow depths with a maximum depth of 8 ft bgs. Native soil was identified below the fill material as provided in the boring logs. Additional investigation to define the depth of the fill material is not warranted at the site.

7. **Section 3.1.2, Monitoring Well Installation and Groundwater Sampling, Page 3-2:** Groundwater samples were not analyzed for dioxins, even though these analytes were required by the SSP Guide. The rationale for excluding these analytes has not been provided. For clarity and defensibility, please provide the rationale for deviating from the SSP Guide.

   Response: See response to Comment #5.

8. **Section 3.4.1, Soil Investigations, Page 3-5:** It is noted that a boring was completed adjacent to test pit location 45TP3, but the specific boring which was completed has not been noted. Figure 3-1, SSP Sample Locations, does not appear to show a boring immediately adjacent to test pit location 45TP3. Please revise the SSP Report to identify the boring that was indicated as being advanced adjacent to test pit location 45TP3, and ensure its location is included on Figure 3-1.

   Response: The location for the boring advanced adjacent to 45TP3 will be provided on Figure 3-1.

9. **Section 3.4.2, Groundwater Investigation, Page 3-6:** It is noted that an additional groundwater sample was collected from 45MW2 to verify SVOC detections in the original sample. This sample does not appear to have been included on Table 3-1, Summary of Sample Identifiers, Depths, and Analytical Methods. For completion, please include the second sample collected at 45MW2 on Table 3-1.

   Response: The re-sample information will be added to Table 3-1.

10. **Section 4.2.1, Identification of COPCs, Page 4-1:** The last sentence of page 4-1 states, "Although total metals concentrations in groundwater were above screening levels, the dissolved fraction of metals in groundwater were below the screening levels; therefore, these metals were not selected as COPCs for groundwater..." This approach is unacceptable since these groundwater samples were collected from monitoring wells (and not via direct push techniques), and deviates from the process outlined in the SSP Guide. Page 3-1 of the SSP Guide states that "only unfiltered [total] organic and metals results will be considered in the assessments (except in circumstances where monitoring wells do not produce samples with sufficiently low solids for a reasonable risk screening to be performed)." The SSP Report has not presented any evidence to indicate that the monitoring wells did not produce samples with sufficiently low solids. Please revise the SSP Report to select contaminants of potential concern in groundwater using total metals results. This comment also applies to the selection of metal COPCs in the human health risk assessment presented in Section 5.0.

    Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #1): Betty Ann Quinn (USEPA) stated that she wanted to see both sets of analytical data, but that typically, only the dissolved metals concentrations needed to be carried through in the risk assessment. She also added that, if it appeared that there was something unusual about the results, the total metals may be more representative of aquifer conditions. As presented in Table 4-4, note that total metals above screening levels were detected in groundwater sample 45MW4 which had a turbidity of 19.99 nepthlometric turbidity units. The total and dissolved data are provided in the SSP report and the dissolved data are used in the screenings and HHRA.

11. **Section 4.2.2, Cumulative Risk Screen, Page 4-2:** The discussion in Section 4.2.2 notes that exposure point concentrations (EPCs) were calculated for this assessment, but the process for developing EPCs has not been presented (i.e., using EPA's ProUCL software). For clarity, please revise the SSP Report to describe how EPCs were calculated, and append any supporting documentation as appropriate.

    Response: The following text will be added to Section 4.2.2: "Methods used to calculate 95% UCLs (EPCs) are based on guidance provided in the following documents *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA 2002b) and *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations* (USEPA 2006a). In general, the method used to calculate a 95% UCL

depends on: 1) the number of samples, 2) the prevalence of non-detects, and 3) the data distribution (e.g., normal or lognormal). Non-detects introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore, distributional assumptions are difficult to make for COPCs with a high rate of non-detects. ProUCL 4.0 (USEPA 2007c) is used to calculate EPCs for the sites with the exception of data sets with a low frequency of detection for which the MDC was used in the risk screenings."

12. **Section 4.3.1.1, Ecological Site Characterization, Page 4-9:** This section states that "The Virginia Department of Game and Inland Fisheries survey identified three threatened wildlife species and two rare plant species associated with RAAP grassland communities." The SLERA needs to state if these species are anticipated to be present at or around SWMU 45, and the amount of risk that these species may (or may not) encounter from the potential site-related exposure pathways. The SSP Report does not provide enough information to help determine if these species are present, or could be affected by the site. Please revise the SSP Report to address this concern.

    Response: The following text will be added to Section 4.3.1.1: "No threatened wildlife species or rare plant species were identified at the site."

13. **Section 4.3.3.1, Data Organization, Page 4-11:** This section summarizes the surface soil samples used in the SLERA. Understanding the location of these samples in relation to site features could be a useful line of evidence for the risk characterization. The photographs in Appendix F.1 show that the site is heavily vegetated. The ability to co-locate the soil samples and their results with site features (vegetation, physical disturbance etc.) would help the SLERA. This issue is especially important for the risk characterization since it appears that certain COPECs are co-located, as are their highest concentrations (see also Section 4.3.7, Risk Management – Scientific Management Decision Point). Please provide a map showing the location of these samples in relation to the habitat setting, and also provide co-located photograph references. The risk conclusions in Section 4.3.7 should be revisited to describe the geospatial setting of COPEC occurrence in relation to each other as well as to the surrounding habitat.

    Response: Text will be added to the last sentences of paragraphs 2 and 3 of Section 4.3.7 to reference Figure 4-3 which presents sample location and metal debris areas. The photographs provided in Appendix F.1 depict the overall site conditions and do not relate to specific sample locations. As shown on Figure 2-10, the site itself consists of a small cleared area located in the center of the study area (location of 45TP3, 45TP6, 45TP7, and 45SB4) with the remainder of the study area being vegetated woodland areas.

14. **Section 4.3.5.2, Dose Rate Modeling Approach, Page 4-13:** The text indicates that the information in this section provides the methods for 'dose rate modeling'. It is incorrect to use this phrase since the method back-calculates receptor-specific soil benchmarks. Please correct the terminology to reflect the risk threshold(s) developed from the approach developed in the document.

Response: See response to Comment #4.

15. **Section 4.3.6.2, Dose Rate Modeling Approach, Page 4-15:** The equation does not provide enough detail to describe the dose associated with each food type. The variables in the denominator parenthesis need to contain subscripts to denote i.e. the '$_i$th' food type that is summed. Please correct this equation to provide all the information needed to understand how the ingestion dose is calculated.

    Response: The *i*th food type will be noted throughout the report for refined dose rate modeling.

16. **Section 4.5, Nature and Extent Assessment, Page 4-19:** The nature and extent assessment is limited to landfill debris, and does not address the nature and extent of individual chemicals identified at the site. Therefore, it is unclear whether the limited sampling at this site has been sufficient to adequately characterize overall site conditions. Of concern is that two surface soil samples collected from test pits (45TP2A and 45TP4A) reported PCB and PAHs above applicable screening criteria, but very few or no surface soil samples were collected in the near vicinity of these test pits to further define the extent of this contamination. Please revise the SSP Report to include a more thorough evaluation of the extent of contamination of individual chemicals identified at the site, and indicate whether any data gaps remain with respect to the PCB and PAH contamination identified in surface soil at the site. Further, please expand the discussion presented in Section 4.5 to also discuss the chemical constituents detected and any associated conclusions which can be drawn, or any correlations which can be made between the debris and constituents detected.

    Response: A nature and extent assessment is not included as part of the SSP process. Section 4.5 describing the area of landfill material is provided for information purposes only to provide an understanding of the small size of the landfill itself.

17. **Section 5.2.2, Identification of Exposure Pathways, Page 5-4:** The complete exposure scenarios identified on the summary table on Page 5-4 are inconsistent with the complete exposure scenarios identified in Appendix E, Table E.1-1, Selection of Exposure Pathways. Table E.1-1 notes that exposure to surface soil for the future commercial/industrial worker, future construction worker, and future resident is potentially complete, and will be evaluated quantitatively. However, the summary table on Page 5-4 has not selected exposure to surface soil as a potentially complete exposure pathway for those receptors. Please revise the SSP Report to address this discrepancy.

    Response: As noted on the summary table on page 5-4 (note #3), "The evaluation of total soil assumes that construction, excavation, or other activities "mix" the surface and subsurface soil, thus changing the constituent concentrations on the surface." Therefore, under a future land use scenario (including the future commercial/industrial worker, future construction worker, future maintenance worker, and future resident) as also described in Section 5.2.2.2, these receptors are assessed for exposure to total soil.

18. **Section 5.2.3, Calculation of EPCs, Page 5-6**: The Johnson and Ettinger model (JEM) based on U.S. Environmental Protection Agency (EPA) 2004 guidance "*User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion Into Buildings*" was used to estimate indoor air concentrations of volatiles migrating from groundwater through the subsurface and into a structure. However, the SSP Report has not provided the basis for all the site-specific inputs into the model. To ensure that the assumptions used in the JEM were applicable to the site, please provide a brief discussion that describes the basis for the inputs selected in the JEM applied to the site.

    Response: The third sentence of the fourth paragraph of Section 5.2.3 will be revised as follows: "Utilizing the MDC in groundwater and site specific soil physical properties (as presented in Appendix E-4), the Johnson and Ettinger Model (Johnson et al 1991 – updated 2004) was used to estimate indoor air concentration of volatile COPCs migrating from groundwater through the soil and into a structure."

19. **Section 5.3, Toxicity Assessment, Page 5-6:** It is stated that toxicity criteria were obtained from the 2007 USEPA Region III RBC Table. As previously noted, this table has been superseded by the Regional SL table. Updated toxicity criteria are now available for several COPCs. For example, the oral reference dose (RfD) for cobalt listed in Table E.1-5.1 of Appendix E is 2.00E-02; however, the Regional SL now indicates that the oral RfD for cobalt is 3.00E-04. Please revise the SSP Report to use the most current toxicity values available. Recalculate the risks/hazards based on the current toxicity values or alternately, demonstrate in the uncertainty analysis how the use of the new toxicity data would impact the overall conclusions of the HHRA.

    Response: See response to Comment #1.

20. **Appendix D.2.2, Site Screening Process Boring Logs**: The boring logs for several borings do not include photoionization detector (PID) measurements. For example, the boring log for 45SC2, 45SC3, 45SC6, 45SC7, 45SC9 – 45SC13, 45SC15, 45SC16, and 45MW4 do not include PID measurements. The SSP Report does not address why PID screening values are included for some borings and not others. Please clarify why PID measurements are not available for all borings, and ensure that this issue is discussed in Section 3.4, Work Plan Field Changes.

    Response: Site characterization borings 45SC3, 45SC6, 45SC7, 45SC9 – 45SC13, 45SC15, and 45SC16 were completed only to identify the presence or absence of potential landfill material; therefore, PID readings were not collected for these site characterization borings. PID readings were not collected in the field for 45MW4. This information will be added to Section 3.4.

21. **Appendix D.2.2, Site Screening Process Boring Logs:** The log for Test Pit 3 (45TP3) appears to refer to the samples collected at this test pit inconsistently. Under the Sample Number column of the boring log, the samples are identified as 45TP3A and 45TP3B; however, the Field Notes column refers to the samples as 45TP1A and 45TP1B. Please

revise this boring log to address this discrepancy, and assure that the samples submitted were actually given their own unique sample name.

Response: The test pit log for 45TP3 will be revised to reflect samples 45TP3A and 45TP3B were collected from the test pit.

22. **Appendix E, Human Health Risk Assessment, Table E.1-4.1a:** It is unclear why an exposure frequency (EF) of 50 days is being used for maintenance workers. The footnote on this table indicates that site maintenance is anticipated to be conducted once a week with two weeks of vacation a year. However, please note that the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites,* dated December 2002 (SSL Guidance), indicates that an EF of 225 days should be used for outdoor workers in roles including, but not limited to, groundskeepers, gardeners, specified mechanics and repairers, non-specified mechanics and repairers, construction and maintenance workers, and painters. While it appears that maintenance workers at SWMU 45 may not encounter the site this frequently, the SSP Report should include further rationale for not selecting an EF of 225 days or other value falling between the value used by RAAP and the EPA recommended value (e.g., 100 days, assuming 2 days per week per year, with 2 weeks vacation). Please revise the HHRA to further support the professional judgment that 50 days is the most representative EF for a maintenance worker at this site by describing the anticipated type of maintenance work that is likely to occur. The discussion should demonstrate why the proposed value of 50 days is more appropriate than the EF recommended in the SSL Guidance or any value between 50 and 225 days (e.g., 100 days). Alternately, revise the HHRA to use an EF of 225 days for maintenance workers or other value (e.g., 100 days) demonstrated to be more appropriate for this receptor type.

Response: Note 1 on Table E.1-4.1a will be revised as follows: "(1) Best professional judgment. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation. This is considered a conservative exposure frequency based on the nature of maintenance activities likely conducted at the site which would include occasional mowing since the site not active."

23. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The ingestion rate (IR) of tap water by a commercial worker is listed as 1 liter per day. However, Exhibit 1-2 of the SSL Guidance recommends an IR of 2 liters per day for both indoor and outdoor commercial workers. Please revise the HHRA to further support the use of 1 liter per day ingestion rate, or alternately, revise the HHRA to use an IR of 2 liters per day for commercial workers.

Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #6): Betty Ann Quinn (USEPA) stated that due to the inclusion of the residential scenario which uses an ingestion rate of 2 L/day that the use of an ingestion rate of 1L/day for the commercial worker is acceptable.

24. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The skin surface area available for contact with tap water for a commercial worker is listed as 800 square centimeters per day (cm^2/day). A reference for this information has not been provided. The first note on the table indicates that this value was selected based on best professional judgment of the mean surface area for hands for men and women. However, a more specific reference for the mean surface area value should be provided. Please revise the HHRA to present this information.

    Response: On Table E.1-4.2a, note (1) will be revised as follows: "(1) Best Professional Judgment. Based on the mean surface area for hands for men and women (USEPA, 2004).

25. **Appendix E, Human Health Risk Assessment, Table E.1-4.2b:** Note 7 at the bottom of the table references "USEPA, 2003" for an inhalation rate value. However, the complete USEPA reference has not been provided. For defensibility and transparency, please provide the complete reference for the inhalation rate value.

    Response: The following reference will be added to Table E.1-4.2b: USEPA, 2003. EPA Region III Risk-Based Concentration Table: Technical Background Information. Revised 4/16/2003.

26. **Appendix F.1, Section 4.4, Pages 7 and 8:** Small errors were noted in the calculations provided in the examples. For instance, the C_{TRV} should be 5.58E-01 mg/kg and the NOAEL HQ should be 2.15E+0 mg/kg. These adjusted values affect the remaining calculations. Please correct these errors.

    Response: Upon review of the calculations in Section F.1, Section 4.4, pages 7 and 8, the original calculations are correct.

Tina MacGillivray/Richmond/URSCorp
01/20/2010 02:20 PM

To Lee Mareck/Richmond/URSCorp@URSCorp
cc
bcc
Subject Fw: SWMU 45 SSP RTCs

Geiger.William@epamail.epa.gov
01/20/2010 02:10 PM

To "McKenna, Jim J Mr CIV USA AMC" <jim.mckenna@us.army.mil>
cc "Cutler,Jim" <James.Cutler@deq.virginia.gov>, "jim spencer" <james_o_spencer@urscorp.com>, jerome.redder@atk.com, "Mendoza, Richard R Mr CIV USA IMCOM" <richard.r.mendoza@us.army.mil>, Timothy.Leahy@shawgrp.com, "Meyer, Tom NAB02" <Tom.Meyer@usace.army.mil>
Subject SWMU 45 SSP RTCs

EPA and VDEQ have reviewed and approve of Radford's 11/12/09 Response to our 7/09 comments on the SWMU 45 Site Screening Process Report.

As discussed at the November 2009 Quarterly Meeting, institutional controls for the waste left in place will need to be documented as part of the final remedy at SWMU 45. EPA, VDEQ, and Radford will ensure that the documentation and controls are consistent with those of similar AOCs/SMWUs at Radford and other RCRA facilities.

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"McKenna, Jim J Mr CIV USA AMC "
<jim.mckenna@us.army.mil>
11/13/09 02:06 PM

To <diane.wisbeck@arcadis-us.com>, <Geiger.William@epamail.epa.gov>, <jerome.redder@atk.com>, "jim spencer"
cc
bcc
Subject RE: Agenda topics for 18 Nov 2009 Partnering Meeting (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: FOUO

Will, Jim Cutler and all,

Attaching the following for our 18 Nov 2009 meeting.

1. Two pdf files containing examples/excerpt of Statement of Basis and Site Status Update for use in issuing the RCRA CORA Permit. Note these are internal drafts and therefore are a work in progress but wanted you to see where we are with them.

2. "List of Planned and Submitted Documents" 09 Nov 2009

3. IRP "Status Update" Nov 2009

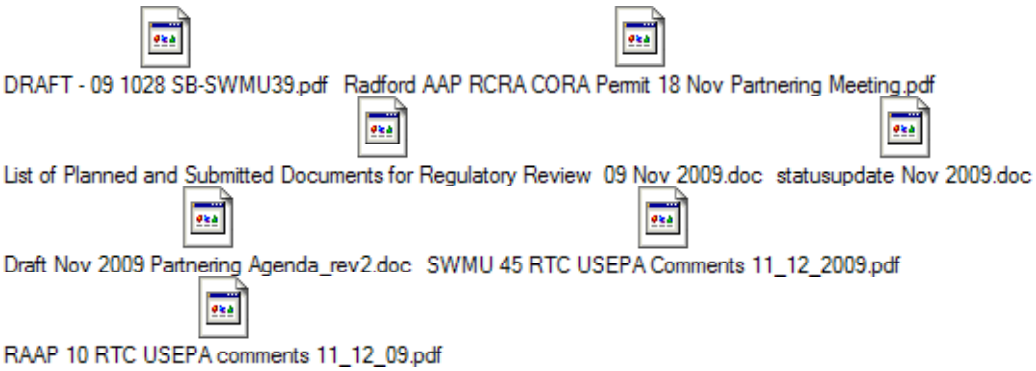
4. Draft meeting agenda, same as I sent before

5. RTCs for SWMU 45 SSP and RAAP-010 RFI reports

Please send to others in your organization who need to see this.

Thanks,
Jim

Classification: UNCLASSIFIED
Caveats: FOUO



Response to Comments (November 9, 2009)
Comments on the *Draft Solid Waste Management Unit 45 (RAAP-24) Site Screening Process Report*, Radford Army Ammunition Plant (RAAP), Radford, Virginia, dated January 2009 (SSP Report). Received July 28, 2009.

GENERAL COMMENTS

1. The selection of chemicals of potential concern (COPCs) in Section 4.0, SSP Data Evaluation and Pre-Remedial Risk Screening, and Section 5.0, Human Health Risk Assessment is based on comparison of maximum contaminant concentrations to the October 2007 EPA Region 3 risk-based screening concentrations (RBCs) for soil and tap water. It should be noted, however, that Region 3 now relies on "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). The website was developed with DOE's Oak Ridge National Laboratory (ORNL) under an Interagency Agreement as an update of the EPA Region 3 RBC Table, Region 6 HHMSSL Table and the Region 9 PRG Table. It is suggested that future evaluations use the Regional Screening Levels (SLs), since a number of toxicity values have been updated and a number of the screening levels have changed.

   The Regional SLs may substantially differ from the RBCs since they address dermal, oral, and inhalation exposure while the RBCs only address ingestion exposure. In addition, the SLs no longer support route-to-route extrapolation and the most current toxicity data are reflected in the SL Table. Please revise the SSP Report to include a discussion in the uncertainty analysis regarding the impact of using outdated screening values, or revise the pre-remedial risk screening and human health risk assessment (HHRA) to utilize these updated values.

   Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #1): Per agreements reached in partnering meetings in June 2008 and October 2008, it was approved to utilize the October 2007 RBC table for HHRAs completed or substantially complete as of that time. The revised Regional Screening Table was not released to the public until September 2008. The results of the HHRAs for SWMU 45 and RAAP 10 (SWMUs 35, 37, 38, and AOC Q) were presented at the October 2008 meeting and will therefore utilize the April 2007 RBC table. During the October 2008 partnering meeting, it was also agreed that regardless of what toxicity data is used for the HHRA for a site, the new toxicity data would be used to calculate remedial goals. For URS, the new regional screening levels will be used starting with the Study Area at SWMU 13 RFI Report in compliance with previous agreements. If an updated value changed significantly so that it would impact the conclusions for the site, an analysis of the effects of this change will be conducted. A discussion of the use of the October 2007 RBC values versus the 2008 RSLs will be added to the uncertainties section of the report.

2. Potential subsurface soil and groundwater exposures to ecological receptors were not evaluated since these pathways were considered incomplete. However, given the

location of SWMU 45 within the New River floodplain, a potential exists for underlying waste to become exposed and site groundwater to recharge the New River. As such, the SLERA should address these two potential exposure media, or provide justification for not addressing them.

Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #2): The site was assessed in accordance with the approved work plan (Work Plan Addendum 022). The following text will be added to Section 4: "As stated in the work plan (Section 1.5.2) "While site groundwater discharge may be hydraulically connected to the New River, the completeness of this pathway is unknown. If site-related groundwater impacts are identified, an assessment of the potential impacts to the New River will be conducted via screening the groundwater data for COPCs against Virginia Water Quality Criteria and EPA Region III freshwater ecological screening values." Site-related releases from the SWMU to groundwater were not identified for the site; therefore, assessment of the New River was not required. In addition, the assessment of subsurface soil with respect to ecological receptors has not been completed for the site since the exposure (via erosion, etc.) and transport of subsurface soil COPECs to surface soil or to the New River is highly unlikely and is not considered a complete exposure pathway. Typical storm water erosion or flooding in the area would not expose subsurface soils (defined as a depth greater than 1 ft bgs). As the site is not located adjacent to high energy water features such as a coastal area with direct wave action, quantification of the subsurface pathway is not necessary.

3. The SLERA used Steps 1, 2, and 3a described in the *1997 USEPA Ecological Risk Assessment Guidance for Superfund*. However, Step 3a is not a step that can be used in a SLERA because it is the first step of a Baseline Ecological Risk Assessment (BERA). Combining Steps 1 and 2 of the SLERA with Step 3a of the BERA precludes the Scientific/Management Decision Point (SMDP) which is supposed to occur at the end of Step 2. A SMDP represents a point where the risk assessor, risk managers, and stakeholders reach consensus on the elements of the risk assessment, including risk management objectives, endpoint selection, and decision criteria before proceeding to BERA, if necessary. Combining these three distinct steps resulted in an unconventional SLERA which did not follow EPA's Ecological Risk Assessment (ERA) guidelines. Removing the consensus-based SMDP also diminished the defensibility of the risk conclusions, which were based on only two surface water and two sediment samples. Please revise the SLERA accordingly.

   Response: As discussed on the August 13, 2009 Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #3): the SLERA was completed in accordance with the approved RFAAP SLERA Framework (Revised 9/17/07). Per Ruth Prince (USEPA), the question of combining Steps 1, 2, and 3a is somewhat different. First, the EPA- approved SLERA framework allows for this. But secondly, this particular comment is a true process-only comment. We gain in streamlining and timeliness by combining the steps for often what will be a complete ecological risk assessment, and lose nothing. If there is anything inaccurate or unsatisfactory about any of the steps, including the transition from 2 to 3a, the Agencies are free to object and comment, and revisions can be made. In fact,

combining steps 1, 2, and 3a is becoming a much more common practice in general for the reasons given.
The portion of the comment relating to the basis of conclusions on two surface water and sediment samples appears to be a hold-over comment from another report. No surface water or sediment samples were assessed as part of the SSP report.

4. The SLERA uses a 'back calculation' method to evaluate the food chain exposure scenarios. This method introduces a confusing use of terms and methods that are not entirely consistent with standard EPA SLERA guidance methods. The SSP Report should be thoroughly edited to omit the use of 'dose modeling' and 'toxicity reference value' (TRVs) terms, when in reality the equations provided in section 4 generate back-calculated soil benchmarks for food chain receptors based on specific endpoints (No Observed Adverse Effect Level [NOAEL] or Lowest Observed Adverse Effect Level [LOAEL] TRVs (see section 4.5.3 on page 4-12 of the SSP Report). Also, the consistent use of benchmark versus dose should be clarified in the Assessment and Measurement Endpoints (page 4-12) for the terrestrial wildlife populations. The information indicates that modeled dose values are used as part of the measurement of risk. However, in reality, the back-calculated NOAEL or LOAEL exposure concentration (mg/kg or ug/kg) is used as the measurement tool. Please review all the SLERA portions of the document to clarify that the food chain modeling back calculates NOAEL and LOAEL soil benchmarks for use in risk characterization, and remove the inappropriate use of 'dose' terminology.

   Response: The SLERA process as presented in this SSP report is formatted in the same manner as previous SLERA submitted for review and accepted by the USEPA. The calculations are conducted in accordance with the methodology used to calculate Eco SSLs as provided in the Guidance for Developing Ecological Soil Screening Levels (OSWER Directive 9285.7-55, November 2003, Revised February 2005). The calculations are based on an HQ of 1.0 which is the condition where the exposure and the dose associated with no observed adverse effects or lowest observed adverse effects levels are equal, indicating adverse effects levels at or below this soil concentration are unlikely. Therefore, the assessment is dose based with the toxicity reference value having been calculated using the dose based NOAEL or LOAEL.

SPECIFIC COMMENTS

5. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1**: It does not appear that soil samples were analyzed for all of the analytes required by the *Site Screening Process Guidance Document*, dated October 2001 (SSP Guide), included as Appendix B. The Soil Sampling and Analysis for SWMU 45 table presented on Page 3-1 indicates that soil samples were analyzed for target analyte list (TAL) metals, target compound list (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), TCL pesticides, and explosives. Dioxins, which are required analytes on Page 3-1 of the SSP Guide, appear to have been excluded. Please revise the SSP Report to note this deviation from the SSP Guide, and provide

justification for not sampling for dioxins. Additionally, please address any impact this may have on the outcome of the SSP Report.

Response: As presented in WPA 022 (Section 1.6.5), "If evidence of burned material (i.e., ash) is apparent at one or more test pit locations, then surface soil and subsurface soil samples from up to two locations and groundwater will be submitted for analysis of TCL dioxin/furan by SW-846 Method 8290." No burned material was noted during test pit excavation; therefore, soil and groundwater samples were not submitted for dioxin/furan analysis. The following text will be added to sections 3.1.1 and 3.1.2: "Per WPA 022, since burned material (i.e., ash) was not encountered during test pit excavation, soil and groundwater samples were not submitted for dioxin/furan analysis."

6. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1:** It is noted that test pits and soil borings were completed within the site area to a maximum depth of 11 feet (ft) below ground surface (bgs). The 2007 geophysical investigation suggested that fill material may be as deep as 20 ft (Page 2-7). The rationale for not extending the borings and test pits to a depth of 20 feet has not been provided. Additional information should be included in the SSP Report which explains why the borings/trenches were terminated at a shallower depth than necessary to define the limits of the fill material. Please revise the SSP Report to include additional details explaining how the completion depths selected are representative of the site conditions and why continuing the soil investigation to define the full extent of the fill material is not warranted.

   Response: The geophysics report only provides a potential estimate of the depth of fill material at the site. During excavation of the test pits, fill material was encountered at shallow depths with a maximum depth of 8 ft bgs. Native soil was identified below the fill material as provided in the boring logs. Additional investigation to define the depth of the fill material is not warranted at the site.

7. **Section 3.1.2, Monitoring Well Installation and Groundwater Sampling, Page 3-2:** Groundwater samples were not analyzed for dioxins, even though these analytes were required by the SSP Guide. The rationale for excluding these analytes has not been provided. For clarity and defensibility, please provide the rationale for deviating from the SSP Guide.

   Response: See response to Comment #5.

8. **Section 3.4.1, Soil Investigations, Page 3-5:** It is noted that a boring was completed adjacent to test pit location 45TP3, but the specific boring which was completed has not been noted. Figure 3-1, SSP Sample Locations, does not appear to show a boring immediately adjacent to test pit location 45TP3. Please revise the SSP Report to identify the boring that was indicated as being advanced adjacent to test pit location 45TP3, and ensure its location is included on Figure 3-1.

   Response: The location for the boring advanced adjacent to 45TP3 will be provided on Figure 3-1.

9. **Section 3.4.2, Groundwater Investigation, Page 3-6:** It is noted that an additional groundwater sample was collected from 45MW2 to verify SVOC detections in the original sample. This sample does not appear to have been included on Table 3-1, Summary of Sample Identifiers, Depths, and Analytical Methods. For completion, please include the second sample collected at 45MW2 on Table 3-1.

   Response: The re-sample information will be added to Table 3-1.

10. **Section 4.2.1, Identification of COPCs, Page 4-1**: The last sentence of page 4-1 states, "Although total metals concentrations in groundwater were above screening levels, the dissolved fraction of metals in groundwater were below the screening levels; therefore, these metals were not selected as COPCs for groundwater…" This approach is unacceptable since these groundwater samples were collected from monitoring wells (and not via direct push techniques), and deviates from the process outlined in the SSP Guide. Page 3-1 of the SSP Guide states that "only unfiltered [total] organic and metals results will be considered in the assessments (except in circumstances where monitoring wells do not produce samples with sufficiently low solids for a reasonable risk screening to be performed)." The SSP Report has not presented any evidence to indicate that the monitoring wells did not produce samples with sufficiently low solids. Please revise the SSP Report to select contaminants of potential concern in groundwater using total metals results. This comment also applies to the selection of metal COPCs in the human health risk assessment presented in Section 5.0.

    Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #1): Betty Ann Quinn (USEPA) stated that she wanted to see both sets of analytical data, but that typically, only the dissolved metals concentrations needed to be carried through in the risk assessment. She also added that, if it appeared that there was something unusual about the results, the total metals may be more representative of aquifer conditions. As presented in Table 4-4, note that total metals above screening levels were detected in groundwater sample 45MW4 which had a turbidity of 19.99 nepthlometric turbidity units. The total and dissolved data are provided in the SSP report and the dissolved data are used in the screenings and HHRA.

11. **Section 4.2.2, Cumulative Risk Screen, Page 4-2:** The discussion in Section 4.2.2 notes that exposure point concentrations (EPCs) were calculated for this assessment, but the process for developing EPCs has not been presented (i.e., using EPA's ProUCL software). For clarity, please revise the SSP Report to describe how EPCs were calculated, and append any supporting documentation as appropriate.

    Response: The following text will be added to Section 4.2.2: "Methods used to calculate 95% UCLs (EPCs) are based on guidance provided in the following documents *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA 2002b) and *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations* (USEPA 2006a). In general, the method used to calculate a 95% UCL

depends on: 1) the number of samples, 2) the prevalence of non-detects, and 3) the data distribution (e.g., normal or lognormal). Non-detects introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore, distributional assumptions are difficult to make for COPCs with a high rate of non-detects. ProUCL 4.0 (USEPA 2007c) is used to calculate EPCs for the sites with the exception of data sets with a low frequency of detection for which the MDC was used in the risk screenings."

12. **Section 4.3.1.1, Ecological Site Characterization, Page 4-9:** This section states that "The Virginia Department of Game and Inland Fisheries survey identified three threatened wildlife species and two rare plant species associated with RAAP grassland communities." The SLERA needs to state if these species are anticipated to be present at or around SWMU 45, and the amount of risk that these species may (or may not) encounter from the potential site-related exposure pathways. The SSP Report does not provide enough information to help determine if these species are present, or could be affected by the site. Please revise the SSP Report to address this concern.

    Response: The following text will be added to Section 4.3.1.1: "No threatened wildlife species or rare plant species were identified at the site."

13. **Section 4.3.3.1, Data Organization, Page 4-11:** This section summarizes the surface soil samples used in the SLERA. Understanding the location of these samples in relation to site features could be a useful line of evidence for the risk characterization. The photographs in Appendix F.1 show that the site is heavily vegetated. The ability to co-locate the soil samples and their results with site features (vegetation, physical disturbance etc.) would help the SLERA. This issue is especially important for the risk characterization since it appears that certain COPECs are co-located, as are their highest concentrations (see also Section 4.3.7, Risk Management – Scientific Management Decision Point). Please provide a map showing the location of these samples in relation to the habitat setting, and also provide co-located photograph references. The risk conclusions in Section 4.3.7 should be revisited to describe the geospatial setting of COPEC occurrence in relation to each other as well as to the surrounding habitat.

    Response: Text will be added to the last sentences of paragraphs 2 and 3 of Section 4.3.7 to reference Figure 4-3 which presents sample location and metal debris areas. The photographs provided in Appendix F.1 depict the overall site conditions and do not relate to specific sample locations. As shown on Figure 2-10, the site itself consists of a small cleared area located in the center of the study area (location of 45TP3, 45TP6, 45TP7, and 45SB4) with the remainder of the study area being vegetated woodland areas.

14. **Section 4.3.5.2, Dose Rate Modeling Approach, Page 4-13:** The text indicates that the information in this section provides the methods for 'dose rate modeling'. It is incorrect to use this phrase since the method back-calculates receptor-specific soil benchmarks. Please correct the terminology to reflect the risk threshold(s) developed from the approach developed in the document.

Response: See response to Comment #4.

15. **Section 4.3.6.2, Dose Rate Modeling Approach, Page 4-15:** The equation does not provide enough detail to describe the dose associated with each food type. The variables in the denominator parenthesis need to contain subscripts to denote i.e. the '$_i$th' food type that is summed. Please correct this equation to provide all the information needed to understand how the ingestion dose is calculated.

    Response: The *i*th food type will be noted throughout the report for refined dose rate modeling.

16. **Section 4.5, Nature and Extent Assessment, Page 4-19:** The nature and extent assessment is limited to landfill debris, and does not address the nature and extent of individual chemicals identified at the site. Therefore, it is unclear whether the limited sampling at this site has been sufficient to adequately characterize overall site conditions. Of concern is that two surface soil samples collected from test pits (45TP2A and 45TP4A) reported PCB and PAHs above applicable screening criteria, but very few or no surface soil samples were collected in the near vicinity of these test pits to further define the extent of this contamination. Please revise the SSP Report to include a more thorough evaluation of the extent of contamination of individual chemicals identified at the site, and indicate whether any data gaps remain with respect to the PCB and PAH contamination identified in surface soil at the site. Further, please expand the discussion presented in Section 4.5 to also discuss the chemical constituents detected and any associated conclusions which can be drawn, or any correlations which can be made between the debris and constituents detected.

    Response: A nature and extent assessment is not included as part of the SSP process. Section 4.5 describing the area of landfill material is provided for information purposes only to provide an understanding of the small size of the landfill itself.

17. **Section 5.2.2, Identification of Exposure Pathways, Page 5-4:** The complete exposure scenarios identified on the summary table on Page 5-4 are inconsistent with the complete exposure scenarios identified in Appendix E, Table E.1-1, Selection of Exposure Pathways. Table E.1-1 notes that exposure to surface soil for the future commercial/industrial worker, future construction worker, and future resident is potentially complete, and will be evaluated quantitatively. However, the summary table on Page 5-4 has not selected exposure to surface soil as a potentially complete exposure pathway for those receptors. Please revise the SSP Report to address this discrepancy.

    Response: As noted on the summary table on page 5-4 (note #3), "The evaluation of total soil assumes that construction, excavation, or other activities "mix" the surface and subsurface soil, thus changing the constituent concentrations on the surface." Therefore, under a future land use scenario (including the future commercial/industrial worker, future construction worker, future maintenance worker, and future resident) as also described in Section 5.2.2.2, these receptors are assessed for exposure to total soil.

18. **Section 5.2.3, Calculation of EPCs, Page 5-6**: The Johnson and Ettinger model (JEM) based on U.S. Environmental Protection Agency (EPA) 2004 guidance "*User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion Into Buildings"* was used to estimate indoor air concentrations of volatiles migrating from groundwater through the subsurface and into a structure. However, the SSP Report has not provided the basis for all the site-specific inputs into the model. To ensure that the assumptions used in the JEM were applicable to the site, please provide a brief discussion that describes the basis for the inputs selected in the JEM applied to the site.

    Response: The third sentence of the fourth paragraph of Section 5.2.3 will be revised as follows: "Utilizing the MDC in groundwater and site specific soil physical properties (as presented in Appendix E-4), the Johnson and Ettinger Model (Johnson et al 1991 – updated 2004) was used to estimate indoor air concentration of volatile COPCs migrating from groundwater through the soil and into a structure."

19. **Section 5.3, Toxicity Assessment, Page 5-6:** It is stated that toxicity criteria were obtained from the 2007 USEPA Region III RBC Table. As previously noted, this table has been superseded by the Regional SL table. Updated toxicity criteria are now available for several COPCs. For example, the oral reference dose (RfD) for cobalt listed in Table E.1-5.1 of Appendix E is 2.00E-02; however, the Regional SL now indicates that the oral RfD for cobalt is 3.00E-04. Please revise the SSP Report to use the most current toxicity values available. Recalculate the risks/hazards based on the current toxicity values or alternately, demonstrate in the uncertainty analysis how the use of the new toxicity data would impact the overall conclusions of the HHRA.

    Response: See response to Comment #1.

20. **Appendix D.2.2, Site Screening Process Boring Logs**: The boring logs for several borings do not include photoionization detector (PID) measurements. For example, the boring log for 45SC2, 45SC3, 45SC6, 45SC7, 45SC9 – 45SC13, 45SC15, 45SC16, and 45MW4 do not include PID measurements. The SSP Report does not address why PID screening values are included for some borings and not others. Please clarify why PID measurements are not available for all borings, and ensure that this issue is discussed in Section 3.4, Work Plan Field Changes.

    Response: Site characterization borings 45SC3, 45SC6, 45SC7, 45SC9 – 45SC13, 45SC15, and 45SC16 were completed only to identify the presence or absence of potential landfill material; therefore, PID readings were not collected for these site characterization borings. PID readings were not collected in the field for 45MW4. This information will be added to Section 3.4.

21. **Appendix D.2.2, Site Screening Process Boring Logs:** The log for Test Pit 3 (45TP3) appears to refer to the samples collected at this test pit inconsistently. Under the Sample Number column of the boring log, the samples are identified as 45TP3A and 45TP3B; however, the Field Notes column refers to the samples as 45TP1A and 45TP1B. Please

revise this boring log to address this discrepancy, and assure that the samples submitted were actually given their own unique sample name.

Response: The test pit log for 45TP3 will be revised to reflect samples 45TP3A and 45TP3B were collected from the test pit.

22. **Appendix E, Human Health Risk Assessment, Table E.1-4.1a:** It is unclear why an exposure frequency (EF) of 50 days is being used for maintenance workers. The footnote on this table indicates that site maintenance is anticipated to be conducted once a week with two weeks of vacation a year. However, please note that the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites,* dated December 2002 (SSL Guidance), indicates that an EF of 225 days should be used for outdoor workers in roles including, but not limited to, groundskeepers, gardeners, specified mechanics and repairers, non-specified mechanics and repairers, construction and maintenance workers, and painters. While it appears that maintenance workers at SWMU 45 may not encounter the site this frequently, the SSP Report should include further rationale for not selecting an EF of 225 days or other value falling between the value used by RAAP and the EPA recommended value (e.g., 100 days, assuming 2 days per week per year, with 2 weeks vacation). Please revise the HHRA to further support the professional judgment that 50 days is the most representative EF for a maintenance worker at this site by describing the anticipated type of maintenance work that is likely to occur. The discussion should demonstrate why the proposed value of 50 days is more appropriate than the EF recommended in the SSL Guidance or any value between 50 and 225 days (e.g., 100 days). Alternately, revise the HHRA to use an EF of 225 days for maintenance workers or other value (e.g., 100 days) demonstrated to be more appropriate for this receptor type.

    Response: Note 1 on Table E.1-4.1a will be revised as follows: "(1) Best professional judgment. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation. This is considered a conservative exposure frequency based on the nature of maintenance activities likely conducted at the site which would include occasional mowing since the site not active."

23. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The ingestion rate (IR) of tap water by a commercial worker is listed as 1 liter per day. However, Exhibit 1-2 of the SSL Guidance recommends an IR of 2 liters per day for both indoor and outdoor commercial workers. Please revise the HHRA to further support the use of 1 liter per day ingestion rate, or alternately, revise the HHRA to use an IR of 2 liters per day for commercial workers.

    Response: As discussed on the August 13, 2009, Army/USEPA/VDEQ/TechLaw conference call (Discussion Point #6): Betty Ann Quinn (USEPA) stated that due to the inclusion of the residential scenario which uses an ingestion rate of 2 L/day that the use of an ingestion rate of 1L/day for the commercial worker is acceptable.

24. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The skin surface area available for contact with tap water for a commercial worker is listed as 800 square centimeters per day (cm^2/day). A reference for this information has not been provided. The first note on the table indicates that this value was selected based on best professional judgment of the mean surface area for hands for men and women. However, a more specific reference for the mean surface area value should be provided. Please revise the HHRA to present this information.

    Response: On Table E.1-4.2a, note (1) will be revised as follows: "(1) Best Professional Judgment. Based on the mean surface area for hands for men and women (USEPA, 2004).

25. **Appendix E, Human Health Risk Assessment, Table E.1-4.2b:** Note 7 at the bottom of the table references "USEPA, 2003" for an inhalation rate value. However, the complete USEPA reference has not been provided. For defensibility and transparency, please provide the complete reference for the inhalation rate value.

    Response: The following reference will be added to Table E.1-4.2b: USEPA, 2003. EPA Region III Risk-Based Concentration Table: Technical Background Information. Revised 4/16/2003.

26. **Appendix F.1, Section 4.4, Pages 7 and 8:** Small errors were noted in the calculations provided in the examples. For instance, the C_{TRV} should be 5.58E-01 mg/kg and the NOAEL HQ should be 2.15E+0 mg/kg. These adjusted values affect the remaining calculations. Please correct these errors.

    Response: Upon review of the calculations in Section F.1, Section 4.4, pages 7 and 8, the original calculations are correct.

Geiger.William@epamail.epa.gov
07/28/09 09:21 AM

To <jim.mckenna@us.army.mil>, <diane.wisbeck@arcadis-us.com>, <jerome.redder@atk.com>, "jim spencer"
cc
bcc
Subject SWMU 45 SSP Comments

See Jim's "big picture" comment below, as well as the more specific comments attached. Let us know if you'd like to have a call to discuss. Thanks

(See attached file: Draft SWMU 45 Comments.doc)

William A. Geiger
Office of Remediation (3LC20)
USEPA Region III
1650 Arch Street
Philadelphia, PA 19103
(215)814-3413
----- Forwarded by William Geiger/R3/USEPA/US on 07/28/2009 09:14 AM -----

"Cutler,Jim" <James.Cutler@deq.virginia.gov>
07/21/2009 09:02 AM

To William Geiger/R3/USEPA/US@EPA
cc
Subject SWMU 45 SSP

Will,

Based on the data presented to date it appears that no remediation would be required at SWMU 45. However there is significant uncharacterized landfill waste that will be left in place. Institutional controls (ICs) would be required to prevent contact with this waste. Groundwater monitoring would also be required as a Virginia ARAR (relevant and appropriate for waste left in place) to ensure future protectiveness.

I also have questions regarding the depth of some of the test pits which may be too shallow to intercept the underlying waste. Some of the other characterization concerns of Tech Law may become moot depending on the constraints of any proposed ICs.

Jim

James L. Cutler Jr.

Federal Facilities Project Manager

Office of Remediation Programs

Virginia Dept. of Environmental Quality

804-698-4498 Draft SWMU 45 Comments.doc

Presented below are review comments on the *Draft Solid Waste Management Unit 45 (RAAP-24) Site Screening Process Report*, Radford Army Ammunition Plant (RAAP), Radford, Virginia, dated January 2009 (SSP Report).

GENERAL COMMENTS

1. The selection of chemicals of potential concern (COPCs) in Section 4.0, SSP Data Evaluation and Pre-Remedial Risk Screening, and Section 5.0, Human Health Risk Assessment is based on comparison of maximum contaminant concentrations to the October 2007 EPA Region 3 risk-based screening concentrations (RBCs) for soil and tap water. It should be noted, however, that Region 3 now relies on "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). The website was developed with DOE's Oak Ridge National Laboratory (ORNL) under an Interagency Agreement as an update of the EPA Region 3 RBC Table, Region 6 HHMSSL Table and the Region 9 PRG Table. It is suggested that future evaluations use the Regional Screening Levels (SLs), since a number of toxicity values have been updated and a number of the screening levels have changed.

   The Regional SLs may substantially differ from the RBCs since they address dermal, oral, and inhalation exposure while the RBCs only address ingestion exposure. In addition, the SLs no longer support route-to-route extrapolation and the most current toxicity data are reflected in the SL Table. Please revise the SSP Report to include a discussion in the uncertainty analysis regarding the impact of using outdated screening values, or revise the pre-remedial risk screening and human health risk assessment (HHRA) to utilize these updated values.

2. Potential subsurface soil and groundwater exposures to ecological receptors were not evaluated since these pathways were considered incomplete. However, given the location of SWMU 45 within the New River floodplain, a potential exists for underlying waste to become exposed and site groundwater to recharge the New River. As such, the SLERA should address these two potential exposure media, or provide justification for not addressing them.

3. The SLERA used Steps 1, 2, and 3a described in the *1997 USEPA Ecological Risk Assessment Guidance for Superfund*. However, Step 3a is not a step that can be used in a SLERA because it is the first step of a Baseline Ecological Risk Assessment (BERA). Combining Steps 1 and 2 of the SLERA with Step 3a of the BERA precludes the Scientific/Management Decision Point (SMDP) which is supposed to occur at the end of Step 2. A SMDP represents a point where the risk assessor, risk managers, and stakeholders reach consensus on the elements of the risk assessment, including risk management objectives, endpoint selection, and decision criteria before proceeding to BERA, if necessary. Combining these three distinct steps resulted in an unconventional SLERA which did not follow EPA's Ecological Risk Assessment (ERA) guidelines. Removing the consensus-based SMDP also diminished the defensibility of the risk conclusions, which were based

on only two surface water and two sediment samples. Please revise the SLERA accordingly.

4. The SLERA uses a 'back calculation' method to evaluate the food chain exposure scenarios. This method introduces a confusing use of terms and methods that are not entirely consistent with standard EPA SLERA guidance methods. The SSP Report should be thoroughly edited to omit the use of 'dose modeling' and 'toxicity reference value' (TRVs) terms, when in reality the equations provided in section 4 generate back-calculated soil benchmarks for food chain receptors based on specific endpoints (No Observed Adverse Effect Level [NOAEL] or Lowest Observed Adverse Effect Level [LOAEL] TRVs (see section 4.5.3 on page 4-12 of the SSP Report). Also, the consistent use of benchmark versus dose should be clarified in the Assessment and Measurement Endpoints (page 4-12) for the terrestrial wildlife populations. The information indicates that modeled dose values are used as part of the measurement of risk. However, in reality, the back-calculated NOAEL or LOAEL exposure concentration (mg/kg or ug/kg) is used as the measurement tool. Please review all the SLERA portions of the document to clarify that the food chain modeling back calculates NOAEL and LOAEL soil benchmarks for use in risk characterization, and remove the inappropriate use of 'dose' terminology.

SPECIFIC COMMENTS

5. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1**: It does not appear that soil samples were analyzed for all of the analytes required by the *Site Screening Process Guidance Document*, dated October 2001 (SSP Guide), included as Appendix B. The Soil Sampling and Analysis for SWMU 45 table presented on Page 3-1 indicates that soil samples were analyzed for target analyte list (TAL) metals, target compound list (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), TCL pesticides, and explosives. Dioxins, which are required analytes on Page 3-1 of the SSP Guide, appear to have been excluded. Please revise the SSP Report to note this deviation from the SSP Guide, and provide justification for not sampling for dioxins. Additionally, please address any impact this may have on the outcome of the SSP Report.

6. **Section 3.1.1, Soil Borings and Soil Sampling, Page 3-1:** It is noted that test pits and soil borings were completed within the site area to a maximum depth of 11 feet (ft) below ground surface (bgs). The 2007 geophysical investigation suggested that fill material may be as deep as 20 ft (Page 2-7). The rationale for not extending the borings and test pits to a depth of 20 feet has not been provided. Additional information should be included in the SSP Report which explains why the borings/trenches were terminated at a shallower depth than necessary to define the limits of the fill material. Please revise the SSP Report to include additional details explaining how the completion depths selected are representative of the

site conditions and why continuing the soil investigation to define the full extent of the fill material is not warranted.

7. **Section 3.1.2, Monitoring Well Installation and Groundwater Sampling, Page 3-2:** Groundwater samples were not analyzed for dioxins, even though these analytes were required by the SSP Guide. The rationale for excluding these analytes has not been provided. For clarity and defensibility, please provide the rationale for deviating from the SSP Guide.

8. **Section 3.4.1, Soil Investigations, Page 3-5:** It is noted that a boring was completed adjacent to test pit location 45TP3, but the specific boring which was completed has not been noted. Figure 3-1, SSP Sample Locations, does not appear to show a boring immediately adjacent to test pit location 45TP3. Please revise the SSP Report to identify the boring that was indicated as being advanced adjacent to test pit location 45TP3, and ensure its location is included on Figure 3-1.

9. **Section 3.4.2, Groundwater Investigation, Page 3-6:** It is noted that an additional groundwater sample was collected from 45MW2 to verify SVOC detections in the original sample. This sample does not appear to have been included on Table 3-1, Summary of Sample Identifiers, Depths, and Analytical Methods. For completion, please include the second sample collected at 45MW2 on Table 3-1.

10. **Section 4.2.1, Identification of COPCs, Page 4-1**: The last sentence of page 4-1 states, "Although total metals concentrations in groundwater were above screening levels, the dissolved fraction of metals in groundwater were below the screening levels; therefore, these metals were not selected as COPCs for groundwater…" This approach is unacceptable since these groundwater samples were collected from monitoring wells (and not via direct push techniques), and deviates from the process outlined in the SSP Guide. Page 3-1 of the SSP Guide states that "only unfiltered [total] organic and metals results will be considered in the assessments (except in circumstances where monitoring wells do not produce samples with sufficiently low solids for a reasonable risk screening to be performed)." The SSP Report has not presented any evidence to indicate that the monitoring wells did not produce samples with sufficiently low solids. Please revise the SSP Report to select contaminants of potential concern in groundwater using total metals results. This comment also applies to the selection of metal COPCs in the human health risk assessment presented in Section 5.0.

11. **Section 4.2.2, Cumulative Risk Screen, Page 4-2:** The discussion in Section 4.2.2 notes that exposure point concentrations (EPCs) were calculated for this assessment, but the process for developing EPCs has not been presented (i.e., using EPA's ProUCL software). For clarity, please revise the SSP Report to describe how EPCs were calculated, and append any supporting documentation as appropriate.

12. **Section 4.3.1.1, Ecological Site Characterization, Page 4-9:** This section states that "The Virginia Department of Game and Inland Fisheries survey identified three threatened wildlife species and two rare plant species associated with RAAP grassland communities." The SLERA needs to state if these species are anticipated to be present at or around SWMU 45, and the amount of risk that these species may (or may not) encounter from the potential site-related exposure pathways. The SSP Report does not provide enough information to help determine if these species are present, or could be affected by the site. Please revise the SSP Report to address this concern.

13. **Section 4.3.3.1, Data Organization, Page 4-11:** This section summarizes the surface soil samples used in the SLERA. Understanding the location of these samples in relation to site features could be a useful line of evidence for the risk characterization. The photographs in Appendix F.1 show that the site is heavily vegetated. The ability to co-locate the soil samples and their results with site features (vegetation, physical disturbance etc.) would help the SLERA. This issue is especially important for the risk characterization since it appears that certain COPECs are co-located, as are their highest concentrations (see also Section 4.3.7, Risk Management – Scientific Management Decision Point). Please provide a map showing the location of these samples in relation to the habitat setting, and also provide co-located photograph references. The risk conclusions in Section 4.3.7 should be revisited to describe the geospatial setting of COPEC occurrence in relation to each other as well as to the surrounding habitat.

14. **Section 4.3.5.2, Dose Rate Modeling Approach, Page 4-13:** The text indicates that the information in this section provides the methods for 'dose rate modeling'. It is incorrect to use this phrase since the method back-calculates receptor-specific soil benchmarks. Please correct the terminology to reflect the risk threshold(s) developed from the approach developed in the document.

15. **Section 4.3.6.2, Dose Rate Modeling Approach, Page 4-15:** The equation does not provide enough detail to describe the dose associated with each food type. The variables in the denominator parenthesis need to contain subscripts to denote i.e. the '$_i$th' food type that is summed. Please correct this equation to provide all the information needed to understand how the ingestion dose is calculated.

16. **Section 4.5, Nature and Extent Assessment, Page 4-19:** The nature and extent assessment is limited to landfill debris, and does not address the nature and extent of individual chemicals identified at the site. Therefore, it is unclear whether the limited sampling at this site has been sufficient to adequately characterize overall site conditions. Of concern is that two surface soil samples collected from test pits (45TP2A and 45TP4A) reported PCB and PAHs above applicable screening criteria, but very few or no surface soil samples were collected in the near vicinity of these test pits to further define the extent of this contamination. Please revise the SSP Report to include a more thorough evaluation of the extent of

contamination of individual chemicals identified at the site, and indicate whether any data gaps remain with respect to the PCB and PAH contamination identified in surface soil at the site. Further, please expand the discussion presented in Section 4.5 to also discuss the chemical constituents detected and any associated conclusions which can be drawn, or any correlations which can be made between the debris and constituents detected.

17. **Section 5.2.2, Identification of Exposure Pathways, Page 5-4:** The complete exposure scenarios identified on the summary table on Page 5-4 are inconsistent with the complete exposure scenarios identified in Appendix E, Table E.1-1, Selection of Exposure Pathways. Table E.1-1 notes that exposure to surface soil for the future commercial/industrial worker, future construction worker, and future resident is potentially complete, and will be evaluated quantitatively. However, the summary table on Page 5-4 has not selected exposure to surface soil as a potentially complete exposure pathway for those receptors. Please revise the SSP Report to address this discrepancy.

18. **Section 5.2.3, Calculation of EPCs, Page 5-6**: The Johnson and Ettinger model (JEM) based on U.S. Environmental Protection Agency (EPA) 2004 guidance "*User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion Into Buildings"* was used to estimate indoor air concentrations of volatiles migrating from groundwater through the subsurface and into a structure. However, the SSP Report has not provided the basis for all the site-specific inputs into the model. To ensure that the assumptions used in the JEM were applicable to the site, please provide a brief discussion that describes the basis for the inputs selected in the JEM applied to the site.

19. **Section 5.3, Toxicity Assessment, Page 5-6:** It is stated that toxicity criteria were obtained from the 2007 USEPA Region III RBC Table. As previously noted, this table has been superseded by the Regional SL table. Updated toxicity criteria are now available for several COPCs. For example, the oral reference dose (RfD) for cobalt listed in Table E.1-5.1 of Appendix E is 2.00E-02; however, the Regional SL now indicates that the oral RfD for cobalt is 3.00E-04. Please revise the SSP Report to use the most current toxicity values available. Recalculate the risks/hazards based on the current toxicity values or alternately, demonstrate in the uncertainty analysis how the use of the new toxicity data would impact the overall conclusions of the HHRA.

20. **Appendix D.2.2, Site Screening Process Boring Logs**: The boring logs for several borings do not include photoionization detector (PID) measurements. For example, the boring log for 45SC2, 45SC3, 45SC6, 45SC7, 45SC9 – 45SC13, 45SC15, 45SC16, and 45MW4 do not include PID measurements. The SSP Report does not address why PID screening values are included for some borings and not others. Please clarify why PID measurements are not available for all borings, and ensure that this issue is discussed in Section 3.4, Work Plan Field Changes.

21. **Appendix D.2.2, Site Screening Process Boring Logs:** The log for Test Pit 3 (45TP3) appears to refer to the samples collected at this test pit inconsistently. Under the Sample Number column of the boring log, the samples are identified as 45TP3A and 45TP3B; however, the Field Notes column refers to the samples as 45TP1A and 45TP1B. Please revise this boring log to address this discrepancy, and assure that the samples submitted were actually given their own unique sample name.

22. **Appendix E, Human Health Risk Assessment, Table E.1-4.1a:** It is unclear why an exposure frequency (EF) of 50 days is being used for maintenance workers. The footnote on this table indicates that site maintenance is anticipated to be conducted once a week with two weeks of vacation a year. However, please note that the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, dated December 2002 (SSL Guidance), indicates that an EF of 225 days should be used for outdoor workers in roles including, but not limited to, groundskeepers, gardeners, specified mechanics and repairers, non-specified mechanics and repairers, construction and maintenance workers, and painters. While it appears that maintenance workers at SWMU 45 may not encounter the site this frequently, the SSP Report should include further rationale for not selecting an EF of 225 days or other value falling between the value used by RAAP and the EPA recommended value (e.g., 100 days, assuming 2 days per week per year, with 2 weeks vacation). Please revise the HHRA to further support the professional judgment that 50 days is the most representative EF for a maintenance worker at this site by describing the anticipated type of maintenance work that is likely to occur. The discussion should demonstrate why the proposed value of 50 days is more appropriate than the EF recommended in the SSL Guidance or any value between 50 and 225 days (e.g., 100 days). Alternately, revise the HHRA to use an EF of 225 days for maintenance workers or other value (e.g., 100 days) demonstrated to be more appropriate for this receptor type.

23. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The ingestion rate (IR) of tap water by a commercial worker is listed as 1 liter per day. However, Exhibit 1-2 of the SSL Guidance recommends an IR of 2 liters per day for both indoor and outdoor commercial workers. Please revise the HHRA to further support the use of 1 liter per day ingestion rate, or alternately, revise the HHRA to use an IR of 2 liters per day for commercial workers.

24. **Appendix E, Human Health Risk Assessment, Table E.1-4.2a:** The skin surface area available for contact with tap water for a commercial worker is listed as 800 square centimeters per day (cm^2/day). A reference for this information has not been provided. The first note on the table indicates that this value was selected based on best professional judgment of the mean surface area for hands for men and women. However, a more specific reference for the mean surface area value should be provided. Please revise the HHRA to present this information.

25. **Appendix E, Human Health Risk Assessment, Table E.1-4.2b:** Note 7 at the bottom of the table references "USEPA, 2003" for an inhalation rate value. However, the complete USEPA reference has not been provided. For defensibility and transparency, please provide the complete reference for the inhalation rate value.

26. **Appendix F.1, Section 4.4, Pages 7 and 8:** Small errors were noted in the calculations provided in the examples. For instance, the C_{TRV} should be 5.58E-01 mg/kg and the NOAEL HQ should be 2.15E+0 mg/kg. These adjusted values affect the remaining calculations. Please correct these errors.

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

19 FEB 2009

MCHB-TS-REH

MEMORANDUM FOR Office of Environmental Quality, Radford Army Ammunition Plant (SJMRF-OP-EQ/Mr. Jim McKenna), P.O. Box 2, Radford, VA 24143-0002

SUBJECT: Document Titled: "Draft Site Screening Process Report for SWMU 45 (RAAP-24) Radford Army Ammunition Plant, Virginia, January 2009"

1. The US Army Center for Health Promotion and Preventive Medicine reviewed the subject document on behalf of the Office of The Surgeon General pursuant to Army Regulation 200-1 (Environmental Protection and Enhancement). We appreciate the opportunity to review this report and concur with the recommendation of no further action as being protective of human health and the environment.

2. The document was reviewed by Mr. Dennis Druck, Environmental Health Risk Assessment Program. He can be reached at DSN 584-2953, commercial (410) 436-2953 or electronic mail "dennis.druck@us.army.mil".

FOR THE COMMANDER:

JEFFREY S. KIRKPATRICK
Director, Health Risk Management

CF:
HQDA (DASG-PPM-NC)
IMCOM-NE (IMNE-PWD-E)
USACE (CEHNC-CX-ES)
USAEC (IMAE-CD/Mr. Rich Mendoza)

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January 30, 2009

Mr. William Geiger
RCRA General Operations Branch, Mail Code: 3WC23
Waste and Chemicals Management Division
U. S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 24143-0100

Subject: With Certification, Solid Waste Management Unit 45 (RAAP-024), Site Screening Process Report, Draft January 2009
EPA ID# VA1 210020730

Dear Mr. Geiger and Mr. Cutler:

Enclosed is the certification for the subject document that was sent to you on January 20, 2009. Also enclosed is the 20 January 2009 transmittal email.

Please coordinate with and provide any questions or comments to myself at (540) 639-8658, Jerry Redder ATK staff (540) 639-7536 or Jim McKenna, ACO Staff (540) 731-5782.

Sincerely,

P.W. Holt, Environmental Manager
Alliant Techsystems Inc.

c: Karen Sismour
Virginia Department of Environmental Quality
P. O. Box 10009
Richmond, VA 23240-0009

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09-815-11
JMcKenna

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Coordination: J. McKenna M. A. Miano

09-815-11
JMcKenna

Concerning the following:

Radford Army Ammunition Plant
Solid Waste Management Unit 45 (RAAP-024)
Site Screening Process Report
Draft, January 2009

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

SIGNATURE: _____
PRINTED NAME: Jon R. Drushal
TITLE: Lieutenant Colonel (P), US Army
Commanding

SIGNATURE: _____
PRINTED NAME: Kent Holiday
TITLE: Vice President and General Manager
ATK Energetics Systems

09-815-11
JMcKenna

Greene, Anne

From: McKenna, Jim
Sent: Tuesday, January 20, 2009 1:14 PM
To: Greene, Anne; ealohman@deq.virginia.gov; Druck, Dennis E Mr CIV USA MEDCOM CHPPM; diane.wisbeck@arcadis-us.com; durwood willis2; Geiger.William@epamail.epa.gov; Redder, Jerome; jim spencer; jlcutler@deq.virginia.gov; kjsismour@deq.virginia.gov; Llewellyn, Tim; Mendoza, Richard R Mr CIV USA IMCOM; Meyer, Tom NAB02; Parks, Jeffrey N; Timothy.Leahy@shawgrp.com; Tina_Devine@URSCorp.com
Subject: Draft SWMU 45 SSP Report & Tracking Numbers (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

All:

Note the contractor will ship the subject document with a copy of this email to the POCs and tracking numbers below.

Follow up certification letter will be sent from Radford AAP under separate cover.

Thank you in advance for support of the Radford AAP Installation Restoration Program.

Jim McKenna

Below are the POCs with FedEx tracking numbers for the Draft SWMU 45 SSP Report.

James McKenna 7962 6252 5533 2 Paper copies/2 CDs Will Geiger 7972 5894 5974 3 Paper [illegible]ies/3 CDs Jim Cutler 7972 5892 5230 1 Paper copy/1 CD Karen Sismour 7962 6749 7163 1 [illegible]r copy/1 CD Tom Meyer 7962 6263 9061 1 Paper copy/1 CD Richard Mendoza 7962 6250 4237 [illegible]aper copy/1 CD Dennis Druck 7962 6244 5418 1 CD Elizabeth Lohman 7972 5888 1925 1 CD Susan Ryan 7962 6256 6305 1 CD

Classification: UNCLASSIFIED
Caveats: NONE

Greene, Anne

F TrackingUpdates@fedex.com
S Friday, February 06, 2009 9:40 AM
To: Greene, Anne
Subject: FedEx Shipment 797312677078 Delivered

This tracking update has been requested by:

Company Name:	US ARMY BLDG 220ALLIANT TECH
Name:	PAIGE W HOLT
E-mail:	'not provided by requestor'

Our records indicate that the following shipment has been delivered:

Purchase order number:	PAIGE W HOLT
Reference:	24200008AL01.00
Ship (P/U) date:	Feb 5, 2009
Delivery date:	Feb 6, 2009 9:31 AM
Sign for by:	K.COOKE
Delivered to:	Mailroom
Service type:	FedEx Priority Overnight
Packaging type:	FedEx Envelope
Number of pieces:	1
Weight:	0.50 lb.
Special handling/Services:	Deliver Weekday
Tracking number:	797312677078

Shipper Information	Recipient Information
PAIGE W HOLT	WILLIAM GEIGER
US ARMY BLDG 220ALLIANT TECH	EPA, REGION III
STATE ROUTE 114; RADFORD ARMY AMMUNITION PLANT	1650 ARCH ST; RCRA GEN OPER BRANCH 3WC23
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Greene, Anne

F TrackingUpdates@fedex.com
S Friday, February 06, 2009 10:27 AM
To: Greene, Anne
Subject: FedEx Shipment 797312665019 Delivered

This tracking update has been requested by:

Company Name:	US ARMY BLDG 220ALLIANT TECH
Name:	PAIGE W HOLT
E-mail:	'not provided by requestor'

Our records indicate that the following shipment has been delivered:

Purchase order number:	PAIGE W HOLT
Reference:	24200008a101.00
Ship (P/U) date:	Feb 5, 2009
Delivery date:	Feb 6, 2009 10:25 AM
Sign for by:	M.HENRY
Delivered to:	Receptionist/Front Desk
Service type:	FedEx Priority Overnight
Packaging type:	FedEx Envelope
Number of pieces:	1
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EXECUTIVE SUMMARY

URS Group, Inc. (URS) conducted a Resource Conservation and Recovery Act (RCRA) Site Screening Process (SSP) at the Radford Army Ammunition Plant (RFAAP) for Solid Waste Management Unit (SWMU) 45 (RAAP-24), an inactive, sanitary landfill. The SSP was performed in accordance with the U.S. Environmental Protection Agency (USEPA) Region III and Virginia Department of Environmental Quality (VDEQ)-approved Master Work Plan (MWP) Addendum 022 (URS 2007b), the requirements set forth in the 2000 RCRA permit for RFAAP (USEPA 2000), and the USEPA approved SSP Guidance Document for RFAAP (USEPA 2001a, Appendix B).

The SSP was designed to assess: whether releases of hazardous substances, pollutants, chemicals, hazardous wastes, or hazardous constituents have occurred to the environment at the site evaluated, whether further investigation (i.e., risk assessment or RCRA Facility Investigation (RFI)) or an interim removal action is appropriate at a site, or whether no further action (NFA) at a site is appropriate. Five steps were completed for the SSP following the approved guidance document including: 1) performance of a desktop audit and site visit to develop the scope of the SSP Work Plan, 2) preparation of a SSP site-specific Work Plan, 3) performance of the field work in accordance with the approved SSP Work Plan, 4) evaluation of the SSP data and completion of pre-remedial risk screening, and 5) assessment of the need for further investigation, interim removal action, or preparation of a "No Further Action" Decision Document, per the RCRA Corrective Action permit based on the results of the SSP and risk screening.

Human Health Risk Screening

A human health risk screening was conducted in accordance with the SSP Guidance (USEPA 2001a, Appendix B) to evaluate the potential human health risks associated with previous activities at the site. Surface soil, total soil, and groundwater were the media evaluated for the risk screenings for residential and industrial scenarios. Risks and hazards for these scenarios are summarized below. As presented in Section 4.2, for an industrial scenario the human health risk screenings for surface and total soil indicated that calculated risks and hazards were below the established SSP thresholds of 1E-05 and 1E+00, respectively, therefore not requiring additional assessment on the basis of risk to human health under an industrial scenario.

Also as presented in Section 4.2, for a residential scenario the human health risk screenings for surface and total soil indicated that calculated risks and hazards were above the established SSP thresholds of 1E-05 and 1E+00, respectively. The results of the carcinogenic residential risk screening were above the established SSP threshold (1E-05) for surface soil and total soil primarily due to arsenic concentrations below the background point estimate; therefore, the calculated risks are not considered site-related. The site-related risk for surface and total soil, when excluding arsenic, is 8E-06 which is below the SSP risk threshold of 1E-05.

The results of the noncarcinogenic residential risk screening were above the established SSP threshold (1E+00) for surface soil and total soil. Due to multiple chemicals contributing to a residential HI greater than 1, the HIs were segregated based on primary target organs for chronic exposure. The HI segregation for surface soil resulted in values equal to or greater than the established SSP target organ HI threshold of 0.5 for the following target organs: blood, central nervous system (CNS), vascular, kidney, gastrointestinal (GI) tract, liver, and eyes. The HI segregation for total soil resulted in values equal to or greater than the cumulative SSP target organ HI threshold of 0.5 for the following target organs: blood, CNS, vascular, GI tract, liver, and eyes. As presented in Section 4.2.6 when excluding metals below their background point estimates, the site-related target organ HIs for surface and total soil above the established SSP target organ threshold of 0.5 include blood (due to antimony – total soil only), vascular (due to nitroglycerin), GI tract (due to chromium and copper), and eyes (due to Aroclor 1254). The human health risk screenings for surface and total soil indicated that calculated hazards for several target organs were above the established SSP target organ HI threshold of 0.5, therefore requiring additional assessment on the basis of risk to human health under a residential scenario.

The results of the lead modeling for soil predicted the probability of the child resident receptor for SWMU 45 expected to have blood levels of 10 µg/dL or greater was below the established threshold of 5%. The iron exposure assessment for soil results for the hypothetical future child resident was below the applicable iron margin of exposure screening criteria for SWMU 45.

As presented in Section 4.2, groundwater risk screenings indicated that calculated risks and hazards were below the established SSP thresholds of 1E-05 and 1E+00, respectively, therefore not requiring additional assessment on the basis of risk to human health from groundwater.

In accordance with the SSP Guidance (Appendix B, Section 6.1.6), due to HIs above the established SSP HI target organ threshold of 0.5 for several target organs (blood, vascular, GI tract, and eyes) under the residential scenario for soil, a quantitative risk assessment was completed for site and a summary is presented below.

Human Health Risk Assessment

A quantitative human health risk assessment (HHRA) was performed for the SSP to evaluate potential residential hazards identified by the screening and evaluate what further actions, if any, should be undertaken at the site based on human health risk. The risk assessment evaluated the following scenarios: current/future maintenance worker, hypothetical future construction worker, hypothetical future commercial worker, hypothetical future adult resident, hypothetical future child resident, and hypothetical future lifetime resident.

The results of the risk assessment indicate that the calculated site-related cancer risks and hazards (when taking target organs and background for metals into consideration) were within USEPA target ranges for Superfund sites (1E-06 to 1E-04 for risk and 1E+00 or less for HI) for the current receptor, maintenance worker, and for hypothetical future receptors evaluated under industrial and residential land use scenarios.

Soil to Groundwater Screening

The soil to groundwater pathway at SWMU 45 was evaluated for the SSP by comparing chemical data to default SSLs, calculated site-specific SSLs, background point estimates, and by evaluating groundwater results at the site. COPCs leaching to groundwater at levels of potential concern (concentrations above adjusted tap water risk-based concentrations [T-RBCs]) were not identified when considering site-specific SSLs, background, and site groundwater data.

Screening Level Ecological Risk Assessment

A screening level ecological risk assessment was performed at SWMU 45 as part of the SSP. Chemicals of potential ecological concern (COPECs) identified in soil at SWMU 45 for preliminary ecological risk estimates included metals for direct contact, and metals, polychlorinated biphenyls, and 4,4-dichloro-diphenyl-trichloroethane (4,4'-DDT) for wildlife. Refined ecological risk estimates for the direct contact pathway indicated limited metals detections above background and screening levels. Refined risk estimates for wildlife resulted in no chemicals with a LOAEL-based hazard quotient (HQ) greater than 1. The results of the screening level ecological risk assessment indicated there is adequate information to conclude that ecological risks are negligible at SWMU 45; therefore, there is no need for further action at this SSP site on the basis of ecological risk.

Conclusions and Recommendations

No further action beyond the implementation of institutional controls is recommended for SWMU 45 based on the following results of the SSP screening:

- The HHRA resulted in site-related cancer risks and hazards (when taking target organs and background for metals into consideration) within USEPA target ranges for Superfund sites (1E-06 to 1E-04 for risk and 1E+00 or less for HI);

- Results of the lead modeling for soil predicted the probability of the child resident receptor for SWMU 45 expected to have blood levels of 10 μg/dL or greater was below the established threshold of 5%;

- The iron exposure assessment for soil results for the hypothetical future child resident were below the applicable iron margin of exposure screening criteria;

- COPCs leaching to groundwater at levels of potential concern (concentrations above adjusted tap water risk-based concentrations [T-RBCs]) were not identified when considering site-specific SSLs, background, and site groundwater data; and

- The results of the screening level ecological risk assessment indicated there is adequate information to conclude that ecological risks are negligible at SWMU 45; therefore, there is no need for further action at this SSP site on the basis of ecological risk.

Institutional controls are being implemented at SWMU 45 within the boundaries depicted on Figure 2-1. The objective of the ICs is to maintain the site in its current industrial/commercial state as a closed solid waste management unit and to prevent any future residential use. Specifically this site has been incorporated into plant management manual to ensure long-term protection of human health and the environment. The management manual provides for advance notice, assessment and approval of intrusive work that may occur within the plant with a general digging prohibition at sites such as this. In the event the property is transferred or leased, equivalent ICs will be put into terms and conditions of the deed or lease, which are no less restrictive than the IC objectives described above. Furthermore, the transferee or lessee will be responsible for ensuring IC compliance by any future users. However, the Army acknowledges the responsibility for all original liability under CERCLA and its right and responsibility to enforce ICs.

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LIST OF ABBREVIATIONS AND ACRONYMS

º .....Degree
°C .....Degrees Celsius
% .....Percent
2D-ERI.....Two-Dimensional Electrical Resistivity Imaging
AF .....Area Use Factor
AOC.....Area of Concern
ARAR .....Applicable Relevant and Appropriate Requirements
As.....Arsenic
BAF.....Bioaccumulation Factor
bgs.....Below Ground Surface
CDI.....Chronic Daily Intake
CERCLA.....Comprehensive Environmental Response, Compensation, and Liability Act
CFR.....Code of Federal Regulations
cfs.....Cubic feet per second
cm/sec .....Centimeters Per Second
CNS.....Central Nervous System
COPC.....Chemical of Potential Concern
COPEC.....Chemical of Potential Ecological Concern
CSF .....Cancer Slope Factor
CSM.....Conceptual Site Model
DAF .....Dilution Attenuation Factor
DDT .....Dichloro-Diphenyl-Trichloroethane
DQO.....Data Quality Objective
ECSM .....Ecological Conceptual Site Model
EM .....Electromagnetic
EPC.....Exposure Point Concentration
EPIC.....Environmental Photographic Interpretation Center
ERAGS .....Ecological Risk Assessment Guidance for Superfund
ft.....Feet
GI .....Gastrointestinal
GPS.....Global Positioning System
HHRA .....Human Health Risk Assessment
HHRS.....Human Health Risk Screening
HI .....Hazard Index
HQ.....Hazard Quotient
I-RBC.....Industrial Risk-Based Concentration
IDM.....Investigation-Derived Material
IEUBK .....Integrated Exposure Uptake Biokinetic
IRIS.....Integrated Risk Information System
LOAEL .....Lowest Observable Adverse Effect Level
MDC .....Maximum Detected Concentration
MDL.....Method Detection Limit
µg/dL.....Microgram Per Deciliter
mg/kg .....Milligrams Per Kilogram
µg/kg .....Microgram Per Kilogram
mg/L.....Milligrams Per Liter
µg/L.....Microgram Per Liter
MHSP.....Master Health and Safety Plan
ML .....Sandy Silt

LIST OF ABBREVIATIONS AND ACRONYMS

MMA .....Main Manufacturing Area
MQAP.....Master Quality Assurance Plan
msl.....Mean Sea Level
MWP.....Master Work Plan
NCEA.....National Center for Environmental Assessment
NFA .....No Further Action
NOAEL.....No Observable Adverse Effect Level
NSV .....No Screening Value
ORP.....Oxidation-Reduction Potential
PAH .....Polynuclear Aromatic Hydrocarbon
PCB.....Polychlorinated Biphenyl
PEF.....Particulate Emission Factor
PETN .....Pentaerythritol Tetranitrate
PPE.....Personal Protective Equipment
PVC.....Polyvinyl Chloride
QA.....Quality Assurance
QC.....Quality Control
R-RBC .....Residential Risk-Based Concentration
RAGS.....Risk Assessment Guidance for Superfund
RBC .....Risk-Based Concentration
RCRA.....Resource Conservation and Recovery Act
RDA.....Recommended Daily Allowance
RFA.....RCRA Facility Assessment
RFAAP.....Radford Army Ammunition Plant
RFI .....RCRA Facility Investigation
RL .....Reporting Limit
SASW .....Spectral Analysis of Surface Waves
SLERA.....Screening Level Ecological Risk Assessment
SMDP.....Scientific/Management Decision Point
SOP .....Standard Operating Procedure
SSL.....Soil Screening Level
SSP.....Site Screening Process
SVOC.....Semi-Volatile Organic Compound
SWMU .....Solid Waste Management Unit
TAL.....Target Analyte List
TCL.....Target Compound List
TOC .....Total Organic Carbon
TOX .....Total Organic Halogen
TRV .....Toxicity Reference Value
T-RBC.....Tap Water Risk-Based Concentration
UCL .....Upper Confidence Limit
URS.....URS Group, Inc.
USACE .....United States Army Corps of Engineers
USATHAMA..United States Army Toxic and Hazardous Material Agency
USEPA.....United States Environmental Protection Agency
VDEQ .....Virginia Department of Environmental Quality
VI .....Verification Investigation
VOC.....Volatile Organic Compound
WPA.....Work Plan Addendum

1.0 INTRODUCTION

This Site Screening Process (SSP) report presents the results and findings of the Resource Conservation and Recovery Act (RCRA) investigation conducted at the Radford Army Ammunition Plant (RFAAP) for Solid Waste Management Unit 45 (RAAP-24), an inactive, sanitary landfill. The project site is located in the north-central section of the Main Manufacturing Area (MMA) at RFAAP in Radford, Virginia (Figure 1-1).

The work was conducted by URS Group, Inc. (URS) to fulfill the requirements set forth in the 2000 RCRA Corrective Action permit as tasked by the United States Army Corps of Engineers (USACE), Baltimore District, in accordance with Contract Number W9128F-04-D-001, Delivery Order No. DA01.

URS performed the SSP in accordance with the Site Screening Process developed for RFAAP and Work Plan Addendum (WPA) 022 to the MWP, which was developed to address specific aspects of this project and to describe project-related activities not included in the MWP. These documents, approved by the United States Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), contain the Master Quality Assurance Plan (MQAP), the Master Health and Safety Plan (MHSP), and associated project-specific addenda.

1.1 PURPOSE

The SSP is designed to assess:

- Whether releases of hazardous substances, pollutants, chemicals, hazardous wastes, or hazardous constituents have occurred to the environment at the site evaluated;
- Whether further investigation (i.e., risk assessment or RCRA Facility Investigation [RFI]) is required;
- Whether an interim removal action at the site is required; or
- Whether no further action (NFA) at the site is appropriate.

1.2 REPORT ORGANIZATION

Section 2.0 presents site background information. Section 3.0 outlines the field investigation program. SSP risk screening procedures, assumptions, and results are presented in Section 4.0. The human health risk assessment is presented in Section 5.0 and the conclusions and recommendations for the site are provided in Section 6.0.

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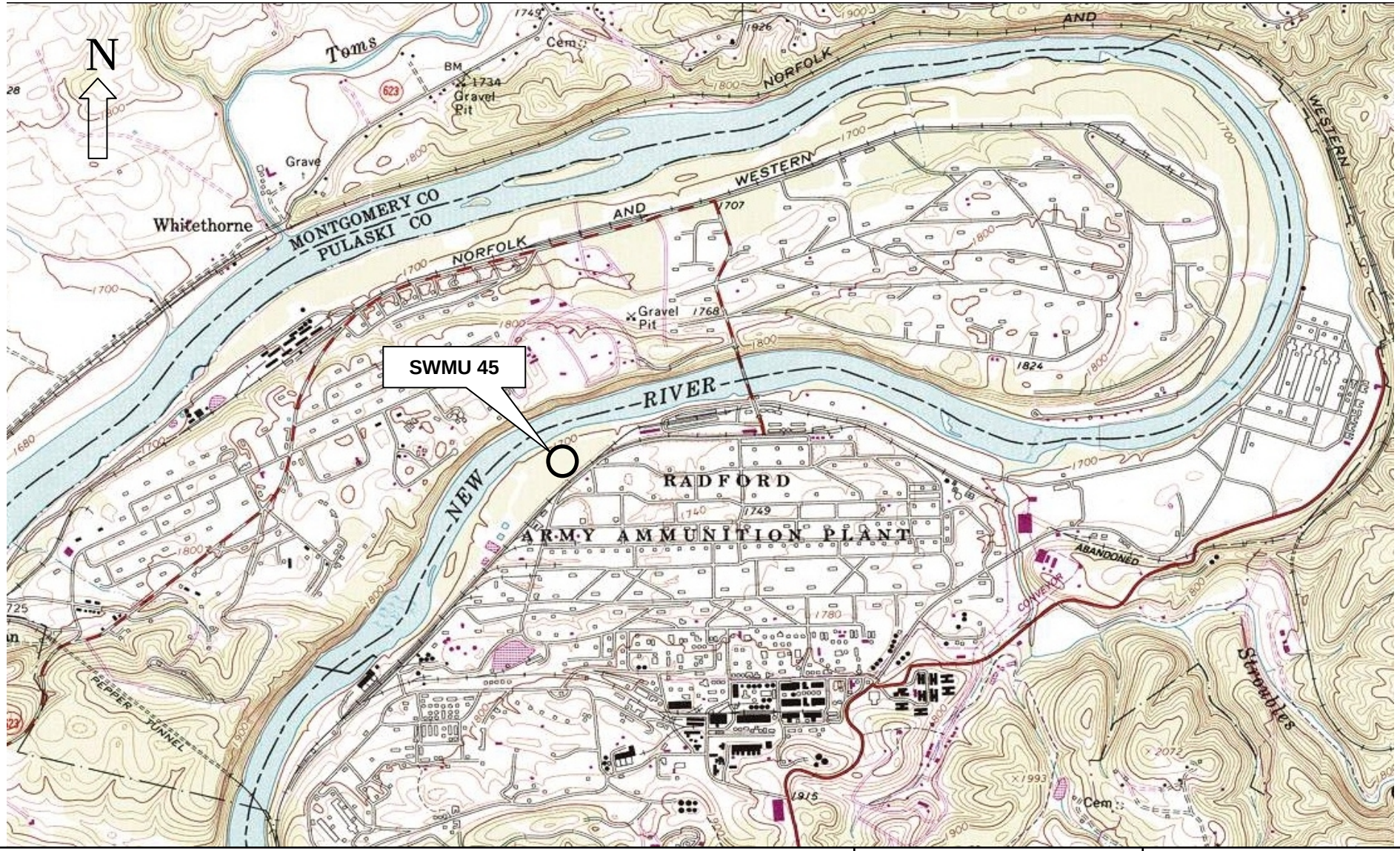

FIGURE 1-1
Site Location Map

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = 2000'*	File Name: Fig1-1 SiteLoc

SWMU 45
SSP Report
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
540 Falmouth Street
Suite 201
Richmond, Virginia 23230

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2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION

2.1.1 Physiography

SWMU 45 comprises an approximate 3.4-acre study area located in the northwest section of the MMA at RFAAP (Figure 1-1) on the alluvial terrace south of the New River and east of calcium sulfate drying bed/disposal areas (SWMU 38 and area of concern [AOC] Q). The site is situated at approximately 1,700 to 1,710 feet (ft) above mean sea level (msl) and slopes slightly toward the north and the New River. SWMU 45 is topographically lower than areas to the south and topographically higher than areas to the north, east, and west (Figure 2-1). The RFAAP Installation perimeter fence, approximately 50 ft north of the site, is located between the site and the New River which is 200 ft north of the site. The land north of the fence slopes steeply down to the New River, which is approximately 24 ft lower than SWMU 45.

The immediate SWMU 45 area consists of a pine plantation community with nearly complete vegetative cover. The area is characterized by tall stands of loblolly pine with understory species including wingstem, boxelder, foxtail, deer tongue, and immature sycamore. A security buffer zone approximately 40 ft wide is periodically cleared of tall vegetation (bush-hogged approximately once per year) inside the fence adjacent to the site. A site photographic log is included in Appendix A.1.

2.1.2 Tanks and Structures

Tanks or structures are not located within or near the area of SWMU 45.

2.1.3 Surface Water

Based on topography, overland storm water flow that originates upgradient from the south will flow to the northeast through a well-defined drainage pathway along the railroad tracks separating the site from the main road. This storm water flows approximately 600 ft and discharges to the New River. The site is located within the 100-year floodplain of the New River (USHUD 1978).

Grading during construction of the Installation perimeter fence has created a slight topographic rise at the fence line that diverts storm water flows toward the northeast and southwest at the site. Storm water and precipitation will tend to infiltrate rather than runoff the site due to the area's flat topography, heavy vegetation, and a thick layer of organic matter on the ground surface. Although an approximate six foot wide, 15 foot long, and two foot deep area of standing water was observed during the geophysical investigation (see Section 2.3.4); the water accumulation was likely the result of recent precipitation events. The surrounding terrain drains into this depressed area which was likely the result of a previous test excavation conducted in the landfill area based on vegetative covered soil piles observed in adjacent areas.

The New River flows northeast approximately 200 ft north-northwest of the site. No other surface water bodies, i.e drainage ditches, manholes, catch basins, or flow paths, appear to be present in the immediate SWMU 45 area.

2.1.4 Site Soil

SWMU 45 is underlain by Unison-Urban Land complex soil. This soil has moderate permeability and medium-to-strong acidity (IT 2001). Soil classification is not practical in urban land areas because the original soil has been physically altered or obscured. A typical profile of undisturbed Unison soil consists of a 15-inch thick surface layer of dark brown loam and a 43-inch thick subsoil of yellowish-red, sticky plastic clay underlain by a red sandy clay loam to a depth of 58 inches. In general, permeability is moderate in Unison soil, natural fertility is low, and organic matter content is low to moderate. *In situ* soil pH measurements of surface soil taken during a URS site reconnaissance in 2005 indicated nearly neutral pH of 6.6 to 6.7.

Physical soil properties at the site were investigated as part of a facility-wide RCRA Verification Investigation (VI) conducted by Dames & Moore in 1991 and 1992. Three soil borings were completed for monitoring well installations (45MW1, 45MW2, and 45MW3) at the locations shown on Figure 2-1. Physical soil data for three soil samples collected from these borings are summarized in the following table.

Summary of VI Physical Soil Data (Dames & Moore, 1992)

Sample No.	Sample Depth (ft bgs)	Moisture (%)	Grain Size Distribution			Atterberg Limits (LL/PI)	USCS Classification
			Gravel (%)	Sand (%)	Fines (%)		
45MW1	10-12	13.6	6.2	69.4	24.4	Non plastic	SM
45MW2	5.5-6	9.2	0.0	89.7	10.3	Non plastic	SP-SM
45MW3	26-27	29.7	26.7	28.4	44.9	34/14	SC

Notes:
ft bgs = feet below ground surface, USCS = Unified Soil Classification System
SM = silty sand, SP = poorly graded sand, SC = clayey sand

Boring logs for 45MW1, 45MW2, and 45MW3 are included in Appendix D.2. Subsurface conditions encountered in the borings consisted of unconsolidated alluvial deposits, which generally become coarser with depth. Soil types encountered in the borings were primarily silty sand (SM) and sandy silt (ML) in surface soil and silty clayey sand with gravel (SM/SC) at depth.

Physical properties of site soil have also been evaluated for the SSP by submitting four soil samples collected from soil borings 45SB4 and 45SB8 to URS' laboratory in Totowa, New Jersey for physical testing. Test parameters and results are summarized in Table 2-1 and in the table below.

Summary of Physical Soil Test Data for SSP

Test Parameter	Range of Parameter Values
Unified Soil Classification System Symbol	ML (low plasticity silt) – 0-2.5 ft bgs SM (silty sand) – 1.5-4 ft bgs CL-ML (low plasticity clay-silt) – 5.5-8 ft bgs CL (low plasticity clay) – 5.5-8 ft bgs
Water Content (%)	12.3 to 20.8%
Sieve Analysis - % fines (minus 200 Sieve)	41.0 to 61.1%
Sieve Analysis - hydrometer percent minus 2 µm	9 to 17%
pH – distilled water	4.1 to 6.4
pH – 0.01 M Calcium Chloride Solution	3.7 to 5.9
Total organic carbon	0.22 to 1.7%
Total bulk density (pounds per cubic foot)	85.1 to 114.8

Soil physical test results from the SSP indicate that the primary soil type at shallow depths (0-4 ft bgs) is silty sand/sandy silt and at intermediate depths (5-8 ft bgs) the primary soil type is low plasticity clayey silt. A complete report of the SSP physical test results is included in Appendix D.1.

2.1.5 Site Geology

Site geologic conditions were characterized for the SSP by completing 16 direct push soil borings to a depth of 10 ft below ground surface (bgs), excavating 7 test pits, installing one additional groundwater monitoring well (45MW4), physical testing of four soil samples, and using data collected from three existing site groundwater monitoring wells (45MW1, 45MW2, and 45MW3). Monitoring well, soil boring, and test pit locations are shown on Figure 3-1. Monitoring well construction data are summarized in Table 2-2 and boring logs/construction diagrams are included in Appendix D.2.

Subsurface data from site borings, test pits, and monitoring wells have been used to construct a geologic cross section. Cross section A-A' is orientated south-southeast to north-northwest across SWMU 45. As illustrated on Figure 2-2, the area of SWMU 45 is underlain by approximately 30+ ft of unconsolidated alluvial deposits. These deposits generally consist of sediments comprising of a bottom layer of soft inorganic silts (ML) and silty clays (SC) approximately 5 to 9 ft thick. A silty sandy gravel layer approximately 5 to 7 ft thick overlies the silt/clay layer. From the gravelly zone, deposits generally consist of a fining upward sequence of fine to medium, micaceous silty sand (SM) and sandy silt (ML)/sandy clay (CL). Soil borings conducted at the site were not advanced to the depth of bedrock. As a result, the depth of Cambrian Elbrook Formation limestone bedrock (weathered and/or competent) is greater than the depths explored during site investigations (30 to 36 ft bgs).

Landfill material and debris were encountered within the unconsolidated alluvial deposits of several test pits and soil borings as shown on Figure 2-2. The nature and extent of encountered landfill material and debris is discussed in Section 4.5.

2.1.6 Site Hydrology

Groundwater conditions at the site were characterized by three existing groundwater monitoring wells (45MW1, 45MW2, and 45MW3) installed in 1991 as part of the VI, the installation of monitoring well 45MW4, obtaining water level measurements at well locations, and completion of slug tests to provide estimates of the hydraulic conductivity of the uppermost aquifer within the screened intervals.

2.1.6.1 Occurrence of Groundwater and Groundwater Flow Direction

The uppermost zone of groundwater at the site occurs in unconfined conditions within the lower portion of the unconsolidated alluvial sediments consisting of silt and silty gravels, approximately 20 to 25 ft bgs. Groundwater elevation data collected during SSP field activities (June 2008 and August 2008) are summarized in Table 2-2 and shown on Figures 2-3 and 2-4 as potentiometric contour maps. The overall local groundwater flow direction shown on these figures is primarily toward the east-northeast. Hydraulic gradients for the flow paths shown on Figures 2-3 and 2-4 were calculated as follows:

Hydraulic Gradient for Lateral Groundwater Flow at SWMU 45

Date	Flow Path Contour Lines	Elevation Difference (ft)	Flow Path Distance (ft)	Calculated Hydraulic Gradient (ft/ft)
6/24/2008	1681.39 ft to 1681.25 ft	0.14	310	4.52E-04
8/12/2008	1681.06 ft to 1680.80 ft	0.26	270	9.63E-04
Average Hydraulic Gradient (ft/ft)				7.08E-04

Review of the above table and Figures 2-3 and 2-4 show variations in groundwater flow direction and hydraulic gradient from the June 24 event and the August 12 event. Variations in groundwater flow direction and hydraulic gradient at the site may be due in part to changes to river stage and discharge from

the New River located immediately north of the site area and the low hydraulic gradient observed at the site. River effects on groundwater flow have been recently documented at the SWMU 54 site, which is also located on an alluvial terrace adjacent to the New River (URS 2008). Review of daily New River mean discharge flow rates during the June and August measurement events did indicate a higher mean river flow on June 24, 2008 (1,430 cubic feet per second [cfs]) compared to August 12, 2008 (874 cfs) (USGS 2008). Both of the discharge rates were below the 68 year average river flow of 2,640 cubic feet per second indicating relatively low-flow conditions during the June and August 2008 SSP field activities (USGS 2008).

2.1.6.2 Hydraulic Conductivity and Groundwater Flow Velocity

Rising head slug tests were conducted at monitoring wells 45MW1 through 45MW4 to provide estimates of the hydraulic conductivity of well screened intervals. Slug testing methods are described in Section 3.3.6 and slug test results are summarized in the following table. Detailed analysis and calculations for the slug tests are included in Appendix D.5.

Summary of Rising Head Slug Test Results

Well ID	Lithology of Screened Interval	Hydraulic Conductivity (cm/sec)
45MW1	Alluvium	2.68E-05
45MW2	Alluvium	9.66E-06
45MW3	Alluvium	3.80E-04
45MW4	Alluvium	3.62E-04
Average Hydraulic Conductivity		**1.95E-04**

Slug test analysis indicated an average hydraulic conductivity of 1.95E-04 centimeters per second (cm/sec) or 0.553 ft/day for the screened interval consisting of alluvium. This average hydraulic conductivity value is consistent with unconsolidated silts and silty sands (Freeze and Cherry 1979).

The following equation was used to calculate an approximate average velocity of groundwater flow within the uppermost aquifer in the area of SWMU 45.

$$V_s = Ki/n_e$$

Where:

V_s = average groundwater flow (seepage) velocity (ft/day)

K = hydraulic conductivity (ft/day)

i = hydraulic gradient (ft/ft)

n_e = effective porosity (%)

The following values were substituted into this equation:

K =	0.553 ft/day	Average value calculated from slug tests at SWMU 45
i =	7.08E-04 ft/ft	Average value calculated across monitored area
n_e =	0.25	Estimated average effective porosity for fine sand and gravel

Using the above values, the average calculated groundwater-flow velocity at SWMU 45 is 1.57E-03 ft/day or 0.57 ft/year.

2.2 SITE BACKGROUND – HISTORY

A United States Environmental Protection Agency RCRA Facility Assessment (RFA) conducted at RFAAP identified SWMU 45, an inactive landfill (Landfill No. 3), as having the potential to release constituents into the environment (USEPA 1987). The RFA described this landfill as having operated in the 1970s. Another report (USATHAMA 1984) described this landfill as the first known landfill at RFAAP, which operated between 1957 and 1961 (Dames & Moore 1992). The latter dates of operation appear to be more reliable based on recollections of plant personnel, the aerial photography, and apparent ages of pine trees planted after landfill operations ceased (Dames & Moore 1992).

Aerial photography from 1949 shows a cleared area with ground scarring in the area between, but just south of, existing site monitoring wells 45MW2 and 45MW3. An aerial photograph from 1962 does not show the ground scarring but shows a darker-tone and possibly disturbed area south of well 45MW2. An aerial photograph from 1971 did not show the 1949 or 1962 scarring patterns but did show a white-toned scarred area along the former access road approximately 100 ft north of existing site monitoring wells 45MW1.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 RCRA Facility Assessment (RFA) – USEPA 1987

An assessment was conducted at SWMU 45 to evaluate potential hazardous waste or hazardous chemical releases and implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. Environmental samples were not collected at SWMU 45 as part of the inspection. At the time of the RFA, the area identified by site personnel as the landfill was "indistinguishable from the surrounding area as a landfill site." According to the RFA, the disposal unit began operation in the 1970s but was not active at the time of the visual site inspection conducted in 1986. Paper and refuse were reportedly placed in the landfill. No data indicating releases had been identified at the time of the RFA.

2.3.2 Verification Investigation – 1992

The results of a VI were reported by Dames & Moore in 1992. The objective of the VI was to evaluate whether toxic or hazardous constituents were present and had the potential of migrating beyond the boundaries of the identified SWMUs (Dames & Moore 1992). The VI included a geophysical survey of an approximate 5-acre study area, and installation and sampling of three groundwater monitoring wells as described below.

Geophysical Survey

A geophysical survey was conducted in the SWMU 45 area as part of the VI to better delineate landfill and disposal boundaries at the site. The survey was conducted over the approximate 3.6-acre area shown on Figure 2-5. The reconnaissance-level geophysics survey was conducted using the EM-31 in conductivity mode and a proton magnetometer. For the initial survey, measurements were collected at intervals of 10 ft along seven parallel north-south lines placed 100 ft apart. The survey covered an area of 250 by 600 ft (Figure 2-5). Additional data were collected at intervals of 10 ft from line 2+00 East to 4+00 East and at intervals of five feet from 5+80 East to 6+20 East due to anomalous features detected that warranted further investigation. Figure 2-5 shows the summary interpretation of the geophysical data included in the Dames & Moore VI Report (1992) including three potential burial areas and a potential metallic object anomaly.

Monitoring Well Installation and Groundwater Sampling

Three groundwater monitoring wells were installed at the site to evaluate potential releases to groundwater from the identified landfill area including one upgradient well (45MW1) and two downgradient wells (45MW2 and 45MW3). These monitoring wells were installed to monitor the uppermost zone of groundwater present within unconsolidated alluvium.

Groundwater samples were collected site monitoring wells in November 1991 for analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), explosives, Target Analyte List (TAL) metals, total organic carbon (TOC), total organic halogens (TOX), and pH. Sample results are summarized in Table 2-3 and compared to current EPA Region III adjusted tap water risk-based concentrations (T-RBCs). Bis(2-chloroethyl)ether and manganese were detected in the sample collected from downgradient well 45MW3 at concentrations above their adjusted T-RBCs. Manganese was also detected in the upgradient well 45MW1 sample at a concentration above its adjusted T-RBC.

2.3.3 Installation Assessment – EPIC Aerial Photographic Analysis – USEPA 1992

The Environmental Photographic Interpretation Center (EPIC), through the USEPA and U.S. Army Toxic and Hazardous Material Agency (USATHAMA), provided aerial photographic analysis of 42 known SWMUs at RFAAP (USEPA 1992). Aerial photographs from 1937 through 1986 were analyzed to identify features that may have represented sources of potential groundwater or surface water effects at RFAAP.

Activity at SWMU 45 was first noted in aerial photography at this site in 1949, which included substantial clearing, possible fill activity, light-toned mounded material, and staining (USEPA 1992 and Figure 2-6). The site appeared to have been enlarged by clearing between 1949 and 1954 with access roads and open storage of containers visible in 1954; however, most of the site appeared to be in the early stages of revegetation (USEPA 1992). Additionally, a small area of possible liquid was reported visible near the containers seen in the 1954 photograph (USEPA 1992). The 1954 aerial photograph referenced in the report is not available, however the interpreted information referenced in the report text for 1954 is available on the EPIC markup of the photograph from 1962 (Figure 2-7). By 1962, the site appeared to be revegetating and evidence of mounded material and staining was absent (USEPA 1992 and Figure 2-7). In 1966, a possible trench and a dark-toned material were visible in the photograph (USEPA 1992). The 1966 aerial photograph referenced in the report is not available, however the interpreted information referenced in the report text for 1966 is available on the EPIC markup of the photograph from 1971 (Figure 2-8). By 1971, most of the area was revegetating except for a small ground scarred area (USEPA 1992 and Figure 2-8). By 1975, the site appears to be revegetated except for a small ground scarred (Figure 2-9). By 1986, the site appeared to be inactive and revegetating (USEPA 1992 and Figure 2-10).

2.3.4 Geophysical Investigation – 2007

As a part of WPA 022, a geophysical investigation of the site area was conducted in April 2007 by ATS International, Inc. (ATS) under URS oversight. The scope of investigations is described in detail in the EPA and VDEQ approved geophysical investigation plan included in WPA 022, Appendix D.1. The investigation was performed once a 325 ft by 800 ft survey grid was placed at the site shown on Figure 2-11. There were three main elements of the geophysical investigation:

- Using electromagnetic induction (EM) to delineate the horizontal extent of fill material;
- Using two-dimensional electrical resistivity imaging (2D-ERI) to assess the vertical extent of fill material, assess the potential for leachate migration, and confirm the horizontal extent of fill material delineated by the EM survey; and
- Completing five targeted spectral analysis of surface waves (SASW) to corroborate the vertical extent of fill material and assess the depth to bedrock beneath the site.

Locations of the geophysical surveys are shown on Figure 2-11. Results of the geophysical survey were used to better delineate landfill boundaries at the site, provide data to guide the SSP investigation at the site, and confirm that existing monitoring wells 45MW1, 45MW2, and 45MW3 are appropriately positioned to detect potential releases to groundwater. A copy of the geophysical investigation report prepared by ATS is included in WPA 022, Appendix D.2, and a summary of their results and conclusions is presented below.

EM Survey Results

The purpose of the EM survey was to evaluate lateral changes in EM distribution that may indicate the presence of fill materials. Strong, localized contrasts in conductivity may indicate the presence of buried materials that differ from the natural materials. The quadrature component of the EM data provides apparent terrain conductivity, which is a weighted average of the conductivity through the depth of measurement beneath the instrument. High magnitude responses, either positive or negative, indicate high bulk conductivity in the materials under the instrument. The in-phase component of the EM data is the ratio of the secondary to primary magnetic field, and it is sensitive to the presence of highly conductive material such as shallow metal objects. It is generally considered the metal-detection mode of the EM investigation.

Figure 2-12 presents a contour map of quadrature component of EM data. Figure 2-13 presents a contour map of in-phase component of EM data. The quadrature component of the EM data revealed an area in the north central portion of the study area characterized by elevated conductivities relative to the majority of the site. While variations in conductivity is normal, the magnitude of observed conductivities is unlikely the result solely of variations in natural geologic conditions. In addition, although standing water was observed within a non-contiguous ditch in this portion of the site, it is unlikely that the size of the area of elevated conductivities is the result of higher groundwater saturation from the standing water. This zone of high conductivity in the north-central part of the surveyed area, northwest of well 45MW1 and between wells 45MW2 and 45MW3 appears to be coincident with the disturbed ground at the end of the site access road in the 1949 and 1964 aerial photographs.

The distribution of the in-phase EM data component is generally consistent with that of the quadrature component. A number of small in-phase anomalies are observed in the north central portion of the site, with additional correlated anomalies in other areas. One of these anomalies, located approximately 75 ft west of 45MW1, appeared to be coincident with an observed piece of sheet metal at the ground surface.

2D-ERI Survey Results

The resistivity imaging survey was conducted to collect cross-sectional resistivity data over areas of anomalous EM to delineate the vertical extent of potential fill materials. Figure 2-14 provides locations of electrodes for the five resistivity lines superimposed over the contour map of the quadrature component of the EM data. Figure 2-15 provides interpreted pseudo-section results for the five resistivity lines. The resistivity lines placed through the anomalous EM zones display low-resistivity zones in the shallow subsurface that correlate well with the lateral extents of the elevated EM zones. The low resistivity zones are generally characterized by lower values and greater depth than low resistivity features found elsewhere on the resistivity cross sections. Interpreted together, ATS concluded the EM and resistivity data suggest the presence of fill materials that may be as deep as 20 ft in some places.

SASW Survey Results

The purpose of the SASW survey was to corroborate the depth to bedrock and vertical extent of potential fill materials in the event that leachate was present beneath the fill that masked the vertical boundary with the natural materials. The SASW results are not of themselves conclusive, but are supportive of the above interpretations. Results of SASW profiles are provided on Figure 2-16. SASW profiles, which were placed in what was interpreted by ATS to be natural materials, display a relatively abrupt change from velocities of 500 to 700 ft per second to velocities of approximately 1,700 ft per second at approximately 5 to 7 ft in depth. Those SASW profiles placed in the shallow low-resistivity zones,

interpreted to be potential fill materials, generally display low velocities to depths of 18 to 20 ft below grade where they increase suddenly to greater than 2,000 ft per second.

Investigation Uncertainties

It was noted by ATS that there are uncertainties associated with interpretations of the geophysical data. For example, the resistivity results from Line 3 are very similar to those of Line 2, but Line 3 is not mapped as passing through the zone of elevated EM. However, ATS noted these results are consistent with other studies they have conducted using these methodologies to map the lateral and vertical extent of fill. ATS also noted that it is generally not feasible, based on geophysical results, to determine the type of materials comprising the interpreted fill. Fill from displaced natural materials can display similar EM and resistivity signatures to those of municipal waste. However, ATS noted that there is no substantial evidence of leachate present at the site.

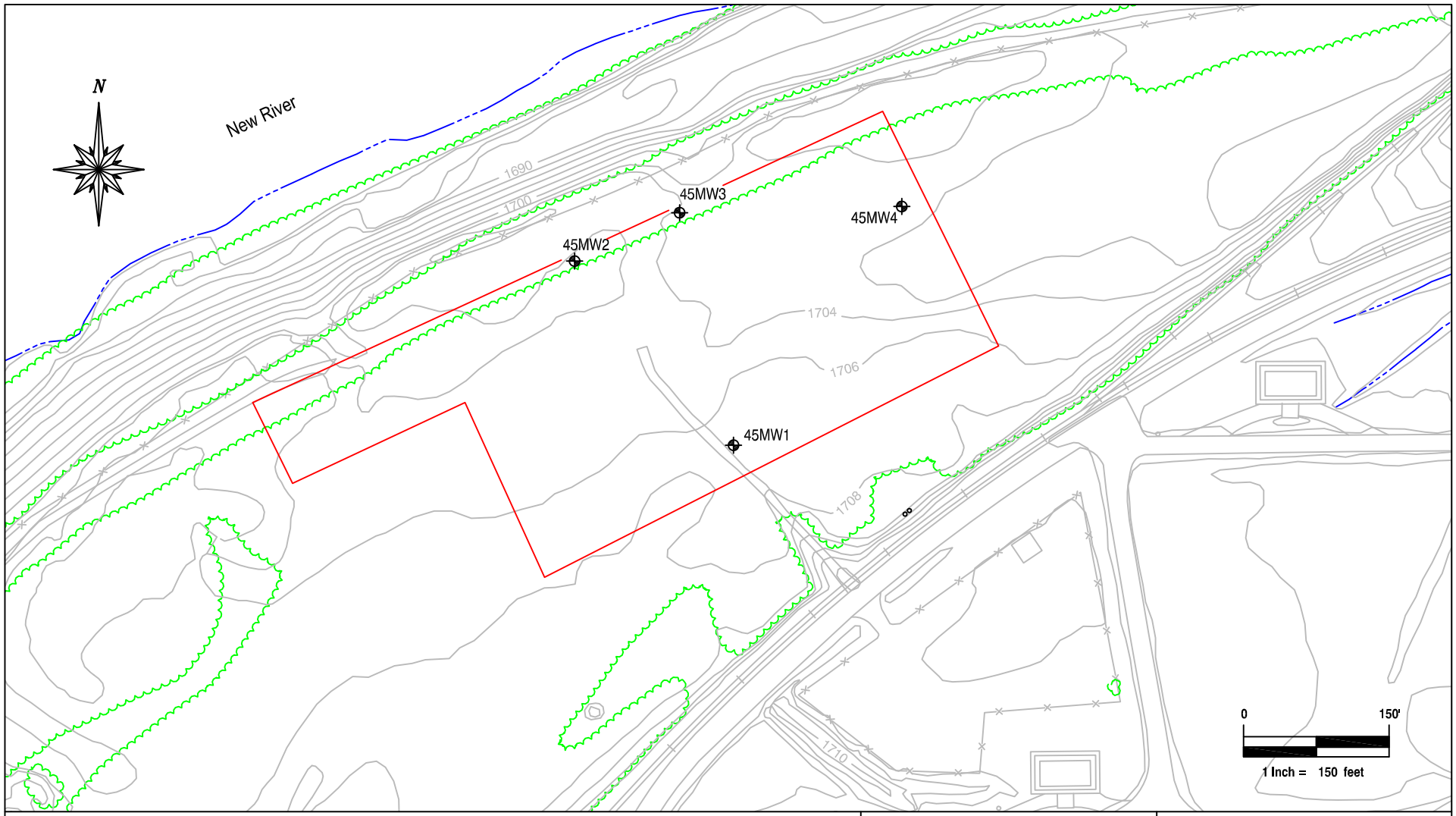
Post Survey Reconnaissance

URS completed a brief reconnaissance at the site after the geophysical survey was completed. Five of the anomalies identified in the EM survey were selected for further investigation to confirm the geophysical survey results and provide data to guide the follow-up SSP investigations at the site. Figure 2-17 depicts the five geophysical anomalies areas targeted for the reconnaissance. URS dug holes of varying depths and widths using a shovel.

Metal debris was identified at anomalies 1, 2, and 4. The debris included metal parts tags, pipes, pipe fittings, springs and bars as well as several unknown items. This debris was within 0 to 1 ft bgs, however, it appeared that more debris could have been uncovered if the excavations were expanded. Anomaly 1 could only be excavated to 1 ft depth due to hitting a hard cement-like layer. On review of the field information, the hard, dark colored heavy material observed at anomalies 1 and 3 may be slag material.

Clayey soil was encountered at anomalies 3 and 5, but no other materials or debris. While two distinct layers of soil were observed at anomaly 3, it was on a mound approximately 3 ft above a surrounding gulley so it may not have been dug deep enough to uncover any debris.

Other types of solid waste such as paper, cans, bottles, or plastic were not observed during the reconnaissance. The observations confirm metallic debris fill material at the locations identified in the EM survey. A photographic log of the further investigation of the five anomalies identified during the geophysical survey are provided in WPA 022, Appendix D.3.



Legend

- Monitoring Well Location
- Topographic Contour
- Perimeter Fence
- Vegetation
- Approximate Limits of Study Area

FIGURE 2-1

Site Topographic Map

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: 1" = 150'	File Name: Fig. 1-2 SiteTopo

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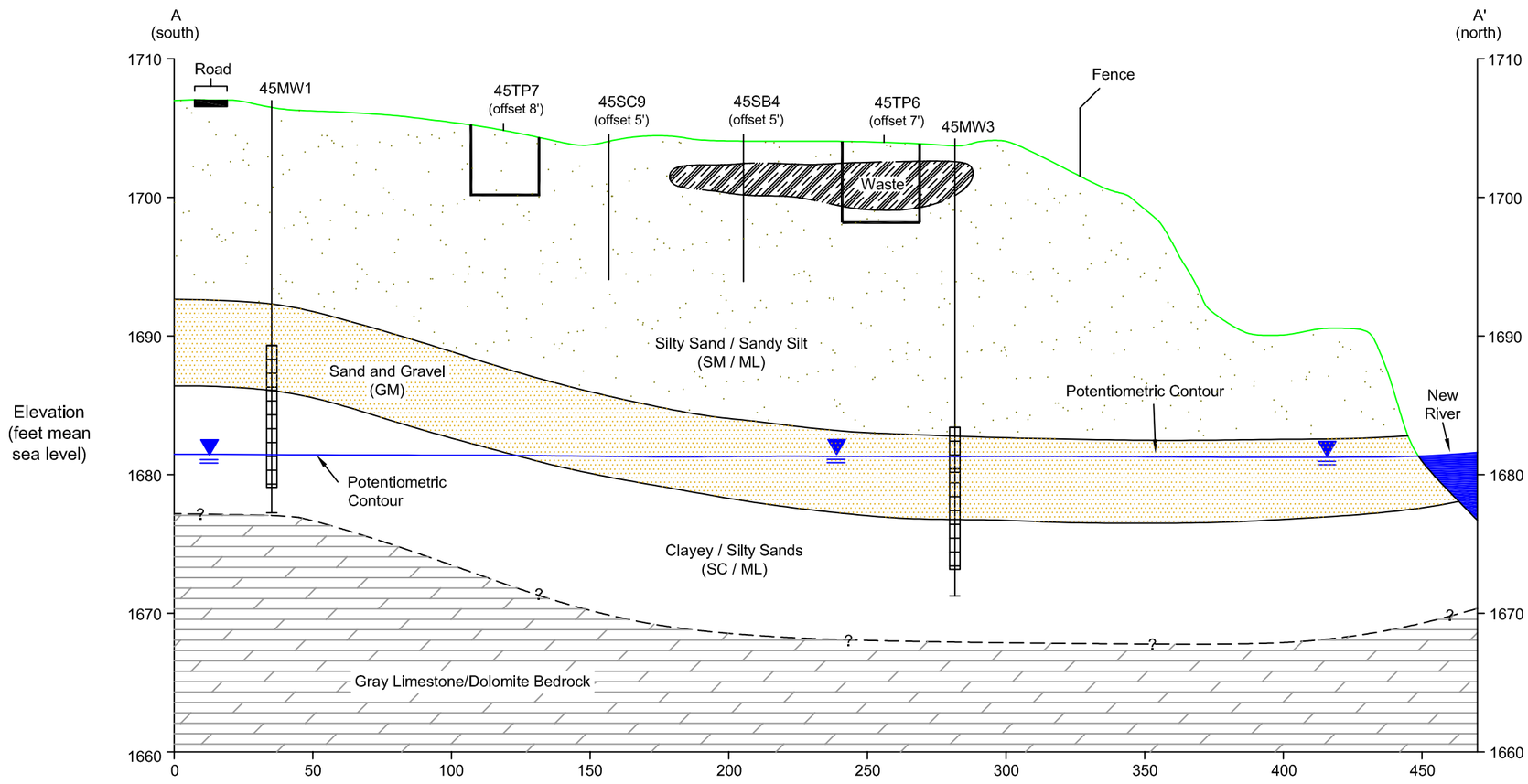

1" = 10'

1" = 50'

Vertical
Exaggeration = 5

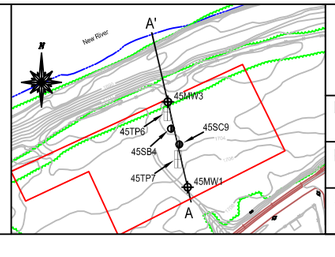

FIGURE 2-2
SWMU 45 Cross Section - A-A'

Date: October 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: As Shown	File Name: Fig.2-2 45CrossSecA-A'

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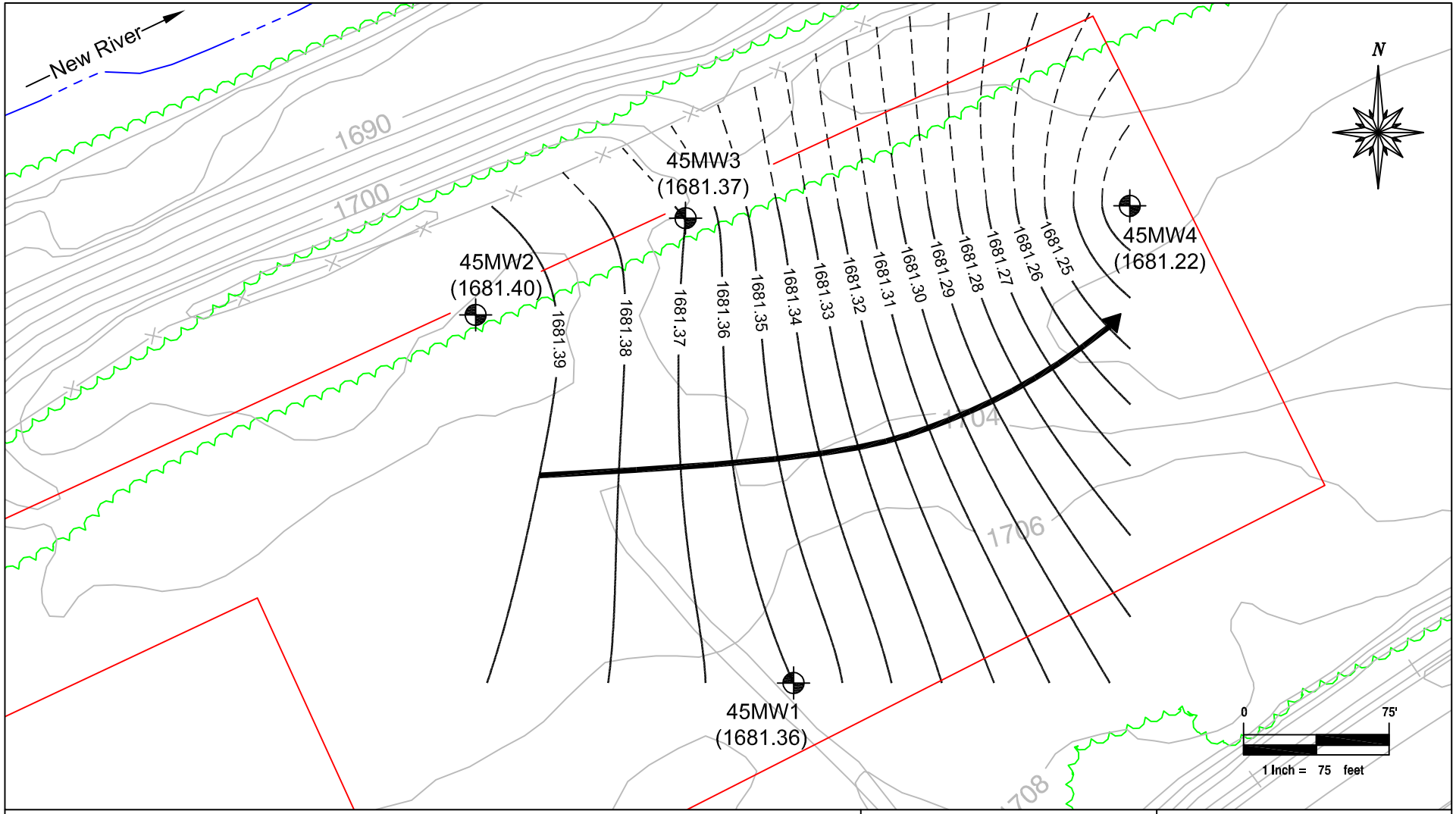

Legend

- Monitoring Well Location
- Topographic Contour
- Perimeter Fence
- Vegetation
- Potentiometric Contour Line
- Inferred Potentiometric Contour Line
- Inferred Groundwater Flow Direction
- (1680.94) Groundwater Elevation (feet, mean sea level)

FIGURE 2-3

Groundwater Potentiometric Map
June 24, 2008

Date: September 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: 1" = 75'	File Name: Fig.2-3 PotMap 6-08

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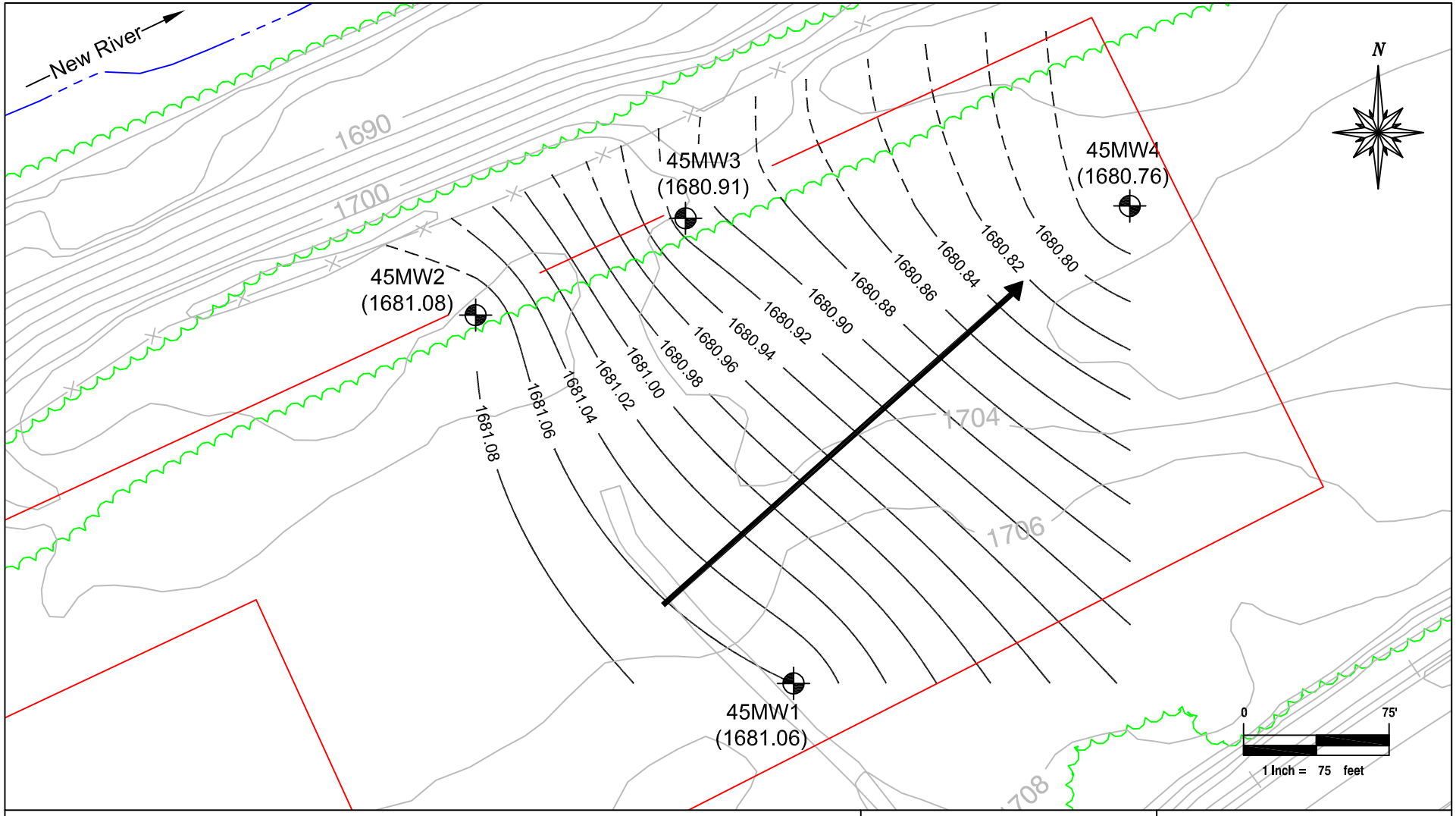

Legend

- Monitoring Well Location
- Topographic Contour
- Perimeter Fence
- Vegetation
- Potentiometric Contour Line
- Inferred Potentiometric Contour Line
- Inferred Groundwater Flow Direction
- (1680.94) Groundwater Elevation (feet, mean sea level)

FIGURE 2-4

Groundwater Potentiometric Map
August 12, 2008

Date: September 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: 1" = 75'	File Name: Fig.2-4 PotMap 8-08

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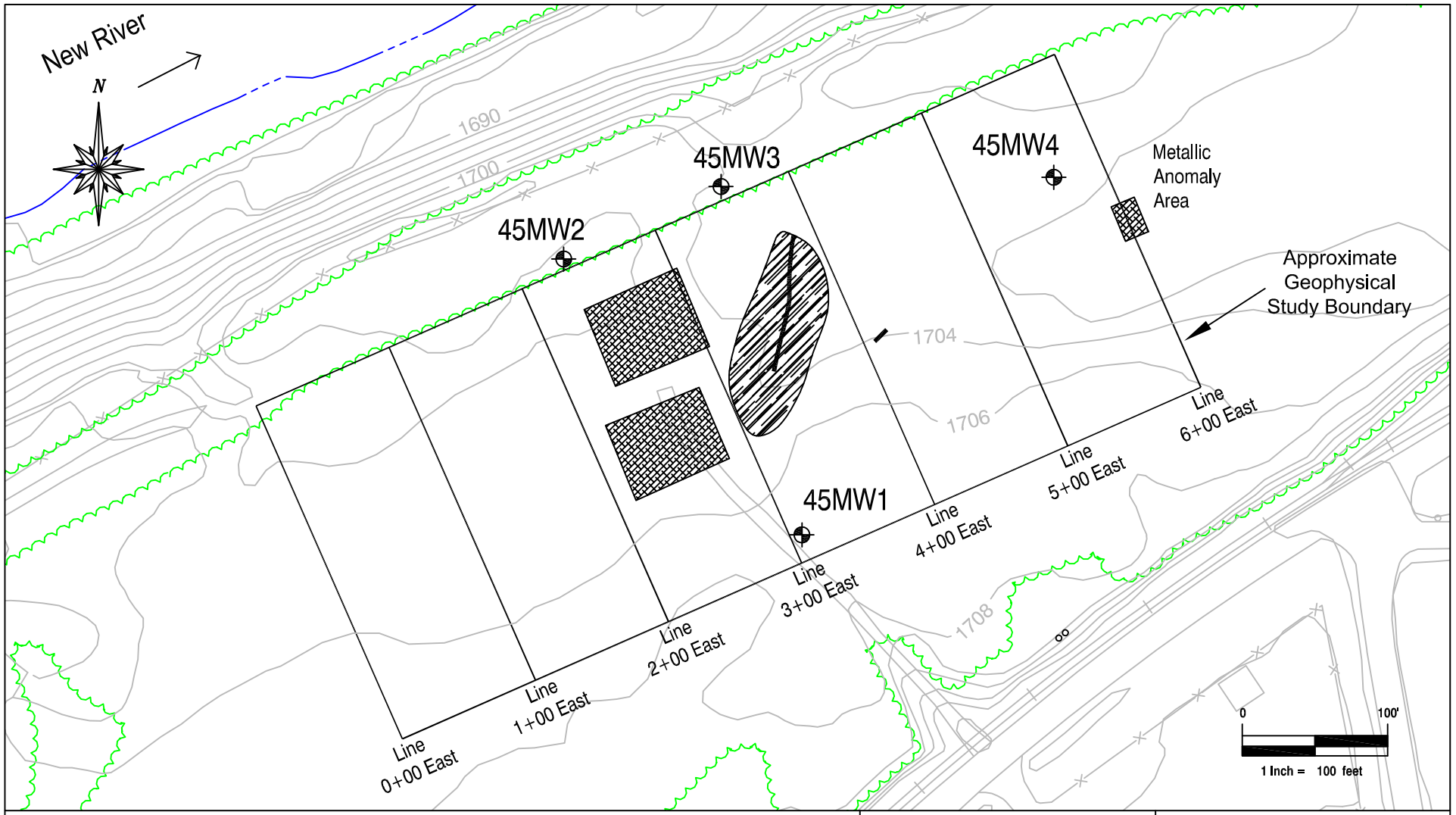

Legend

- Topographic Contour
- Monitoring Well Location
- Non-Metallic Anomaly Area
- Metallic Anomaly Area
- Non-Contiguous Ditch

FIGURE 2-5

1992 VI Geophysical Survey Results

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: 1" = 100'	File Name: Fig. 2-5 '92 VI Geo

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FIGURE 2-6

Aerial Photograph - 1949

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = ~265'*	File Name: Fig 2-6 1949 Aerial

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FIGURE 2-7

Aerial Photograph - 1962

Date: August 2008	URS Project #: 11656351
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Scale: *1" = ~225'*	File Name: Fig2-7 1962 Aerial

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FIGURE 2-8

Aerial Photograph - 1971

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = ~230'*	File Name: Fig2-8 1971 Aerial

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FIGURE 2-9
Aerial Photograph - 1975

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = ~205'*	File Name: Fig2-9 1975 Aerial

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FIGURE 2-10

Aerial Photograph - 1986

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = ~230'*	File Name: Fig2-10 1986 Aerial

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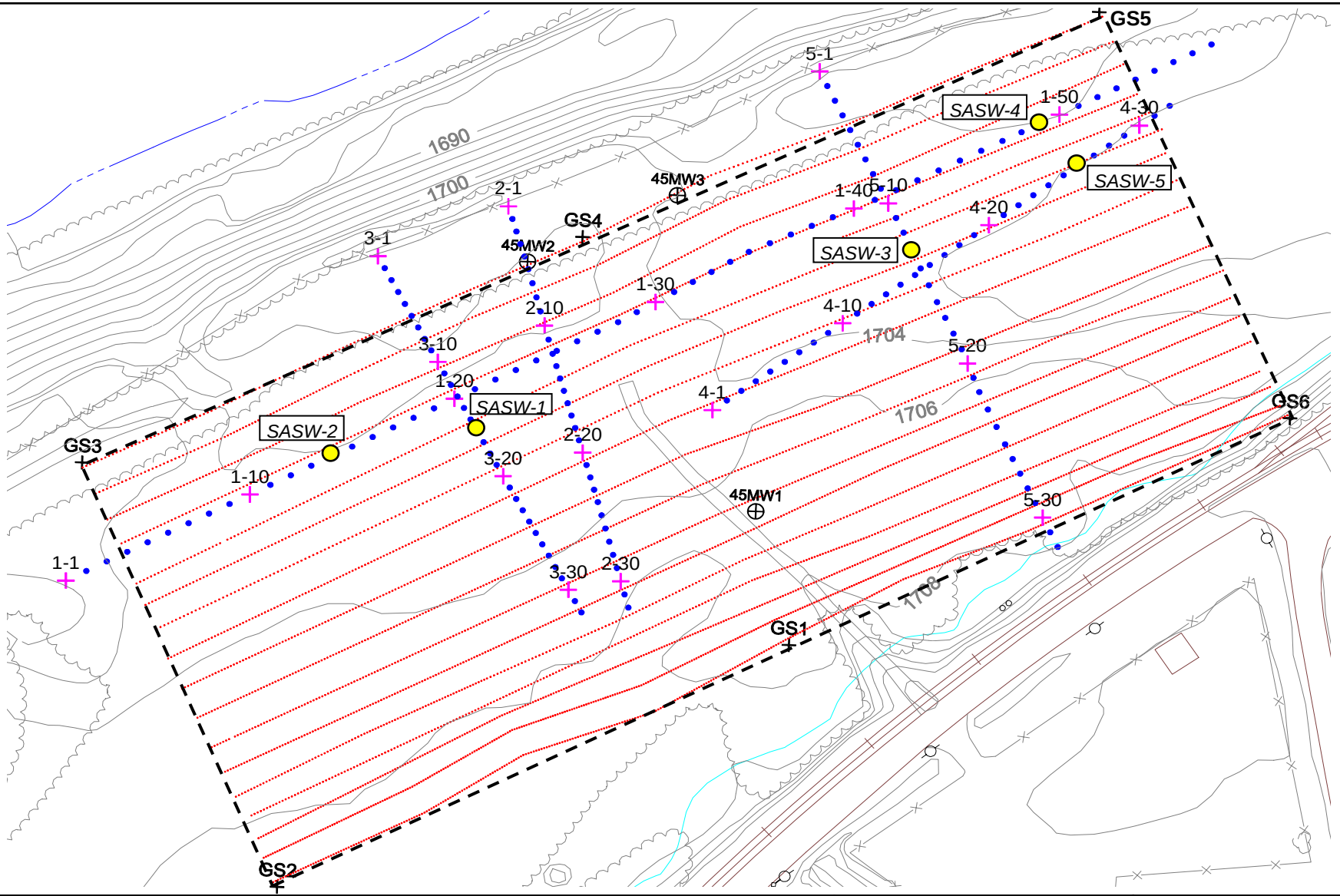

= *paths of EM traverses*

1-1 = *locations of resistivity electrodes*

= *location of SASW profile*

Scale: 1 inch = 105 feet

0 — 105 feet — 210

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 2-11

2007 Geophysical Survey Area

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-11 Res.Results

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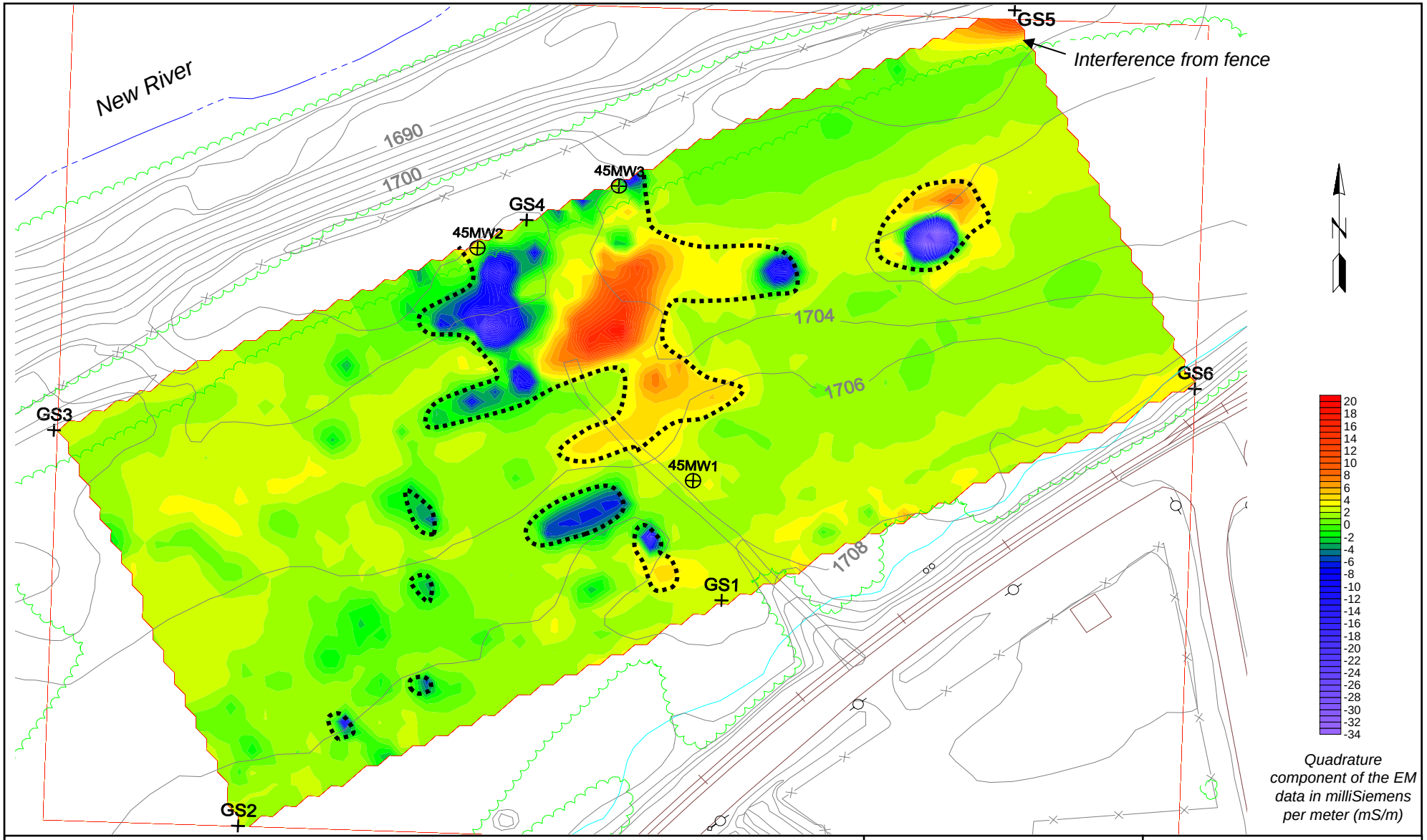

= Zones of high conductivity

Scale: 1 inch = 105 feet

0 105 210
feet

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 2-12

2007 Geophysical Survey - EM Data
Contour of Quadrature Component

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-12 Quad.Data

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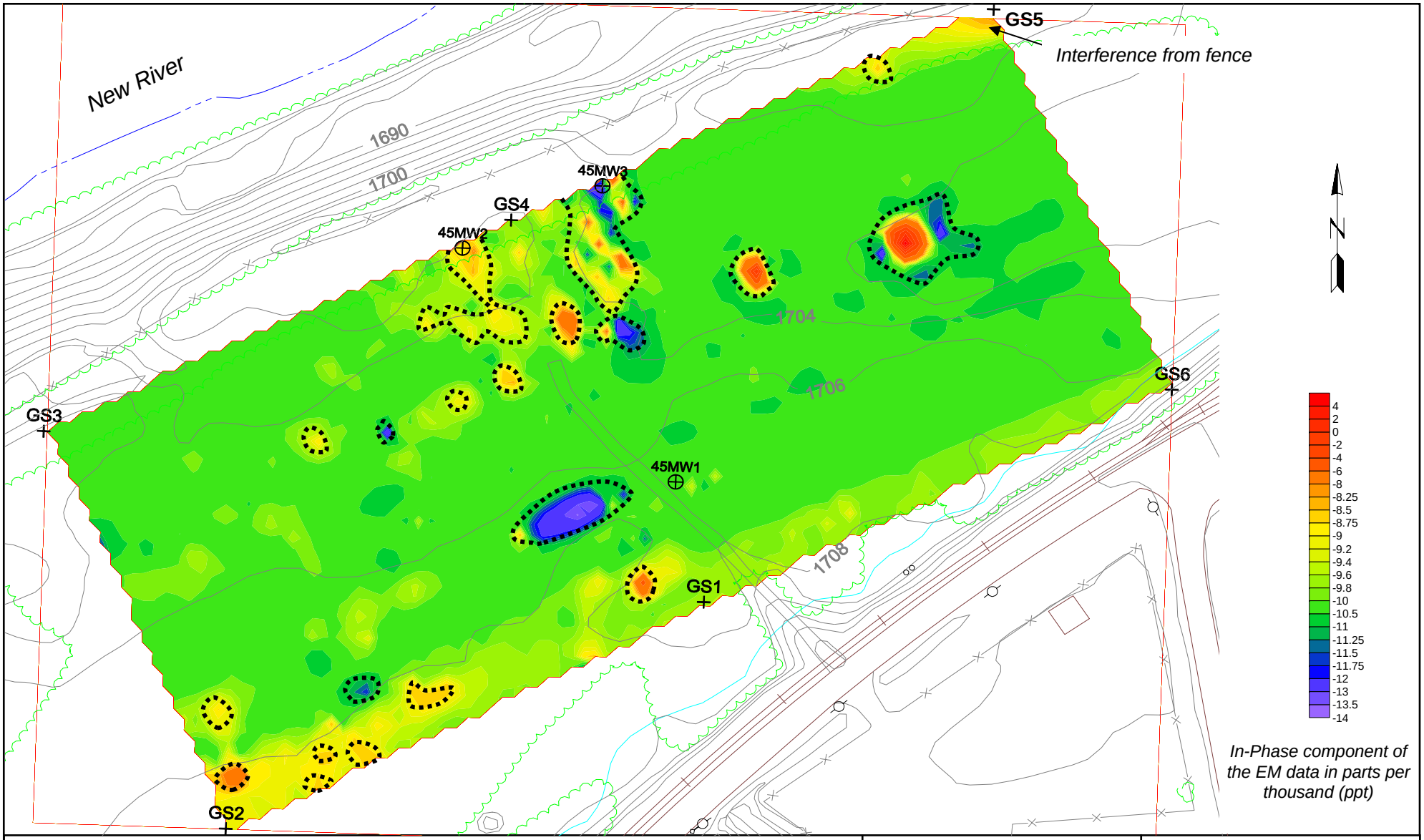

= Zones of high conductivity

Scale: 1 inch = 105 feet

0 105 210
feet

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 2-13

2007 Geophysical Survey - EM Data
Contour of In-Phase Component

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-13 InPhaseData

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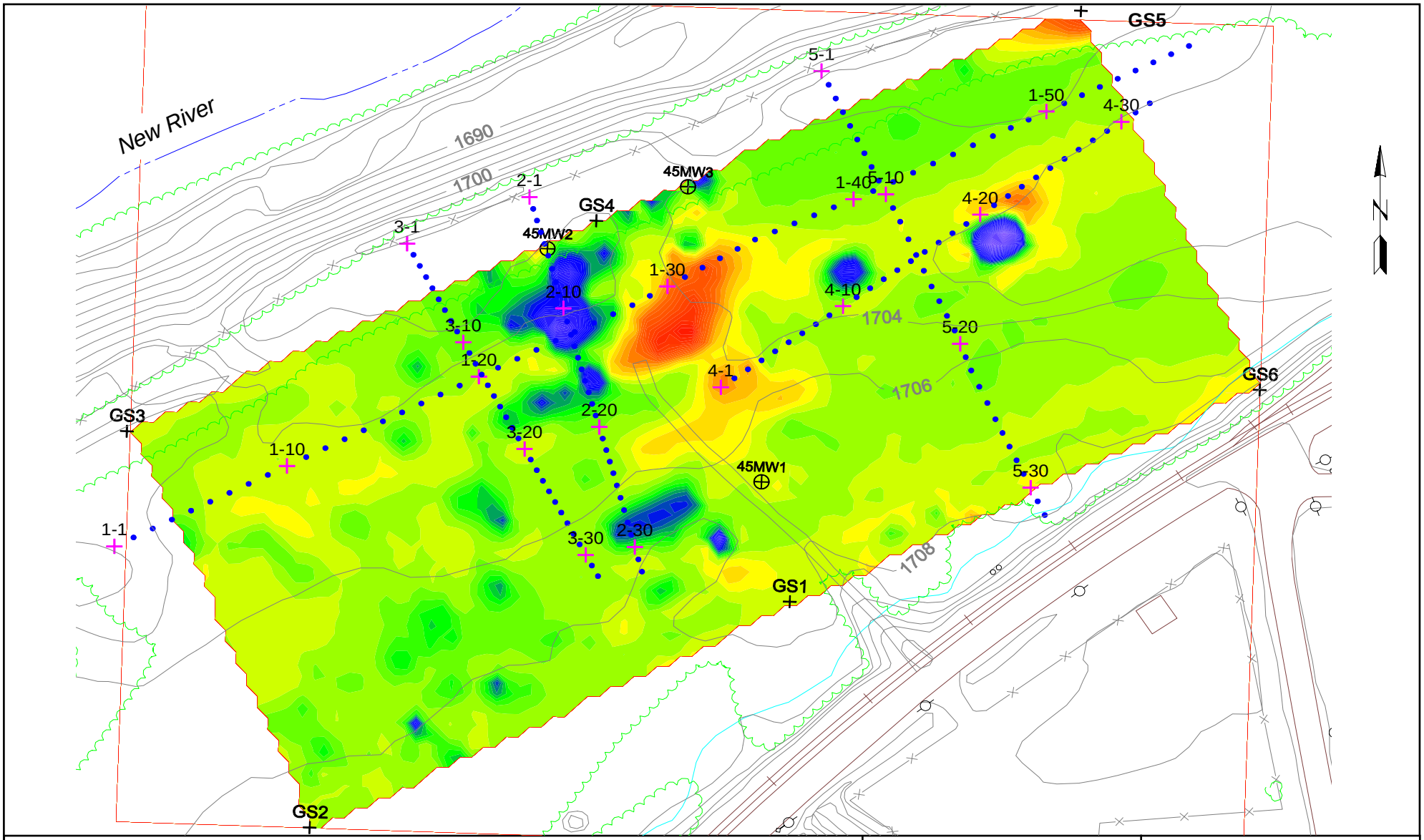

1-1 = *locations of resistivity electrodes*

Scale: 1 inch = 105 feet

0 — 105 feet — 210

Geophysical Survey Data provided by: ATS International, Advanced Technical Services

FIGURE 2-14

2007 Geophysical Survey - Location of Resistivity Survey Lines

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-14 Res.Locs

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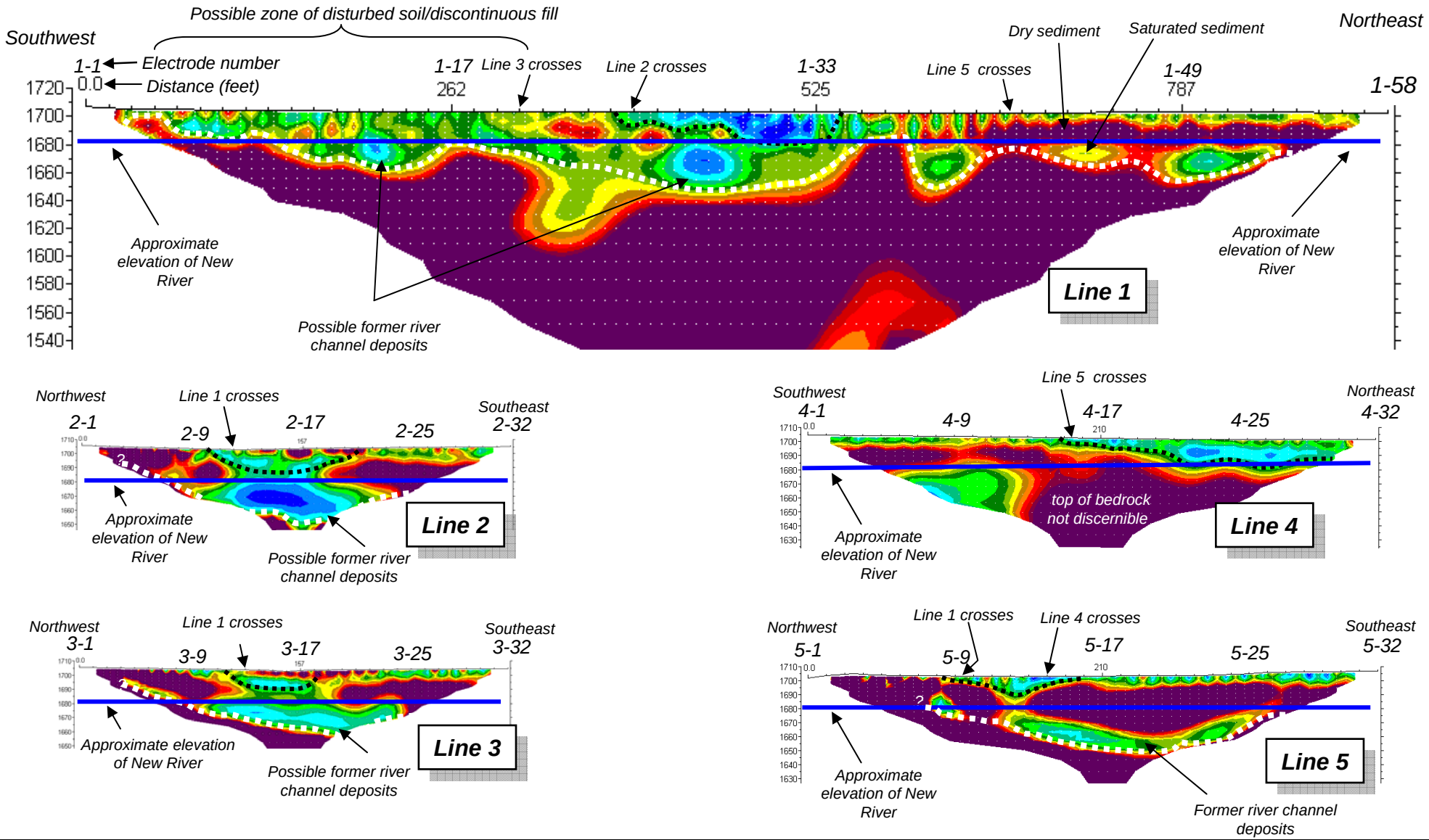
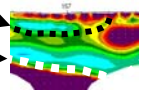


Legend

Interpreted base of potential fill materials (black dotted line)

Interpreted top of bedrock (white dotted line)



Resistivity Scale in Ohm-meters

0.00 50.0 100 150 200 250 300 350

Distances and elevations are in feet

Cross-section Scale: 1 inch = 100 feet

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 2-15

2007 Geophysical Survey - Resistivity Results

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-15 Res.Results

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Results of the SASW Profiles

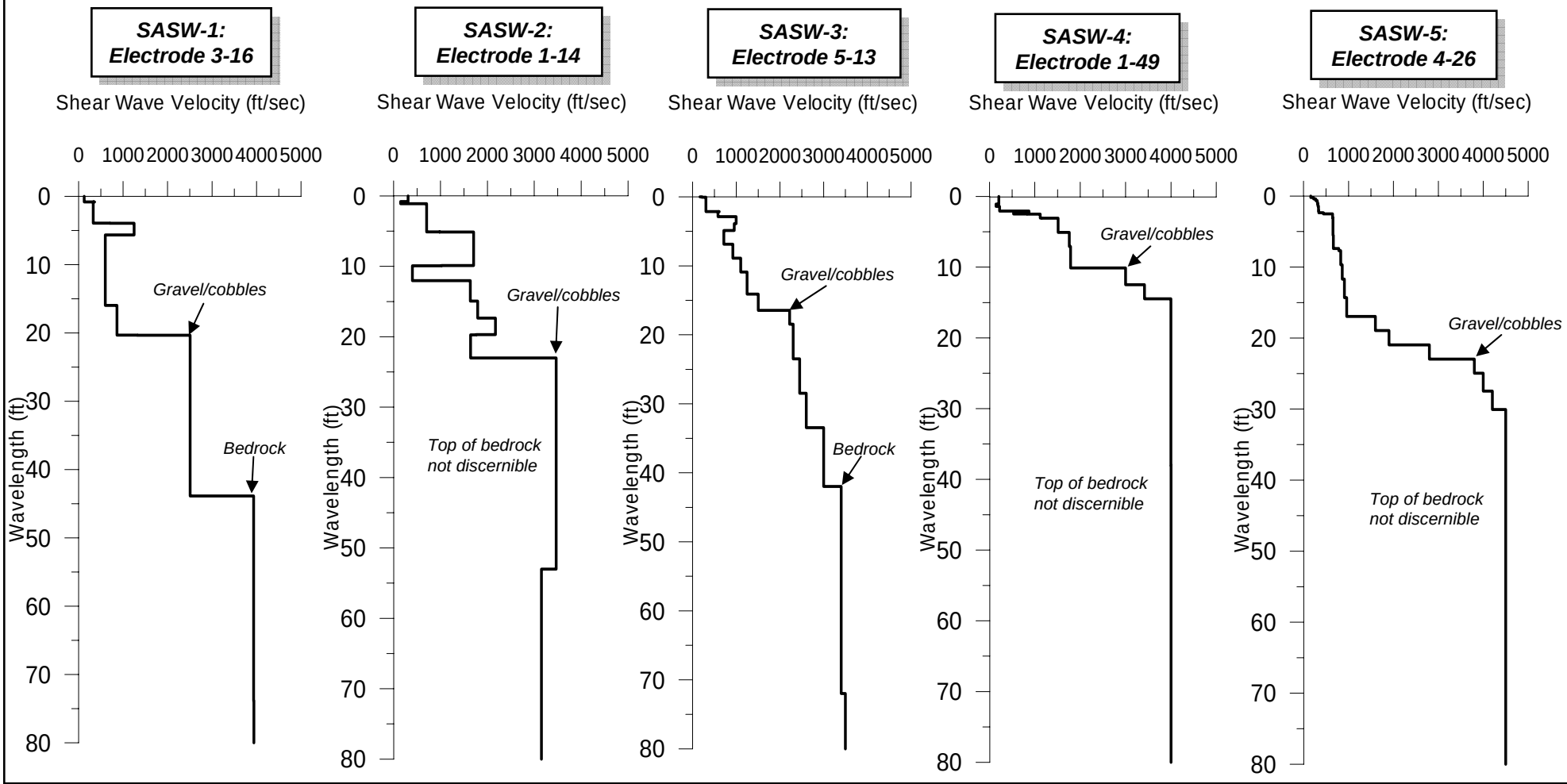

FIGURE 2-16
2007 Geophysical Survey - Results of SASW Profiles

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: 1" = 2000'	File Name: Fig2-16 SASWResults

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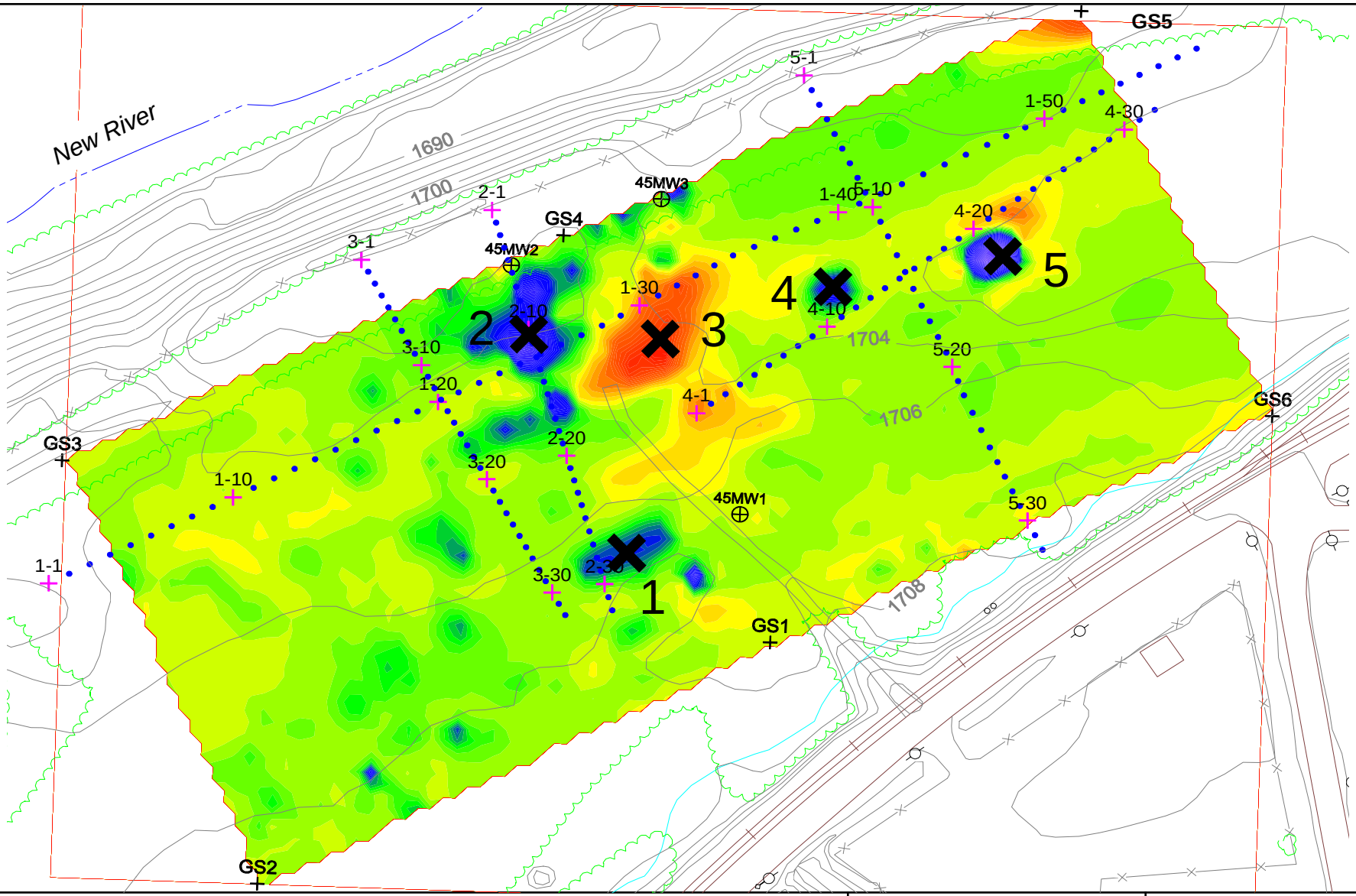

✕ = *anomaly area (#)*

1-1 = *locations of resistivity electrodes*

Scale: 1 inch = 105 feet

0 — 105 feet — 210

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 2-17

2007 Geophysical Survey – Geophysical Anomaly Areas

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *As Shown*	File Name: Fig2-17 Ano.Areas

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Table 2-1
Physical Soil Testing Results
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Soil Sample			Physical Soil Testing Results										
Location	Depth Collected (ft bgs)	USCS Soil Type	Water Content (D2216)	Liquid Limit (D4318)	Plastic Limit (D4318)	Plastic Index (D4318)	Grain Size Minus No. 200 (D422)	Hydrometer % Minus 2 μm (D422)	pH Distilled Water (D4972)	pH 0.01M CaCl Solution (D4972)	Tota Organic Carbon (Walkley-Black)	Specific Gravity (D854)	Total Bulk Density (D2937)
			%	--	--	--	%	%	SU	SU	%	--	pcf
45SB4A	1.5-4	SM	20.3	29	26	3	41.0	9	6.4	5.9	0.49	nt	91.5
45SB4B	5.5-8	CL-ML	20.8	28	21	7	59.9	16	4.5	4	0.22	nt	114.8
45SB8A	0-2.5	ML	14.9	36	26	10	50.7	10	6.2	5.7	1.4	nt	85.1
45SB8B	5.5-8	CL	12.3	30	21	9	61.1	17	4.1	3.7	1.7	nt	89.4

Notes:
ft bgs = Feet below ground surface
pcf = Pounds per cubic foot
USCS = Unified Soil Classification System
(D2216) = ASTM Test Method

SU = Standard Units
-- = Unitless
nt = Not tested
np = Not plastic

SM = Sand with silty fines
CL = Clay low plasticity
ML = Silt low plasticity
g/cm^3=Grams per cubic centimeter

Table 2-2
Monitoring Well Construction and Groundwater Data
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

	Monitoring Well Construction Information						6/24/2008		8/12/2008	
Well Identification	**Date Installed**	**Well Diameter (In)**	**Total Well Depth (ft bgs)**	**Elevation Ground Surface (ft msl)***	**Elevation TOC (ft msl)***	**Screened Interval (ft bgs)**	**Depth to Water (ft BTOC)**	**Groundwater Elevation (ft msl)**	**Depth to Water (ft BTOC)**	**Groundwater Elevation (ft msl)**
45MW1	9/28/1991	4	27.3	1706.39	1708.86	17.3 - 27.3	27.50	1681.36	27.80	1681.06
45MW2	9/30/1991	4	24.8	1702.79	1705.33	14.8 - 24.8	23.93	1681.40	24.25	1681.08
45MW3	9/30/1991	4	30.0	1703.28	1705.69	20.0 - 30.0	24.32	1681.37	24.78	1680.91
45MW4	5/8/2008	2	32.5	1701.69	1703.83	17.5 - 32.5	22.61	1681.22	23.07	1680.76

Notes:
TOC = Top of Casing
BTOC = Below Top of Casing
ft = feet
msl = mean sea level
bgs = below ground surface
* Monitoring wells were surveyed on 4/23/08

Table 2-3
Summary of Historical Analytical Groundwater Detections at SWMU 45
Modified from Dames and Moore Verification Report Investigation (October 1992)
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID Field ID Sample Date Well Depth (feet) Matrix	CAS	C/N	Adjusted Tap Water RBC	MCL	45MW1 RDWC*1 11/8/1991 22 GW	45MW2 RDWC*2 11/8/1991 20 GW	45MW3 RDWC*3 11/7/1991 25 GW
TAL Metals (ug/L)							
Barium	7440-39-3	N	730	2,000	33.3	68.2	132
Calcium	7440-70-2	--	--	--	63,400	85,900	114,000
Iron	7439-89-6	N	2,555	--	141	<38.8	541
Lead[(1)]	7439-92-1	--	--	15	<1.26	<1.26	4.12
Magnesium	7439-95-4	--	--	--	25,200	30,800	36,000
Manganese	7439-96-5	N	73	--	681	3.47	98
Potassium	7440-09-7	--	--	--	1,460	<375	<375
Sodium	7440-23-5	--	--	--	50,800	4,530	10,900
Explosives (ug/L)							
None detected	--	--	--	--	ND	ND	ND
TCL VOCs (ug/L)							
Carbon Disulfide	75-15-0	N	104.3	--	0.737	<0.5	<0.5
Toluene	108-88-3	N	227.1	--	<0.5	1.27	<0.5
TCL SVOCs (ug/L)							
Bis(2-chloroethyl)ether	111-44-4	C	0.0096	--	<1.9	<1.9	3.39
Total Unknown TICs	--	--	--	--	(3) 37	(1) 6	ND
Other (ug/L)							
Total Organic Carbon (TOC)	--	--	--	--	16,400	10,600	16,300
Total Organic Halogens (TOX)	--	--	--	--	80.4	104	66
pH (Standard Units)	12408-02-5	--	--	--	7.26	6.96	6.76

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
ND = Not Detected
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table

C/N = Carcinogenic/Non-carcinogenic per EPA RBC Table (October 2007)
MCL = Maximum Contaminant Level
[(1)] = Lead MCL value is an action level

= Concentration above Tap Water RBC value

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3.0 FIELD INVESTIGATION PROGRAM

The field investigation program for the SSP conducted at SWMU 45 included a soil investigation and a groundwater investigation as outlined in the following sections.

3.1 SAMPLING AND ANALYSIS

The SSP sampling and analysis program is summarized in Table 3-1; this table identifies the boring locations, chemical and physical sample locations and depths, and analytical methods and parameters. Figure 3-1 shows the soil sample locations and groundwater monitoring wells sampled for the SSP.

3.1.1 Soil Borings and Soil Sampling

Sixteen direct push borings and 7 test pits were used to characterize soil conditions at SWMU 45. Soil boring and test pit locations are shown on Figure 3-1, provided in Table 3-1, and summarized below.

Soil Sampling and Analysis for SWMU 45

Date/Event	Soil Sample Locations	Analytical Parameters	Comments
May 2008	***Test Pits:*** 45TP1 through 45TP7	TAL Metals, Target Compound List (TCL) VOCs, TCL SVOCs, TCL Polychlorinated Biphenyls (PCBs), TCL Pesticides, and Explosives	Assess the presence/absence of waste material in anomaly locations identified from the geophysical investigation. Assess the nature and extent of constituents within the source area.
	Soil Boring (Chemical Sampling): 45SB1, 45SB5, 45SB8, and 45SB14	TAL Metals, TCL VOCs, TCL SVOCs, TCL PCBs, TCL Pesticides, and Explosives	Assess the presence/absence of waste material in within the site area. Assess the nature and extent of constituents within the source area.
	Soil Borings (Physical Samples): 45SB4 and 45SB8	pH, TOC, grain size, bulk density, Atterberg Limits, moisture content	Geotechnical and physical property analysis.
	Soil Borings (Characterization): 45SC2, 45SC3, 45SC6, 45SC7, 45SC9, 45SC10, 45SC11, 45SC12, 45SC13, 45SC15, and 45SC16	Not applicable	Assess the presence or absence of landfill material and/or debris.

Test pits and soil borings were completed within the site area to a maximum depth of 11 ft bgs. Two soil samples were collected from each test pit and chemical sampling boring, as outlined in the table above, from the following intervals: (1) surface - "A" sample and (2) immediately below landfill material or debris if present or a depth of 5-7 ft bgs – "B" sample. Soil samples were analyzed for TAL Metals, TCL VOCs, TCL SVOCs, TCL PCBs, TCL pesticides, and explosives. Per WPA 022, since burned material (i.e., ash) was not encountered during test pit excavation, soil samples were not submitted for dioxin/furan analysis. Additionally, two samples were collected from soil borings 45SB4 and 45SB8 for physical testing of pH, TOC, grain size, bulk density, Atterberg Limits, and moisture content. Physical test results are summarized in Table 2-1 and the complete results are presented in Appendix D.1.

3.1.2 Monitoring Well Installation and Groundwater Sampling

As shown on Figure 3-1, three previously existing monitoring wells (45MW1, 45MW2, and 45MW3) are located on the site. In May 2008, monitoring well 45MW4 was installed at the site at a location east of 45TP4 and 45TP5 to evaluate potential releases to groundwater from these anomalous areas identified during the geophysical study as previously discussed in Section 2.3.4. Monitoring well construction data are summarized in Table 2-2.

Groundwater samples were collected from existing wells 45MW1, 45MW2, and 45MW3, as well as, newly installed monitoring well 45MW4 in May 2008. An additional groundwater sample was collected from 45MW2 in August 2008. Per WPA 022, since burned material (i.e., ash) was not encountered during test pit excavation, groundwater samples were not submitted for dioxin/furan analysis. The groundwater sampling and analysis program is summarized in Table 3-1 and in the table below. Figure 3-1 shows the monitoring well locations.

Monitoring Well Sampling and Analysis

Sampling Date	Monitoring Wells Sampled	Analytical Parameters
May 2008	45MW1 (B) 45MW2 (D) 45MW3 (D) 45MW4 (D)	TAL metals (filtered and total), TCL VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs, Explosives, and Perchlorate Field water quality parameters: pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential (ORP), and turbidity.
August 2008	45MW2 (D)	TCL SVOCs Field water quality parameters: pH, temperature, specific conductance, dissolved oxygen, ORP, and turbidity.

Notes: (B) = Background, (D) = Downgradient.

3.2 QUALITY ASSURANCE

Quality Assurance (QA) planning defined the overall system of activities for assuring the reliability of data produced. The system integrated the quality planning, assessment, and corrective actions of various groups in the organization to provide the independent QA program necessary to establish and maintain an effective system for collection and analysis of environmental samples and related activities. The program encompasses the generation of complete data with its subsequent review, validation, and documentation.

The accuracy and integrity of SSP data were ensured through the implementation of internal quality control (QC) measures consistent with WPA 022 (URS 2007b). QA and QC procedures, including field QC, laboratory QC, data management, and data validation, were integrated into the investigation program to meet data quality objectives (DQOs) established and approved for the SSP. The data were evaluated for each of the DQO indicators and the results of this evaluation are presented in Appendix G.1. DQOs for the SSP were met.

3.3 INVESTIGATION METHODOLOGY

3.3.1 Soil Sampling for Chemical Analysis

Surface and subsurface soil samples were collected for chemical analysis following the procedures outlined in standard operating procedure (SOP) 30.1 included in Appendix C and as described in Section 5.2 of the MWP (URS 2003). Soil sampling forms are presented in Appendix D.3.

The soil core interval was examined and classified by the site geologist and recorded in the field logbook and on the boring log consistent with SOPs 10.1 and 10.3, respectively (Appendix C). Soil was then extracted from the appropriate interval; sample containers were filled, labeled, and placed into coolers with ice and maintained at 4 degrees Celsius (°C).

Soil samples were collected from the borings using an all-terrain vehicle (ATV)-mounted direct push rig. This rig was equipped with 1.25-inch diameter push rods, 4-ft long, 2-inch diameter, stainless steel closed solid barrel sampler (Macro-Core®) with a disposable liner and stainless steel cutting shoes. A percussion hammer was used to advance the sampling assembly. Following withdrawal of the Macro-Core® and removal of the liner, a cutting device was used to open the liner before inspection and processing of the sample cores.

Once the termination depth of the boring was reached and sample collection was completed, the borehole was backfilled with hydrated bentonite chips. Excess soil cuttings were temporarily accumulated in 55-gallon drums at the Installation-approved area for disposal as discussed in Section 3.3.7. Soil boring logs are included in Appendix D.2.

3.3.2 Test Pits

Test pits were completed using a mini-track excavator following the procedures outlined in SOP 20.4 (Appendix C). Test pit logs were completed as described in SOPs 10.3 and 20.4 (Appendix C) and test pit activities were documented in the field log as described in SOP 10.1 (Appendix C). Equipment was decontaminated before use at each location following SOP 80.1 (Appendix C). Soil samples were collected from the test pits following surficial and subsurface techniques described in SOP 30.1 (Appendix C). A direct push boring was advanced adjacent to the location of test pit 45TP3 to investigate subsurface conditions below the landfill material to a depth of 12 ft bgs. Excess material excavated from the test pits was placed into 55-gallon drums and temporarily accumulated at the Installation-approved area for disposal as discussed in Section 3.3.8. Test pit boring logs are included in Appendix D.2.

3.3.3 Monitoring Well Installation and Development

Monitoring well 45MW4 was installed following the procedures outlined in SOP 20.1 (Appendix C) and as described in Section 5.2 of the MWP (URS 2003). The monitoring well boring was completed using a track mounted drill rig and 4.25-inch inner diameter hollow stem augers. Boring logs were completed as described in SOP 10.3 (Appendix C) and drilling activities were documented in the field logbook as described in SOP 10.1 (Appendix C). Downhole drill rig tools and equipment were decontaminated before use at each location following SOP 80.1 (Appendix C).

The monitoring well was constructed with 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) 0.01-inch factory slotted screen and riser pipe with threaded joints. A fifteen foot long screen was used for the well, with the screened positioned across the water table at a similar interval to the existing site monitoring wells. A Boring log and construction diagram for 45MW4 are included in Appendix D.2. Monitoring well construction data are summarized in Table 2-2.

Prior to sampling, each of the monitoring wells was developed consistent with SOP 20.2 (Appendix C) and as described in Section 5.2 of the MWP (URS 2003). Development was completed after well completion and stabilization using a surge block, disposable bailer, and stainless steel, adjustable flow rate submersible pump with new disposable tubing. Development was continued at each monitoring well until a minimum of three equivalent well volumes were purged, water quality indicator parameters had stabilized, development water was clear to the unaided eye, and any remaining sediment had been removed from the well. Decontamination and purge water were temporarily accumulated in 55-gallon drums at the Installation-approved area for disposal as discussed in Section 3.3.8. Well development records are included in Appendix D.3.

3.3.4 Groundwater Sampling

Groundwater samples were collected for chemical analysis in accordance with SOP 30.2 (Appendix C) and as described in Section 5.2.10 of the MWP (URS 2003). Groundwater sampling information was recorded in the field logbooks as described in SOPs 10.1 and 10.2 (Appendix C). Groundwater sampling field data sheets are included in Appendix D.3.

Low flow purging and sampling techniques were used to collect the groundwater samples from the monitoring wells. Purging in these monitoring wells was at a rate of 500 milliliters per minute (ml/min) or less to minimize excessive drawdown. Sampling followed the procedures outlined in Section 3.3 of SOP 30.2 (Appendix C). Equipment used to purge and sample wells was thoroughly decontaminated before and after use following SOP 80.1 (Appendix C). All equipment used for monitoring water quality parameters was calibrated before use according to the manufacturer's instructions and SOP 40.1 (Appendix C). Prior to the sampling round, the depth to water was measured at each well to the nearest 0.01 ft using an electronic water level indicator in accordance with SOP 40.2. Calibration and measurement data were recorded in the field logbook and on groundwater sampling forms, which are presented in Appendix D.3.

A stainless steel, adjustable flow rate submersible pump, and new disposable tubing were used to collect the groundwater samples. The pump tubing was connected to an in-line flow-through cell and the multi-parameter meter probe was connected to the flow cell to monitor water quality parameters during purging. Pumping was started and the pump rate was adjusted to cause minimal drawdown (less than 0.2 ft if possible). A Horiba Model U-22 multi-parameter water quality meter was used to monitor pH, specific conductance, temperature, ORP, dissolved oxygen, and turbidity during purging. Purging was continued until parameter stabilization was achieved. Once purging was complete, the pumping rate was reduced to its lowest steady rate and the in-line flow cell was disconnected from the tubing to allow for sampling from the tubing directly into sample containers provided by the laboratory.

Groundwater samples were collected and containerized in the order of volatilization sensitivity of the parameters. Filtered and unfiltered samples were collected for metals analysis. Metals samples were filtered with an in-line high capacity 0.45-micron disposable filter. The appropriate sample containers were filled, labeled, and placed into coolers with ice and maintained at 4 °C.

3.3.5 Water Quality Measurements

Field water quality measurements were collected consistent with SOP 40.1 (Appendix C) using a Horiba Model U-22 multi-parameter water quality meter. Prior to its use each day, the meter was calibrated according to the manufacturer's instructions.

3.3.6 Aquifer Tests

Due to the water levels being within the screened interval of each of the wells, rising head slug tests were conducted at monitoring wells 45MW1 through 45MW4 in accordance with SOP 40.3 (Appendix C) and Section 5.9 of the MWP (URS 2003). A 3-inch diameter and 4-ft long solid PVC slug was used for the slug tests to induce instantaneous changes in water levels. Water level changes were recorded using a downhole pressure transducer with an internal data logger (Solinst Levelogger, 3001 - Level/Temperature F15 mini). Slug-test data analysis was performed using AQTESOLV for Windows Pro Version 3.0. Appendix D.5 includes the slug test output and analysis.

3.3.7 Site Surveying

Draper Aden Associates completed a survey of monitoring wells 45MW1, 45MW2, 45MW3, and 45MW4. Surveying was conducted using the U.S. State [Virginia (South Zone)] Plane Coordinate System (measured in U.S. survey ft) using the North American Datum 1983. Vertical elevations at the site were surveyed to the nearest 0.01 ft using the National Vertical Datum of 1988. The locations and

elevations of samples, borings, and test pits were also obtained using a Trimble Pathfinder Pro XRS® global positioning system (GPS).

3.3.8 Investigation-Derived Material (IDM) Management

IDM management activities were conducted consistent with the procedures outlined in WPA 022 (URS 2007b) and documented in the field logbook, and conducted as described below.

3.3.8.1 Accumulation

IDM accumulated during field sampling activities, monitoring well installation, and groundwater sampling activities included the following materials and containers:

- Soil cuttings/solid waste – twenty-five 55-gallon drums;
- Personal protective equipment (PPE), probe liners, and plastic sheeting – two 55-gallon drums; and
- Decontamination and purge water – two 55-gallon drums.

IDM accumulation and labeling was conducted as outlined in MWP SOP 70.1 (Appendix C). Drums were transferred to the Installation's approved container accumulation area at SWMU 17 while this IDM was on hold pending analysis for characterization and disposal.

3.3.8.2 Material Characterization

IDM characterization samples were collected for each set of containerized soil cuttings and decontamination/purge water generated during the investigation. IDM was characterized to evaluate whether it was a RCRA characteristic hazardous waste as described in Title 40 of the Code of Federal Regulations (CFR) Part 261, Subpart C (as referenced in the Virginia Hazardous Waste Management Regulations). The analytical results for the IDM characterization samples indicated the soil cuttings, water, and PPE were non-hazardous material. IDM sample results are presented in Appendix D.4.

3.3.8.3 Transportation and Disposal

Before disposal, waste analytical results were provided to the Installation, IDM management subcontractor, and the disposal facilities for review and approval. Manifests were reviewed and signed by Installation personnel prior to loading and transporting of the IDM. The Installation maintains a record of the manifests and related information including analytical testing results and waste profiles.

First Piedmont transported the nonhazardous soil drums and the nonhazardous material to the First Piedmont Landfill in Chatham, Virginia.

3.3.8.4 Decontamination Water

Following the waste characterization sample analysis, the Installation and RFAAP Process Water Treatment Plant engineers were provided a copy of the water IDM sample results and groundwater sample results. After receiving Plant approval, decontamination water and purge water were discharged into the collection system of the Process Water Treatment Plant.

3.4 WORK PLAN FIELD CHANGES

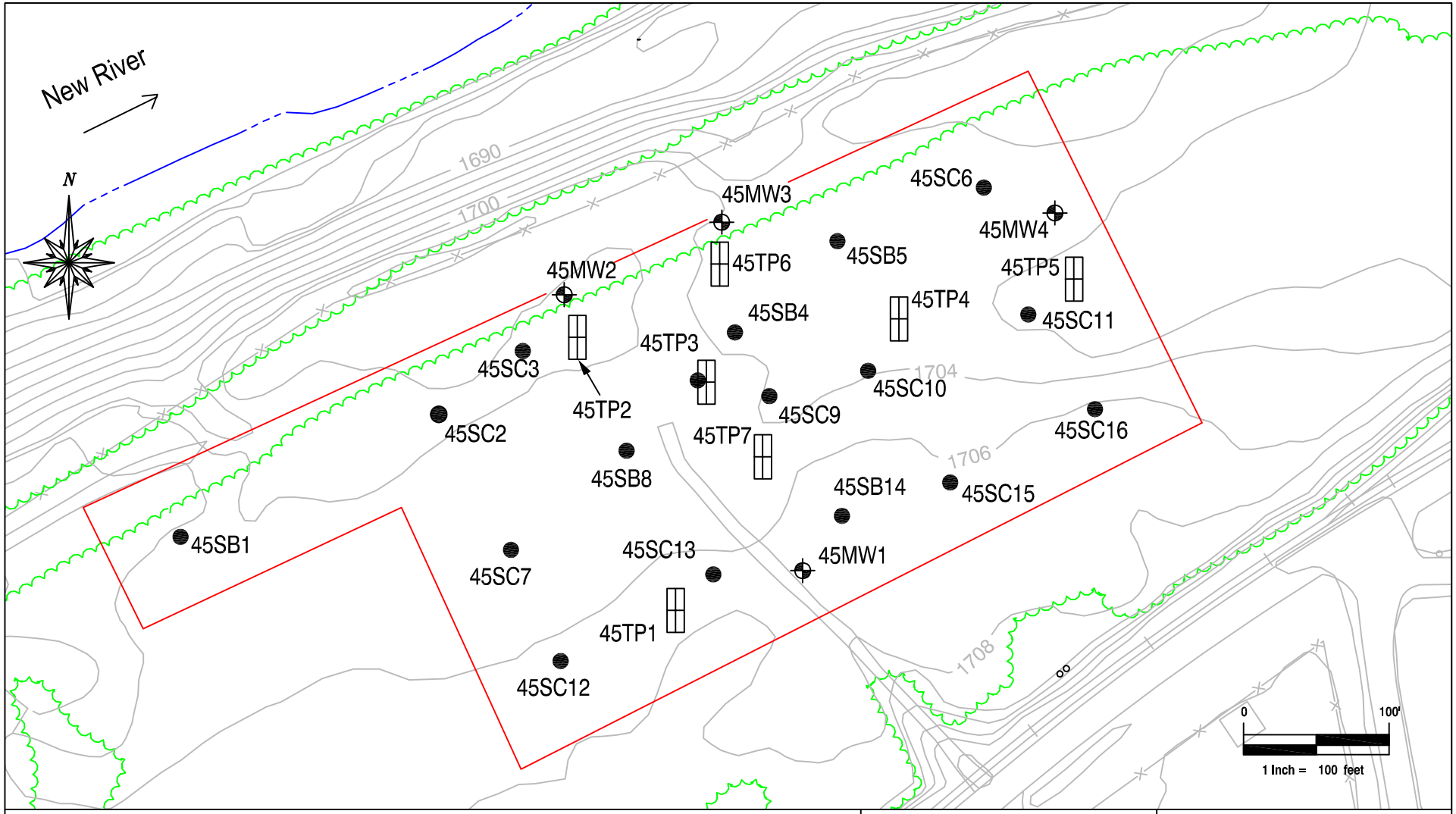
During field sampling activities, modifications to the Work Plan were necessary to adjust for field conditions as summarized below.

3.4.1 Soil Investigations

At test pit location 45TP3, a direct push boring was completed adjacent to the test pit to investigate subsurface conditions below the reach of the mini-track excavator. Site characterization borings 45SC3, 45SC6, 45SC7, 45SC9 through 45SC13, 45SC15, and 45SC16 were completed only to identify the presence or absence of potential landfill material; therefore, PID readings were not collected for these site characterization borings. PID readings were not collected in the field for 45MW4. No other modifications to the work plan were necessary to adjust for field conditions for the soil investigation.

3.4.2 Groundwater Investigations

An additional groundwater sample was collected from 45MW2 to verify SVOC detections in the original groundwater sample but not in the associated original duplicate groundwater sample.



Legend

- Monitoring Well Location
- Soil Boring Location
- Test Pit Location
- Topographic Contour
- Perimeter Fence
- Vegetation
- Approximate Limits of Study Area

Note: Test Pits Not to Scale

FIGURE 3-1

SSP Sample Locations

Date: August 2008	URS Project #: 11656351
Prepared by: CLD	Approved by: JOS
Scale: 1" = 100'	File Name: Fig.3-1 SSP samploc

SWMU 45

SSP InvestigationSWMU 45
Radford Army Ammunition Plant
Radford, Virginia

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Table 3-1
Summary of Sample Identifiers, Depths, and Analytical Methods
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

					Chemical Analysis												Physical Analysis				
Sample ID	Date	Time	Duplicate Location	Depth (ft bgs)	TAL Metals/CV Mercury/Cyanide (Filtered) SW-846 Method 6010B/7471A/9012A	TAL Metals/CV Mercury/Cyanide (Unfiltered) SW-846 Method 6010B/7471A/9012A	Pesticides/PCBs SW-846 Method 8081A/8082	VOCs SW-846 Method 8260B	SVOCs SW-846 Method 8270C	Perchlorate SW-846 Method 6850	Explosives/Nitroglycerin/ PETN SW-846 Method 8330m/8332	TCLP Full List	TCLP Metals	Chemical Oxygen Demand EPA Method 410.4	pH (corrosivity) SW-846 Method 9040B	Paint Filter Test SW-846 Method 9095	Grain Size ASTM D422	Atterburg Limits ASTM D4318	Moisture Content ASTM D2216	Total Organic Carbon Walkley-Black	pH ASTM D4972
Soil																					
Test Pits [1]																					
45TP1A	5/5/2008	11:15		0-1		X	X	X	X		X										
45TP1B	5/5/2008	11:40		1.4-2		X	X	X	X		X										
45TP2A	5/5/2008	12:15		0-1		X	X	X	X		X										
45TP2B	5/5/2008	12:40		1.5-2		X	X	X	X		X										
45TP3A	5/5/2008	13:20		0-1		X	X	X	X		X										
45TP3B	5/7/2008	10:10		8-11		X	X	X	X		X										
45TP4A	5/6/2008	14:00		0-1		X	X	X	X		X										
45TP4B	5/6/2008	14:30		3-3.25		X	X	X	X		X										
45TP5A	5/6/2008	15:00		0-1		X	X	X	X		X										
45TP5B	5/6/2008	15:25		5-5.25		X	X	X	X		X										
45TP6A	5/6/2008	10:25		0-1		X	X	X	X		X										
45TP6B	5/6/2008	11:10		5.5-6		X	X	X	X		X										
45TP7A	5/6/2008	13:05		0-1		X	X	X	X		X										
45TP7B	5/6/2008	13:45		5-5.5		X	X	X	X		X										
DUP-1	5/7/2008	10:10	45TP3B	8-11		X	X	X	X		X										
Soil Borings																					
45SB1A	5/7/2008	11:00		0-1		X	X	X	X		X										
45SB1B	5/7/2008	11:05		5-7		X	X	X	X		X										
45SB4A-PS	5/7/2008	14:40		0-4													X	X	X	X	X
45SB4B-PS	5/7/2008	14:45		4-8													X	X	X	X	X
45SB5A	5/7/2008	11:55		0-1		X	X	X	X		X										
45SB5B	5/7/2008	12:00		5-7		X	X	X	X		X										
45SB8A	5/7/2008	13:40		0-1		X	X	X	X		X										
45SB8B	5/7/2008	13:45		5-7		X	X	X	X		X										
45SB8A-PS	5/7/2008	13:40		0-4													X	X	X	X	X
45SB8B-PS	5/7/2008	13:45		4-8													X	X	X	X	X
45SB14A	5/7/2008	12:55		0-1		X	X	X	X		X										
45SB14B	5/7/2008	13:00		5-7		X	X	X	X		X										
DUP-2	5/7/2008	12:55	45SB14A	0-1		X	X	X	X		X										
MS/MSD	5/6/2008	14:30				X	X	X	X		X										
MS/MSD	5/7/2008	11:00				X	X	X	X		X										
Site Characterization Borings																					
45SC2																					
45SC3																					
45SC6																					
45SC7																					
45SC9																					
45SC10																					
45SC11																					

Table 3-1
Summary of Sample Identifiers, Depths, and Analytical Methods
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

					Chemical Analysis												Physical Analysis				
Sample ID	Date	Time	Duplicate Location	Depth (ft bgs)	TAL Metals/CV Mercury/Cyanide (Filtered) SW-846 Method 6010B/7471A/9012A	TAL Metals/CV Mercury/Cyanide (Unfiltered) SW-846 Method 6010B/7471A/9012A	Pesticides/PCBs SW-846 Method 8081A/8082	VOCs SW-846 Method 8260B	SVOCs SW-846 Method 8270C	Perchlorate SW-846 Method 6850	Explosives/Nitroglycerin/ PETN SW-846 Method 8330m/8332	TCLP Full List	TCLP Metals	Chemical Oxygen Demand EPA Method 410.4	pH (corrosivity) SW-846 Method 9040B	Paint Filter Test SW-846 Method 9095	Grain Size ASTM D422	Atterburg Limits ASTM D4318	Moisture Content ASTM D2216	Total Organic Carbon Walkley-Black	pH ASTM D4972
Site Characterization Borings Cont.																					
45SC12																					
45SC13																					
45SC15																					
45SC16																					
Aqueous																					
EQB11	5/6/2008	16:00		N/A		X	X	X	X		X										
EQB12	5/7/2008	15:45		N/A		X	X	X	X		X										
Groundwater																					
45MW1	5/22/2008	10:30		N/A	X	X	X	X	X	X	X										
45MW2	5/21/2008	15:10		N/A	X	X	X	X	X	X	X										
45MW3	5/22/2008	13:40		N/A	X	X	X	X	X	X	X										
45MW4	5/22/2008	11:30		N/A	X	X	X	X	X	X	X										
DUP-3	5/21/2008	15:10	45MW2	N/A	X	X	X	X	X	X	X										
MS/MSD	5/22/2008	13:40		N/A	X	X	X	X	X	X	X										
EQB13	5/22/2008	13:40		N/A	X	X	X	X	X	X	X										
Trip Blank 1	5/21/2008	N/A		N/A	X	X	X	X	X	X	X										
Trip Blank 2	5/22/2008	N/A		N/A	X	X	X	X	X	X	X										
45MW2	8/12/2008	12:30		N/A					X												
DUP-1	8/10/2008	12:30	45MW2	N/A					X												
IDM																					
45IDM-SOIL	5/9/2008	8:10		N/A							X	X			X	X					
45IDM-WATER	5/22/2008	15:20		N/A									X	X	X						

Notes:
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl
PETN = Pentaerythritol Tetranitrate
TAL = Target Analyte List
ft bgs = feet below ground surface
TCLP = Toxicity Characteristic Leaching Proceedure
ASTM = American Society for Testing and Materials

4.0 SSP DATA EVALUATION AND PRE-REMEDIAL RISK SCREENING

4.1 ANALYTICAL RESULTS

The SSP analytical results for detected chemicals are presented in Table 4-1 (soil) and Table 4-2 (groundwater). Table 2-1 summarizes the physical soil testing results for the SSP. Complete physical soil testing results are included in Appendix D.1. A summary of the site screening process and the results of the screening for SWMU 45 are presented below. The SSP guidance is provided in Appendix B.

4.2 HUMAN HEALTH RISK SCREENING

The purpose of the SSP human health risk screening is to evaluate site data using conservative criteria so a site can be eliminated from further consideration or identify if the site requires further evaluation. The screening procedures include the following five steps:

- Identification of chemicals of potential concern (COPCs) and cumulative risk screening;
- Chemical specific screening for lead and iron;
- Comparison to soil screening levels (SSLs);
- Comparison to applicable relevant and appropriate requirements (ARARs); and
- Comparison to background point estimates (available for select metals).

4.2.1 Identification of COPCs

COPCs were identified for the site by comparing the maximum detected concentration (MDC) for detected chemicals in a specific medium to USEPA Region III Residential risk-based concentrations (R-RBCs) and Industrial risk-based concentrations (I-RBCs) for soil and T-RBCs for groundwater, if available. In accordance with USEPA Region III guidance, RBCs for noncarcinogenic chemicals were adjusted downward to a Hazard Quotient (HQ) of 0.1 to ensure that chemicals with additive effects were not prematurely eliminated during screening. For the purpose of COPC identification and risk screening, data from duplicate sample pairs were averaged and treated as one result. If a chemical was detected in one of the sample pair, half the detection limit of the non-detect was averaged with the detected result, and the result was considered detected. Chemicals that had a MDC greater than the adjusted USEPA Region III RBC or for which no screening value (NSV) existed were selected as COPCs and retained for quantitative assessment.

Tables 4-3 and 4-4 present the results of the COPC evaluations for surface soil and total soil, respectively. COPCs identified for surface soil and total soil included:

- *TAL metals:* aluminum, antimony, arsenic, cadmium, chromium, cobalt (NSV), copper, iron, lead, manganese, vanadium, and zinc;
- *TCL Pesticides:* none;
- *TCL PCBs:* Aroclor 1254 and Aroclor 1260;
- *TCL VOCs:* none;
- *TAL SVOCs:* benzo(a)pyrene, dibenz(a,h)anthracene, dimethylphthalate (NSV), di-n-octylphthalate (NSV); and
- *Explosives:* nitroglycerin.

Table 4-5 presents the results of the COPC evaluation for groundwater. COPCs identified for groundwater included perchlorate, cobalt (NSV), chloroform, and bis(2-chloroethoxy)methane (NSV). Although total metals concentrations in groundwater were above screening levels, the dissolved fraction

of metals in groundwater were below the screening levels; therefore, these metals were not selected as COPCs for groundwater with the exception of cobalt for which no screening value is available.

4.2.2 Cumulative Risk Screen

The cumulative human health risk screen consisted of calculating the ratios between the exposure point concentrations (EPCs) of COPCs in each medium and the corresponding RBC. For purposes of this screening process, MDCs or a 95% upper confidence limit (UCL; if appropriate) will be considered in the cumulative risk screening as representative EPCs. Methods used to calculate 95% UCLs (EPCs) are based on guidance provided in the following documents *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA 2002b) and *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations* (USEPA 2006). In general, the method used to calculate a 95% UCL depends on: 1) the number of samples, 2) the prevalence of non-detects, and 3) the data distribution (e.g., normal or lognormal). Non-detects introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore, distributional assumptions are difficult to make for COPCs with a high rate of non-detects. ProUCL 4.0 (USEPA 2007c) is used to calculate EPCs for the sites with the exception of data sets with a low frequency of detection for which the MDC was used in the risk screenings.

Both carcinogenic and noncarcinogenic effects were evaluated in accordance with Section 6.1.1.2 of the SSP Guidance (Appendix B). If the cumulative cancer risk is greater than or equal to 1E-05 then a quantitative risk assessment should be performed. If the cumulative cancer risk for a site is less than 1E-05 and other screening criteria evaluated for the SSP are below established SSP thresholds, then NFA would be recommended for the site.

If the noncarcinogenic cumulative hazard index (HI) is greater than 1, there is a potential for adverse noncarcinogenic health effects. In such cases, COPCs are divided into categories based on the target organ affected (e.g., liver, kidney) and target organ-specific HIs are calculated. The results of the cumulative risk screens are interpreted as follows:

- If the cumulative HI for a site is greater than or equal to 0.5 for a target organ, then a quantitative risk assessment would be recommended for the site; or
- If the cumulative HI for a site is less than 0.5 for each target organ, and other screening criteria evaluated for the SSP are below established SSP thresholds, then NFA would be recommended for the site.

4.2.2.1 Cumulative Risk Screen - Soil

The EPC summary and cumulative risk screening for surface soil are presented on Tables 4-6 and 4-7, respectively. The EPC summary and cumulative risk screening for total soil are presented on Tables 4-8 and 4-9, respectively. A summary of the screening results is presented below:

Cumulative Human Health Risk Screening Results for Soil

	Surface Soil			Total Soil		
	Above/ Below	**Risk/ Hazard**	**Drivers**	**Above/ Below**	**Risk/ Hazard**	**Drivers**
Residential Risk	Above	3.E-05	Arsenic, PCBs, SVOCs, Nitroglycerin	Above	2.E-05	Arsenic, PCBs, SVOCs, Nitroglycerin
Industrial Risk	Below	5.E-06	--	Below	4.E-06	--
Residential Hazard	Above	4	Metals, Aroclor 1254, Nitroglycerin	Above	4	Metals, Aroclor 1254, Nitroglycerin
Industrial Hazard	Below	0.3	--	Below	0.3	--

The cumulative human health risk screens were above the established SSP risk and hazard levels of 1E-05 and 0.5, respectively, for the residential scenario for surface and total soil. Cumulative risk screenings were below the established SSP risk and hazard levels of 1E-05 and 1, respectively, for the industrial scenarios.

Due to multiple chemicals contributing to a residential HI greater than 1, as presented on Table 4-7 (surface soil) and Table 4-9 (total soil), the HIs have been segregated based on primary target organs for chronic exposure. The HI segregation for surface soil resulted in values equal to or higher than the cumulative SSP HI threshold of 0.5 for the following target organs: blood, central nervous system (CNS), vascular, kidney, gastrointestinal (GI) tract, liver, and eyes. The HI segregation for total soil resulted in values equal to or higher than the cumulative SSP HI threshold of 0.5 for the following target organs: blood, CNS, vascular, GI tract, liver, and eyes.

4.2.2.2 Cumulative Risk Screen - Groundwater

Due to the number of samples, MDCs for COPCs were used in the cumulative risk screening for groundwater as presented on Tables 4-10. A summary of the screening results is presented below:

Cumulative Human Health Risk Screening Results for Groundwater

	Groundwater		
	Above/ Below	**Risk/ Hazard**	**Drivers**
Risk	Below	5.E-06	--
Hazard	Below	0.2	--

The cumulative human health risk screens were below the established SSP risk and hazard thresholds of 1E-05 and 1.0, respectively, for groundwater.

4.2.3 Lead and Iron Screening

The MDCs for lead in surface soil and total soil for SWMU 45 were above the residential lead screening level of 400 mg/kg, and therefore, the potential hazard associated with lead was evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) model for the child resident scenario.

Site-specific lead exposures were evaluated for residential exposures at SWMU 45 using the IEUBK model (USEPA 2007a). This calculation was based on the site-specific mean concentration of lead detected in total soil (100.4 mg/kg) and the maximum detected dissolved lead concentration in groundwater (0.36 micrograms per liter [µg/L]). The results of the modeling presented in Appendix E.2 predict the probability of children expected to have blood levels of 10 microgram per deciliter (µg/dL) or greater. The lead risks are considered unacceptable if the child-blood lead level for more than 5% of children is estimated to be equal to or greater than the Center for Disease Control and Prevention (CDCP) concern threshold of 10 µg/dL. The results of the lead modeling predicted the probability of the child resident receptor for SWMU 45 expected to have blood levels of 10 µg/dL or greater (0.004%) was below the established threshold of 5%.

Since iron concentrations in soil result in an HQ of greater than 0.5, further assessment is required. This assessment consists of a "margin of exposure evaluation" where the estimated intake of iron is compared to the recommended daily allowance (RDA) and concentrations known to cause adverse health effects in children (NCEA 2006). Appendix E.2 presents the margin of exposure evaluation for surface soil and total soil. A summary of the results for SWMU 45 is presented below.

Iron Margin of Exposure Evaluation – Future Child Resident

	Surface Soil			Total Soil		
		Estimated Site Intake	**Exposure Screening Level**		**Estimated Site Intake**	**Exposure Screening Level**
RDA Screen (mg/day)	Below	6.2	10	Below	5.3	10
Provisional Reference Dose (RfD) Screen (mg/kg-day)	Below	0.42	0.7	Below	0.35	0.7

The iron exposure assessment results for the hypothetical future child resident were below the applicable iron margin of exposure screening criteria for SWMU 45.

4.2.4 SSL Comparison - Soil

4.2.4.1 Generic SSLs (Soil-to-groundwater Screening Levels)

An SSL screening was conducted for detected chemicals in soil to evaluate the potential for leaching of chemicals from soil to groundwater. As presented in Table 4-11, the MDC for each detected chemical in soil was compared to its USEPA SSL included in the USEPA Region III RBC Table, if available. A dilution attenuation factor (DAF) of 20 was used. Organic chemicals with concentrations greater than their generic SSLs were then evaluated utilizing site-specific SSLs (Section 4.2.4.2).

The MDC comparisons of soil to generic SSLs (DAF 20) for detected chemicals indicated that antimony, arsenic, chromium, manganese, and Aroclor 1254 were above their SSLs (Table 4-11).

4.2.4.2 Site-specific SSL Comparison

A site-specific SSL was calculated for Aroclor 1254, which was above its generic SSL (DAF 20), using site-specific soil organic carbon data collected during the SSP. Site-specific SSLs were calculated using the USEPA Soil Screening Guidance and Equation 4-1 shown below (USEPA 2002c). The calculations and summary table are presented in Appendix D.6.

$$C_t = C_w(K_{oc} * f_{oc} + \frac{\theta_a + \theta_w * H'}{\rho_b}) \qquad \text{Equation } 4-1$$

Where:

Parameter	Definition (Units)	Value
C_t	Screening level in soil, (mg/kg)	
C_w	Target leachate concentration (mg/L): (Tap Water Risk-based Concentration (T-RBC) * 20 (DAF)	Chemical-specific
K_{oc}	Soil organic carbon-water partition coefficient (L/kg)	Chemical-specific
f_{oc}	Total Organic carbon content of soil, (kg/kg)	0.0095
θ_w	Water-filled soil porosity, (L_{water}/L_{soil})	0.3 (U.S. USEPA, 1991b)
θ_a	Air-filled soil porosity, (L_{air}/L_{soil}), (η - θ_w)	0.13 (U.S. USEPA, 1991b)
η	Total soil porosity, (L_{pore}/L_{soil}), (1 - ρ_b/ρ_s)	0.43 (U.S. USEPA, 1991b)
ρ_b	Dry soil bulk density	1.5 kg/L (U.S. USEPA, 1991b)
ρ_s	Soil particle density	2.65 kg/L (U.S. USEPA, 1991b)
H'	Henry's law constant	Chemical-specific

The MDC for Aroclor 1254 (1.2 mg/kg) was below the site-specific SSL calculated (5.15 mg/kg) using the average TOC value from the physical samples collected at the site during the SSP (Appendix D.1).

4.2.5 Background Comparison - Soil

The final step in the risk screening process is the comparison of the MDCs of COPCs identified in soil to the established Facility-wide inorganic background point estimate concentrations for metals (IT 2001). The comparison of MDCs for metals identified as COPCs in surface soil and total soil with their background point estimates resulted in site soil MDCs above background point estimates for cadmium, chromium, copper, lead, and zinc (Table 4-12).

4.2.6 Human Health Risk Screening Summary

Soil COPCs with screening values were limited to metals, PCBs, SVOCs, and nitroglycerin. The soil cumulative human health risk screens were above the established SSP risk and hazard levels of 1E-05 and 1.0, respectively, for the residential scenario for surface and total soil. Cumulative risk screenings were below the established SSP risk and hazard levels of 1E-05 and 1.0, respectively, for the industrial scenario.

The results of the carcinogenic residential risk screening were above the established SSP threshold (1E-05) for surface soil and total soil primarily due to arsenic concentrations below the background point estimate. The site-related risk, when excluding metals risk drivers detected below background (arsenic) in surface and total soil, is 8E-06 which is below the SSP risk threshold of 1E-05.

The noncarcinogenic residential hazard screening was above the established SSP threshold (HI=1) for surface soil primarily due to metals, Aroclor 1254, and nitroglycerin. As presented in the table below when taking background and target organs into account, the HI segregation for surface soil resulted in rounded values equal to or higher than the cumulative SSP HI target organ threshold of 0.5 for the following target organs: vascular, GI tract, and eyes.

Hazard Summary – Surface Soil

Target Organ (HI)	Hazard Drivers (HQ)	Drivers < Background	Site Related HI
Blood (0.7)	iron (0.6), antimony (0.09), zinc (0.05)	iron	0.14
CNS (0.7)	aluminum (0.2), manganese (0.5)	aluminum, manganese	NA
Vascular (0.8)	arsenic (0.3), nitroglycerin (0.49)	arsenic	0.49 (0.5 rounded)
Kidney (0.5)	cadmium (0.06), vanadium (0.4)	vanadium	0.06
GI Tract (1.1)	chromium (0.17), copper (0.35), iron (0.6)	iron	0.52
Liver (0.8)	chromium (0.17), iron (0.6)	iron	0.17
Eyes (0.5)	Aroclor 1254 (0.47)	NA	0.47 (0.5 rounded)

The site-related residential vascular HI for surface soil, when excluding metals hazard drivers detected below background (arsenic), when rounded is 0.5 due to nitroglycerin (HQ=0.49). The site-related residential GI tract HI for surface soil, when excluding metals hazard drivers detected below background (iron), is 0.5 due to chromium (HQ=0.17) and copper (HQ=0.35). The site-related residential HI for eyes for surface soil when rounded is 0.5 due to Aroclor 1254 (HQ=0.47).

The noncarcinogenic residential hazard screening was above the established SSP threshold (HI=1) for total soil primarily due to metals, Aroclor 1254, and nitroglycerin. As presented in the table below when taking background and target organs into account, the HI segregation for total soil resulted in rounded values equal to or higher than the cumulative SSP HI target organ threshold of 0.5 for the following target organs: blood, vascular, GI tract, and eyes.

Hazard Summary – Total Soil

Target Organ (HI)	Hazard Drivers (HQ)	Drivers < Background	Site Related HI
Blood (1.1)	iron (0.5), antimony (0.54), zinc (0.07)	iron	0.6
CNS (0.6)	aluminum (0.2), manganese (0.4)	aluminum, manganese	NA
Vascular (0.7)	arsenic (0.2), nitroglycerin (0.49)	arsenic	0.49 (0.5 rounded)
GI Tract (1.0)	chromium (0.27), copper (0.21), iron (0.5)	iron	0.48 (0.5 rounded)
Liver (0.8)	chromium (0.27), iron (0.5)	iron	0.27
Eyes (0.5)	Aroclor 1254 (0.5)	NA	0.5

The site-related residential blood HI for total soil, when excluding metals hazard drivers detected below background (iron), is 0.6 primarily due to antimony (HQ=0.54) for which a background point estimate is not available and zinc (HQ=0.07). The site-related residential vascular HI for total soil, when excluding metals hazard drivers detected below background (arsenic), when rounded is 0.5 due to nitroglycerin (HQ=0.49). The site-related residential GI tract HI for total soil, when excluding metals hazard drivers detected below background (iron), when rounded is 0.5 due to chromium (HQ=0.27) and copper (HQ=0.21). The site-related residential HI for eyes for surface soil is 0.5 due to Aroclor 1254.

The results of the lead modeling predicted the probability of the child resident receptor for SWMU 45 expected to have blood levels of 10 μg/dL or greater was below the established threshold of 5%. The iron exposure assessment results for the hypothetical future child resident were below the applicable iron margin of exposure screening criteria for SWMU 45.

The MDC comparisons of total soil to generic SSLs (DAF 20) for detected chemicals indicated that antimony, arsenic, chromium, manganese, and Aroclor 1254 were above their SSLs (Table 4-11). Aroclor 1254 is not a concern because the detected concentration is below its calculated site-specific SSL. The arsenic and manganese concentrations above their SSLs are not a concern because their MDCs are below their background point estimates. Antimony, for which no background point estimate is available, was above its SSL in one sample (45TP4B). Chromium was above its SSL and its background point estimate in two samples (45TP4A and 45TP4B). Although antimony and chromium were detected at concentrations greater than their SSLs, groundwater results did not indicate leaching of these chemicals from soil to groundwater at dissolved concentrations above adjusted T-RBCs.

Groundwater COPCs with screening values were limited to perchlorate and chloroform. The groundwater cumulative human health risk screens were below the established SSP risk and hazard levels of 1E-05 and 1.0, respectively.

4.2.7 Uncertainties Analysis

Cumulative risk screening involves the use of assumptions, judgments, and incomplete data to varying degrees that contribute to the uncertainty of the final estimates of risk. Uncertainties result both from the use of assumptions or models in lieu of actual data and from the error inherent in the estimation of risk-related parameters, which may cause risk to be overestimated or underestimated. Based on the uncertainties described below, this risk screening should not be construed as presenting an absolute estimate of risk to persons potentially exposed to COPCs.

Consideration of the uncertainty associated with various aspects of the cumulative risk screening allows better interpretation of the risk screening results and understanding of the potential adverse effects on human health. In general, the primary sources of uncertainty are associated with environmental sampling and analysis, selection of chemicals for evaluation, toxicological data, and exposure assessment. The effects of these uncertainties on the risk estimates are discussed below.

4.2.7.1 Environmental Sampling and Analysis

Uncertainty in environmental chemical analysis can stem from several sources including errors inherent in the sampling or analytical procedures. Analytical accuracy errors or sampling errors can result in rejection of data, which decreases the available data for use in the human health risk screening, or in the qualification of data, which increases the uncertainty in the detected chemical concentrations. There is uncertainty associated with chemicals reported in samples at concentrations below the reporting limit (RL) but still included in data analysis and with those chemicals qualified with the letter J, indicating that the concentrations are estimated. Another issue involves the amount of blank-related (i.e., B-qualified) data in the data set. The effects of using data with these uncertainties may overestimate or underestimate risks.

Another uncertainty associated with sampling and analysis concerns the inclusion of chemicals that are potentially present in the environment due to anthropogenic sources. For example, polynuclear aromatic hydrocarbons (PAH) are considered ubiquitous in soil from anthropogenic sources, such as the burning of fossil fuels, forest fires, and airborne particulates eroded from roadways and automobile tires. If such chemicals are not site-related, the risks attributable to site activities may be overestimated. This uncertainty may have a low-to-moderate effect on overestimating risks.

4.2.7.2 Selection of Chemicals for Evaluation

A comparison of EPCs to USEPA Region III RBCs was conducted for surface soil and total soil. Chemicals whose EPCs were below their respective R-RBCs were not carried through the risk screening. It is unlikely that this risk-based screening excluded chemicals that should be included, based on the conservative exposure assumptions and conservatively derived toxicity criteria that are the basis of the RBCs. Although following this methodology does not provide a quantitative risk estimate for every

chemical, it focuses the assessment on the chemicals accounting for the greatest risks (i.e., chemicals whose EPCs are above their respective RBCs) and the cumulative risk screening estimates would not be expected to be significantly greater.

Background concentrations of metal constituents in soil have been previously calculated and are available for use in the cumulative risk screening. However, as a conservative measure in the SSP, COPC selection excludes consideration of background data. Thus, it is unlikely that this risk-based screening excluded chemicals that should be included. Uncertainties associated with excluding the use of background data may lead to low-to-moderate overestimation of risks due to metals.

Uncertainty is introduced at the COPC selection step for chemicals that have adjusted RBCs or SSLs lower than the method detection limit (MDL). Specialized low-level analytical methods for PAH and explosive compounds implemented for the SSP minimize this uncertainty. Essential nutrients, calcium, magnesium, potassium, and sodium were eliminated as COPCs per the SSP guidance (USEPA 2001a).

The use of the October 2007 RBCs rather than the April 2009 Regional Screening Level Table for the SSP human health risk screening could result in the inclusion or exclusion of chemicals based on outdated toxicity data. Therefore to lessen the uncertainty associated with the use of these screening levels, an assessment of the data was conducted with respect to the April 2009 Regional Screening Levels which did not result in the identification of any additional COPCs for the site.

4.2.7.3 Exposure Point Concentrations

In establishing EPCs, the concentrations of chemicals in the media evaluated are assumed to remain constant over time. Depending on the properties of the chemical and the media in which it was detected, this assumption could overestimate risks, depending on the degree of chemical transport to other media.

When calculating EPCs from sample data, one half of the MDL was sometimes used for non-detect samples in the calculation of the 95% UCL of the mean. Approaches which substitutes values for non-detected chemical concentrations is associated with uncertainty, because chemicals that were not detected at the specified sample MDL may be absent from the medium or may be present at a concentration below the sample MDL. The uncertainty of the EPC will increase as the number of non-detects in a data set increases and the uncertainty could result in either the overestimation or underestimation of EPCs.

The 95% UCL is used as the EPC for each medium if at least eight samples are available. If the 95% UCL is greater than the MDC or if fewer than eight samples are available, the maximum is conservatively used as a default EPC. Using a value that is based on one sampling location (i.e., the maximum) has associated uncertainty and it adds a great deal of conservatism to the assessment.

4.2.7.4 Toxicological Data

Toxicological factors contributing to uncertainties associated with the human health risk screening process include the use of RBC age-adjusted ingestion and inhalation rates, the lack of toxicity criteria for some chemicals, and uncertainty associated with the lack of dermal risk estimates.

For chemicals without RBCs, provisional toxicity criteria were used where available. Provisional toxicity criteria present a source of uncertainty because, although the USEPA has evaluated the compound, a consensus has not been established on the toxicity criteria. For this assessment, use of provisional toxicity criteria was preferable to not evaluating the chemical in order to limit data gaps. However, because these toxicity criteria have not been formally accepted by USEPA, there is uncertainty with these values and, therefore, with the risks calculated using these toxicity criteria.

For some chemicals, toxicity criteria were unavailable. Although lack of published toxicity data could result in an underestimation of risk, an attempt is made to balance this uncertainty with the use of available toxicological data derived using conservative methodologies

Uncertainty is associated with using RBCs and SSLs because they do not consider dermal uptake. Given the conservative nature of the screening process, such as the use of the EPCs and R-RBCs, it is unlikely that omission of the dermal exposures in the risk screening process will result in the failure to misidentify require further evaluation or a response action.

4.3 ECOLOGICAL RISK SCREENING PROCESS

The purpose of the ecological risk screening is to provide conclusions and recommendations regarding potential ecological risk associated with SWMU 45. The Screening Level Ecological Risk Assessment (SLERA) was performed in accordance with the Final Process for Ecological Risk Assessment – Radford AAP (URS 2007a). The SLERA process is summarized below in Sections 4.3.1 through 4.3.8. Refer to Appendix F.1 for a detailed description of the SLERA process utilized for the site evaluations and an example calculation. A summary of the SLERA results are provided below and the complete tables for the SLERA are provided in Appendix F.2.

4.3.1 Scope of Work

The SLERA includes Steps 1, 2, and 3a of Ecological Risk Assessment Guidance for Superfund [ERAGS] (USEPA 1997b). Step 1 includes a screening-level problem formulation and ecological effects evaluation. Step 2 includes a preliminary exposure estimate and risk calculation. Step 3a reviews and refines the conservative assumptions used in the risk calculation (Step 2). The addition of Step 3a focuses the outcome of the SLERA, streamlines the review process, and functions as the initial basis for ecological risk management decision making.

The objectives of the ecological risk screening are to:

- Identify potentially complete exposure pathways between chemicals of potential ecological concern (COPECs) and receptors;
- Assess whether the COPECs are above toxicological screening values that are considered to be protective of ecological receptors;
- Identify uncertainty and/or data gaps in the ecological risk screening; and
- Identify an appropriate scientific management decision point (SMDP) for the site area based on the ecological risk screening results.

4.3.1.1 Ecological Site Characterization

An overview of the site physiography, water resources, geology, and soil for SWMU 45 is presented in Section 2.0. SWMU 45 is a former sanitary landfill located in the northeastern section of the MMA approximately 200 feet from the New River. The site is located in densely wooded area. Observations made during the site reconnaissance indicate the vegetation community at the site appears healthy and vigorous (see photographic log, Appendix A). Indications of chemical vegetative stress were not observed.

In addition to the information contained in Section 2.0, additional site characterization is required for the ecological risk screening, which includes local ecological receptors (threatened and endangered species) and ecological resources. A discussion of potential biota likely to use the site area is included in this section. During site visits, wildlife species were observed at the site such as squirrels, deer, and red foxes.

The Virginia Department of Game and Inland Fisheries Installation-Wide Biological Survey (VDGIF 1999) recorded various species associated with the grassland communities at RFAAP. Based on their survey of the grassland habitats, the invertebrates (approximately 250 species) and birds (83 species) accounted for the majority of species observations at RFAAP. Potential species utilizing the grassland areas of the site include common passerine birds (e.g., American robin) and small mammals (e.g., short-

tailed shrew). Larger mammals (e.g., white-tailed deer and red fox) and raptors (e.g., red-tailed hawk) may potentially utilize the grassland habitat for foraging. Animals such as the mallard duck, belted kingfisher, and raccoon could be expected to forage in the New River.

The Virginia Department of Game and Inland Fisheries survey identified three threatened wildlife species and two rare plant species associated with RFAAP grassland communities (currently not on the 2002 Plant Watch List; http://www.dcr.state.va.us/dnh/plantlist02.pdf). They include:

- Regal Fritillary Butterfly (*Speyeria idalia*);
- Henslow's Sparrow (*Ammodramus henslowii*);
- Loggerhead Shrike (*Lanius ludovicianus*);
- Midland Sedge (*Carex mescochorea*); and
- Shaggy False Gromwell (*Onosmodium hispidissimum*).

Threatened wildlife observations in 1999 at RFAAP included the Regal Fritillary Butterfly (VDGIF 1999). The Regal Fritillary Butterfly was documented in the east-central and eastern edges of the MMA. No threatened wildlife species or rare plant species were identified at the site.

4.3.2 Identification of Chemicals of Potential Ecological Concern

4.3.2.1 Approach

Soil samples were collected from 0 to 1 ft bgs below organic layers at the surface. This layer contains the zone of highest biological activity of soil organisms and the soil that is most frequently contacted by terrestrial biota. Although fossorial wildlife may be in contact with soil below 1 ft bgs, the preys of these animals are primarily associated with surficial soil. Furthermore, incidental exposure to the soil below 1 ft bgs is likely to be insignificant relative to surface soil exposure.

Surficial soil (0 to 1 ft bgs) represents the potential exposure media to ecological receptors. The following sections describe the process used to evaluate soil, the selection of COPECs evaluated in the SLERA, and the uncertainties associated with COPEC selection.

4.3.2.1 Terrestrial

Potential ecological receptors at SWMU 45 may be exposed to COPECs in soil through the following exposure routes:

- Direct contact/absorption from soil;
- Direct ingestion of soil;
- Incidental ingestion of soil; and
- Direct ingestion of biota with accumulated COPECs.

Although receptors may be exposed to COPECs through inhalation or drinking surface water, sufficient literature regarding toxicity due to these pathways is lacking to quantitatively evaluate such exposure routes. Given the potential mobility of COPECs between food web trophic levels, a number of terrestrial categories were selected. Individual receptor species were selected to represent five wildlife receptor categories and these species possess the following characteristics that are essential for assessing COPEC mobility within the food web:

- Highly likely to occur at the site in relatively high abundance;
- Limited home range;
- Important role in the local food web; and
- Sufficient toxicological information is available in the literature.

Receptor categories and the species selected to represent the wildlife categories include:

- Plant communities;
- Soil invertebrate/microbial communities;
- Omnivorous birds: American Robin (*Turdus migratorius*);
- Carnivorous birds: Red-tailed Hawk (*Buteo jamaicensis*);
- Herbivorous animals: Meadow Vole (*Microtus pennsylvanicus*);
- Omnivorous mammals: Red Fox (*Vulpes vulpes*); and
- Carnivorous mammals: Short-tailed Shrew (*Blarina brevicauda*).

Potential wildlife utilizing the site includes passerine bird and small mammalian species common to RFAAP grasslands (VDGIF 1999).

4.3.3 Identification of Exposure Pathways and Potential Receptors Analysis

4.3.3.1 Data Organization

The following table identifies the soil samples used for the SLERA. These samples were analyzed for TAL metals, TCL pesticides, TCL PCBs, TCL VOCs, TCL SVOCs, and explosives (including nitroglycerin and pentaerythritol tetranitrate [PETN]). Refer to Table 3-1 for a detailed list of samples and analytes.

Soil Samples Evaluated for SLERA

SWMU 45	
45TP1A	45SB1A
45TP2A	45SB5A
45TP3A	45SB8A
45TP4A	45SB14A
45TP5A	
45TP6A	
45TP7A	

Detected chemical occurrence and distribution tables for surface soil are presented in Table F.2-1. Refer to Table 4-1 for a complete list of results for detected analytes. In addition, to evaluate the adequate sensitivity of the MDL for the necessary screening levels, Table F.2-2 provides a screening of the maximum MDL versus available ecological screening values for non-detected chemicals in surface soil.

Chemicals that were not detected in at least one sample were considered as uncertain analytes in the evaluation of risk. Other qualified analytical data were retained in the assessment.

In cases where chemicals were analyzed using multiple laboratory methods, the analytical results for the method with the lowest MDL were retained for the risk assessment. For example, concentrations of

explosives were assessed using Method 8330 rather than the SVOC Method 8270. Eliminating the method having the higher detection limit did not result in exclusion of samples with higher detected concentrations.

4.3.3.2 Ecological Conceptual Site Model (ECSM)

The terrestrial ECSM is presented on Figure 4-1. Surface soil is a potential exposure medium of concern based on historical activities at the site. Based on the site characterization and data, the terrestrial receptor exposure to surface soil pathway exists.

4.3.4 Identification of Assessment and Measurement Endpoints

Assessment endpoints are explicit statements of ecological resources (entities) and attributes of those entities that are important to protect (USEPA 1998). Measurement endpoints represent quantifiable ecological characteristics that can be measured, interpreted, and related to ecological resources chosen as assessment endpoints. Assessment and measurement endpoints for the resources in the terrestrial site are outlined below.

4.3.4.1 Terrestrial

Assessment and measurement endpoints for terrestrial receptors are as follows:

Assessment Endpoints	Measurement Endpoints
• Survival, growth, and reproduction of terrestrial plants	• MDCs for chemicals detected in surface soil will be compared to concentrations representing no adverse effects thresholds to the survival of plants communities reported in the scientific literature
• Survival, growth, and reproduction of soil invertebrates and microbial communities	• MDCs for chemicals detected in surface soil will be compared to concentrations representing no adverse effects thresholds to the survival of soil invertebrates or microbial communities reported in the scientific literature
• Survival, growth, and reproduction of terrestrial wildlife (birds and mammals) populations and communities	• MDCs for detected bioaccumulative chemicals in soil will be compared to no observable adverse effects levels (NOAELs) and lowest observable adverse effects levels (LOAELs) associated with effects on growth, reproduction, or survival of terrestrial wildlife

4.3.5 Preliminary Exposure Estimate and Ecological Effects Evaluation

The preliminary exposure estimate and ecological effects evaluation considers the most conservative risk scenario. Highly conservative assumptions are used to estimate COPEC exposure to terrestrial receptors for pathways to be quantitatively evaluated. Conservative toxicity reference values (TRVs) are used to evaluate the ecological effects of exposure using the two approaches discussed below.

Risk is assessed by comparing the preliminary exposure estimate (MDC) of each detected chemical to the established TRV (detailed in Appendix F.1, Section 2.1). The preliminary risk is characterized in terms of a HQ, which is expressed as:

$$\mathbf{HQ = MDC/TRV}$$

where:

HQ = Hazard Quotient for the chemical (unitless)

MDC = Maximum Detected Concentration for chemical (mg/kg)

TRV = Screening Level for chemical (mg/kg)

An HQ of less than 1 indicates no or negligible risk. The potential for risk increases as the HQ increases above unity. However, this result should be considered in the context of other characteristics of the exposure area. A summary of the results of the preliminary exposure assessment are presented in Appendix F.2.

4.3.5.1 Direct Contact Approach

The maximum soil concentrations for detected chemicals are used as the preliminary exposure estimate concentrations to develop a conservative risk scenario for the direct contact pathway to soil invertebrates and terrestrial plants. The results of the preliminary exposure assessments for plants and invertebrates are provided below.

Terrestrial Plants

Preliminary direct contact HQs calculated for plants are presented in Table F.2-6 for detected chemicals. Of the detected chemicals for which screening values were available, the concentrations of aluminum, chromium, copper, lead, manganese, selenium, vanadium, and zinc resulted in HQ values that were greater than 1.

Soil Invertebrates and Microbial Communities

Preliminary direct contact HQs calculated for invertebrates are presented in Table F.2-8 for detected chemicals. Of the detected chemicals for which screening values were available, the concentrations of chromium, copper, iron, manganese, mercury, vanadium, and zinc resulted in HQ values that were greater than 1.

4.3.5.2 Dose Rate Modeling Approach

Preliminary risk characterization for wildlife receptors uses the conservative preliminary exposure estimate and ecological effects evaluation to characterize risk to potential terrestrial receptors. Risk is assessed by comparing the preliminary exposure estimate of each detected bioaccumulative chemical, as defined in Table 4-2 in *Bioaccumulative Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status, and Needs*, EPA-823-R-00-001, to the TRV developed in the ecological effects evaluation. An example calculation for dose rate modeling is provided in Appendix F.1, Section 4.1, utilizing the equation below.

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \ (BAF_{food} \cdot DF) + IR_s \ )AF}$$

where:

C_{TRV} = NOAEL or LOAEL-based screening level (mg chemical/kg soil)
ADD = NOAEL or LOAEL (mg COPC/kg body weight-day)
BW = Minimum Body Weight of the receptor (kg)
IR_{food} = Maximum Ingestion Rate of food (kg food ingested per day, dry weight)
BAF_{food} = Bioaccumulation Factor (BAF) of most contaminated dietary component used, specific to prey type and COPEC (ratio of mg of COPEC/kg fauna, wet weight to mg COPC/ kg substrate, dry weight)
DF = Dietary Fraction (most contaminated dietary component assumed to be 100% of diet)
IR_s = Maximum Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
AF = 100% Area Use Factor

In the preliminary dose rate modeling approach, the maximum COPEC concentrations for detected bioaccumulative chemicals, along with assumptions of maximum ingestion rate, minimum body weight, 100% area use, and 100% bioavailability are used in the conservative risk scenario as the preliminary exposure estimate for soil and compared to the calculated TRVs. Preliminary receptor-specific exposure parameters are presented on Table F.2-9. A summary of the results of the preliminary exposure assessment for terrestrial wildlife is provided below.

Terrestrial Wildlife

Quantitative risk characterization for terrestrial wildlife is limited to direct ingestion of biota and incidental ingestion of soil. The preliminary risks for detected bioaccumulative chemicals are summarized in Table F.2-24 for each terrestrial wildlife receptor and the chemicals with HQs greater than 1 are characterized as follows:

Receptor	NOAEL Only HQ>1	NOAEL and LOAEL HQ>1
Meadow Vole	cadmium	arsenic, copper, lead, selenium, zinc
Short-tailed Shrew	chromium, selenium	arsenic, cadmium, copper, lead, zinc, Aroclor 1254, Aroclor 1260
Red Fox	none	arsenic, cadmium, chromium, copper, lead, selenium, zinc, Aroclor 1254, Aroclor 1260
American Robin	Aroclor 1254, Aroclor 1260	cadmium, chromium, copper, lead, mercury, selenium, zinc, 4,4- Dichloro-diphenyl-trichloroethane (DDT)
Red-tailed Hawk	cadmium, chromium	copper, lead, zinc

4.3.6 Refined Exposure Estimate and Risk Characterization

Refined exposure estimates and ecological effects are developed for two major receptor categories having complete exposure pathways to be quantitatively evaluated: 1) direct contact to plants and invertebrates, and 2) wildlife ingestion (i.e., omnivorous birds and mammals, carnivorous birds and mammals, and herbivorous mammals). The refined exposure and risk characterization, Step 3a of ERAGS, reviews and refines the conservative assumptions used in the risk calculation (USEPA 1997a). In Step 3a, conservative assumptions used in the preliminary exposure and risk characterization are replaced with more environmentally realistic assumptions to evaluate risk posed by constituents identified in the preliminary risk characterization. The addition of Step 3a focuses the outcome of the SLERA, streamlines the review process, and functions as the initial basis for ecological risk management decision-making.

As noted below for the refined exposure estimate and risk characterization, the 95% UCL is used as the exposure concentration rather than the MDC. Methods used to calculate 95% UCLs are based on guidance provided in the following documents *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA 2002b) and *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations* (USEPA 2006).

In general, the method used to calculate a 95% UCL depends on: 1) the prevalence of non-detects, and 2) the data distribution (e.g., normal or lognormal). Non-detects introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore,

distributional assumptions are difficult to make for COPCs with a high rate of non-detects. ProUCL 4.0 is used to calculate EPCs for the site. EPCs for soil COPECs are presented in Table F.2-4 for SWMU 45 (Appendix F.2)

For the refined evaluation, risk is assessed by comparing the EPC (95% UCL) of each detected chemical to the TRV. The refined risk HQ is expressed as:

$$\mathbf{HQ = EPC/TRV}$$

where:

HQ = Hazard Quotient for the chemical (unitless)

EPC = Calculated Exposure Point Concentration for chemical (mg/kg)

TRV = Screening Level for chemical (mg/kg)

An HQ of less than 1 indicates no or negligible risk. The potential for risk increases as the HQ increases above unity. However, this result should be considered in the context of other characteristics of the exposure area. Results of the refined exposure assessment are presented in Appendix F.2.

4.3.6.1 Direct Contact Approach

The refined exposure estimate for the direct contact pathway to soil invertebrate and microbial communities incorporates the 95% UCL as the exposure concentration for evaluating the COPECs using a conservative yet more realistic exposure assumption than MDCs. A summary of the results of the refined exposure assessment for plants and invertebrates is provided below.

Terrestrial Plants

Refined direct contact HQs calculated for plants are presented in Table F.2-6 for detected chemicals. Of the detected chemicals for which screening values were available, the concentrations of aluminum, chromium, copper, lead, manganese, vanadium, and zinc resulted in refined HQ values that were greater than 1.

Soil Invertebrates and Microbial Communities

Refined direct contact HQs calculated for invertebrates are presented in Table F.2-8 for detected chemicals. Of the detected chemicals for which screening values were available, the concentrations of chromium, copper, iron, manganese, mercury, vanadium, and zinc resulted in refined HQ values that were greater than 1.

4.3.6.2 Dose Rate Modeling Approach

The conservative assumptions used in the preliminary exposure estimate and ecological effects evaluation were replaced with more environmentally realistic assumptions resulting in a more realistic estimate of potential risk. An example calculation for dose rate modeling is provided in Appendix F.1, Section 4.4, utilizing the equation below.

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_i \cdot DF_i) + IR_s)AF}$$

where:

C_{TRV} = NOAEL or LOAEL-based screening level (mg chemical/kg soil)
ADD = NOAEL or LOAEL (mg COPC/kg body weight-day)
BW = Average Body Weight of the receptor (kg)
IR_{food} = Average Ingestion Rate of food (kg food ingested per day, dry weight)
BAF_i = BAF of dietary component used for the i_{th} food item, specific to prey type (i.e., plant, invetebrate, or mammal) and COPEC (ratio of mg of COPEC/kg fauna, wet weight to mg COPEC/ kg substrate, dry weight)
DF_i = Dietary Fraction for i_{th} Food Item
IR_s = Average Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)
$AF_{refined}$ = Refined Area Use Factor (detailed below)

The refined exposure estimates and ecological effects are developed for wildlife receptors having complete exposure pathways to be quantitatively evaluated (i.e., omnivorous birds, and carnivorous and herbivorous mammals). In the refined model, an average body weight, average ingestion rate, and a 95% UCL as the EPC are used. Refined receptor-specific exposure parameters are presented on Table F.2-9 (Appendix F.2). In addition, a realistic area use factor ($AF_{refined}$) was calculated as the ratio of the site area to the average home range of the receptor which is also presented in Table F.2-9 (Appendix F.2). A summary of the results of the refined exposure assessment for terrestrial wildlife is provided below.

Terrestrial Wildlife

The refined risk characterization results are presented in Table F.2-24 and summarized below for each of the receptors with chemical HQs greater than 1:

Receptor	NOAEL Only HQ>1	NOAEL and LOAEL HQ>1
Meadow Vole	none	none
Short-tailed Shrew	Aroclor 1254 (2.2), Aroclor 1260 (1.9)	none
Red Fox	none	none
American Robin	lead (2.7), zinc (2.0), 4,4-DDT (1.6)	none
Red-tailed Hawk	none	none

*Note: (2.5) = NOAEL-based HQ

4.3.7 Risk Management – Scientific Management Decision Point

The findings of the ecological risk screen including site characterization and risk calculations are used as input to risk management decision-making for the site. The SMDP reached from the ecological risk screening concludes that one of the following statements is true:

- There is adequate information to conclude that ecological risks are negligible and therefore there is no need for further action at the site on the basis of ecological risk;
- The information is not adequate to make a decision at this point and further refinement of data is needed to augment the ecological risk screening; or
- The information collected and presented indicates that a more thorough assessment is warranted.

Terrestrial plant COPECs with refined HQs greater than 1 included: aluminum (HQ=280), chromium (HQ=39), copper (HQ=16), lead (HQ=3), manganese (HQ=3.8), vanadium (HQ=16), and zinc (HQ=7.6). Although the refined aluminum HQ is greater than 1, the average pH in the surface soil is greater than 5.5 (see Appendix D.1). Therefore, since aluminum is biologically inactive in circumneutral to alkaline conditions (pH 5.5-8.0) such as those present at the site, aluminum is not considered a COPEC. Manganese and vanadium are below background point estimates (see Section 4.2.5); therefore, these chemicals are not considered site-related. Chromium is above the plant screening level (SL) and background point estimate at one location (45TP4A). Copper is above the plant SL and background point estimate at two locations (45TP2A and 45TP4A). Lead is above the plant SL and background point estimate at three locations (45TP1A, 45TP2A, and 45TP4A). Zinc is above the plant SL and background point estimate at five locations (45SB1A, 45TP1A, 45TP2A, 45TP4A, and 45TP5A). Although metals concentrations in plants were above the screening levels, indications of chemical vegetative stress were not observed at the site. The limited metals concentrations above ecological screening levels are primarily located in the areas of surficial metal debris at the site (Figure 4-3).

Soil invertebrates and microbial processes COPECs with refined HQs greater than 1 included chromium (HQ=97), copper (HQ=14), iron (HQ=160), manganese (HQ=1.8), mercury (HQ=1.2), vanadium (HQ=1.6), and zinc (HQ=10). Iron, manganese, and vanadium are below background point estimates (see Section 4.2.5); therefore, these chemicals are not considered site-related. Chromium is above the invertebrate SL and background point estimate at one location (45TP4A). Copper is above the invertebrate SL and background point estimate at two locations (45TP2A and 45TP4A). Mercury is above the invertebrate SL and background point estimate at two locations (45TP2A and 45TP3A). Zinc is above the invertebrate SL and background point estimate at five locations (45SB1A, 45TP1A, 45TP2A, 45TP4A, and 45TP5A). The limited metals concentrations above ecological screening levels are primarily located in the areas of surficial metal debris at the site (Figure 4-3).

The refined risk characterization for wildlife resulted in the identification of no chemicals with a LOAEL-based HQ greater than 1.

After consideration of the limited metals concentrations above ecological screening levels for plants and invertebrates, the lack of refined LOAEL-based HQs greater than 1 for terrestrial receptors, and the nature of disposal activities at the site resulting in the limited metals concentrations above screening levels (i.e. surficial metal debris), the SMDP is the following:

There is adequate information to conclude that ecological risks are negligible and therefore there is no need for further action at the site on the basis of ecological risk.

4.3.8 EXPOSURE AND RISK UNCERTAINTY ANALYSIS

Based on this assessment, while factors such as lack of TSV and wildlife profile assumptions may create limited uncertainty, the overall result of the conservative nature of the process has produced a conservative assessment of potential ecological risks associated with the site.

Assumptions and other factors that tend to overestimate, underestimate, or have an unknown effect on the findings of the ecological risk screening are presented below with a discussion of their uncertainty.

4.3.8.1 Data Quality

Insufficient sampling density or the analyte list may not provide a representative estimate of exposure to COPECs. Misrepresentation of exposure results in uncertainty and may lead to an overestimation or underestimation of risk. Ten or more sampling locations at the site under consideration reduce this uncertainty. Moreover, the extensive list of constituents analyzed reduces the likelihood of failing to identify a COPEC. Therefore, the uncertainty in the ecological risk screening results associated with data quality is likely minimal.

4.3.8.2 COPEC Bioavailability

Chemical analyses of exposure media measured the total levels of the COPECs rather than the more bioavailable toxic forms. The availability of the total concentrations alone assumes that the entire fraction is bioavailable and toxic. This is likely to be a very conservative assumption that varies from constituent to constituent. It was also assumed that no geochemical factors limited receptor exposure to, or the potential for toxic expression of COPECs. It is likely that COPECs may, to some degree, adsorb to fine-grained particles and/or complex with chemical complexing agents and organic ligands in the exposure media. Such actions may change the chemical speciation of the COPECs to a less toxic form, or reduce the concentrations of bioavailable chemicals and subsequent uptake by receptors. Therefore, risk is likely to be overestimated.

4.3.8.3 Wildlife Profile Assumptions

Dose rate models require a number of assumptions, which could result in either an overestimation or underestimation of risk to receptors. For example, body weights and ingestion rates are estimated from limited information. In addition, receptors are assumed to feed on specified food sources, although some such as the Red Fox may feed opportunistically on a greater variety of food types.

AFs were estimated based on the size of the site relative to the home ranges of the receptors. However, the foraging of birds and mammals is not assessed simply by size, but rather a function of habitat suitability, habitat productivity, and species-specific foraging behaviors. Therefore, because habitat quality is not accounted for in estimating AF, the risk to terrestrial receptors in this assessment is likely to be overestimated.

4.3.8.4 Lack of Toxicological Data

The evaluation of ecological effects was limited in the direct contact and wildlife ingestion pathways due to limited toxicological data of the COPECs. The effects of many COPECs evaluated for the direct contact pathway to invertebrates and microbial communities were not quantified due to the lack of invertebrate derived TRVs. In addition, NOAEL and LOAEL TRVs were not available for receptors exposed to multiple COPECs. Therefore, due to the lack of toxicological data, the risk to potential receptors may be underestimated or unknown.

4.3.8.5 TRVs

NOAEL and LOAEL TRVs identified for wildlife receptors represent the most conservative application of toxicity test results identified from the literature. High uncertainty factors were used to provide TRVs representative of chronic exposure and sub-lethal effects. This approach is likely to overestimate the sensitivity of many ecological receptors and likely overestimates risk to potential receptors.

4.3.8.6 Hazard Quotients

Uncertainties in characterizing risks are primarily associated with the assumption that an HQ greater than 1 is an adequate indicator of the potential for ecological risks of individual chemicals. Given the use of conservative and realistic exposure and effects assumptions previously discussed, there is minimal uncertainty that the potential for ecological risks of individual chemicals are not identified in the ecological risk screening of the site. Conversely, there is a strong possibility for false positive identification of ecological risks for some individual chemicals.

4.3.8.7 Exposure and Risk Uncertainty Conclusions

While factors such as lack of TSV and wildlife profile assumptions may create limited uncertainty, the very small size and negligible habitat quality of the site in combination with these limited uncertainties has produced a conservative assessment of potential ecological risks associated with SWMU 45.

4.4 CONCEPTUAL SITE MODEL (CSM)

SWMU 45 is an inactive landfill area. Paper and municipal refuse were the only materials reportedly disposed of in SWMU 45. The site is located on an alluvial terrace approximately 200 ft south of the New River. Surface water bodies, drainage ditches, manholes, catch basins, or preferred drainage paths or features are not present at the site. Storm water is expected to infiltrate rather than runoff the site due to the site's nearly flat topography, heavy vegetation, and a thick layer of organic matter in surface soil.

Groundwater is present at the site within unconsolidated alluvium and underlying bedrock at depths of approximately 18 to 23 ft bgs. The overall direction of groundwater flow in the alluvial floodplain is northeastward toward the New River. While site groundwater discharge may be hydraulically connected to the New River, the completeness of this pathway is unknown. Site-related groundwater effects were not identified at the site above SSP risk threshold values; and therefore, an assessment of the potential effects to the New River was not completed. Potentially affected media at the site include:

- Surface and subsurface soil via disposal of landfill material and debris;
- Subsurface soil via leaching of chemicals; and
- Groundwater via leaching of chemicals.

A CSM for SWMU 45 is presented on Figure 4-2.

4.5 NATURE AND EXTENT ASSESSMENT

As shown on Figure 4-3, landfill material (rubber, paper, and other debris) was encountered in 45TP3 from 2 ft to 8 ft bgs and 45TP6 from 1.5 ft to 5 ft bgs. Metallic and other debris (bottles, paper, etc.) was encountered in 45SB4 from 1.5 ft to 4 ft bgs and 45TP4 from 0.25 to 2.75 ft bgs with the debris accounting for approximately 10 to 15 % by volume and the remainder soil. Metallic debris was encountered in 45TP1 from 0.5 ft to 1.25 ft bgs and 45TP2 from 0.25 ft to 1 ft bgs. A test pit photo log is provided in Appendix A.2. The area and approximate volumes of material are provided below and on Figure 4-3.

Material Volumes

Location	Area (sq ft)	Average Thickness (ft)	Volume (BCY)
45TP1	1,400	0.75	39
45TP2	2,600	0.75	72
45TP3, 45TP6, 45SB4, 45MW3	7,900	3.5	1,024
45TP4	1,000	2.5	93
Total	12,900		1,228

Note: BCY = bank cubic yards (in-place volume)

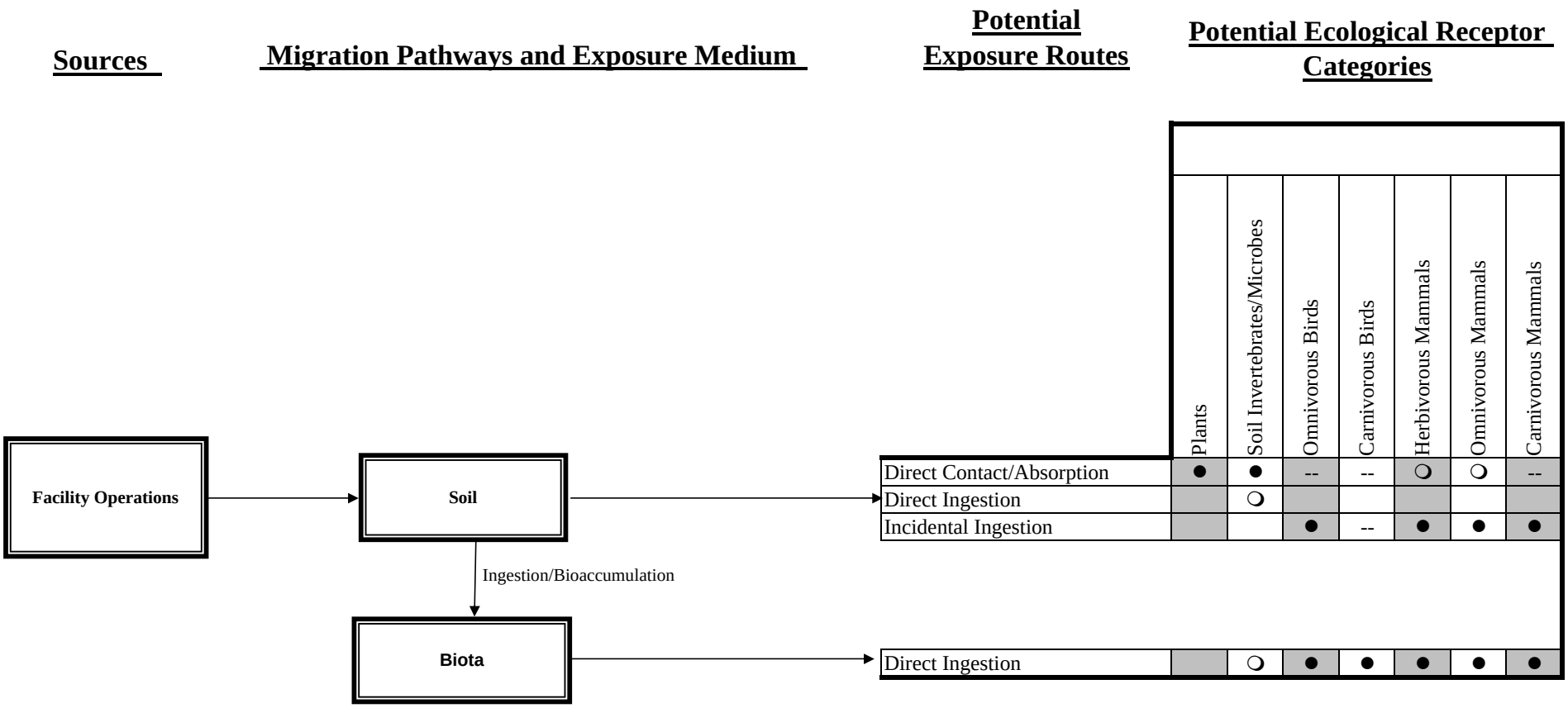
Landfill material is limited primarily to the immediate area surrounding 45TP3, 45TP6, 45SB4, and 45MW3 encompassing approximately 7,900 sq ft (0.18 acres). An area of metallic and other debris was identified at 45TP4 encompassing approximately 1,000 sq ft (0.02 acres). Other isolated metallic debris areas (45TP1 and 45TP2) encompass approximately 4,000 sq ft (0.1 acres).

4.6 CONCLUSIONS AND RECOMMENDATION

Due to HIs above the SSP HI target organ threshold of 0.5 for several target organs under the residential scenario, a quantitative risk assessment was completed for site and is presented in Section 5.0. The lead and iron evaluations were below established thresholds; therefore, further assessment of lead and iron are not necessary. Metals concentrations above their default SSLs are limited to one subsurface soil sample for

antimony and one surface soil sample and one subsurface soil sample for chromium and the evaluation of the groundwater for antimony and chromium did not indicate leaching of these chemicals at dissolved levels above their adjusted T-RBCs; therefore, no additional assessment of soil-to-groundwater evaluation is necessary. The results of the SLERA indicated there is adequate information to conclude that ecological risks are negligible at SWMU 45; therefore, there is no need for further action at the site on the basis of ecological risk.

Figure 4-1
Terrestrial Ecological Conceptual Site Model
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia



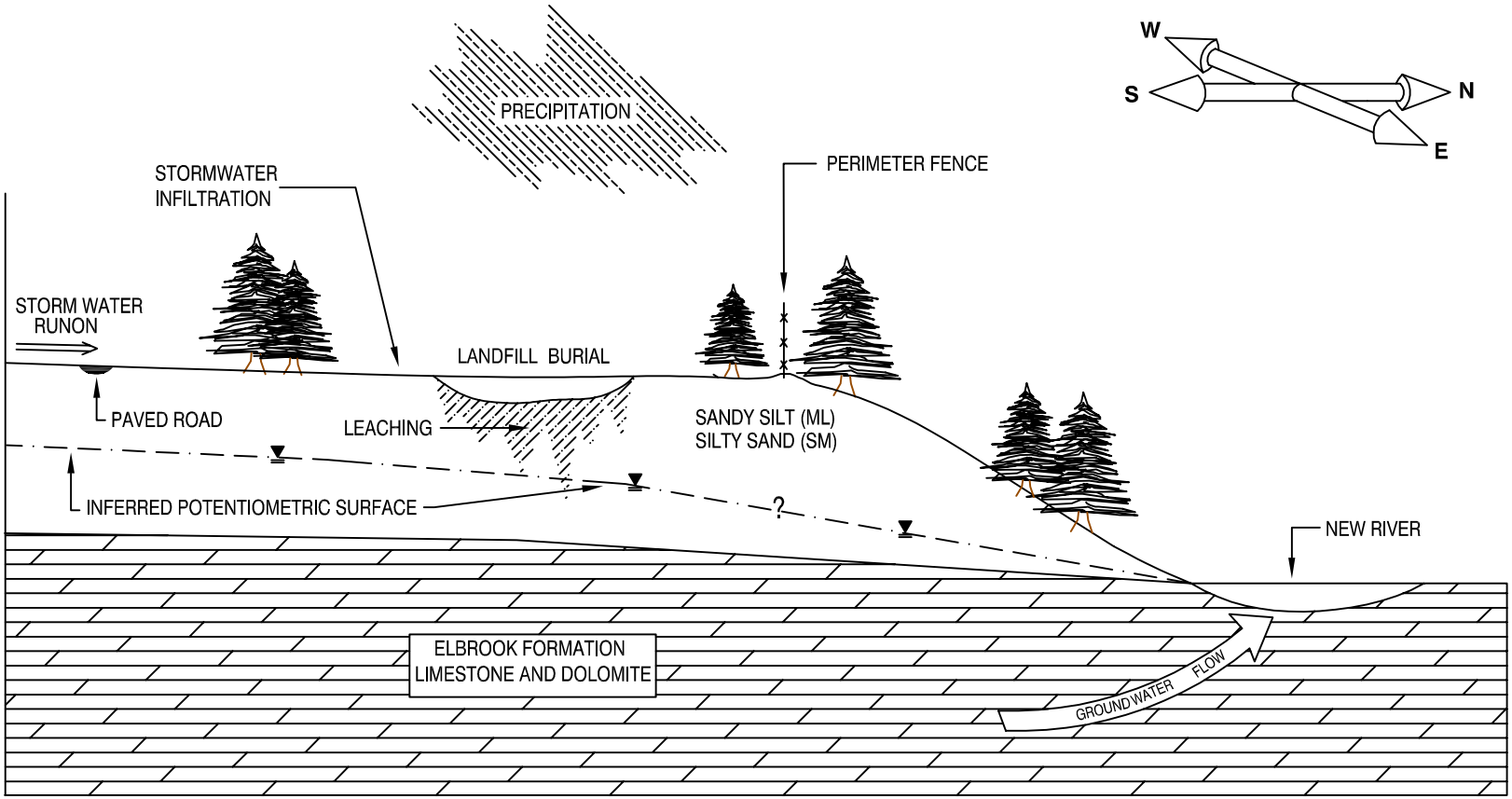
Notes:

● = POTENTIALLY COMPLETE PATHWAY EVALUATED QUANTITATIVELY

❍ = COMPLETE PATHWAY EVALUATED QUALITATIVELY

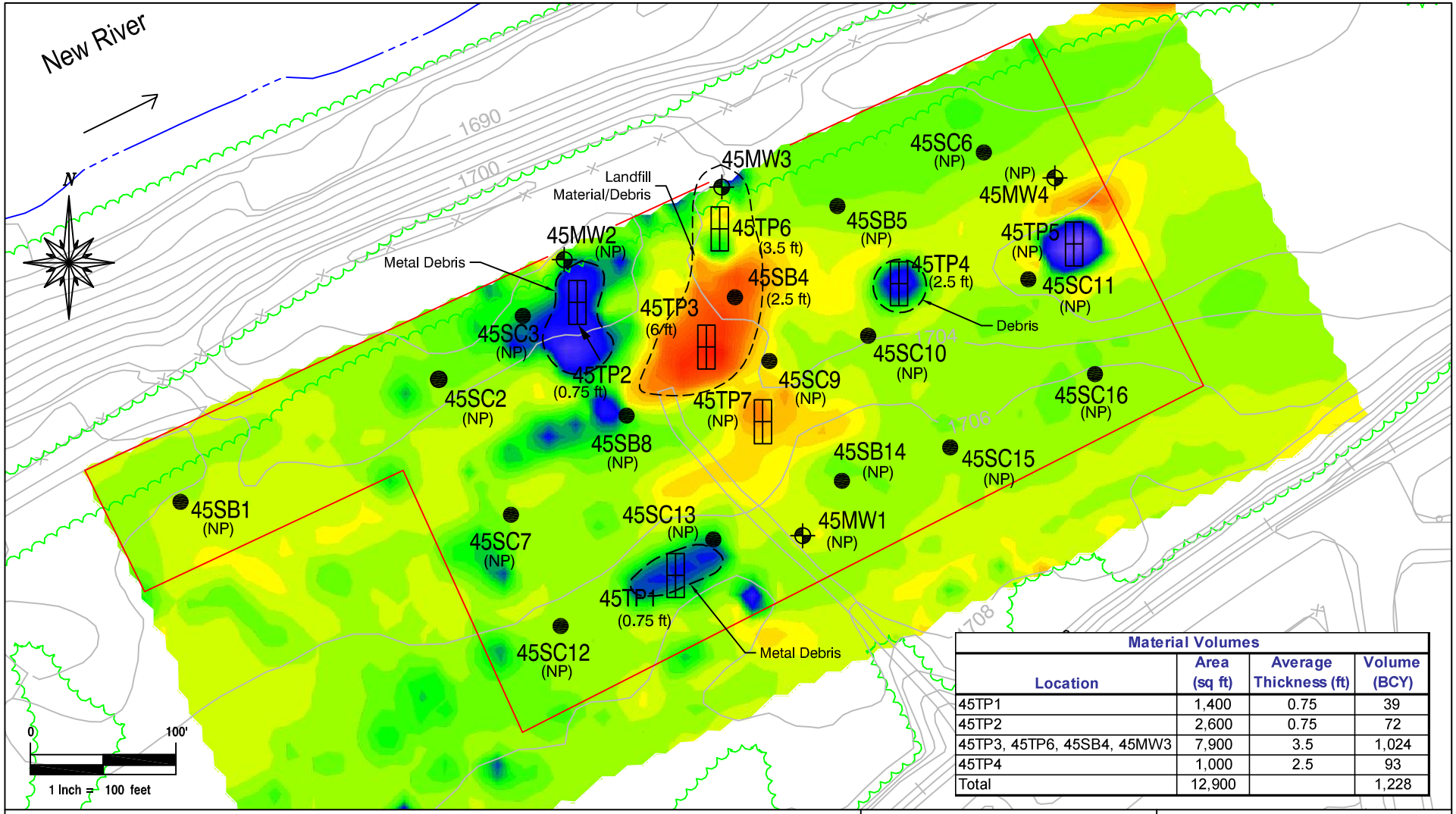
-- = PATHWAY IS INSIGNIFICANT

BLANK = INCOMPLETE PATHWAY



CONCEPTUAL DRAWING - NO SCALE IMPLIED

FIGURE 4-2 Conceptual Site Model		**SWMU 45** SSP Report Radford Army Ammunition Plant Radford, Virginia
Date: August 2008	URS Project #: 11656351	
Prepared by: DBC	Approved by: JOS	URS Group, Inc. 5540 Falmouth Street Suite 201 Richmond, Virginia 23230
Scale: 1" = 150'	File Name: Fig. 4-2 CSM	



Material Volumes			
Location	Area (sq ft)	Average Thickness (ft)	Volume (BCY)
45TP1	1,400	0.75	39
45TP2	2,600	0.75	72
45TP3, 45TP6, 45SB4, 45MW3	7,900	3.5	1,024
45TP4	1,000	2.5	93
Total	12,900		1,228

Legend

- Monitoring Well Location
- Soil Boring Location
- Test Pit Location
- Topographic Contour
- Perimeter Fence
- Vegetation
- Approximate Limits of Study Area
- Approximate Limits of Landfill Material/Debris
- (NP) Landfill Material/ Debris Not Present
- (6 ft) Thickness of Landfill Material/Debris

Note: Test Pits Not to Scale

FIGURE 4-3

Landfill Material and Debris Locations

Date: August 2008	URS Project #: 11656351
Prepared by: CLD	Approved by: JOS
Scale: 1" = 100'	File Name: Fig.4-3 SSP samploc

SWMU 45
SSP Report
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
5540 Falmouth Street
Suite 201
Richmond, Virginia 23230

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Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45SB1A 5/7/2008 0-1		MDL	RL	45SB1B 5/7/2008 5-7		MDL	RL	45SB5A 5/7/2008 0-1		MDL	RL	45SB5B 5/7/2008 5-7		MDL	RL	45SB8A 5/7/2008 0-1		MDL	RL	45SB8B 5/7/2008 5-7		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals (mg/kg)																														
Aluminum	7429-90-5	N	40,041	7,821	102,200	--	11,000		200	1,000	14,000		2	10	9,100		2	10	12,000		2	10	10,000		2	10	12,000		2	10
Antimony	7440-36-0	N	--	3.13	40.88	13.2	0.074	J	0.026	0.2	<0.2	U	0.026	0.2	<0.2	U	0.026	0.2	<0.2	U	0.026	0.2	0.077	J	0.026	0.2	<0.2	U	0.026	0.2
Arsenic	7440-38-2	C	15.8	0.426	1.91	0.026	***1.1***	,L,m	0.026	0.2	***0.84***	,L,m	0.026	0.2	***0.57***	,L,m	0.026	0.2	***0.73***	,L,m	0.026	0.2	***1.1***	,L,m	0.026	0.2	***0.66***	,L,m	0.026	0.2
Barium	7440-39-3	N	209	1,564	20,440	6,015	190		0.33	1	130		0.33	1	110		0.33	1	120		0.33	1	160		0.33	1	150		0.33	1
Beryllium	7440-41-7	N	1.02	15.64	204.4	1,154	0.98	J	0.061	1	1.4		0.061	1	0.93	J	0.061	1	1.2		0.061	1	1.1		0.061	1	1.3		0.061	1
Cadmium	7440-43-9	N	0.69	3.91	51.1	27.45	0.49	J	0.45	2	<2	U	0.45	2	<2	U	0.45	2	<2	U	0.45	2	<2	U	0.45	2	0.53	J	0.45	2
Calcium	7440-70-2	--	--	--	--	--	1,600		9.8	50	1,800		9.8	50	1,400		9.8	50	1,600		9.8	50	1,000		9.8	50	1,100		9.8	50
Chromium [1]	7440-47-3	N	65.3	23.46	306.6	42.048	18		0.8	5	20		0.8	5	16		0.8	5	19		0.8	5	19		0.8	5	21		0.8	5
Cobalt	7440-48-4	--	72.3	--	--	--	8.5		0.53	2	8.9		0.53	2	7.4		0.53	2	8.4		0.53	2	8.8		0.53	2	8.5		0.53	2
Copper	7440-50-8	N	53.5	312.86	4,088	10,518	9.9		0.027	0.2	9.6		0.027	0.2	6.5		0.027	0.2	8.5		0.027	0.2	33		0.027	0.2	14		0.027	0.2
Iron	7439-89-6	N	50,962	5,475	71,540	--	24,000		490	5,000	21,000		0.98	10	14,000		0.98	10	19,000		0.98	10	17,000		0.98	10	17,000		0.98	10
Lead [2]	7439-92-1	--	26.8	400	750	--	79		0.12	1	9.2		0.024	0.2	7.9		0.024	0.2	7.7		0.024	0.2	56		0.047	0.4	8.7		0.024	0.2
Magnesium	7439-95-4	--	--	--	--	--	2,500		2.8	50	3,400		2.8	50	2,700		2.8	50	3,400		2.8	50	2,600		2.8	50	3,200		2.8	50
Manganese	7439-96-5	N	2,543	156.43	2,044	951.9	930		3.5	20	620		0.18	1	390		0.18	1	470		0.18	1	700		0.18	1	590		0.18	1
Mercury [3]	7439-97-6	--	0.13	2.35	30.66	--	0.019	J	0.0075	0.05	0.012	J	0.0075	0.05	0.02	J	0.0075	0.05	<0.05	U	0.0075	0.05	0.027	J	0.0075	0.05	0.016	J	0.0075	0.05
Nickel	7440-02-0	N	62.8	156.43	2,044	--	10		0.035	0.1	14		0.035	0.1	9.9		0.035	0.1	11		0.035	0.1	10		0.035	0.1	14		0.035	0.1
Potassium	7440-09-7	--	--	--	--	--	1,400		14	50	2,000		14	50	950		14	50	1,400		14	50	1,400		14	50	1,200		14	50
Selenium	7782-49-2	N	--	39.11	511	18.98	0.15	J,L,m	0.028	0.3	0.12	J,L,m	0.028	0.3	0.12	J,L,m	0.028	0.3	0.036	J,L,m	0.028	0.3	0.18	J,L,m	0.028	0.3	0.11	J,L,m	0.028	0.3
Silver	7440-22-4	N	--	39.11	511	31.03	0.048	J	0.0093	0.1	0.041	J	0.0093	0.1	0.037	J	0.0093	0.1	0.032	J	0.0093	0.1	0.049	J	0.0093	0.1	0.04	J	0.0093	0.1
Sodium	7440-23-5	--	--	--	--	--	34	J	18	100	34	J	18	100	40	J	18	100	42	J	18	100	40	J	18	100	42	J	18	100
Thallium	7440-28-0	N	2.11	0.548	7.154	3.638	0.36		0.0068	0.1	0.14		0.0068	0.1	0.1		0.0068	0.1	0.14		0.0068	0.1	0.21		0.0068	0.1	0.14		0.0068	0.1
Vanadium	7440-62-2	N	108	7.821	102.2	730.1	16		0.032	0.1	20		0.032	0.1	16		0.032	0.1	17		0.032	0.1	17		0.032	0.1	21		0.032	0.1
Zinc	7440-66-6	N	202	2,346	30,660	13,622	330		0.49	5	71		0.49	5	57		0.49	5	58		0.49	5	160		0.49	5	100		0.49	5
Cyanide (mg/kg)																														
Cyanide	57-12-5	N	--	156.43	2,044	147.5	0.11	J	0.098	0.12	<0.12	U	0.095	0.12	<0.12	U	0.094	0.12	<0.11	U	0.088	0.11	0.12		0.092	0.11	<0.11	U	0.088	0.11
Pesticides/PCBs (ug/kg)																														
4,4'-DDT	50-29-3	C	--	1.9E+03	8.4E+03	1.2E+03	<4	U	1.3	4	<3.9	U	1.2	3.9	<3.8	U	1.2	3.8	<3.6	U	1.1	3.6	<3.8	U	1.2	3.8	<3.6	U	1.1	3.6
Endosulfan II	33213-65-9	N	--	4.7E+04	6.1E+05	--	<4	U	1	4	<3.9	U	1	3.9	<3.8	U	0.99	3.8	<3.6	U	0.93	3.6	<3.8	U	0.98	3.8	<3.6	U	0.93	3.6
gamma-Chlordane	5103-74-2	C	--	1.8E+03	8.2E+03	--	<4	U	0.57	4	<3.9	U	0.56	3.9	<3.8	U	0.55	3.8	<3.6	U	0.51	3.6	1.4	J	0.54	3.8	<3.6	U	0.51	3.6
Aroclor 1254 [4]	11097-69-1	C	--	1.6E+02	1.4E+03	1.1E+03	<40	U	5.4	40	<39	U	5.2	39	12	J	5.1	38	<36	U	4.8	36	<38	U	5	38	<36	U	4.8	36
Aroclor 1260	11096-82-5	C	--	3.2E+02	1.4E+03	--	<82	U	19	82	<79	U	19	79	<78	U	18	78	<73	U	17	73	<77	U	18	77	<73	U	17	73
TCL VOCs (ug/kg)																														
1,2,4-Trichlorobenzene	120-82-1	N	--	7.8E+04	1.0E+06	2.4E+03	<6.1	U,UJ,m	0.29	6.1	<5.9	U	0.28	5.9	<5.8	U	0.28	5.8	<5.4	U	0.26	5.4	<5.7	U	0.28	5.7	<5.5	U	0.26	5.5
2-Butanone	78-93-3	N	--	4.7E+06	6.1E+07	2.9E+04	31		3	24	<24	U	2.9	24	26		2.8	23	<22	U	2.6	22	16	J	2.8	23	<22	U	2.6	22
Acetone	67-64-1	N	--	7.0E+06	9.2E+07	2.2E+04	210	B,J,m	5.2	24	62	B,B,z	5	24	200	B	4.9	23	65	B,B,z	4.6	22	160	B,B,z	4.8	23	81	B,B,z	4.6	22
Benzene	71-43-2	C	--	1.2E+04	5.2E+04	1.9E+00	<6.1	U,UJ,m	0.16	6.1	<5.9	U	0.15	5.9	<5.8	U	0.15	5.8	<5.4	U	0.14	5.4	<5.7	U	0.15	5.7	<5.5	U	0.14	5.5
Bromomethane	74-83-9	N	--	1.1E+04	1.4E+05	4.1E+01	<6.1	U	1.5	6.1	<5.9	U	1.4	5.9	<5.8	U	1.4	5.8	<5.4	U	1.3	5.4	<5.7	U	1.4	5.7	<5.5	U	1.3	5.5
Carbon Disulfide	75-15-0	N	--	7.8E+05	1.0E+07	1.9E+04	<6.1	U	0.32	6.1	3.8	JB,B,z	0.31	5.9	3.7	JB,B,z	0.31	5.8	3.5	JB,B,z	0.29	5.4	<5.7	U	0.3	5.7	3.5	JB,B,z	0.29	5.5
Chlorobenzene	108-90-7	N	--	1.6E+05	2.0E+06	6.8E+02	<6.1	U,UJ,m	0.25	6.1	<5.9	U	0.24	5.9	<5.8	U	0.23	5.8	<5.4	U	0.22	5.4	<5.7	U	0.23	5.7	<5.5	U	0.22	5.5
Chloroform	67-66-3	N	--	7.8E+04	1.0E+06	9.1E-01	0.28	J,B,z	0.18	6.1	<5.9	U	0.17	5.9	<5.8	U	0.17	5.8	***0.29***	J,B,z	0.16	5.4	<5.7	U	0.17	5.7	0.38	J,B,z	0.16	5.5
Isopropylbenzene	98-82-8	N	--	7.8E+05	1.0E+07	6.4E+04	<6.1	U,UJ,m	0.15	6.1	<5.9	U	0.15	5.9	<5.8	U	0.14	5.8	<5.4	U	0.13	5.4	<5.7	U	0.14	5.7	<5.5	U	0.13	5.5
Methyl Acetate	79-20-9	N	--	7.8E+06	1.0E+08	2.5E+04	16	J,J,m	1	24	<24	U	0.98	24	5.5	J	0.97	23	<22	U	0.91	22	11	J	0.95	23	5.4	J	0.91	22
Methylene Chloride	75-09-2	C	--	8.5E+04	3.8E+05	1.9E+01	<24	U	4.8	24	<24	U	4.7	24	<23	U	4.6	23	<22	U	4.3	22	<23	U	4.5	23	<22	U	4.3	22
Toluene	108-88-3	N	--	6.3E+05	8.2E+06	2.7E+04	<6.1	U,UJ,m	0.49	6.1	<5.9	U	0.48	5.9	2.1	J	0.47	5.8	<5.4	U	0.44	5.4	<5.7	U	0.46	5.7	<5.5	U	0.44	5.5
Xylenes	1330-20-7	N	--	1.6E+06	2.0E+07	3.0E+03	<6.1	U,UJ,m	0.71	6.1	<5.9	U	0.69	5.9	<5.8	U	0.68	5.8	<5.4	U	0.64	5.4	<5.7	U	0.67	5.7	<5.5	U	0.64	5.5
TCL SVOCs (ug/kg)																														
1,1'-Biphenyl	92-52-4	N	--	3.9E+05	5.1E+06	9.6E+04	<210	U	0.56	210	<200	U	0.54	200	0.77	J,B,z	0.53	200	<180	U	0.5	180	<970	U	2.6	970	0.73	J	0.5	190
2,4-Dinitrotoluene	121-14-2	N	--	1.6E+04	2.0E+05	5.7E+02	<210	U	16	210	<200	U	16	200	<200	U	15	200	<180	U	14	180	***3,100***		75	970	<190	U	14	190
2,6-Dinitrotoluene	606-20-2	N	--	7.8E+03	1.0E+05	2.5E+02	<210	U	2	210	<200	U	1.9	200	<200	U	1.9	200	<180	U	1.8	180	170	J	9.3	970	<190	U	1.8	190
2-Methylnaphthalene	91-57-6	N	--	3.1E+04	4.1E+05	4.4E+03	0.81	J	0.58	210	<200	U	0.57	200	0.77	J	0.56	200	<180	U	0.52	180	<970	U	2.7	970	<190	U	0.52	190
Acenaphthene	83-32-9	N	--	4.7E+05	6.1E+06	1.0E+05	<21	U	0.49	21	<20	U	0.47	20	<20	U	0.46	20	<18	U	0.43	18	<97	U	2.3	97	<19	U	0.44	19
Acenaphthylene [5]	208-96-8	N	--	2.3E+05	3.1E+06	--	<21	U	0.73	21	<20	U	0.71	20	<20	U	0.7	20	<18	U	0.65	18	<97	U	3.4	97	<19	U	0.65	19
Anthracene	120-12-7	N	--	2.3E+06	3.1E+07	4.7E+05	<21	U	0.52	21	<20	U	0.5	20	<20	U	0.5	20	<18	U	0.46	18	<97	U	2.4	97	<19	U	0.46	19
Benzaldehyde	100-52-7	N	--	7.8E+05	1.0E+07	--	<210	U	32	210	<200	U	31	200	<200	U	30	200	<180	U	28	180	<970	U	150	970	<190	U	29	190
Benzo(a)anthracene	56-55-3	C	--	2.2E+02	3.9E+03	4.8E+02	3.3	J	0.66	21	<20	U	0.63	20	1.2	J	0.62	20	<18	U	0.58	18	15	J	3.1	97	1.1	J	0.59	19
Benzo(a)pyrene	50-32-8	C	--	2.2E+01	3.9E+02	1.2E+02	<21	U	1.3	21	<20	U	1.2	20	<20	U	1.2	20	<18	U	1.1	18	<97	U	5.9	97	<19	U	1.1	19
Benzo(b)fluoranthene	205-99-2	C	--	2.2E+02	3.9E+03	1.5E+03	16	J	1	21	<20	U	1	20	<20	U	0.99	20	<18	U	0.92	18	<97	U	4.9	97	<19	U	0.93	19
Benzo(g,h,i)perylene [5]	191-24-2	N	--	2.3E+05	3.1E+06	--	<82	U	2.8	82	<79	U	2.7	79	<78	U	2.7	78	<73	U	2.5	73	<380	U	13	380	<73	U	2.5	73
Benzo(k)fluoranthene	207-08-9	C	--	2.2E+03	3.9E+04	1.5E+04	2.8	J	0.87	21	<20	U	0.85	20	<20	U	0.83	20	<18	U	0.78	18	17	J	4.1	97	<19	U	0.78	19
Bis(2-ethylhexyl)phthalate	117-81-7	C	--	4.6E+04	2.0E+05	2.9E+06	<210	U	1.6	210	<200	U	1.5	200	1.5	J	1.5	200	<180	U	1.4	180	<970	U	7.4	970	<190	U	1.4	190
Butyl Benzyl Phthalate	85-68-7	N	--	1.6E+06	2.0E+07	1.7E+07	3.3	J,B,z	2.6	210	<200	U	2.5	200	<200	U	2.4	200	<180	U	2.3	180	<970	U	12	970	2.9	J,B,z	2.3	190
Chrysene	218-01-9	C	--	2.2E+04	3.9E+05	4.8E+04	4.1	J	0.58	21	<20	U	0.56	20	0.77	J	0.55	20	<18	U	0.52	18	15	J	2.7	97	<19	U	0.52	19
Dibenz(a,h)anthracene	53-70-3	C	--	2.2E+01	3.9E+02	4.6E+02	<82	U	0.66	82	<79	U	0.63	79	<78	U	0.62	78	<73	U	0.58	73	<380	U	3.1	380	<73	U	0.59	73
Dibenzofuran	132-64-9	N	--	7.8E+03	1.0E+05	--	<210	U	0.32	210	<200	U	0.31	200	<200	U	0.31	200	<180	U	0.29	180	<970	U	1.5	970	<190	U	0.29	190
Diethyl Phthalate	84-66-2	N	--	6.3E+06	8.2E+07	4.5E+05	0.81	J	0.45	210	0.79	J	0.44	200	1.2	J	0.43	200	0.72	J	0.4	180	<970	U	2.1	970	0.73	J	0.41	190
Dimethyl Phthalate	131-11-3	--	--	--	--	--	<210	U	0.41	210	<200	U	0.4	200	<200	U	0.39	200	<180	U	0.37	180	<970	U	1.9	970	<190	U	0.37	190
Di-n-butyl Phthalate	84-74-2	N	--	7.8E+05	1.0E+07	5.0E+06	12	J	1.5	210	6.7	J	1.4	200	16	J	1.4	200	13	J	1.3	180	3,400		6.9	970	8.4	J	1.3	190
Di-n-octyl Phthalate	117-84-0	--	--	--	--	--	<210	U	12	210	<200	U	12	200	<200	U	11	200	<180	U	11	180	<970	U	56	970	<190	U	11	190

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45SB1A 5/7/2008 0-1		MDL	RL	45SB1B 5/7/2008 5-7		MDL	RL	45SB5A 5/7/2008 0-1		MDL	RL	45SB5B 5/7/2008 5-7		MDL	RL	45SB8A 5/7/2008 0-1		MDL	RL	45SB8B 5/7/2008 5-7		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
Fluoranthene	206-44-0	N	--	3.1E+05	4.1E+06	6.3E+06	<21	U	4.6	21	<20	U	4.4	20	<20	U	4.4	20	<18	U	4.1	18	<97	U	22	97	<19	U	4.1	19
Fluorene	86-73-7	N	--	3.1E+05	4.1E+06	1.4E+05	<21	U	0.34	21	<20	U	0.33	20	0.39	J	0.33	20	<18	U	0.3	18	<97	U	1.6	97	<19	U	0.31	19
Indeno(1,2,3-cd)pyrene	193-39-5	C	--	2.2E+02	3.9E+03	4.2E+03	<82	U	0.85	82	<79	U	0.83	79	<78	U	0.81	78	<73	U	0.76	73	<380	U	4	380	<73	U	0.76	73
Isophorone	78-59-1	C	--	6.7E+05	3.0E+06	4.1E+02	2.8	J,B,z	0.49	210	2	J	0.47	200	4.6	J	0.47	200	1.8	J	0.44	180	3.8	J,B,z	2.3	970	1.1	J,B,z	0.44	190
Naphthalene	91-20-3	N	--	1.6E+05	2.0E+06	1.5E+02	6.1	J,B,z	0.28	21	5.1	J,B,z	0.28	20	5.4	J,B,z	0.27	20	5.4	J,B,z	0.25	18	7.6	J,B,z	1.3	97	6.2	J,B,z	0.25	19
N-Nitrosodiphenylamine	86-30-6	C	--	1.3E+05	5.8E+05	7.6E+02	<210	U	0.98	210	<200	U	0.95	200	<200	U	0.93	200	<180	U	0.87	180	370	J	4.6	970	<190	U	0.87	190
Phenanthrene[5]	85-01-8	N	--	2.3E+05	3.1E+06	--	<21	U	4.4	21	<20	U	4.3	20	<20	U	4.2	20	<18	U	3.9	18	<97	U	21	97	<19	U	4	19
Phenol	108-95-2	N	--	2.3E+06	3.1E+07	6.7E+04	2	J	0.85	210	1.2	J	0.83	200	1.2	J	0.81	200	<180	U	0.76	180	<970	U	4	970	1.1	J	0.76	190
Pyrene	129-00-0	N	--	2.3E+05	3.1E+06	6.8E+05	3.3	J	0.39	21	<20	U	0.37	20	0.77	J	0.37	20	<18	U	0.34	18	7.6	J	1.8	97	<19	U	0.35	19
Nitroglycerin/PETN (mg/kg)																														
Nitroglycerin	55-63-0	N	--	0.782	10.22	--	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5
Percent Solids (%)																														
Percent Solids	--	--	--	--	--	--	82		0.1	0.1	85		0.1	0.1	86		0.1	0.1	92		0.1	0.1	87		0.1	0.1	92		0.1	0.1

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45SB14A 5/7/2008 0-1		MDL	RL	45SB14A-DUP (Dup-2) 5/7/2008 0-1		MDL	RL	45SB14B 5/7/2008 5-7		MDL	RL	45TP1A 5/5/2008 0-1		MDL	RL	45TP1B 5/5/2008 2		MDL	RL	45TP2A 5/5/2008 0-1		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals (mg/kg)																														
Aluminum	7429-90-5	N	40,041	7,821	102,200	--	11,000		2	10	11,000		2	10	19,000		2	10	9,800		2	10	10,000		2	10	11,000		2	10
Antimony	7440-36-0	N	--	3.13	40.88	13.2	0.22		0.026	0.2	0.12	J	0.026	0.2	0.046	J	0.026	0.2	2.5		0.026	0.2	<0.2	U	0.026	0.2	2		0.026	0.2
Arsenic	7440-38-2	C	15.8	0.426	1.91	0.026	***0.84***	,L,m	0.026	0.2	***0.82***	,L,m	0.026	0.2	***1.2***	,L,m	0.026	0.2	***2.8***		0.026	0.2	***0.6***		0.026	0.2	***4.5***		0.026	0.2
Barium	7440-39-3	N	209	1,564	20,440	6,015	170		0.33	1	160		0.33	1	140		0.33	1	130		0.33	1	92		0.33	1	220		0.33	1
Beryllium	7440-41-7	N	1.02	15.64	204.4	1,154	1		0.061	1	1		0.061	1	1.2		0.061	1	1		0.061	1	0.8	J	0.061	1	1.1		0.061	1
Cadmium	7440-43-9	N	0.69	3.91	51.1	27.45	<2	U	0.45	2	<2	U	0.45	2	<2	U	0.45	2	1.3	J	0.45	2	<2	U	0.45	2	6.2		0.45	2
Calcium	7440-70-2	--	--	--	--	--	1,500		9.8	50	1,500		9.8	50	1,400		9.8	50	1,800		9.8	50	1,000		9.8	50	2,100		9.8	50
Chromium [1]	7440-47-3	N	65.3	23.46	306.6	42.048	22		0.8	5	19		0.8	5	27		0.8	5	21		0.8	5	16		0.8	5	35		0.8	5
Cobalt	7440-48-4	--	72.3	--	--	--	7.7		0.53	2	7.6		0.53	2	11		0.53	2	7.9		0.53	2	7.6		0.53	2	9		0.53	2
Copper	7440-50-8	N	53.5	312.86	4,088	10,518	9.3		0.027	0.2	8.6		0.027	0.2	13		0.027	0.2	71		0.13	1	6.5		0.027	0.2	1,100		1.1	8
Iron	7439-89-6	N	50,962	5,475	71,540	--	18,000		0.98	10	16,000		0.98	10	27,000		0.98	10	27,000		0.98	10	15,000		0.98	10	44,000		0.98	10
Lead [2]	7439-92-1	--	26.8	400	750	--	81		0.047	0.4	51		0.047	0.4	11		0.024	0.2	200		0.24	2	8.1		0.024	0.2	450		0.47	4
Magnesium	7439-95-4	--	--	--	--	--	2,500		2.8	50	2,500		2.8	50	4,700		2.8	50	2,200		2.8	50	2,500		2.8	50	2,800		2.8	50
Manganese	7439-96-5	N	2,543	156.43	2,044	951.9	640		0.18	1	630		0.18	1	510		0.18	1	640		0.18	1	420		0.18	1	***980***		0.18	1
Mercury [3]	7439-97-6	--	0.13	2.35	30.66	--	0.018	J	0.0075	0.05	0.0089	J	0.0075	0.05	0.023	J	0.0075	0.05	0.12		0.0075	0.05	0.0087	J	0.0075	0.05	0.22		0.0075	0.05
Nickel	7440-02-0	N	62.8	156.43	2,044	--	11		0.035	0.1	11		0.035	0.1	14		0.035	0.1	13	B	0.035	0.1	8.9	B	0.035	0.1	24	B	0.035	0.1
Potassium	7440-09-7	--	--	--	--	--	1,400		14	50	1,400		14	50	2,400		14	50	1,400		14	50	1,300		14	50	1,300		14	50
Selenium	7782-49-2	N	--	39.11	511	18.98	0.12	J,L,m	0.028	0.3	0.13	J,L,m	0.028	0.3	<0.3	U,UL,m	0.028	0.3	0.26	J	0.028	0.3	0.068	J	0.028	0.3	0.32		0.028	0.3
Silver	7440-22-4	N	--	39.11	511	31.03	0.045	J	0.0093	0.1	0.047	J	0.0093	0.1	0.024	J	0.0093	0.1	0.1		0.0093	0.1	0.031	J	0.0093	0.1	0.73		0.0093	0.1
Sodium	7440-23-5	--	--	--	--	--	41	J	18	100	38	J	18	100	45	J	18	100	67	J	18	100	34	J	18	100	50	J	18	100
Thallium	7440-28-0	N	2.11	0.548	7.154	3.638	0.15		0.0068	0.1	0.16		0.0068	0.1	0.21		0.0068	0.1	0.24		0.0068	0.1	0.11		0.0068	0.1	0.42		0.0068	0.1
Vanadium	7440-62-2	N	108	7.821	102.2	730.1	18		0.032	0.1	18		0.032	0.1	27		0.032	0.1	20		0.032	0.1	15		0.032	0.1	27		0.032	0.1
Zinc	7440-66-6	N	202	2,346	30,660	13,622	130		0.49	5	120		0.49	5	73		0.49	5	760		0.49	5	57		0.49	5	2,500		0.49	5
Cyanide (mg/kg)																														
Cyanide	57-12-5	N	--	156.43	2,044	147.5	<0.12	U	0.094	0.12	<0.12	U	0.094	0.12	<0.11	U	0.09	0.11	0.16		0.11	0.14	<0.12	U	0.093	0.12	0.13	J	0.11	0.14
Pesticides/PCBs (ug/kg)																														
4,4'-DDT	50-29-3	C	--	1.9E+03	8.4E+03	1.2E+03	<3.9	U	1.2	3.9	<3.8	U	1.2	3.8	<3.7	U	1.2	3.7	21	,J,c	1.4	4.6	<3.8	U	1.2	3.8	<4.5	U	1.4	4.5
Endosulfan II	33213-65-9	N	--	4.7E+04	6.1E+05	--	<3.9	U	1	3.9	<3.8	U	1	3.8	<3.7	U	0.95	3.7	<4.6	U	1.2	4.6	<3.8	U	0.99	3.8	36	,J,c	1.2	4.5
gamma-Chlordane	5103-74-2	C	--	1.8E+03	8.2E+03	--	<3.9	U	0.55	3.9	<3.8	U	0.55	3.8	<3.7	U	0.53	3.7	<4.6	U	0.65	4.6	<3.8	U	0.55	3.8	<4.5	U	0.64	4.5
Aroclor 1254 [4]	11097-69-1	C	--	1.6E+02	1.4E+03	1.1E+03	<39	U	5.1	39	<38	U	5.1	38	<37	U	4.9	37	37	J	6.1	46	<38	U	5.1	38	730		6	45
Aroclor 1260	11096-82-5	C	--	3.2E+02	1.4E+03	--	<78	U	19	78	<78	U	19	78	<75	U	18	75	<92	U	22	92	<78	U	18	78	630		22	92
TCL VOCs (ug/kg)																														
1,2,4-Trichlorobenzene	120-82-1	N	--	7.8E+04	1.0E+06	2.4E+03	<5.8	U	0.28	5.8	<5.8	U	0.28	5.8	<5.6	U	0.27	5.6	<6.9	U	0.33	6.9	<5.8	U	0.28	5.8	<6.8	U	0.33	6.8
2-Butanone	78-93-3	N	--	4.7E+06	6.1E+07	2.9E+04	25		2.8	23	17	J	2.8	23	9.8	J	2.7	22	320	E,J,q	3.3	28	260	E,J,q	2.8	23	250		3.3	27
Acetone	67-64-1	N	--	7.0E+06	9.2E+07	2.2E+04	210	B	4.9	23	150	B,B,z	4.9	23	65	B,B,z	4.7	22	920	E,J,q	5.8	28	630	E,J,q	4.9	23	760	E,J,q	5.8	27
Benzene	71-43-2	C	--	1.2E+04	5.2E+04	1.9E+00	<5.8	U	0.15	5.8	<5.8	U	0.15	5.8	<5.6	U	0.14	5.6	0.21	J	0.18	6.9	<5.8	U	0.15	5.8	<6.8	U	0.17	6.8
Bromomethane	74-83-9	N	--	1.1E+04	1.4E+05	4.1E+01	<5.8	U	1.4	5.8	<5.8	U	1.4	5.8	<5.6	U	1.4	5.6	<6.9	U	1.7	6.9	<5.8	U	1.4	5.8	<6.8	U	1.7	6.8
Carbon Disulfide	75-15-0	N	--	7.8E+05	1.0E+07	1.9E+04	3.7	JB,B,z	0.31	5.8	<5.8	U	0.31	5.8	3.6	JB,B,z	0.29	5.6	3.5	J	0.36	6.9	<5.8	U	0.31	5.8	3.5	J	0.36	6.8
Chlorobenzene	108-90-7	N	--	1.6E+05	2.0E+06	6.8E+02	<5.8	U	0.24	5.8	<5.8	U	0.24	5.8	<5.6	U	0.23	5.6	<6.9	U	0.28	6.9	<5.8	U	0.23	5.8	<6.8	U	0.28	6.8
Chloroform	67-66-3	N	--	7.8E+04	1.0E+06	9.1E-01	0.29	J,B,z	0.17	5.8	0.44	J,B,z	0.17	5.8	0.42	J,B,z	0.16	5.6	<6.9	U	0.2	6.9	<5.8	U	0.17	5.8	<6.8	U	0.2	6.8
Isopropylbenzene	98-82-8	N	--	7.8E+05	1.0E+07	6.4E+04	<5.8	U	0.14	5.8	<5.8	U	0.14	5.8	<5.6	U	0.14	5.6	<6.9	U	0.17	6.9	<5.8	U	0.14	5.8	<6.8	U	0.17	6.8
Methyl Acetate	79-20-9	N	--	7.8E+06	1.0E+08	2.5E+04	9.3	J	0.97	23	8.4	J	0.97	23	<22	U	0.93	22	11	J	1.1	28	5.5	J,B,z	0.97	23	9.5	J	1.1	27
Methylene Chloride	75-09-2	C	--	8.5E+04	3.8E+05	1.9E+01	<23	U	4.6	23	<23	U	4.6	23	<22	U	4.4	22	<28	U	5.4	28	<23	U	4.6	23	<27	U	5.4	27
Toluene	108-88-3	N	--	6.3E+05	8.2E+06	2.7E+04	<5.8	U	0.47	5.8	<5.8	U	0.47	5.8	<5.6	U	0.45	5.6	<6.9	U	0.55	6.9	<5.8	U	0.47	5.8	<6.8	U	0.55	6.8
Xylenes	1330-20-7	N	--	1.6E+06	2.0E+07	3.0E+03	<5.8	U	0.68	5.8	<5.8	U	0.68	5.8	<5.6	U	0.65	5.6	<6.9	U	0.81	6.9	<5.8	U	0.68	5.8	<6.8	U	0.8	6.8
TCL SVOCs (ug/kg)																														
1,1'-Biphenyl	92-52-4	N	--	3.9E+05	5.1E+06	9.6E+04	0.78	J,B,z	0.54	200	0.78	J	0.54	200	<190	U	0.51	190	1.4	J,B,z	0.63	230	<390	U	1.1	390	1.4	J,B,z	0.63	230
2,4-Dinitrotoluene	121-14-2	N	--	1.6E+04	2.0E+05	5.7E+02	<200	U	15	200	<200	U	15	200	<190	U	15	190	<230	U	18	230	430		31	390	26	J	18	230
2,6-Dinitrotoluene	606-20-2	N	--	7.8E+03	1.0E+05	2.5E+02	<200	U	1.9	200	<200	U	1.9	200	<190	U	1.8	190	<230	U	2.2	230	21	J	3.8	390	<230	U	2.2	230
2-Methylnaphthalene	91-57-6	N	--	3.1E+04	4.1E+05	4.4E+03	0.78	J	0.56	200	0.78	J	0.56	200	<190	U	0.53	190	4.1	J	0.66	230	<390	U	1.1	390	3.6	J	0.65	230
Acenaphthene	83-32-9	N	--	4.7E+05	6.1E+06	1.0E+05	<20	U	0.47	20	<20	U	0.47	20	<19	U	0.45	19	0.92	J	0.55	23	<39	U	0.93	39	1.8	J	0.55	23
Acenaphthylene [5]	208-96-8	N	--	2.3E+05	3.1E+06	--	<20	U	0.7	20	<20	U	0.7	20	<19	U	0.67	19	2.3	J	0.83	23	<39	U	1.4	39	<23	U	0.82	23
Anthracene	120-12-7	N	--	2.3E+06	3.1E+07	4.7E+05	<20	U	0.5	20	<20	U	0.5	20	<19	U	0.48	19	1.4	J	0.59	23	<39	U	0.99	39	5	J	0.58	23
Benzaldehyde	100-52-7	N	--	7.8E+05	1.0E+07	--	<200	U	31	200	<200	U	31	200	<190	U	29	190	<230	U	36	230	<390	U	61	390	<230	U	36	230
Benzo(a)anthracene	56-55-3	C	--	2.2E+02	3.9E+03	4.8E+02	1.6	J	0.63	20	2.7	J	0.63	20	<19	U	0.6	19	13	J	0.74	23	<39	U	1.2	39	49		0.73	23
Benzo(a)pyrene	50-32-8	C	--	2.2E+01	3.9E+02	1.2E+02	<20	U	1.2	20	<20	U	1.2	20	<19	U	1.2	19	20	J	1.4	23	<39	U	2.4	39	43		1.4	23
Benzo(b)fluoranthene	205-99-2	C	--	2.2E+02	3.9E+03	1.5E+03	<20	U	0.99	20	<20	U	0.99	20	<19	U	0.95	19	31		1.2	23	<39	U	2	39	82		1.2	23
Benzo(g,h,i)perylene [5]	191-24-2	N	--	2.3E+05	3.1E+06	--	<78	U	2.7	78	<78	U	2.7	78	<75	U	2.6	75	19	J	3.2	92	<160	U	5.3	160	38	J	3.1	92
Benzo(k)fluoranthene	207-08-9	C	--	2.2E+03	3.9E+04	1.5E+04	<20	U	0.84	20	2.3	J	0.84	20	<19	U	0.8	19	6.4	J	0.99	23	<39	U	1.7	39	20	J	0.98	23
Bis(2-ethylhexyl)phthalate	117-81-7	C	--	4.6E+04	2.0E+05	2.9E+06	1.9	J	1.5	200	<200	U	1.5	200	<190	U	1.5	190	120	J	1.8	230	<390	U	3	390	13	J,B,x	1.8	230
Butyl Benzyl Phthalate	85-68-7	N	--	1.6E+06	2.0E+07	1.7E+07	16	J	2.5	200	3.1	J,B,z	2.4	200	11	J	2.3	190	18	J	2.9	230	7	J	4.9	390	<230	U	2.9	230
Chrysene	218-01-9	C	--	2.2E+04	3.9E+05	4.8E+04	1.9	J	0.56	20	2.7	J	0.56	20	<19	U	0.53	19	13	J	0.66	23	<39	U	1.1	39	30		0.65	23
Dibenz(a,h)anthracene	53-70-3	C	--	2.2E+01	3.9E+02	4.6E+02	<78	U	0.63	78	<78	U	0.63	78	<75	U	0.6	75	<92	U	0.74	92	<160	U	1.2	160	28	J	0.73	92
Dibenzofuran	132-64-9	N	--	7.8E+03	1.0E+05	--	<200	U	0.31	200	<200	U	0.31	200	<190	U	0.29	190	2.3	J	0.36	230	<390	U	0.61	390	1.8	J	0.36	230
Diethyl Phthalate	84-66-2	N	--	6.3E+06	8.2E+07	4.5E+05	0.78	J	0.43	200	1.2	J	0.43	200	0.75	J	0.42	190	3.7	J	0.51	230	<390	U	0.86	390	3.2	J	0.51	230
Dimethyl Phthalate	131-11-3	--	--	--	--	--	<200	U	0.4	200	<200	U	0.4	200	<190	U	0.38	190	<230	U	0.47	230	<390	U	0.79	390	<230	U	0.46	230
Di-n-butyl Phthalate	84-74-2	N	--	7.8E+05	1.0E+07	5.0E+06	16	J	1.4	200	6.6	J	1.4	200	7.8	J	1.3	190	230		1.7	230	1,500		2.8	390	320		1.6	230
Di-n-octyl Phthalate	117-84-0	--	--	--	--	--	<200	U	11	200	<200	U	11	200	<190	U	11	190	27	J	14	230	<390	U	23	390	<230	U	13	230

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45SB14A 5/7/2008 0-1		MDL	RL	45SB14A-DUP (Dup-2) 5/7/2008 0-1		MDL	RL	45SB14B 5/7/2008 5-7		MDL	RL	45TP1A 5/5/2008 0-1		MDL	RL	45TP1B 5/5/2008 2		MDL	RL	45TP2A 5/5/2008 0-1		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
Fluoranthene	206-44-0	N	--	3.1E+05	4.1E+06	6.3E+06	<20	U	4.4	20	<20	U	4.4	20	<19	U	4.2	19	17	J	5.2	23	<39	U	8.7	39	60		5.1	23
Fluorene	86-73-7	N	--	3.1E+05	4.1E+06	1.4E+05	<20	U	0.33	20	<20	U	0.33	20	<19	U	0.31	19	1.8	J	0.39	23	<39	U	0.65	39	1.8	J	0.38	23
Indeno(1,2,3-cd)pyrene	193-39-5	C	--	2.2E+02	3.9E+03	4.2E+03	<78	U	0.82	78	<78	U	0.82	78	<75	U	0.78	75	27	J	0.97	92	<160	U	1.6	160	42	J	0.96	92
Isophorone	78-59-1	C	--	6.7E+05	3.0E+06	4.1E+02	5.1	J	0.47	200	0.78	J,B,z	0.47	200	<190	U	0.45	190	0.92	J	0.55	230	<390	U	0.93	390	1.4	J	0.55	230
Naphthalene	91-20-3	N	--	1.6E+05	2.0E+06	1.5E+02	5.1	J,B,z	0.27	20	6.2	J,B,z	0.27	20	5.2	J,B,z	0.26	19	14	J,B,z	0.32	23	6.2	J,B,z	0.54	39	9.1	J,B,z	0.32	23
N-Nitrosodiphenylamine	86-30-6	C	--	1.3E+05	5.8E+05	7.6E+02	<200	U	0.93	200	<200	U	0.93	200	<190	U	0.89	190	<230	U	1.1	230	100	J	1.9	390	18	J	1.1	230
Phenanthrene[5]	85-01-8	N	--	2.3E+05	3.1E+06	--	<20	U	4.2	20	<20	U	4.2	20	<19	U	4	19	13	J	5	23	<39	U	8.4	39	28		4.9	23
Phenol	108-95-2	N	--	2.3E+06	3.1E+07	6.7E+04	2.3	J	0.82	200	4.3	J	0.82	200	1.1	J	0.78	190	2.8	J	0.97	230	<390	U	1.6	390	3.2	J	0.96	230
Pyrene	129-00-0	N	--	2.3E+05	3.1E+06	6.8E+05	1.9	J	0.37	20	1.6	J	0.37	20	<19	U	0.35	19	18	J	0.44	23	<39	U	0.74	39	52		0.43	23
Nitroglycerin/PETN (mg/kg)																														
Nitroglycerin	55-63-0	N	--	0.782	10.22	--	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	3.8	J	0.39	5
Percent Solids (%)																														
Percent Solids	--	--	--	--	--	--	86		0.1	0.1	86		0.1	0.1	89		0.1	0.1	73		0.1	0.1	86		0.1	0.1	73		0.1	0.1

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45TP2B 5/5/2008 1.5		MDL	RL	45TP3A 5/5/2008 0-1		MDL	RL	45TP3B 5/7/2008 8-12		MDL	RL	45TP3B-DUP (Dup-1) 5/7/2008 8-12		MDL	RL	45TP4A 5/6/2008 0-1		MDL	RL	45TP4B 5/6/2008 3-3.25		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals (mg/kg)																														
Aluminum	7429-90-5	N	40,041	7,821	102,200	--	11,000		2	10	18,000		2	10	17,000		2	10	16,000		2	10	11,000		2	10	13,000		200	1,000
Antimony	7440-36-0	N	--	3.13	40.88	13.2	0.054	J	0.026	0.2	0.21		0.026	0.2	0.081	J	0.026	0.2	0.092	J	0.026	0.2	4.6		0.026	0.2	***33***	,L,m	0.026	0.2
Arsenic	7440-38-2	C	15.8	0.426	1.91	0.026	***0.71***		0.026	0.2	***12***		0.026	0.2	***0.95***	,L,m	0.026	0.2	***0.9***	,L,m	0.026	0.2	***3.2***		0.026	0.2	***1.8***		0.026	0.2
Barium	7440-39-3	N	209	1,564	20,440	6,015	110		0.33	1	62		0.33	1	150		0.33	1	150		0.33	1	240		0.33	1	300		1.7	5
Beryllium	7440-41-7	N	1.02	15.64	204.4	1,154	1.1		0.061	1	0.55	J	0.061	1	1.1		0.061	1	1.2		0.061	1	1.2		0.061	1	1.6		0.061	1
Cadmium	7440-43-9	N	0.69	3.91	51.1	27.45	<2	U	0.45	2	<2	U	0.45	2	<2	U	0.45	2	<2	U	0.45	2	2.1		0.45	2	2	J	0.45	2
Calcium	7440-70-2	--	--	--	--	--	1,400		9.8	50	650		9.8	50	2,100		9.8	50	1,900		9.8	50	2,000		9.8	50	2,700		9.8	50
Chromium [1]	7440-47-3	N	65.3	23.46	306.6	42.048	19		0.8	5	28		0.8	5	26		0.8	5	25		0.8	5	***79***		0.8	5	***170***		0.8	5
Cobalt	7440-48-4	--	72.3	--	--	--	7		0.53	2	3.8		0.53	2	11		0.53	2	11		0.53	2	8.4		0.53	2	11		0.53	2
Copper	7440-50-8	N	53.5	312.86	4,088	10,518	9.3		0.027	0.2	12		0.027	0.2	12		0.027	0.2	12		0.027	0.2	460		0.53	4	560		0.53	4
Iron	7439-89-6	N	50,962	5,475	71,540	--	17,000		0.98	10	26,000		0.98	10	25,000		0.98	10	25,000		0.98	10	47,000		9.8	100	39,000		980	10,000
Lead [2]	7439-92-1	--	26.8	400	750	--	11		0.024	0.2	20		0.024	0.2	11		0.024	0.2	11		0.024	0.2	760		0.47	4	300		0.24	2
Magnesium	7439-95-4	--	--	--	--	--	3,000		2.8	50	1,200		2.8	50	4,600		2.8	50	4,500		2.8	50	2,700		2.8	50	3,600	,L,m	2.8	50
Manganese	7439-96-5	N	2,543	156.43	2,044	951.9	420		0.18	1	250		0.18	1	760		0.18	1	610		0.18	1	***1,100***		0.18	1	***990***		3.5	20
Mercury [3]	7439-97-6	--	0.13	2.35	30.66	--	0.011	J	0.0075	0.05	0.16		0.0075	0.05	0.024	J	0.0075	0.05	0.02	J	0.0075	0.05	0.13	,K,m	0.0075	0.05	0.15	,K,m	0.0075	0.05
Nickel	7440-02-0	N	62.8	156.43	2,044	--	12	B	0.035	0.1	7.8	B	0.035	0.1	16		0.035	0.1	16		0.035	0.1	23	B	0.035	0.1	34	B	0.035	0.1
Potassium	7440-09-7	--	--	--	--	--	1,000		14	50	970		14	50	1,400		14	50	1,300		14	50	1,500		14	50	1,600		14	50
Selenium	7782-49-2	N	--	39.11	511	18.98	<0.3	U	0.028	0.3	0.41		0.028	0.3	0.097	J,L,m	0.028	0.3	<0.3	U,UL,m	0.028	0.3	0.27	J	0.028	0.3	0.15	J	0.028	0.3
Silver	7440-22-4	N	--	39.11	511	31.03	0.042	J	0.0093	0.1	0.046	J	0.0093	0.1	0.051	J	0.0093	0.1	0.044	J	0.0093	0.1	0.56		0.0093	0.1	0.34		0.0093	0.1
Sodium	7440-23-5	--	--	--	--	--	40	J	18	100	<100	U	18	100	220		18	100	220		18	100	58	J	18	100	59	J	18	100
Thallium	7440-28-0	N	2.11	0.548	7.154	3.638	0.11		0.0068	0.1	0.54		0.0068	0.1	0.18		0.0068	0.1	0.17		0.0068	0.1	0.3		0.0068	0.1	0.19		0.0068	0.1
Vanadium	7440-62-2	N	108	7.821	102.2	730.1	18		0.032	0.1	28		0.032	0.1	25		0.032	0.1	25		0.032	0.1	46		0.032	0.1	40		0.063	0.2
Zinc	7440-66-6	N	202	2,346	30,660	13,622	70		0.49	5	60		0.49	5	77		0.49	5	75		0.49	5	1,500		0.49	5	1,000	B	9.7	100
Cyanide (mg/kg)																														
Cyanide	57-12-5	N	--	156.43	2,044	147.5	<0.11	U	0.092	0.11	0.18		0.1	0.13	<0.12	U	0.097	0.12	<0.12	U	0.1	0.12	0.23		0.1	0.12	0.17		0.1	0.13
Pesticides/PCBs (ug/kg)																														
4,4'-DDT	50-29-3	C	--	1.9E+03	8.4E+03	1.2E+03	<3.8	U	1.2	3.8	<4.2	U	1.3	4.2	<4	U	1.2	4	<4.1	U	1.3	4.1	<4.1	U	1.3	4.1	<4.2	U	1.3	4.2
Endosulfan II	33213-65-9	N	--	4.7E+04	6.1E+05	--	<3.8	U	0.97	3.8	<4.2	U	1.1	4.2	<4	U	1	4	<4.1	U	1.1	4.1	<4.1	U	1.1	4.1	<4.2	U	1.1	4.2
gamma-Chlordane	5103-74-2	C	--	1.8E+03	8.2E+03	--	<3.8	U	0.54	3.8	<4.2	U	0.6	4.2	<4	U	0.57	4	<4.1	U	0.58	4.1	<4.1	U	0.58	4.1	<4.2	U	0.6	4.2
Aroclor 1254 [4]	11097-69-1	C	--	1.6E+02	1.4E+03	1.1E+03	16	J	5	38	9.7	J	5.6	42	24	J	5.3	40	8.4	J	5.4	41	520		5.5	41	1,200		11	85
Aroclor 1260	11096-82-5	C	--	3.2E+02	1.4E+03	--	<76	U	18	76	<86	U	20	86	<81	U	19	81	<83	U	20	83	<83	U	20	83	<170	U	41	170
TCL VOCs (ug/kg)																														
1,2,4-Trichlorobenzene	120-82-1	N	--	7.8E+04	1.0E+06	2.4E+03	<5.7	U	0.28	5.7	<6.4	U	0.31	6.4	<6.1	U	0.29	6.1	<6.2	U	0.3	6.2	<6.2	U	0.3	6.2	<6.4	U,UJ,m	0.31	6.4
2-Butanone	78-93-3	N	--	4.7E+06	6.1E+07	2.9E+04	240	E,J,q	2.8	23	290	E,J,q	3.1	26	12	J	2.9	24	<25	U	3	25	20	J	3	25	21	J	3.1	26
Acetone	67-64-1	N	--	7.0E+06	9.2E+07	2.2E+04	600	E,J,q	4.8	23	840	E,J,q	5.4	26	45	B,B,z	5.1	24	31	B,B,z	5.2	25	250	E,J,q	5.3	25	290	E,J,q	5.4	26
Benzene	71-43-2	C	--	1.2E+04	5.2E+04	1.9E+00	<5.7	U	0.15	5.7	0.28	J	0.16	6.4	0.18	J	0.15	6.1	0.49	J	0.16	6.2	0.51	J	0.16	6.2	0.18	J,J,m	0.16	6.4
Bromomethane	74-83-9	N	--	1.1E+04	1.4E+05	4.1E+01	<5.7	U	1.4	5.7	<6.4	U	1.6	6.4	<6.1	U	1.5	6.1	<6.2	U	1.5	6.2	<6.2	U	1.5	6.2	1.8	J	1.6	6.4
Carbon Disulfide	75-15-0	N	--	7.8E+05	1.0E+07	1.9E+04	3	J	0.3	5.7	3.4	J	0.34	6.4	4.5	JB,B,z	0.32	6.1	4.7	JB,B,z	0.33	6.2	3.3	J	0.33	6.2	3.3	J,J,m	0.34	6.4
Chlorobenzene	108-90-7	N	--	1.6E+05	2.0E+06	6.8E+02	<5.7	U	0.23	5.7	<6.4	U	0.26	6.4	<6.1	U	0.24	6.1	<6.2	U	0.25	6.2	<6.2	U	0.25	6.2	<6.4	U,UJ,m	0.26	6.4
Chloroform	67-66-3	N	--	7.8E+04	1.0E+06	9.1E-01	<5.7	U	0.17	5.7	<6.4	U	0.19	6.4	<6.1	U	0.18	6.1	<6.2	U	0.18	6.2	<6.2	U	0.18	6.2	<6.4	U	0.19	6.4
Isopropylbenzene	98-82-8	N	--	7.8E+05	1.0E+07	6.4E+04	<5.7	U	0.14	5.7	<6.4	U	0.16	6.4	<6.1	U	0.15	6.1	<6.2	U	0.15	6.2	<6.2	U	0.15	6.2	<6.4	U,UJ,m	0.16	6.4
Methyl Acetate	79-20-9	N	--	7.8E+06	1.0E+08	2.5E+04	1.6	J,B,z	0.95	23	6.1	J,B,z	1.1	26	<24	U	1	24	<25	U	1	25	8.9	J	1	25	14	J,J,m	1.1	26
Methylene Chloride	75-09-2	C	--	8.5E+04	3.8E+05	1.9E+01	<23	U	4.5	23	<26	U	5	26	<24	U	4.8	24	<25	U	4.9	25	<25	U	4.9	25	<26	U	5.1	26
Toluene	108-88-3	N	--	6.3E+05	8.2E+06	2.7E+04	<5.7	U	0.46	5.7	<6.4	U	0.51	6.4	<6.1	U	0.49	6.1	<6.2	U	0.5	6.2	<6.2	U	0.5	6.2	<6.4	U,UJ,m	0.52	6.4
Xylenes	1330-20-7	N	--	1.6E+06	2.0E+07	3.0E+03	<5.7	U	0.67	5.7	<6.4	U	0.75	6.4	<6.1	U	0.71	6.1	<6.2	U	0.72	6.2	<6.2	U	0.73	6.2	<6.4	U,UJ,m	0.75	6.4
TCL SVOCs (ug/kg)																														
1,1'-Biphenyl	92-52-4	N	--	3.9E+05	5.1E+06	9.6E+04	<190	U	0.52	190	1.3	J,B,z	0.59	220	<210	U	0.56	210	0.82	J,B,z	0.57	210	0.83	J,B,z	0.57	210	<220	U	0.59	220
2,4-Dinitrotoluene	121-14-2	N	--	1.6E+04	2.0E+05	5.7E+02	<190	U	15	190	<220	U	17	220	<210	U	16	210	<210	U	16	210	<210	U	16	210	<220	U	17	220
2,6-Dinitrotoluene	606-20-2	N	--	7.8E+03	1.0E+05	2.5E+02	<190	U	1.8	190	<220	U	2.1	220	<210	U	2	210	<210	U	2	210	<210	U	2	210	<220	U	2.1	220
2-Methylnaphthalene	91-57-6	N	--	3.1E+04	4.1E+05	4.4E+03	<190	U	0.55	190	2.1	J	0.61	220	0.81	J	0.58	210	1.2	J	0.59	210	1.7	J	0.59	210	1.3	J	0.61	220
Acenaphthene	83-32-9	N	--	4.7E+05	6.1E+06	1.0E+05	0.76	J	0.46	19	<22	U	0.51	22	<21	U	0.48	21	0.82	J	0.49	21	<21	U	0.5	21	<22	U	0.51	22
Acenaphthylene [5]	208-96-8	N	--	2.3E+05	3.1E+06	--	<19	U	0.68	19	<22	U	0.77	22	<21	U	0.73	21	<21	U	0.74	21	1.2	J	0.74	21	0.86	J	0.77	22
Anthracene	120-12-7	N	--	2.3E+06	3.1E+07	4.7E+05	<19	U	0.49	19	<22	U	0.54	22	<21	U	0.52	21	0.82	J	0.53	21	1.2	J	0.53	21	1.3	J,J,m	0.55	22
Benzaldehyde	100-52-7	N	--	7.8E+05	1.0E+07	--	<190	U	30	190	<220	U	33	220	<210	U	32	210	<210	U	32	210	<210	U	33	210	47	J,J,m	34	220
Benzo(a)anthracene	56-55-3	C	--	2.2E+02	3.9E+03	4.8E+02	1.1	J	0.61	19	4.7	J	0.69	22	1.2	J	0.65	21	1.6	J	0.66	21	17	J	0.67	21	9.4	J	0.69	22
Benzo(a)pyrene	50-32-8	C	--	2.2E+01	3.9E+02	1.2E+02	11	J	1.2	19	<22	U	1.3	22	<21	U	1.2	21	<21	U	1.3	21	23		1.3	21	20	J,J,m	1.3	22
Benzo(b)fluoranthene	205-99-2	C	--	2.2E+02	3.9E+03	1.5E+03	11	J	0.97	19	18	J	1.1	22	<21	U	1	21	<21	U	1	21	38		1.1	21	30	,J,d	1.1	22
Benzo(g,h,i)perylene [5]	191-24-2	N	--	2.3E+05	3.1E+06	--	<76	U	2.6	76	<86	U	2.9	86	<81	U	2.8	81	<83	U	2.8	83	17	J	2.8	83	20	J,J,m	2.9	86
Benzo(k)fluoranthene	207-08-9	C	--	2.2E+03	3.9E+04	1.5E+04	<19	U	0.82	19	1.3	J	0.92	22	<21	U	0.87	21	<21	U	0.89	21	5	J	0.89	21	6	J,J,d	0.92	22
Bis(2-ethylhexyl)phthalate	117-81-7	C	--	4.6E+04	2.0E+05	2.9E+06	<190	U	1.5	190	3.4	J,B,x	1.7	220	<210	U	1.6	210	<210	U	1.6	210	5	J,B,x	1.6	210	9.8	J,B,x	1.7	220
Butyl Benzyl Phthalate	85-68-7	N	--	1.6E+06	2.0E+07	1.7E+07	<190	U	2.4	190	3	J	2.7	220	<210	U	2.5	210	<210	U	2.6	210	<210	U	2.6	210	<220	U	2.7	220
Chrysene	218-01-9	C	--	2.2E+04	3.9E+05	4.8E+04	0.76	J	0.54	19	4.3	J	0.61	22	0.81	J	0.58	21	1.2	J	0.59	21	12	J	0.59	21	6.4	J,J,m	0.61	22
Dibenz(a,h)anthracene	53-70-3	C	--	2.2E+01	3.9E+02	4.6E+02	<76	U	0.61	76	<86	U	0.69	86	<81	U	0.65	81	<83	U	0.66	83	<83	U	0.67	83	<86	U	0.69	86
Dibenzofuran	132-64-9	N	--	7.8E+03	1.0E+05	--	<190	U	0.3	190	0.43	J	0.34	220	<210	U	0.32	210	<210	U	0.33	210	0.83	J	0.33	210	0.43	J	0.34	220
Diethyl Phthalate	84-66-2	N	--	6.3E+06	8.2E+07	4.5E+05	1.1	J	0.42	190	3	J	0.48	220	1.2	J	0.45	210	1.6	J	0.46	210	2.9	J	0.46	210	1.7	J	0.48	220
Dimethyl Phthalate	131-11-3	--	--	--	--	--	<190	U	0.39	190	<220	U	0.43	220	<210	U	0.41	210	<210	U	0.42	210	0.83	J	0.42	210	<220	U	0.43	220
Di-n-butyl Phthalate	84-74-2	N	--	7.8E+05	1.0E+07	5.0E+06	150	J	1.4	190	120	J	1.5	220	6.1	J	1.5	210	9.5	J	1.5	210	22	J,B,x	1.5	210	16	J,B,x	1.5	220
Di-n-octyl Phthalate	117-84-0	--	--	--	--	--	<190	U	11	190	<220	U	13	220	<210	U	12	210	<210	U	12	210	<210	U	12	210	27	J,J,d	13	220

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45TP2B 5/5/2008 1.5		MDL	RL	45TP3A 5/5/2008 0-1		MDL	RL	45TP3B 5/7/2008 8-12		MDL	RL	45TP3B-DUP (Dup-1) 5/7/2008 8-12		MDL	RL	45TP4A 5/6/2008 0-1		MDL	RL	45TP4B 5/6/2008 3-3.25		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
Fluoranthene	206-44-0	N	--	3.1E+05	4.1E+06	6.3E+06	<19	U	4.3	19	<22	U	4.8	22	<21	U	4.6	21	<21	U	4.6	21	19	J	4.7	21	<22	U	4.8	22
Fluorene	86-73-7	N	--	3.1E+05	4.1E+06	1.4E+05	<19	U	0.32	19	<22	U	0.36	22	<21	U	0.34	21	0.41	J	0.35	21	0.41	J	0.35	21	<22	U	0.36	22
Indeno(1,2,3-cd)pyrene	193-39-5	C	--	2.2E+02	3.9E+03	4.2E+03	<76	U	0.8	76	<86	U	0.89	86	<81	U	0.85	81	<83	U	0.87	83	26	J	0.87	83	28	J,J,d	0.9	86
Isophorone	78-59-1	C	--	6.7E+05	3.0E+06	4.1E+02	1.5	J	0.46	190	2.6	J	0.51	220	3.2	J	0.49	210	2.5	J	0.5	210	0.83	J	0.5	210	3.4	J	0.51	220
Naphthalene	91-20-3	N	--	1.6E+05	2.0E+06	1.5E+02	6.1	J,B,z	0.27	19	7.7	J,B,z	0.3	22	8.1	J,B,z	0.28	21	7.8	J,B,z	0.29	21	6.6	J,B,z	0.29	21	7.7	J,B,z	0.3	22
N-Nitrosodiphenylamine	86-30-6	C	--	1.3E+05	5.8E+05	7.6E+02	<190	U	0.91	190	<220	U	1	220	<210	U	0.97	210	15	J	0.99	210	<210	U	0.99	210	<220	U	1	220
Phenanthrene[5]	85-01-8	N	--	2.3E+05	3.1E+06	--	<19	U	4.1	19	<22	U	4.6	22	<21	U	4.4	21	<21	U	4.5	21	7.4	J	4.5	21	<22	U	4.6	22
Phenol	108-95-2	N	--	2.3E+06	3.1E+07	6.7E+04	1.9	J	0.8	190	3.8	J	0.89	220	1.2	J	0.85	210	1.2	J	0.87	210	2.9	J	0.87	210	2.6	J	0.9	220
Pyrene	129-00-0	N	--	2.3E+05	3.1E+06	6.8E+05	0.38	J	0.36	19	4.3	J	0.41	22	1.2	J	0.38	21	2.5	J	0.39	21	19	J	0.39	21	7.3	J,J,d	0.41	22
Nitroglycerin/PETN (mg/kg)																														
Nitroglycerin	55-63-0	N	--	0.782	10.22	--	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5
Percent Solids (%)																														
Percent Solids	--	--	--	--	--	--	88		0.1	0.1	78		0.1	0.1	83		0.1	0.1	81		0.1	0.1	81		0.1	0.1	78		0.1	0.1

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45TP5A 5/6/2008 0-1		MDL	RL	45TP5B 5/6/2008 5		MDL	RL	45TP6A 5/6/2008 0-1		MDL	RL	45TP6B 5/6/2008 5.5		MDL	RL	45TP7A 5/6/2008 0-1		MDL	RL	45TP7B 5/6/2008 5-5.5		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals (mg/kg)																														
Aluminum	7429-90-5	N	40,041	7,821	102,200	--	14,000		2	10	18,000		2	10	17,000		2	10	15,000		2	10	14,000		2	10	13,000		2	10
Antimony	7440-36-0	N	--	3.13	40.88	13.2	0.76		0.026	0.2	0.062	J	0.026	0.2	0.26		0.026	0.2	0.093	J	0.026	0.2	0.18	J	0.026	0.2	<0.2	U	0.026	0.2
Arsenic	7440-38-2	C	15.8	0.426	1.91	0.026	***1.8***		0.026	0.2	***1***		0.026	0.2	***6.5***		0.026	0.2	***0.89***		0.026	0.2	***11***		0.026	0.2	***0.79***		0.026	0.2
Barium	7440-39-3	N	209	1,564	20,440	6,015	160		0.33	1	130		0.33	1	95		0.33	1	150		0.33	1	84		0.33	1	91		0.33	1
Beryllium	7440-41-7	N	1.02	15.64	204.4	1,154	1.3		0.061	1	1		0.061	1	0.76	J	0.061	1	1.2		0.061	1	0.69	J	0.061	1	0.82	J	0.061	1
Cadmium	7440-43-9	N	0.69	3.91	51.1	27.45	0.63	J	0.45	2	<2	U	0.45	2	<2	U	0.45	2	0.5	J	0.45	2	<2	U	0.45	2	<2	U	0.45	2
Calcium	7440-70-2	--	--	--	--	--	1,200		9.8	50	1,300		9.8	50	1,300		9.8	50	2,000		9.8	50	210		9.8	50	1,200		9.8	50
Chromium [1]	7440-47-3	N	65.3	23.46	306.6	42.048	23		0.8	5	29		0.8	5	22		0.8	5	24		0.8	5	39		0.8	5	20		0.8	5
Cobalt	7440-48-4	--	72.3	--	--	--	9.1		0.53	2	10		0.53	2	8.6		0.53	2	9.4		0.53	2	5		0.53	2	7.7		0.53	2
Copper	7440-50-8	N	53.5	312.86	4,088	10,518	6.3		0.027	0.2	11		0.027	0.2	19		0.027	0.2	20		0.027	0.2	9.4		0.027	0.2	8.3		0.027	0.2
Iron	7439-89-6	N	50,962	5,475	71,540	--	24,000		0.98	10	26,000		0.98	10	23,000		0.98	10	22,000		0.98	10	24,000		0.98	10	19,000		0.98	10
Lead [2]	7439-92-1	--	26.8	400	750	--	100		0.12	1	12		0.024	0.2	33		0.024	0.2	27		0.024	0.2	22		0.024	0.2	8.4		0.024	0.2
Magnesium	7439-95-4	--	--	--	--	--	3,000		2.8	50	4,600		2.8	50	2,000		2.8	50	3,900		2.8	50	940		2.8	50	3,200		2.8	50
Manganese	7439-96-5	N	2,543	156.43	2,044	951.9	900		0.18	1	510		0.18	1	510		0.18	1	560		0.18	1	490		0.18	1	370		0.18	1
Mercury [3]	7439-97-6	--	0.13	2.35	30.66	--	0.037	J,K,m	0.0075	0.05	0.017	J,K,m	0.0075	0.05	0.12	,K,m	0.0075	0.05	0.089	,K,m	0.0075	0.05	0.088	,K,m	0.0075	0.05	0.015	J,K,m	0.0075	0.05
Nickel	7440-02-0	N	62.8	156.43	2,044	--	13	B	0.035	0.1	15	B	0.035	0.1	9.7	B	0.035	0.1	14	B	0.035	0.1	6.6	B	0.035	0.1	11	B	0.035	0.1
Potassium	7440-09-7	--	--	--	--	--	1,700		14	50	1,900		14	50	1,000		14	50	1,400		14	50	730		14	50	1,800		14	50
Selenium	7782-49-2	N	--	39.11	511	18.98	0.18	J	0.028	0.3	0.13	J	0.028	0.3	0.87		0.028	0.3	<0.3	U	0.028	0.3	0.58		0.028	0.3	<0.3	U	0.028	0.3
Silver	7440-22-4	N	--	39.11	511	31.03	0.073	J	0.0093	0.1	0.029	J	0.0093	0.1	0.052	J	0.0093	0.1	0.077	J	0.0093	0.1	0.046	J	0.0093	0.1	0.024	J	0.0093	0.1
Sodium	7440-23-5	--	--	--	--	--	38	J	18	100	38	J	18	100	33	J	18	100	67	J	18	100	<100	U	18	100	35	J	18	100
Thallium	7440-28-0	N	2.11	0.548	7.154	3.638	0.35		0.0068	0.1	0.21		0.0068	0.1	0.46		0.0068	0.1	0.17		0.0068	0.1	0.45		0.0068	0.1	0.15		0.0068	0.1
Vanadium	7440-62-2	N	108	7.821	102.2	730.1	23		0.032	0.1	29		0.032	0.1	43		0.032	0.1	24		0.032	0.1	25		0.032	0.1	21		0.032	0.1
Zinc	7440-66-6	N	202	2,346	30,660	13,622	300		0.49	5	78		0.49	5	110		0.49	5	130		0.49	5	36		0.49	5	57		0.49	5
Cyanide (mg/kg)																														
Cyanide	57-12-5	N	--	156.43	2,044	147.5	0.17		0.1	0.13	<0.12	U	0.095	0.12	0.24		0.093	0.12	0.19		0.099	0.12	<0.11	U	0.092	0.11	<0.11	U	0.088	0.11
Pesticides/PCBs (ug/kg)																														
4,4'-DDT	50-29-3	C	--	1.9E+03	8.4E+03	1.2E+03	<4.3	U	1.3	4.3	<3.9	U	1.2	3.9	<3.8	U	1.2	3.8	4.2	,J,c	1.3	4.1	<3.8	U	1.2	3.8	<3.6	U	1.1	3.6
Endosulfan II	33213-65-9	N	--	4.7E+04	6.1E+05	--	<4.3	U	1.1	4.3	<3.9	U	1	3.9	<3.8	U	0.99	3.8	<4.1	U	1.1	4.1	<3.8	U	0.98	3.8	<3.6	U	0.93	3.6
gamma-Chlordane	5103-74-2	C	--	1.8E+03	8.2E+03	--	<4.3	U	0.61	4.3	<3.9	U	0.56	3.9	<3.8	U	0.54	3.8	<4.1	U	0.58	4.1	<3.8	U	0.54	3.8	<3.6	U	0.51	3.6
Aroclor 1254 [4]	11097-69-1	C	--	1.6E+02	1.4E+03	1.1E+03	19	J	5.7	43	<39	U	5.2	39	39		5.1	38	110		5.4	41	12	J	5	38	<36	U	4.8	36
Aroclor 1260	11096-82-5	C	--	3.2E+02	1.4E+03	--	<86	U	21	86	<79	U	19	79	<78	U	18	78	<83	U	20	83	<77	U	18	77	<73	U	17	73
TCL VOCs (ug/kg)																														
1,2,4-Trichlorobenzene	120-82-1	N	--	7.8E+04	1.0E+06	2.4E+03	<6.5	U	0.31	6.5	<5.9	U	0.28	5.9	<5.8	U	0.28	5.8	0.48	J	0.3	6.2	<5.7	U	0.28	5.7	<5.5	U	0.26	5.5
2-Butanone	78-93-3	N	--	4.7E+06	6.1E+07	2.9E+04	27		3.1	26	<24	U	2.9	24	11	J	2.8	23	<25	U	3	25	<23	U	2.8	23	8.2	J	2.6	22
Acetone	67-64-1	N	--	7.0E+06	9.2E+07	2.2E+04	220		5.5	26	72		5	24	150		4.9	23	46		5.2	25	210		4.8	23	160		4.6	22
Benzene	71-43-2	C	--	1.2E+04	5.2E+04	1.9E+00	<6.5	U	0.17	6.5	<5.9	U	0.15	5.9	<5.8	U	0.15	5.8	0.47	J	0.16	6.2	<5.7	U	0.15	5.7	<5.5	U	0.14	5.5
Bromomethane	74-83-9	N	--	1.1E+04	1.4E+05	4.1E+01	<6.5	U	1.6	6.5	<5.9	U	1.4	5.9	<5.8	U	1.4	5.8	<6.2	U	1.5	6.2	<5.7	U	1.4	5.7	<5.5	U	1.3	5.5
Carbon Disulfide	75-15-0	N	--	7.8E+05	1.0E+07	1.9E+04	4.2	J	0.34	6.5	3.8	J	0.31	5.9	3.2	J	0.3	5.8	9.8		0.32	6.2	2.9	J	0.3	5.7	2.7	J	0.29	5.5
Chlorobenzene	108-90-7	N	--	1.6E+05	2.0E+06	6.8E+02	<6.5	U	0.26	6.5	<5.9	U	0.24	5.9	<5.8	U	0.23	5.8	0.51	J	0.25	6.2	<5.7	U	0.23	5.7	<5.5	U	0.22	5.5
Chloroform	67-66-3	N	--	7.8E+04	1.0E+06	9.1E-01	<6.5	U	0.19	6.5	<5.9	U	0.17	5.9	<5.8	U	0.17	5.8	<6.2	U	0.18	6.2	<5.7	U	0.17	5.7	<5.5	U	0.16	5.5
Isopropylbenzene	98-82-8	N	--	7.8E+05	1.0E+07	6.4E+04	<6.5	U	0.16	6.5	<5.9	U	0.15	5.9	<5.8	U	0.14	5.8	4.6	J	0.15	6.2	<5.7	U	0.14	5.7	<5.5	U	0.13	5.5
Methyl Acetate	79-20-9	N	--	7.8E+06	1.0E+08	2.5E+04	12	J	1.1	26	3	J,B,z	0.98	24	6.7	J,B,z	0.97	23	<25	U	1	25	13	J	0.95	23	3.5	J,B,z	0.91	22
Methylene Chloride	75-09-2	C	--	8.5E+04	3.8E+05	1.9E+01	<26	U	5.1	26	<24	U	4.7	24	<23	U	4.6	23	5.4	J	4.9	25	<23	U	4.5	23	4.5	J	4.3	22
Toluene	108-88-3	N	--	6.3E+05	8.2E+06	2.7E+04	<6.5	U	0.52	6.5	<5.9	U	0.48	5.9	<5.8	U	0.47	5.8	<6.2	U	0.5	6.2	<5.7	U	0.46	5.7	<5.5	U	0.44	5.5
Xylenes	1330-20-7	N	--	1.6E+06	2.0E+07	3.0E+03	<6.5	U	0.76	6.5	<5.9	U	0.69	5.9	<5.8	U	0.68	5.8	13		0.72	6.2	<5.7	U	0.67	5.7	<5.5	U	0.64	5.5
TCL SVOCs (ug/kg)																														
1,1'-Biphenyl	92-52-4	N	--	3.9E+05	5.1E+06	9.6E+04	0.86	J,B,z	0.59	220	<200	U	0.54	200	<200	U	0.53	200	3.3	J,B,z	0.57	210	1.5	J,B,z	0.53	190	<190	U	0.5	190
2,4-Dinitrotoluene	121-14-2	N	--	1.6E+04	2.0E+05	5.7E+02	<220	U	17	220	<200	U	16	200	<200	U	15	200	<210	U	16	210	<190	U	15	190	<190	U	14	190
2,6-Dinitrotoluene	606-20-2	N	--	7.8E+03	1.0E+05	2.5E+02	<220	U	2.1	220	<200	U	1.9	200	<200	U	1.9	200	<210	U	2	210	<190	U	1.9	190	<190	U	1.8	190
2-Methylnaphthalene	91-57-6	N	--	3.1E+04	4.1E+05	4.4E+03	1.3	J	0.62	220	<200	U	0.57	200	<200	U	0.55	200	28	J	0.59	210	0.76	J	0.55	190	<190	U	0.52	190
Acenaphthene	83-32-9	N	--	4.7E+05	6.1E+06	1.0E+05	1.3	J	0.52	22	<20	U	0.47	20	<20	U	0.46	20	1.6	J	0.49	21	<19	U	0.46	19	<19	U	0.44	19
Acenaphthylene [5]	208-96-8	N	--	2.3E+05	3.1E+06	--	0.86	J	0.77	22	<20	U	0.71	20	2.3	J	0.7	20	<21	U	0.74	21	3.1	J	0.69	19	<19	U	0.66	19
Anthracene	120-12-7	N	--	2.3E+06	3.1E+07	4.7E+05	0.86	J	0.55	22	<20	U	0.5	20	1.5	J	0.49	20	2.5	J	0.53	21	<19	U	0.49	19	<19	U	0.47	19
Benzaldehyde	100-52-7	N	--	7.8E+05	1.0E+07	--	<220	U	34	220	<200	U	31	200	<200	U	30	200	81	J	32	210	40	J	30	190	<190	U	29	190
Benzo(a)anthracene	56-55-3	C	--	2.2E+02	3.9E+03	4.8E+02	6.9	J	0.69	22	1.2	J	0.63	20	4.6	J	0.62	20	<21	U	0.66	21	5.3	J	0.61	19	<19	U	0.59	19
Benzo(a)pyrene	50-32-8	C	--	2.2E+01	3.9E+02	1.2E+02	17	J	1.3	22	<20	U	1.2	20	<20	U	1.2	20	<21	U	1.3	21	<19	U	1.2	19	<19	U	1.1	19
Benzo(b)fluoranthene	205-99-2	C	--	2.2E+02	3.9E+03	1.5E+03	23		1.1	22	<20	U	1	20	20		0.98	20	<21	U	1	21	18	J	0.97	19	<19	U	0.93	19
Benzo(g,h,i)perylene [5]	191-24-2	N	--	2.3E+05	3.1E+06	--	<86	U	3	86	<79	U	2.7	79	<78	U	2.7	78	<83	U	2.8	83	<77	U	2.6	77	<73	U	2.5	73
Benzo(k)fluoranthene	207-08-9	C	--	2.2E+03	3.9E+04	1.5E+04	4.3	J	0.92	22	<20	U	0.85	20	2.7	J	0.83	20	<21	U	0.88	21	2.7	J	0.82	19	<19	U	0.78	19
Bis(2-ethylhexyl)phthalate	117-81-7	C	--	4.6E+04	2.0E+05	2.9E+06	9.5	J,B,x	1.7	220	28	J,B,x	1.5	200	<200	U	1.5	200	56	J	1.6	210	9.5	J,B,x	1.5	190	2.2	J,B,x	1.4	190
Butyl Benzyl Phthalate	85-68-7	N	--	1.6E+06	2.0E+07	1.7E+07	3	J	2.7	220	<200	U	2.5	200	<200	U	2.4	200	16	J	2.6	210	12	J	2.4	190	<190	U	2.3	190
Chrysene	218-01-9	C	--	2.2E+04	3.9E+05	4.8E+04	7.7	J	0.61	22	0.79	J	0.56	20	6.6	J	0.55	20	<21	U	0.59	21	4.6	J	0.54	19	<19	U	0.52	19
Dibenz(a,h)anthracene	53-70-3	C	--	2.2E+01	3.9E+02	4.6E+02	<86	U	0.69	86	<79	U	0.63	79	<78	U	0.62	78	<83	U	0.66	83	<77	U	0.61	77	<73	U	0.59	73
Dibenzofuran	132-64-9	N	--	7.8E+03	1.0E+05	--	0.86	J	0.34	220	<200	U	0.31	200	<200	U	0.3	200	<210	U	0.32	210	0.76	J	0.3	190	<190	U	0.29	190
Diethyl Phthalate	84-66-2	N	--	6.3E+06	8.2E+07	4.5E+05	2.2	J	0.48	220	1.2	J	0.44	200	3.5	J	0.43	200	7.8	J	0.46	210	4.2	J	0.43	190	0.73	J	0.41	190
Dimethyl Phthalate	131-11-3	--	--	--	--	--	<220	U	0.44	220	<200	U	0.4	200	<200	U	0.39	200	<210	U	0.42	210	<190	U	0.39	190	<190	U	0.37	190
Di-n-butyl Phthalate	84-74-2	N	--	7.8E+05	1.0E+07	5.0E+06	46	J,B,x	1.5	220	17	J,B,x	1.4	200	68	J	1.4	200	60	J	1.5	210	27	J,B,x	1.4	190	13	J,B,x	1.3	190
Di-n-octyl Phthalate	117-84-0	--	--	--	--	--	<220	U	13	220	<200	U	12	200	<200	U	11	200	33	J	12	210	<190	U	11	190	<190	U	11	190

Table 4-1
Summary of Detected Chemicals in Soil Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date / Sample Depth (ft bgs)	CAS #	C/N	Facility-Wide Background Point Estimate[A]	Adjusted Soil RBC (Residential)	Adjusted Soil RBC (Industrial)	Soil to Groundwater SSL (DAF 20)	45TP5A 5/6/2008 0-1		MDL	RL	45TP5B 5/6/2008 5		MDL	RL	45TP6A 5/6/2008 0-1		MDL	RL	45TP6B 5/6/2008 5.5		MDL	RL	45TP7A 5/6/2008 0-1		MDL	RL	45TP7B 5/6/2008 5-5.5		MDL	RL
							Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
Fluoranthene	206-44-0	N	--	3.1E+05	4.1E+06	6.3E+06	5.2	J	4.9	22	<20	U	4.4	20	7	J	4.4	20	7.8	J	4.6	21	5.7	J	4.3	19	<19	U	4.1	19
Fluorene	86-73-7	N	--	3.1E+05	4.1E+06	1.4E+05	0.43	J	0.36	22	<20	U	0.33	20	<20	U	0.32	20	3.7	J	0.35	21	<19	U	0.32	19	<19	U	0.31	19
Indeno(1,2,3-cd)pyrene	193-39-5	C	--	2.2E+02	3.9E+03	4.2E+03	<86	U	0.9	86	<79	U	0.83	79	<78	U	0.81	78	<83	U	0.86	83	<77	U	0.8	77	<73	U	0.77	73
Isophorone	78-59-1	C	--	6.7E+05	3.0E+06	4.1E+02	2.6	J	0.52	220	0.79	J	0.47	200	2.3	J	0.46	200	7.4	J	0.5	210	3.8	J	0.46	190	0.73	J	0.44	190
Naphthalene	91-20-3	N	--	1.6E+05	2.0E+06	1.5E+02	6.9	J,B,z	0.3	22	5.9	J,B,z	0.28	20	7	J,B,z	0.27	20	47		0.29	21	6.9	J,B,z	0.27	19	5.5	J,B,z	0.25	19
N-Nitrosodiphenylamine	86-30-6	C	--	1.3E+05	5.8E+05	7.6E+02	<220	U	1	220	<200	U	0.95	200	<200	U	0.93	200	23	J	0.99	210	<190	U	0.92	190	<190	U	0.88	190
Phenanthrene[5]	85-01-8	N	--	2.3E+05	3.1E+06	--	<22	U	4.7	22	<20	U	4.3	20	5	J	4.2	20	16	J	4.5	21	<19	U	4.1	19	<19	U	4	19
Phenol	108-95-2	N	--	2.3E+06	3.1E+07	6.7E+04	2.6	J	0.9	220	1.2	J	0.83	200	1.2	J	0.81	200	<210	U	0.86	210	<190	U	0.8	190	<190	U	0.77	190
Pyrene	129-00-0	N	--	2.3E+05	3.1E+06	6.8E+05	8.2	J	0.41	22	0.39	J	0.37	20	10	J	0.37	20	4.5	J	0.39	21	6.5	J	0.36	19	<19	U	0.35	19
Nitroglycerin/PETN (mg/kg)																														
Nitroglycerin	55-63-0	N	--	0.782	10.22	--	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5	<5	U	0.39	5
Percent Solids (%)																														
Percent Solids	--	--	--	--	--	--	77		0.1	0.1	85		0.1	0.1	86		0.1	0.1	81		0.1	0.1	87		0.1	0.1	91		0.1	0.1

Notes:

CAS = Chemical Abstracts Service
ft bgs = Feet Below Ground Surface
mg/kg = Milligram Per Kilogram
µg/kg = Microgram Per Kilogram
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
MDL = Method Detection Limit
RL = Reporting Limit
LQ = Laboratory Qualifier
VQ = Validation Qualifier
r = Reason Code
NT = Not Tested
-- = No Value Available

= Concentration Exceeds Adjusted Soil Residential RBC

= Concentration Exceeds Adjusted Soil Industrial RBC

underline = Concentration Exceeds Site Background Values

bold italic = Concentration Exceeds SSL DAF20

RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
C/N = Carcinogenic/Noncarcinogenic per EPA RBC Table (October 2007)
SSL DAF20 = Soil Screening Level at a Dilution Attenuation Factor of 20
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance
[3] = Mercuric chloride soil RBC value used
[4] = Noncarcinogenic Residential RBC value for Aroclor 1254 was used for screening
[5] = Pyrene soil RBC values used

Laboratory Qualifiers

B	Analyte found in associated blank as well as in the sample.
E	Concentration exceeded the upper level of the calibration range of the instrument for that specific analysis. For TICs, compound not present in calibration standard, calculated using total peak areas ion chromatographs and response factor of 1.
J	Estimated value.
U	The compound was analyzed for but not detected. The reporting limit will be adjusted to reflect any dilution, and for soil, the percent moisture.

Validation Qualifiers

B	Not detected substantially above the level reported in laboratory or field blanks.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
N	Tentative Identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
J	Analyte present. Reported value may not be accurate or precise.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
U	Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL	Not detected, quantitation limit is probably higher.
UJ	Not detected, quantitation limit may be inaccurate or imprecise.

Reason Codes

c	Calibration failure; poor or unstable (%D) response
d	MS/MSD or LCS/LCSD RPD imprecision
m	MS/MSD recovery failure
q	Concentration exceeded the linear range
x	Field and/or equipment blank contamination
z	Method blank and/or storage blank contamination

Table 4-2
Summary of Detected Chemicals in Groundwater Analytical Samples
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date	CAS	C/N	Adjusted Tap Water RBC	MCL	Units	45MW1 5/22/2008 Result	LQ, VQ, r	MDL	RL	45MW2 5/21/2008 Result	LQ, VQ, r	MDL	RL	45MW2-DUP (DUP-3) 5/21/2008 Result	LQ, VQ, r	MDL	RL	45MW2 8/12/2008 Result	LQ, VQ, r	MDL	RL	45MW2-DUP (DUP-1) 8/12/2008 Result	LQ, VQ, r	MDL	RL	45MW3 5/22/2008 Result	LQ, VQ, r	MDL	RL	45MW4 5/22/2008 Result	LQ, VQ, r	MDL	RL
Perchlorate																																	
Perchlorate	14797-73-0	N	2.555	--	ug/L	4.7		0.015	0.2	0.65		0.015	0.2	0.64		0.015	0.2	NT				NT				0.81		0.015	0.2	1.3		0.015	0.2
TAL Metals																																	
Aluminum, Total	7429-90-5	N	3,650	--	ug/L	760	,K,m	20	50	550	,K,m	20	50	890	,K,m	20	50	NT				NT				210	,K,m	20	50	2,400	,K,m	20	50
Antimony, Dissolved	7440-36-0	N	1.46	--	ug/L	0.43	J	0.32	3	<3	U	0.32	3	<3	U	0.32	3	NT				NT				1.1	J	0.32	3	<3	U	0.32	3
Antimony, Total	7429-90-5	N	3,650	--	ug/L	0.6	J	0.32	3	<3	U	0.32	3	<3	U	0.32	3	NT				NT				<3	U	0.32	3	<3	U	0.32	3
Arsenic, Total	7440-38-2	C	0.0446	10	ug/L	<3	U	0.24	3	<3	U	0.24	3	<3	U	0.24	3	NT				NT				<3	U	0.24	3	0.56	J	0.24	3
Barium, Dissolved	7440-39-3	N	730	2,000	ug/L	66		0.23	2	47		0.23	2	45		0.23	2	NT				NT				42		0.23	2	57		0.23	2
Barium, Total	7440-39-3	N	730	2,000	ug/L	75		0.23	2	56		0.23	2	52		0.23	2	NT				NT				46		0.23	2	80		0.23	2
Cadmium, Total	7440-43-9	N	1.825	5	ug/L	0.1	J	0.056	0.2	<0.2	U	0.056	0.2	0.064	J	0.056	0.2	NT				NT				<0.2	U	0.056	0.2	0.11	J	0.056	0.2
Calcium, Dissolved	7440-70-2	--	--	--	ug/L	96,000		69	500	62,000		69	500	60,000		69	500	NT				NT				68,000		69	500	70,000		69	500
Calcium, Total	7440-70-2	--	--	--	ug/L	99,000		69	500	75,000		69	500	60,000		69	500	NT				NT				69,000		69	500	74,000		69	500
Chromium, Dissolved [1]	7440-47-3	C	10.95	100	ug/L	3.8		0.33	2	2	,B,p	0.33	2	1.9	J,B,p	0.33	2	NT				NT				1.6	J,B,p	0.33	2	3.4		0.33	2
Chromium, Total [1]	7440-47-3	C	10.95	100	ug/L	8.9		0.33	2	4.9	,J,f	0.33	2	12	,J,f	0.33	2	NT				NT				4.2		0.33	2	11		0.33	2
Cobalt, Dissolved	7440-48-4	--	--	--	ug/L	0.43	J	0.05	1	2.2		0.05	1	1.4		0.05	1	NT				NT				1.9		0.05	1	1.3		0.05	1
Cobalt, Total	7440-48-4	--	--	--	ug/L	3.2		0.05	1	3.6	,J,f	0.05	1	11	,J,f	0.05	1	NT				NT				2.9		0.05	1	3		0.05	1
Copper, Dissolved	7440-50-8	N	146	1,300	ug/L	0.79	J	0.29	1	<1	U	0.29	1	<1	U	0.29	1	NT				NT				0.41	J	0.29	1	0.31	J	0.29	1
Copper, Total	7440-50-8	N	146	1,300	ug/L	4.8		0.29	1	1.2		0.29	1	1.9		0.29	1	NT				NT				0.86	J	0.29	1	4.1		0.29	1
Iron, Dissolved	7439-89-6	N	2,555	--	ug/L	<20	U	9.6	20	10	J	9.6	20	<20	U	9.6	20	NT				NT				<20	U	9.6	20	26		9.6	20
Iron, Total	7439-89-6	N	2,555	--	ug/L	1,400		9.6	20	1,100		9.6	20	1,800		9.6	20	NT				NT				480		9.6	20	4,100		9.6	20
Lead, Dissolved [2]	7439-92-1	--	15	--	ug/L	0.36	J	0.29	1	<1	U	0.29	1	<1	U	0.29	1	NT				NT				<1	U	0.29	1	<1	U	0.29	1
Lead, Total [2]	7439-92-1	--	15	--	ug/L	7.9		0.29	1	0.77	J	0.29	1	1.2		0.29	1	NT				NT				<1	U	0.29	1	1.6		0.29	1
Magnesium, Dissolved	7439-95-4	--	--	--	ug/L	33,000		63	500	20,000		63	500	19,000		63	500	NT				NT				20,000		63	500	31,000		63	500
Magnesium, Total	7439-95-4	--	--	--	ug/L	35,000		63	500	23,000		63	500	20,000		63	500	NT				NT				21,000		63	500	33,000		63	500
Manganese, Dissolved	7439-96-5	N	73	--	ug/L	3.3		0.3	3	4.2		0.3	3	2.8	J	0.3	3	NT				NT				1.3	J	0.3	3	9.5		0.3	3
Manganese, Total	7439-96-5	N	73	--	ug/L	81		0.3	3	44		0.3	3	57		0.3	3	NT				NT				32		0.3	3	190		0.3	3
Nickel, Dissolved	7440-02-0	N	73	--	ug/L	0.75	J	0.35	2	2.6		0.35	2	1.9	J	0.35	2	NT				NT				1.3	J	0.35	2	8.1		0.35	2
Nickel, Total	7440-02-0	N	73	--	ug/L	5.9		0.35	2	2.7	,J,f	0.35	2	9.8	,J,f	0.35	2	NT				NT				2.6		0.35	2	9.5		0.35	2
Potassium, Dissolved	7440-09-7	--	--	--	ug/L	790	,B,p	62	200	270	,B,p	62	200	250	,B,p	62	200	NT				NT				550	,B,p	62	200	450	,B,p	62	200
Potassium, Total	7440-09-7	--	--	--	ug/L	1,100		62	200	450	J	62	500	560		62	200	NT				NT				680		62	200	980		62	200
Selenium, Dissolved	7782-49-2	N	18.25	--	ug/L	0.38	J	0.3	3	0.54	J	0.3	3	0.62	J	0.3	3	NT				NT				0.54	J	0.3	3	<3	U	0.3	3
Selenium, Total	7782-49-2	N	18.25	--	ug/L	0.63	J	0.3	3	0.88	J	0.3	3	0.67	J	0.3	3	NT				NT				0.48	J	0.3	3	0.38	J	0.3	3
Silver, Total	7440-22-4	N	18.25	--	ug/L	0.19	J	0.061	0.5	0.16	J	0.061	0.5	0.64		0.061	0.5	NT				NT				<0.5	U	0.061	0.5	<0.5	U	0.061	0.5
Sodium, Dissolved	7440-23-5	--	--	--	ug/L	19,000		210	500	3,900		210	500	3,900		210	500	NT				NT				4,700		210	500	6,700		210	500
Sodium, Total	7440-23-5	--	--	--	ug/L	19,000		210	500	4,200		210	500	4,100		210	500	NT				NT				4,900		210	500	7,000		210	500
Vanadium, Dissolved	7440-62-2	N	3.65	--	ug/L	0.39	J	0.27	5	0.44	J	0.27	5	0.36	J	0.27	5	NT				NT				0.31	J,B,o	0.27	5	0.5	J	0.27	5
Vanadium, Total	7440-62-2	N	3.65	--	ug/L	2.6	J	0.27	5	1.9	J	0.27	5	2.8	J	0.27	5	NT				NT				0.83	J	0.27	5	6.6		0.27	5
Zinc, Dissolved	7440-66-6	N	1,095	--	ug/L	5.4	J,B,x	1.8	10	11	,B,x	1.8	10	4.1	J,B,x	1.8	10	NT				NT				2.7	J,B,x	1.8	10	3.8	J,B,x	1.8	10
Zinc, Total	7440-66-6	N	1,095	--	ug/L	9.3	J,B,x	1.8	10	9.5	J,B,x	1.8	10	6.3	J,B,x	1.8	10	NT				NT				3.9	J,B,x	1.8	10	10	,B,x	1.8	10
Cyanide																																	
Cyanide, Total	57-12-5	N	73	--	ug/L	2.21	J,B,p	1.9	10	2.25	J,B,p	1.9	10	3.46	J,B,p	1.9	10	NT				NT				2.6	J,B,p	1.9	10	2.48	J,B,p	1.9	10
TCL VOCs																																	
Chloroform	67-66-3	C	0.155	80	ug/L	0.7	J	0.061	1	<1	U	0.061	1	<1	U	0.061	1	NT				NT				<1	U	0.061	1	<1	U	0.061	1
Toluene	108-88-3	N	227.1	1,000	ug/L	<1	U	0.072	1	0.26	J,B,y	0.072	1	<1	U	0.072	1	NT				NT				0.1	J,B,y	0.072	1	<1	U	0.072	1
TCL SVOCs																																	
1,1'-Biphenyl	92-52-4	N	30.42	--	ug/L	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	0.03	J	0.015	5
2-Chlorophenol	95-57-8	N	3.042	--	ug/L	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	0.06	J	0.016	5
2-Methylnaphthalene	91-57-6	N	2.433	--	ug/L	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	<5	U	0.015	5	0.03	J	0.015	5
Acenaphthene	83-32-9	N	36.5	--	ug/L	<0.5	U	0.013	0.5	<0.5	U	0.013	0.5	<0.5	U	0.013	0.5	<0.5	U	0.013	0.5	<0.5	U	0.013	0.5	<0.5	U	0.013	0.5	0.02	J	0.013	0.5
Acenaphthylene [3]	208-96-8	N	18.25	--	ug/L	<0.5	U	0.012	0.5	<0.5	U	0.012	0.5	<0.5	U	0.012	0.5	<0.5	U	0.012	0.5	<0.5	U	0.012	0.5	<0.5	U	0.012	0.5	0.02	J	0.012	0.5
Acetophenone	98-86-2	N	60.83	--	ug/L	<5	U	0.043	5	<5	U	0.043	5	<5	U	0.043	5	<5	U	0.043	5	<5	U	0.043	5	<5	U	0.043	5	0.06	J	0.043	5
Benzo(a)anthracene	56-55-3	C	0.03	--	ug/L	<0.5	U	0.037	0.5	0.06	J	0.037	0.5	<0.5	U	0.037	0.5	<0.5	U	0.037	0.5	<0.5	U	0.037	0.5	<0.5	U	0.037	0.5	<0.5	U	0.037	0.5
Bis(2-chloroethoxy)methane	111-91-1	--	--	--	ug/L	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	0.03	J	0.016	5
Bis(2-ethylhexyl) Phthalate	117-81-7	C	4.784	--	ug/L	0.87	J,B,z	0.41	5	0.47	J,B,z	0.41	5	0.48	J,B,z	0.41	5	<5	U	0.41	5	0.92	U	0.41	5	0.47	J,B,z	0.41	5	0.66	J,B,z	0.41	5
Butyl Benzyl Phthalate	85-68-7	N	730	--	ug/L	<5	U	0.029	5	0.4	J,B,z	0.029	5	0.39	J,B,z	0.029	5	0.15	J	0.029	5	0.35	J	0.029	5	0.4	J,B,z	0.029	5	0.41	J,B,z	0.029	5
Chrysene	218-01-9	C	3	--	ug/L	<0.5	U	0.02	0.5	0.05	J	0.02	0.5	<0.5	U	0.02	0.5	<0.5	U	0.02	0.5	<0.5	U	0.02	0.5	<0.5	U	0.02	0.5	<0.5	U	0.02	0.5
Dibenzofuran	132-64-9	N	3.65	--	ug/L	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	<5	U	0.016	5	0.02	J	0.016	5
Diethylphthalate	84-66-2	N	2,920	--	ug/L	0.06	J,B,z	0.034	5	0.09	J,B,z	0.034	5	0.07	J,B,z	0.034	5	0.15	J,B,z	0.034	5	0.18	J,B,z	0.034	5	0.05	J,B,z	0.034	5	0.09	J,B,z	0.034	5
Di-n-butylphthalate	84-74-2	N	365	--	ug/L	<5	U	0.38	5	1.3	J,B,x	0.38	5	0.43	J,B,x	0.38	5	3.2	JB,B,z	0.38	5	3.9	JB,B,z	0.38	5	<5	U	0.38	5	<5	U	0.38	5
Di-n-octylphthalate	117-84-0	--	--	--	ug/L	<5	U	0.34	5	0.58	J	0.34	5	<5	U	0.34	5	<5	U	0.34	5	<5	U	0.34	5	<5	U	0.34	5	<5	U	0.34	5
Fluoranthene	206-44-0	N	146	--	ug/L	<0.5	U	0.016	0.5	0.03	J	0.016	0.5	<0.5	U	0.016	0.5	<0.5	U	0.016	0.5	<0.5	U	0.016	0.5	<0.5	U	0.016	0.5	<0.5	U	0.016	0.5
Hexachloroethane	67-72-1	C	3.65	--	ug/L	<5	U	0.038	5	<5	U	0.038	5	<5	U	0.038	5	<5	U	0.038	5	<5	U	0.038	5	<5	U	0.038	5	0.07	J,J,m	0.038	5
Naphthalene	91-20-3	N	0.651	--	ug/L	<0.5	U	0.023	0.5	<0.5	U	0.023	0.5	<0.5	U	0.023	0.5	<0.5	U	0.023	0.5	<0.5	U	0.023	0.5	<0.5	U	0.023	0.5	0.04	J	0.023	0.5
Phenanthrene [3]	85-01-8	N	18.25	--	ug/L	<0.5	U	0.015	0.5	0.02	J	0.015	0.5	<0.5	U	0.015	0.5	<0.5	U	0.015	0.5	<0.5	U	0.015	0.5	<0.5	U	0.015	0.5	<0.5	U	0.015	0.5
Phenol	108-95-2	N	1,095	--	ug/L	0.03	J,B,z	0.028	5	<5	U	0.028	5	<5	U	0.028	5	<5	U	0.028	5	<5	U	0.028	5	<5	U	0.028	5	0.04	J,B,z	0.028	5
Explosives																																	
HMX	2691-41-0	N	182.5	--	ug/L	<5	U	0.2	5	<5	U	0.2	5	<5	U	0.2	5	NT				NT				0.77	J,J,g	0.2	5	<5	U	0.2	5
Field Parameters																																	
Dissolved Oxygen	--	--	--	--	mg/L	7.01				3.47				3.47				16.34				16.34				4.94				5.48			
Oxidation Reduction Potential	--	--	--	--	mV	96				147				147				152				152				173				162			
pH	--	--	--	--	SU	6.69				6.54				6.54				6.84				6.84				6.33				6.82			
Conductivity	--	--	--	--	mS	0.099				66.8				66.8				65.6				65.6				56.2				69.6			
Temperature	--	--	--	--	°C	19.6				15.8				15.8				11.92				11.92				17.5				16			
Turbidity	--	--	--	--	ntu	29.8				6.4				6.4				NT				NT				8.62				19.99			

Notes:
CAS = Chemical Abstracts Service
µg/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
MDL = Method Detection Limit
RL = Reporting Limit
LQ = Laboratory Qualifier
VQ = Validation Qualifier
r = Reason Code
NT = Not Tested
mg/L = Milligram Per Liter
mV = millivolt
SU = Standard Units
mS = milliSiemen
°C = degrees Celcius
ntu = Nephelometric Turbidity

RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)
MCL = Maximum Contaminant Level
-- = No Value Available

[1] = Chromium VI RBC used for screening
[2] = USEPA Action Level used for screening
[3] = Pyrene RBC used for screening

=Exceeds Adjusted T-RBC

=Exceeds MCL

Data Qualifiers:
B = Not detected substantially above the level reported in laboratory or field blanks.
J = Analyte present. Reported value may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
U = Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
f = Field duplicate imprecision
m = MS/MSD recovery failure.
o = Calibration blank contamination
p = Preparation blank contamination
x = Trip blank contamination
y = Trip blank contamination
z = Method blank and/or storage blank contamination

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Table 4-3
SWMU 45 COPC Determination - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
Surface Soil		**TAL Metals**														
	7429-90-5	Aluminum	9,100	18,000	mg/kg	45TP3A	11/11	2 - 200	18,000	7,821	N	102,200	N	IND	Y	**ARES**
	7440-36-0	Antimony	0.074	4.6	mg/kg	45TP4A	10/11	0.026 - 0.026	4.6	3.13	N	40.88	N	IND	Y	**ARES**
	7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	11/11	0.026 - 0.026	12	0.426	C	1.91	C	IND	Y	***ARES/IND***
	7440-39-3	Barium	62	240	mg/kg	45TP4A	11/11	0.33 - 0.33	240	1,564	N	20,440	N	IND	N	BSL
	7440-41-7	Beryllium	0.55	1.3	mg/kg	45SB14A DUP AVG	11/11	0.061 - 0.061	1.3	15.64	N	204.4	N	IND	N	BSL
	7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	5/11	0.45 - 0.45	6.2	3.911	N	51.1	N	IND	Y	**ARES**
	7440-47-3	Chromium [1]	16	79	mg/kg	45TP4A	11/11	0.8 - 0.8	79	23.46	N	306.6	N	IND	Y	**ARES**
	7440-48-4	Cobalt	3.8	9.1	mg/kg	45TP5A	11/11	0.53 - 0.53	9.1	--	--	--	--	--	Y	NSV
	7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	11/11	0.027 - 1.1	1,100	312.9	N	4,088	N	IND	Y	**ARES**
	7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	11/11	0.98 - 490	47,000	5,475	N	71,540	N	IND	Y	**ARES**
	7439-92-1	Lead [2]	7.9	760	mg/kg	45TP4A	11/11	0.024 - 0.47	760	400	--	750	--	AL	Y	***ARES/IND***
	7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	11/11	0.18 - 3.5	1,100	156.4	N	2,044	N	IND	Y	**ARES**
	7439-97-6	Mercury [3]	0.01345	0.22	mg/kg	45TP2A	11/11	0.0075 - 0.0075	0.22	2.35	--	30.66	--	IND	N	BSL
	7440-02-0	Nickel	6.6	24	mg/kg	45TP2A	11/11	0.035 - 0.035	24	156.4	N	2,044	N	IND	N	BSL
	7782-49-2	Selenium	0.12	0.87	mg/kg	45TP6A	11/11	0.028 - 0.028	0.87	39.11	N	511	N	IND	N	BSL
	7440-22-4	Silver	0.037	0.73	mg/kg	45TP2A	11/11	0.0093 - 0.0093	0.73	39.11	N	511	N	IND	N	BSL
	7440-28-0	Thallium	0.1	0.54	mg/kg	45TP3A	11/11	0.0068 - 0.0068	0.54	0.548	N	7.154	N	IND	N	BSL
	7440-62-2	Vanadium	16	46	mg/kg	45TP4A	11/11	0.032 - 0.032	46	7.821	N	102.2	N	IND	Y	**ARES**
	7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	11/11	0.49 - 0.49	2,500	2,346	N	30,660	N	IND	Y	**ARES**
		Cyanide														
	57-12-5	Cyanide	0.11	0.24	mg/kg	45TP6A	8/11	0.092 - 0.11	2.4E-01	156	N	2,044	N	IND	N	BSL
		Pesticides/PCBs														
	50-29-3	4,4'-DDT	2.1E-02	2.1E-02	mg/kg	45TP1A	1/11	0.0012 - 0.0014	2.1E-02	1.9E+00	C	8.4E+00	C	IND	N	BSL
	33213-65-9	Endosulfan II	3.6E-02	3.6E-02	mg/kg	45TP2A	1/11	0.00098 - 0.0012	3.6E-02	4.7E+01	N	6.1E+02	N	IND	N	BSL
	5103-74-2	gamma-Chlordane	1.4E-03	1.4E-03	mg/kg	45SB8A	1/11	0.00054 - 0.00065	1.4E-03	1.8E+00	C	8.2E+00	C	IND	N	BSL
	11097-69-1	Aroclor 1254 [4]	9.7E-03	7.3E-01	mg/kg	45TP2A	8/11	0.005 - 0.0061	7.3E-01	1.6E-01	N	1.4E+00	C	IND	Y	**ARES**
	11096-82-5	Aroclor 1260	6.3E-01	6.3E-01	mg/kg	45TP2A	1/11	0.018 - 0.022	6.3E-01	3.2E-01	C	1.4E+00	C	IND	Y	**ARES**
		TCL VOCs														
	78-93-3	2-Butanone	1.1E-02	3.2E-01	mg/kg	45TP1A	10/11	0.0028 - 0.0033	3.2E-01	4.7E+03	N	6.1E+04	N	IND	N	BSL
	67-64-1	Acetone	1.5E-01	9.2E-01	mg/kg	45TP1A	11/11	0.0048 - 0.0058	9.2E-01	7.0E+03	N	9.2E+04	N	IND	N	BSL
	71-43-2	Benzene	2.1E-04	5.1E-04	mg/kg	45TP4A	3/11	0.00015 - 0.00018	5.1E-04	1.2E+01	C	5.2E+01	C	IND	N	BSL
	75-15-0	Carbon Disulfide	1.9E-03	4.2E-03	mg/kg	45TP5A	9/11	0.0003 - 0.00036	4.2E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	67-66-3	Chloroform	2.8E-04	3.7E-04	mg/kg	45SB14A DUP AVG	2/11	0.00017 - 0.0002	3.7E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	79-20-9	Methyl Acetate	5.5E-03	1.6E-02	mg/kg	45SB1A	11/11	0.00095 - 0.0011	1.6E-02	7.8E+03	N	1.0E+05	N	IND	N	BSL
	108-88-3	Toluene	2.1E-03	2.1E-03	mg/kg	45SB5A	1/11	0.00046 - 0.00055	2.1E-03	6.3E+02	N	8.2E+03	N	IND	N	BSL
		TCL SVOCs														
	92-52-4	1,1'-Biphenyl	7.7E-04	1.5E-03	mg/kg	45TP7A	8/11	0.00053 - 0.0026	1.5E-03	3.9E+02	N	5.1E+03	N	IND	N	BSL
	91-57-6	2-Methylnaphthalene	7.6E-04	4.1E-03	mg/kg	45TP1A	9/11	0.00055 - 0.0027	4.1E-03	3.1E+01	N	4.1E+02	N	IND	N	BSL
	83-32-9	Acenaphthene	9.2E-04	1.8E-03	mg/kg	45TP2A	3/11	0.00046 - 0.0023	1.8E-03	4.7E+02	N	6.1E+03	N	IND	N	BSL
	208-96-8	Acenaphthylene [5]	8.6E-04	3.1E-03	mg/kg	45TP7A	5/11	0.00069 - 0.0034	3.1E-03	2.3E+02	N	3.1E+03	N	IND	N	BSL
	120-12-7	Anthracene	8.6E-04	5.0E-03	mg/kg	45TP2A	5/11	0.00049 - 0.0024	5.0E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	100-52-7	Benzaldehyde	4.0E-02	4.0E-02	mg/kg	45TP7A	1/11	0.03 - 0.15	4.0E-02	7.8E+02	N	1.0E+04	N	IND	N	BSL
	56-55-3	Benzo(a)anthracene	1.2E-03	4.9E-02	mg/kg	45TP2A	11/11	0.00061 - 0.0031	4.9E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	50-32-8	Benzo(a)pyrene	1.7E-02	4.3E-02	mg/kg	45TP2A	4/11	0.0012 - 0.0059	4.3E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	205-99-2	Benzo(b)fluoranthene	1.6E-02	8.2E-02	mg/kg	45TP2A	8/11	0.00097 - 0.0049	8.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	191-24-2	Benzo(g,h,i)perylene [5]	1.7E-02	3.8E-02	mg/kg	45TP2A	3/11	0.0026 - 0.013	3.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	207-08-9	Benzo(k)fluoranthene	1.3E-03	2.0E-02	mg/kg	45TP2A	10/11	0.00082 - 0.0041	2.0E-02	2.2E+00	C	3.9E+01	C	IND	N	BSL
	117-81-7	Bis(2-ethylhexyl)phthalate	1.3E-03	1.2E-01	mg/kg	45TP1A	8/11	0.0015 - 0.0074	1.2E-01	4.6E+01	C	2.0E+02	C	IND	N	BSL
	85-68-7	Butyl Benzyl Phthalate	3.0E-03	1.8E-02	mg/kg	45TP1A	6/11	0.0024 - 0.012	1.8E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
	218-01-9	Chrysene	7.7E-04	3.0E-02	mg/kg	45TP2A	11/11	0.00054 - 0.0027	3.0E-02	2.2E+01	C	3.9E+02	C	IND	N	BSL
	53-70-3	Dibenz(a,h)anthracene	2.8E-02	2.8E-02	mg/kg	45TP2A	1/11	0.00061 - 0.0031	2.8E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	132-64-9	Dibenzofuran	4.3E-04	2.3E-03	mg/kg	45TP1A	6/11	0.0003 - 0.0015	2.3E-03	7.8E+00	N	1.0E+02	N	IND	N	BSL
	84-66-2	Diethyl Phthalate	8.1E-04	4.2E-03	mg/kg	45TP7A	10/11	0.00043 - 0.0021	4.2E-03	6.3E+03	N	8.2E+04	N	IND	N	BSL
	131-11-3	Dimethyl Phthalate	8.3E-04	8.3E-04	mg/kg	45TP4A	1/11	0.00039 - 0.0019	8.3E-04	--	--	--	--	IND	Y	NSV
	84-74-2	Di-n-butyl Phthalate	1.1E-02	3.4E+00	mg/kg	45SB8A	11/11	0.0014 - 0.0069	3.4E+00	7.8E+02	N	1.0E+04	N	IND	N	BSL
	117-84-0	Di-n-octyl Phthalate	2.7E-02	2.7E-02	mg/kg	45TP1A	1/11	0.011 - 0.056	2.7E-02	--	--	--	--	IND	Y	NSV
	206-44-0	Fluoranthene	5.2E-03	6.0E-02	mg/kg	45TP2A	6/11	0.0043 - 0.022	6.0E-02	3.1E+02	N	4.1E+03	N	IND	N	BSL
	86-73-7	Fluorene	3.9E-04	1.8E-03	mg/kg	45TP1A	5/11	0.00032 - 0.0016	1.8E-03	3.1E+02	N	4.1E+03	N	IND	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.6E-02	4.2E-02	mg/kg	45TP2A	3/11	0.0008 - 0.004	4.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	78-59-1	Isophorone	8.3E-04	4.6E-03	mg/kg	45SB5A	11/11	0.00046 - 0.0023	4.6E-03	6.7E+02	C	3.0E+03	C	IND	N	BSL
	91-20-3	Naphthalene	5.4E-03	1.4E-02	mg/kg	45TP1A	11/11	0.00027 - 0.0013	1.4E-02	1.6E+02	N	2.0E+03	N	IND	N	BSL

Table 4-3
SWMU 45 COPC Determination - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
	86-30-6	N-Nitrosodiphenylamine	1.8E-02	3.7E-01	mg/kg	45SB8A	2/11	0.00092 - 0.0046	3.7E-01	1.3E+02	C	5.8E+02	C	IND	N	BSL
	85-01-8	Phenanthrene [5]	5.0E-03	2.8E-02	mg/kg	45TP2A	4/11	0.0041 - 0.021	2.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	108-95-2	Phenol	1.2E-03	3.8E-03	mg/kg	45TP3A	9/11	0.0008 - 0.004	3.8E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	129-00-0	Pyrene	7.7E-04	5.2E-02	mg/kg	45TP2A	11/11	0.00036 - 0.0018	5.2E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
		Nitroglycerin/PETN														
	55-63-0	Nitroglycerin	3.8E+00	3.8E+00	mg/kg	45TP2A	1/11	0.39 - 0.39	3.8E+00	7.8E-01	N	1.0E+01	N	IND	Y	**ARES**

Notes:

COPC = Chemical of Potential Concern
mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
PETN = Pentaerythritol Tetranitrate
RBC = USEPA Region III Risk-Based Concentration
(RBC) values from the October 11, 2007,
RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
(N/C) = Noncarcinogenic/Carcinogenic per EPA RBC Table (October 2007)
-- = No Value Available
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance
[3] = Mercuric chloride soil RBC value used
[4] = Noncarcinogenic Residential RBC value for Aroclor 1254 was used for screening
[5] = Pyrene RBCs used

ARAR = Applicable, Relevant, and Appropriate Requirement
TBC = To-Be-Considered
IND = Adjusted Industrial RBC
AL = USEPA Action Level
RDA = Recommended Daily Allowance

ARES = Above Residential RBC
ARES/IND = Above Residential RBC/Industrial RBC
BSL = Below Residential/Industrial RBC Screening Levels
NSV = No Screening Value Available

Table 4-4
SWMU 45 COPC Determination - Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
Total Soil		**TAL Metals**														
	7429-90-5	Aluminum	9,100	19,000	mg/kg	45SB14B	22/22	2 - 200	19,000	7,821	N	102,200	N	IND	Y	**ARES**
	7440-36-0	Antimony	0.046	33	mg/kg	45TP4B	16/22	0.026 - 0.026	33	3.13	N	40.88	N	IND	Y	**ARES**
	7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	22/22	0.026 - 0.026	12	0.426	C	1.91	C	IND	Y	***ARES/IND***
	7440-39-3	Barium	62	300	mg/kg	45TP4B	22/22	0.33 - 1.7	300	1,564	N	20,440	N	IND	N	BSL
	7440-41-7	Beryllium	0.55	1.6	mg/kg	45TP4B	22/22	0.061 - 0.061	1.6	15.6	N	204.4	N	IND	N	BSL
	7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	8/22	0.45 - 0.45	6.2	3.911	N	51.1	N	IND	Y	**ARES**
	7440-47-3	Chromium [1]	16	170	mg/kg	45TP4B	22/22	0.8 - 0.8	170	23.46	N	306.6	N	IND	Y	**ARES**
	7440-48-4	Cobalt	3.8	11	mg/kg	45SB14B	22/22	0.53 - 0.53	11	--	--	--	--	--	Y	NSV
	7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	22/22	0.027 - 1.1	1,100	312.9	N	4,088	N	IND	Y	**ARES**
	7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	22/22	0.98 - 980	47,000	5,475	N	71,540	N	IND	Y	**ARES**
	7439-92-1	Lead [2]	7.7	760	mg/kg	45TP4A	22/22	0.024 - 0.47	760	400	--	750	--	USEPA	Y	***ARES/IND***
	7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	22/22	0.18 - 3.5	1,100	156.4	N	2,044	N	IND	Y	**ARES**
	7439-97-6	Mercury [3]	0.0087	0.22	mg/kg	45TP2A	21/22	0.0075 - 0.0075	0.22	2.35	--	30.66	--	IND	N	BSL
	7440-02-0	Nickel	6.6	34	mg/kg	45TP4B	22/22	0.035 - 0.035	34	156.4	N	2,044	N	IND	N	BSL
	7782-49-2	Selenium	0.036	0.87	mg/kg	45TP6A	18/22	0.028 - 0.028	0.87	39.11	N	511	N	IND	N	BSL
	7440-22-4	Silver	0.024	0.73	mg/kg	45TP2A	22/22	0.0093 - 0.0093	0.73	39.11	N	511	N	IND	N	BSL
	7440-28-0	Thallium	0.1	0.54	mg/kg	45TP3A	22/22	0.0068 - 0.0068	0.54	0.548	N	7.154	N	IND	N	BSL
	7440-62-2	Vanadium	15	46	mg/kg	45TP4A	22/22	0.032 - 0.063	46	7.821	N	102.2	N	IND	Y	**ARES**
	7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	22/22	0.49 - 9.7	2,500	2,346.429	N	30,660	N	IND	Y	**ARES**
		Cyanide														
	57-12-5	Cyanide	0.11	0.24	mg/kg	45TP6A	10/22	0.088 - 0.11	2.4E-01	156.429	N	2,044	N	IND	N	BSL
		Pesticides/PCBs														
	50-29-3	4,4'-DDT	4.2E-03	2.1E-02	mg/kg	45TP1A	2/22	0.0011 - 0.0014	2.1E-02	1.9E+00	C	8.4E+00	C	IND	N	BSL
	33213-65-9	Endosulfan II	3.6E-02	3.6E-02	mg/kg	45TP2A	1/22	0.00093 - 0.0012	3.6E-02	4.7E+01	N	6.1E+02	N	IND	N	BSL
	5103-74-2	gamma-Chlordane	1.4E-03	1.4E-03	mg/kg	45SB8A	1/22	0.00051 - 0.00065	1.4E-03	1.8E+00	C	8.2E+00	C	IND	N	BSL
	11097-69-1	Aroclor 1254 [4]	9.7E-03	1.2E+00	mg/kg	45TP4B	12/22	0.0048 - 0.011	1.2E+00	1.6E-01	N	1.4E+00	C	IND	Y	**ARES**
	11096-82-5	Aroclor 1260	6.3E-01	6.3E-01	mg/kg	45TP2A	1/22	0.017 - 0.041	6.3E-01	3.2E-01	C	1.4E+00	C	IND	Y	**ARES**
		TCL VOCs														
	120-82-1	1,2,4-Trichlorobenzene	4.8E-04	4.8E-04	mg/kg	45TP6B	1/22	0.00026 - 0.00033	4.8E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	78-93-3	2-Butanone	6.8E-03	3.2E-01	mg/kg	45TP1A	16/22	0.0026 - 0.0033	3.2E-01	4.7E+03	N	6.1E+04	N	IND	N	BSL
	67-64-1	Acetone	3.8E-02	9.2E-01	mg/kg	45TP1A	22/22	0.0046 - 0.0058	9.2E-01	7.0E+03	N	9.2E+04	N	IND	N	BSL
	71-43-2	Benzene	1.8E-04	5.1E-04	mg/kg	45TP4A	6/22	0.00014 - 0.00018	5.1E-04	1.2E+01	C	5.2E+01	C	IND	N	BSL
	74-83-9	Bromomethane	1.8E-03	1.8E-03	mg/kg	45TP4B	1/22	0.0013 - 0.0017	1.8E-03	1.1E+01	N	1.4E+02	N	IND	N	BSL
	75-15-0	Carbon Disulfide	1.9E-03	9.8E-03	mg/kg	45TP6B	19/22	0.00029 - 0.00036	9.8E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	108-90-7	Chlorobenzene	5.1E-04	5.1E-04	mg/kg	45TP6B	1/22	0.00022 - 0.00028	5.1E-04	1.6E+02	N	2.0E+03	N	IND	N	BSL
	67-66-3	Chloroform	2.8E-04	4.2E-04	mg/kg	45SB14B	5/22	0.00016 - 0.0002	4.2E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	98-82-8	Isopropylbenzene	4.6E-03	4.6E-03	mg/kg	45TP6B	1/22	0.00013 - 0.00017	4.6E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	79-20-9	Methyl Acetate	1.6E-03	1.6E-02	mg/kg	45SB1A	17/22	0.00091 - 0.0011	1.6E-02	7.8E+03	N	1.0E+05	N	IND	N	BSL
	75-09-2	Methylene Chloride	4.5E-03	5.4E-03	mg/kg	45TP6B	2/22	0.0043 - 0.0054	5.4E-03	8.5E+01	C	3.8E+02	C	IND	N	BSL
	108-88-3	Toluene	2.1E-03	2.1E-03	mg/kg	45SB5A	1/22	0.00044 - 0.00055	2.1E-03	6.3E+02	N	8.2E+03	N	IND	N	BSL
	1330-20-7	Xylenes	1.3E-02	1.3E-02	mg/kg	45TP6B	1/22	0.00064 - 0.00081	1.3E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
		TCL SVOCs														
	92-52-4	1,1'-Biphenyl	5.5E-04	3.3E-03	mg/kg	45TP6B	11/22	0.0005 - 0.0026	3.3E-03	3.9E+02	N	5.1E+03	N	IND	N	BSL
	91-57-6	2-Methylnaphthalene	7.6E-04	2.8E-02	mg/kg	45TP6B	12/22	0.00052 - 0.0027	2.8E-02	3.1E+01	N	4.1E+02	N	IND	N	BSL
	83-32-9	Acenaphthene	5.3E-04	1.8E-03	mg/kg	45TP2A	6/22	0.00043 - 0.0023	1.8E-03	4.7E+02	N	6.1E+03	N	IND	N	BSL
	208-96-8	Acenaphthylene [5]	8.6E-04	3.1E-03	mg/kg	45TP7A	6/22	0.00065 - 0.0034	3.1E-03	2.3E+02	N	3.1E+03	N	IND	N	BSL
	120-12-7	Anthracene	5.4E-04	5.0E-03	mg/kg	45TP2A	8/22	0.00046 - 0.0024	5.0E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	100-52-7	Benzaldehyde	4.0E-02	8.1E-02	mg/kg	45TP6B	3/22	0.028 - 0.15	8.1E-02	7.8E+02	N	1.0E+04	N	IND	N	BSL
	56-55-3	Benzo(a)anthracene	1.1E-03	4.9E-02	mg/kg	45TP2A	16/22	0.00058 - 0.0031	4.9E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	50-32-8	Benzo(a)pyrene	1.1E-02	4.3E-02	mg/kg	45TP2A	6/22	0.0011 - 0.0059	4.3E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	205-99-2	Benzo(b)fluoranthene	1.1E-02	8.2E-02	mg/kg	45TP2A	10/22	0.00092 - 0.0049	8.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	191-24-2	Benzo(g,h,i)perylene [5]	1.7E-02	3.8E-02	mg/kg	45TP2A	4/22	0.0025 - 0.013	3.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	207-08-9	Benzo(k)fluoranthene	1.3E-03	2.0E-02	mg/kg	45TP2A	11/22	0.00078 - 0.0041	2.0E-02	2.2E+00	C	3.9E+01	C	IND	N	BSL
	117-81-7	Bis(2-ethylhexyl)phthalate	1.3E-03	1.2E-01	mg/kg	45TP1A	12/22	0.0014 - 0.0074	1.2E-01	4.6E+01	C	2.0E+02	C	IND	N	BSL
	85-68-7	Butyl Benzyl Phthalate	2.9E-03	1.8E-02	mg/kg	45TP1A	10/22	0.0023 - 0.012	1.8E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
	218-01-9	Chrysene	7.6E-04	3.0E-02	mg/kg	45TP2A	15/22	0.00052 - 0.0027	3.0E-02	2.2E+01	C	3.9E+02	C	IND	N	BSL
	53-70-3	Dibenz(a,h)anthracene	2.8E-02	2.8E-02	mg/kg	45TP2A	1/22	0.00058 - 0.0031	2.8E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	132-64-9	Dibenzofuran	4.3E-04	2.3E-03	mg/kg	45TP1A	7/22	0.00029 - 0.0015	2.3E-03	7.8E+00	N	1.0E+02	N	IND	N	BSL
	84-66-2	Diethyl Phthalate	7.2E-04	7.8E-03	mg/kg	45TP6B	20/22	0.0004 - 0.0021	7.8E-03	6.3E+03	N	8.2E+04	N	IND	N	BSL
	131-11-3	Dimethyl Phthalate	8.3E-04	8.3E-04	mg/kg	45TP4A	1/22	0.00037 - 0.0019	8.3E-04	--	--	--	--	--	Y	NSV
	84-74-2	Di-n-butyl Phthalate	6.7E-03	3.4E+00	mg/kg	45SB8A	22/22	0.0013 - 0.0069	3.4E+00	7.8E+02	N	1.0E+04	N	IND	N	BSL
	117-84-0	Di-n-octyl Phthalate	2.7E-02	3.3E-02	mg/kg	45TP6B	3/22	0.011 - 0.056	3.3E-02	--	--	--	--	--	Y	NSV
	206-44-0	Fluoranthene	5.2E-03	6.0E-02	mg/kg	45TP2A	7/22	0.0041 - 0.022	6.0E-02	3.1E+02	N	4.1E+03	N	IND	N	BSL

Table 4-4
SWMU 45 COPC Determination - Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
	86-73-7	Fluorene	2.9E-04	3.7E-03	mg/kg	45TP6B	7/22	0.0003 - 0.0016	3.7E-03	3.1E+02	N	4.1E+03	N	IND	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.6E-02	4.2E-02	mg/kg	45TP2A	4/22	0.00076 - 0.004	4.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	78-59-1	Isophorone	7.3E-04	7.4E-03	mg/kg	45TP6B	20/22	0.00044 - 0.0023	7.4E-03	6.7E+02	C	3.0E+03	C	IND	N	BSL
	91-20-3	Naphthalene	5.1E-03	4.7E-02	mg/kg	45TP6B	22/22	0.00025 - 0.0013	4.7E-02	1.6E+02	N	2.0E+03	N	IND	N	BSL
	86-30-6	N-Nitrosodiphenylamine	7.7E-03	3.7E-01	mg/kg	45SB8A	5/22	0.00087 - 0.0046	3.7E-01	1.3E+02	C	5.8E+02	C	IND	N	BSL
	85-01-8	Phenanthrene [5]	5.0E-03	2.8E-02	mg/kg	45TP2A	5/22	0.0039 - 0.021	2.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	108-95-2	Phenol	1.1E-03	3.8E-03	mg/kg	45TP3A	16/22	0.00076 - 0.004	3.8E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	129-00-0	Pyrene	3.8E-04	5.2E-02	mg/kg	45TP2A	16/22	0.00034 - 0.0018	5.2E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
		Nitroglycerin/PETN														
	55-63-0	Nitroglycerin	3.8E+00	3.8E+00	mg/kg	45TP2A	1/22	0.39 - 0.39	3.8E+00	7.8E-01	N	1.0E+01	N	IND	Y	**ARES**

Notes:

COPC = Chemical of Potential Concern
mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
PETN = Pentaerythritol Tetranitrate
RBC = USEPA Region III Risk-Based Concentration
(RBC) values from the October 11, 2007,
RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
(N/C) = Noncarcinogenic/Carcinogenic per EPA RBC Table (October 2007)
-- = No Value Available
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance
[3] = Mercuric chloride soil RBC value used
[4] = Noncarcinogenic Residential RBC value for Aroclor 1254 was used for screening
[5] = Pyrene RBCs used

ARAR = Applicable, Relevant, and Appropriate Requirement
TBC = To-Be-Considered
IND = Adjusted Industrial RBC
AL = USEPA Action Level
RDA = Recommended Daily Allowance

ARES = Above Residential RBC
ARES/IND = Above Residential RBC/Industrial RBC
BSL = Below Residential/Industrial RBC Screening Levels
NSV = No Screening Value Available

Table 4-5
Groundwater COPC Selection
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	C/N	Adjusted Tap Water RBC	MCL	COPC Flag (Y/N)	Rationale for Selection or Deletion
Perchlorate													
Perchlorate	14797-73-0	0.645	4.7	ug/L	45MW1	4/4	0.015 - 0.015	4.7	N	2.555	--	Y	**ARBC**
TAL Metals													
Aluminum, Total	7429-90-5	210	2,400	ug/L	45MW4	4/4	20 - 20	2,400	N	3,650	--	N	BSL
Antimony, Dissolved	7440-36-0	0.43	1.1	ug/L	45MW3	2/4	0.32 - 0.32	1.1	N	1.46	--	N	BSL
Antimony, Total	7429-90-5	0.6	0.6	ug/L	45MW1	1/4	0.32 - 0.32	0.6	N	3,650	--	N	BSL
Arsenic, Total	7440-38-2	0.56	0.56	ug/L	45MW4	1/4	0.24 - 0.24	0.56	C	0.0446	10	Y	**ARBC**
Barium, Dissolved	7440-39-3	42	66	ug/L	45MW1	4/4	0.23 - 0.23	66	N	730	2,000	N	BSL
Barium, Total	7440-39-3	46	80	ug/L	45MW4	4/4	0.23 - 0.23	80	N	730	2,000	N	BSL
Cadmium, Total	7440-43-9	0.046	0.11	ug/L	45MW4	3/4	0.056 - 0.056	0.11	N	1.825	5	N	BSL
Chromium, Dissolved [1]	7440-47-3	1.6	3.8	ug/L	45MW1	4/4	0.33 - 0.33	3.8	C	10.95	100	N	BSL
Chromium, Total [1]	7440-47-3	4.2	11	ug/L	45MW4	4/4	0.33 - 0.33	11	C	10.95	100	Y	**ARBC**
Cobalt, Dissolved	7440-48-4	0.43	1.9	ug/L	45MW3	4/4	0.05 - 0.05	1.9	--	--	--	Y	NSV
Cobalt, Total	7440-48-4	2.9	7.3	ug/L	45MW2 DUP AVG	4/4	0.05 - 0.05	7.3	--	--	--	Y	NSV
Copper, Dissolved	7440-50-8	0.31	0.79	ug/L	45MW1	3/4	0.29 - 0.29	0.79	N	146	1,300	N	BSL
Copper, Total	7440-50-8	0.86	4.8	ug/L	45MW1	4/4	0.29 - 0.29	4.8	N	146	1,300	N	BSL
Iron, Dissolved	7439-89-6	7.4	26	ug/L	45MW4	2/4	9.6 - 9.6	26	N	2,555	--	N	BSL
Iron, Total	7439-89-6	480	4,100	ug/L	45MW4	4/4	9.6 - 9.6	4,100	N	2,555	--	Y	**ARBC**
Lead, Dissolved [2]	7439-92-1	0.36	0.36	ug/L	45MW1	1/4	0.29 - 0.29	0.36	--	15	--	N	BSL
Lead, Total [2]	7439-92-1	0.985	7.9	ug/L	45MW1	3/4	0.29 - 0.29	7.9	--	15	--	N	BSL
Manganese, Dissolved	7439-96-5	1.3	9.5	ug/L	45MW4	4/4	0.3 - 0.3	9.5	N	73	--	N	BSL
Manganese, Total	7439-96-5	32	190	ug/L	45MW4	4/4	0.3 - 0.3	190	N	73	--	Y	**ARBC**
Nickel, Dissolved	7440-02-0	0.75	8.1	ug/L	45MW4	4/4	0.35 - 0.35	8.1	N	73	--	N	BSL
Nickel, Total	7440-02-0	2.6	9.5	ug/L	45MW4	4/4	0.35 - 0.35	9.5	N	73	--	N	BSL
Selenium, Dissolved	7782-49-2	0.38	0.58	ug/L	45MW2 DUP AVG	3/4	0.3 - 0.3	0.58	N	18.25	--	N	BSL
Selenium, Total	7782-49-2	0.38	0.775	ug/L	45MW2 DUP AVG	4/4	0.3 - 0.3	0.775	N	18.25	--	N	BSL
Silver, Total	7440-22-4	0.19	0.4	ug/L	45MW2 DUP AVG	2/4	0.061 - 0.061	0.4	N	18.25	--	N	BSL
Vanadium, Dissolved	7440-62-2	0.31	0.5	ug/L	45MW4	4/4	0.27 - 0.27	0.5	N	3.65	--	N	BSL
Vanadium, Total	7440-62-2	0.83	6.6	ug/L	45MW4	4/4	0.27 - 0.27	6.6	N	3.65	--	Y	**ARBC**
Zinc, Dissolved	7440-66-6	2.7	7.55	ug/L	45MW2 DUP AVG	4/4	1.8 - 1.8	7.55	N	1,095	--	N	BSL
Zinc, Total	7440-66-6	3.9	10	ug/L	45MW4	4/4	1.8 - 1.8	10	N	1,095	--	N	BSL
Cyanide													
Cyanide, Total	57-12-5	2.21	2.855	ug/L	45MW2 DUP AVG	4/4	1.9 - 1.9	2.855	N	73	--	N	BSL
TCL VOCs													
Chloroform	67-66-3	0.7	0.7	ug/L	45MW1	1/4	0.061 - 0.061	0.7	C	0.155	80	Y	**ARBC**
Toluene	108-88-3	0.1	0.148	ug/L	45MW2 DUP AVG	2/4	0.072 - 0.072	0.148	N	227.1	1,000	N	BSL
TCL SVOCs													
1,1'-Biphenyl	92-52-4	0.03	0.03	ug/L	45MW4	1/4	0.015 - 0.015	0.03	N	30.42	--	N	BSL
2-Chlorophenol	95-57-8	0.06	0.06	ug/L	45MW4	1/4	0.016 - 0.016	0.06	N	3.042	--	N	BSL
2-Methylnaphthalene	91-57-6	0.03	0.03	ug/L	45MW4	1/4	0.015 - 0.015	0.03	N	2.433	--	N	BSL
Acenaphthene	83-32-9	0.02	0.02	ug/L	45MW4	1/4	0.013 - 0.013	0.02	N	36.5	--	N	BSL
Acenaphthylene [3]	208-96-8	0.02	0.02	ug/L	45MW4	1/4	0.012 - 0.012	0.02	N	18.25	--	N	BSL
Acetophenone	98-86-2	0.06	0.06	ug/L	45MW4	1/4	0.043 - 0.043	0.06	N	60.83	--	N	BSL
Bis(2-chloroethoxy)methane	111-91-1	0.03	0.03	ug/L	45MW4	1/4	0.016 - 0.016	0.03	--	--	--	Y	NSV
Bis(2-ethylhexyl) Phthalate	117-81-7	0.47	0.87	ug/L	45MW1	4/4	0.41 - 0.41	0.87	C	4.784	--	N	BSL
Butyl Benzyl Phthalate	85-68-7	0.25	0.41	ug/L	45MW4	3/4	0.029 - 0.029	0.41	N	730	--	N	BSL
Dibenzofuran	132-64-9	0.02	0.02	ug/L	45MW4	1/4	0.016 - 0.016	0.02	N	3.65	--	N	BSL
Diethylphthalate	84-66-2	0.05	0.165	ug/L	45MW2 DUP AVG	4/4	0.034 - 0.034	0.165	N	2,920	--	N	BSL
Di-n-butylphthalate	84-74-2	3.55	3.55	ug/L	45MW2 DUP AVG	1/4	0.38 - 0.38	3.55	N	365	--	N	BSL
Hexachloroethane	67-72-1	0.07	0.07	ug/L	45MW4	1/4	0.038 - 0.038	0.07	C	3.65	--	N	BSL
Naphthalene	91-20-3	0.04	0.04	ug/L	45MW4	1/4	0.023 - 0.023	0.04	N	0.651	--	N	BSL
Phenol	108-95-2	0.03	0.04	ug/L	45MW4	2/4	0.028 - 0.028	0.04	N	1,095	--	N	BSL
Explosives													
HMX	2691-41-0	0.77	0.77	ug/L	45MW3	1/4	0.2 - 0.2	0.77	N	182.5	--	N	BSL

Table 4-5
Groundwater COPC Selection
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Notes:

CAS = Chemical Abstracts Service
µg/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)
MCL = Maximum Contaminant Level
DUP AVG = averaged result for duplicate samples

ARBC = Above Tap Water RBC
BSL = Below Tap Water RBC/MCL

[1] = Chromium VI RBC used for screening
[2] = USEPA Action Level used for screening
[3] = Pyrene RBC used for screening

Table 4-6
Exposure Point Concentration Summary for Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Point		Chemical of Potential Concern	Units	Arithmetic Mean of Detects	UCL	Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil	7429-90-5	Aluminum	mg/kg	12,355	13,984	18,000	13,984	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-36-0	Antimony	mg/kg	1.083	2.922	4.6	2.922	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.0
	7440-38-2	Arsenic	mg/kg	4.127	7.505	12	7.505	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-43-9	Cadmium	mg/kg	2.144	2.245	6.2	2.245	mg/kg	95% KM (t) UCL	ProUCL 4.0
	7440-47-3	Chromium	mg/kg	29.14	38.99	79	38.99	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-48-4	Cobalt	mg/kg	7.65	8.587	9.1	8.587	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-50-8	Copper	mg/kg	157.8	1,177	1,100	1,100	mg/kg	Maximum Detected Concentration	EPC>MDC
	7439-89-6	Iron	mg/kg	26,091	32,490	47,000	32,490	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-92-1	Lead	mg/kg	163.1	361.1	760	361.1	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-96-5	Manganese	mg/kg	684.1	830.2	1,100	830.2	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-62-2	Vanadium	mg/kg	25.36	31.66	46	31.66	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-66-6	Zinc	mg/kg	539.8	1,218	2,500	1,218	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	11097-69-1	Aroclor 1254	mg/kg	0.1723	0.8937	0.73	0.73	mg/kg	Maximum Detected Concentration	EPC>MDC
	11096-82-5	Aroclor 1260*	mg/kg	--	--	0.63	0.63	mg/kg	Maximum Detected Concentration	--
	50-32-8	Benzo(a)pyrene	mg/kg	0.0258	0.0249	0.043	0.0249	mg/kg	95% KM (t) UCL	ProUCL 4.0
	53-70-3	Dibenz(a,h)anthracene*	mg/kg	--	--	0.028	0.028	mg/kg	Maximum Detected Concentration	--
	131-11-3	Dimethyl Phthalate*	mg/kg	--	--	0.00083	0.00083	mg/kg	Maximum Detected Concentration	--
	117-84-0	Di-n-octyl Phthalate*	mg/kg	--	--	0.027	0.027	mg/kg	Maximum Detected Concentration	--
	55-63-0	Nitroglycerin*	mg/kg	--	--	3.8	3.8	mg/kg	Maximum Detected Concentration	--

Notes:

UCL = Upper Confidence Limit

mg/kg = Milligram Per Kilogram

* Due to the low frequency of detection, a mean and UCL were not calculated.

EPC = Exposure Point Concentration

MDC = Maximum Detected Concentration

Table 4-7
Cumulative HHRS - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

CAS #	Chemical	Units	Detection Frequency	EPC	RBC Residential	C/N	RBC Industrial	C/N	Hazard (Residential)	Risk (Residential)	Hazard (Industrial)	Risk (Industrial)	Hazard Segregation Target Organ
	TAL Metals												
7429-90-5	Aluminum	mg/kg	11/11	13,984	78,214	N	1,022,000	N	2.E-01	--	1.E-02	--	developmental CNS
7440-36-0	Antimony	mg/kg	10/11	2.92	31.29	N	409	N	9.E-02	--	7.E-03	--	blood
7440-38-2	Arsenic	mg/kg	11/11	7.51	0.426	C	1.91	C	--	1.8.E-05	--	4.E-06	--
7440-38-2	Arsenic	mg/kg	11/11	7.51	23.5	N	307	N	3.E-01	--	2.E-02	--	skin/ vascular
7440-43-9	Cadmium	mg/kg	5/11	2.25	39.11	N	511	N	6.E-02	--	4.E-03	--	kidney
7440-47-3	Chromium [1]	mg/kg	11/11	39	234.6	N	3,066	N	1.7.E-01	--	1.E-02	--	GI tract/fetus/bone marrow/liver
7440-48-4	Cobalt	mg/kg	11/11	8.59	--	--	--	--	--	--	--	--	--
7440-50-8	Copper	mg/kg	11/11	1,100	3,129	N	40,880	N	3.5.E-01	--	3.E-02	--	GI tract
7439-89-6	Iron	mg/kg	11/11	32,490	54,750	N	715,400	N	6.E-01	--	5.E-02	--	blood/ liver/ GI tract
7439-92-1	Lead [2]	mg/kg	11/11	361.1	400	--	750	--	--	--	--	--	--
7439-96-5	Manganese	mg/kg	11/11	830.2	1,564	N	20,440	N	5.E-01	--	4.E-02	--	CNS
7440-62-2	Vanadium	mg/kg	11/11	31.7	78.21	N	1,022	N	4.E-01	--	3.E-02	--	kidney
7440-66-6	Zinc	mg/kg	11/11	1,218	23,464	N	306,600	N	5.E-02	--	4.E-03	--	blood
	PCBs												
11097-69-1	Aroclor 1254	mg/kg	8/11	0.73	0.32	C	1.43	C	--	2.E-06	--	5.E-07	--
11097-69-1	Aroclor 1254	mg/kg	8/11	0.73	1.56	N	20	N	4.7.E-01	--	4.E-02	--	eyes
11096-82-5	Aroclor 1260	mg/kg	1/11	0.63	0.32	C	1.43	C	--	2.E-06	--	4.E-07	--
	TCL SVOCs												
50-32-8	Benzo(a)pyrene	mg/kg	4/11	0.02488	0.022	C	0.392	C	--	1.E-06	--	6.E-08	--
53-70-3	Dibenz(a,h)anthracene	mg/kg	1/11	0.028	0.022	C	0.392	C	--	1.E-06	--	7.E-08	--
131-11-3	Dimethyl Phthalate	mg/kg	1/11	0.00083	--	--	--	--	--	--	--	--	--
117-84-0	Di-n-octyl Phthalate	mg/kg	1/11	0.02700	--	--	--	--	--	--	--	--	--
	Nitroglycerin									--	--	--	--
55-63-0	Nitroglycerin	mg/kg	1/11	3.8	3	C	10	C	--	1.E-06	--	4.E-07	--
55-63-0	Nitroglycerin	mg/kg	1/11	3.8	7.82	N	102	N	4.9.E-01	--	4.E-02	--	vascular
							Cumulative Risk/Hazard		4.E+00	3.E-05	3.E-01	5.E-06	

Target Organ Segregation

Total blood HI =	**0.7**	Total blood HI =	0.06
Total CNS HI =	**0.7**	Total CNS HI =	0.05
Total skin HI =	0.3	Total skin HI =	0.02
Total vascular HI =	**0.8**	Total vascular HI =	0.06
Total kidney HI =	**0.5**	Total kidney HI =	0.04
Total GI Tract HI =	**1.1**	Total GI Tract HI =	0.1
Total fetus HI =	0.2	Total fetus HI =	0.01
Total bone marrow HI =	0.2	Total bone marrow HI =	0.01
Total liver HI =	**0.8**	Total liver HI =	0.06
Total eyes HI =	**0.5**	Total eyes HI =	0.04

Notes:

mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Bipheny;
SVOC = Semivolatile Organic Compound
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance

EPC = Exposure Point Concentration
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)
Bold = Indicates a target organ HI >0.5

Table 4-8
Exposure Point Concentration Summary for Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Point		Chemical of Potential Concern	Units	Arithmetic Mean of Detects	UCL	Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Total Soil	7429-90-5	Aluminum	mg/kg	13,155	14,247	19,000	14,247	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-36-0	Antimony	mg/kg	2.761	17.02	33	17.02	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.0
	7440-38-2	Arsenic	mg/kg	2.525	5.55	12	5.55	mg/kg	95% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7440-43-9	Cadmium	mg/kg	1.719	1.423	6.2	1.423	mg/kg	95% KM (t) UCL	ProUCL 4.0
	7440-47-3	Chromium	mg/kg	32.32	63.42	170	63.42	mg/kg	95% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7440-48-4	Cobalt	mg/kg	8.393	9.028	11	9.028	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-50-8	Copper	mg/kg	109.5	672.6	1,100	672.6	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7439-89-6	Iron	mg/kg	24,273	27,495	47,000	27,495	mg/kg	95% Student's t UCL	ProUCL 4.0
	7439-92-1	Lead	mg/kg	100.4	492	760	492	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7439-96-5	Manganese	mg/kg	621.4	705.1	1,100	705.1	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-62-2	Vanadium	mg/kg	24.36	27.61	46	27.61	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-66-6	Zinc	mg/kg	350.4	1,635	2,500	1,635	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	11097-69-1	Aroclor 1254	mg/kg	0.2267	0.7791	1.2	0.7791	mg/kg	99% KM (Chebyshev) UCL	ProUCL 4.0
	11096-82-5	Aroclor 1260*	mg/kg	--	--	0.63	0.63	mg/kg	Maximum Detected Concentration	--
	50-32-8	Benzo(a)pyrene	mg/kg	0.02233	0.017	0.043	0.0170	mg/kg	95% KM (t) UCL	ProUCL 4.0
	53-70-3	Dibenz(a,h)anthracene*	mg/kg	--	--	0.028	0.028	mg/kg	Maximum Detected Concentration	--
	131-11-3	Dimethyl Phthalate*	mg/kg	--	--	0.00083	0.00083	mg/kg	Maximum Detected Concentration	--
	117-84-0	Di-n-octyl Phthalate*	mg/kg	--	--	0.033	0.033	mg/kg	Maximum Detected Concentration	--
	55-63-0	Nitroglycerin*	mg/kg	--	--	3.8	3.8	mg/kg	Maximum Detected Concentration	--

Notes:

FOD = frequency of detection

UCL = Upper Confidence Limit

mg/kg = Milligram Per Kilogram

* Due to the low frequency of detection, a mean and UCL were not calculated.

EPC = Exposure Point Concentration

MDC = Maximum Detected Concentration

Table 4-9
Cumulative HHRS - Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

CAS #	Chemical	Units	Detection Frequency	EPC	RBC Residential	C/N	RBC Industrial	C/N	Hazard (Residential)	Risk (Residential)	Hazard (Industrial)	Risk (Industrial)	Hazard Segregation Target Organ
	TAL Metals												
7429-90-5	Aluminum	mg/kg	22/22	14,247	78,214	N	1,022,000	N	2.E-01	--	1.E-02	--	developmental CNS
7440-36-0	Antimony	mg/kg	16/22	17	31	N	409	N	5.4.E-01	--	4.E-02	--	blood
7440-38-2	Arsenic	mg/kg	22/22	5.55	0.43	C	1.91	C	--	1.E-05	--	3.E-06	--
7440-38-2	Arsenic	mg/kg	22/22	5.55	23.5	N	307	N	2.E-01	--	2.E-02	--	skin/ vascular
7440-43-9	Cadmium	mg/kg	8/22	1.42	39	N	511	N	4.E-02	--	3.E-03	--	kidney
7440-47-3	Chromium [1]	mg/kg	22/22	63.4	235	N	3,066	N	3.E-01	--	2.E-02	--	GI tract/fetus/bone marrow/liver
7440-48-4	Cobalt	mg/kg	22/22	9.03	--	--	--	--	--	--	--	--	--
7440-50-8	Copper	mg/kg	22/22	672.6	3,129	N	40,880	N	2.E-01	--	2.E-02	--	GI tract
7439-89-6	Iron	mg/kg	22/22	27,495	54,750	N	715,400	N	5.E-01	--	4.E-02	--	blood/ liver/ GI tract
7439-92-1	Lead [2]	mg/kg	22/22	492	400	--	750	--	--	--	--	--	--
7439-96-5	Manganese	mg/kg	22/22	705	1,564	N	20,440	N	5.E-01	--	3.E-02	--	CNS
7440-62-2	Vanadium	mg/kg	22/22	27.6	78	N	1,022	N	4.E-01	--	3.E-02	--	kidney
7440-66-6	Zinc	mg/kg	22/22	1,635	23,464	N	306,600	N	7.E-02	--	5.E-03	--	blood
	PCBs												
11097-69-1	Aroclor 1254	mg/kg	12/22	0.78	0.32	C	1.43	C	--	2.E-06	--	5.E-07	--
11097-69-1	Aroclor 1254	mg/kg	12/22	0.78	1.56	N	20	N	5.E-01	--	4.E-02	--	eyes
11096-82-5	Aroclor 1260	mg/kg	1/22	0.63	0.32	C	1.43	C	--	2.E-06	--	4.E-07	--
	TCL SVOCs									--	--		
50-32-8	Benzo(a)pyrene	mg/kg	6/22	0.017	0.022	C	0.39	C	--	8.E-07	--	4.E-08	--
53-70-3	Dibenz(a,h)anthracene	mg/kg	1/22	0.028	0.022	C	0.39	C	--	1.E-06	--	7.E-08	--
131-11-3	Dimethyl Phthalate	mg/kg	1/22	0.00083	--	--	--	--	--	--	--	--	--
117-84-0	Di-n-octyl Phthalate	mg/kg	3/22	0.033	--	--	--	--	--	--	--	--	--
	Nitroglycerin									--	--	--	--
55-63-0	Nitroglycerin	mg/kg	1/22	3.8	3	C	10	C	--	1.E-06	--	4.E-07	--
55-63-0	Nitroglycerin	mg/kg	1/22	3.8	7.82	N	102	N	4.9.E-01	--	4.E-02	--	vascular
							Cumulative Risk/Hazard		4.E+00	2.E-05	3.E-01	4.E-06	

Target Organ Segregation

Total blood HI =	**1.1**	Total blood HI =	0.09
Total CNS HI =	**0.6**	Total CNS HI =	0.05
Total skin HI =	0.2	Total skin HI =	0.02
Total vascular HI =	**0.7**	Total vascular HI =	0.06
Total kidney HI =	0.4	Total kidney HI =	0.03
Total GI Tract HI =	**1.0**	Total GI Tract HI =	0.1
Total fetus HI =	0.3	Total fetus HI =	0.02
Total bone marrow HI =	0.3	Total bone marrow HI =	0.02
Total liver HI =	**0.8**	Total liver HI =	0.06
Total eyes HI =	**0.5**	Total eyes HI =	0.04

Notes:

mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Bipheny;
SVOC = Semivolatile Organic Compound
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance

EPC = Exposure Point Concentration
HI = Hazard Index
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)
Bold = Indicates a target organ HI >0.5

Table 4-10
Cumulative HHRS - Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

CAS #	Chemical	Units	Detection Frequency	MDC	Tap Water RBC	C/N	Non Carcinogenic HI	Excess Cancer Risk	Noncarcinogenic Target Organ
14797-73-0	Perchlorate	ug/L	4/4	4.7	25.55	N	2.E-01	--	thyroid
7440-48-4	Cobalt	ug/L	4/4	1.9	--	--	--	--	--
111-91-1	bis(2-chloroethyloxy)methane	ug/L	1/4	0.03	--	--	--	--	--
67-66-3	Chloroform	ug/L	1/4	0.7	0.155	C	--	5.E-06	--
					Cumulative Risk/Hazard		2.E-01	5.E-06	

Target Organ Segregation

Total thyroid HI across all media = 0.2

Notes:

µg/L = Microgram Per Liter
CAS = Chemical Abstracts Service
MDC = Maximum Detected Concentration
HI = Hazard Index
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)

Table 4-11
SSL Screening
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	SSL (DAF 20)	COPC Flag (Y/N)	Rationale for Selection or Deletion
TAL Metals											
Aluminum	7429-90-5	9,100	19,000	mg/kg	45SB14B	22/22	2 - 200	19,000	--	Y	NSV
Antimony	7440-36-0	0.046	33	mg/kg	45TP4B	16/22	0.026 - 0.026	33	13.2	Y	**ASSL**
Arsenic	7440-38-2	0.57	12	mg/kg	45TP3A	22/22	0.026 - 0.026	12	0.026	Y	**ASSL**
Barium	7440-39-3	62	300	mg/kg	45TP4B	22/22	0.33 - 1.7	300	6,015	N	BSL
Beryllium	7440-41-7	0.55	1.6	mg/kg	45TP4B	22/22	0.061 - 0.061	1.6	1,154	N	BSL
Cadmium	7440-43-9	0.49	6.2	mg/kg	45TP2A	8/22	0.45 - 0.45	6.2	27.45	N	BSL
Chromium [1]	7440-47-3	16	170	mg/kg	45TP4B	22/22	0.8 - 0.8	170	42.05	Y	**ASSL**
Cobalt	7440-48-4	3.8	11	mg/kg	45SB14B	22/22	0.53 - 0.53	11	--	Y	NSV
Copper	7440-50-8	6.3	1,100	mg/kg	45TP2A	22/22	0.027 - 1.1	1,100	10,518	N	BSL
Iron	7439-89-6	14,000	47,000	mg/kg	45TP4A	22/22	0.98 - 980	47,000	--	Y	NSV
Lead	7439-92-1	7.7	760	mg/kg	45TP4A	22/22	0.024 - 0.47	760	--	Y	NSV
Manganese	7439-96-5	250	1,100	mg/kg	45TP4A	22/22	0.18 - 3.5	1,100	951.92	Y	**ASSL**
Mercury	7439-97-6	0.0087	0.22	mg/kg	45TP2A	21/22	0.0075 - 0.0075	0.22	--	Y	NSV
Nickel	7440-02-0	6.6	34	mg/kg	45TP4B	22/22	0.035 - 0.035	34	--	Y	NSV
Selenium	7782-49-2	0.036	0.87	mg/kg	45TP6A	18/22	0.028 - 0.028	0.87	18.98	N	BSL
Silver	7440-22-4	0.024	0.73	mg/kg	45TP2A	22/22	0.0093 - 0.0093	0.73	31.03	N	BSL
Thallium	7440-28-0	0.1	0.54	mg/kg	45TP3A	22/22	0.0068 - 0.0068	0.54	3.64	N	BSL
Vanadium	7440-62-2	15	46	mg/kg	45TP4A	22/22	0.032 - 0.063	46	730	N	BSL
Zinc	7440-66-6	36	2,500	mg/kg	45TP2A	22/22	0.49 - 9.7	2,500	13,622	N	BSL
Cyanide											
Cyanide	57-12-5	0.11	0.24	mg/kg	45TP6A	10/22	0.088 - 0.11	2.4E-01	147	N	BSL
Pesticides/PCBs											
4,4'-DDT	50-29-3	4.2	21	µg/kg	45TP1A	2/22	1.1 - 1.4	2.1E+01	1.2E+03	N	BSL
Endosulfan II	33213-65-9	36	36	µg/kg	45TP2A	1/22	0.93 - 1.2	3.6E+01	--	Y	NSV
gamma-Chlordane	5103-74-2	1.4	1.4	µg/kg	45SB8A	1/22	0.51 - 0.65	1.4E+00	--	Y	NSV
Aroclor 1254	11097-69-1	9.7	1,200	µg/kg	45TP4B	12/22	4.8 - 11	1.2E+03	1.1E+03	Y	**ASSL**
Aroclor 1260	11096-82-5	630	630	µg/kg	45TP2A	1/22	17 - 41	6.3E+02	--	Y	NSV
TCL VOCs											
1,2,4-Trichlorobenzene	120-82-1	0.48	0.48	µg/kg	45TP6B	1/22	0.26 - 0.33	4.8E-01	2.4E+03	N	BSL
2-Butanone	78-93-3	6.75	320	µg/kg	45TP1A	16/22	2.6 - 3.3	3.2E+02	2.9E+04	N	BSL
Acetone	67-64-1	38	920	µg/kg	45TP1A	22/22	4.6 - 5.8	9.2E+02	2.2E+04	N	BSL
Benzene	71-43-2	0.18	0.51	µg/kg	45TP4A	6/22	0.14 - 0.18	5.1E-01	1.9E+00	N	BSL
Bromomethane	74-83-9	1.8	1.8	µg/kg	45TP4B	1/22	1.3 - 1.7	1.8E+00	4.1E+01	N	BSL
Carbon Disulfide	75-15-0	1.9275	9.8	µg/kg	45TP6B	19/22	0.29 - 0.36	9.8E+00	1.9E+04	N	BSL
Chlorobenzene	108-90-7	0.51	0.51	µg/kg	45TP6B	1/22	0.22 - 0.28	5.1E-01	6.8E+02	N	BSL
Chloroform	67-66-3	0.28	0.42	µg/kg	45SB14B	5/22	0.16 - 0.2	4.2E-01	9.1E-01	N	BSL
Isopropylbenzene	98-82-8	4.6	4.6	µg/kg	45TP6B	1/22	0.13 - 0.17	4.6E+00	6.4E+04	N	BSL
Methyl Acetate	79-20-9	1.6	16	µg/kg	45SB1A	17/22	0.91 - 1.1	1.6E+01	2.5E+04	N	BSL
Methylene Chloride	75-09-2	4.5	5.4	µg/kg	45TP6B	2/22	4.3 - 5.4	5.4E+00	1.9E+01	N	BSL
Toluene	108-88-3	2.1	2.1	µg/kg	45SB5A	1/22	0.44 - 0.55	2.1E+00	2.7E+04	N	BSL
Xylenes	1330-20-7	13	13	µg/kg	45TP6B	1/22	0.64 - 0.81	1.3E+01	3.0E+03	N	BSL
TCL SVOCs											
1,1'-Biphenyl	92-52-4	0.55	3.3	µg/kg	45TP6B	11/22	0.5 - 2.6	3.3E+00	9.6E+04	N	BSL
2-Methylnaphthalene	91-57-6	0.76	28	µg/kg	45TP6B	12/22	0.52 - 2.7	2.8E+01	4.4E+03	N	BSL

Table 4-11
SSL Screening
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	SSL (DAF 20)	COPC Flag (Y/N)	Rationale for Selection or Deletion
Acenaphthene	83-32-9	0.53	1.8	µg/kg	45TP2A	6/22	0.43 - 2.3	1.8E+00	1.0E+05	N	BSL
Acenaphthylene	208-96-8	0.86	3.1	µg/kg	45TP7A	6/22	0.65 - 3.4	3.1E+00	--	Y	NSV
Anthracene	120-12-7	0.54	5	µg/kg	45TP2A	8/22	0.46 - 2.4	5.0E+00	4.7E+05	N	BSL
Benzaldehyde	100-52-7	40	81	µg/kg	45TP6B	3/22	28 - 150	8.1E+01	--	Y	NSV
Benzo(a)anthracene	56-55-3	1.1	49	µg/kg	45TP2A	16/22	0.58 - 3.1	4.9E+01	4.8E+02	N	BSL
Benzo(a)pyrene	50-32-8	11	43	µg/kg	45TP2A	6/22	1.1 - 5.9	4.3E+01	1.2E+02	N	BSL
Benzo(b)fluoranthene	205-99-2	11	82	µg/kg	45TP2A	10/22	0.92 - 4.9	8.2E+01	1.5E+03	N	BSL
Benzo(g,h,i)perylene	191-24-2	17	38	µg/kg	45TP2A	4/22	2.5 - 13	3.8E+01	--	Y	NSV
Benzo(k)fluoranthene	207-08-9	1.3	20	µg/kg	45TP2A	11/22	0.78 - 4.1	2.0E+01	1.5E+04	N	BSL
Bis(2-ethylhexyl)phthalate	117-81-7	1.325	120	µg/kg	45TP1A	12/22	1.4 - 7.4	1.2E+02	2.9E+06	N	BSL
Butyl Benzyl Phthalate	85-68-7	2.9	18	µg/kg	45TP1A	10/22	2.3 - 12	1.8E+01	1.7E+07	N	BSL
Chrysene	218-01-9	0.76	30	µg/kg	45TP2A	15/22	0.52 - 2.7	3.0E+01	4.8E+04	N	BSL
Dibenz(a,h)anthracene	53-70-3	28	28	µg/kg	45TP2A	1/22	0.58 - 3.1	2.8E+01	4.6E+02	N	BSL
Dibenzofuran	132-64-9	0.43	2.3	µg/kg	45TP1A	7/22	0.29 - 1.5	2.3E+00	--	Y	NSV
Diethyl Phthalate	84-66-2	0.72	7.8	µg/kg	45TP6B	20/22	0.4 - 2.1	7.8E+00	4.5E+05	N	BSL
Dimethyl Phthalate	131-11-3	0.83	0.83	µg/kg	45TP4A	1/22	0.37 - 1.9	8.3E-01	--	Y	NSV
Di-n-butyl Phthalate	84-74-2	6.7	3,400	µg/kg	45SB8A	22/22	1.3 - 6.9	3.4E+03	5.0E+06	N	BSL
Di-n-octyl Phthalate	117-84-0	27	33	µg/kg	45TP6B	3/22	11 - 56	3.3E+01	--	Y	NSV
Fluoranthene	206-44-0	5.2	60	µg/kg	45TP2A	7/22	4.1 - 22	6.0E+01	6.3E+06	N	BSL
Fluorene	86-73-7	0.29	3.7	µg/kg	45TP6B	7/22	0.3 - 1.6	3.7E+00	1.4E+05	N	BSL
Indeno(1,2,3-cd)pyrene	193-39-5	26	42	µg/kg	45TP2A	4/22	0.76 - 4	4.2E+01	4.2E+03	N	BSL
Isophorone	78-59-1	0.73	7.4	µg/kg	45TP6B	20/22	0.44 - 2.3	7.4E+00	4.1E+02	N	BSL
Naphthalene	91-20-3	5.1	47	µg/kg	45TP6B	22/22	0.25 - 1.3	4.7E+01	1.5E+02	N	BSL
N-Nitrosodiphenylamine	86-30-6	7.7425	370	µg/kg	45SB8A	5/22	0.87 - 4.6	3.7E+02	7.6E+02	N	BSL
Phenanthrene	85-01-8	5	28	µg/kg	45TP2A	5/22	3.9 - 21	2.8E+01	--	Y	NSV
Phenol	108-95-2	1.1	3.8	µg/kg	45TP3A	16/22	0.76 - 4	3.8E+00	6.7E+04	N	BSL
Pyrene	129-00-0	0.38	52	µg/kg	45TP2A	16/22	0.34 - 1.8	5.2E+01	6.8E+05	N	BSL
Nitroglycerin/PETN											
Nitroglycerin	55-63-0	3.8	3.8	mg/kg	45TP2A	1/22	0.39 - 0.39	3.8E+00	--	Y	NSV

Notes:

CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
mg/kg = Milligram Per Kilogram
µg/kg = Microgram Per Kilogram
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PETN = Pentaerythritol Tetranitrate
[1] = Chromium VI SSL DAF20 value was used

SSL DAF20 = Soil Screening Levels at a Dilution Attenuation Factor of 20 per EPA (SSL) values from the October 11, 2007 RBC Table

ASSL = Above Soil Screening Level
BSL = Below Soil Screening Levels
NSV = No Screening Value Available

Table 4-12
COPC/Background Screening
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Surface Soil COPC/Background Comparison

CAS #	Chemical	Minimum Concentration Surface Soil	Maximum Concentration Surface Soil	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Point Estimate[A]	Background Comparison
	TAL Metals									
7429-90-5	Aluminum	9,100	18,000	mg/kg	45TP3A	11/11	2 - 200	18,000	40,041	N
7440-36-0	Antimony	0.074	4.6	mg/kg	45TP4A	10/11	0.026 - 0.026	4.6	--	NBE
7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	11/11	0.026 - 0.026	12	15.8	N
7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	5/11	0.45 - 0.45	6.2	0.69	**Y**
7440-47-3	Chromium	16	79	mg/kg	45TP4A	11/11	0.8 - 0.8	79	65.3	**Y**
7440-48-4	Cobalt	3.8	9.1	mg/kg	45TP5A	11/11	0.53 - 0.53	9.1	72.3	N
7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	11/11	0.027 - 1.1	1,100	53.5	**Y**
7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	11/11	0.98 - 490	47,000	50,962	N
7439-92-1	Lead	7.9	760	mg/kg	45TP4A	11/11	0.024 - 0.47	760	26.8	**Y**
7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	11/11	0.18 - 3.5	1,100	2,543	N
7440-62-2	Vanadium	16	46	mg/kg	45TP4A	11/11	0.032 - 0.032	46	108	N
7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	11/11	0.49 - 0.49	2,500	202	**Y**

Total Soil COPC/Background Comparison

CAS #	Chemical	Minimum Concentration Total Soil	Maximum Concentration Total Soil	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Point Estimate[A]	Background Comparison
	TAL Metals									
7429-90-5	Aluminum	9,100	19,000	mg/kg	45SB14B	22/22	2 - 200	19,000	40,041	N
7440-36-0	Antimony	0.046	33	mg/kg	45TP4B	16/22	0.026 - 0.026	33	--	NBE
7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	22/22	0.026 - 0.026	12	15.8	N
7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	8/22	0.45 - 0.45	6.2	0.69	**Y**
7440-47-3	Chromium	16	170	mg/kg	45TP4B	22/22	0.8 - 0.8	170	65.3	**Y**
7440-48-4	Cobalt	3.8	11	mg/kg	45SB14B	22/22	0.53 - 0.53	11	72.3	N
7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	22/22	0.027 - 1.1	1,100	53.5	**Y**
7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	22/22	0.98 - 980	47,000	50,962	N
7439-92-1	Lead	7.7	760	mg/kg	45TP4A	22/22	0.024 - 0.47	760	26.8	**Y**
7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	22/22	0.18 - 3.5	1,100	2,543	N
7440-62-2	Vanadium	15	46	mg/kg	45TP4A	22/22	0.032 - 0.063	46	108	N
7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	22/22	0.49 - 9.7	2,500	202	**Y**

Notes:

CAS = Chemical Abstracts Service
TAL = Target Analyte List
NBE = No Background Estimate Available
mg/kg = Milligram Per Kilogram
[A] = Facility-Wide Background Point Estimate as Reported in the Facility-Wide Background Study Report (IT 2001)

5.0 HUMAN HEALTH RISK ASSESSMENT

This human health risk assessment (HHRA) evaluates the probability and magnitude of potential adverse effects on human health associated with exposure to site-related chemicals in soil and groundwater. Refer to Section 2.0 for additional information regarding the site background. The HHRA was conducted for the site consistent with guidance included in EPA's *Interim Final Risk Assessment Guidance for Superfund* (RAGS), as well as other USEPA guidance (USEPA 1989; 1991; 1997a; 2001b; 2002c; and 2004b). Guidance documents are also noted on the RAGS Part D tables provided in Appendix E.1.

This HHRA consists of the following six sections:

- **Section 5.1: Data Summary and Selection of COPCs:** Relevant site data are gathered, examined, and discussed. Basic constituent statistics and screening levels are summarized. COPCs are identified by comparison to screening criteria as discussed in Section 5.1.2;
- **Section 5.2: Exposure Assessment:** Potentially exposed populations (e.g., receptors) and exposure routes are identified, and exposure point concentrations (EPCs) are calculated for COPCs. Standard exposure factors and health-protective assumptions are used to assess the magnitude, frequency, and duration of exposure for each exposure route and intakes are calculated;
- **Section 5.3: Toxicity Assessment:** Toxicity criteria for COPCs are gathered and presented;
- **Section 5.4: Risk Characterization:** Quantitative risks and hazards are estimated and summarized by combining toxicity criteria with intakes for each exposure route;
- **Section 5.5: Uncertainties Analysis:** Uncertainties, "including uncertainties in the physical setting definition for the site, in the models used, in the exposure parameters, and in the toxicity assessment" (USEPA 1989) are discussed; and
- **Section 5.6: Summary and Conclusions:** The results of the HHRA are summarized.

As previously stated, the tabulated risk assessment results are presented in accordance with USEPA guidance described in RAGS: Volume I - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (USEPA 2001b). RAGS D requires the risk assessment results to be presented in a series of standardized tables, which are presented in Appendix E.1.

5.1 DATA SUMMARY AND SELECTION OF COPCS

5.1.1 Data Summary

Table 5-1 identifies the samples used in the COPC screening for soil. Data from the groundwater samples collected from 45MW1, 45MW2, 45MW3, and 45MW4 were used in the COPC screening for groundwater. Refer to Section 4.0 for complete data tables for detected analytes for each media. Additional information regarding the data used in the HHRA is summarized below:

- Flagged data such as J-flagged data (estimated concentration) and B-flagged data (detected in an associated blank) are considered detections and are used without modification;
- Rejected results (R-flagged) are not used;
- Data from duplicate sample pairs are averaged and treated as one result. If an analyte is detected in one of the sample pair, one half the detection limit of the non-detect is averaged with the detected result and the result is considered detected; and

- Chemicals that were not detected in at least one sample were considered as uncertain analytes in the evaluation of risk. Other qualified analytical data were retained in the assessment.

Additional information regarding specific soil and groundwater samples used in the HHRA is provided in Sections 5.1.1.1 and 5.1.1.2.

5.1.1.1 Surface Soil and Total Soil

As presented in Table 5-1, soil samples collected during sampling events completed in 2008 for the SSP investigation were used for the COPC screenings. In addition in Table 5-1, the soil samples for the site have been divided into surface soil (0 to 1 ft bgs) and subsurface soil (1 to 11 ft bgs). The two soil data groupings used for COPC screening and the HHRA are surface soil (0 to 1 ft bgs) and total soil (0 to 15 ft bgs). The total soil data grouping consists of combining surface and subsurface soil to address mixing of potential constituents in soil during construction or land development activities. A total of 11 surface soil samples and 11 subsurface soil samples were used in the HHRA. Refer to Figure 3-1 for boring and monitoring well locations.

5.1.1.2 Groundwater

Groundwater samples collected from 45MW1, 45MW2, 45MW3, and 45MW4 during the sampling event completed in 2008 for the SSP were used for the COPC screening.

5.1.2 Identification of COPCs

COPCs were identified for the site by comparing the MDC to the following screening levels for each media: USEPA Region III R-RBCs and I-RBCs (surface soil and total soil) and T-RBCs (groundwater) as presented in the October 2007 USEPA Region III RBC and Alternate RBC Tables (USEPA 2007b). The lowest screening criterion for each medium was used to identify the COPCs. In accordance with USEPA Region III guidance, RBCs for non-carcinogenic chemicals were adjusted downward to a HQ of 0.1 to ensure that chemicals with additive effects were not prematurely eliminated during screening.

For nutrients detected in soil (calcium, potassium, magnesium, and sodium) that have no available RBC, the MDC was compared to the RDA-derived soil ingestion screening criteria. RDAs used to calculate the RDA-derived ingestion screening criteria were obtained from Recommended Dietary Allowances, 10th edition ©1989 by the National Academy of Sciences (National Academy Press, Washington, D.C.). Table 5-2 presents the equation, exposure parameters, and RDAs used, as well as the calculated screening criteria for the adult resident and child resident receptors. The lowest screening criterion for each nutrient (e.g., the screening criteria for the child resident) was selected as the screening criterion.

A lead evaluation, completed as part of the site screening process presented in Section 4.2.3, resulted in modeled blood lead levels below the established threshold; therefore, lead is not assessed further in the HHRA.

Analytes detected at a maximum concentration greater than the corresponding adjusted RBC or screening values identified above (or those for which no screening criteria exists) were selected as COPCs. COPC screening tables the site are presented in Appendix E.1, Tables E.1-2.1 (COPC Determination - Surface Soil), E.1-2.2 (COPC Determination - Total Soil), E.1-2.3 (Non-Detect Screening - Soil), E.1-2.4 (COPC Determination - Groundwater), and E.1-2.5 (Groundwater Non-Detect Screening). A summary of the results of the human health COPC screenings for the site are presented in the table below.

Human Health COPCs Identified

Chemical	Surface Soil	Total Soil	Groundwater
Aluminum	X	X	
Antimony	X	X	

Chemical	Surface Soil	Total Soil	Groundwater
Arsenic	X	X	
Cadmium	X	X	
Chromium	X	X	
Copper	X	X	
Cobalt*	X	X	X
Iron	X	X	
Manganese	X	X	
Vanadium	X	X	
Zinc	X	X	
Aroclor 1254	X	X	
Aroclor 1260	X	X	
Benzo(a)pyrene	X	X	
Dibenz(a,h)anthracene	X	X	
Dimethylphthalate*	X	X	
Di-n-octylphthalate*	X	X	
Nitroglycerin	X	X	
Bis(2-chloroethoxy)methane*			X
Perchlorate			X
Chloroform			X

Note: * denotes COPC identified due to no screening value available

Although total metals concentrations in groundwater were above screening levels, the dissolved fraction of metals in groundwater were below the screening levels; therefore, these metals were not selected as COPCs for groundwater with the exception of cobalt for which no screening value is available.

5.2 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate "the type and magnitude of exposures to chemicals of potential concern" (USEPA 1989). When combined with chemical-specific toxicity information (summarized in the toxicity assessment), these exposures produce estimations of potential cancer risks and non-cancer hazards.

5.2.1 Conceptual Site Model/Receptor Characterization

SWMU 45 is an inactive landfill area. Paper and municipal refuse were the only materials reportedly disposed of in SWMU 45. The site is located on an alluvial terrace approximately 200 ft south of the New River. Surface water bodies, drainage ditches, manholes, catch basins, or preferred drainage paths or features are not present at the site. Storm water is expected to infiltrate rather than runoff the site due to the site's nearly flat topography, heavy vegetation, and a thick layer of organic matter in surface soil.

Groundwater is present at the site within unconsolidated alluvium and underlying bedrock at depths of approximately 18 to 23 ft bgs. The overall direction of groundwater flow in the alluvial floodplain is northeastward toward the New River. While site groundwater discharge may be hydraulically connected to the New River, the completeness of this pathway is unknown. Site-related groundwater effects were not identified at the site above SSP risk thresholds; and therefore, an assessment of the potential effects to the New River was not completed. Potentially affected media at the site include:

- Surface and subsurface soil via disposal of landfill material and debris;
- Subsurface soil via leaching of chemicals; and

- Groundwater via leaching of chemicals.

A CSM is provided on Figure 4-2.

The SWMU is not currently active; therefore, maintenance workers (e.g., groundskeepers) are the most likely receptors under current site conditions. Due to installation security, it is unlikely that trespassers could gain access to the SWMU; however, risks associated with the maintenance worker are considered protective of the limited exposure experienced by the trespasser. Under future site conditions, maintenance workers continue to be receptors and although the development of the area is unlikely due to small size of the site, construction workers and commercial workers may be hypothetical receptors if the area is developed. RFAAP is likely to remain a military installation; therefore, a residential scenario is considered unlikely. However, the residential scenario was evaluated for the SWMU to assess clean closure requirements under RCRA.

5.2.2 Identification of Exposure Pathways

The potential receptors identified for the site include current/future maintenance workers, hypothetical future commercial workers, hypothetical future construction workers, hypothetical future child resident, hypothetical future adult resident, and hypothetical future lifetime resident. Carcinogenic risk is assessed for the hypothetical lifetime resident to account for cumulative lifetime risk. The exposure duration for the lifetime resident scenario is assumed to be 30 years total; therefore, for carcinogens, exposures are combined for hypothetical child resident (6 years) and adult resident (24 years). In Appendix E.1, Table E.1-1 summarizes the selection of exposure pathways for the SWMU and receptor listing the rationale for the inclusion or exclusion of each pathway. A conceptual site diagram presenting the sources, release mechanisms, pathways, and receptors for the site are presented on Figure 5-1. The table below summarizes the exposure pathways and media evaluated for each of the potential receptor populations.

Media/Exposure Pathways	Exposure Scenarios			
	Current/Future	Future		
	Maintenance Worker	Commercial Worker	Construction Worker	Resident [1]
Surface Soil				
Ingestion	X			
Dermal Absorption	X			
Inhalation of Fugitive Dust	X			
Inhalation of Outdoor Vapors [2]				
Total Soil [3]				
Ingestion	X	X	X	X
Dermal Absorption	X	X	X	X
Inhalation of Fugitive Dust	X	X	X	X
Inhalation of Outdoor Vapors [2]				
Inhalation of Indoor Vapors [2]				
Groundwater				
Ingestion		X		X
Dermal Absorption		X		X
Inhalation of Outdoor Vapors			X	

Media/Exposure Pathways	Exposure Scenarios			
	Current/Future	Future		
	Maintenance Worker	Commercial Worker	Construction Worker	Resident [1]
Inhalation of Indoor Vapors		X		X
Inhalation of Vapors while Showering [4]				X

X = Quantitative Evaluation

[1] The exposure duration for the lifetime resident scenario is assumed to be 30 years total; therefore, for carcinogens, exposures are combined for hypothetical child resident (6 years) and adult resident (24 years).

[2] VOCs not identified as COPC for soil; therefore, no assessment of vapors.

[3] The evaluation of total soil assumes that construction, excavation, or other activities "mix" the surface and subsurface soil, thus changing the constituent concentrations available on the surface.

[4] Inhalation of vapors while showering is evaluated using the adult resident only.

5.2.2.1 Current/Future Land Use Scenario

One receptor, the maintenance worker, was identified under the current land use scenario. The current maintenance worker is assumed to contact surface soil. It is assumed that the maintenance worker scenario is likely to exist in the future; therefore, exposure to total soil is possible if excavation activities resulting in the mixing of surface soil and subsurface soil occur in the future.

5.2.2.2 Future Land Use Scenario Only

In the event that construction occurs at the site, soil that was previously found at depth may be brought to the surface and become available to receptors. Therefore, the future hypothetical industrial use scenarios of the construction worker and commercial worker are assumed to come into contact with total soil at the site. In addition, potential future exposures to groundwater are evaluated in the HHRA. It is assumed that the commercial worker is exposed to groundwater via tap water. The construction worker is only exposed to vapors emanating to ambient air from groundwater beneath excavation trenches.

Although the site is assumed to remain industrial in nature, the residential scenario is evaluated in this HHRA to meet clean closure requirements under RCRA. Future hypothetical resident is assumed to come into contact with total soil and groundwater.

5.2.3 Calculation of EPCs

To calculate intakes, the mean concentration of each COPC is estimated and is referred to as the EPC. To account for uncertainty when estimating EPCs from sample data, the 95% upper confidence limit of the mean (95% UCL) is used instead of the mean itself (USEPA 1989). Methods used to calculate 95% UCLs are based on guidance provided in the following documents *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA 2002b) and *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations* (USEPA 2006).

In general, the method used to calculate a 95% UCL depends on: 1) the number of samples, 2) the prevalence of non-detects, and 3) the data distribution (e.g., normal or lognormal). Non-detects introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore, distributional assumptions are difficult to make for COPCs with a high rate of non-detects. ProUCL 4.0 (USEPA 2007c) is used to calculate EPCs for the site with the exception of data sets with a low frequency of detection for which the MDC was used in the risk assessment. EPCs for soil COPCs are presented in Tables E.1-3.1 and E.1-3.2 of Appendix E.1. EPC calculations for the site are

included in Appendix D.7. EPCs were not calculated for groundwater; therefore, the MDC for COPCs identified for groundwater were used in the risk assessment.

To address the inhalation of fugitive dust from soil exposure pathway, particulate emission factors (PEFs) were used to derive ambient air EPCs for non-volatile soil COPCs. The PEFs used to calculate inhalation daily intakes were calculated in accordance with the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002c), as provided in Appendix E.1, Table E.1-4.4.

To evaluate inhalation of VOCs from groundwater, EPCs were calculated for VOCs in air using the models as summarized below. VOCs were not identified as COPCs in soil. Utilizing the MDC in groundwater and site specific soil physical properties (as presented in Appendix E-4), the Johnson and Ettinger Model (Johnson et al 1991 – updated 2004) was used to estimate indoor air concentration of volatile COPCs migrating from groundwater through the soil and into a structure. The spreadsheet is found in Appendix E.4 and the results provided in Appendix E.1, Table E.1-4.6.

EPCs of VOCs in air due to volatilization from groundwater were estimated for a showering scenario, applicable to the adult resident, using the Foster-Chrostowski (1987) shower room model. The model is provided in Appendix E.1, Table E.1-4.7.

In the event that excavation work is performed on site, the worker may be exposed to volatile emissions from groundwater below the bottom of the trench. While USEPA does not have a standardized model for estimating concentrations of airborne VOCs in a trench or a pit, the VDEQ provides such a model on their Voluntary Remediation Program (VRP) web site (http://www.deq.state.va.us/vrprisk/). The equation and parameters are given in Appendix E.1, Table E.1-4.8.

5.2.4 Quantification of Exposure: Calculation of Daily Intakes

For each receptor and pathway, chronic daily intake (CDI, expressed as milligrams of COPC per kilogram body weight per day) for each COPC is estimated by combining the EPC with exposure parameters such as ingestion rate, frequency of contact, duration, and frequency of exposure. In addition, intake parameters are selected so the combination of intake variables results in an estimate of the reasonable maximum exposure for that pathway (USEPA 1989).

Intake formulas, exposure parameters, and chemical-specific parameters are provided in Appendix E.1, Tables E.1-4.1 through E.1-4.8. The results of the CDI calculations are presented for each receptor in Appendix E.1, Tables E.1-7.1 through E.1-7.7.

5.3 TOXICITY ASSESSMENT

The methodology used for classifying health effects from exposure to chemicals is recommended by USEPA and considers chronic exposures. The chronic toxicity criteria were obtained from the October 2007 USEPA Region III RBC Table (available at http://www.epa.gov/reg3hwmd/risk/), which utilizes the following hierarchy:

- Tier 1 - USEPA's Integrated Risk Information System (IRIS);
- Tier 2 - Provisional Peer-Reviewed Toxicity Values (PPRTVs), as developed on a chemical-specific basis by the Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center; and
- Tier 3 - other sources of toxicological reference values that include those from Cal EPA, MRLs from ATSDR, and finally the HEAST toxicity values.

Toxicity criteria used to quantify non-carcinogenic hazards (reference doses – RfDs) and carcinogenic risks (e.g., cancer slope factors – CSFs) are presented in Appendix E.1, Tables E.1-5.1, E.1-5.2, E.1-6.1, and E.1-6-2.

5.3.1 Health Effects Classification and Criteria Development

According to USEPA's science policy, there are two primary approaches to developing toxicity values or health effects criteria. The non-threshold approach is based on USEPA's scientific policy position that a small number of molecular events can evoke changes in a single cell or a small number of cells. This is described as a non-threshold initiator mechanism because there is essentially no level of exposure (i.e., a threshold) to a constituent that will not result in some finite possibility of causing an adverse effect. Another assumption stemming from USEPA's science policy is that the dose-response curve is linear at low doses. For most carcinogens, toxicity criteria are based on the non-threshold approach.

The threshold approach is based on the assumption that organisms have repair and detoxification capabilities that must be exceeded by some critical concentration (threshold) before the adverse effect is manifested. For example, an organ can have a large number of cells performing the same or similar functions that must be significantly depleted before the effect on the organ is realized. This threshold view holds that a range of exposures from just above zero to some finite value can be tolerated by the organism without an appreciable risk of adverse effects. Toxicity criteria for non-carcinogens are based on the threshold approach. Furthermore, as additional information regarding the mechanisms of toxicity becomes available, the threshold approach may also apply to some carcinogens (*e.g.*, chloroform).

5.3.1.1 Cancer Slope Factors

For carcinogens, USEPA estimates the excess lifetime cancer risks associated with various levels of exposure by developing cancer slope factors (CSFs) and unit risks. CSFs are expressed in terms of reciprocal dose, as units of: $(\text{mg chemical/kg body weight - day})^{-1}$, and describe the upper-bound increase in an individual's risk of developing cancer over a 70-year lifetime per unit of exposure. Unit risks are expressed either as a reciprocal air concentration, in units of micrograms per meter cubed $(\mu g/m^3)^{-1}$ or as a reciprocal drinking water concentration, in units of micrograms per liter $(\mu g/L)^{-1}$. Similarly, they are defined as the probability of an individual developing cancer over a 70-year lifetime from exposure to one unit of concentration in air or water. Because regulatory efforts are geared to be protective of public health, including even the most sensitive members of the population, the CSFs are derived using conservative assumptions.

CSFs and unit risks are derived from the results of human epidemiological studies or chronic animal bioassays. Animal studies usually must be conducted using relatively high doses to detect possible adverse effects. Because humans are expected to be exposed to doses lower than doses used in the animal studies, the potential cancer risks at lower doses are estimated by using mathematical models. The data from animal studies are typically fitted to the linearized multistage model to obtain a dose-response relationship. In general, after the data are fit to the dose-response model, the 95% UCL of the slope of the resulting dose-response relationship at low doses is calculated. This upper-bound limit is subjected to various adjustments and an interspecies scaling factor is applied to derive the slope factor or unit risk for humans. Thus, the actual risks associated with a given intake of a potential carcinogen quantitatively evaluated based on animal data are generally regarded as not likely to be above the risks estimated using these CSFs or unit risks and they may be as low as zero (USEPA 1986b). Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves. These models provide rough, but plausible, estimates of the upper limits on lifetime risk. CSFs and unit risks based on human epidemiological data are derived using conservative assumptions and are unlikely to underestimate risks for a given level of exposure.

Weight-of-evidence categories represent an assessment of the amount and quality of the data, which support the finding that specific chemicals and elements can cause cancer in humans. Although USEPA's guideline for carcinogen risk assessment (USEPA 1996) proposes a weight-of-evidence narrative, IRIS currently uses the original alphanumeric classification. Under the existing guidelines (USEPA 1986a), chemicals are classified as either Group A, Group B1, Group B2, Group C, Group D, or Group E. Group A includes those substances for which high-quality studies have demonstrated a relationship between the exposure to the substance in question and the development of cancer in human populations. Groups B1,

B2, and C represent chemicals with limited (B1) or insufficient (B2) human evidence of carcinogenicity, and sufficient (B1, B2) or insufficient (C) animal data. Group D substances are those for which there is insufficient evidence or not evidence of carcinogenicity in humans or animals and Group E substances are those not having evidence of carcinogenicity available in adequate human or animal studies.

5.3.1.2 Reference Doses and Reference Concentrations

Toxicity criteria for non-carcinogens are generally developed using verified risk reference doses (RfDs) and reference concentrations (RfCs). These are developed by USEPA and listed in IRIS or can be obtained from HEAST (USEPA 1997c) and supplements. RfDs are expressed in units of dose (mg chemical/kg body weight-day) and are usually derived either from human studies involving workplace exposures or from animal studies. In addition, RfDs are estimates (with uncertainty spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subpopulations) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD is used as a reference point for gauging the potential effects of exposures. Usually, exposures (as chemical intakes or doses) that are less than the RfD are not likely to be associated with adverse health effects.

RfDs are developed for both chronic and sub-chronic exposures. Chronic RfDs are presented in IRIS or HEAST and are intended for use in evaluating exposures of durations greater than seven years. Sub-chronic RfDs are developed by USEPA's National Center for Environmental Assessment (NCEA) and are used to characterize the potential for the occurrence of non-carcinogenic effects associated with short-term exposures [two weeks to seven years as defined by USEPA (USEPA 1989)]. The sub-chronic RfDs are developed similarly to chronic RfDs and are typically equal to chronic RfDs or are an order of magnitude greater (less stringent). Sub-chronic RfDs are presented in HEAST but are no longer being reviewed and updated in the same manner as IRIS. Because there is greater uncertainty associated with the sub-chronic RfDs, chronic RfDs have been used in this HHRA.

RfDs are derived using uncertainty factors that reflect scientific judgment regarding the various types of data used to estimate the RfD. RfDs are typically estimated from no observable adverse effect levels (NOAELs) or lowest observable adverse effect levels (LOAELs) in human or animal studies. Uncertainty factors, generally 10-fold factors, are intended to account for:

- The variation in sensitivity among members of the human population;
- The uncertainty in extrapolating animal data to the case of humans;
- The uncertainty in extrapolating from data obtained in a study that is less-than-lifetime exposure;
- The uncertainty in using LOAEL data, when necessary, rather than NOAEL data; and
- The inability of a single study to adequately address every possible adverse outcome in humans.

To derive RfDs, NOAELs or LOAELs are divided by one or more uncertainty factors, as appropriate. When taken together, these uncertainty factors may confer an extra margin of safety of up to a factor of 10,000 below a LOAEL. In some cases, modifying factors are also applied to RfDs to take into account other uncertainties in the toxicity database and reflect the professional judgment of those reviewing the database. The net result is that RfDs are generally considered to provide a conservative estimate of the likelihood of adverse non-carcinogenic effects.

5.3.1.3 Adjustment for Dermal Absorption

Toxicity criteria have not been developed by USEPA specifically for dermal absorption; instead, oral toxicity criteria are adjusted to assess this pathway. In order to have a meaningful comparison between the dermal absorption dose estimates, which represent internal (or absorbed) doses, and oral toxicity criteria, which typically represent potential (or administered) doses, toxicity criteria are modified to represent absorbed doses. The method for modifying toxicity criteria involves calculation of an absolute

oral absorption factor for each chemical and use of this value to increase the chemical's CSF or to decrease the chemical's RfD, as shown in the following equations:

- Adjusted Dermal CSF = CSF/Absolute oral absorption factor; and
- Adjusted Dermal RfD = RfD x Absolute oral absorption factor.

The absolute oral absorption factors should reflect the specific conditions under which the toxicological study was conducted (e.g., method of administration such as gavage, water or diet, and vehicle of administration such as solvent or solution). The absolute oral absorption factors and adjusted toxicity criteria for the COPCs used when evaluating dermal absorption are presented in RAGS D Tables E.1-5.1 and E.1-6.1. The adjusted CSFs and RfDs presented in these tables were used to evaluate potential risks associated with dermal absorption.

5.4 RISK CHARACTERIZATION

Quantitative risks and hazards due to exposure to COPCs are estimated and summarized by combining toxicity criteria (presented in the Toxicity Assessment) with CDIs (calculated in the Exposure Assessment). Methods used to calculate risks and hazards are taken from (USEPA 1989).

For exposures to potential carcinogens, the individual upper-bound excess lifetime cancer risk was calculated by multiplying the estimated CDI by the CSF. In order to assess the individual excess lifetime cancer risks associated with simultaneous exposure to COPCs, the risks derived from the individual chemicals are summed within each exposure pathway. For the residential scenario, carcinogenic risk was evaluated for the lifetime resident. In addition, carcinogenic risk for the residential scenario for carcinogens that act via a mutagenic mode of action (i.e., benzo(a)pyrene) as identified in the October 2007 Region III RBC table were evaluated utilizing default age-dependant adjustment factors in accordance with the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA 2005).

Non-carcinogenic adverse health effects are calculated by dividing the CDI of each COPC by its RfD, forming a HQ. HQs greater than one (1) indicate the potential for adverse health effects. To estimate non-carcinogenic adverse health effects due to simultaneous exposure to several COPCs, HQs for individual COPCs are summed within each exposure pathway to form a HI. As with HQs, HIs that are greater than 1 indicate potential adverse health effects. In such cases, COPCs are divided into categories based on the target organ affected (e.g., liver, kidney) and target organ-specific HIs are recalculated. Non-carcinogenic hazards were evaluated for child and adult residents independently.

Excess lifetime cancer risks derived in this report are compared to USEPA's target risk range for Superfund sites of 1E-06 to 1E-04 (USEPA 1989). In addition, USEPA's Office of Solid Waste and Emergency Response has issued a directive (USEPA 1991) clarifying the role of HHRA in the Superfund process. The directive states that, if the cumulative carcinogenic risk to a receptor (based on reasonable maximum exposure for both current and future land use) is less than 1E-04 and the non-carcinogenic HI is equal to or less than 1, action generally is not warranted unless adverse environmental effects are likely.

Calculation of risks and hazards due to exposure to COPCs are presented in Appendix E.1 in Tables E.1-7.1 through E.1-7.7. A refinement of the HIs based on target organs is conducted. As shown in Appendix E.1 in Tables E.1-9.1 through E.1-9.7, the refinement consists of calculating HIs based on a target organ-specific basis. In addition in Appendix E.1, Table E.1-10.1 summarizes risks and hazards for risk/HI drivers (i.e., those COPCs contributing to a total risk greater than 1.E-04 or a total target organ hazard greater than 1).

Risks and hazards presented in Appendix E.1 in Tables E.1-9.1 through E.1-9.7 are summarized in the tables below. The total risk for each receptor is below or within USEPA's target risk range for Superfund sites (1E-06 to 1E-04, USEPA 1989). The total HIs after target organ segregation for all receptors are equal to or below the USEPA reference HI of 1E+00 with the exception of the hypothetical future construction worker (CNS).

Summary of Risks and Hazards

Timeframe/Receptor	Risk	HI	Risk Drivers	Target Organ Segregation HI>1
Current Maintenance Worker	1.E-06	0.08	None	None
Future Maintenance Worker	1.E-06	0.08	None	None
Hypothetical Future Commercial Worker	3.E-06	0.3	None	None
Hypothetical Future Construction Worker	5.E-06	**9**	None	CNS (HI=8) – Soil (Al – Inh (1.7), Mn – Inh (6))
Hypothetical Future Adult Resident	See Lifetime Resident	0.8	NA	None
Hypothetical Future Child Resident	See Lifetime Resident	**5.6**	NA	None
Hypothetical Lifetime Resident	3.E-05	NA	None	NA

Note: NA = Not Applicable
HI = Hazard Index
CNS = Central Nervous System
Bold = Above USEPA Risk or Hazard Range
Al = Aluminum, Mn = Manganese
Ing = Ingestion, Inh = Inhalation, Derm = Dermal

5.4.1 Background

Statistical evaluations were conducted to compare metals concentrations in soil at SWMU 45 to background concentrations presented in the RFAAP Facility-Wide Background Study Report (IT 2001). These evaluations followed the procedures outlined in the USEPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (USEPA 2002a) and included distribution testing and comparisons of site data to background using ProUCL 4.0. At SWMU 45, if the distribution testing showed that either site data sets and background data sets in each case were not normal, consistent with Section 4.1 of the above referenced USEPA guidance, comparisons of site to background were conducted using non-parametric testing to evaluate whether site concentrations were consistently higher or lower than the background data set. If the distribution of the site and background data sets were both distributed normally, a paired t-test was conducted to evaluate whether site concentrations were consistently higher or lower than the background data set unless non-detects were present in either data set then the default comparison using ProUCL 4.0 is nonparametric. Appendix D.7 presents the results of the statistical evaluations. Summaries of the means comparison results are provided Appendix D.7, Tables D.7.2-1a (surface soil) and D.7.2-1b (total soil).

Based on the background evaluations presented in Appendix D.7, COPCs identified for SWMU 45 that are consistently lower than background include arsenic, chromium, cobalt, iron, manganese, and vanadium for surface soil and aluminum, arsenic, cadmium, chromium, cobalt, iron, and vanadium for

total soil. Note that background comparisons could not be conducted for antimony (surface and total soil) and cadmium (surface soil) due to the number of detections in the background data set.

Recent investigations conducted within flood plain areas at RFAAP (SWMUs 54, 35, 37, 38, and AOC Q), have indicated naturally occurring manganese levels in alluvial soil that are consistently similar to or above facility background, when tests are conducted using means comparisons (t-test or rank sum) but substantially below the background point estimate of 2,543 mg/kg. A similar situation is apparent at SWMU 45, where total manganese concentrations in soil are consistently above the background data set when means tests are conducted. Further evaluation of the SWMU 45 data indicates that the higher concentrations do not appear to be associated with disposal activities, as similar mean concentrations of manganese are observed outside of waste disposal areas (605.6 mg/kg) and inside of waste disposal areas (630 mg/kg). This is also supported by a slightly lower median concentration of manganese within the waste disposal area (535 mg/kg) than outside of the disposal area (605 mg/kg). Disposal areas (i.e., areas containing landfill material or debris) are presented on Figure 4-3. Based on the results of this evaluation, the concentrations in manganese in total soil for SWMU 45 are considered to be within the background range for the site area and not related to site waste disposal activities. These data comparisons are summarized in the following table.

Sample Locations	Number of Samples	Range (mg/kg)	Mean (mg/kg)	Median (mg/kg)	Facility Background Point Estimate
SWMU 45 *Inside of Disposal Area*: 45TP1, 45TP2, 45TP3, 45TP4, 45TP5, 45TP6, 45TP7	14	250 to 1,100	630	535	2,543
SWMU 45 *Outside of Disposal Area*: 45SB1, 45SB5, 45SB8, 45SB14	8	390 to 930	605.6	605	

5.5 HHRA SUMMARY AND CONCLUSIONS

This HHRA was performed to evaluate the potential human health effects associated with previous activities at the SWMU. Receptors evaluated included: current/future maintenance worker, hypothetical future construction worker, hypothetical future commercial worker, hypothetical future adult resident, hypothetical future child resident, and hypothetical future lifetime resident.

As presented in Section 5.4, the total risk for each receptor is below or within USEPA's target risk range for Superfund sites (1E-06 to 1E-04, USEPA 1989). The total HIs after target organ segregation for all receptors are equal to or below the USEPA reference HI of 1E+00 with the exception of the hypothetical future construction worker (CNS) due to aluminum and manganese concentrations in total soil via the inhalation pathway (CNS HI of 8). When excluding metal hazard drivers below background in (aluminum and manganese) as presented in Section 5.4.1, the site related hazard is below the USEPA reference HI of 1E+00.

5.6 UNCERTAINTIES ANALYSIS

Risk assessments involve the use of assumptions, judgments, and incomplete data to varying degrees that contribute to the uncertainty of the final estimates of risk. Uncertainties result both from the use of assumptions or models in lieu of actual data and from the error inherent in the estimation of risk related parameters and may cause risk to be overestimated or underestimated. Based on the uncertainties described below, this risk assessment should not be construed as presenting an absolute estimate of risk to persons potentially exposed to COPCs.

Consideration of the uncertainty attached to various aspects of the risk assessment allows better interpretation of the risk assessment results and understanding of the potential adverse effects on human health. In general, the primary sources of uncertainty are associated with environmental sampling and analysis, selection of chemicals for evaluation, toxicological data, and exposure assessment. The effects of these uncertainties on the risk estimates are discussed below.

5.6.1 Environmental Sampling and Analysis

If the samples do not adequately represent media at SWMU 45, hazard/risk estimates could be overestimated or underestimated. The sampling and analysis plan was designed to investigate anticipated areas of concern at the SWMU. Therefore, there is less chance that the hazard/risk estimates are biased low. Also, if the analytical methods used do not apply to some chemicals that are present at the site, risk could be underestimated. Because the analytical methods at the site were selected to address all chemicals that are known or suspected to be present on the basis of the site history, the potential for not identifying a COPC is reduced.

Uncertainty in environmental chemical analysis can stem from several sources including errors inherent in the sampling or analytical procedures. Analytical accuracy errors or sampling errors can result in rejection of data, which decreases the available data for use in the HHRA, or in the qualification of data, which increases the uncertainty in the detected chemical concentrations. There is uncertainty associated with chemicals reported in samples at concentrations below the method reporting limit but still included in data analysis and with those chemicals qualified "J" indicating that the concentrations are estimated. Another issue involves the amount of blank related (i.e., B-qualified) data in the data set. These data were retained in the HHRA without modification. The inclusion of "B" qualified data in the risk assessment may overestimate risk.

Another uncertainty associated with sampling and analysis concerns the inclusion of chemicals that are potentially present in the environment due to anthropogenic sources. For example, PAHs are considered ubiquitous in soil from anthropogenic sources, such as the burning of fossil fuels, forest fires, and airborne particulates eroded from roadways and automobile tires. If such chemicals are not site-related, the risks associated with the site may be overestimated. This uncertainty may have a low-to-moderate effect on overestimating risks.

5.6.2 Selection of Chemicals for Evaluation

A comparison of maximum detected chemical concentrations to USEPA Region III RBCs was conducted for both surface and total soil. Chemicals whose maximum concentrations were below their respective RBCs were not carried through the assessment. It is unlikely that this risk based screening excluded chemicals that should be included, based on the conservative exposure assumptions and conservatively derived toxicity criteria that are the basis of the RBCs. Although following this methodology does not provide a quantitative risk estimate for every chemical, it focuses the assessment on the chemicals accounting for the greatest risks (i.e., chemicals whose maximum concentrations are above their respective RBCs) and the cumulative risk estimates would not be expected to be significantly greater. As presented on the non-detect MDL screening tables in Appendix E.1, Tables E.1-2.3 and E.1-2.5, the maximum MDLs are above the adjusted RBCs for several chemical in soil and groundwater; therefore, the site-related risks and hazards could be underestimated for the risk assessments due to inadequate detection limits.

Background concentrations of metals in soil at RFAAP have been characterized and are used in statistical comparisons to site soil to evaluate whether concentrations of metals detected at SWMU 45 are consistently higher or lower than background. Uncertainties associated with the use of these data may lead to a low-to-moderate overestimation or underestimation of surface and total soil risks due to metals.

Screening criteria are derived from RDAs for essential human dietary minerals, trace elements, and electrolytes that are toxic at very high doses (i.e., calcium, magnesium, potassium, and sodium).

Omitting these essential human nutrients from further evaluation is expected to have a low effect on risk and hazard estimates.

The use of the October 2007 RBCs rather than the April 2009 Regional Screening Level Table for the SSP human health risk screening could result in the inclusion or exclusion of chemicals based on outdated toxicity data. Therefore to lessen the uncertainty associated with the use of these screening levels, an assessment of the data was conducted with respect to the April 2009 Regional Screening Levels which did not result in the identification of any additional COPCs for the site.

5.6.3 Exposure Assessment

The primary areas of uncertainty affecting exposure parameter estimation involve the assumptions regarding exposure pathways, the estimation of exposure point concentrations, and the exposure parameters used to estimate chemical doses.

An underlying assumption in the HHRA is that individuals at the site would engage in activities that result in exposures via each selected pathway. For example, it was assumed that maintenance workers engage in regular activities (once a week) under current and future land use conditions resulting in exposure to COPCs. This assumption is conservative, in that it is more likely that the activity patterns occur occasionally.

In establishing EPCs, the concentrations of chemicals in the media evaluated are assumed to remain constant over time. Depending on the properties of the chemical and the media in which it was detected, this assumption could over estimate risks, depending on the degree of chemical transport to other media or the rate and extent a chemical degrades over time.

When calculating EPCs from sample data, one half of the MDL was sometimes used for non-detect samples in the calculation of the 95% UCL of the mean. Approaches which substitutes values for non-detected chemical concentrations are associated with uncertainty, because chemicals that were not detected at the specified sample MDL may be absent from the medium or may be present at a concentration below the sample MDL. The uncertainty of the exposure point concentration will increase as the number of non-detects in a data set increases and the uncertainty could result in either the overestimation or underestimation of EPCs.

The exposure parameters used to describe the extent, frequency, and duration of exposure is associated with uncertainty. Actual risks for individuals within an exposed population may differ from those predicted, depending upon their actual intake rates (e.g., soil ingestion rates), nutritional status, or body weight. Exposure assumptions were selected to produce an upper bound estimate of exposure in accordance with USEPA guidelines regarding evaluation of potential exposures at Superfund sites (e.g., exposures were assumed to occur for 25 years for workers). In addition, many USEPA default exposure parameters are highly conservative and are based on risk management interpretations of limited data (USEPA 1991). For example, although current USEPA guidance recommends default soil ingestion rates of 100 mg/day for individuals over 6 years of age, other studies, such as Calabrese et al. (1990), have shown that the USEPA default soil ingestion rate of 100 mg/day is likely to greatly overestimate adult exposures and risks. In addition, chemicals in soil are assumed 100% bioavailable; this assumes that ingested chemicals present in a soil matrix are absorbed through the gastrointestinal (GI) tract, which is unlikely due to the affinity of chemicals for soil particles. Therefore, based on the conservative exposure assumptions used in the HHRA, exposures and estimated potential risks are likely to be overestimated for the ingestion of soil pathways.

Evaluation of the dermal absorption exposure pathway is affected by uncertainties in dermal exposure parameters. For example, there is uncertainty associated with the exposed skin surface areas used, since the choice of exposed body parts could slightly overestimate or underestimate risks. Uncertainties that are more significant are associated with the selection and use of dermal absorption factors. For this HHRA, the dermal absorption factors and calculations were based on USEPA Region III guidance, USEPA''s *Risk Assessment Guidance for Superfund (RAGS): Part E, Supplemental Guidance for Dermal*

Risk Assessment (USEPA 2004). Very limited information is available on dermal absorption of chemicals from contacted soil under environmental conditions. In fact, there are not actual human epidemiological data to support the hypothesis that absorption of soil bound compounds under exposure conditions is a complete route of exposure. For example, the Public Health Statements from the Agency for Toxic Substance Disease Registry (ATSDR 1999b) indicates cadmium is not known to result in human health effects by dermal absorption because virtually zero cadmium can enter the body through the skin under normal circumstances (i.e., without exposure to very high concentrations for long periods or exposure to skin that is damaged (ATSDR 1999a). Therefore, using the dermal absorption factors to evaluate dermal absorption exposures to soil may result in an overestimation of risks.

5.6.4 Toxicological Data

The HHRA relies on USEPA derived dose response criteria. These health effects criteria are conservative and are designed to be protective of sensitive subpopulations. The health criteria used to evaluate long-term exposures, such as RfDs or CSFs, are based on concepts and assumptions that bias an evaluation in the direction of overestimation of health risk. As USEPA notes in its *Guidelines for Carcinogenic Risk Assessment* (USEPA 1986a), there are major uncertainties in extrapolating both from animals to humans and from high to low doses. There are important species differences in uptake, metabolism, and organ distribution of carcinogens, as well as species and strain differences in target site susceptibility, human populations are variable with respect to genetic constitution, diet, occupational and home environment, activity patterns, and other cultural factors.

These uncertainties are compensated for using upper bound 95% UCLs for CSFs (carcinogens), and safety factors for RfDs (non-carcinogens). The assumptions used here provide a rough but plausible estimate of the upper limit of risk; in other words, it is not likely that the true risk would be much more than the estimated risk, but it could very well be considerably lower. More refined modeling in the area of dose response calculation (e.g., using maximum likelihood dose response values rather than the 95% UCL) would be expected to substantially lower the final risk.

For dermal absorption exposure pathways, the absence of dermal toxicity criteria necessitates the use of oral toxicity data. To calculate risk estimates for the dermal absorption pathway, absorbed dermal absorption doses are combined with oral toxicity values (also discussed above in Section 5.3). Oral toxicity values, which are typically expressed in terms of potential (or administered) doses, should be adjusted when assessing dermal absorption doses, which are expressed as internal (or absorbed) doses. In this assessment, absolute oral absorption factors that reflect the toxicity study conditions were used to modify the oral toxicity criteria. For those chemicals lacking sufficient information, a default oral absorption factor of 1.0 was used. The risk estimates for the dermal absorption pathways may be overestimated or underestimated, depending on how the values used in the HHRA reflect the difference between the oral and dermal routes.

Inhalation toxicity criteria are unavailable for many of the COPCs. This HHRA does not use oral-based toxicity criteria to estimate risks from inhalation exposure because of the following uncertainties associated with such a substitution:

- Many chemicals show portal-of-entry toxicity – that is, adverse health effects occur primarily at the tissue site at which the chemical is introduced into the body (e.g., GI tract, lung, or skin). For example, orally administered benzo(a)pyrene is associated with benign and malignant tumors in the gut mucosa (Neal and Rigdon 1967), but inhaled benzo(a)pyrene produces an increased incidence of upper respiratory tract tumors (Thyssen et al. 1981). Therefore, quantitative risk estimates based on these two administration routes are dissimilar;

- Physiological and anatomical differences between the GI tract and respiratory systems invalidate a cross-route quantitative risk extrapolation. The small intestine of humans contains a very large surface area that readily absorbs most compounds by passive diffusion (Klaasen et al. 1986). The

oral absorption of a few compounds, such as iron, is an energy-dependent (active-transport) process, wherein; the absorption rate is proportional to the body's current need for iron;

- The rate and extent of pulmonary absorption are much more complex and depend on such factors as particle size distribution of the airborne toxicant and blood-gas solubility of the toxicant (Klaasen et al. 1986). Particles with median aerodynamic diameters of approximately 1 micrometer (μm) or less are absorbed by the alveolar region of the human lung. Larger particles deposit in the tracheobronchial or nasopharyngeal regions where they are cleared by mucociliary mechanisms and subsequently swallowed or physically removed and exhaled. Therefore, pulmonary absorption is more highly dependent on the physiochemical properties of the material than oral absorption;

- Because highly soluble gases (e.g., chloroform) are more rapidly absorbed into the blood than poorly soluble gases (e.g., ethylene), they take much longer to reach equilibrium. Thus, the inhalation absorption rate of a gas is more dependent on blood solubility than the oral absorption rate of the same substance administered as a liquid; and

- Human inhalation risk estimates based on oral toxicity data in subhuman species are distorted by both route-to-route extrapolation and interspecies extrapolation. For example, the rodent GI tract, which includes a structurally unique fore stomach, is anatomically and functionally distinct from the human lung, which contains a very large alveolar surface area for extensive absorption. The rate and extent of absorption across these distinct physiological systems are not alike.

In addition, for inhalation exposure to substances present as dusts, vapors, gases, or airborne particulate matter, dose extrapolation is far more complex, and therefore associated with uncertainty. The major confounding factors that prohibit a direct dose extrapolation of an inhaled toxicant are the following:

- Over 40 functionally different cell types in the lung – the distribution, consequent metabolic reactions, and air exchange rates vary widely across species;

- Differential concentration and activity of the detoxifying protein glutathione;

- Interspecies and intraspecies differences in the ability to repair pulmonary cell damage, and to clear toxic chemicals and immune complexes from the respiratory tract. For example, species vary in the ability to activate macrophages – nonspecific immune cells that can both protect the inner lining of the respiratory system and, at high concentrations, damage healthy tissues;

- Anatomical variations in the respiratory pathway, which affect both absorption rates and time to reach steady-state blood levels; and

- Sensitivity to solubility and concentration variables; because of metabolic saturation (i.e., the exhaustion of normal metabolic activity caused by exposure to high concentrations), highly soluble chemicals deviate from first-order kinetics – which makes it difficult to predict the rates and extent of biotransformation and detoxification reactions. Furthermore, intermittent inhalation exposure to highly blood-soluble chemicals results in bioaccumulation in fat tissue because of the insufficient time between exposure sessions for complete clearance of the chemical. Such slow release from the fat compartment to other body tissues can result in toxicological and metabolic effects that are difficult to assess and vary across species.

For chemicals without Integrated Risk Information System (IRIS) toxicity criteria, provisional toxicity criteria were used where available (Appendix E.1 - Tables E.1-5.1 through E.1-6.2). Provisional toxicity criteria present a source of uncertainty, since USEPA has evaluated the compound, but consensus has not been established on the toxicity criteria. Provisional oral toxicity values were used for aluminum, antimony, arsenic, chromium, cobalt, copper, iron, thallium, vanadium, zinc, Aroclor 1254, chloroform, di-n-octylphthalate, and nitroglycerin. For this assessment, use of provisional toxicity criteria was

preferable to not evaluating the chemical in order to limit data gaps. However, because these toxicity criteria have not been formally accepted by USEPA, there is uncertainty with these values and, therefore, with the risks calculated using these toxicity criteria.

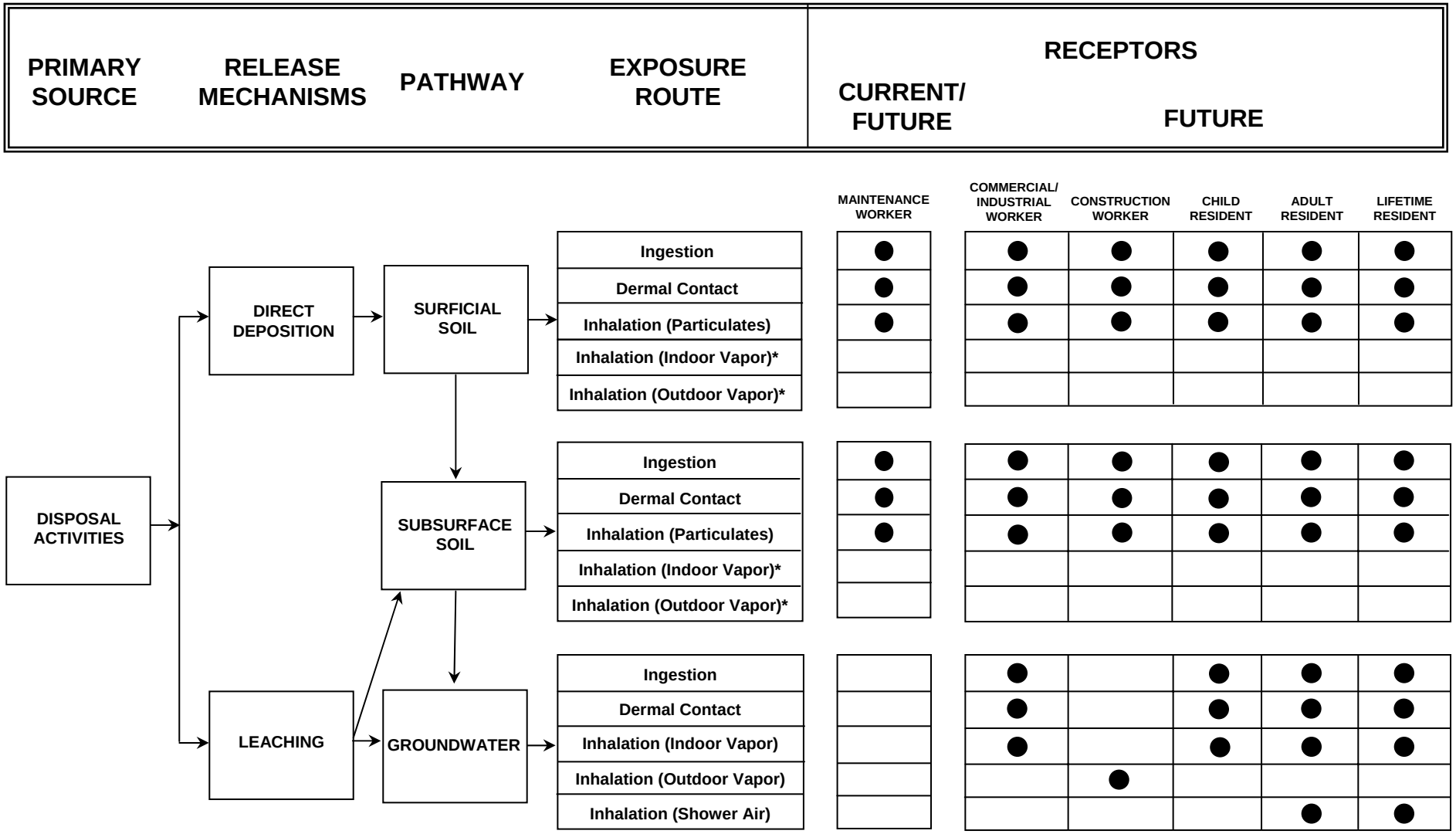
Some detected constituents (cobalt, di-n-octylphthalate, dimethylphthalate, bis(2-chloroethoxy)methane) do not have USEPA Region III RBCs and were therefore carried forward as COPCs into the HHRA. Provisional/surrogate toxicity values were researched for these COPCs and cancer risk/non-cancer hazard calculations were derived. It is undetermined if the uncertainty is biased high or low for these COPCs because of the provisional nature of the toxicity data used. However, these COPCs are addressed quantitatively in the HHRA using what little toxicity data are available to reduce the level of uncertainty associated with the risk assessment results.

For some chemicals, toxicity criteria for all pathways (i.e., oral, dermal, and inhalation) were unavailable (Appendix E.1 -Tables E.1-5.1 through E.1-6.2). Although lack of published toxicity data could result in an underestimation of risk, an attempt is made to balance this uncertainty with the use of available toxicological data derived using conservative methodologies.

The use of the October 2007 RBCs rather than the April 2009 Regional Screening Level Table as the primary basis for the human health risk assessment could result in an underestimation or overestimation of risk based on the use outdated toxicity data. Therefore to lessen the uncertainty associated with the use of this toxicity data, an assessment of risk for the site was conducted utilizing the most current toxicity data which did not result in any change to the risk assessment conclusions.

5.6.5 Risk Characterization

Minor uncertainty is associated with rounding of the risk and hazard estimates. Thus, the actual risk or hazard may be slightly greater or less than the presented values. A related issue is that rounding causes minor differences between summed risk and hazard values, depending on how the summing is performed. For example, RAGS Table 7s in Appendix E presents risks and hazards that are summed for exposure route, exposure point, exposure medium, and medium total. Only for the first (exposure route) are the individual chemical-specific risks and hazards summed to derive the total. For the subsequent summations (exposure point, exposure medium, and medium total), each is the summation of the preceding sums. For this reason, there can also be minor rounding-related differences between the 'same' values presented in RAGS Table 9s and 10s in Appendix E.



● Potentially complete pathway assessed quantitatively

* VOCs not identified as COPCs in soil; therefore, vapors via the inhalation pathway not assessed for soil

FIGURE 5-1
Conceptual Site Diagram

Date: *January 2009*	**URS Project#:** *11656351*
Prepared by: *CLD*	**Approved by:** *JOS*
Scale: *Not to Scale*	**File Name:** *Fig.5-1 CSD*

SWMU 45
SSP Report
Radford Army Ammunition Plant
Radford, Virginia

URS
URS Group, Inc.
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Suite 201
Richmond, VA 23230

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Table 5-1
Sample Assemblages Surface and Subsurface Soil for COPC Screening
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

SWMU 45			
Surface Soil			
45SB1A	45SB14A	45TP3A	45TP6A
45SB5A	45TP1A	45TP4A	45TP7A
45SB8A	45TP2A	45TP5A	
Subsurface Soil			
45SB1B	45SB14B	45TP3B	45TP6B
45SB5B	45TP1B	45TP4B	45TP7B
45SB8B	45TP2B	45TP5B	

Table 5-2
RDA-based Screening Criteria Calculations
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

SOIL AND GROUNDWATER CRITERIA

Soil Screening Criteria (mg/kg) = RDA/AI / ((IR_S x EF x ED x 10^{-6} kg/mg x year/365 days) / AT)

Groundwater Screening Criteria (µg/L) = RDA/AI x 1000 µg/mg / ((IR_W x EF x ED x year/365 days) / AT)

Parameter	Definition	Value	Units
RDA/AI	= Recommended Daily Allowance/Adequate Intake	nutrient-specific	mg/day
IR_S	= Soil Ingestion Rate		
	- adult resident	100	mg soil/day
	- child resident	200	mg soil/day
IR_W	= Tap water ingestion rate		
	- adult resident	2	L water/day
	- child resident	1	L water/day
EF	= Exposure frequency		
	- residential	350	days/year
ED	= Exposure duration		
	- adult resident	24	years
	- child resident	6	years
AT	= Averaging time		
	- adult resident	24	years
	- child resident	6	years

	Reference	CAS	RDA/AI[c,d] (mg/day)		Soil Screening Criteria (mg/kg)			Groundwater Screening Criteria (µg/L)		
			Adult	Child	Adult Resident	Child Resident	Selected Criteria (Minimum)	Adult Resident	Child Resident	Selected Criteria (Minimum)
Calcium	(a)	7440-70-2	800	210	8.3E+06	1.1E+06	1.1E+06	4.2E+05	2.2E+05	2.2E+05
Magnesium	(a)	7439-95-4	130	30	1.4E+06	1.6E+05	1.6E+05	6.8E+04	3.1E+04	3.1E+04
Potassium	(b)	2023-69-5	1600	500	1.7E+07	2.6E+06	2.6E+06	8.3E+05	5.2E+05	5.2E+05
Sodium	(b)	7440-23-5	400	120	4.2E+06	6.3E+05	6.3E+05	2.1E+05	1.3E+05	1.3E+05

(a) Recommended Dietary Allowances, 10th edition ©1989 by the National Academy of Sciences (National Academy Press, Washington, D.C.)
(b) Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride, ©1997 by the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine (National Academy Press, Washington, D.C.)
(c) RDA/AIs for calcium and magnesium represent the lower end of the RDA/AI for persons 7 years old and over (adults) and 6 years old and under (children).
(d) RDA/AIs for potassium and sodium represent the lower end of the minimum requirement for healthy persons 7 years old and over (adults) and 6 years old and under (children).

6.0 CONCLUSIONS AND RECOMMENDATION FOR FUTURE ACTION

An SSP has been completed for SWMU 45 following the USEPA approved site screening process for RFAAP (USEPA 2001a). The SSP included sampling of soil and groundwater to evaluate releases to the environment and completion of human health and ecological risk screening elements outlined in the SSP guidance. In addition to the human health risk screening, a quantitative HHRA was completed as a supplement to the SSP to further assess potential hazards identified during the risk screenings for hypothetical future residential land use scenario.

In accordance with the approved site screening process, no further action beyond the implementation of institutional controls is recommended for SWMU 45 based on the following results of the SSP screening:

- The HHRA resulted in site-related cancer risks and hazards (when taking target organs and background for metals into consideration) within USEPA target ranges for Superfund sites (1E-06 to 1E-04 for risk and 1E+00 or less for HI);
- Results of the lead modeling for soil predicted the probability of the child resident receptor for SWMU 45 expected to have blood levels of 10 μg/dL or greater was below the established threshold of 5%;
- The iron exposure assessment for soil results for the hypothetical future child resident were below the applicable iron margin of exposure screening criteria;
- COPCs leaching to groundwater at levels of potential concern (concentrations above adjusted tap water risk-based concentrations [T-RBCs]) were not identified when considering site-specific SSLs, background, and site groundwater data;
- The results of the screening level ecological risk assessment indicated there is adequate information to conclude that ecological risks are negligible at SWMU 45; therefore, there is no need for further action at this SSP site on the basis of ecological risk.

Institutional controls are being implemented at SWMU 45 within the boundaries depicted on Figure 2-1. The objective of the ICs is to maintain the site in its current industrial/commercial state as a closed solid waste management unit and to prevent any future residential use. Specifically this site has been incorporated into plant management manual to ensure long-term protection of human health and the environment. The management manual provides for advance notice, assessment and approval of intrusive work that may occur within the plant with a general digging prohibition at sites such as this. In the event the property is transferred or leased, equivalent ICs will be put into terms and conditions of the deed or lease, which are no less restrictive than the IC objectives described above. Furthermore, the transferee or lessee will be responsible for ensuring IC compliance by any future users. However, the Army acknowledges the responsibility for all original liability under CERCLA and its right and responsibility to enforce ICs.

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SOLID WASTE MANAGEMENT UNIT 45 (RAAP-24) SITE SCREENING PROCESS REPORT

RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

FINAL
JANUARY 2010

URS

CONTRACT NO.
W9128F-04-D-001
DELIVERY ORDER
NO. DA01

SOLID WASTE MANAGEMENT UNIT 45 (RAAP-24) SITE SCREENING PROCESS REPORT

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RADFORD, VIRGINIA

FINAL
JANUARY 2010

URS

CONTRACT NO.
W9128F-04-D-001
DELIVERY ORDER
NO. DA01

APPENDIX A

PHOTOGRAPHIC LOGS

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APPENDIX A.1

SITE PHOTOGRAPHIC LOG

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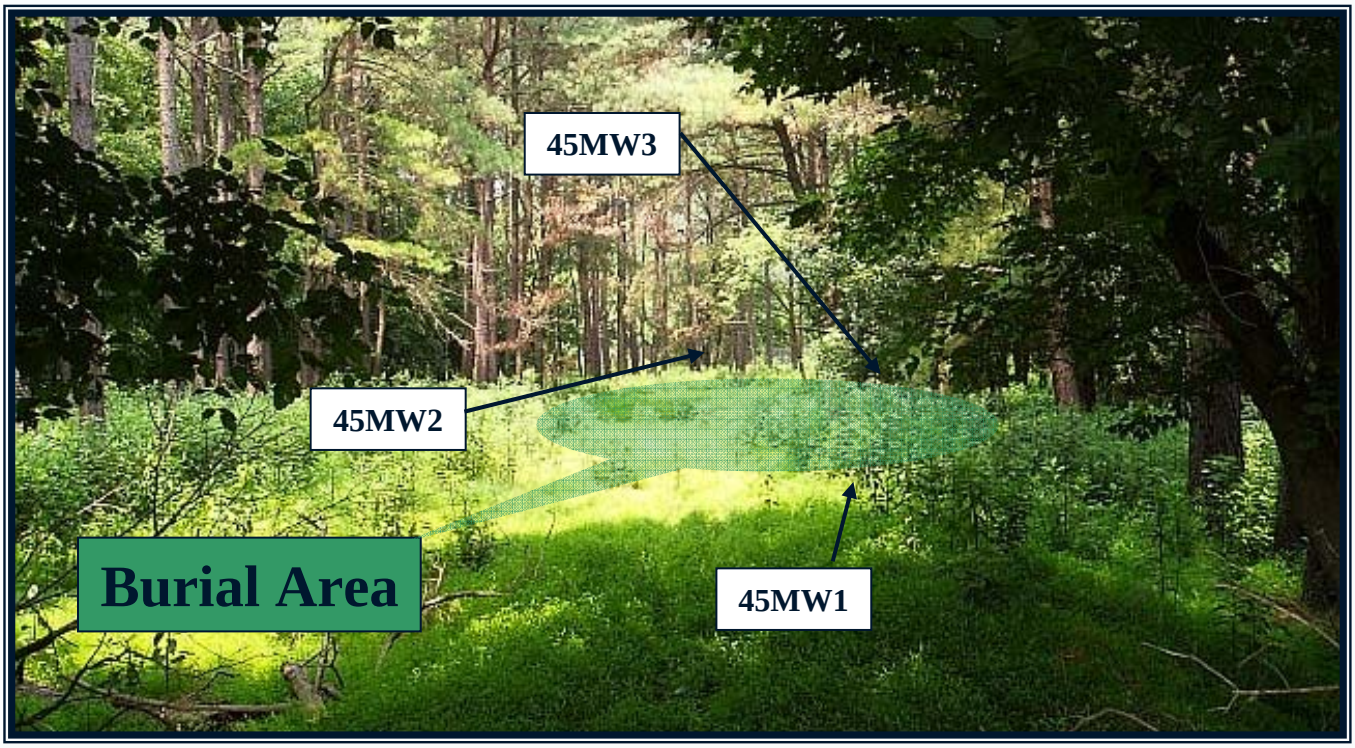

PHOTO 1: Burial area facing north-northwest toward the New River.

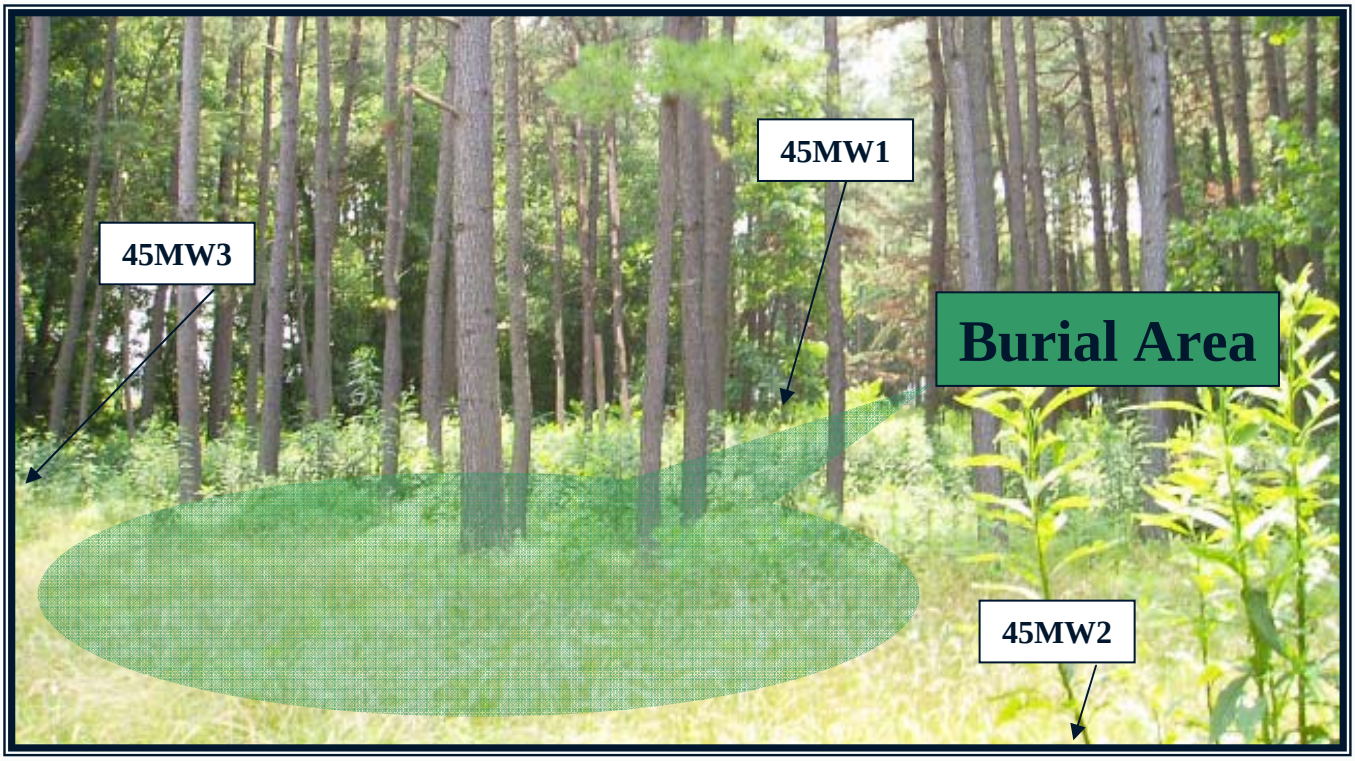

PHOTO 2: Burial area near 45MW2 facing south-southeast.

PHOTO 3: Burial area facing north at 45MW1

PHOTO 4: Near the site center facing north toward 45MW2 and the New River

PHOTO 5: Facing southwest parallel to the Installation perimeter fence along the New River

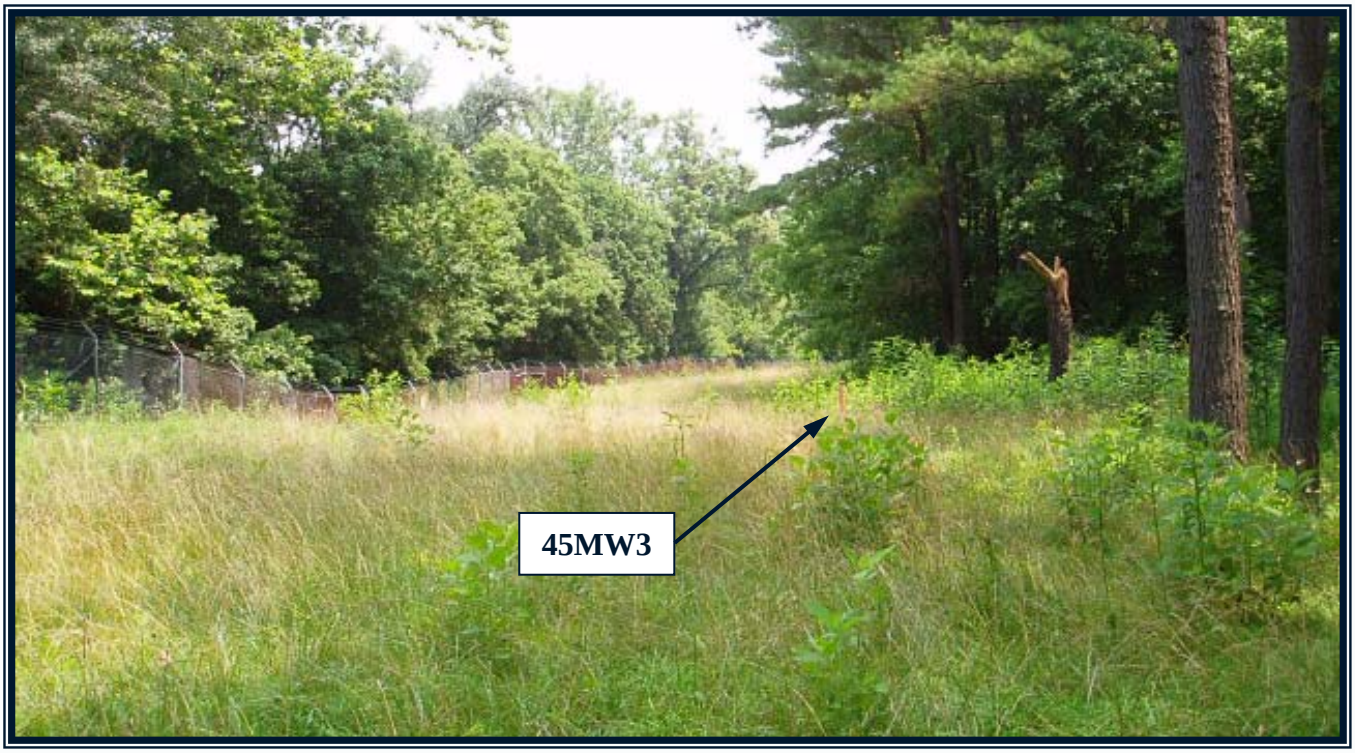

PHOTO 6: Facing northeast parallel to the Installation perimeter fence along the New River

PHOTO 7: At the Installation perimeter fence, facing north-northwest toward the New River

PHOTO 8: SWMU 45: Water-filled depression in center of presumed burial area, approximately six feet wide by 15 feet long and two feet deep

APPENDIX A.2

TEST PIT PHOTOGRAPHIC LOG

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PHOTO 1: SWMU 45 – Test Pit 1

PHOTO 2: SWMU 45 – Metal Debris in Test Pit 2

PHOTO 3: SWMU 45 – Landfill Material In Test Pit 3 (wiring, plastic, bottles, etc.)

PHOTO 4: SWMU 45 – Debris in Test Pit 4 (metal, plastic, bottles, paper, etc.)

PHOTO 5: SWMU 45 – Test Pit 5 – no landfill material or metal debris present

PHOTO 6: SWMU 45 – Landfill Material in Test Pit 6
(metal, plastic, bottles, paper, etc.)

PHOTO 5: SWMU 45 – Test Pit 7 – no landfill material or metal debris present

APPENDIX B

SSP GUIDANCE DOCUMENT

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1.0 INTRODUCTION

The Radford Army Ammunition Plant (RFAAP) is an active military installation located in the mountains of southwest Virginia, and covers approximately 4,080 acres in Montgomery and Pulaski County, Virginia.

The United States Environmental Protection Agency (USEPA) issued a RCRA Corrective Action Permit to Alliant Ammunition and Powder Company (Alliant) and the U.S. Department of the Army (Army) on October 31, 2000. Within the RCRA Corrective Action permit is a listing of 31 identified Site Screening Areas (SSAs) which are to be investigated in accordance with this EPA approved Site Screening Process (SSP). Should additional SSAs be identified at RFAAP, a site screening will need to be completed in accordance with this SSP.

This SSP has been developed as the central document describing how site screening will be applied to the RFAAP. Overall, the SSP is devised to expedite investigations of SSAs at RFAAP to determine what level of evaluation is appropriate for these identified areas. The SSP will help determine whether there have been releases of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents to the environment from an SSA, and determine whether an SSA should proceed further through the RFI process, be the subject of an interim removal action or be considered for no further action.

Once a SSA is identified, the following five distinct tasks will be undertaken:

- Performance of a Desktop Audit and site visit to determine the scope of the SSP site-specific Work Plan(s);
- Development of an SSP site-specific Work Plan outlining a Sampling and Analysis Plan as well as a risk screening plan (human health and ecological, as appropriate) for EPA approval;
- Performance of SSP field work in accordance with the approved SSP Work Plan;
- Evaluation of SSP data and completion of pre-remedial risk screening; and
- Determination of the need for further investigation of the SSA, an interim removal action at the SSA or preparation of a No Further Action Decision Document, per the RCRA Corrective Action permit, based on results of the SSP and risk screening.

The following sections detail these SSP tasks.

2.0 SITE VISIT AND DESKTOP AUDIT

The purpose of the Desktop Audit is to evaluate and document, through review of existing information, if operations at the SSA(s) have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes or hazardous constituents to the environment. The Desktop Audit process includes a search of all documents related to operations at the SSA as well as interviews with personnel knowledgeable about the site. Available information for each SSA, including location and a site map, description of past and current land uses, and a description of releases and associated cleanups, will form the basis for the Desktop Audit. Other information sources will include the administrative record and other local, state and federal documentation containing information pertinent to the site.

Typical existing information that will be examined during the Desktop Audit will include site use, ownership and operational history, groundwater and surface water use and characteristics, soil exposure characteristics, and air exposure pathways. This information can be obtained from maps, publications by the United States Geological Survey (USGS) and state geological surveys, regional databases and geographic information systems, and aerial photography. On the basis of information collected during the Desktop Audit, a list of chemicals potentially stored, handled, released, or disposed at each SSA will be compiled.

In addition to the Desktop Audit, a site visit will be conducted at each SSA. The site visit will include a visual inspection of the SSA to aid in site characterization, including identifying potential contaminant sources; chemical migration pathways; potential human and ecological receptors; and receptor exposure pathways. Additionally, potential media to be sampled and sampling locations will be identified for the SSP.

Results of the Desktop Audit and site visit will be presented in a summary report. Included in the report will be an SSA-specific Conceptual Site Model (CSM) depicting potential contaminant sources, environmental and exposure pathways of concern, and potential human and ecological receptors. The CSM will maximize the usability of analytical data derived from site characterization efforts for subsequent risk assessments, and will form the basis for any additional data collection to support the human health and ecological risk screening. These results will be used in formulating the SSP Work Plan, including the need for human health and ecological risk screening.

3.0 DEVELOPMENT OF SITE SCREENING INSPECTION SAMPLING AND ANALYSIS STRATEGY

A site-specific Work Plan will be developed for each SSA investigated under the SSP. The Work Plans will reference the Desktop Audit Summary, providing a detailed description of historical information, SSA conditions, results of previous investigative work and results of the site visit. The Work Plans will also present a Sampling and Analysis Plan (SAP) that describes the number, types and locations of samples to be collected, sample analyses, and the rationale for the sampling plan. The purpose of sample collection and analysis will be to assess the presence or absence of hazardous substances, contaminants, hazardous wastes, or hazardous constituents, and to provide data for performing human health and ecological risk screening in order to evaluate if there is a potential threat to human health or the environment at the SSA.

Media sampled during the SSP will be identified based upon Desktop Audit and site visit findings, and approval of the USEPA Region III.

Potential media of interest in the SSP may include surface soil (0 to 1 feet below ground surface [bgs] 0-6 inches for constituents other than VOCs, 6-12 inches for VOCs), subsurface soil, groundwater, surface water, sediment, and animal and plant tissue (e.g., fish). Where appropriate, geophysical techniques will be used to aid in placement of groundwater and soil sample locations and to confirm and delineate suspected buried waste material identified during the Desktop Audit and site visit. Field screening for explosives using immunoassay-type sampling kits can be performed at SSAs (a complete list of all explosive compounds and respective detection limits using this method will be included in the Work Plan). However, immunoassay-type analytical data cannot be used for risk screening, unless it can be shown through confirmation sampling and analysis that the results of the field test kits are of equivalent precision and accuracy to standard methods of analysis.

Groundwater samples collected during SSP investigations may be obtained via direct push techniques (DPT) or from groundwater monitoring wells, depending on site conditions and data needs. For groundwater samples collected from monitoring wells, only unfiltered organic and metals results will be considered in the assessments (except in circumstances where monitoring wells do not produce samples with sufficiently low solids for a reasonable risk screening to be performed). For DPT groundwater samples, only the filtered metals and unfiltered organic results will be considered in the assessment. Groundwater parameters measured during field activities should include pH, Eh, dissolved oxygen, specific conductance, temperature, salinity, and turbidity, as appropriate, depending on the medium- and SSA-specific conditions.

All environmental media samples collected during the SSP will be analyzed for the full suite of Contract Laboratory Procedure (CLP) constituents and other constituents based on the findings of the Desktop Audit including additional analytes requested by EPA. The analytical target list will include Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs) and dioxins, and Target Analyte List (TAL) inorganic chemicals, including cyanide. Based on past uses of specific SSAs for explosives treatment, and the results of field screening immunoassay methods, it may be necessary to analyze specific samples for nitramine/nitroaromatic compounds. Depending on the history of the SSA and other available information, it may be necessary to

analyze specific samples for perchlorates. Soil samples should be analyzed for physical properties (e.g., bulk density, grain size, specific gravity, percent moisture, and total organic carbon [TOC]), as necessary.

Analytical methods used in the SSP will generally be USEPA CLP/Standard Methods and/or SW-846 Methods. Polynuclear aromatic hydrocarbons (PAHs) and pesticides/PCBs may be analyzed using low detection methods. For example, the National Oceanographic and Atmospheric Administration (NOAA) Status and Trends Methods (USEPA Method No. 1668 [GC/MS, congener standards]; USEPA, 1995d) will be used to meet PCB method detection limits (MDLs) required for the human health and ecological risk screening. An analysis of risk-based concentrations (RBCs) and Biological Technical Assistance Group (BTAG) screening levels relative to analytical reporting limits (RLs) will be conducted as part of Work Plan preparation to ensure that RLs do not exceed screening concentrations (to the greatest extent practicable).

CLP laboratory analytical data will be subjected to data validation in accordance with the Innovative Approaches for Validation of Organic and Inorganic Data, as amended by USEPA Region III (USEPA, 1995a). Section 5 describes the data validation and data evaluation process that will be used in the SSP.

4.0 PERFORMANCE OF FIELD WORK

All SSP field work at SSAs will be performed in accordance with the Master Project Plans for RFAAP and the SSA-specific SSP Work Plan described in Section 3.0 above. The Master Project Plan, including a Field Sampling Plan, Quality Assurance Project Plan, and Health and Safety Plan, addresses the full range of potentially applicable activities that could be required throughout the SSP.

5.0 DATA VERIFICATION, VALIDATION AND USABILITY ASSESSMENT

5.1 Data Verification

Data will be verified in accordance with USEPA Region III Innovative Approaches for Data Validation (USEPA, 1995). Verification for organic data will be performed at Manual Level M2 and the verification for inorganic data will be performed at Manual Level IM1 (if a determination is made that an SSA does require a RFI and formal baseline risk assessment, the existing SSP data will be re-validated at the M3 and IM2 level, respectively). Particular emphasis will be placed on holding time compliance, equipment calibration, spike recoveries, and blank results, although all required elements of the verification process will be considered. The analytical results for nonCLP parameters will be verified based on the Region III Modifications to the National Functional Guidelines further modified to reflect the acceptance specifications of the referenced method to the extent that those specifications differ from those in the Region III Modifications to the National Functional Guidelines. Data qualifiers will be assigned based on the results of verification findings. Laboratory deliverable packages will be equivalent to USEPA CLP deliverable packages, containing complete quality control (QC) summary reports, quality assurance (QA) documentation, and raw data.

Data qualifiers provide information pertaining to the degree of confidence to be considered relative to the presence (or absence) of reported chemicals, and also identify numerical results considered to be less accurate and/or precise than is normal for the method. A list of the data qualifiers that may be applied during the verification effort and their definitions are presented below.

Data Qualifier Codes	
J	The analyte was positively identified. The associated result is the approximate concentration of the analyte in the sample.
K	The analyte was detected. Reported value may be biased high.
R	Serious analytical problems were encountered and quality control criteria were not met. The data point is rejected. The analyte may or may not be present in the sample.
N	Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts
L	The analyte was detected. Reported value may be biased low.
U	The analyte was analyzed for, but not detected above the reported quantitation limit.
UL	The analyte was not detected. The reported quantitation limit is approximate and may be lower.
UJ	The analyte was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
B	The analyte was analyzed for, but was not detected substantially above the level reported in the laboratory or field blanks.

Data tables must report non-detects with the following format: < xx, where xx is the sample reporting limit (but not the method detection limit, the instrument detection limit, the contract detection limit, etc.). Thus, all data tables will have either a blank to show that a constituent was not analyzed, a number to show the numeric value of the detected constituent, or a less than symbol followed by the sample reporting limit. The usual data qualifiers will be added as necessary. A data validation report with hand annotated Form 1s will be prepared to present data validation findings.

5.2 Data Validation and Usability Assessment

Data that are compliant with the minimum specifications of the subject analytical methods, still may not provide sufficient qualitative and/or quantitative quality to make decisions at the requisite statistical confidence. To assess risks associated with chemicals of potential concern (COPCs) at a SSA, data of known quality must be used (USEPA, 1992a). An understanding of analytical data quality is necessary for evaluation of uncertainties related to the data, and consideration of these uncertainties in the decision-making process for the SSAs. To facilitate this goal, data from the SSPs will be evaluated for quality and usability prior to its use in the human health and ecological risk screening.

Guidance such as Guidance for the Data Quality Objective Process (EPA QA/G-4, 1994), Guidance for the Data Quality Assessment Process (EPA QA/G-9, 2000), Risk Assessment Guidance for Superfund, Volume I (USEPA, 1989), and Guidance for Data Usability in Risk Assessment (USEPA, 1992a) will be used to evaluate data for usability in the human health and ecological risk screening. Data will be evaluated for quality based on information in the data verification report. Specifically, data will be evaluated for appropriateness of analytical methods and qualifiers, significant blank contamination, and tentatively identified compounds (TICs). Further, and perhaps more importantly, biases and variability inherent in the data will be assessed in relation to the relative interval between the risk screening level and the reported concentration. Additionally, given that a statistical relationship can be defined between variability, the number of samples in a given data set, and the statistical confidence with which a given conclusion may be drawn, the sampling plan and reported results will be evaluated in relationship to the DQOs established during the planning process.

All validated data that is not qualified and data that is qualified with J, L, K, U, UL, UJ, and B will be used to identify COPCs in the risk screening process, unless the inherent limitations of the analytical method and/or matrix effects obviate this use. Data qualified as rejected (i.e., R) will not be used in COPC identification.

Analytical results for the essential nutrients, calcium, sodium, potassium, and magnesium, in both solid and aqueous media, will not be considered in the assessments. All other metals, including iron, and all organic chemicals, including laboratory contaminants not disqualified in the data verification and validation processes, will be considered in the COPC identification process if detected at least once in environmental samples at an SSA.

5.3 Tentatively Identified Compounds

Chemical analysis to identify and quantify organic compounds is performed with gas chromatography-mass spectrometry (GC-MS) methods. The GC-MS instrument is calibrated for a series of target analytes using chemical standards of known concentration and purity. Quantification of these target analytes is performed against specific internal standards as identified in the respective method. Identification of these target analytes is based on a comparison of the unknown analyte to the chemical standards used during calibration based on the analyte's retention time and mass spectra.

Chromatographic peaks in volatile/semivolatile fractions analyses that are not target analytes, surrogates, or internal standards are potential Tentatively Identified Compounds (TICs). TICs must be qualitatively identified by a National Institute of Standards and Technology (NIST) mass spectral library search and the identification assessed by the data reviewer. For each sample, the laboratory conducts a mass spectral search of the NIST library and report the possible identity for the 10 VOC and/or 20 SVOC largest fraction peaks that are not surrogates, internal standards, or target compounds, but that have an area or height greater than 10 percent of the area or height of the nearest internal standard. TIC results are reported for each sample on the Organic Analyses Data Sheet (Form I - VOC-TIC or SVOC -TIC)

TICs will be reported and included in the COPC identification based upon the degree of match, evidence of similar pattern, analyst professional judgment, availability of toxicity data (e.g., IRIS, HEAST, or NCEA reference doses and/or slope factors), and consultation with EPA Region III (see Section 6.1.1.1). The top 20 TICs will be reported by name and CAS Registry number and may be quantified. Quantification of TICs will be based on input from EPA staff. Positive identification and quantification of TICs will be accomplished by acquiring the appropriate standards and calibrating the GC-MS for the tentatively identified compounds. TICs that lack toxicity data will be discussed in the uncertainty section of the screening risk assessment results.

6.0 SCREENING PROCEDURES

Human health and ecological screening procedures will be performed as a part of the SSP. Section 6.1 presents the methodology for the human health screening procedures and Section 6.2 presents the methodology for the ecological risk screening .

6.1 Human Health Screening Procedures

Human health screening procedures will be conducted in accordance with the USEPA Risk Assessment Guidance for Superfund (RAGS) (USEPA, 1989 and 1991b) and USEPA Region III guidance (USEPA, 1991c, 1993a, and 1998a) with modifications. The purpose of the screening step is to evaluate site data with respect to conservative criteria so that sites requiring no further action can be eliminated from further consideration. This process will also be used to identify sites requiring further evaluation to proceed through additional steps. The conceptual site model (CSM) developed in Section 2.0 will be used to identify those media that are associated with identified exposure pathways. If potential current and future exposure pathways associated with a particular medium are determined to be incomplete, then it may not be necessary to carry that medium through the screening process, given approval by EPA.

The screening procedure will involve the following steps:

1. Identification of COPCs and Cumulative Risk Screening

2. Chemical-Specific Screening for Lead and Iron

3. Comparison to Soil Screening Levels (SSLs)

4. Comparison to ARARs

5. Background Comparisons

These steps are described in the following sections.

6.1.1 Identification of COPCs and Cumulative Risk Screening

6.1.1.1 Identification of COPCs for Human Health Cumulative Risk Screening

As stated previously, chemicals detected at least once in environmental samples at an SSA will be evaluated in the COPC identification stage of the human health screening. The essential nutrients calcium, sodium, potassium, and magnesium; chemicals disqualified in the validation process; and TICs not positively identified, will be eliminated as COPCs.

COPCs will be identified by comparing maximum detected concentrations (MDCs) in a specific medium with chemical-specific risk-based screening criteria, unless the data display the statistical properties required to calculate a valid 95% upper confidence limit (UCL). If this is the case, then the 95% UCL will be employed. Chemicals with MDCs exceeding risk-based

criteria will be identified as COPCs and will be carried through to the cumulative risk screening step of the assessment.

Soil and Sediment. COPCs in surface and subsurface soil and sediment will be identified by comparing MDCs (or a 95% UCL if appropriate) in these media to Risk-Based Concentrations (RBCs) in the most recent version of the USEPA Region III Risk-Based Concentration Table for soil ingestion using the residential and industrial scenarios (USEPA 2000).

For soils and sediments that are exposed a significant portion of the year (i.e., > 6 months/year), screening levels shall correspond, or be adjusted to correspond, to an increased cancer risk of 1 x 10-6 and a noncancer Hazard Quotient (HQ) of 0.1. COPCs can be identified if the MDCs (or a 95% UCL if appropriate) are greater than the screening values for the ingestion and/or inhalation pathways. For sediments that are not exposed, comparisons to adjusted soil screening levels may be used to decide on the need for further evaluation (e.g., quantitative risk assessment), further investigation or response action.

Groundwater and Surface Water. COPCs in groundwater and surface water will be identified by comparing MDCs (or a 95% UCL if appropriate) of chemicals in these media to RBCs in the most recent version of the USEPA Region III Risk-Based Concentration Table for tap water (USEPA 2000), and to federal and state Maximum Contaminant Levels (MCLs) for groundwater and surface water used as a source of drinking water.

For groundwater, as well as surface water that may be a source of drinking water, RBC screening levels shall correspond, or be adjusted to correspond, to an increased cancer risk of 1 x 10-6 and a noncancer Hazard Quotient (HQ) of 0.1. For other surface water, comparisons to adjusted groundwater screening levels may be used to decide on the need for further evaluation (e.g., quantitative risk assessment), further investigation, or response action. Note that all ground water is considered a source of drinking water unless deemed non-potable (i.e., Class III).

Fish. COPCs in fish will be identified by comparing MDCs (or a 95% UCL if appropriate) of chemicals in fish tissue samples to screening level RBCs for fish in the USEPA Region III Risk-Based Concentration Table (USEPA, 2000). Screening levels shall correspond, or be adjusted to correspond, to an increased cancer risk of 1 x 10-6 and a noncancer Hazard Quotient (HQ) of 0.1.

Chemicals Lacking RBCs

For chemicals lacking Region III published RBCs, but having available associated toxicity data that are peer-reviewed, risk assessors will obtain information from the following sources, which are listed in order of preference: USEPA's Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), and provisional values from the National Center for Environmental Assessment (NCEA). From these sources, the Army will make a good faith effort to propose alternative screening values, for EPA concurrence.

Summary. In summary, a detected chemical will be retained as a COPC for a specific medium if the MDC (or a 95% UCL if appropriate) is greater than the corresponding screening criteria described above.

6.1.1.2 Cumulative Risk Screening

The cumulative risk screening process will consist of calculating ratios between the maximum exposure point concentrations (EPCs) of COPCs in an environmental medium and the corresponding USEPA Region III residential and industrial RBCs. COPCs are those chemicals brought forward from the COPC identification step (see Section 6.1.1.1). Carcinogenic and noncarcinogenic effects will be evaluated for exposure to chemicals in each environmental medium sampled.

6.1.1.2.1 Estimation of Exposure Point Concentrations

For purposes of this screening process, maximum detected concentrations (MDCs) (or a 95% UCL if appropriate) will be considered in the cumulative risk screening as representative exposure point concentrations (EPCs) for the SSA as a conservative measure. The selection of the MDC for the exposure point concentration in most cases is motivated by the recognition that in many cases when the number of samples is small, the alternative approach reverts to the maximum detected concentration because the calculated 95% UCL exceeds the MDC.

6.1.1.2.2 Human Health Effects - Carcinogens

The potential for carcinogenic risk will be evaluated by estimating excess cancer risk for each COPC. Using the maximum EPC and the respective screening level RBC value, excess residential and industrial cancer risk can be estimated using the following formula:

$$Excess\,Cancer\,Risk = TR\frac{Max.EPC_i}{RBC_i}$$

Where:

TR	=	The target lifetime cancer risk of 1x10-6
EPCi	=	EPC of COPCi detected in soils and fish (mg/kg) or water (g/L)
RBCi	=	RBC for COPCi in soils and fish (mg/kg) or water (g/L) based on carcinogenic effects at the TR stated above

Finally, the cumulative residential and industrial excess cancer risk is estimated for each SSA. The cumulative excess cancer risk for exposure to multiple COPCs is estimated using the following equation:

$$Cumulative\ Excess\ Cancer\ Risk = \sum \left[TR\ x \frac{Max.EPC_i}{RBC_i} \right]$$

In accordance with 40 Code of Federal Regulations (C.F.R.) 300.430, carcinogenic risk within the benchmark range of 1x10-4 (1 cancer case in 10,000) to 1x10-6 (1 cancer case in 1,000,000) is generally considered acceptable. The following statement is from 40 C.F.R. 300.430 (2000): "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10-4 to 10-6 using information on the relationship between dose and response. The 10-6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure."

Multiplying the EPC/RBC ratio by USEPA's point of departure risk level, 10-6, results in an excess cancer risk estimate for the COPC. Excess cancer risk estimates for all COPCs will be summed to account for potential carcinogenic effects associated with multiple chemical exposures (USEPA, 1989) for each medium. The results of cumulative risk screening will be evaluated as follows:

- If the calculated cumulative excess cancer risk is greater than or equal to 1×10^{-5} for any of the medium, then a quantitative risk assessment would be performed for the SSA, or

- If the calculated cumulative excess cancer risk is: 1) below 1×10^{-5} for all media; and 2) no other screening criteria, as defined by this document, have been exceeded, then no further action (NFA) would be recommended for the SSA.

6.1.1.2.3 Human Health Effects - Noncarcinogens

The potential for adverse noncarcinogenic health effects will be evaluated by calculating a residential and industrial HQ for each COPC. Using the maximum EPC and a respective noncarcinogenic RBC, a residential or industrial HQ can be estimated with the following formula:

$$HQ = THQ \frac{Max.EPC_i}{RBC_i}$$

Where: THQ = The target HQ of 0.1
EPCi = EPC of COPCi detected in soils and fish (mg/kg) or groundwater (g/L)
RBCi = RBC for COPCi in soils and fish (mg/kg) or Groundwater (g/L) based on noncarcinogenic effects at the THQ stated above.

Finally, the cumulative residential and industrial non-carcinogenic hazard index (HI) for exposure to multiple COPCs is estimated as follows:

$$Cumulative\ Noncarcinogenic\ HI = \sum \left[THQ\, x \frac{Max.EPC_i}{RBC_i} \right]$$

Per USEPA guidance for a Baseline Risk Assessment, when the HI exceeds 1, there is a potential for adverse noncarcinogenic health effects (USEPA, 1989). Generally, the more the HI exceeds unity, the greater the potential for adverse health effects. Additionally, when the HI exceeds 1, and multiple chemicals contribute to the exceedance, the HI is segregated on the basis of toxic effects and target organs (i.e., hepatic, renal, respiratory, cardiovascular, gastrointestinal, hematological, musculoskeletal, dermal, ocular effects, neurological, reproductive, developmental, and immune system).

For the cumulative risk screening procedure, HI segregation will involve obtaining the most recent and reliable noncarcinogenic health effects data for COPCs, such as data in the Integrated Risk Information System database (EPA) and databases developed by the Agency for Toxic Substances and Disease Registry (ATSDR). Health effects will be considered for only chronic exposure to COPCs. For COPCs with multiple target organs, the organ that the chemical primarily targets will be considered in hazard segregation.

The results of the cumulative hazard screening will be evaluated as follows:

- In accordance with Region III guidance for risk screening, if the cumulative noncarcinogenic HI for a SSA, computed by this method, is greater or equal than 0.5 for any target organ, then a quantitative risk assessment would be performed for the SSA, or

- If the cumulative noncarcinogenic HI for an SSA, computed by this method, is: 1) less than 0.5 for all target organs; and 2) no other screening criteria, as defined by this document, have been exceeded, then NFA would be recommended for the SSA.

6.1.1.3 Uncertainty Analysis

Uncertainties associated with the cumulative risk screening will be qualitatively evaluated to determine the accuracy of the approach. Factors that may contribute to uncertainty include the use of RBC age-adjusted ingestion and inhalation rates, the use of toxicity information provided by NCEA when RBCs are not available, and the level of uncertainty due to a lack of dermal risk estimates. Uncertainty in the assessment could also arise if health-based RBCs are less than analytical method detection limits.

Uncertainty is associated with the use of RBCs and SSLs because they do not consider dermal uptake. The Site Screening Process is geared towards a risk-based identification of COPCs and preliminary assessment of human and ecological risks that is objective and quantitative. As such, it hinges on the availability of appropriate, risk-based screening levels. No such levels have been identified for dermal exposures to soil, sediment, water or air. Given the conservative nature of the screening process (e.g., use of MDC for exposure point concentrations, use of residential screening level RBCs for soil and groundwater), it is considered very unlikely that omission of

dermal exposures in the risk screening process will result in failure to identify a SSA that would require further investigation or response. To guard against this possibility, contaminant concentrations at all SSAs that pass the risk screening will be scrutinized for the occurrence of contaminants that are known to be easily absorbed through the skin, and if necessary, dermal risks for selected contaminants will be calculated in accordance with USEPA's Dermal Exposure Guidance (USEPA, 1992c, 1997a). These dermal risks may be added to the Cumulative Excess Cancer Risk or Cumulative Noncarcinogenic HI computed above.

6.1.2 Chemical-Specific Screening for Lead and Iron

6.1.2.1 Lead

If lead concentrations in soil are greater than 400 mg/kg (USEPA, 1994a), or lead concentrations in groundwater or surface water are greater than 15 g/L (USEPA 1996b), then potential risk associated with lead will be evaluated using the IEUBK model (USEPA, 1994b). The model will be run using site-specific input parameters based on SSP findings and consultation with USEPA Region III. If the percentage of children expected to have blood lead levels of 10 micrograms per deciliter (μg/dL) or greater exceeds 5%, then further investigation or response action will be required for the SSA.

6.1.2.2 Iron

If iron concentrations in soil or water result in an HQ of 0.5 or greater, then a "margin of exposure" evaluation will be performed. Risks from exposure to iron will be characterized by comparing estimated iron intake to the recommended dietary allowance (RDA) and concentrations known to cause adverse effects in children (NCEA, 1996).

6.1.3 Comparison to Soil Screening Levels (SSLs)

USEPA's Soil Screening Guidance (USEPA, 1996a) will be used as the source of information for three types of SSLs, which address:

- Chemical migration of VOCs from subsurface soil to air;
- Chemical migration of contaminants from soil to air via fugitive dust; and
- Chemical migration of contaminants from soil to groundwater.

MDCs (or a 95% UCL if appropriate) of chemicals found in soil and sediment will be compared to screening levels for leaching of contaminants to groundwater, i.e., soil-to-groundwater screening levels (USEPA, 1996a). Many soil-to-groundwater screening values can be found in the USEPA Region III RBC Tables. A dilution attenuation factor (DAF) of 20 may be used unless groundwater is considered to be shallow. In this case, a site-specific DAF should be calculated. Chemicals found at concentrations exceeding soil-to-groundwater screening levels will be evaluated in a qualitative manner to assess the need for further assessment, investigation, or response action. Geotechnical information such as Total Organic Carbon (TOC), pH, groundwater characteristics, etc., will be an integral part of the qualitative evaluation. In

particular, the SSL comparison will be evaluated with respect to its application to site conditions, such as the karst environment which is present throughout RFAAP. Based on the qualitative evaluation, and other relevant information, a recommendation will be made as to whether further evaluation, investigation, or response action should take place for the SSA.

6.1.4 Comparison to ARARs

MDCs (or a 95% UCL if appropriate) of chemicals found at each SSA will be compared to Applicable or Relevant and Appropriate Requirements (ARARs), including, but not limited to: federal and Virginia Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act, federal Ambient Water Quality Standards under the Clean Water Act, Virginia Water Quality Criteria, Virginia AST/UST TPH guidance level for soil (100 mg/kg) and Virginia AST/UST TPH guidance level for groundwater (1 mg/L) (VDEQ, 1995). Chemicals which are found at concentrations greater than ARARs will be identified. If an MDC (or a 95% UCL if appropriate) is greater than one or more ARARs, a recommendation will be made as to whether further evaluation, investigation, or response action should take place for the SSA. EPA may decide that further evaluation, investigation or response action is required at a SSA, based upon consultation with the Commonwealth if State ARARs are involved.

6.1.5 Background Comparison

As a final step in the human health screening process, MDCs of chemicals identified as COPCs will be compared to the EPA-approved site-specific background concentrations shown in the following table. This table includes inorganic chemicals whose 95% upper tolerance limit (UTL) are greater than residential RBC values and are based on the inorganic background data collected at RFAAP.

Facility-Wide Point Estimates for Soil

[Units in mg/kg]

Chemical	Minimum Concentration	Maximum Concentration	95% UTL of the Mean
Aluminum	3,620	47,900	40,041
Arsenic	1.2	35.9	15.8
Chromium	6.3	75.8	65.3
Iron	7,250	67,700	50,962
Manganese	16.7	2,040	2,543
Thallium	1.3	5	2.11
Vanadium	12.2	114	108

Based on the background comparison, and other relevant information, a recommendation will be made as to whether further investigation or response action is warranted at each SSA.

6.1.6 Summary of Human Health Risk Screening Procedures

The results of each screen will be summarized. If COPCs have been identified, in a particular medium, the SSA will be subject to further evaluation, such as a quantitative risk assessment. The results of the SSP will also be used to further refine the CSM.

6.2 Ecological Risk Screening Procedures

The USEPA Risk Assessment Forum (1992) recommended a general framework for conducting ecological risk assessments (ERAs). The Forum framework is presented in Figure 6-1. USEPA has since refined the framework and prepared ERA guidance (USEPA 1997). The approach taken for the SSA ecological screening at RFAAP follows the ERA eight-step approach in the USEPA guidance. Other guidance documents which may be consulted during the ecological risk screening process include the USEPA Region III BTAG ERA guidelines (USEPA 1995b), and the Tri-Service Procedural Guidelines for ERAs, Volume 1 (Wentsel et al, 1996).

The eight-step process is summarized in Figure 6-2. Since this is an ecological risk screen, the process focuses on Steps 1 and 2. These steps are intended to provide a foundation of information pertaining to ecological resources and potential interactions with site-related contamination in order that risk managers can make conservative decisions regarding ecological risks at individual SSAs.

The following steps will be followed for the ecological risk screening :

Site Reconnaissance

Problem Formulation

Exposure Assessment

Ecological Effects Assessment

Risk Characterization

Figure 6-1 Ecological Risk Assessment Framework (USEPA, 1997)

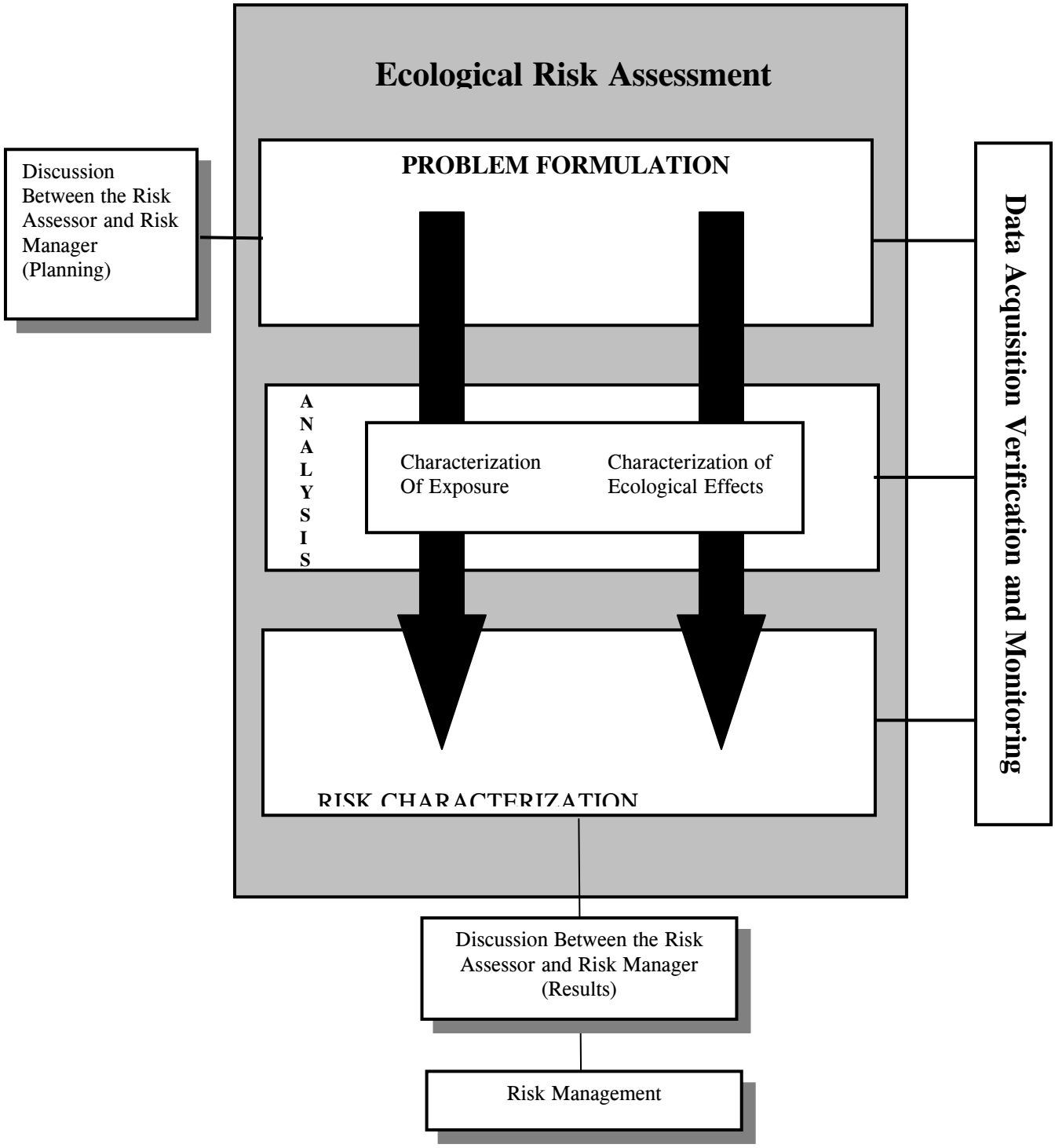
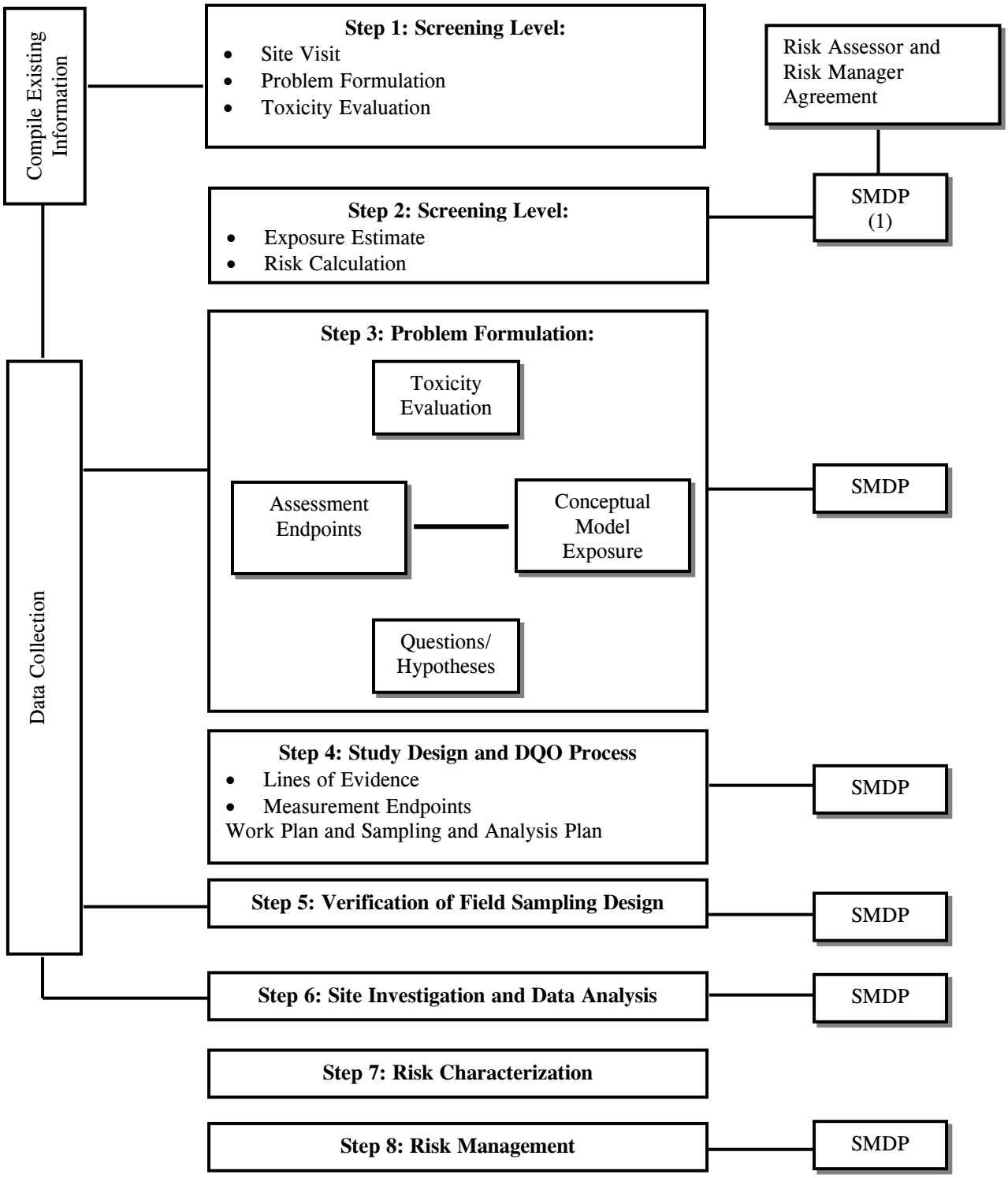


Figure 6-2 Eight-Step Ecological Risk Assessment Process for Superfund (USEPA, 1997)



The ecological risk screening will provide conclusions and recommendations regarding ecological risk at the site. The Army will use these data to make ecological risk management recommendations for each SSA. The scientific/management decision point reached from the ecological risk screening will include one of the following:

- There is adequate information to conclude that ecological risks are negligible and therefore there is no need for further action at the SSA on the basis of ecological risk;

- The information is not adequate to make a decision at this point and further refinement of data is needed to augment the ecological risk screening; or

- The information collected and presented indicates that a more thorough assessment is warranted.

6.2.1 Problem Formulation

Problem formulation is the first phase of a ecological risk screening and discusses the goals, breadth, and focus of the screening. It involves the collection and analysis of existing data to the greatest extent possible. Problem formulation includes general descriptions of RFAAP SSAs, with emphasis on size of the SSAs, proximity to operational areas and/or sensitive habitats, and the habitats and ecological receptors present. This phase also involves characterization of site contaminants, contaminant sources, migration routes, and an evaluation of complete routes of contaminant exposure to important ecological receptors. Assessment and measurement endpoints that will be evaluated are also selected. Finally, a conceptual model is developed that describes how contaminants associated with the sites in question may come into contact with ecological receptors. Much of this step will have been completed during the site reconnaissance, the review of historical information, and the development of the work plan, as discussed in Sections 2.0 and 3.0, respectively.

The following sections provide more detailed descriptions of the steps involved in the development of the problem formulation component of the ecological risk screening.

6.2.1.1 Site Characterization

The objectives of this step are to initially identify and characterize the site(s) ecological resources, and to preliminarily describe the nature and extent of chemical contamination at the site(s) in question. Information pertaining to site land-use (past, current and future), size, proximity to operable areas and/or sensitive habitats, and habitats and ecological resources will be developed during the site characterization. The SSP is a screening level process that will be used to determine if a site should proceed further through the RFI stage. As such, detailed field sampling and quantitative analysis of biota will not be performed during the SSP. If contamination is identified which may impact ecological receptors, a recommendation in the SSP report would include biota sampling.

This step will actually begin with the site visit discussed in Section 2.0. Information about local ecological resources (including threatened and endangered species) will also be obtained from maps of the study area, available scientific literature, and federal and state agencies (e.g., U.S.

Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, Department of Natural Heritage database, etc.). The site characterization will also describe likely contaminant sources, release mechanisms, complete migration pathways, the fate of chemicals resulting from site-related activities, as well as important ecological resources that could be adversely affected by these chemicals.

6.2.1.2 Identification of Chemicals of Potential Ecological Concern

COPCs will be identified by comparison of maximum site concentrations to approved Region III BTAG screening values and/or by simple food-web modeling. Initial screening of analytical data will be conducted using general screening values considered protective of all wildlife. Chemicals with MDCs (or a 95% UCL if appropriate) exceeding screening values and/or chemicals for which no screening values are available will be initially identified as COPCs to be carried through to the risk characterization step of the ecological risk screening. Values may be derived from sources such as, Federal and state standard Ambient Water Quality Criteria, Ontario Ministry of the Environment LEL values for freshwater habitats (Ontario Ministry of Environment and Energy, 1993), Great Lakes Research TEL values (Smith et al., 1996) for freshwater habitats, and EPA and ORNL surface soil screening levels (USEPA, 2000b and Will and Suter, 1995a).

6.2.1.3 Identification of Exposure Pathways and Potential Receptors for Analysis

The pathways by which ecological receptors may be exposed to COPCs at the site(s) will be identified along with the receptor groups that could be adversely affected by these chemicals. Several potential exposure pathways may exist at the site(s). For example, terrestrial vegetation may be exposed to contaminants via direct aerial deposition and root translocation, although aerial deposition is highly variable and difficult to quantify. Terrestrial animals may be exposed to soil contaminants through ingestion of contaminated food items and by incidentally ingesting soil while grooming fur, preening feathers, digging, grazing close to the soil, or feeding on items to which soil has adhered (such as roots and tubers). Terrestrial animal receptors may also come into contact with contaminants in surface water by using surface water for drinking water, although this exposure route represents a negligible portion of total exposure for most receptors.

Aquatic and semi-aquatic organisms at the RFAAP may be exposed to contaminants via direct contact with surface water and sediments, incidental ingestion of surface water and sediments, and consumption of contaminated food items. Aquatic and semi-aquatic organisms may also be exposed to constituents from contaminated groundwater that flows into surface water.

For purpose of the SSA ecological risk screening, exposure pathways representing important and likely meaningful routes of contaminate uptake will be assessed for appropriate receptor groups. If sufficient information exists to examine more obscure exposure routes (e.g. aerial deposition or inhalation) or if the assessment of an exposure route will substantially contribute to the risk understanding (e.g. drinking water) it will be examined to assess whether it warrants the evaluation.

Based on the identification of site-specific habitats, food webs, COPCs, and exposure pathways, recommendations will be made for species or species groups to be selected for evaluation in the risk screening. These may include the following receptor groups:

- For terrestrial systems: terrestrial plants, terrestrial invertebrates, reptiles and amphibians, invertebrate-eating birds (e.g., robin), invertebrate-eating mammals (e.g., shrew), carnivorous mammals (e.g. red fox), and carnivorous birds (e.g., red-tailed hawk) may be included. In addition, plant-eating mammals (e.g., rabbit), and omnivorous mammals (e.g. raccoon) may be included.

- For aquatic systems: aquatic plants, benthic invertebrates, fish, reptiles and amphibians, fish-eating birds (e.g. great blue heron), and fish-eating mammals (e.g. mink) may be included.

6.2.1.4 Identification of Assessment and Measurement Endpoints

One of the major tasks in screening problem formulation is the selection of assessment and measurement endpoints. An assessment endpoint is defined as "an explicit expression of actual environmental values that are to be protected" (USEPA, 1992d). Measurement endpoints are "measurable ecological characteristics that are related to the valued characteristic chosen as the assessment endpoint" (USEPA 1992d). Measurement endpoints serve as tools for ranking and evaluating environmental values that are to be protected. While declines in populations and shifts in community structure can be quantified, studies of this nature are generally time-consuming and difficult to interpret. However, measurement endpoints indicative of observed effects on individuals are relatively easy to measure in laboratory toxicity studies and can be related to the site specific assessment endpoint.

Toxicity data and assessment endpoints shall be discussed with BTAG, and agreed upon, in accordance with the USEPA Guidance (USEPA 1997). This step also includes the development of a conceptual site model (CSM) and identification of the specific objectives and scope of the ecological risk screening. The CSM is designed to diagrammatically identify potentially exposed receptor populations and applicable exposure pathways, based on the physical nature of the site and the potential contaminant source areas. Generally, a separate CSM will be developed for each SSA because the contaminant source, migration pathways, assessment and measurement endpoint, and exposure pathways are site-specific. However, in appropriate cases, more than one SSA can be included in a single CSM if, for example, there are common exposure and/or migration pathways.

6.2.2 Exposure Assessment

This section of the ecological risk screening includes identification of contaminant concentration data used to represent ecological exposure in various media. For each exposure pathway selected for quantitative evaluation, conservative exposure point concentrations (EPCs) will be used and the receptor specific exposure will be quantified. EPCs will be estimated using environmental sampling data either alone or in conjunction with simple environmental fate and transport models.

The food chain modeling will be performed in accordance with current USEPA CERCLA guidance for ecological risk assessment, and use conservative exposure parameter values (maximum ingestion rate, minimum body weight, 100% bioavailability) (USEPA, 1993b). The ecological exposure assessment will consist of two phases. The first, most conservative, phase will be based on conservative exposure assumptions such as:

Maximum analytical results for each medium of concern used as EPCs; and

Site use factor equals 1

The second phase will be based on conservative yet more realistic exposure assumptions such as:

- Site use factor determined based on the size of the SSA, proximity to operational areas and/or sensitive habitats, the quality of habitat present, and behavior of important ecological receptors; and

- Use of average body weight and average intake for selected wildlife receptors.

6.2.3 Ecological Effects Assessment

This step in the ecological risk screening develops toxic reference values (TRVs) for ecological receptors, to be used in the risk characterization. Acknowledging that data pertaining to ecological risk characterization is continually being updated, the Army shall consult with EPA on the most-up-to-date and appropriate data sources, when reaching this stage in the screening process. The toxicity of COPCs to terrestrial and aquatic organisms will be summarized using relevant toxicity data for the selected receptor species. The TRVs to be used in the evaluation of potential adverse effects to terrestrial and aquatic species will be derived from the literature, where possible.

In food web modeling, calculated doses will be compared to toxicological thresholds (no observed adverse effect levels [NOAELs] and lowest observed adverse effect levels [LOAELs]). The Army shall develop TRVs for wildlife receptors derived from NOAELs and LOAELs taken from various literature sources. BTAG will review these values and may provide technical assistance in selecting wildlife derived NOAELs and LOAELs. Only EPA and BTAG approved TRVs will be used in identifying COPCs at SSAs.

6.2.4 Risk Characterization

This step compares exposure point contaminant concentrations with benchmark concentrations protective of ecological receptors. The ratio of the maximum contaminant concentration to the benchmark value is called the HQ or Ecological Effects Quotient (EEQ), and is defined as follows:

$$EEQ = Emax/TRV$$

Where: EEQ = Ecological Effects Quotient for contaminant (unitless)

Emax = Maximum Concentration for contaminant (mg/L or mg/kg)

TRV = Toxicity Reference Value for contaminant (mg/L or mg/kg)

When the ratio of the maximum concentration to its respective benchmark value exceeds 1.0, further assessment may be needed. The EEQ value should not be construed as being probabilistic; rather, it is a numerical indicator of the extent to which a maximum concentration exceeds or is less than a benchmark. When EEQ values exceed 1.0, it is an indication that ecological receptors are potentially at risk based on conservative exposure assumptions.

The preliminary risk characterization will be based on the conservative preliminary exposure assumptions. A major part of the risk characterization is the interpretation of the preliminary estimates of risk in light of the conservative assumptions and uncertainties (see Section 6.2.5).

Additional evaluation of site-specific data may be necessary to confirm with greater certainty whether ecological receptors are actually at risk at the site, especially since most benchmarks are based on conservative exposure assumptions. A refined estimate of EEQs will be made using the refined exposure factors (Section 6.2.2). The results of the conservative and refined risk estimates will be evaluated in light of the uncertainties of the risk assessment process (Section 6.2.5). Furthermore, other factors, such as low frequency of detection, may mitigate potential risks for a COPC with an elevated EEQ value.

6.2.5 Uncertainty Analysis

When the above steps are completed, the results are interpreted and the uncertainties associated with the ecological risk screening are addressed. General uncertainties associated with the ecological risk screening will be qualitatively evaluated to determine the conservatism of the approach. For example, uncertainty in this site screening could arise if ecological based criteria are less than analytical method detection limits. In addition, background screening will be performed at this stage to aid in risk management decisions. Maximum detected concentrations of inorganic constituents may be compared to background values (see Section 6.1.4) to assist in assessing whether or not potential ecological risk is associated with site-related conditions.

7.0 SITE SCREENING PROCESS REPORT

Results of the desktop audit, nature and extent determination (if available), and the human health and ecological screening procedures will be presented in an SSP Report for each SSA with a recommendation for future action. The EPA will review the SSP Report for each SSA and based on results of the screening procedures, a decision will be made as to whether each SSA should be recommended for no further action, or for further action. A need for further action will be based on but not limited to the following: historical use of the SSA, history of documented release (if any), analytical data from the SSA, and the overall weight of the evidence. In general, further action at an SSA may be required under the following circumstances:

- Cumulative Excess Cancer Risk (CECR) greater than 1x10-5
- HI greater than 0.5 per target organ
- Maximum Detected Concentration > SSL for chemical migration from soil to ground water or other screening values (e.g., Virginia AST/UST TPH guidance level for soil; Virginia State and Federal MCLs, Virginia AST/UST TPH guidance level for ground water; or Federal and State Ambient Water Quality Criteria for surface water)
- Ecological risk considerations per Section 6.2

If none of the above circumstances occur, EPA may recommend no further action and memorialize this recommendation in a Decision Document.

If any of the above circumstances occur, further action may be required. Further action may consist of one or more of the following:

- Interim Removal Action, followed by sampling to confirm that risks have been reduced to acceptable levels
- Focused RFI (including additional sampling)
- RFI/CMS

8.0 DISPUTE RESOLUTION

Disputes arising during the course of the SSP shall be resolved using the dispute resolution procedures of the RCRA Corrective Action Permit, Part I, C.

9.0 REFERENCES

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APPENDIX C

STANDARD OPERATING PROCEDURES

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Standard Operating Procedures

SOP SERIES	TITLE
10.0	**DOCUMENTATION**
10.1	Field Logbook
10.2	Surface Water, Groundwater, and Soil/Sediment Field Logbooks
10.3	Boring Logs
10.4	Chain-of-Custody Forms
20.0	**SUBSURFACE INVESTIGATION**
20.1	Monitoring Well Installation
20.2	Monitoring Well Development
20.3	Well and Boring Abandonment
20.4	Test Pits
20.7	Resistivity and Electromagnetic Surveys
20.8	Magnetic and Metal Detection Surveys
20.11	Drilling Methods and Procedures
30.0	**SAMPLING**
30.1	Soil Sampling
30.2	Groundwater Sampling
30.6	Containerized Material
30.7	Sampling Strategies
30.9	Collection of Soil Samples By USEPA SW-846 Method 5035 Using Disposable Samplers
40.0	**FIELD EVALUATION**
40.1	Multiparameter Water Quality Monitoring Instrument
40.2	Water Level and Well-Depth Measurements
40.3	Slug Tests
50.0	**SAMPLE MANAGEMENT**
50.1	Sample Labels
50.2	Sample Packaging
70.0	**INVESTIGATION-DERIVED MATERIAL**
70.1	Investigation-Derived Material
80.0	**DECONTAMINATION**
80.1	Decontamination
90.0	**AIR MONITORING EQUIPMENT**
90.1	Photoionization Detector (HNu Model PI-101 and HW-101)

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STANDARD OPERATING PROCEDURE 10.1
FIELD LOGBOOK

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording daily site investigation activities.

Records should contain sufficient information so that anyone can reconstruct the sampling activity without relying on the collector's memory.

2.0 MATERIALS

- Field Logbook;
- Indelible ink pen; and
- Clear tape.

3.0 PROCEDURE

Information pertinent to site investigations will be recorded in a bound logbook. Each page/form will be consecutively numbered, dated, and signed. All entries will be made in indelible ink, and all corrections will consist of line out deletions that are initialed and dated. If only part of a page is used, the remainder of the page should have an "X" drawn across it. At a minimum, entries in the logbook will include but not be limited to the following:

- Project name (cover);
- Name and affiliation of personnel on site;
- Weather conditions;
- General description of the field activity;
- Sample location;
- Sample identification number;
- Time and date of sample collection;
- Specific sample attributes (e.g., sample collection depth flow conditions or matrix);
- Sampling methodology (grab or composite sample);
- Sample preservation, as applicable;
- Analytical request/methods;
- Associated quality assurance/quality control (QA/QC) samples;
- Field measurements/observations, as applicable; and
- Signature and date of personnel responsible for documentation.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCES

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STANDARD OPERATING PROCEDURE 10.2
SURFACE WATER, GROUNDWATER, AND SOIL/SEDIMENT FIELD LOGBOOKS

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording surface water, groundwater, and soil/sediment sampling information, as well as instrument calibration data in field logbooks.

2.0 MATERIAL

- Applicable field logbook (see attached forms); and
- Indelible ink pen.

3.0 PROCEDURE

All information pertinent to surface water, groundwater, or soil/sediment sampling will be recorded in the appropriate logbook. Each page/form of the logbook will be consecutively numbered. All entries will be made with an indelible ink pen. All corrections will consist of line out deletions that are initialed and dated.

3.1 SOIL/SEDIMENT

3.1.1 Field Parameters/Logbook (Form 10.2-a)

1. HIGH CONCENTRATION EXPECTED?: Answer "Yes" or "No.";
2. HIGH HAZARD?: Answer "Yes" or "No.";
3. INSTALLATION/SITE: Record the complete name of the installation or site;
4. AREA: Record the area designation of the sample site;
5. INST. NAME: Record the two-letter installation name for Radford Army Ammunition Plant – "RD";
6. SAMPLE MATRIX CODE: Record the appropriate sample matrix code. Common codes are "SD" for solid - sediment, "SI" for soil - gas, "SL for solid sludge, "SO" for surface other, "SS" for solid – soil, "SW" for surface wipe, "WD" for water – potable, "WG" for water – ground, "WS" water – surface, "WT" – water treated and "WW" water -waste;
7. SITE ID: Record a code up to 20 characters or numbers that is unique to the site;
8. ENV. FIELD SAMPLE IDENTIFIER: Record a code up to 20 characters specific for the sample;
9. DATE: Enter the date the sample was taken;
10. TIME: Enter the time (12-hour or 24-hour clock acceptable as long as internally consistent) the sample was taken;
11. AM PM: Circle "AM" or "PM" to designate morning or afternoon (12-hour clock);
12. SAMPLE PROG: Record "RFI" (RCRA Facility Investigation) or other appropriate sample program;
13. DEPTH (TOP): Record the total depth sampled;
14. DEPTH INTERVAL: Record the intervals at which the plug will be sampled;

15. UNITS: Record the units of depth (feet, meters);
16. SAMPLE MEASUREMENTS: Check the appropriate sampling method;
17. CHK: Check off each container released to a laboratory;
18. ANALYSIS: Record the type of analysis to be performed on each sample container;
19. SAMPLE CONTAINER: Record the sample container type and size;
20. NO.: Record the number of containers;
21. REMARKS: Record any remarks about the sample;
22. TOTAL NUMBER OF CONTAINERS FOR SAMPLE: Record the total number of containers;
23. SITE DESCRIPTION: Describe the location where the sample was collected;
24. SAMPLE FORM: Record the form of the sample (i.e., clay, loam, etc.) using The Unified Soil Classification System (USCS);
25. COLOR: Record the color of the sample as determined from standard Munsell Color Charts;
26. ODOR: Record the odor of the sample or "none";
27. PID: Record the measured PID values or other similar measurement instrument value;
28. UNUSUAL FEATURES: Record anything unusual about the site or sample;
29. WEATHER/TEMPERATURE: Record the weather and temperature; and
30. SAMPLER: Record your name.

3.1.2 Map File Form (refer to form 10.2-c)

1. SITE ID: Record the Site ID from the field parameter form;
2. POINTER: Record the field sample number for the sample being pointed to;
3. DESCRIPTION/MEASUREMENTS: Describe the location where the sample was taken, along with distances to landmarks;
4. SKETCH/DIMENSIONS: Diagram the surroundings and record the distances to landmarks;
5. MAP REFERENCE: Record which U.S.G.S. Quad Map references the site;
6. COORDINATE DEFINITION: Write the compass directions and the X- and Y-coordinates of the map run;
7. COORDINATE SYSTEM: Write "UTM" (Universal Transverse Mercator);
8. SOURCE: Record the 1-digit code representing the Map Reference;
9. ACCURACY: Give units (e.g., write "1-M" for 1 meter);
10. X-COORDINATE: Record the X-coordinate of the sample site location;
11. Y-COORDINATE: Record the Y-coordinate of the sample site location;
12. UNITS: Record the units used to measure the map sections;
13. ELEVATION REFERENCE: Record whether topography was determined from a map or a topographical survey;
14. ELEVATION SOURCE: Record the 1-digit code representing the elevation reference;

15. ACCURACY: Record the accuracy of the map or survey providing the topographical information;
16. ELEVATION: Record the elevation of the sampling site;
17. UNITS: Write the units in which the elevation is recorded; and
18. SAMPLER: Write your name.

3.2 SURFACE WATER

3.2.1 Field Parameter Logbook (Forms 10.2-b and 10.2-c)

1. CAL REF: Record the calibration reference for the pH meter;
2. pH: Record the pH of the sample;
3. TEMP: Record the temperature of the sample in degrees Celsius;
4. COND: Record the conductivity of the water;
5. Description of site and sample conditions (refer to 10.2-b);
6. Map File Form (refer to Section 3.1.2).

3.3 GROUNDWATER (FORMS 10.2- D)

3.3.1 Field Parameter Logbook (Form 10.2.b)

Refer to Section 3.2.1.

3.3.2 Map File and Purging Forms

1. WELL NO. OR ID: Record the abbreviation appropriate for where the sample was taken. Correct abbreviations can be found on pages 18-21 of the IRDMIS User's Guide for chemical data entry;
2. SAMPLE NO.: Record the reference number of the sample;
3. WELL/SITE DESCRIPTION: Describe the location where the sample was taken, along with distances to landmarks;
4. X-COORD AND Y-COORD: Record the survey coordinates for the sampling site;
5. ELEV: Record the elevation where the sample was taken;
6. UNITS: Record the units the elevation was recorded in;
7. DATE: Record the date in the form MM/DD/YY;
8. TIME: Record the time, including a designation of AM or PM;
9. AIR TEMP.: Record the air temperature, including a designation of C or F (Celsius or Fahrenheit);
10. WELL DEPTH: Record the depth of the well in feet and inches;
11. CASING HEIGHT: Record the height of the casing in feet and inches;
12. WATER DEPTH: Record the depth (underground) of the water in feet and inches;
13. WELL DIAMETER: Record the diameter of the well in inches;
14. WATER COLUMN HEIGHT: Record the height of the water column in feet and inches;
15. SANDPACK DIAM.: Record the diameter of the sandpack. Generally, this will be the same as the bore diameter;

16. EQUIVALENT VOLUME OF STANDING WATER: Use one of the following equations to determine one equivalent volume (EV);

    1 EV = volume in casing + volume in saturated sandpack. Or:

    $1\ EV = [\pi R_w^2 h_w + 0.30p(R_s^2 - R_w^2)h_s] * (0.0043)$

Where:

R_s = radius of sandpack in inches
R_w = radius of well casing in inches
h_s = height of sandpack in inches
h_w = water depth in inches

$0.0043 = gal/in^3$

and filter pack porosity is assumed as 30%, or

Volume in casing =
$(0.0043\ gal/in^3)(p)(12\ in/ft)(R_c^2)(W_h)$

Where:

R_c = radius of casing in inches, and
W_h = water column height in feet

Vol. in sandpack =
(0.0043 gal/in3)(p)(12 in/ft)(Rb2 - Rc2)(Wh)(0.30)

(if Wh is less than the length of the sandpack), or

Vol. in sandpack =
(0.0043 gal/in3)(p)(12 in/ft)(Rb2 - Rc2)(Sh)(0.30)

(if Wh is greater than the length of the sandpack).

where:

Rb = radius of the borehole, and
Sh = length of the sandpack.

Show this calculation in the comments section.

1. PUMP RATE: Record pump rate;
2. TOTAL PUMP TIME: Record total purge time and volume;
3. WELL WENT DRY? Write “YES” or “NO”;
4. PUMP TIME: Record pump time that made the well go dry;
5. VOLUME REMOVED: Record the volume of water (gal) removed before the well went dry;
6. RECOVERY TIME: Record the time required for the well to refill;

7. PURGE AGAIN?: Answer “YES” or “NO”;
8. TOTAL VOL. REMOVED: Record the total volume of water (in gallons) removed from the well;
9. CAL REF.: Record the calibration reference for the pH meter;
10. TIME: Record time started (INITIAL T(0)), 2 times DURING the sampling and the time sampling ended (FINAL);
11. pH: Record the pH at start of sampling (INITIAL), twice DURING the sampling, and at the end of sampling (FINAL);
12. TEMP: Record the water temperature (Celsius) at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL);
13. COND: Record the conductivity of the water at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL);
14. D.O.: Record the dissolved oxygen level in the water at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL);
15. TURBIDITY: Record the readings from the turbidity meter (nephelometer) and units at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL);
16. ORD: Record the oxidation/reduction (RedOx) potential of the water sample at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL);
17. HEAD SPACE: Record any positive readings from organic vapor meter reading taken in well headspace before sampling;
18. NAPL: Record the presence and thickness of any non-aqueous phase liquids (LNAPL and DNAPL)
19. COMMENTS: Record any pertinent information not already covered in the form; and
20. SIGNATURE: Sign the form.

3.4 FIELD CALIBRATION FORMS (REFER TO FORM 10.2-E)

1. Record time and date of calibration;
2. Record calibration standard reference number;
3. Record meter ID number;
4. Record initial instrument reading, recalibration reading (if necessary), and final calibration reading on appropriate line;
5. Record value of reference standard (as required);
6. COMMENTS: Record any pertinent information not already covered on form; and
7. SIGNATURE: Sign form.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCE

USEPA. 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response, January.

FIELD PARAMETER/LOGBOOK FORM 10.2-a
SOIL AND SEDIMENT SAMPLES

HIGH CONCENTRATION EXPECTED? _____ HIGH HAZARD?

INSTALLATION/SITE _____ AREA _____

INST NAME _____ FILE NAME _____

SAMPLE MATRIX CODE _____ SITE ID _____
ENV. FIELD SAMPLE IDENTIFIER _____

DATE (MM/DD/YY) __/__/__ TIME _____ AM PM SAMPLE PROGRAM

DEPTH (TOP) _____ DEPTH INTERVAL _____ UNIT _____

SAMPLING METHOD:

SPLIT SPOON ___ AUGER ___ SHELBY TUBE ___ SCOOP ___ OTHER

CHK	ANALYSIS	SAMPLE CONTAINER	NO.	REMARKS

TOTAL NUMBER OF CONTAINERS FOR SAMPLE_____

DESCRIPTION OF SITE AND SAMPLE CONDITIONS

SITE DESCRIPTION:_____

_____

_____

SAMPLE FORM _____ COLOR _____ ODOR _____

PID (HNu)_____ UNUSUAL FEATURES_____

_____

WEATHER/TEMPERATURE

SAMPLER _____

FIELD PARAMETER/LOGBOOK FORM 10.2-b
GROUNDWATER AND SURFACE WATER SAMPLES

HIGH CONCENTRATION EXPECTED? _____ HIGH HAZARD?

INSTALLATION/SITE _____ AREA

INST CODE _____ FILE NAME _____ SITE TYPE

SITE ID _____ FIELD SAMPLE NUMBER

DATE (MM/DD/YY) __/__/__ TIME _____ AM PM SAMPLE PROG.

DEPTH (TOP) _____ DEPTH INTERVAL _____ UNITS

SAMPLING MEASUREMENTS

CAL REF. _____ pH _____ TEMPERATURE °C _____ CONDUCTIVITY _____ REDOX _____

DISSOLVED OXYGEN ____ TURBIDITY _____ OTHER

CHK	ANALYSIS	SAMPLE CONTAINER	NO.	REMARKS

TOTAL NUMBER OF CONTAINERS FOR SAMPLE_____

DESCRIPTION OF SITE AND SAMPLE CONDITIONS

SITE DESCRIPTION_____

SAMPLING METHOD_____

SAMPLE FORM _____ COLOR _____ ODOR _____

PID (HNu)_____

UNUSUAL FEATURES_____

WEATHER/TEMPERATURE_____ SAMPLER _____

EXAMPLE MAP FILE LOGBOOK FORM 10.2-c
SURFACE WATER, SOIL, AND SEDIMENT SAMPLES

SITE ID_____ POINTER_____

DESCRIPTION/MEASUREMENTS_____

SKETCH/DIMENSIONS :

MAP REFERENCE_____

COORDINATE DEFINITION (X is _____ Y is _____)

COORDINATE SYSTEM _____ SOURCE _____ ACCURACY_____

X-COORDINATE _____ Y-COORDINATE _____ UNITS_____

ELEVATION REFERENCE_____

ELEVATION SOURCE _____ ACCURACY _____ELEVATION_____

UNITS_____

SAMPLER_____

EXAMPLE MAP FILE AND PURGING LOGBOOK FORM 10.2-d
GROUNDWATER SAMPLES

WELL COORD. OR ID _____ SAMPLE NO._____

WELL/SITE DESCRIPTION_____

_____

X-COORD. _____ Y-COORD. _____ ELEV. _____ UNITS

DATE ____/____/____ TIME _____ AIR TEMP.

WELL DEPTH _____ FT. _____ IN. CASING HT. _____ FT. _____ IN.

WATER DEPTH _____ FT. _____ IN. WELL DIAMETER _____ IN.

WATER COLUMN HEIGHT _____ FT. _____ IN. SANDPACK DIAM. _____ IN.

EQUIVALENT VOLUME OF STANDING WATER _____ (GAL) (L)

VOLUME OF BAILER _____ (GAL) (L) or PUMP RATE _____ (GPM) (LPM)

TOTAL NO. OF BAILERS (5 EV) _____ or PUMP TIME _____ MIN.

WELL WENT DRY? [Yes] [No] NUM. OF BAILERS _____ or PUMP TIME

VOL. REMOVED _____ (GAL) (L) RECOVERY TIME

PURGE AGAIN? [Yes] [No] TOTAL VOL. REMOVED _____ (GAL) (L)

DATE & TIME	QUANTITY REMOVED	TIME REQ'D	pH	Cond	Temp	ORD	Turb	DO	Character of water (color / clarity / odor / partic.)
(before)									
(during)									
(during)									
(during									
(after)									

COMMENTS_____

SIGNATURE_____

EXAMPLE FIELD CALIBRATION FORM 10.2-e
FOR pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY,
ORD, AND DISSOLVED OXYGEN METERS

INITIAL CALIBRATION	FINAL CALIBRATION
DATE:	**DATE:**
TIME:	**TIME:**

pH METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

pH STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
7.0			
10.0			
4.0			

CONDUCTIVITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

COND. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

TEMPERATURE METER CALIBRATION

METER ID_____

TEMP. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
ICE WATER			
BOILING WATER			
OTHER _____			

EXAMPLE FIELD CALIBRATION FORM 10.2-e
FOR pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY,
ORD, AND DISSOLVED OXYGEN METERS

TURBIDITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

ORD METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

DISSOLVED OXYGEN METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

COMMENTS_____

SIGNATURE_____

STANDARD OPERATING PROCEDURE 10.3
BORING LOGS

1.0 INTRODUCTION

The purpose of this standard operating procedure (SOP) is to describe the methods to be followed for classifying soil and rock, as well as preparing borehole logs and other types of soil reports.

2.0 MATERIALS

The following equipment is required for borehole logging:

- HTRW ENG Form 5056-R and 5056A-R boring log forms;
- Daily inspection report forms;
- Chain-of-custody forms;
- Request for analysis forms;
- ASTM D 2488 classification flow chart;
- Soil and/or Rock color chart (i.e., Munsell®);
- Grain size and roundness chart;
- Graph paper;
- Engineer's scale;
- Previous reports and boring logs;
- Pocketknife or putty knife;
- Hand lens;
- Dilute hydrochloric acid (10% volume);
- Gloves;
- Personal protective clothing and equipment, as described in work plan addenda health and safety plan;
- Photoionization detector or other appropriate monitoring equipment per site-specific health and safety plan; and
- Decontamination supplies (SOP 80.1).

3.0 PROCEDURE

Each boring log should fully describe the subsurface environment and the procedures used to obtain this description.

Boring logs should be prepared in the field on USACE Engineer Form 5056-R and 5056-R. Logs should be recorded in the field directly on the boring log form and not transcribed from a field book.

A “site geologist” should conduct borehole logging and soil/rock identification and description or other professional trained in the identification and description of soil/rock.

3.1 BORING LOG INFORMATION

As appropriate, the following information should be recorded on the boring log during the course of drilling and sampling activities:

- Project information including name, location, and project number;
- Each boring and well should be uniquely numbered and located on a sketch map as part of the log;
- Type of exploration;
- Weather conditions including events that could affect subsurface conditions;
- Dates and times for the start and completion of borings, with notations by depth for crew shifts and individual days;
- Depths/heights in feet and in decimal fractions of feet;
- Descriptions of the drilling equipment including rod size, bit type, pump type, rig manufacturer and model, and drilling personnel;
- Drilling sequence and descriptions of casing and method of installation;
- Description and identification of soils in accordance with ASTM Standard D 2488;
- Descriptions of each intact soil sample for the parameters identified in Section 3.2;
- Descriptions and classification of each non-intact sample (e.g., wash samples, cuttings, auger flight samples) to the extent practicable;
- Description and identification of rock;
- Description of rock (core(s)) for the parameters identified in Section 3.7;
- Scaled graphic sketch of the rock core (included or attached to log) according to the requirements identified in Section 3.7;
- Lithologic boundaries, with notations for estimated boundaries;
- Depth of water first encountered in drilling, with the method of first determination (any distinct water level(s) below the first zone will also be noted);
- Interval by depth for each sample taken, classified, and/or retained, with length of sample recovery and sample type and size (diameter and length);
- Blow counts, hammer weight, and length of fall for driven samplers;
- Rate of rock coring and associated rock quality designation (RQD) for intervals cored;
- Drilling fluid pressures, with driller’s comments;
- Total depth of drilling and sampling;
- Drilling fluid losses and gains should be recorded;
- Significant color changes in the drilling fluid returned;
- Soil gas or vapor readings with the interval sampled, with information on instrument used and calibration;

- Depth and description of any in-situ test performed; and
- Description of other field tests conducted on soil and rock samples.

3.2 SOIL PARAMETERS FOR LOGGING

In general, the following soil parameters should be included on the boring log when appropriate:

- Identification per ASTM D 2488 with group symbol;
- Secondary components with estimated percentages per ASTM D 2488;
- Color;
- Plasticity per ASTM D 2488;
- Density of non-cohesive soil or consistency of cohesive soil;
- Moisture condition per ASTM D 2488 (dry, moist, or wet);
- Presence of organic material;
- Cementation and HCL reaction testing per ASTM D 2488;
- Coarse-grained particle description per ASTM D 2488 including angularity, shapes, and color;
- Structure per ASTM D 2488 and orientation;
- Odor; and
- Depositional environment and formation, if known.

ASTM D 2488 categorizes soils into 13 basic groups with distinct geologic and engineering properties based on visual-manual identification procedures. The following steps are required to classify a soil sample:

1. Observe basic properties and characteristics of the soil. These include grain size grading and distribution, and influence of moisture on fine-grained soil.
2. Assign the soil an ASTM D 2488 classification and denote it by the standard group name and symbol.
3. Provide a written description to differentiate between soils in the same group if necessary.

Many soils have characteristics that are not clearly associated with a specific soil group. These soils might be near the borderline between groups, based on particle distribution or plasticity characteristics. In such a case, assigning dual group names and symbols (e.g., GW/GC or ML/CL) might be an appropriate method of describing the soil. The two general types of soils, for which classification is performed, coarse- and fine-grained soils, are discussed in the following sections.

3.3 COURSE-GRAINED SOIL IDENTIFICATION

For soils in the coarse-grained soils group, more than half of the material in the soil matrix will be retained by a No. 200 sieve (75-μm).

1. Coarse-grained soils are identified on the basis of the following:
   a) Grain size and distribution;
   b) Quantity of fine-grained material (i.e., silt and clay as a percentage); and

c) Character of fine-grained material.

2. The following symbols are used for classification:

Basic Symbols			Modifying Symbols
G	=	gravel	W = well graded
S	=	sand	P = poorly graded
			M = with silty fines
			C = with clayey fines

3. The following basic facts apply to coarse-grained soil classification.

- The basic symbol G is used if the estimated percentage of gravel is greater than that for sand. In contrast, the symbol S is used when the estimated percentage of sand is greater than the percentage of gravel.
- Gravel ranges in size from 3-inch to 1/4-inch (No. 4 sieve) diameter. Sand ranges in size from the No. 4 sieve to No. 200 sieve. The Grain Size Scale used by Engineers (ASTM Standard D 422-63) is the appropriate method to further classify grain size as specified by ASTM D 2488.
- Modifying symbol W indicates good representation of all particle sizes.
- Modifying symbol P indicates that there is an excess or absence of particular sizes.
- The symbol W or P is used only when there are less than 15% fines in a sample.
- Modifying symbol M is used if fines have little or no plasticity (silty).
- Modifying symbol C is used if fines have low to high plasticity (clayey).

Figure 10.03a is a flowchart for identifying coarse-grained soils by ASTM D 2488.

3.4 FINED-GRAINED SOIL IDENTIFICATON

If one-half or more of the material will pass a No. 200 sieve (75 μm), the soil is identified as fine-grained.

1. Fine-grained soils are classified based on dry strength, dilatancy, toughness, and plasticity.
2. Classification of fine-grained soils uses the following symbols:

Basic Symbols			Modifying Symbols		
M	=	silt (non plastic)	L	=	low liquid limit (lean)
C	=	clay (plastic)	H	=	high liquid limit (fat)
O	=	organic			
Pt	=	peat			

3. The following basic facts apply to fine-grained soil classification:
   - The basic symbol M is used if the soil is mostly silt, while the symbol C applies if it consists mostly of clay.
4. Use of symbol O (group name OL/OH) indicates that organic matter is present in an amount sufficient to influence soil properties. The symbol Pt indicates soil that consists mostly of organic material.

- Modifying symbols (L and H) are based on the following hand tests conducted on a soil sample:

  — Dry strength (crushing resistance).

— Dilatancy (reaction to shaking).

— Toughness (consistency near plastic limit).

- Soil designated ML has little or no plasticity and can be recognized by slight dry strength, quick dilatency, and slight toughness.
- CL indicates soil with slight to medium plasticity, which can be recognized by medium to high dry strength, very slow dilatancy, and medium toughness.

Criteria for describing dry strength per ASTM D 2488 are as follows:

Description	Criteria
None	Dry sample crumbles into powder with pressure of handling
Low	Dry specimen crumbles into powder with some finger pressure
Medium	Dry specimen breaks into pieces or crumbles with considerable finger pressure
High	Dry specimen cannot be broken with finger pressure but will break into pieces between thumb and a hard surface
Very high	Dry specimen cannot be broken between the thumb and a hard surface stiffness

Criteria for describing dilatancy per ASTM D 2488 are as follows:

None	No visible change in the sample
Slow	Water appears slow on the surface of the sample during shaking and does not disappear or disappears slowly upon squeezing
Rapid	Water appears quickly on the surface of the sample during shaking and disappears quickly upon squeezing

Criteria for describing toughness per ASTM D 2488 are as follows:

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit and the thread and lump are weak and soft
Medium	Medium pressure is required to roll the thread to near the plastic limit and the thread and lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit and the thread and lump have very high stiffness

Figure 10.03b is a flowchart for identifying fine-grained soils by ASTM D 2488.

3.5 DENSITY AND CONSISTENCY

Relative density for coarse-grained soils and consistency for fine-grained soils can be estimated using standard penetration test blow count data (ASTM D 1586). The number of blows required for each 6 inches of penetration or fraction thereof is recorded. If the sampler is driven less than 18 inches, the number of blows per each complete 6-inch interval and per partial interval is recorded.

For partial increments, the depth of penetration should be recorded to the nearest 1 inch. If the sampler advances below the bottom of the boring under the weight of rods (static) and/or hammer, then this information should be recorded on the log.

The following are some "rule-of-thumb" guidelines for describing the relative density of coarse-grained soils:

Blow Count	Relative Density for Sand
0–4	Very loose
4–10	Loose
10–30	Medium dense
30–50	Dense
>50	Very Dense

The following are some "rule-of-thumb" guidelines for describing the consistency of fine-grained soils:

Blow Count	Consistency for Clays	Description
0–2	Very Soft	Sample sags or slumps under its own weight
2–4	Soft	Sample can be pinched in two between the thumb and forefinger
4–8	Medium Stiff	Sample can be easily imprinted with fingers
8–16	Stiff	Sample can be imprinted only with considerable pressure of fingers
16–32	Very Stiff	Sample can be imprinted very slightly with fingers
>32	Hard	Sample cannot be imprinted with fingers; can be pierced with pencil

3.6 OTHER DESCRIPTIVE INFORMATION

The approximate percentage of gravel, sand, and fines (use a percentage estimation chart) should be recorded per ASTM D 2488 as follows:

Modifiers	Descriptions
Trace	Less than 5%
Few	5%–10%
Little	15%–25%
Some	30%–45%
Mostly	50%–100%

Color/discoloration should be recorded and described using a soil color chart, such as the Munsell® Soil Color Charts. A narrative and numerical description should be given from the color chart, such as Brown 10 YR, 5/3 (Munsell®). Odor should be described if organic or unusual.

Plasticity should be described as follows:

Description	Criteria
Non-plastic	A 1/8-inch thread cannot be rolled at any water content
Low	Thread can barely be rolled and lump cannot be formed when drier than plastic limit.
Medium	Thread is easy to roll; plastic limit can be reached with little effort and lump crumbles when drier than plastic limit.

High	Considerable time is required to reach the plastic limit and lump can be formed without crumbling when drier than plastic limit

Moisture condition should be recorded as dry (absence of moisture), moist (damp but no visible water) or wet (visible free water).

Cementation should be recorded (carbonates or silicates) along with the results of HCL reaction testing. The reaction with HCL should be described as none (no visible reaction), weak (some reaction with slowly forming bubbles) or strong (violent reaction with bubbles forming immediately).

Particle description information for coarse-grained soil should be recorded where appropriate per ASTM D 2488 including maximum particle size, angularity (angular, subangular, subrounded, or rounded), shape (flat, elongated or flat and elongated), and color.

Structure (along with orientation) should be reported using the following ASTM D 2488 descriptions:

Description	Criteria
Stratified	Alternating layers of varying material or color with layers greater than 6 millimeters thick
Laminated	Alternating layers of varying material or color with layers less than 6 millimeters thick
Fissured	Breaks along definite planes of fracture with little resistance
Slickensided	Fracture planes that appear polished or glossy, can be striated
Blocky	Inclusion of small pockets of different soils
Homogeneous	Same color and appearance throughout

3.7 ROCK CORE PARAMETERS FOR LOGGING

In general, the following parameters should be included on the boring log when rock coring is conducted:

- Rock type;
- Formation;
- Modifier denoting variety;
- Bedding/banding characteristics;
- Color;
- Hardness;
- Degree of cementation;
- Texture;
- Structure and orientation;
- Degree of weathering;
- Solution or void conditions;
- Primary and secondary permeability including estimates and rationale; and
- Lost core interval and reason for loss.

A scaled graphic sketch of the core should provided on or attached to the log, denoting by depth, location, orientation, and nature (natural, coring-induced, or for fitting into core box) of all core breaks. Where fractures are too numerous to be shown individually, their location may be drawn as a zone.

The RQD values for each core interval (run) should be calculated and included on the boring log. The method of calculating the RQD is as follows per ASTM D 6032:

RQD = [Σ length of intact core pieces > 100 mm (4-inches)] x 100%/total core length.

3.8 PROCEDURES FOR ROCK CLASSIFICATION

For rock classification record mineralogy, texture, and structural features (e.g., biotite and quartz fine grains, foliated parallel to relict bedding oriented 15 to 20 degrees to core axis, joints coated with iron oxide). Describe the physical characteristics of the rock that are important for engineering considerations such as fracturing (including minimum, maximum, and most common and degree of spacing), hardness, and weathering.

1. The following is to be used as a guide for assessing fracturing:

AEG Fracturing	Spacing
Crushed	up to 0.1 foot
Intense	0.1–0.5 foot
Moderate	0.5 foot–10 feet
Slight	1.0 foot–3.0 feet
Massive	>3.0 feet

2. Record hardness using the following guidelines:

Hardness	Criteria
Soft	Reserved for plastic material
Friable	Easily crumbled by finger pressure
Low	Deeply gouged or carved with pocketknife
Moderate	Readily scratched with knife; scratch leaves heavy trace of dust
Hard	Difficult to scratch with knife; scratch produces little powder and is often faintly visible
Very Hard	Cannot be scratched with knife

3. Describe weathering using the following guidelines:

Weathering	Decomposition	Discoloration	Fracture Condition
Deep	Moderate to complete alteration of minerals feldspars altered to clay, etc.	Deep and thorough	All fractures extensively coated with oxides, carbonates, or clay
Moderate	Slight alteration of minerals, cleavage	Moderate or localized and	Thin coatings or stains

Weathering	Decomposition	Discoloration	Fracture Condition
	surface lusterless and stained	intense	
Weak	No megascopic alteration of minerals	Slight and intermittent and localized	Few strains on fracture surfaces
Fresh	Unaltered, cleavage, surface glistening		

3.9 PROCEDURE FOR LOGGING REFUSE

The following procedure applies to the logging of subsurface samples composed of various materials in addition to soil as may be collected from a landfill or other waste disposal site.

1. Observe refuse as it is brought up by the hollow stem auger, bucket auger, or backhoe.

2. If necessary, place the refuse in a plastic bag to examine the sample.

3. Record observations according to the following criteria:

   - Composition (by relative volume), e.g., paper, wood, plastic, cloth, cement, or construction debris. Use such terms as "mostly" or "at least half." Do not use percentages;
   - Moisture condition: dry, moist, or wet;
   - State of decomposition: highly decomposed, moderately decomposed, slightly decomposed, etc.;
   - Color: obvious mottling and/or degree of mottling;
   - Texture: spongy, plastic (cohesive), friable;
   - Odor;
   - Combustible gas readings (measure down hole and at surface); and
   - Miscellaneous: dates of periodicals and newspapers, ability to read printed materials, degree of drilling effort (easy, difficult, and very difficult).

3.10 SUBMITTAL REQUIREMENTS

Each original boring log should be submitted to the Contracting Officer Representative (CRO) after completion of the boring. When a monitoring well will be installed in a boring, the boring log and well installation diagram should be submitted together.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Not applicable.

6.0 REFERENCES

ASTM Standard D 422-63 (2002)e1. 2002. *Standard Test Method for Particle-Size Analysis of Soils.*

ASTM Standard D 1586–99 (1999). 1999. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*

ASTM Standard D 2488-06. 2006. *Standard Practice for Description and Identification of Soils Visual-Manual Procedure).*

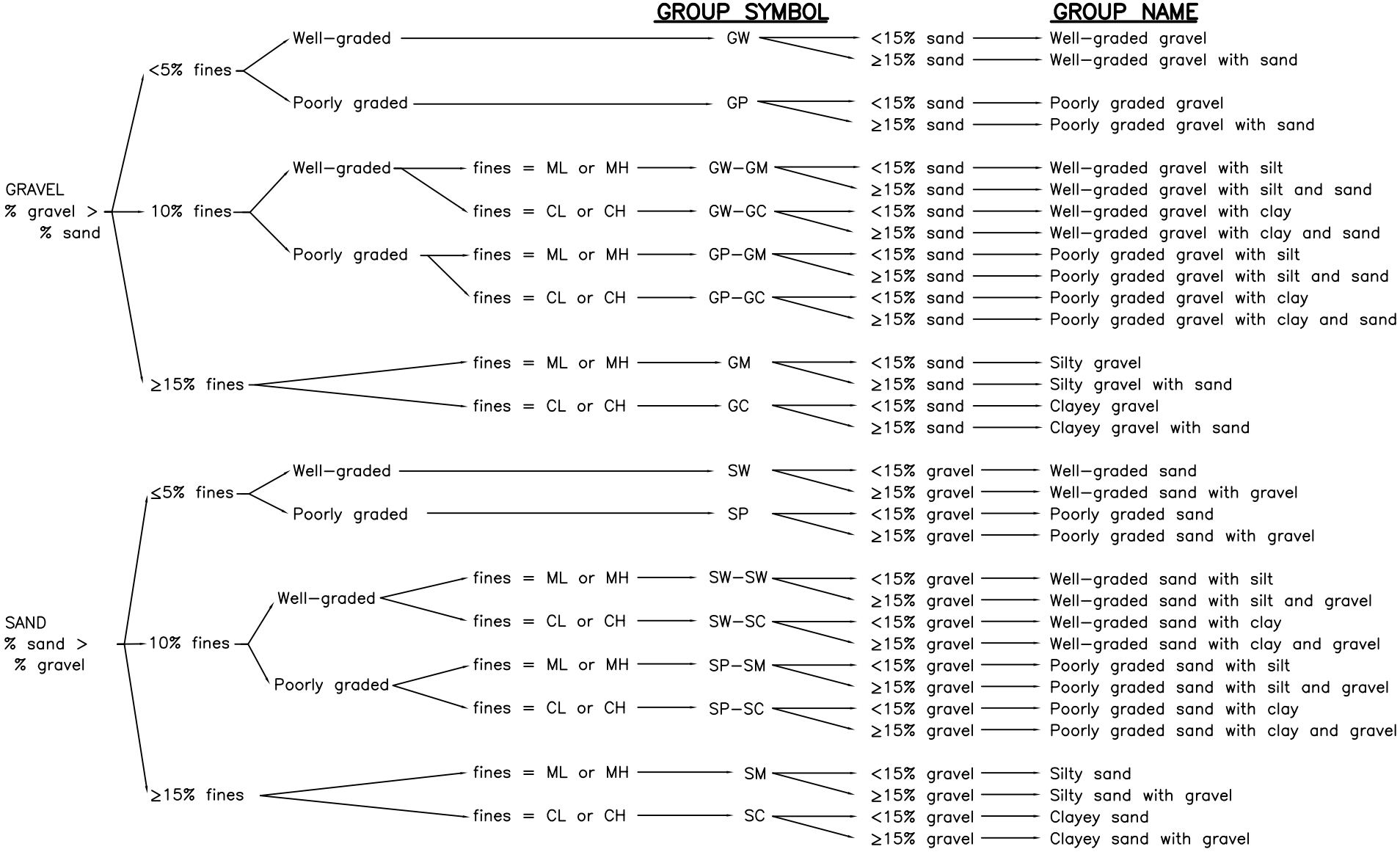
ASTM Standard D 5434-03. 2003. *Guide for Field Logging of Subsurface Explorations of Soil and Rock.*

ASTM Standard D 6032-02 (2006). 2006. *Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core.*

Compton, R. R. 1962. *Manual of Field Geology.* John Wiley & Sons, Inc., New York.

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000, 1, November.

U.S. Department of the Interior. 1989. *Earth Manual.* Water and Power Resources Service, Washington, DC.



NOTE: PERCENTAGES ARE BASED ON ESTIMATING AMOUNTS OF FINES, SAND, AND GRAVEL TO THE NEAREST 5%.

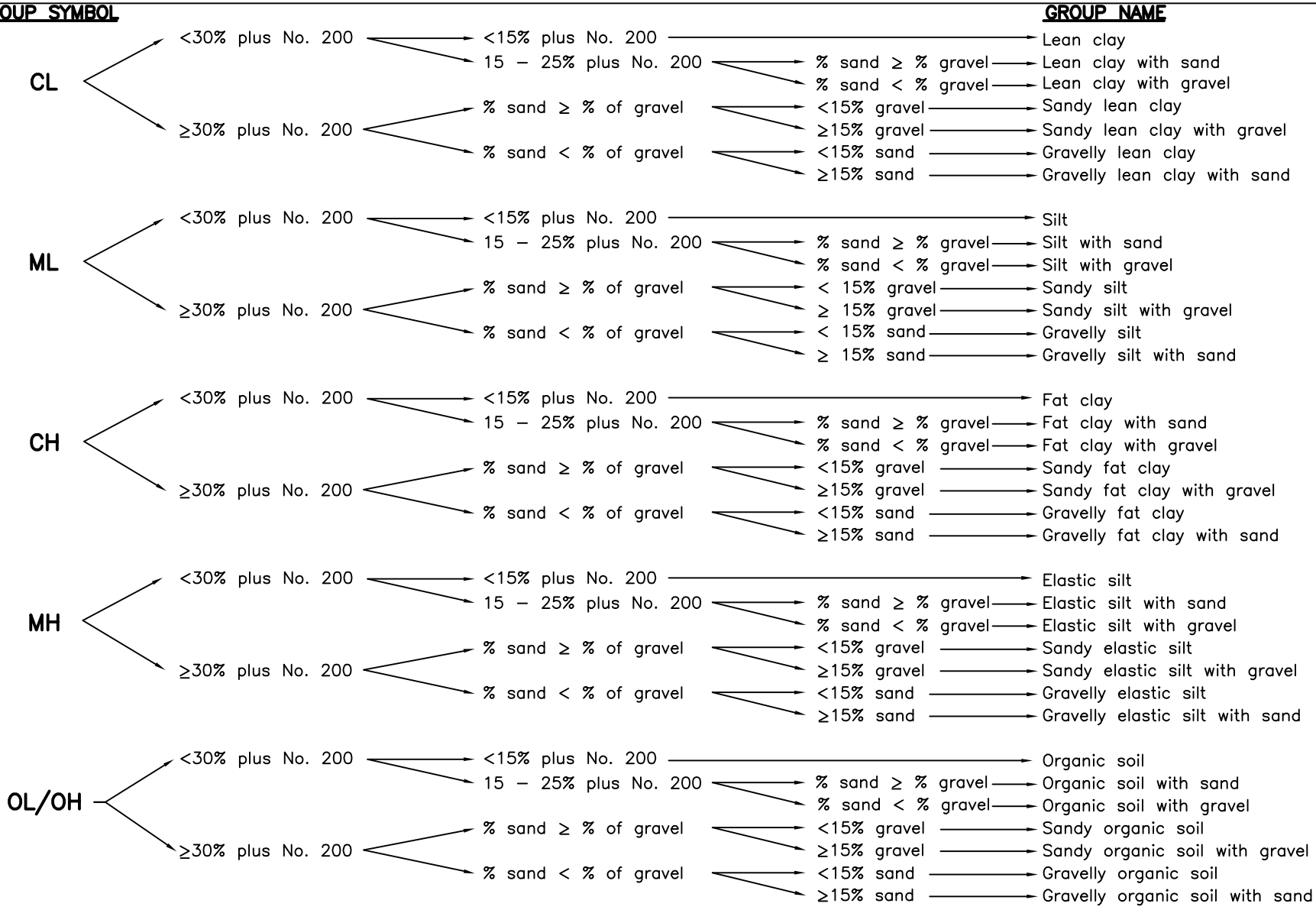
SOURCE: ASTM D 2488

Radford Army Ammuntion Plant

FIGURE 10.03a

FLOW CHART FOR IDENTIFYING COARSE-GRAINED SOILS

Date: *October 2007*	**Prepared By:** *DBC/TLD*
Scale: *N.T.S.*	**File Name:** *SOP Figure 10.03a_Coarse*



NOTE: PERCENTAGES ARE BASED ON ESTIMATING AMOUNTS OF FINES, SAND, AND GRAVEL TO THE NEAREST 5%.

SOURCE: ASTM D 2488

Radford Army Ammuntion Plant		FIGURE 10.03b
Date: *October 2007*	**Prepared By:** *DBC/TLD*	**FLOW CHART FOR IDENTIFYING FINE-GRAINED SOILS**
Scale: *N.T.S.*	**File Name:** *SOP Figure 10.03b_Fine*	

STANDARD OPERATING PROCEDURE 10.4
CHAIN-OF-CUSTODY FORM

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for use of the chain-of-custody form. An example is provided as part of this SOP. Other formats with similar levels of detail are acceptable.

2.0 MATERIALS

- Chain-of-custody form; and
- Indelible ink pen.

3.0 PROCEDURE

1. Record the project name and number.
2. Record the project contact's name and phone number.
3. Print sampler's names in "Samplers" block.
4. Enter the Field Sample No.
5. Record the sampling dates for all samples.
6. List the sampling times (military format) for all samples.
7. Indicate, "grab" or "composite" sample with an "X."
8. Record matrix (e.g., aqueous, soil).
9. List the analyses/container volume across top.
10. Enter the total number of containers per Field Sample No. in the "Subtotal" column.
11. Enter total number of containers submitted per analysis requested.
12. State the carrier service and airbill number, analytical laboratory, and custody seal numbers.
13. List any comments or special requests in the "Remarks" section.
14. Sign, date, and time the "Relinquished By" section when the cooler is relinquished to the next party.
15. Upon completion of the form, retain the shipper copy and place the forms and the other copies in a zip seal bag to protect from moisture. Affix the zip seal bag to the inside lid of the sample cooler to be sent to the designated laboratory.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCES

USEPA. 1990. *Sampler's Guide to the Contract Laboratory Program.* EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, DC, December 1990.

USEPA. 1991. *User's Guide to the Contract Laboratory Program..* EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response, January 1991.

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FIGURE 10.4-a
EXAMPLE CHAIN-OF-CUSTODY FORM

Project Number	Project Name				Matrix	A N A L Y S E S									LAB :
Project Contact (Name and Phone Number)															AIRBILL No:
Samplers:															Courier:
Field Sample No.	Date (MM-DD-YY)	Time	Comp	Grab										Subtotal	REMARKS
TOTAL															

Relinquished by:	Date/time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/time	Received by: (for lab)	Date/Time	Remarks	

STANDARD OPERATING PROCEDURE 20.1
MONITORING WELL INSTALLATION

1.0 SCOPE AND APPLICATION

The installation of monitoring wells is contingent upon the existing conditions at the project site. The purpose of this standard operating procedure (SOP) is to delineate the quality control measures required to ensure the accurate installation of monitoring wells. For a particular site investigation, the associated work plan addenda should be consulted for specific installation instructions. The term "monitoring wells", as used herein is defined to denote any environmental sampling well.

2.0 MATERIALS

2.1 DRILLING EQUIPMENT

- Appropriately sized drill rig adequately equipped with augers, bits, drill stem, etc;
- Steam cleaner and approved source water for decontamination of drilling equipment, etc.;
- Source of approved water;
- Photoionization detector or other appropriate monitoring instrument per the site-specific Health and Safety plan;
- Water level indicator (electrical);
- Weighted steel tape measure;
- Steel drums and other appropriate containers for investigation-derived materials (drill cuttings, contaminated PPE, decontamination solutions, etc.);
- Absorbent pads and/or logs;
- Personal protective equipment and clothing (PPE) per site-specific health and safety plan; and
- Decontamination supplies, pad with heavy plastic sheeting (SOP 80.1).

2.2 WELL INSTALLATION MATERIALS

Technical information on all installed materials (screens, riser pipe, filter pack, bentonite, cement, etc.) and representative samples of the proposed filter pack will be supplied to the Contracting Officer's Representative (COR) before initiating well installation.

Well screen slot size and filter pack gradation will be determined based on existing site geology before initiating site-specific investigations.

- Well screen:

  Polyvinyl Chloride (PVC): JOHNSON (or equivalent); PVC commercially slotted continuous slot, wire wrapped screen; 4-in. diameter.; SCH 40; SCH 80; flush-threaded (leak-proof) joints; PVC should conform to National Sanitation Foundation (NSF) Standard 14 for potable water usage or ASTM Standard Specification F 480 and bear the appropriate rating logo. PVC should be free of ink markings, cleaned, and prepackaged by manufacturer;

Stainless Steel: JOHNSON (or equivalent); stainless steel Vee-Wire continuous slot, wire wrapped screen; 304 stainless steel (unless the sum concentration of Cl^-, F^-, and Br^- is <1000 ppm, case type 316 should be used); ASTM F 480 flush threads; cleaned, wrapped, and heat-sealed by manufacturer;

- Riser pipe:
  - — PVC: JOHNSON (or equivalent); STD. PVC; 4-in. diameter.; SCH 40; SCH 80; flush-threaded (leak-proof) joints; PVC should conform to NSF Standard 14 or F 480; free of ink markings; cleaned and prepackaged by manufacturer;
  - — Stainless Steel: JOHNSON (or equivalent); SCH 5; 304 stainless steel; ASTM type A312 material; 4-in. diameter.; cleaned, wrapped and heat-sealed by manufacturer;
- Plugs/Caps: JOHNSON (or equivalent); standard PVC or stainless steel;
- Filter pack: MORIE, clean sorted gravel (or equivalent);
- Bentonite seal: BAROID, bentonite pellets (3/8-in. diameter.);
- Cement: Type II Portland Cement; if sulfate concentrations are higher than 1500 ppm, Type IV Portland Cement will be used;
- Bentonite powder: BAROID, Aquagel Gold Seal;
- Steel Protective Casing: BRAINARD-KILMAN (or equivalent) zinc-plated steel, lockable, painted;
- Containers for purged water, as required;
- Submersible pump or bailer of appropriate capacity, and surge block sized to fit well;
- Hach DREL 2000 portable laboratory (or equivalent);
- Multiprobe Electronic Water Quality Recorder (Hydrolab);
- Electric well sounder and measuring tape;
- Portland Type II cement (see footnote); and
- Steel Posts (pickets), painted (see footnote).

2.3 DOCUMENTATION

- Copy of work plans and health and safety plan;
- Copy of USACE EM 110-1-4000 Monitoring Well Requirements;
- Copies of permits (area entry, hot work, well, and utility clearance);
- Boring log forms;
- Well completion diagram form; and
- Field logbook.

2.4 GEOLOGIST'S PERSONAL EQUIPMENT

- Boring log materials per SOP 10.3; and
- Personal protective equipment and clothing (PPE) as required by the site-specific health and safety plan.

3.0 PROCEDURE

3.1 MATERIALS APPROVAL

3.1.1 Source Water

Water sources for drilling, grouting, sealing, filter pack placement, well installation, and equipment decontamination must be approved by the COR before arrival of the drilling equipment. Information required for the water source includes:

- Water source;
- Manufacturer/owner and their address and telephone number;
- Type of treatment and filtration prior to tap;
- Time of access;
- Cost per gallon (if applicable); and
- Dates and results associated with all available chemical analyses over the past 2 years, and the name and address of the analytical laboratory (if applicable).

3.1.2 Bentonite

Pure sodium bentonite with no additives (bentonite) will be the only drilling fluid additive allowed, and its use must be approved by the COR before the arrival of the drilling equipment. The information required for evaluation includes brand name, manufacturer, manufacturer's address and telephone number, product description, and intended use for the product, and potential effects on chemical analysis of water samples.

3.1.3 Granular Filter Pack

Granular filter pack material must be approved by the COR before drilling. A one-pint representative sample must be supplied to the COR. Information required includes lithology, grain size distribution, brand name, source, processing method, and size of intended screen.

3.1.4 Cement

Portland Type II cement will be used for grout (or Type IV, as noted in Section 2.2).

3.2 DRILLING

The objective of the selected drilling technique used at given site is to ensure that the drilling method provides representative data while minimizing subsurface contamination, cross contamination, and drilling costs.

Drilling methods that are appropriate for boring or monitoring well installation will depend on the subsurface geology most likely to be encountered in the boring. The geology for each site should be determined by reviewing previous investigation data (boring data, geophysics, etc.) from the site or nearby areas. Specific drilling methods that will be used to support site activities will be incorporated into work plan addenda.

Section 5.2.2 of the Master Work Plan discusses the different drilling methods that may be appropriate for installation of monitoring wells at the Radford Army Ammunition Plant (RFAAP) based on the different types of conditions encountered. The different drilling methods discussed in this section of the Master Work Plan including:

- Hollow Stem Auger (for soil);
- Air Rotary (soil and rock);
- Water Rotary and wire-line casing advancement (soil and rock);
- Drill-Through-Casing Driver (soil and rock); and
- Sonic (soil and rock).

3.2.1 Responsibilities of the Site Geologist

A Site Geologist will be present during all well drilling and installation activities and will fully characterize all tasks performed in support of these activities in the monitoring well logbook. The Site Geologist will be responsible for the logging samples, monitoring drilling operations, recording water losses/gains and groundwater data, preparing the boring logs and well diagrams, and recording the well installation procedures for one operating rig. The Site Geologist will have sufficient equipment in operable condition on-site to perform efficiently his/her duties.

3.2.2 Additives

No lubricants will be used on down hole drilling equipment. Additives containing either lead or copper will not be allowed. In addition, polychlorinated biphenyls will not be permitted in hydraulic fluids or other fluids used in the drilling rig, pumps, or other field equipment and vehicles.

Surface runoff or other fluids will not be allowed to enter any boring or well during or after drilling/construction.

Antifreeze used to keep equipment from freezing will not contain rust inhibitors and sealants. Antifreeze is prohibited in any areas in contact with drilling fluid. Absorbent pillows will be placed to catch any obvious leaks from the drill rig.

3.2.3 Boring Logs and Field Notes

Borings for monitoring wells will be logged by a geologist as described in SOP 10.3. Logs will be recorded on USACE HTRW ENG Form 5056-R and 5056A-R boring log forms.

Daily investigation activities at the site related to drilling should be recorded in field logbooks as described in SOPs 10.1 and 10.2.

3.3 WELL CONSTRUCTION AND INSTALLATION

Specifications for monitoring well construction and installation for a given site being investigated are to be included in work plan addenda. In case the previously defined criteria have not been met before the depth range for a given hole is reached, the geologist will stop the drilling and confer with the supervisor. The current boring conditions (depth, nature of the stratigraphic unit, and water-table depth) will be compared to those of other wells nearby to decide whether to continue drilling or to terminate and complete the well.

3.3.1 Overburden Wells

Overburden wells at the RFAAP are typically designed as a 4-inch diameter, single cased well (see Figure 20-1a) installed into a surficial aquifer, which is present above bedrock. For this type of well, the well boring would be terminated before penetrating any underlying confining unit and/or bedrock.

Section 5.2.2 of the Master Work Plan discusses the different drilling methods that may be appropriate for installation of overburden wells.

If dense, non-aqueous liquid (DNAPL) is encountered during drilling, the well boring will be terminated and completed at the base of the overburden aquifer being monitored.

3.3.2 Bedrock Wells

Multi-cased wells or wells with an outer casing installed into competent bedrock should be specified for wells that are designed to monitor groundwater within bedrock (see Figure 20-1c). The installation of a multi-cased well or outer casing will isolate the zone(s) monitored from overburden and will minimize the potential for cross-contamination during and after drilling.

The general procedure to be followed for installation of a multi-cased well is as follows. This procedure assumes the installation of a 4-inch diameter monitoring well. Specific procedures, drilling techniques and design of monitoring wells will be presented in work plan addenda for site-specific investigations.

1. If soil sampling is required within overburden, use appropriate drilling techniques to advance the boring and collect the soil samples.

2. A minimum 10-inch drill bit should be advanced from the surface into competent bedrock a distance not less than 2 feet. A drilling technique appropriate for penetrating overburden and bedrock should be used such as air rotary.

3. After the borehole has been advanced to the target depth within competent bedrock, a 6-inch diameter steel or Schedule 80 PVC outer casing should be lowered to the bottom of the boring.

4. Once the outer casing has been lowered to the bottom of the boring, the casing should be grouted in-place using a decontaminated tremie pipe equipped with a side discharge. The annulus between the outer casing and borehole wall will be injected with grout until undiluted grout reaches the surface.

5. The grouting mixture, specification, and placement should be consistent with the requirements identified in Section 3.3.8.

6. The grout should be allowed to cure a minimum of 24 hours before further drilling.

7. After adequate curing time for outer casing, drilling with a 5-5/8-inch bit until the desired total depth is reached should complete the well boring.

8. Once the well boring is completed, an appropriate bedrock well will be constructed based on site-specific conditions. The types of wells that may be installed may include a constructed well with screen, casing, filter pack, seal, and grout; an open-bedrock well; or a lined open bedrock well (see Section 3.3.3).

3.3.3 Well Screen Usage

Well screen usage for a given site should be specified in work plan addenda based on expected site conditions.

In general, wells installed within overburden will be installed with a screen as per Figure 20.01-a or 20.01-b. Bedrock wells may be installed with or without a screen depending on site specific conditions such as the depth of water bearing zones, stability of bedrock, occurrence of karst zones, and construction of existing wells at the site being investigated.

In general, bedrock wells installed within karst zones will be completed as open-hole construction (see Figure 20.01c). If evidence of potential or severe borehole collapse (unstable bedrock) is indicated during drilling, casing and screen will be installed in the borehole as a removable lining. If desired, multiple flow zones may

be monitored in an open bedrock well by installing a multiport well, which has monitoring/sampling intervals sealed off from the rest of the boring and from each other by packers.

3.3.4 Beginning Well Installation

Schedule

Monitoring well installation should begin within 12 hours of boring completion for holes that are uncased or partially cased with temporary drill casing. In the case where a partially cased hole into bedrock is to be partially developed prior to well insertion, the well installation should begin within 12 hours of this initial development. For holes that are fully cased, installation should begin within 48 hours. Once begun, well installation should not be interrupted.

Placement of Materials

Temporary casing and hollow stem augers may be removed from the boring prior to well installation if the potential for cross contamination is low and if the borehole will remain stable during the time required for installation.

Where borehole conditions are unstable, some or all of the well materials may need to be installed prior to removal of the temporary casing or hollow stem augers. The casing or hollow stem augers should have an inside diameter sufficient to allow the installation of the screen and casing plus annular space for a pipe through which to place filter pack and grout.

Any materials blocking the bottom of the drill casing or hollow stem auger should be dislodged and removed from the casing prior to well insertion.

3.3.5 Screens, Casing, and Fittings

Borehole Specifications

The borehole for each well should be of sufficient diameter to provide for at least 2 inches of annular space between the borehole wall and all sides of the casing.

Well Screens

Material specifications for well screens, casings, and fittings are discussed in Section 2.2.
Screen bottoms should be securely fitted with a threaded cap or plug of the same composition as the screen. The cap/plug should be within 0.5 feet of the open portion of the screen. A sediment trap/sump will not be used.

Screen slot size will be appropriately sized to retain 90%–100% of the filter pack material, the size of which will be determined by sieve analysis of formation material.

Well screen lengths should be specified in work plan addenda and will be based on various site-specific factors such as environmental setting, subsurface conditions, analytes of concern, regulatory considerations, etc.

Assembly and Placement of Well Screen and Casing

Personnel should take precautions to assure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly. Clean latex or nitrile gloves should be worn when handling the screen and casing assembly. Flush, threaded joints usually can be tightened by hand. If necessary, steam cleaned wrenches may be used to tighten joints.

In general, each section of the well assembly is lowered into the borehole, one section at a time, screwing each section securely into the section below it. No grease, lubricant, polytetrafluoroethylene (PTFE) tape, or glue may be used in joining the sections of screen and casing.

The assembly should be lowered to its predetermined level and held in position for placement of the filter pack. It is essential that the assembly be installed straight (with centralizers as appropriate) to allow for appropriate sampling. Buoyant forces associated with fluids in the borehole may require that the assembly be installed with the aid of hydraulic rams of the drill rig. When the well assembly is placed to predetermined level, a temporary cap should be place on the well to prevent foreign material from entering the well.

The bottoms of well screens should be placed no more than 3 feet above the bottom of the drilled borehole. If significant overdrilling is required, a pilot boring should be used. Sufficient filter pack should be placed at the bottom of the borehole

The well casing should be pre-cut (square) to extend 2 to 2.5 feet above the ground surface. Before placement of the last piece of well casing, a notch or other permanent reference point will be cut, filed, or scribed into the top edge of the casing.

The tops of all well casing will be capped with covers composed of materials compatible with the products used in the well installation. Caps will be loose fitting, constructed to preclude binding to the well casing caused by tightness of fit, unclean surfaces, or weather conditions. In either case, it should be secure enough to preclude the introduction of foreign material into the well, yet allow pressure equalization between the well and the atmosphere.

The top of each well casing should be level so that the maximum difference in elevation between the highest and lowest points of the casing is less than or equal to 0.02 ft.

3.3.6 Filter Pack

The volume of filter pack that is required to fill the annular between the well screen/casing and borehole should be computed, measured, and recorded.
Granular filter packs will be chemically and texturally clean, inert, and siliceous. The gradation of filter packs will be selected based on the screen size used and will be specified in the work plan addenda for the site being investigated.

Primary Filter Pack

Filter pack material should be placed in the borehole using a decontaminated tremie pipe. An appropriate amount of primary filter pack should be placed in the borehole prior to final positioning of the well screen to provide an appropriate barrier between the bottom of the borehole and the bottom of the screen. Once the initial filter pack has been placed and the well assembly is appropriately positioned and centered in the borehole, the remaining primary filter pack should be placed in increments (and tamped) as the tremie pipe is gradually raised.

As the primary filter pack is placed, approved source water may need to be added to help move the filter pack. A weighted tape should be used to measure the top of the filter pack as it is being placed. If bridging of the filter pack occurs, then this bridging should be broken mechanically prior to adding additional filter pack.

When temporary casing or hollow stem augers are used, the casing or augers should be removed in increments such that lifting of the well assembly is minimal. After removal of each increment, it should be confirmed by direct measurement that the primary filter pack has not been displaced during the removal.
The primary filter pack should extend from the bottom of the borehole to 3 to 5 ft above the top of the screen.

Secondary Filter Pack

The primary filter pack may be capped with 1 to 2 feet of feet of secondary filter pack to prevent the intrusion of the bentonite seal into the primary filter pack. The need for this filter pack (and specifications) should be addressed in work plan addenda for the site being investigated. Such factors as the gradation of the primary filter pack, the potential for grout extrusion, and site hydrogeology should be considered when evaluating the need for this filter pack.

3.3.7 Bentonite Seal

A bentonite seal, consisting of hydrated 3/8-inch diameter. bentonite pellets, will be installed immediately above the filter pack. The seal may be installed with a tremie pipe, which is lowered to the top of the filter pack and slowly raised as the pellets fill the annular space. In deep wells, the pellets may bridge and block the tremie pipe; in this case, pellets may be placed by free fall into the borehole. A weighted tape should be used to measure the top of seal as it is installed.

When cement grout is to be used above the bentonite seal, a minimum of 3 to 4 hours should be allowed for hydration of the pellets.

When installing a seal above the water table, water should be added to the bentonite for proper hydration. In this case, the seal should be placed in lifts of 0.5 to 1 foot with each lift hydrated for a period of 30 minutes.
If the bentonite seal is to be installed far below the water table, a bentonite slurry seal will be installed. Cement-bentonite grout will not be used below the water table. The slurry will be mechanically blended aboveground to ensure a lump-free mixture. The slurry will consist of bentonite powder and approved water mixed to a minimum of 20 percent solids by weight of pumpable slurry with a density of 9.4 pounds per gallon or greater. The slurry will be pumped into place through a tremie pipe and measured as installed.
Bentonite seals should be 3 to 5 ft thick as measured immediately after placement. The final depth to the top of the bentonite seal will be measured and recorded before grouting.

3.3.8 Grout

Cement grout used in construction will be composed of the following:

- Type II Portland Cement (or Type IV as noted in Section 2.2);
- Bentonite (2 to 5% dry bentonite per 94-lb sack of dry cement); and
- A maximum of 6 to 7-gallons of approved water per 94-lb sack of cement

Neither additives nor borehole cuttings will be mixed with the grout. Bentonite will be added after the required amount of cement is mixed with the water.

All grout material will be combined in an aboveground container and mechanically blended to produce a thick, lump-free mixture. The mixed grout will be recirculated through the grout pump before placement.
Grout placement should be performed as follows:

1. Grout should be placed from a rigid tremie pipe located just over the top of the bentonite seal. The tremie pipe should be decontaminated prior to use.
2. The tremie pipe should be kept full of grout from start to finish with the discharge end of the pipe completely submerged as it is slowly and continuously lifted.
3. The annulus between the drill casing and well casing should be filled with sufficient grout to allow for the planned drill casing removal. Grout should not penetrate the well screen or filter pack.

- For incremental removal of drill casing, grout should be pumped to maintain at least 10 ft of grout in the drill casing remaining in the borehole after removing the selected length of casing. After each section of casing is removed, the tremie pipe may be reinserted to the base of the casing not yet removed.
- In the case where drill casing will be removed all at once, grout should be pumped from the tremie pipe until undiluted grout flows from the annulus at the ground surface.

4. If the un-grouted portion of a borehole is less than 15 feet and without fluids after drill casing removal, then the un-grouted portion may be filled by pouring grout from the surface.
5. If drill casing was not used for well installation, grouting should proceed to the surface in one continuous operation.
6. For grout placement in a dry and open hole less than 15 ft deep, grout may be manually mixed and poured in from the surface providing that integrity of the bentonite seal is maintained.
7. Protective casing should be installed immediately after completion of grouting.
8. Grout settlement should be checked within 24 hours of the initial grout placement. Additional grout should be added grout should be added to fill any observed depressions.

The following will be noted in the boring logs: (1) exact amounts of cement, bentonite, and water used in mixing grout and (2) actual volume of grout placed in the hole.

3.3.9 Well Protection

The major elements of well protection will include:

- A protective casing;
- Protective concrete pad around the well; and
- Protective steel posts set around the well outside of the concrete pad.

Well Protective Casing

Well protective casings will be installed around all monitoring wells immediately after grouting. The protective casing should consist of a minimum 5-ft long, steel pipe (protective casing) installed over the well casing and into the grout. The protective casing should be installed to a depth of approximately 2.5-feet below ground surface (extending approximately 2.5 feet above ground surface). The internal well casing (riser) and protective casing will not be separated by more than 0.2 feet of height.

An internal mortar collar will be placed within the protective steel casing and outside the well casing to a height of 0.5 above ground surface.

After placement and curing of the mortar collar, an internal drainage hole will be drilled through the protective casing, which is centered no more than 1/8 inch above the grout filled annulus between the well riser and the protective casing.

Any annulus formed between the outside of the protective casing and the borehole will be filled to ground surface with cement.

Concrete Pad

After the grout has thoroughly set and the well protective casing has been installed, a protective concrete pad will be installed around the well. This pad will be at least 4 inches thick and 4 feet square and sloped away from the well to provide for adequate drainage.

Protective Posts

Additional protection will be provided at each well location by the installation of four steel posts outside of each corner of the concrete pad. The installation of protective posts should occur before the well is sampled. The posts should have a minimum diameter of 3 inches, be placed 2 to 3 feet below ground surface, and extend at least 3 feet above ground surface. Posts should be painted orange using a brush.

Posts should be set in post holes, which are backfilled with concrete. For additional protection, the posts can be filled with concrete.

3.3.10 Well Construction Diagram and Field Notes

The construction of each well will be depicted as built in a well construction diagram (see Figure 20.1a). The diagram will be attached to the boring log and the following will be graphically denoted:

- Bottom of boring;
- Screen location, length, and size;
- Coupling locations;
- Granular filter pack;
- Seal;
- Grout;
- Cave-in;
- Centralizers;
- Height of riser;
- Protective casing detail;
- Water level 24 hours after completion with date and time of measurement;
- Quantity and composition of materials used; and
- Material between bottom of boring and bottom of screen.

Daily activities at the site related to monitoring well installation should be recorded in the field logbooks as described in SOPs 10.1 and 10.2.

3.4 GENERAL SEQUENCE OF MONITORING WELL COMPLETION

The following is a general sequence of monitoring well completion with reference to the specific details included in Section 3.3.

1. Completion of borehole;
2. Assembly and placement of well assembly as described in Section 3.3.5;
3. Placement of the appropriate filter pack(s) as discussed in Section 3.3.6;
4. Installation of an appropriate bentonite seal as discussed in Section 3.3.7;
5. Grouting the remaining annular space of the borehole as discussed in Section 3.3.8;
6. Set the protective casing for the well as discussed in Section 3.3.9;
7. Complete the protective concrete pad as discussed in Section 3.3.9; and

8. Install the protective posts as discussed in Section 3.3.9.

3.5 INVESTIGATION-DERIVED MATERIAL

Investigation-derived material will be managed in accordance with procedures defined in the work plan addenda for the site being investigated and SOP 70.1.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Refer to the site-specific health and safety plan.

6.0 REFERENCES

ASTM Standard D 5092-04e1. 2004. *Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers.*

ASTM Standard F 480-06b. 2006. *Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80.*

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000, 1, November.

EXAMPLE WELL DEVELOPMENT FORM

WELL DESIGNATION:_____ DATE(S) OF INSTALLATION:_____/_____/_____

SITE GEOLOGIST:_____ DEVELOPMENT DATE(S):_____/_____/_____

STATIC WATER LEVELS BEFORE AND AFTER DEVELOPMENT * :

BEFORE _____ DATE _____ 24 HR. AFTER _____ DATE_____

DEPTH TO SEDIMENT BEFORE AND AFTER DEVELOPMENT * :

BEFORE _____ DATE _____ 24 HR. AFTER _____ DATE_____

DEPTH TO WELL BOTTOM *: _____ SCREEN LENGTH _____

HEIGHT OF WELL CASING ABOVE GROUND SURFACE: _____

QUANTITY OF MUD/WATER:

LOST DURING DRILLING	(+)_____gallons
REMOVED PRIOR TO WELL INSERTION	(-)_____gallons
LOST DURING THICK FLUID DISPLACEMENT	(+)_____gallons
ADDED DURING FILTER PACK PLACEMENT	(+)_____gallons
TOTAL LOSSES	_____gallons

(a) Water column ht. (ft.) _____ (b) Well radius (in.)_____

(c) Screen length (ft.) _____ (d) Borehole radius (in.)_____

(e) QUANTITY OF FLUID STANDING IN WELL

Install Equation Editor and double-click here to view equation. 1 _____ gallons

(Show Calculation)

(f) QUANTITY OF FLUID IN ANNULUS Install Equation Editor and double-click here to view equation. 1_____gallons

(Show Calculation)

DEVELOPMENT VOLUME = (5 * TOTAL LOSSES) + [5 * (e + f)] = _____ gallons

(Show Calculation)

* **ALL DEPTHS MEASURED FROM TOP OF WELL CASING**

EXAMPLE WELL DEVELOPMENT RECORD

WELL DESIGNATION _____ DATE(S) OF DEVELOPMENT: _____/_____/_____

TYPE AND SIZE OF PUMP:_____

TYPE AND SIZE OF BAILER:_____

DESCRIPTION OF SURGE TECHNIQUE:_____

RECORD OF DEVELOPMENT

DATE & TIME	QUANTITY REMOVED	TIME REQ'D	pH	Cond	Temp	ORD	Turb	DO	Character of water (color/clarity/ odor/partic.)
(before)									
(during)									
(during)									
(during									
(after)									

TYPICAL PUMPING RATE_____ GAL./HR. EST. RECHARGE RATE_____

TOTAL QUANTITY OF WATER REMOVED_____ TIME REQUIRED_____

REMARKS_____

SIGNATURE OF SITE GEOLOGIST_____

Facility/Project Name

Facility License, Permit or Monitoring Number

Type of Protective Cover: Above-Ground ☐ Flush-To-Ground ☐

Well Distance From Waste/Source Boundary

Maximum Depth of Frost Penetration (estimated)

Local Grid Location of Well ☐N. ____ m. ☐S. ☐E. ____ m. ☐W.

Grid Origin Location
Lat. ____ ____ ____ Long ____ ____ ____ or
St. Plane ____ m. N. ____ m. E.

Section Location of Waste/Source
____1/4 of ____1/4 of Sec. ____ T. ____ N.R. ____ ☐E. ☐W.

Location of Well Relative to Waste/Source
u ☐ Upgradient s ☐ Sidegradient
d ☐ Downgradient n ☐ Not Known

Well Number

Date Well Installed (Start)

Date Well Installed (Completed)

Well Installed By: (Person's Name & Firm)

Note: Use top of casing (TOC) for all depth measurments.

A. Protective casing, top elevation ____ m. MSL

B. Well casing, Top elevation ____ m. MSL

C. Land surface elevation ____ m. MSL

D. Surface seal, bottom ____ m. TOC or ____ m. MSL

16. USCS classification of sell near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

17. Sieve analysis attached? ☐ Yes ☐ No

18. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

19. Drilling fluid used Water ☐ Air ☐ Drilling mud ☐ None ☐

20. Drilling additives used? ☐ Yes ☐ No
Describe ____

21. Source of water (attach analysis): ____

E. Secondary filter, top ____ m. TOC or ____ m. MSL

F. Bentonite seal, top ____ m. TOC or ____ m. MSL

G. Secondary filter, top ____ m. TOC or ____ m. MSL

H. Primary filter, top ____ m. TOC or ____ m. MSL

I. Screen joint ____ m. TOC or ____ m. MSL

J. Well bottom ____ m. TOC or ____ m. MSL

K. Filter pack, bottom ____ m. TOC ____ m. MSL

L. Borehole, bottom ____ m. TOC or ____ m. MSL

M. Borehole, diameter ____ mm.

N. O.D. well casing ____ mm.

O. I.D. well casing ____ mm.

P. 24-hr water level after completion ____ m. TOC or ____ m. MSL

1. Cap and Lock? ☐ Yes ☐ No

2. Protective posts? ☐ Yes ☐ No

3. Protective casing:
a. Inside diameter: ____ mm.
b. Length: ____ m.

4. Drainage port(s) ☐ Yes ☐ No

5. Surface seal:
a. Cap Gravel blanket ☐ Bentonite ☐ Concrete ☐ ____ Other ☐

b. Annular space seal: Bentonite ☐ Cement ☐ ____ Other ☐

6. Material between well casing and protective casing: Bentonite ☐ Cement ☐ ____ Other ☐

7. Annular space seal: A. Granular Bentonite ☐
b. ____ Lbs/gal mud weight.....Bentonite-sand slurry ☐
c. ____ Lbs/gal mud weight.....Bentonite slurry ☐
d. ____ x Bentonite.....Bentonite-cement grout ☐
e. ____ m^3 volume added for any of the above
f. How installed: Tremie ☐ Tremie pumped ☐ Gravity ☐

8. Centralizers ☐ Yes ☐ No

9. Secondary Filter ☐ Yes ☐ No
a. Volume added ____ m^3 ____ Bags/Size

10. Bentonite seal: a. Bontonite granules ☐
b. 1/4in. 3/6in. 1/2in. Bentonite pellets ☐
c. ____ Other ☐

11 Secondary Filter ☐ Yes ☐ No
a. Volume added ____ m^3 ____ Bags/Size

12. Filter pack material: Manufacturer, product name & mesh size
a.
b. Volume added ____ m^3 ____ Bags/Size

13. Well casing: Flush threated PVC schedule 40 ☐ Flush threated PVC schedule 80 ☐ ____ Other ☐

14. Screen material:
a. Screen type: Factory cut ☐ Continous slot ☐ ____ Other ☐
b. Manufacturer
c. Slot size: 0.____ In.
d. Slotted length: ____ In.

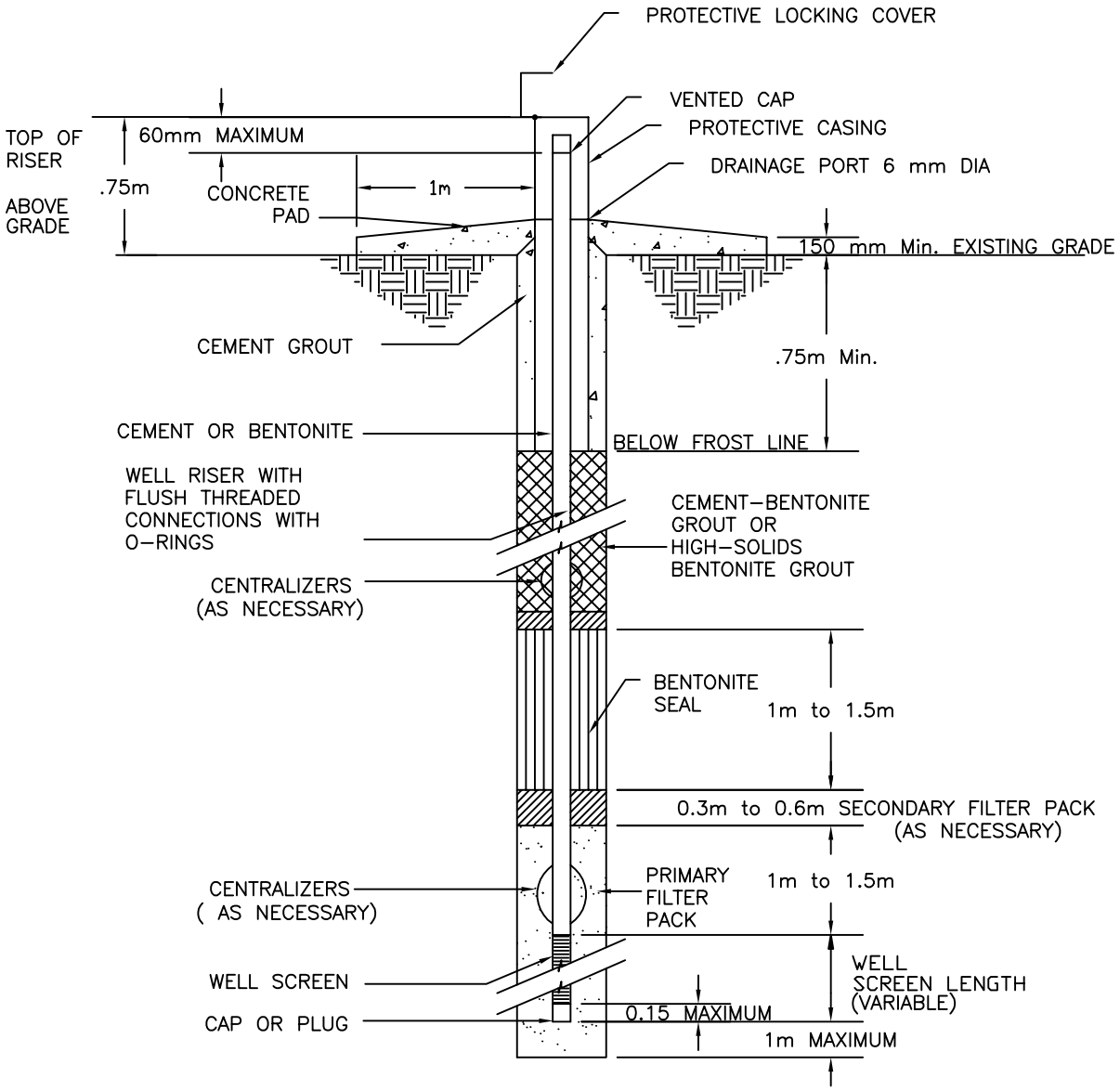
15. Backfill material (below filter pack): None ☐
____ Other ☐

Radford Army Ammuntion Plant

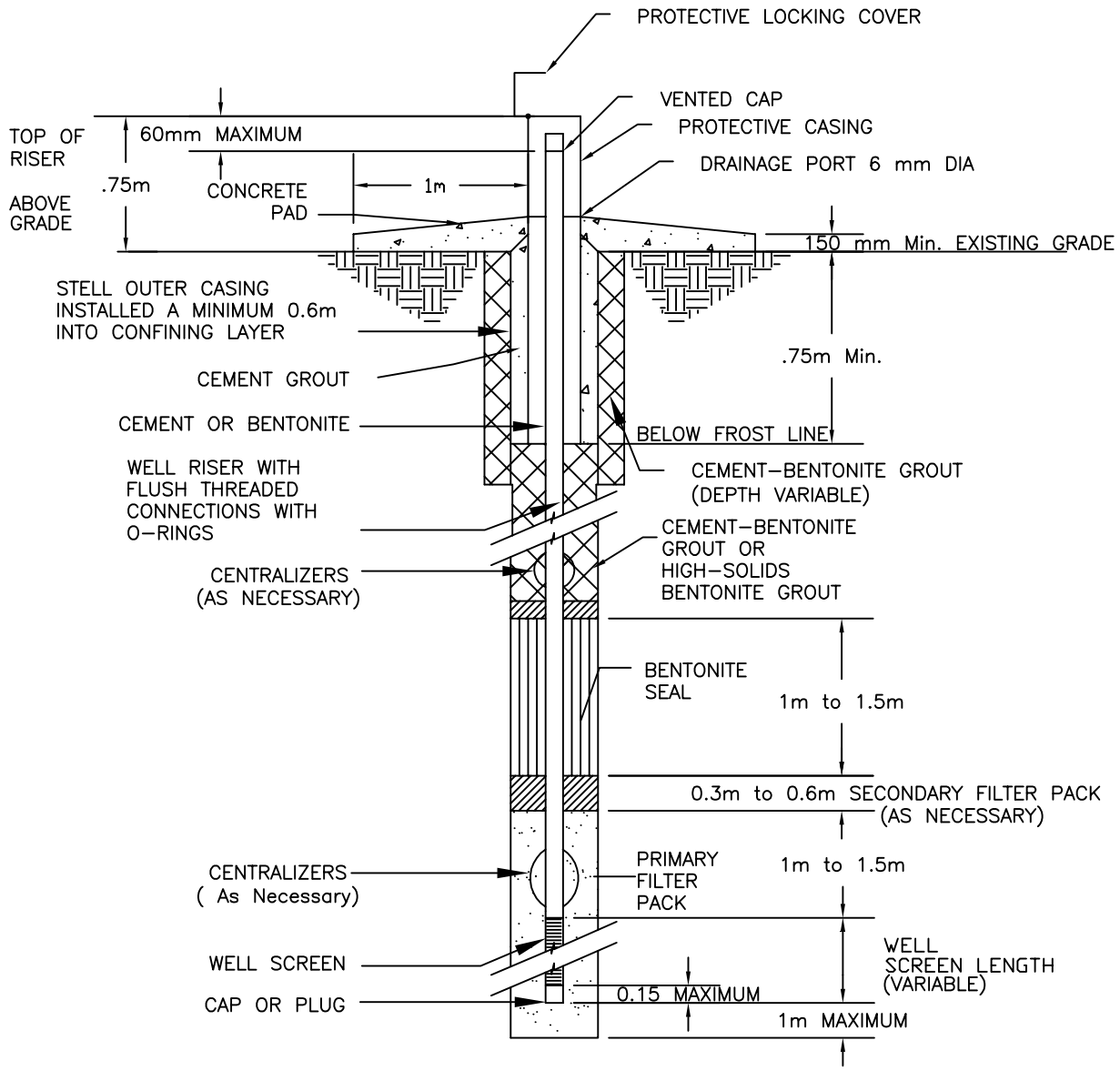
FIGURE 20-1a

SCHEMATIC CONSTRUCTION DIAGRAM OF MONITORING WELL

Date:	Prepared By:
October 2007	*URS Corp./DBC*
Scale:	**File Name:**
NO SCALE	*SOP Figure 20-1a*



Radford Army Ammuntion Plant		FIGURE 20-1b
Date: *October 2007*	**Prepared By:** *URS Corp./DBC*	**SCHEMATIC CONSTRUCTION OF SINGLE-CASED WELL WITH STICKUP COMPLETION**
Scale: *NO SCALE*	**File Name:** *SOP Figure 20-1b*	



Radford Army Ammuntion Plant		FIGURE 20-1c
Date: *October 2007*	**Prepared By:** *URS Corp./DBC*	**SCHEMATIC CONSTRUCTION OF MULTI-CASED WELL WITH CONCRETE PAD**
Scale: *NO SCALE*	**File Name:** *SOP Figure 20-1c*	

STANDARD OPERATING PROCEDURE 20.2
MONITORING WELL DEVELOPMENT

1.0 SCOPE AND APPLICATION

Well development is the process by which drilling fluids, solids, and other mobile particulates within the vicinity of the newly installed monitoring well are removed, while ensuring proper hydraulic connection to the aquifer. Development stabilizes the formation and filter pack sands around the well screen to ensure aquifer water moves freely to the well.

Well development will be initiated not less than 48 consecutive hours but no longer than 7 calendar days following grouting and/or placement of surface protection.

2.0 MATERIALS

- Work Plans;
- Well Development Form;
- Field Logbook;
- Boring Log and Well Completion Diagram for the well;
- Submersible pump, control box, associated equipment, etc;
- Photoionization detector or other appropriate monitoring instrument as specified in site-specific health and safety plan;
- Personal protective equipment and clothing (PPE) as specified in site-specific health and safety plan;
- Flow-through-cell and probes measuring specific conductance, pH, temperature, oxidation/reduction potential, dissolved oxygen, and turbidity;
- Decontamination supplies (SOP 80.1);
- Electric well level indicator and measuring tape;
- Appropriate containers for purged water and other investigation-derived material, as required; and
- Drilling tools for reverse-air circulation development, as appropriate.

3.0 PROCEDURE

3.1 SELECTING METHOD OF DEVELOPMENT

The type of subsurface conditions encountered should determine the method of well development used at a particular site at the Radford Army Ammunition Plant (RFAAP).

When monitoring wells are installed within overburden material, fractured bedrock or karst aquifers producing little sediment, a combination of mechanical surging and pumping (over pumping) or bailing is generally appropriate for well development. In general, over-pumping is the method of pumping the well at a rate higher than recharge occurs. Moving a tight-fitting surge block along the inside of the well screen to create a vacuum completes surging.

When monitoring wells are installed with solution features containing excessive amounts of sediment, reverse-circulation airlifting should be used as the initial step of development. Because reverse-circulation tools airlift methods avoid forcibly exposing the annular space to air, reverse-circulation tools can be run throughout the entire water column in the wells being developed.

After the excessive sediment has been removed by reverse-circulation airlifting, conventional pumping techniques may be used as appropriate to complete the well development.

3.2 DEVELOPMENT AND SAMPLING TIMING

Final development of monitoring wells should not be initiated any sooner than 48 hours after or more than 7 days beyond the final grouting of the well. Pre-development or preliminary development may be initiated before this 48-hour minimum period. Preliminary development may be conducted for open wells or for screened wells after installation of the well screen, casing, and filter pack but before installation of the annular seal. Pre-development is recommended when the natural formation will be used as a filter pack.
Well development should be completed at least 14 days prior to sampling.

3.3 SUMMARY OF PROCEDURES

In general, the following procedure should be followed when developing a well using the pump and surge technique:

1. Prepare the work area outside the well by placing plastic sheeting on the ground to avoid cross-contamination.
2. Calibrate water quality meters (refer to SOP 40.1).
3. Determine the depth to water and total depth of well (refer to SOP 40.2).
4. Calculate the equivalent volume (EV) of water in well to be developed (refer to SOP 30.2).
5. Pump or bail the well to ensure that water flows into it and to remove some of the fine materials from the well. Removal of a minimum of one EV is recommended at this point. The rate of removal should be high enough to stress the well by lowering the water level to approximately one-half its original level.
6. Remove pump or bailer, slowly lower a close-fitting surge block into the well until it rests below the static water level but above the screened interval. (NOTE: The latter is not required in the case of an LNAPL well.)
7. Begin a gentle surging motion along top on-third length of the screen, which will allow any material blocking the screen to break up, go into suspension, and move into the well. Note that development should always begin above or at the top of the screen and move progressively downward to prevent the surge block from becoming sand locked in the well casing. Continue surging for 5-10 minutes, remove surge block, and pump or bail the well, rapidly removing at least one EV.
8. Repeat previous step at successively lower levels within the well screen, until the bottom of the well is reached. As development progresses, successive surging can be more vigorous and of longer duration as long as the amount of sediment in the screen is kept to a minimum.
9. Development should continue until the well development criteria listed in Section 3.1.3 have been achieved.
10. All water removed must be managed as directed by the site investigation plan.

3.3.1 Well Development Criteria

In general, well development should proceed until the following criteria are met:

1. At a minimum, removal of three EV of water from the well.
2. Removal of three times of the amount of fluid (mud and/or water) lost during drilling.
3. Removal of three times the fluid used for well installation.
4. The following indicator parameters should be stabilized as indicated by three successive readings within:
    - ± 0.2 for pH;
    - ±3% for specific conductance;
    - ±10 mV for oxidation/reduction potential;
    - ± 1 degree Celsius for temperature; and
    - ±10% for turbidity and dissolved oxygen (except for wells installed in karst aquifers).
5. Well water is clear to the unaided eye (except for wells installed in karst aquifers).
6. The sediment thickness remaining within the well is less than one percent of the screen length or less than 0.1 ft for screens equal to or less than 10 feet.
7. Site specific factors should be evaluated to determine appropriate well development criteria have been if:
    - Well recharge is so slow that the required volume of water cannot be removed during 48 consecutive hours of development;
    - Water discoloration persists after the required volumetric development; and
    - Excessive sediment remains after the required volumetric development.

3.4 WELL DEVELOPMENT RECORD

Record all data as required on a Well Development Record Form (see example), which becomes a part of the complete Well Record. These data include the following:

- Project name, location;
- Well designation, location;
- Date(s) and time(s) of well installation;
- Static water level from top of well casing before and 24 hours after development;
- Depths and dimensions of the well, the casing, and the screen, obtained from the Well Diagram;
- Water losses and uses during drilling, obtained from the boring log for the well;
- Water contained in the well, obtained from calculations using the depth of the water column and the well radius, plus the radius and height of the filter pack and an assumed 30% porosity;
- Measurements of the following indicator parameters: pH, conductivity, oxidation/reduction potential, temperature, and turbidity before and after development and once during each EV;
- Notes on characteristics of the development water;
- Data on the equipment and technique used for development; and
- Estimated recharge rate and rate/quantity of water removal during development.

Well development records shall be submitted to the COR after the development has been completed.

3.5 INVESTIGATION-DERIVED MATERIAL

Investigation-derived material will be managed in accordance with procedures defined in the work plan addendum for the site being investigated and SOP 70.1.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Refer to the site-specific health and safety plan.

6.0 REFERENCES

Aller, Linda, et al. 1989. *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells.* National Water Well Association.

ASTM Standard D 5092-04e1. 2004. *Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers*.

EPA Groundwater Handbook. 1989.

Nielsen, David M. 1993. *Correct Well Design Improves Monitoring,* in "Environmental Protection," Vol. 4, No.7, July, 1993.

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000, 1 November.

EXAMPLE WELL DEVELOPMENT FORM

WELL DESIGNATION:_____ DATE(S) OF INSTALLATION:_____/_____/_____

SITE GEOLOGIST:_____ DEVELOPMENT DATE(S):_____/_____/_____

STATIC WATER LEVELS BEFORE AND AFTER DEVELOPMENT :

BEFORE _____ DATE _____ 24 HR. AFTER _____ DATE_____

DEPTH TO SEDIMENT BEFORE AND AFTER DEVELOPMENT * :

BEFORE _____ DATE _____ 24 HR. AFTER _____ DATE_____

DEPTH TO WELL BOTTOM *: _____ SCREEN LENGTH _____

HEIGHT OF WELL CASING ABOVE GROUND SURFACE: _____

QUANTITY OF MUD/WATER:

LOST DURING DRILLING	(+)_____	gallons
REMOVED PRIOR TO WELL INSERTION	(-)_____	gallons
LOST DURING THICK FLUID DISPLACEMENT	(+)_____	gallons
ADDED DURING FILTER PACK PLACEMENT	(+)_____	gallons
TOTAL LOSSES	_____	gallons

(a) Water column ht. (ft.) _____ (b) Well radius (in.)_____

(c) Screen length (ft.) _____ (d) Borehole radius (in.)_____

(e) QUANTITY OF FLUID STANDING IN WELL

Install Equation Editor and double-click here to view equation. 1 _____ gallons
(Show Calculation)

(f) QUANTITY OF FLUID IN ANNULUS Install Equation Editor and double-click here to view equation. 1_____gallons
(Show Calculation)

DEVELOPMENT VOLUME = (3 * TOTAL LOSSES) + [5 * (e + f)] = _____ gallons
(Show Calculation)

* **ALL DEPTHS MEASURED FROM TOP OF WELL CASING**

EXAMPLE WELL DEVELOPMENT RECORD

WELL DESIGNATION _____ DATE(S) OF DEVELOPMENT: _____/_____/_____

TYPE AND SIZE OF PUMP:_____

TYPE AND SIZE OF BAILER:_____

DESCRIPTION OF SURGE TECHNIQUE:_____

RECORD OF DEVELOPMENT

DATE & TIME	QUANTITY REMOVED	TIME REQ'D	pH	Cond	Temp	ORD	Turb	DO	Character of water (color/clarity/ odor/partic.)
(before)									
(during)									
(during)									
(during									
(after)									

TYPICAL PUMPING RATE_____ GAL./HR. EST. RECHARGE RATE_____

TOTAL QUANTITY OF WATER REMOVED_____ TIME REQUIRED_____

REMARKS_____

SIGNATURE OF SITE GEOLOGIST_____

STANDARD OPERATING PROCEDURE 20.3
WELL AND BORING ABANDONMENT

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to establish the protocols by which all borings and wells will be abandoned. The primary objective of boring or well abandonment activities is to permanently abandon the boring or well so that the natural migration of groundwater or soil vapor is not significantly influenced.

2.0 MATERIALS

- Well abandonment equipment including appropriate grout mixing/placement equipment, and heavy equipment as appropriate (drill rig, crane, backhoe, etc.);
- Pure sodium bentonite powder with no additives (bentonite);
- Bentonite pellets (seal);
- Cement (Portland Type II); and
- Approved source water.

3.0 PROCEDURE

The volume of grout required for borehole or well abandonment should be calculated prior to proceeding with abandonment. These calculations should consider loss of material to the formation, changes in borehole diameter, potential zones of washout, and shrinkage of material. Calculations should be recorded on an abandonment record (see Section 3.1.4).

In general, cement grout should be used for boring and well abandonment per the specifications in Section 3.1 and procedures identified in the following sections. Specialized narrow diameter soil borings (3-inches or less) associated with direct push methods or hand augers may be abandoned using bentonite pellets or chips (see Section 3.5).

Any replacement borings or wells associated with the abandonment should be offset at least 20 feet from any abandoned site in a presumed up- or cross-gradient direction.

3.1 GROUT

Grout used in construction will be composed by weight of the following:

- Type II Portland cement (Type IV Portland Cement if sulfate concentrations are greater than 1,500 ppm);
- Bentonite (2 to 5% dry bentonite per 94-lb sack of dry cement); and
- A maximum of 6 to 7 gallons of approved water per 94-lb sack of cement.

Neither additives nor borehole cuttings will be mixed with the grout. Bentonite will be added after the required amount of cement is mixed with the water.

All grout material will be combined in an aboveground container and mechanically blended to produce a thick, lump-free mixture. The mixed grout will be recirculated through the grout pump before placement.

Grout placement will be performed using a commercially available grout pump and a rigid tremie pipe. Removal and grouting will be accomplished in stages, aquifer by aquifer, sealing the boring from the bottom to ground surface. This will be accomplished by placing a grout pipe to the bottom and pumping grout through the pipe until undiluted grout reaches the bottom of the next higher section of casing or, for the top-most section, until grout flows from the boring at ground surface.

After 24 hours, the abandoned drilling site will be checked for grout settlement. Any settlement will be filled with grout and rechecked 24 hours later. This process will be repeated until firm grout remains at the ground surface.

3.2 BORINGS

The term "borings" as used in this SOP applies to any drilled hole made that is not completed as a well. This includes soil test borings, soil sampling borings, and deep stratigraphic borings. Whether completed to the planned depth or aborted for any reason before reaching that depth, borings will be grouted and will be normally closed within 12 hours.

To achieve an effective seal, the borehole to be abandoned should be free of debris and foreign matter that may restrict the adhesion of the grout to the borehole wall. Borehole flushing with a tremie pipe may be required to remove such materials prior to grouting.

Each boring to be abandoned should be sealed by grouting from the bottom of the boring to the ground surface. This will be accomplished by placing a tremie pipe to the bottom of the borehole and pumping grout through the pipe at a steady rate. The grouting should be completed slowly and continuously to prevent channeling of material. The tremie pipe should be raised when pumping pressure increases significantly or when undiluted grout reaches the surface.

After 24 hours of completing the abandonment, the abandoned boring or well should be checked for any grout settlement. The settlement depression should be filled with grout and rechecked 24 hours later. Grout should be placed with a tremie pipe if the open hole is 15 feet or deeper or if the hole is not dry. Otherwise, the grout may be poured from the surface.

3.3 NARROW BORINGS

Narrow borings, those with diameter less than 3 inches, advanced by hand auger or direct push methods, may be sealed using bentonite pellets or chips rather than a grout mixture. Often times a grout pump is not available to mix the grout when these methods have been used. Bentonite pellets or chips will be poured into the boring from the ground surface. Then bentonite will hydrate by absorbing moisture from the ground; unapproved water should not be added to the boring. After 24 hours, the abandoned boring will be checked, and any grout settlement will be topped off with more bentonite. The process will be repeated until bentonite remains at ground surface unless site condition indicates otherwise.

3.4 WELLS

The following procedure applies to wells aborted before completion and existing wells determined to be ineffective or otherwise in need of closure.

General Considerations

A number of techniques are available for abandoning monitoring wells and other monitoring devices including:

- Abandonment in place by grouting the well screen and casing in place;
- Removal of the well by pulling; and
- Overdrilling.

The particular method used for abandonment should be specified in the work plan addenda developed for a site-specific investigation. Several factors must be considered when selecting the appropriate abandonment technique including well construction, well condition, and subsurface conditions.
In general the preferred method for abandonment of wells is to remove all existing well materials to:

- Reduce the potential for the formation of a vertical conduit to occur at the contact between the casing and annular seal;
- Reduce the potential for well materials interfering with the abandonment procedures; and
- Decrease the potential for reaction between the well materials and grout used for abandonment.

In general, all well materials will be removed during abandonment (including screen and casing) by either pulling out the casing, screen, and associated materials or by overdrilling using a rotary or hollow stem auger drilling procedure.

Abandonment with Well Materials In Place

In the event that it is not possible to remove the casing and screen, the casing and screen will be perforated using a suitable tool. A minimum of four rows of perforations several inches long and a minimum of five perforations per linear foot of casing or screen is recommended.

After the screen and casing have been appropriately perforated, the well should be abandoned by grouting from the bottom of the well to the ground surface using a tremie pipe as described in Section 3.2. The tremie pipe should be raised when pumping pressure increases significantly or when undiluted grout reaches the surface.

After 24 hours of completing the abandonment, the abandoned well should be checked for any grout settlement. The settlement depression should be filled with grout and rechecked 24 hours later. Grout should be placed with a tremie pipe if the open hole is 15 feet or deeper or if the hole is not dry. Otherwise, the grout may be poured from the surface.

Abandonment by Removal

Site conditions permitting, relatively shallow monitoring wells may be successfully abandoned by removal providing that the well is generally good condition and sections of casing (including screen) can be successfully removed with materials intact.

This method of abandonment is generally accomplished by removing (pulling) sections of casing and screen out of the subsurface using a drill rig, backhoe, crane, etc. of sufficient capacity. Materials with lower tensile strength such as polyvinyl chloride (PVC) generally cannot be removed by pulling if they have been appropriately cemented in place.

Once the well materials have been removed from the borehole, the borehole should be abandoned by grouting in the same manner discussed for borings in Section 3.2. If the borehole collapses after removal of well materials, then the borehole should be over drilled to remove all material and then grouted to the surface.

Overdrilling

With this method of abandonment, the well materials are removed by overdrilling (overreaming) the well location. Overdrilling using rotary techniques may be accomplished using an overreaming tool. This tool consists of a pilot bit that is approximately the same size as the inner diameter of well casing and a reaming bit that is slightly larger than the diameter of the borehole. As drilling proceeds, all well materials are destroyed and returned to the surface. After completion of the overdrilling, the borehole should be immediately grouted with a tremie pipe as described in Section 3.2.

In the case of overburden wells, a hollow stem auger may be used for overdrilling providing that this method of drilling appropriate for the subsurface conditions. The hollow stem auger should be equipped with outward facing carbide-cutting teeth with a diameter 2 to 4 inches larger than the well casing. With this method, the casing guides the cutting head and remains inside the auger. When the auger reaches the bottom of the well boring and the well materials have been removed, the borehole may be grouted with a tremie pipe (Section 3.2) through the augers as the augers are gradually withdrawn.

Considerations for Fractured Bedrock and Karst Wells

Multi-cased wells completed into bedrock as screened wells, open wells, or open-lined wells may be abandoned with the outer casing left in place providing that the integrity of this casing and associated annular seal is good. A cement bond log (acoustic amplitude boring geophysical log) may be used to evaluate the integrity of the casing and annular seal, if the outer casing is to be left in place.

Borings or wells completed in karst zones may be difficult to abandon because of the potential presence of large conduits, which may make it difficult to grout. Where large conduits exist or difficulties are encountered when abandoning a boring or well, fill the portion of the borehole penetrating the solution cavity with inert gravel (quartz, claystone, etc.). Packers can be used to isolate critical intervals for filling with grout above and below these zones.

3.5 RESTORATION

All work areas around the borings or wells abandoned should be restored to a condition essentially equivalent to that before the borings and wells were installed.

3.6 INVESTIGATION-DERIVED MATERIAL

Investigation-derived material should be managed in accordance with the requirements of SOP 70.1 and the work plan addenda associated with the site investigation

3.7 DOCUMENTATION

For each abandoned boring or well, a record should be prepared to include the following as appropriate:

- Project and boring/well designation;
- Location with respect to replacement boring well (if any);
- Open depth of well/annulus/boring prior to grouting;
- Casing or items left in hole by depth, description, composition, and size;
- Copy of the boring log;
- Copy of construction diagram for abandoned well;
- Reason for abandonment;
- Description and total quantity of grout used initially;

- Description and daily quantities of grout used to compensate for settlement;
- Disposition of investigation-derived material;
- Water or mud level prior to grouting and date measured; and
- Remaining casing above ground surface, height above ground surface, size, and disposition of each.

Daily investigation activities at the site related to boring and well abandonment should be recorded in field logbooks as described in SOPs 10.1 and 10.2.

4.0 PRECAUTIONS

Refer to the health and safety plan associated with the Work Plan Addenda and the Master Health and Safety Plan.

5.0 REFERENCES

ASTM Standard D 5299-99 (2005). 2005. *Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.*

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000, 1 November.

STANDARD OPERATING PROCEDURE 20.4
TEST PITS

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the excavation of test pits and provide general guidelines for sample collection from the test pits.

Test pit excavations are conducted to investigate and identify possible areas of contamination. Thus, samples taken from the excavation will be positively biased according to visual inspection (i.e., soil discoloration, soil staining) and field screening. Areas showing evidence of possible contamination will be sampled directly. If no evidence of contamination is present during excavation, then samples will be collected in two equally spaced intervals or at intervals specified in work plan addenda for site-specific investigations. In either case, no less than two representative samples per excavation site should be collected. Excavation (and sampling) shall terminate if the water table is encountered before terminal depth.

2.0 MATERIALS

- Master Work Plan;
- Work Plan Addenda;
- Field log books;
- Appropriate health and safety equipment for monitoring conditions in the work zone and excavation area including a photoionization detector (PID) or other types of monitoring equipment;
- Personal protective equipment and clothing (PPE) per the site-specific health and safety plan;
- Backhoe and associated equipment;
- Appropriate soil sampling equipment such as stainless steel scoops, trowels, spoons, and bowls/trays SOP 30.1);
- Appropriate sample bottles, labels, chain-of-custody forms, and sample shipping supplies etc;
- Tarps or plastic sheeting;
- Measuring tape;
- Camera and film; and
- Decontamination equipment and supplies.

3.0 PROCEDURE

3.1 DOCUMENTATION

Field activities and sampling information should be recorded in the field logbooks as outlined in SOPs 10.1 and 10.2.

Cross-sections and sketches of the layout will be prepared upon completion of the excavation. The sketches will indicate soil horizons and geologic observations. Soil horizons will be differentiated based upon variations in soil color (i.e., Munsell Chart), texture, coarse fragment content, structure, and consistence. Refer to SOP 10.3 for boring log completion procedures. In addition, depth and thickness of horizontal depth

to bedrock (if encountered) and indicators of seasonal high water table (presence of redoximorphic features) will be recorded. Sketches will also indicate the location of any samples collected. Photographs of the excavation will be taken and locations noted on the field map.

3.2 DECONTAMINATION

Decontamination of the backhoe, trowels or spoons, bowls, field tape measure, and other associated equipment will be carried out before use and between each test pit as outlined in work plan addenda and SOP 80.1.

3.3 SITE PREPARATION

Mark out dimensions of excavation and possible hazards (e.g., utilities, former structures). The backhoe must be equipped with a protective shield and the operator properly trained in the use of level B respiratory and dermal protection. The backhoe bucket and arm must be thoroughly decontaminated by steam cleaning before use and between each test pit location as described in work plan addenda and SOP 80.1. Discuss all hazards with equipment operator before any intrusive activities.

Set up exclusion zone with caution tape and position backhoe upwind of excavation site. All activities must be conducted in accordance with the health and safety plan developed for work plan addenda.

3.4 EXCAVATION AND SAMPLING

The backhoe operator shall be directed to excavate until the sampler indicates the desired depth has been reached. If the pit is less than 3 ft deep, the sampler can enter the pit and collect the samples using a decontaminated stainless steel trowel or spoon as described in SOP 30.1. As the pit becomes deeper, the sampler will collect the soil samples directly from the center of the bucket of the backhoe in an area not in contact with the sides of the bucket. The samples will then be transferred from the bucket into the appropriate sample container following sampling techniques outlined in SOP 30.1. Screening processes and analytical parameters for field screening soil samples will vary from site to site as specified per scope of work.

Begin excavating in increments of 6 to12 inches per pass. Deeper passes may be necessary if the soil is rocky. Total excavation width will be of adequate dimensions to visually characterize the soil profile as observed on the excavation walls, typically not exceeding the width of the backhoe bucket. However, total width of the excavation will be dependent on the depth of the excavation, thus wider dimensions may be necessary for characterization of deeper pits. Excavation will be continuously monitored with health and safety monitoring equipment. Safety measures must be exercised when working near and around the backhoe arm and excavation pit. Health and safety procedures and any installation safety procedures must be strictly followed.

All soil removed during excavation shall be placed on a tarp or plastic sheeting. Soil exhibiting signs of contamination based on visual or olfactory observations, as well as monitoring results, will be separated from uncontaminated soil and containerized for site removal.

Samples will be collected at desired intervals as specified in work plan addenda. Sampling procedures will follow the requirement of work plan addenda and SOP 30.1.

3.5 BACK FILL

Once the terminal depth of the excavation is reached or the water table is encountered and all samples are collected, the trench will be backfilled with certified clean fill. Soils removed during excavation shall be containerized and disposed of at an approved landfill or moved to an approved storage area for subsequent disposal. All backfilled material will be tamped to a proper compacted level to ensure no major settling will occur. After all backfilling and compacting procedures are complete, the area will be raked and seeded or resurfaced with asphalt, as appropriate. When the area is properly secured, decontamination procedures shall begin.

4.0 PRECAUTIONS

- Appoint an excavation competent person;
- Conduct daily inspections of excavation and surrounding area;
- Excavation entry is prohibited without approval of the excavation competent person;
- Protect employees in excavations deeper than four feet by means of properly designed protective systems;
- Protective systems must comply with 29 CFR 1926 Subpart P Appendices B, D, and E;
- Excavations will be clearly identified and barricaded to keep unauthorized individuals out.

5.0 REFERENCE

USEPA. 1987. *A Compendium of Superfund Field Operations Methods.* December.

STANDARD OPERATING PROCEDURE 20.7
RESISTIVITY AND ELECTROMAGNETIC INDUCTION SURVEYS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide a general description and technical management guidance on the use of Resistivity and Electromagnetic Induction (Terrain Conductivity) Surveys.

2.0 MATERIALS

- Work Plans;
- Field Logbook;
- Site maps;
- Electromagnetic induction unit; and
- Personal protective equipment and clothing (PPE) per the site-specific health and safety plan.

3.0 PROCEDURE

3.1 DESCRIPTION OF METHODS

3.1.1 Theory and Principles of Operations

Resistivity. A resistivity survey measures the electrical resistivity of a geohydrologic section indirectly. A DC or low-frequency AC electrical current is injected into the ground through electrodes embedded in the ground surface. The flow of current within the subsurface produces an electric field with lines of equal potential perpendicular to the current flow. This potential field (voltage) is measured between a second pair of electrodes also embedded in the ground surface.

The actual resistivity is a complex function of the applied current, observed voltage, and the characteristics of the subsurface section that provide multiple current flow paths. The apparent subsurface resistivity can be calculated as a function of the applied current, the measured voltage, the separation of the electrodes, and the geometry of the current and potential electrode pairs. For the simplest electrode configuration in which all four electrodes are equally spaced in the order current-potential-current (i.e., the Wenner array) the apparent resistivity is given by the following equation:

$$a = \frac{2\pi AV}{I}$$

Where:
a = apparent resistivity in ohm-meters or ohm-feet,
V = the measured potential difference in volts, and
I = the applied current in amperes.
The calculations are similar for other electrode configurations except geometric factors other than 2 are used. Equipment operating manuals provide nomographs for determination of apparent resistivity from field measurements for all standard electrode configurations. These calculations are simple and can be performed on a hand-held calculator.

Of the many possible geometric configurations of current and potential electrodes, some of the most commonly used arrays are as follows:

- Linear array with electrodes in the order current-potential-potential-current. A Wenner array results if the spacing between each successive pair of electrodes is equal. For a Schlumberger array, the distance between the two potential electrodes is a small fraction of the distance between the two current electrodes.
- Linear array with electrodes in the order current-current-potential-potential. In this dipole-dipole configuration, the separation of the two current and the two potential electrodes is equal, with an equal or greater separation of the two dipole pairs.

Resistivity surveys may be conducted to determine either vertical or horizontal electrical anomalies. *Vertical electrical soundings* (VES) are made by symmetrically expanding a Wenner or Schlumberger array in line about a point, i.e., the electrode spacing is increased for successive readings. Measurements of potential and input current are made for each set of electrode spacings, and the apparent resistivity is calculated as described below. The resultant plot of spacing versus apparent resistivity is interpreted to yield the resistivity distribution with depth beneath the midpoint between the potential electrodes. However, the resistivity being measured is that of the materials beneath the entire array.

For *horizontal profiling*, apparent resistivity from a series of measurements is plotted as a function of the X+Y coordinates of the site. One or more of the following procedures accomplishes horizontal profiling:

- A series of VES profiles at several locations are compared;
- Measurements are made with fixed-electrode spacing along a line or over an area; and/or
- Dipole-dipole measurements are made with the current or potential dipole at a fixed location and the other dipole located at increasing distances along a line. This process provides a resistivity "cross-section" beneath the line.

The Wenner and Schlumberger configurations are most often used for vertical investigation, whereas the dipole-dipole configuration is most often used for lateral surveys.

Electromagnetic Induction (EM). In the Electromagnetic Induction (EM) method, the electrical conductivity of a geohydrologic section is measured by transmitting a high-frequency electromagnetic field into the earth, producing eddy currents that generate secondary electromagnetic fields that can be detected by a receiver. The eddy currents are induced in the earth by an aboveground transmitter coil, and the resulting secondary electromagnetic fields are coupled to an aboveground receiver coil. Thus, EM measurements do not require direct ground contact, as is the case for resistivity measurements, and surveys across a line or area may be performed quite rapidly.

EM instruments are calibrated to read subsurface conductivity directly in units of millimhos per meter, Where:

$$\textit{1,000}\ \text{milliohm per meter} = \frac{1}{\text{ohm-meter}}$$

This relation indicates that the conductivity obtained from EM measurements varies inversely with the resistivity measured using a resistivity survey. However, because the subsurface sections associated with the two methods are generally of different depth or cross-sectional area, there is not an exactly inverse relationship between conductivity and resistivity surveys.

The conductivity value obtained by an EM instrument depends on the combined effects of the number of soil and rock layers, their thicknesses and depths, and the inherent conductivities of the materials. The quantity actually measured is an apparent conductivity of the earth volume between the ground surface and an effective penetration depth, which is defined as the depth at which variations in conductivity no longer have a significant effect on the measurement. The sampling depth is related to the spacing between the transmitter and receiver coils of the instrument, approximately as follows:

Sampling depth = 1.5 (coil spacing) (Vertical Dipole)
= 0.75 (coil spacing) (Horizontal Dipole)

Vertical profiling can be accomplished by multiple measurements about a point, with varying coil spacings. Horizontal profiling is performed by making measurements along traverses with a fixed coil spacing.

3.1.2 Application

The measurement of a subsurface resistivity or conductivity at a hazardous waste site provides a valuable contribution to site characterization for the following reasons:

1. Conductivity (resistivity) is a function of the geohydrologic section and is overwhelmingly influenced by the presence of water. Therefore, conductivity (resistivity) can provide indirect evidence on the porosity and permeability of subsurface materials and the degree of saturation. These parameters, in turn, are directly related to subsurface lithology, and to the potential for infiltration/migration of contaminants from a source area.
2. Conductivity (resistivity) is influenced by the presence of dissolved electrolytes in soil or rock pore fluids. Contaminant plumes in the vadose (unsaturated) and saturated zones can be mapped if there is sufficient change in conductivity to be detected by EM or resistivity measurements.

   In general, contaminant plumes of inorganic wastes are most easily detected because conductivity may be increased by 1 to 3 orders of magnitude above background values. The limit of detection is a change from a background of 10%–20%. Plumes of non-polar organic constituents from spills or leaking containers may be detected if sufficient soil moisture has been displaced to affect the ground conductivity to a measurable degree.
3. Conductivity (resistivity) can be used to detect the presence of buried wastes if the degree of saturation, containerization, or inherent electrical properties of the wastes produce sufficient variation from the soil matrix. The degree of detail provided by typical surveys cannot distinguish the size, shape, or mass of sources except in a qualitative manner.

For these reasons, resistivity and conductivity surveys should be investigated as potentially appropriate site characterization tools when any of the following information is desirable:

- Detection and mapping of contaminant plumes; the rate of plume movement may also be deduced from measurements made over time;
- Estimates of depth, thickness, and resistivity of subsurface layers, depth to the water table, or probable geologic composition of a layer;
- Detection, mapping, and depths of burial pits, landfills, clay caps or lenses, or deposits of buried waste;
- Determination of locations for drilling to intercept contamination or to investigate aquifer properties; and
- Corroboration of limited chemical and geohydrologic data at a site.

In general, surface geophysical measurements alone cannot provide a complete assessment of subsurface conditions, When appropriately integrated with other investigative information from subsurface borings,

borehole geophysics, etc., surface geophysical surveys can be an effective, accurate, and cost effective method of obtaining subsurface information. Geophysics at Radford Army Ammunition Plant will, where coverage permits, integrate surface and down hole methods to develop more accurate and refined interpretations of subsurface conditions that possible with either type of method alone.

3.1.3 Instrumentation

Resistivity. The basic components of a field resistivity system are two current and two potential electrodes, electrical cables, centralized power unit (current source), and resistivity meter. Automated instrumentation is commonly used to conduct two or three-dimensional surveys. One such system is the Advanced Geosciences, Inc. (AGI) Sting/Swift system, which includes a central power unit, resistivity meter (Sting), control unit (Swift), and switched electrode cables for use with up to 254 electrodes. This AGI allows for automated measurements, complete control of the measurement array, programmable measurement cycles, large capacity storage of data with linkup to a personal computer. The Sting/Swift system allows for rapid collection of resistivity data and testing of arrays. Measurement ranges for the Sting/Swift system are 0.1 milliohm to 400kohms (resistance) and 0 to 500 volts full-scale auto ranging (volts).

Electromagnetic Induction (EM). Generally EM instruments are available in two forms:

1. Single-piece models operable by one person, with a fixed coil spacing 12 feet; these provide sampling depths on the order of 10 and 20 feet. The Geonics EM31DL is one example of this type of instrument.
2. Dual-coil models, operable by two persons, with variable coil spacing up to about 40 feet (sampling depth up to about 60 feet). The Geonics EM 34-3XL is an example of this type of instrument.

The 12-foot fixed coil and the dual coil apparatus are most commonly used in hazardous waste site investigations. In either case, an additional person to record data and identify measurement locations is highly desirable and more time efficient. The instruments are calibrated to read directly in conductivity units, and values are typically read and recorded on a data sheet. Some units have been modified to provide direct digital recording on magnetic tape.

3.2 DATA ACQUISITION

3.2.1 Field Procedures

Initial Operations. As with most geophysical surveys, conductivity or resistivity surveys involve the following initial steps:

- **Planning.** Known or assumed geohydrologic features of the site, potential source locations and migration characteristics of hazardous constituents, are used to select specific techniques and equipment to establish appropriate locations and depths for geophysical measurements (see Section 5.1.2). The level of detail necessary (data quality objectives) determines the amount of effort and, in simple terms, the required number and density of data points. As a minimum, the data quality will depend on the method and specific equipment selected and the supporting hardware and software capabilities.

An "expert" system known as the Geophysics Advisor Expert System, developed by the Environmental Monitoring Systems Laboratory (EMSL) in Las Vegas, may be used as a planning tool to assist in selecting an appropriate geophysical method. This system prompts the user through a series of site-specific questions that will eventually rank various geophysical methods as to their feasibility at a specific site.

Most of the details can be planned before site activities; however, some leeway must be accorded to the field procedures to account for variable site conditions and weather.

- **Site Layout.** One of the most labor-intensive and time-consuming aspects of the fieldwork involves layout of grids and surveying or careful measurement of locations to allow geophysical surveys to be accomplished in a systematic, documentable manner. Location coordinates of sufficient resolution to accomplish the objectives of the survey must uniquely identify every data point.
- **Array and Spacing Tests.** Select one area or line that typifies the site. Test different array types and spacing. Analyze the data to see if the results match induction or normal resistivity and drilling logs from nearby wells. Select the optimal array type and spacing configuration, and proceed with the survey. If induction or normal resistivity logs are not available for wells at or near the site, log these wells before executing the surface surveys.

Resistivity Measurements. Resistivity electrodes must be installed in the proper array and spacing at a particular site grid location (according to specific manufacturers directions). The cables connecting the electrodes to the current source and potentiometer are then attached, and the current flow is initiated. Voltage is measured directly on the potentiometer. The process is repeated at the next site grid location (for horizontal profiling) or with the next electrode spacing (for vertical electric soundings) as necessary for QC purposes.

General rules for electrode spacings are difficult to specify because of site-specific variation; depending on the site geohydrology and source characteristics. As a general rule of thumb, the maximum electrode spacing should be at least three to five times that of the maximum target depth.

Electromagnetic Induction Measurements. At a given site grid location, the specified orientation of the apparatus is established, i.e., with the axis of the coils either parallel or perpendicular to the direction of the survey line. The meter reading is recorded and the apparatus is moved to the next site grid location.

For the dual-coil method, both the intercoil spacing and coplanarity of the coils must be established before recording the data. Surveys are normally conducted with the coil axes horizontal and at right angles to the survey direction.

EM profiles can be accomplished in a continuous manner using vehicle-mounted equipment in conjunction with strip charts, magnetic tape recorders, or digital recorders. Location information must be appended by tic marks or voice-over and some means provided to reference written field logs in a consistent manner.

3.2.2 Data Format

General. Information obtained during a resistivity or EM survey should be presented according to a standard data format, using standardized data sheets with original field entries. As a minimum, the heading for each data sheet should contain the following information:

- Project, task, site, and location identification;
- Company or organization;
- Date (and time, if applicable);
- Operator's name and signature;
- Method/technique identification;
- Instrument make, model, serial number, and calibration date/frequency (if applicable);
- Test location (according to the survey plan);
- Electrode or coil type and configuration;

- Line or site grid location(s);
- Weather and site conditions and temperatures;
- Identity of relevant calibration and QC data; and
- Records of data for each sounding or profile on a single sheet, if possible;

Resistivity. Survey data should include, in a tabular format, the following information:

- Electrode location, per the survey plan;
- Electrode spacing, in feet or meters;
- Input current applied, in amperes; and
- Measured potential, in volts.

Electromagnetic Induction. Survey data should include, in a tabular format, the following information:

- Coil location, per the survey plan;
- Coil spacing;
- Coil configuration (unless specified in the heading); and
- Meter reading, in millimhos per meter.

Special precautions to systematize and preserve data will be required for data that are recorded continuously on strip charts, magnetic tape recorders, or digital recorders. Strip charts should be permanently affixed to the field logbook. The first original hard copy of output from magnetic tape should be treated similarly. Identifying header information must be recorded directly on the tape.

3.3 DATA INTERPRETATION

3.3.1 Resistivity Data

For each data point, the apparent resistivity is calculated according to the formula appropriate for the type of electrode array employed. For horizontal profiling, curves of apparent resistivity versus distance along a line defined by the site grid locations are plotted. These curves of lateral changes in resistivity at a given electrode spacing (therefore, at a given survey depth) provide a cross-section for interpretation of the anomalous subsurface features. Multiple parallel profile lines can be combined to produce an area map of apparent resistivity at a particular depth.

For vertical electrical soundings, the series of apparent resistivities are plotted versus corresponding electrode spacings on log-log graph paper. The curves can be compared qualitatively with known or suspected subsurface conditions or with idealized layer-models to determine layer thicknesses and depths. Computer processing is typically applied for analysis of complex data sets and inverse layer modeling.

3.3.2 Electromagnetic Induction Data

Corrections may be applied to EM data for accuracy and drift, variation in location from pre-established coordinates, topography, changes in scale, and non-linearities associated with high conductivity values. In all cases, such corrections must be fully supported by data originally recorded or annotated in the field. Profile data along traverses are obtained as plots of conductivity versus distance. As with resistivity profiling, parallel traverse data may be combined to provide conductivity contour maps of a site. Two or more profiles at different sampling depths, as well as sounding data at a given location, provide information

on the relative conductivities of shallow and deeper layers. Contour plots may provide valuable information on the extent and direction of groundwater flow and contaminant transport.

Detailed comparison of EM sounding measurements with layer models of the site can be made. This type of interpretation has been used at sites with relatively simple, uniform geohydrology to determine overburden and bedrock spatial and depth relationships. In some cases, very detailed interpretations, including aquifer flow properties, location of permeable zones, and interaquifer transfer, are possible.

3.4 POTENTIAL PROBLEMS

Resistivity and EM surveys are geophysical methods that, although standardized and frequently applied, are subject to a wide variety of problems. Problems can be expected to arise in the following areas:

- **Planning and Execution.** Rarely is a survey accomplished exactly according to the original plan. Site features not previously specified and myriad other variations can occur that force changes in the details of the approach. However, the data quality objectives of the survey, the general methodology, the amount of data required, and the degree of data interpretation requested should remain unchanged. Project work scopes should be written with some degree of latitude to allow a change in plans whenever justified.
- **Noise and Interferences.** Measurements can be affected severely both by natural and man-made sources of electrical and electromagnetic noise. Nearby power lines, stray ground currents, and atmospheric discharges adversely affect both types of surveys. Large masses of buried metal, fences, railroad tracks and underground pipes or cables can strongly distort measurements and reduce instrument sensitivity to features of interest. These problems generally can be accounted for or overcome but must be recognized early in the survey so that appropriate avoidance measures can be implemented. Known or suspected sources of interference should be included in the initial planning for a project.
- **Weather Conditions**. It is possible to conduct the surveys under almost any conditions that permit traverse of the site. However, snow cover, standing water, heavy rainfall, or thoroughly saturated surface soils may severely restrict the ability to meet project objectives and schedules. Scheduling contingencies should be included whenever possible, especially during periods when inclement weather is expected.
- **Technical Difficulties.** Preventable difficulties include equipment malfunction or misapplication, poor operator training, and lack of applications experience. Other difficulties may arise because the geophysical response of the site is not as initially conceptualized. Early recognition and response by technical management can minimize the effect and severity of any problems. Interim, real-time scrutiny of the data by the site geophysicist is essential. The geophysicist must be responsive regarding equipment replacement, repair, or changes in personnel. The site manager and the site geologist should be cognizant of technical difficulties beyond the control of the field personnel and should recognize the need to change plans, field personnel, or cancel a survey, as appropriate.
- **Topographic Changes.** Significant changes in topography should be addressed when planning and making measurements.

3.5 QUALITY CONTROL

3.5.1 General

Geophysical surveys, including resistivity and conductivity surveys, are subject to misapplication, erroneous interpretations, and use of incomplete or inadequate data. All of these avoidable errors can severely affect both the cost of subsequent site investigations and the validity of the site characterization. This susceptibility

to misuse and potential for negative effect demands an assurance that appropriate quality control measures have been implemented. Quality control aspects common to most types of geophysical field programs are as follows:

- Integrating surface-based results (indirect measurements) with well sampling results, drilling logs, and down hole (direct measurement) geophysical logs.
- Program management personnel with technical expertise in preparing statements of work; reviewing proposals, work plans, and reports; and supervising technical subcontracts and field-related programs.
- Insistence on a defined scope of work, clear specifications, and data validation procedures.
- Appropriate justification before rejection of data points from a data set. Field data sheets should contain all observed data and the conditions that could affect data validity.
- Field data should be recorded in permanent ink in a bound logbook with each page signed and dated by the operator. Original unaltered logbooks should be retained in the site file.
- Complete and clear understanding of manufacturer's operation manual for the particular apparatus being used.
- Properly calibrated instrument provides an added measure of data validity and permits correlation and comparison of the associated data with site features and geohydrologic characteristics not evident at the time of the field effort. Some geophysical survey objectives can be met by relative measurements across an area or with depth.
- An evaluation should be made of noise, interferences, and obstructions at a site. Such measurements, inferences, and explanations should be recorded in the field. These real-time quality control procedures aid field personnel in correction of noise sources over which they have control, in validating suspected external sources, and in early detection of problems that may jeopardize the survey objectives.

3.5.2 Resistivity Surveys

The resistivity apparatus consists of a current source and potentiometer, both of which must be calibrated at least twice a day, e.g., once at the beginning of the day and once at the end of the day.
The current source (source of the energy driving the system) is calibrated by placing an ammeter in series with the electrode cables. The reading obtained on the reference ammeter is then compared with the value read from the ammeter on the current source. The current source ammeter is then adjusted to the reading on the reference ammeter.
The potentiometer is the other apparatus that must be calibrated. This is normally accomplished by placing a precision resistor in series with the current load. A precision resistor is an electronic device that has a predetermined (as specified by the manufacturer) resistance to the electric current passing through the device, i.e., reduction in amperage. The potentiometer is then placed across the resistor. The potential measured should be equal to the product of the known resistance and the indicated current. Precision resistors can be purchased at most electronics supply stores.

All data sets should be accompanied by quality control data that indicate the level of quality of each individual data point. Periodically taking replicate measurements or re-running with the spacing and array configuration accomplishes this. These measurements should be averaged or statistically compared so that measurement precision can be estimated. Each data set should also be referenced to the most recent calibration. Data obtained before a calibration requiring significant changes in instrument controls is suspect. (NOTE: A significant change in instrument readings as a result of recalibration is interpreted as successive calibration values that vary by more than 10%).

Resistivities should be calculated and plotted during data acquisition to determine the overall quality of the data and whether the survey results are consistent with the site conceptualization. Data points representing discontinuities in the curves should be validated by repetition and, if necessary, a fine grid of measurements made to determine whether the anomaly represents a site feature of interest, a spurious reading, or an obstructive interference.

3.5.3 Electromagnetic Induction Surveys

Calibration. The manufacturer calibrates EM instruments over massive rock outcrops of known characteristic that are used as a geologic standard to measure the absolute conductivity over a uniform section of earth. The user should maintain the EM apparatus in calibration by noting drift in the readings at a stable "secondary standard" site. A secondary standard site is a location established in the field that is used to check the accuracy (calibration of the instrument and the drift precision of the instrument). A secondary standard site is a location used daily on large projects to check instrument accuracy, much the same way the manufacturer uses massive rock outcrops for precision and accuracy determination.

Unacceptable drift or erratic operation shall be corrected by replacement with an instrument in proper working order. Values that are obtained from measurements over the stable secondary standard site that vary by more than 10%–15% are considered to be unacceptable drift, if environmental conditions remain somewhat constant (i.e., heavy precipitation can make measurements radically different).

All aspects of the daily quality control measures discussed for resistivity measurements apply also to EM measurements. Repeated periodic measurements (at least twice a day) should be made at one or more locations and orientations at the site to determine the precision of measurements and to detect instrument drift.

4.0 HEALTH AND SAFETY CONSIDERATIONS

All procedures for hazardous waste site entrance, traverse, and egress that apply to general field operations also apply to conduct of geophysical surveys. Resistivity and conductivity surveys depend on traverse of the site on foot or in vehicles, and there are extended periods during which personnel are subject to adverse environments at the site. In addition, resistivity measurements require implanting electrodes beneath the surface, which increases the risk of contact with toxic or hazardous agents. An appropriate level of protection against these risks must be provided during the surveys.
The geophysical methods discussed herein do not require extremely strenuous activity, and exposure to heat or cold is similar to that during other field activities. Extreme weather conditions will have adverse effects on the time required to obtain validated data, thereby increasing the duration of personal exposure to the elements and to hazardous site influences.

In resistivity surveys, substantial levels of electrical charges and voltage may be present across the current electrodes, and field procedures must be designed to ensure that no personnel are in contact with the electrodes when the current source is energized. The site-specific Health and Safety Plan must address emergency procedures in the event of electrical shock and possible loss of consciousness.

5.0 REFERENCES

Discussion of various survey techniques and applications can be found in the following references:

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STANDARD OPERATING PROCEDURE 20.8
MAGNETIC AND METAL DETECTION SURVEYS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide a general description of and technical management guidance on the use of Magnetic and Metal Detection Surveys.

2.0 MATERIALS

- Work Plans;
- Site maps;
- Field logbook;
- Metal detectors;
- Magnetometers;
- Pin flags;
- Surveys tape; and
- Personal protective equipment and clothing (PPE) per the site-specific health and safety plan.

3.0 PROCEDURE

3.1 DESCRIPTION OF METHODS

3.1.1 Theory and Principles of Operation

Magnetometry: All materials subjected to a magnetic field (including the magnetic field of the earth) will develop an induced magnetization, the intensity of which is proportional to the applied magnetic field and the magnetic susceptibility of the material. Ferromagnetic materials, such as iron or steel, have very high magnetic susceptibilities.

Induced magnetization in an object produces a local magnetic field that either reinforces (positive magnetic susceptibility) or reduces (negative susceptibility) the external applied field. The variations in an otherwise homogenous field caused by the presence of the object are called a magnetic anomaly, and observations of such anomalies can be used to infer the presence of nearby objects.

Magnetometry consists of measuring local variations in the earth's magnetic field along a traverse or across an area on the surface. Because the intensity of the earth's magnetic field depends in part on the magnetic susceptibility of subsurface material, a knowledge of variations in field intensity provides an indication of variations in the distribution of materials with different magnetic susceptibilities. In particular, the anomalies produced by buried ferromagnetic objects can be detected by magnetometers, which are instruments designed to measure the earth's magnetic field at a given location. In addition, many natural subsurface features, some of which are of interest in geohydrologic site investigations, may produce magnetic anomalies.

The intensity and inclination, or dip, of the earth's magnetic field varies smoothly (except for anomalies) with latitude. From the south to north across the United States, the intensity and inclination vary from about 49,000

to 60,000 gammas and from about 580 to 760, respectively. Nominal values for the Middle Atlantic Region (Washington, DC) are about 56,500 gammas and 690 for intensity and inclination, respectively. The intensity can vary ("drift") daily due to changes in the ionosphere, sunspots, and other phenomena. Therefore, the latitude, time, and regional magnetic trends are important considerations during the magnetic surveys.

The myriad features of both natural and artificial origin that influence magnetic field measurements means that there is no unique interpretation of a set of magnetometry data. Conversely, there is no unique magnetic anomaly produced by a particular kind of buried object. Factors that influence the response of a magnetometer include the size, shape, depth, orientation, magnetic susceptibility, and permanent magnetism of a buried object. The sensitivity of magnetometers is such that many objects of interest at hazardous waste sites (particularly buried ferromagnetic materials such as drums, tanks, pipes, and iron scrap) are detectable. However, it is often difficult to interpret and identify the source of magnetic anomalies.

Metal Detection: When a radio frequency electromagnetic field generated by a transmitter coil encounters a highly conductive object such as a metal (not necessarily ferromagnetic), alternating currents are induced in the object that, in turn, generate alternating secondary magnetic fields which can be detected as alternating voltages by a receiver coil. The presence of the metal object effectively "couples" the transmitter and receiver coils, which otherwise are oriented so that little or no coupling exists. The principles of metal detector operation are very similar to those associated with electromagnetic induction instruments.

A number of factors influence the response of a metal detector. The receiver response increases with the size and surface area and decreases with the depth of a buried object. Factors such as soil properties and shape complicate detectability and interpretation of responses. Certain shapes, such as elongated metal rods, are difficult to detect. Iron minerals and conductive fluids will affect the detector response in much the same manner as a target of interest. Generally, metal detectors show greater response to smaller nearby targets than to larger targets at greater depth, and the presence of widespread metallic debris at a site can interfere with attempts to detect buried drums and other objects.

3.2 GENERAL APPLICABILITY

Magnetic Surveys (Magnetometry): Applications of magnetic surveys at hazardous waste sites center on confirming the presence (or absence) and location of buried ferromagnetic objects. Location of buried waste containers such as drums or tanks and surveying of proposed drill sites to detect interfering pipes, cables, or tanks are two important applications. Typically, a single 55-gallon drum can be detected at depths of up to 6 meters and large drum deposits or large tanks can be detected at depths of 20 meters or more.

Magnetic surveys can more readily detect metallic masses than identify or characterize targets. Calculations of the mass or size of detected objects generally yields only approximate results.

Magnetic surveys may be impractical in areas where metal pipes, fences, railroad tracks, buildings, and other ferrous metal artifacts are abundant. However, proper selection of equipment and survey techniques can often alleviate some of these problems.

Metal Detection: Metal detectors (MDs) can be used for locating buried metallic containers of various sizes; defining the boundaries of trenches containing metallic containers; locating buried metallic storage tanks; locating buried metallic pipes; avoiding buried utilities when drilling or trenching; or locating utility trenches that may provide a permeable pathway for contaminants.

The detection range of a MD is relatively short. Its sensitive areas are focused directly above and below the coil, providing good definition of object location. Quart-sized metal objects can be detected at a distance of about 1 meter; objects the size of a 55-gallon drum can be detected at depth up to 3 meters; and massive piles

of metals can be detected at depths of 3 to 6 meters. Deeper objects are difficult to detect with a MD. Although most MDs are operated on foot, some can be vehicle-mounted if desired.

3.2.1 Instrumentation

Magnetometers: Two types of magnetometers, the fluxgate and proton procession magnetometers, are commonly used at hazardous waste sites. The fluxgate magnetometer uses an iron core sensor of high magnetic susceptibility. The amount of coiled electrical current necessary to induce magnetic saturation of the rod is directly dependent upon, and thus measures, the strength of the ambient magnetic field. In a proton magnetometer, a strong magnetic field is applied to a bottle of proton-rich fluid (e.g., kerosene), which realigns the protons. The field is then turned off and the frequency of the signal generated by the protons as they realign themselves ("process") to the earth's magnetic field is dependent upon, and thus measures, the strength of the field at that point. Some magnetometers, such as the fluxgate, are extremely sensitive to orientation during measurement. To alleviate this problem, two sensors are connected by a rigid pole to form a "gradiometer" that measures only a certain directional component of the earth's magnetic field. These gradiometers are commonly used at hazardous waste sites.

The type of magnetometer best suited for a particular site investigation depends upon characteristics of that site and should be chosen by a person familiar with the different instruments available. Proton magnetometers, for example, while very useful in some situations, will cease to function in an area with high magnetic gradients such as a junkyard or near a steel bridge.

Different instruments have different levels of sensitivity. In some cases, high sensitivity may be desired to detect deeply buried objects; in other instances, a low sensitivity instrument may be desired to reduce the effects of "noise" from nearby fences or cars. Furthermore, the size of the survey area and the resolution required will determine whether the magnetometer used is hand-held for stationary measurements or a vehicle-mounted continuous sensor model.

Metal Detectors (MDs): Three general classes of metal detectors are commonly used in hazardous waste site studies: pipeline/cable locators, conventional "treasure hunter" detectors, and specialized detectors. EPA field investigation teams commonly use the pipeline/cable detectors; they do not respond to small objects like soda cans. Although most of the "treasure hunter" type detectors are used for locating coin-sized objects, some can be fitted with larger sensor coils suitable for detection of larger objects at greater depths. Some of these models also can operate with adverse soil conditions such as high iron content. Specialized detectors are also available to operate to greater depths, operate over a wide sweep area, operate continuously, cope with special field problems, or operate while vehicle-mounted. These special MDs require an experienced operator and are not commonly available.

3.3 DATA ACQUISITION

3.3.1 Field Procedures

Magnetics: Magnetic measurements are generally made in a cross-grid pattern or if a continuous sensor is used, in a series of parallel lines across the survey area. The desired resolution (reconnaissance or high density) and the size and depth of the objects sought determine the spacing of measurement stations or surveys lines. Because of the phenomenon of temporal magnetic drift, a magnetic survey must include a base station at which magnetic measurements are made at regular intervals. These base stations are later used to correct all survey data for temporal differences due to drift. If the survey area permits, surveys are often conducted in a loop, the base station forming the end and starting points.

Magnetometers require special care during use. An experienced technician is recommended. The operator must not take measurements with the sensor near ferromagnetic objects such as belt buckles or steel-toed boots. The orientation of the magnetometer and its height from the ground must also be carefully controlled

during operation. Recorded data must be annotated with station locations to allow construction of a site magnetic map.

Metal Detector: Planning surveys with metal detectors are similar to surveys with magnetometers. A grid pattern of evenly spaced parallel lines is used. Desired resolution and the size of objects determine the grid spacing. In some cases, elevating the MD a few feet off the ground may help to eliminate noise from small surface objects. An experienced operator is recommended. Recorded data must be annotated with station locations to allow construction of a site metal detection map.

3.3.2 Data Format

Magnetics: The output of a magnetometer is a numerical value (in gausses) of the intensity of the earth's magnetic field at a location. It may be displayed electronically or printed on tape depending on the instrument used. Because the object of a magnetic survey is often to complete a map of the survey area, each magnetic reading must be coupled with a record of its precise location.

The time of each reading must also be recorded to allow temporal drift connection. Some recent proton magnetometers include microprocessors for recording information on readings, locations, and times in one memory for playback at the survey's completion.

Metal Detection: The data provided by a metal detector is less quantitative than that of a magnetometer. The MD signal strength may vary (depending on the instrument) with object depth, size and shape, but this signal does not translate into a quantity such as field strength. It merely indicates the presence of a metal object. This on/off type of signal is useful because it can indicate the boundaries of a metal-bearing zone more clearly than some quantitative data such as magnetometer recordings.

3.4 DATA INTERPRETATION

3.4.1 Magnetics

Before interpreting magnetic data, it must first be corrected for regional trends and temporal drift. Regional trends, as determined from magnetic maps, are subtracted from the observed values to resolve magnetic anomalies due to objects at the site. Temporal drift is corrected by calculating the base station field strength changes over time and subtracting the appropriate time-dependent value from each observation. Other corrections for terrain or for compliance with other magnetic data are also sometimes employed.

The calculations can be done by hand or via computer processing. Once these mathematical corrections have been performed, the result is a set of profiles on a magnetic contour map. Interpretation then involves matching the observed anomalies with inferred underground shapes of given magnetic properties. This "modeling" of the subsurface (or data conversion) can involve mathematical techniques such as upward and downward continuations that reduce topographic and other interfering effects. The interpretation of magnetic anomalies must be based upon auxiliary evidence of what is at the site because there is no unique geometric solution for any magnetic anomaly. Furthermore, because of magnetic inclination, magnetic anomalies do not appear directly above their source. An experienced geophysicist must perform interpretation of magnetic maps.

3.4.2 Metal Detection

Very little interpretation is necessary for metal detection surveys performed to provide qualitative data on the presence of metallic objects in the survey area as a precursor to more detailed subsequent geophysical surveys. For these cases, the positive audible response or meter deflections are recorded on site grid maps, and no further processing or interpretation is made. More detailed metal detection surveys using strip chart or magnetic tape recording are possible. Typically, data is plotted on site grid maps following computer processing. Corrections are made for nonlinearities and to eliminate small-target responses.

3.5 POTENTIAL PROBLEMS

Magnetic and metal detection surveys are geophysical methods that, although frequently applied, are subject to a wide variety of problems. Problems can be expected to arise in the following areas:

Planning and Execution: Rarely is a survey accomplished exactly according to the original plan. Site features not previously specified and other variations can occur that force changes in the details of the approach. However, the objectives of the survey, the general methodology, the amount of data required, and the degree of data interpretation requested should remain unchanged. Project work scopes should be written with some degree of latitude to allow a change in plans whenever justified.

Noise and Interferences: Measurements can be affected severely by both natural and man-made sources of metal and electrical currents. Iron-bearing minerals, metallic structures, and the presence of metal on the operator can adversely affect both types of surveys. Large masses of buried metal, fences, railroad tracks, and underground pipes or cables can strongly distort measurements and reduce instrument sensitivity to features of interest. These problems generally can be overcome but must be recognized early in the survey so that appropriate avoidance measures can be implemented. Known or suspected sources of interference should be included in the initial planning for a project.

Weather Conditions: It is possible to conduct the surveys under almost any conditions that permit traverse of the site. However, snow covers, standing water, heavy rainfall, or thoroughly saturated surface soils adversely affect metal detection surveys.

Technical Difficulties: Preventable difficulties include equipment malfunction or misapplication, poor operator training, and lack of applications experience. Other difficulties may arise because the magnetic character of the site is not as initially conceptualized. Early recognition and response by trained geophysicists can minimize the effect of any problems. Interim, real-time scrutiny of the data by the site geophysicists is essential. The geophysicist must be responsive regarding equipment replacement and/or repair or changes in personnel.

3.6 QUALITY CONTROL

Geophysical surveys, including magnetic and metal detection surveys, are subject to misapplication, erroneous interpretations, and use of incomplete or inadequate data, all of which can severely affect both the cost of subsequent site investigations and the validity of the survey. This susceptibility to misuse and the potential for negative effects demands that appropriate quality control measures have been implemented. Quality control aspects common to most types of geophysical field programs include the following:

- Program management personnel (i.e., the field operations leaders, RI leader and site manager) with adequate technical expertise in the subject for preparing statements of work; reviewing proposals, work plans, and reports; and supervising technical subcontracts.
- Insistence on a defined scope of work, specifications, and data validation procedures.
- Requirement of a field quality control program.
- No data point should be rejected from a data set without appropriate justification; field data sheets should contain all observed data and the conditions that could affect data validation.
- All field data should be recorded in permanent ink in a bound logbook with each page signed and dated by the operator. Original unaltered logbooks should remain in the project files of the RI/FS contractor.

- In general, the objectives of geophysical surveys can be met by relative measurements across an area or with depth. Absolute calibration is therefore of lesser importance than precision of measurements. However, a properly calibrated instrument provides an added measure of data validity and permits correlation and comparison of the associated data with site features and geohydrologic characteristics not evident at the time of the field effort.
- An evaluation should be made of noise, interferences, and obstructions at a site and such measurements, inferences, and explanations should be recorded in the field. These real-time quality control procedures aid field personnel in correcting noise sources over which they have control and validating suspected external sources and in early detection of problems that might jeopardize the survey objectives.

3.6.1 Magnetic Surveys

Calibration: Magnetometer readings should regularly be compared with readings of a reference base station magnetometer; this procedure is necessary if corrections are to be made for changes in the earth's magnetic field over time. Absolute calibration should be performed periodically by use of a reference magnet or a standard laboratory electromagnet. Calibration should be recorded on an instrument calibration sheet, a copy of which accompanies the instrument to the field. Fluxgate magnetometers are inherently calibrated except for the crystal-controlled frequency counter, which requires periodic laboratory calibration.

Daily Quality Control: All data sets should be accompanied by quality control data that indicate the level of quality of each individual data point. Periodically, replicate measurements should be made so that measurement precision can be established. This procedure also requires corrections for variations in the earth's magnetic field with time. Each data set should be referenced to the most recent calibrations. All data obtained before a calibration requiring significant changes in instrument controls is suspect and the measurements should be repeated or otherwise validated. Data should be preliminarily reduced and plotted during the field program to determine the overall quality of the data and whether the survey results are consistent with the site conceptualization. Data points representing discontinuities in the curves should be validated by repetition and, if necessary, a fine grid of measurements made to determine whether the anomaly represents a site feature of interest, a spurious reading, or an obstructive interference.

3.6.2 Metal Detection

Calibration: Metal detectors normally are not calibrated, and only relative response is of interest. Periodically, nulling the instrument at a fixed location known to be free of metal and adjusting the gain to provide a proper response over a known target should check the sensitivity.

Daily Quality Control: Metal detector data should be accompanied by sufficient quality control data to verify that the instrument was operating properly. Occasional repetitive measurements and a log of the sensitivity adjustments usually suffice for this purpose.

4.0 HEALTH AND SAFETY CONSIDERATIONS

All procedures for hazardous waste site entrance, traverse, and egress that apply to general field operations also apply to the conduct of geophysical surveys. Magnetic and metal detection surveys depend on traverse of the site on foot or in vehicles, and there are extended periods during which personnel are subject to adverse environments at the site. A site health and safety survey must be performed before the geophysical survey, and an appropriate level of protection must be provided during the geophysical surveys.

The geophysical methods discussed here do not require sub-surface penetration and do not require extremely strenuous activity. Exposure to heat or cold is similar to that experienced during other field activities.

Extreme weather conditions will have adverse effects on the time required to obtain validated data, thereby increasing the duration of personnel exposure to the elements and to hazardous site influences.

Although the instruments themselves are held above the ground (unless sled mounted) the probes should be covered with non-metallic (i.e., plastic) covers to avoid the possibility of accidental contamination.

5.0 REFERENCES

Discussion of various geophysical survey techniques and applications can be found in the following references:

ASTM Standard D 6429-99 (2006). 2006. *Standard Guide for Selecting Surface Geophysical Methods.*

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Costello, R.L. 1980. *Identification and Description of Geophysical Techniques.* Report No. DRXTH-TE-CR-80084, US Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD; Defense Technical Information System Number ADA 123939.

McKown, G.L., G. A. Sandness and G.W. Dawson. 1980. *Detection and Identification of Buried Waste and Munitions.* Proceedings of the 11th American Defense Preparedness Association Environmental Systems Symposium, Arlington, VA, 1980.

Olhoeft, Gary R. 1989. *Geophysics Advisor Expert System: Version 1.0.* Interagency Agreement DW 14932497, USEPA EMSL, Las Vegas, NV.

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STANDARD OPERATING PROCEDURE 20.11
DRILLING METHODS AND PROCEDURES

1.0 SCOPE AND APPLICATION

The use of an appropriate drilling procedure is contingent upon the existing conditions at the project site. The purpose of this standard operating procedure (SOP) is to outline procedures for the various methods of soil and rock drilling identified in the Master Work Plan. In addition it provides procedures for using sampling devices commonly used during soil and rock drilling such as split-barrel sampling, thin walled tube sampling, direct push samplers, and rock coring. For a particular site investigation, the associated work plan addendum will identify the appropriate drilling method and method of sampling, along with proposed sampling depths and intervals and any special procedures or methods.

2.0 MATERIALS

The following types of materials are generally appropriate for drilling:

2.1 SPLIT-BARREL SAMPLING

- Split barrel sampler;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.2 THIN WALLED TUBE SAMPLING

- Thin walled tubes;
- Sealing materials for sample such as sealing wax, metal disks, wood disks, tape, cheesecloth, caps, etc;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.3 DIRECT PUSH SAMPLING

- Direct push unit with hydraulic ram, hammer, etc;
- Sample collection devices, associated equipment and expendable supplies such as sample liners, sample retainers, appropriate lubricants, etc;
- Hollow extension rods;
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;

- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.4 HOLLOW-STEM AUGER DRILLING

- Drill rig and associated equipment;
- Hollow stem auger assemblies for drilling to appropriate depth including auger heads, drive assembly, pilot assembly, and hollow-stem auger sections;
- Auxiliary devices such as wrenches, auger forks, hoisting hooks, swivels, and adaptors;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.5 DIRECT AIR ROTARY DRILLING

- Drill rig with rotary table and Kelly or top-head drive unit;
- Drill rods, bits, and core barrels (as appropriate);
- Casing;
- Sampling devices and equipment, as appropriate;
- Air compressor and filters, pressure lines, discharge hose, swivel, dust collector, and air-cleaning device (cyclone separator);
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.6 DRILL-THROUGH CASING DRIVER

- Drill rig equipped with a mast-mounted, percussion driver;
- Casing, drill rods, and drill bits or hammers;
- Air compressor and filters, pressure lines, discharge hose, swivel, dust collector, and air-cleaning device (cyclone separator);
- Sampling devices and equipment, as appropriate;
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Welding equipment and materials for installation of casing;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and

- Decontamination supplies and equipment per SOP 80.1.

2.7 DIRECT WATER-BASED ROTARY DRILLING

- Drill rig with derrick, rotary table and Kelly or top-head drive unit;
- Drill rods, bits, and core barrels (as appropriate);
- Casing;
- Water based drilling fluid, with approved additives as appropriate;
- Mud tub, suction hose, cyclone de-sander(s), drilling fluid circulation pump, pressure hose, and swivel;
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1.
- Decontamination supplies and equipment per SOP 80.1.

2.8 DIRECT ROTARY WIRELINE-CASING ADVANCEMENT DRILLING

- Drill rig with either hollow spindle or top-head drive;
- Drill rods, coring or casing bits, overshot assembly, pilot bit, and core barrel;
- Water based drilling fluid, with approved additives as appropriate;
- Mud tub, suction hose, drilling fluid circulation pump, pressure hose, and swivel;
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

2.9 DIAMOND CORE DRILLING

- Direct rotary drill rig and associated equipment (see Sections 2.4, 2.5 or 2.6);
- Core barrels and core bits;
- Core lifters;
- Core boxes, engineers scale, permanent marking pen, and camera for photographing cores;
- Auxiliary tools for handling, assembling, and disassembling tools and samplers;
- Borehole logging materials per SOP 10.3 and sampling equipment and materials, as appropriate per SOP 30.1;
- Containers to manage investigation-derived material per SOP 70.1; and
- Decontamination supplies and equipment per SOP 80.1.

3.0 PROCEDURES

3.1 PENETRATION TEST AND SPLIT-BARREL SAMPLING OF SOILS

The following general procedure may be followed as outlined in ASTM Standard Test Method D 1586.

1. Advance the boring to the desired sampling depth using an appropriate drilling method (see sections below) and remove excessive cuttings from the borehole.
2. Attach the split-barrel sampler to the sampling rods and lower into the borehole. Do not allow the sampler to drop onto the soil to be sampled.
3. Position the hammer above and attach the anvil to the top of the drilling rods.
4. Rest the dead weight of the sampler, rods, anvil, and drive weight on the bottom of the boring and apply a seating blow. If excessive cuttings are encountered at the bottom of the borehole, remove the sampler and rods from borehole and remove the cuttings.
5. Mark the drill rods in three successive 6-inch increments so that the advance of the sampler can be observed.
6. Drive the sampler with blow from the 140 pound hammer and count the number of blows applied in each 6-inch increment until:
   a. Fifty (50) blows have been applied during one of the three 6-inch increments.
   b. A total of 100 blows have been applied.
   c. There is no observed advance of the sampler during the application of 10 successive blows of the hammer.
7. The sampler is advanced the complete 18-inches without the limiting blow counts occurring as described above.
8. Record the number of blows that is required to achieve each 6-inch increment of penetration or fraction of this increment on the boring.
   a. The first 6 inches is considered the seating driver.
   b. The sum of the second and third 6-inch penetration intervals is termed the “standard penetration resistance” or “N-value.”
   c. If the sampler is driven less than 18 inches as discussed in No. 6, then the number of blow for each partial increment will be recorded.
   d. For partial increments, the depth of penetration should be recorded to the nearest 1-inch on the boring log.
   e. If the sampler advances below the bottom of the boring under the weight of rods (static) and/or hammer, then this information will be recorded on the boring log.
9. The raising and dropping of the 140 pound hammer may be accomplished by:
   a. Using a trip, automatic, or semi-automatic hammer drop system that lifts the hammer and allows it to drop 30± 1 inches.
   b. Using a cathead shall be essentially free of rust, oil, or grease and have a diameter in the range of 6 to 10 inches. The cathead should be operated at a minimum speed of rotation of 100 revolutions per minute. No more than 2-1/4 rope turns on the cathead may be used when conducting the penetration test.

10. For each hammer blow, a 30-inch lift and drop shall be used.
11. After completing the penetration test, retrieve the sampler and open. Record the percent recovery or the length of sample recovered. Following the procedures outlined in SOP 30.1 when collecting environmental soil samples.
12. Borehole logging should be completed per SOP 10.3.
13. Split-barrel samples must be decontaminated before and after each use per the requirements of SOP 80.1.

3.2 THIN WALLED TUBE SAMPLING

The following general procedure may be followed for collection of relatively undisturbed, thin walled tube samples (e.g., Shelby tube) as outlined in ASTM Standard Practice D 1587.

1. Clean out the borehole to targeted sampling depth using most appropriate method, which avoids disturbing the material to be sampled. If groundwater is encountered, maintain the liquid level in the borehole at or above the groundwater level during sampling.
2. Place the sample tub so that its bottom rests on the bottom of the borehole.
3. Advance the sampler without rotation by a continuous relatively rapid motion.
4. Determine the length of the advance by the resistance and condition of the formation, the length of the advance should never exceed 5 to 10 diameters of the tube in sands and 10 to 15 diameters of the tube in clay.
5. When the formation is too hard for push type of sampling, the tube may be driven or the practice used for ring-lined barrel sampling may be used per ASTM Standard D 3550. When a sample is driven, the weight and fall of the hammer must be recorded along with the penetration achieved.
6. The maximum length of sample advance will be no longer than the sample-tube length minus an allowance for the sample head and a minimum of 3-inches for sludge-end cuttings.
7. Upon removal of the tube, measure the length of the sample in the tube. Remove the disturbed material in the upper end of the tube and re-measure the sample length.
8. Remove at least one-inch of material from the lower end of the tube for soil description and identification per SOP 10.3. Measure the overall sample length. Seal the lower end of the tube. If directed, the material from the end of the tube will not be removed for soil identification and description; in this case the tube will be sealed promptly.
9. Prepare sample labels and affix (or markings) on the tube.

3.3 DIRECT PUSH SOIL BORING

The following general procedures outlined in this section may be followed as described in ASTM Standard Test Method D 6282.

General considerations for this method include the following:

- A variety of direct push drive systems may be used to advance soil borings based on the intended sampling depths and subsurface conditions and include the following:

Shallower Depths and Less Difficult Conditions

- Percussive driving systems – use hydraulically operated hammers and mechanically operated hammers.
- Static push drive systems – use hydraulic rams to apply pressure and exert static pull (e.g., cone penetrometer systems).
- Vibratory/sonic systems – use a vibratory device, which is attached to the top of the sampler extension rods.

Greater Depths and More Difficult Conditions

- Sonic or resonance drilling systems – use a high power vibratory system to advance larger diameter single or dual tube systems.
- Rotary drilling equipment – use hydraulic system of drill rig for direct push.

- The equipment used for direct push must be capable of apply sufficient static force, or dynamic force, or both, to advance the sampler to the required depth of collection. Additionally, this equipment must have adequate retraction force to remove the sampler and extension/drive rods once the sample has been collected.
- Avoid using excessive down pressure when advancing the drilling tools/sampler. Excessive pressure may cause the direct push unit to offset from the boring location and may damage drilling tools and samplers.
- Sample liners should be compatible with the material being sampled and the type of analysis to be conducted on the sample. Sealing of liners for submittal to the laboratory for physical testing should be accomplished according to ASTM Standard D 4220 (Standard Practice for Preserving and Transporting Soil Samples).
- The general procedure for completing direct push soil borings is the following:

1. Stabilize direct push unit and raise mast at desired location.
2. Attach the hammer assembly to the drill head if not permanently attached. Attach the anvil assembly in the prescribed manner, slide the direct push unit the position over the borehole, and ready the tools for insertion.
3. Inspect the direct push tools before and after use. Decontaminate all down hole tools before and after use per SOP 80.1.
4. Inspect drive shoes for damaged cutting edges, dents or thread failures and these conditions could cause loss of sample recovery and slow the rate of advancement.
5. Assemble samplers and install where required, install sample retainers where needed, and install and secure sampler pistons to ensure proper operation where needed (see Steps 14 through 20 for the various sampler assembly procedures, etc.).
6. After sampler has been appropriately installed (see Steps 14 through 20 for installation procedures, etc.) advance the boring to the target sampling depth using an appropriate direct push technique, as identified above under general considerations.
7. Collect the soil sample from the target sampling depth using one of the methods identified in Steps 14 through 20.
8. Retrieve the sampler and appropriately process the soil sample as identified in Steps 14 through 20 below and in SOP 30.1.
9. Log the borehole per the requirements of SOP 10.3.
10. If collecting another soil sample, decontaminate the sampler for reuse per the requirements of SOP 80.1 or use another decontaminated sampler.

11. Appropriately manage investigation-derived material (discarded samples, decontamination fluids, etc.) per SOP 70.1.
12. Upon completion of the boring and collection of the desired soil samples, abandon the boring per the requirements of SOP 20.2.
13. The following single tube sampling systems (generally piston rod) may be used to collect soil samples (see Steps 14 through 16 below):
    a. Open Solid Barrel Sampler;
    b. Closed Solid Barrel Sampler (e.g. Geoprobe Macro-Core® Piston Rod Sampler); and
    c. Standard Split Barrel Sampler (see Section 3.1).
14. The following two tube sampling systems may be used to collect soil samples (see Steps 17 through 20 below):
    a. Split Barrel Sampler;
    b. Thin Wall Tubes;
    c. Thin Wall Tube Piston Sampler; and
    d. Open Solid Barrel Samplers.
15. Sampling with the single tube, open solid barrel sampler:
    a. Attach the required liner to the cutting shoe by insertion into the machined receptacle are or by sliding over the machined tube.
    b. Insert the liner and shoe into the solid barrel and attach the shoe.
    c. Attach the sampler head to the sampler barrel.
    d. Attach the sampler assembly to the drive rod and the drive head to the drive rod.
    e. Position the sampler assembly under the hammer anvil and advance the sampler assembly into the soil at a steady rate slow enough to allow the soil to be cut by the shoe and move up into the sample barrel.
    f. At the completion of the sampling interval, removal the sampler from the borehole. Remove the filled sampler liner from the barrel by unscrewing the shoe. Cap the liner for laboratory testing or split open for field processing (see SOP 30.1).
    g. Log the borehole per the requirements of SOP 10.3.
16. Sampling with the closed, solid barrel sampler (e.g., Macro-Core® sampler).
    a. Insert or attach the sample liner to the shoe and insert the assembly into the solid barrel sampler. Install the sample, retaining basket, if desired.
    b. Attach the latch coupling or sampler head to the sampler barrel, and attach the piston assembly with point and "O" rings if free water is present, to the latching mechanism.
    c. Insert the piston or packer into the liner to its proper position so that the point leads the sampler shoe. Set latch, charge packer, or install locking pin, and attach assembled sampler to drive rod.
    d. Add drive head and position under the hammer anvil. Apply down pressure, and hammer if needed, to penetrate the soil strata above the targeted sampling interval.
    e. When the sampling interval is reached, insert the piston latch release and recovery tool, removing the piston, or insert the locking pin removal/extension rods through the drive rods, turn counter clockwise, and remove the piston locking pin so the piston can float on top of the sample, or release any other piston holding device.
    f. Direct push or activate the hammer to advance the sampler the desired interval.

g. Retrieve the sampler from the borehole by removing the extension/drive rods. Remove the shoe, and withdraw the sample line with sample for processing (see SOP 30.1).

h. Clean and decontaminate the sampler, reload as described above and repeat the same procedure for collection of addition samples.

i. Log the borehole per the requirements of SOP 10.3.

17. Sampling with standard split barrel (split spoon) sampler generally consists of the following:

a. Attach the split barrel sampler to an extension rod or drill rod.

b. Using a mechanical or hydraulic hammer drive the ampler into the soil the desired interval. The maximum interval that should be driven is equal to the sample chamber length of the split barrel sampler, which is either 18-inches or 24-inches.

c. Retrieve the sampler from the borehole by removing the extension/drive rods.

d. Split the sampler open for field processing (see SOP 30.1).

e. Clean and decontaminate the sampler (SOP 80.1), re-attach and repeat the same procedure for collection of additional samples.

f. Log the borehole per the requirements of SOP 10.3.

18. Sampling with a two tube, split barrel sampler generally consists of the following:

a. Assemble the outer casing with the drive shoe on the bottom, attach the drive head to the top of the outer casing, and attach the sampler to the extension rods.

b. Connect the drive head to the top of the sampler extension rods, and insert the sampler assembly into the outer casing.

c. The cutting shoe of the sampler should contact the soil ahead of the outer casing to minimize sample disturbance.

d. The sample barrel should extend a minimum of 0.25 inches ahead of the outer casing.

e. Mark the outer casing to identify the required drive length, position the outer casing and sampler assembly under the drill head.

f. Move the drill head downward to apply pressure on the tool string. Advance the casing assembly into the soil at a steady rate, which is slow enough to allow the soil to be cut by the shoe and move up inside the sample barrel.

g. Occasional hammer action during the push may assist recovery.

h. If smooth push advancement is not possible because of subsurface conditions, use the hammer to advance the sampler.

i. Stop the application of pressure or hammering when target interval has been sampled. Move the drill head off the drive head. Attach a pulling device to the extension rods or position the hammer bail and retrieve the sampler from the borehole.

j. At the surface, remove the sampler from the extension rods and process the sample per Section 3.01 and SOP 30.1.

k. Log the borehole per the requirements of SOP 10.3.

19. Sampling with a two tube, thin wall tube sampler generally consists of the following:

a. Attach the tube to the tube head using removable screws.

b. Attach the tube assembly to the extension rods and position at the base of the outer casing shoe protruding a minimum of 0.25 inches to contact the soil ahead of the outer casing.

c. Advance the tube with or without the outer casing at a steady rate.

d. After completing the sampling interval, let the tube remain stationary for one minute. Rotate the tube slowly two revolutions to shear off the sample.

e. Remove the tube from the borehole and measure the recovery, and log the borehole per the requirements of SOP 10.3.

f. For field processing, extrude the sample from the tube sampler and process per SOP 30.1. Alternatively, the tube may be sealed and shipped to the laboratory.

20. Sampling with two tube, thin wall tube, piston sampler generally consists of the following:

a. Check the fixed piston sampling equipment for proper operation of the cone clamping assembly and the condition of the "O" rings.

b. Slide the thin wall tube over the piston, and attach it to the tube head. Position the piston at the sharpened end of the thin wall tube just above the sample relief bend.

c. Attach the tube assembly to the extension rods and lower the sampler into position through the outer casing. Install the actuator rods through the extension rod, and attach to the actuator rod in the sampler assembly.

d. Attach a holding ring to the to top of the actuator rod string and hook the winch cable or other hook to the holding ring to hold the actuator rods in a fixed position.

e. Attach the pushing fork to the drill head/probe hammer and slowly apply downward pressure to the extension rods advancing the thin wall tube over the fixed piston into the soil for the length of the sampling interval.

f. After completing the sampling interval, let the tube remain stationary for one minute. Rotate the tube slowly one revolution to shear off the sample.

g. Remove the tube sampler from the borehole and measure the recovery, and log the borehole per the requirements of SOP 10.3.

h. For field processing, extrude the sample from the tube sampler and process per SOP 30.1.

21. Sampling with an two tube, open solid barrel sampler generally consists of the following:

a. This sampling technique may be used when soil conditions prevent advancement of a split barrel sampler or advancement of an outer casing.

b. The solid, single, or segmented barrel sampler requires the use of a liner.

c. Use sampler in advance of outer casing when this casing cannot be advanced.

d. Follow the procedures outlined for two tube, split barrel sampling.

3.4 HOLLOW-STEM AUGER DRILLING

The following general procedure may be followed as outlined in ASTM Standard Guide D 5784.

1. Stabilize drill rig and raise mast at desired location.
2. Attach an initial assembly of hollow-stem auger components (hollow stem auger, hollow auger head, center rod and pilot assembly, as appropriate) to the rotary drive of the drill rig.
3. Push the auger assembly below the ground surface and initiate rotation at a low velocity.
4. Decontamination of auger head may be necessary after this initial penetration if this surface soil is contaminated.
5. Continue drilling from the surface, usually at a rotary velocity of 50 to 100 rotations per minute to the depth where sampling or in-situ testing is required or until the drive assembly is within approximately 6- to 18 inches of the ground surface.
6. As appropriate, collect a soil sample from the required depth interval. The sample may be conducted by

a. Removing the pilot assembly, if used, and inserting and driving a sampler through the hollow stem auger of the auger column; or

b. Using a continuous sampling device within the lead auger section, where the sampler barrel fills with material as the auger is advanced.

7. Additional sections of hollow stems augers may be added to drill to a greater depth. After these auger sections are added, rotation of the hollow-stem auger assembly may be resumed.

8. When drilling through material suspected of being contaminated, the installation of single or multiple (nested) outer casings may be required to isolate zones suspected contamination (see SOP 20.1). Outer casings may be installed in a pre-drilled borehole or using a method in which casing is advanced at the same of drilling.

   Monitoring wells or piezometers may be installed using hollow-stem augers by:

   a. Drilling with or without sampling to the target depth.

   b. Removal of the pilot assembly, if used, and insertion of the monitoring well (or piezometer) assembly.

   c. The hollow stem auger column should be removed incrementally as the monitoring well (or piezometer) completion materials are placed (see SOP 20.1 for grouting).

9. If materials enter the bottom of the auger hollow stem during the removal of the pilot assembly, it should be removed with a drive sampler or other appropriate device.

10. If sampling or *in-situ* testing is not required during completion of the boring, the boring may be advanced with an expendable knock out plate or plug of an appropriate material instead of a pilot assembly.

11. Drill cuttings should be appropriately controlled and contained as IDM per SOP 70.1. It may be necessary to drill through a hole of sheet of plywood or similar material to prevent cuttings from contacting the ground surface.

12. The hollow-auger assembly and sampling devices must be decontaminated before and after each use per the methods specified in SOP 80.1.

13. Borehole logging should be completed per SOP 10.3.

14. Borehole abandonment, when required, should be conducted according to SOP 20.3.

3.5 DIRECT AIR ROTARY DRILLING

The following general procedure may be followed as outlined in ASTM Standard Guide D 5784.

1. Stabilize drill rig and raise mast at desired location. Appropriately position the cyclone separator and seal it to the ground surface considering the prevailing wind direction (exhaust).

2. Establish point for borehole measurements.

3. Attach an initial assembly of a bit, down hole hammer, or core barrel with a single section of drill rod, below the rotary table or top-head drive unit, with the bit placed below the top of the dust collector.

4. Activate the air compressor to circulate air through system.

5. Initiate rotation of bit.

6. Continue with air circulation and rotation of the drill-rod column to the depth where sampling or in-situ testing is required or until the length of the drill rod section limits further penetration.

7. Monitor air pressure during drilling operations. Maintain low air pressure at bit to prevent fracturing of surrounding material.

8. Stop rotation and lift the bit slightly off the bottom of the hole to facilitate removal of drill cuttings and continue air circulation until the drill cuttings are removed from the borehole annulus.

9. Open reaching a desired depth of sampling, stop the air circulation and rest bit on bottom of hole to determine the depth. Record the borehole depth and any resultant caving in. If borehole caving is apparent set a decontaminated casing to protect the boring.
10. When sampling, remove the drill rod column from the borehole or leave the drill rod assembly in place if the sampling can be performed through the hollow axis of the drill rods and bit.
11. Compare the sampling depth to clean-out depth by first resting the sampler on the bottom of the hole and compare that measurement with the clean-out depth measurement.
12. If bottom-hole contamination is apparent (indicated by comparison of sample depth to clean-out depth), it is recommended that the minimum depth below the sampler/bit be 18 inches for testing. Record the depth of sampling or in-situ testing and the depth below the sampler/bit.
13. The procedure described in Steps 8 through 12 should be conducted for each sampling or testing interval.
14. Drilling to a greater depth may be accomplished by attaching an additional drill rod section to the top of the previously advanced drill-rod column and resuming drilling operations as described above.
15. When drilling through material suspected of being contaminated, the installation of single or multiple (nested) outer casings may be required to isolate zones suspected contamination (see SOP 20.1 for grouting requirements). Outer casings may be installed in a pre-drilled borehole or using a method in which casing is advanced at the same of drilling.
16. Monitoring wells or piezometers may be installed by:
    a. Drilling with or without sampling to the target depth.
    b. Removal of the drill rod assembly and insertion of the monitoring well (or piezometer) assembly.
    c. Addition of monitoring well (or piezometer) completion materials (see SOP 20.1).
17. Drill cuttings should be appropriately controlled and contained as IDM per SOP 70.1.
18. The drill rod assembly, sampling devices, and other drilling equipment contacting potentially contaminated material must be decontaminated before and after each use per the methods specified in SOP 80.1.
19. Borehole logging should be completed per SOP 10.3.
20. Borehole abandonment, when required, should be conducted according to SOP 20.3

3.6 DRILL-THROUGH CASING DRILLING

The following general procedure may be followed as outlined in ASTM Standard Guide D 5872.

1. Stabilize drill rig and raise mast at desired location. Appropriately position the cyclone separator and seal it to the ground surface considering the prevailing wind direction (exhaust).
2. Establish point for borehole measurements.
3. Attach an initial assembly of a bit or down hole hammer with a single section of drill rod and casing to the top-head drive unit.
4. Activate the air compressor to circulate air through system.
5. Drilling may be accomplished by
    a. Method 1- the casing will fall, or can be pushed downward behind the bit.
    b. To drill using Drive the casing first followed by drilling out the plug inside the casing.
    c. Method 2 - Advancing the casing and bit as a unit, with the drill bit or hammer, extending up to 12-inches below the casing.
6. Method 3 - Under reaming method where bit or hammer pens a hole slightly larger than the casing so that Method 1, drive the casing first and drill out the plug in the casing by moving the bit or hammer beyond

the casing and then withdrawing it into the casing. Air exiting the bit will remove the cuttings up the hole. Separate cuttings from the return air with a cyclone separator or similar device.

7. To drill using Method 2, advance casing and bit as unit with the bit or hammer extending up to 12-inches beyond the casing depending on the conditions. While drilling, occasionally stop the casing advancement, retract the bit or hammer inside the casing to clear and maintain air circulation to clear cuttings.
8. To drill using Method 3, use a special down hole bit or hammer to open a hole slightly larger than the outside diameter of the casing so that the casing will fall or can be pushed downward immediately behind the bit. After advancing the casing, retract the radial dimension of the drill bit to facilitate removal of the down hole bit or hammer and drill tools inside the casing. Cuttings are removed from the borehole with the air that operates the bit or hammer and can be separated from the air with a cyclone separator or similar device.
9. Monitor air pressure during drilling operations. Maintain low air pressure at bit or hammer to prevent fracturing of surrounding material.
10. Continue air circulation and rotation of the drill rod column until drilling is completed to the target depth (for sampling, in-situ sampling, etc.) or until the length of the drill-rod section limits further penetration.
11. Stop rotation and lift bit or hammer slightly off the bottom of the hole to facilitate removal of drill cuttings and continue air circulation until the drill cuttings are removed from the borehole annulus.
12. After reaching a desired depth of sampling, stop the air circulation and rest the bit on bottom of hole to determine the depth. Record the borehole depth and any resultant caving in. If borehole caving is apparent set a decontaminated casing to protect the boring.
13. When sampling, remove the drill rod column from the borehole. Compare the sampling depth to clean-out depth by first resting the sampler on the bottom of the hole and compare that measurement with the clean-out depth measurement.
14. If bottom-hole contamination is apparent (indicated by comparison of sample depth to clean-out depth), it is recommended that the minimum depth below the sampler/bit be 18 inches for testing. Record the depth of sampling or in-situ testing and the depth below the sampler/bit.
15. The procedure described in Steps 11 through 14 should be conducted for each sampling or testing interval.
16. Drilling to a greater depth may be accomplished by attaching an additional drill rod section and casing section to the top of the previously advanced drill-rod column/casing and resuming drilling operations as described above.
17. Monitoring wells or piezometers may be installed by:
    a. Casing advancement in increments, with or without sampling to the target depth.
    b. Removal of the drill rods and the attached drill bit while the casing is temporarily left in place to support the borehole wall.
    c. Insertion of the monitoring well (or piezometer) assembly.
    d. Addition of monitoring well (or piezometer) completion materials (see SOP 20.1).
18. Drill cuttings should be appropriately controlled and contained as IDM per SOP 70.1.
19. The drill rod assembly, casing, sampling devices, and other drilling equipment contacting potentially contaminated material must be decontaminated before and after each use per the methods specified in SOP 80.1.
20. Borehole logging should be completed per SOP 10.3.
21. Borehole abandonment, when required, should be conducted according to SOP 20.3.

3.7 DIRECT WATER-BASED ROTARY DRILLING

The following general procedure may be followed as outlined in ASTM Standard Guide D 5783.

1. Stabilize drill rig and raise mast at desired location. Appropriately position the mud tub and install surface casing and seal at the ground surface.
2. Establish point for borehole measurements.
3. Attach an initial assembly of a bit or core barrel with a single section of drill rod, below the rotary table or top-head drive unit, with the bit placed with the top of the surface casing.
4. Activate the drilling-fluid circulation pump to circulate drill fluid through the system.
5. Initiate rotation of bit and apply axial force to bit.
6. Document drilling conditions and sequence (fluid loss, circulation pressures, depths of lost circulation, etc.) as described in SOP 10.3.
7. Continue with drill fluid circulation as rotation and axial force are applied to the bit until drilling to the depth
    a) Where sampling or in-situ testing is required;
    b) Until the length of the drill rod section limits further penetration; or
    c) Until core specimen has completely entered the core barrel (when coring) or blockage has occurred.
8. Stop rotation and the lift bit slightly off the bottom of the hole to facilitate removal of drill cuttings and continue fluid circulation until the drill cuttings are removed from the borehole annulus.
9. After reaching a desired depth of sampling, stop the fluid circulation and rest the bit on bottom of hole to determine the depth. Record the borehole depth and any resultant caving in. If borehole caving is apparent set a decontaminated casing to protect the boring.
10. When sampling, drill rod removal is not necessary if the sampling can be performed through the hollow axis of the drill rods and bit.
11. Compare the sampling depth to clean-out depth by first resting the sampler on the bottom of the hole and compare that measurement with the clean-out depth measurement.
12. If bottom-hole contamination is apparent (indicated by comparison of sample depth to clean-out depth), it is recommended that the minimum depth below the sampler/bit be 18 inches for testing. Record the depth of sampling or in-situ testing and the depth below the sampler/bit.
13. The procedure described in Steps 8 through 11 should be conducted for each sampling or testing interval.
14. Drilling to a greater depth may be accomplished by attaching an additional drill rod section to the top of the previously advanced drill-rod column and resuming drilling operations as described above.
15. When drilling through material suspected of being contaminated, the installation of single or multiple (nested) outer casings may be required to isolate zones suspected contamination (see SOP 20.1 for grouting requirements). Outer casings may be installed in a pre-drilled borehole or using a method in which casing is advanced at the same of drilling.
16. Monitoring wells or piezometers may be installed using hollow-stem augers by:
    a. Drilling with or without sampling to the target depth.
    b. Removal of the drill rod assembly and insertion of the monitoring well (or piezometer) assembly.
    c. Addition of monitoring well (or piezometer) completion materials (see SOP 20.1).
17. Drill cuttings and fluids should be appropriately controlled and contained as IDM per SOP 70.1.

18. The drill rod assembly, sampling devices, and other drilling equipment contacting potentially contaminated material must be decontaminated before and after each use per the methods specified in SOP 80.1.
19. Borehole logging should be completed per SOP 10.3.
20. Borehole abandonment, when required, should be conducted according to SOP 20.3.

3.8 DIRECT ROTARY WIRELINE CASING ADVANCEMENT DRILLING

The following general procedure may be followed as outlined in ASTM Standard Guide D 5876.

1. Stabilize drill rig and raise mast at desired location. Appropriately position the mud tub (for water based rotary) and install surface casing and seal at the ground surface.
2. Record the hole depth by knowing the length of the rod-bit assemblies and comparing its position relative to the established surface datum.
3. Attach an initial assembly of a lead drill rod and a bit or core barrel below the top-head drive unit, with the bit placed with the top of the surface casing.
4. Activate the drilling-fluid circulation pump to circulate drill fluid through the system.
5. Initiate rotation of bit and apply axial force to bit.
6. Document drilling conditions and sequence (fluid loss, circulation pressures, depths of lost circulation, down feed pressures etc.) as described in SOP 10.3.
7. In general, the pilot bit or core barrel can be inserted or removed at any time during the drilling process and the large inside diameter rods can act as a temporary casing for testing or installation of monitoring devices.
8. Continue with drill fluid circulation as rotation and axial force are applied to the bit until drilling to the depth
    a) Where sampling or in-situ testing is required;
    b) Until the length of the drill rod section limits further penetration; or
    c) Until core specimen has completely entered the core barrel (when coring) or blockage has occurred.
9. Stop rotation and lift the bit slightly off the bottom of the hole to facilitate removal of drill cuttings and continue fluid circulation until the drill cuttings are removed from the borehole annulus.
10. After reaching a desired depth of sampling, stop the fluid circulation and rest the bit on bottom of hole to determine the depth. Record the borehole depth and any resultant caving in. If borehole caving is apparent set a decontaminated casing to protect the boring.
11. When sampling, drill rod removal is not necessary if the sampling can be performed through the hollow axis of the drill rods and bit.
12. Compare the sampling depth to clean-out depth by first resting the sampler on the bottom of the hole and compare that measurement with the clean-out depth measurement.
13. If bottom-hole contamination is apparent (indicated by comparison of sample depth to clean-out depth), it may be necessary to further clean the hole by rotary recirculation.
14. Continuous sampling may be conducted with a soil core barrel or rock core barrel (see Section 1.7).
15. The pilot bit or core barrel may need to be removed during drilling such as when core barrels are full or there is evidence of core blocking. Before the drill string is reinserted, the depth of the boring should be rechecked to evaluate hole quality and determine whether casing may be required.

16. Water testing may be performed in consolidated deposits by pulling back on the drill rods and passing inflatable packer(s) with pressure fitting to test the open borehole wall (see ASTM Standards D 4630 and D 4631).
17. Drilling to a greater depth may be accomplished by attaching an additional drill rod section to the top of the previously advanced drill-rod column and resuming drilling operations as described above.
18. When drilling through material suspected of being contaminated, the installation of single or multiple (nested) outer casings might be required to isolate zones suspected contamination (see SOP 20.1 for grouting requirements). Outer casings may be installed in a pre-drilled borehole or using a method in which casing is advanced at the same of drilling.
19. Monitoring wells or piezometers may be installed by:
    a. Drilling with or without sampling to the target depth.
    b. Removal of the pilot bit or core barrel and insertion of the monitoring well (or piezometer) assembly.
    c. Addition of monitoring well (or piezometer) completion materials (see SOP 20.1).
20. Drill cuttings and fluids should be appropriately controlled and contained as IDM per SOP 70.1.
21. The drill rod assembly, sampling devices, and other drilling equipment contacting potentially contaminated material must be decontaminated before and after each use per the methods specified in SOP 80.1.
22. Borehole logging should be completed per SOP 10.3.
23. Borehole abandonment, when required, should be conducted according to SOP 20.3.

3.9 DIAMOND CORE DRILLING

The following general procedure may be followed as outlined in ASTM Standard Practice D 2113.

1. Use core-drilling procedures, such as the water-rotary drilling method outlined in Section 3.6.
2. Seat the casing on bedrock or firm formation to prevent raveling of the borehole and to prevent loss of drilling fluid. Level the formation that the casing will be seated on as needed.
3. Begin core drilling using an N-size double-tube, swivel-type core barrel or other approved size or type. Continue core drilling until core blockage occurs or until the net length of the core has been drilled.
4. Remove the core barrel from the borehole, and dis-assemble the core barrel as necessary to remove the core.
5. Reassemble the core barrel and return it to hole.
6. Continue core drilling.
7. Place the recovered core in the core box with the upper (surface) end of the core at the upper-left corner of the core box. Wrap soft or friable cores, etc. as needed or required. Use spacer blocks or slugs properly marked to indicate any noticeable gap in recovered core that might indicate a change or void in the formation. Fit fracture, bedded, or jointed pieces of core together as they naturally occurred.
8. The core within each completed box should be photographed after core surface has been cleaned or peeled, as appropriate, and wetted. Each photo should be in sharp focus and contain a legible scale in feet and tenths of feet (or metric if appropriate). The core should be oriented so that the top of the core is at the top of the photograph. A color chart should be included in the photograph frame as a check on photographic accuracy. The inside lid of the box should also be shown.
9. The inside of the box lid should be labeled at a minimum with the facility name, project name, boring number, box number, and core interval.

10. A preliminary field log of the core must be completed before the core box has been packed for transport (see SOP 10.3). Detailed logging may be conducted at a later time providing the core is appropriately handled and transported.
11. Four levels of sample protection may be used depending on character of the rock and the intended use of the rock core including:
    a. *Routine care* – for rock cored in 5 to 10 foot runs. Consists of placing in structurally sound boxes. Lay flat tubing may be used prior to placing the core.
    b. *Special care* – for rock samples to be tested that are potentially moisture sensitive, such as shale. This care consists of sealing with a tight fitting wrapping of plastic film and application of wax at the ends of the sample.
    c. *Critical care* – for rock samples that may be sensitive to shock and vibration and/or temperature. Protect by encasing each sample in cushioning material, such as sawdust, rubber, polystyrene, foam, etc. A minimum one-inch thick layer of cushioning material should be used. Thermally insulate samples that are potentially sensitive to changes in temperature.
    d. *Soil-Like care* – handle per ASTM Standard D 4220.
12. Drilling conditions and sequence (fluid loss, circulation pressures, depths of lost circulation, down feed pressures, core blockage etc.) should be documented on the boring log as described in SOP 10.3.
13. Drill cuttings and fluids should be appropriately controlled and contained as investigation-derived material per SOP 70.1.
14. The drill rod assembly, sampling devices, and other drilling equipment contacting potentially contaminated material must be decontaminated before and after each use per the methods specified in SOP 80.1.
15. Borehole logging should be completed per SOP 10.3.
16. Borehole abandonment, when required, should be conducted according to SOP 20.3.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Refer to site-specific health and safety plan included in work plan addenda.

6.0 REFERENCES

ASTM Standard D 2113-06 (2006). 1993. *Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation.*

ASTM Standard D 1586-99. 1999. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*

ASTM Standard D 1587-00 (2007) e1. 2007. *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.*

ASTM Standard D 3550-01 (2007). 2007. *Standard Practice for Think Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils.*

ASTM Standard D 4220-95 (2007). 2007. *Standard Practices for Preserving and Transporting Soil Samples.*

ASTM Standard D 4630-96 (2002). 2002. *Standard Test Method for Determining Transmissivity and Storage Coefficient of Low-Permeability Rocks by In Situ Measurements Using the Constant Head Injection Test.*

ASTM Standard D 4631-95 (2000). 2000. *Standard Test Method for Determining Transmissivity and Storativity of Low-Permeability Rocks by In Situ Measurements Using Pressure Pulse Technique.*

ASTM Standard D 5079-02 (2006). 2006. *Standard Practices for Preserving and Transporting Rock Core Samples.*

ASTM Standard D 5782-95 (2006). 2006. *Standard Guide for Use of Direct Air-Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

ASTM Standard D 5783-95 (2006). 2006. *Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

ASTM Standard D 5784-95 (2006). 2006. *Standard Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

ASTM Standard D 5872-95 (2006). 2006. *Standard Guide for Use of Casing Advancement Drilling Methods for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

ASTM Standard D 5876-95 (2005). 2005. *Standard Guide for Use of Direct Rotary Wireline Casing Advancement Drilling Methods for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

ASTM Standard D 6282-98 (2005). 2005. *Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations.*

USACE. 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000. 1, November.

STANDARD OPERATING PROCEDURE 30.1
SOIL SAMPLING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for sampling surface and subsurface soils.

2.0 MATERIALS

- Stainless steel scoop, spoon, trowel, knife, spatula, (as needed);
- Split-spoon, Shelby tube, or core barrel sampler;
- Hand auger or push tube sampler;
- Drill rig and associated equipment (subsurface soil);
- Stainless steel bowls;
- Photoionization detector or other appropriate instrument as specified in site-specific health and safety plan;
- Sampling equipment for collection of volatile organic samples;
- Appropriate sample containers;
- Appropriate sample labels and packaging material.;
- Personal protective equipment and clothing (PPE) per site-specific health and safety plan; and
- Decontamination equipment and supplies (SOP 80.1).

3.0 PROCEDURE

3.1 DOCUMENTATION

Soil sampling information should be recorded in the field logbooks as described in SOPs 10.1 and 10.2.

3.2 SURFICIAL SOIL SAMPLES

The targeted depths for surficial soil samples (surface and near surface) will be specified in the work plan addenda developed for site-specific investigations.

1. All monitoring equipment should be appropriately calibrated before beginning sampling according to the requirements of the work plan addenda and SOP 90.1 or 90.2.
2. All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.
3. Use a spade, shovel, or trowel or other equipment (manufactured from material, which is compatible with the soil to be sampled) to remove any overburden material present (including vegetative mat) to the level specified for sampling.
4. Measure and record the depth at which the sample will be collected with an engineers scale or tape.

5. Remove the thin layer that was in contact with the overburden removal equipment using a clean stainless steel scoop or equivalent and discard it.
6. Begin sampling with the acquisition of any discrete sample(s) for analysis of volatile organic compounds (VOCs), with as little disturbance as possible. VOC samples will not be composited or homogenized.
7. When a sample will not be collected with a core type of sampler (push tube, split spoon, etc.), the sample for VOC analysis will be collected from freshly exposed soil. The method of collection will follow the procedures specified in SOP 30.8 (Methanol Preservation Method) or 30.9 (En Core® Method) based on the requirements of the work plan addenda.
8. Field screen the sample with properly calibrated photoionization detector (PID) or other appropriate instrument. Cut a cross-sectional slice from the core or center of the sample and insert the monitoring instrument(s). Based on the screening results, collect the VOC fraction, as applicable.
9. Collect a suitable volume of sample from the targeted depth with a clean stainless steel scoop (or similar equipment), push tube sampler, or bucket auger
10. For core type of samplers, rough trimming of the sampling location surface should be considered if the sampling surface is not fresh or other waste, different soil strata, or vegetation may contaminate it. Surface layers can be removed using a clean stainless steel, spatula, scoop, or knife. Samples collected with a bucket auger or core type of sampler should be logged per the requirements of SOP 10.3.
11. If homogenization or compositing of the sampling location is not appropriate for the remaining parameters, the sample should be directly placed into appropriate sample containers with a stainless steel spoon or equivalent.
12. If homogenization of the sample location is appropriate or compositing of different locations is desired, transfer the sample to a stainless steel bowl for mixing. The sample should be thoroughly mixed with a clean stainless steel spoon, scoop, trowel, or spatula and then placed in appropriate sample containers per the requirements for containers and preservation specified in work plan addenda. Secure the cap of each container tightly.
13. Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
14. Return any remaining unused soil to the original sample location. If necessary, add clean sand to bring the subsampling areas back to original grade. Replace the vegetative mat over the disturbed areas.

3.3 SUBSURFACE SAMPLES

All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.

1. All monitoring equipment should be appropriately calibrated before sampling according to the requirement of the work plan addendum and SOP 90.1 or SOP 90.2.
2. All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.
3. Collect split-spoon; core barrel, Shelby tube, sonic core or other similar samples during drilling.
4. Upon opening sampler or extruding sample, immediately screen soil for VOCs using a PID or appropriate instrument. If sampling for VOCs, determine the area of highest concentration; use a

stainless steel knife, trowel, or lab spatula to cut the sample; and screen for VOCs with monitoring instrument(s).

5. Log the sample on the boring log before extracting from the sampler per the requirements of SOP 10.3.
6. Any required VOC samples will be collected first followed by the other parameters. VOC samples will not be composited or homogenized and will be collected from the area exhibiting the highest screening level. The method of VOC sample collection will follow the procedures specified in SOP 30.8 (Methanol Preservation Method) or 30.9 (En Core® Method) based on the requirements of the work plan addenda.
7. Field screen the sample with properly calibrated photoionization detector (PID) or other appropriate instrument. Cut a cross-sectional slice from the core or center of the sample and insert the monitoring instrument(s). Based on the screening results, collect the VOC fraction, as applicable.
8. Rough trimming of the sampling location surface should be considered if the sampling surface is not fresh or other waste, different soil strata, or vegetation may contaminate it. Surface layers can be removed using a clean stainless steel, spatula, scoop, or knife.
9. If homogenization or compositing of the sampling location is not appropriate for other parameters, the sample should be directly placed into appropriate sample containers with a stainless steel spoon or equivalent.
10. If homogenization of the sample location is appropriate or compositing of different locations is desired, transfer the sample to a stainless steel bowl for mixing. The sample should be thoroughly mixed with a clean stainless steel spoon, scoop, trowel, or spatula and placed in appropriate sample containers per the requirements for containers and preservation specified in work plan addenda. Secure the cap of each container tightly.
15. Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
16. Discard any remaining sample into the drums used for collection of cuttings.
17. Abandon borings according to procedures outlined in SOP 20.3.

3.4 INVESTIGATION-DERIVED MATERIAL

Investigation-derived material will be managed in accordance with procedures defined in the work plan addenda for the site being investigated and SOP 70.1.

NOTES: If sample recoveries are poor, it may be necessary to composite samples before placing them in jars. In this case, the procedure will be the same except that two split-spoon samples (or other types of samples) will be mixed together. The boring log should clearly state that the samples have been composited, which samples were composited, and why the compositing was done. In addition, VOC fraction should be collected from the first sampling device.

When specified, samples taken for geotechnical analysis (e.g., percent moisture, density, porosity, and grain size) will be undisturbed samples, such as those collected using a thin-walled (Shelby tube) sampler, sonic core sampler, etc.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Refer to the site-specific health and safety plan.

Soil samples will not include vegetative matter, rocks, or pebbles unless the latter are part of the overall soil matrix.

6.0 REFERENCES

ASTM Standard D 1586-99. 1999. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*

ASTM Standard D 1587-00 (2007) e1. 2007. *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.*

ASTM Standard D 5633-04. 2004. *Standard Practice for Sampling with a Scoop.*

USACE. 2001. *Requirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3. 1 February.

STANDARD OPERATING PROCEDURE 30.2
GROUNDWATER SAMPLING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the collection of groundwater samples from monitoring wells.

2.0 MATERIALS

- Work Plans;
- Field logbooks and field parameter forms;
- Plastic sheeting;
- Decontamination equipment and supplies (SOP 80.1);
- Variable-speed, low-flow submersible pump with safety drop cable;
- Nylon stay-ties;
- Generator;
- Dedicated Teflon tubing or Teflon lined polyethylene tubing;
- Flow-through-cell and probes for measuring pH, temperature, specific conductance, oxidation/reduction potential, dissolved oxygen, and turbidity (SOP 40.1);
- Electronic water-level indicator;
- Appropriate sample bottles, labels, chain-of-custody forms, and sample shipping supplies etc;
- Cooler with ice;
- Silicone tubing;
- 0.45-micron disposable filters (as appropriate).
- Personal protective equipment and clothing (PPE) per site-specific health and safety plan;
- Photoionization detector (PID) or other appropriate monitoring instrument per the site-specific health and safety plan; and
- Appropriate containers for investigation-derived material.

3.0 PROCEDURE

3.1 DOCUMENTATION

Groundwater sampling information should be recorded in the field logbooks as described in SOPs 10.1 and 10.2.

The following are general rules for the field parameter logbook for groundwater, as described in SOP 10.2:

- Only information for one site or installation per logbook. The same book maybe used for more than one sampling event.

- The first five pages will be reserved for index, general notes, etc. Sign and date each entry.
- Fill in the forms.
- Duplicate copies, index pages, and calibration sheets remain intact.

3.2 OVERVIEW OF SAMPLING TECHNIQUES

In general, two different techniques may be used to sample groundwater from monitoring wells at Radford Army Ammunition Plant (RFAAP):

- Low flow purging and sampling (Type I); and
- Conventional purging and low-flow sampling (Type II).

These two sampling techniques are intended to address the different groundwater conditions that may be encountered at RFAAP.

The Type I sampling technique will be used in the following situations:

- In wells where only one discrete water-producing zone is encountered;
- In wells with no discrete water bearing zone and a low yield (generally < 0.5 liters per minute); and
- In wells sampled during seasonal low groundwater conditions with greatly reduced yield.

The Type II sampling technique will be used in the following situations:

- In a well with potential or documented multiple flow zones and where individual flow zones will not be evaluated;
- In moderately producing wells (> 0.5 liters per minute) where no discrete flow zones were documented during drilling; and
- In wells sampled during seasonal high groundwater conditions with enhanced yield (and potentially additional flow zones).

Groundwater samples should be collected no sooner than 14 days after well development. Information from the boring logs, well completion records, and well development records should be reviewed before sampling a well to determine the most appropriate sampling technique. Pertinent information for each well to be sampled includes:

- Well construction;
- Depth and nature of water producing zones;
- Sustainable pumping rate of the well to be sampled;
- Well recharge characteristics; and
- Baseline turbidity.

Because of the heterogeneous nature of the fracture and solution-enhanced fractured bedrock at RFAAP, monitoring well purging and sampling techniques will need to be flexible. This flexibility is necessary to obtain representative samples that meet the data quality objectives (DQOs) specified in site-specific work plan addenda.

In general, when using the pumps specified in the following sections, situate any gasoline-powered generator on level ground approximately 15 ft downwind from the well. All generator maintenance (oil and fueling) is to be performed off site. If the hose(s) and/or power cord of the pump is not on a reel, place the pump with its hose and power cord on the plastic sheeting downhill from the well.

3.3 TYPE I SAMPLING PROCEDURES

Type I low flow purging and sampling procedures include the following:

- The work area outside the well will be prepared by placing plastic sheeting on the ground around the well casing to avoid cross-contamination.
- All equipment used to purge and sample the wells will be thoroughly decontaminated before and after use according to the requirements of the work plan addenda and SOP 80.1.
- All equipment to be used for monitoring water quality parameters will be calibrated before beginning purging according to the requirements of the work plan addenda and SOP 40.1.
- Note the condition of the well and well head.
- Monitor the headspace of the well with a photoionization detector as the well cap is removed.
- Measure and record the depth to water with an electronic water level indicator. The measurement of well depth will not be taken until after sampling is completed so that potential re-suspension of any settled solids at the bottom of the well is avoided.
- Well depth at the time of purging will be obtained from well construction and existing data.
- Slowly lower a clean, stainless steel, adjustable flow rate, submersible pump and dedicated Teflon or Teflon-lined polyethylene tubing to the desired depth. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties.
- For wells with very low sustainable pumping rates ($\leq$ 0.5 liters per minute), the pump should be set in the middle of the saturated screen section of the well or middle of the water column for open wells. The pump should be set 12 hours prior to purging so that the depth to water equilibrates and sediments disturbed during pump placement have time to settle.
- For wells with sustainable pumping rates ($>$ 0.5 liters per minute), the pumps will be set at a desired depth prior to purging, allowing for the depth to water to equilibrate before sampling. The desired depth will be specified in work plan addenda based on site-specific conditions and DQOs.
- Connect the pump tubing to an in-line flow-through cell(s) and connect the multi-parameter probe to the cell(s). The end of the tubing exiting the in-line flow-through cell should be placed to discharge into a appropriate container(s) to collect purge water.
- Immediately prior to purging, the depth to water will be measured and record. Start pumping the water at a rate of 100 to 400 milliliters per minute. Avoid surging. The pumping rate should cause minimal drawdown (less than 0.2 ft). Water level measurements should be collected continuously to document stabilization of the water level. Pumping rates should, if needed, be reduced to the minimal capabilities of the pump to avoid dewatering the screen interval and ensure stabilization of indicator parameters.
- During purging, water quality indicator parameters will be monitored at the in-line flow-through cell(s) every 3 to 5 minutes. The parameters to be monitored include pH, specific conductance, oxidation/reduction potential (Eh), dissolved oxygen, and turbidity.

- Continue purging until stabilization of indicator parameters is achieved. Stabilization is defined as three consecutive readings that are within the following criteria:
  - ± 0.1 for pH;
  - ±3% for specific conductance;
  - ±10 mV for oxidation/reduction potential (Eh); and
  - ±10% for turbidity and dissolved oxygen.
- If the parameters have stabilized, but the turbidity is not in the range of 5 to 10 NTU, then both filtered and unfiltered samples should be collected for any metals analysis. Filter metal samples should be collected with an in-line filter using a high capacity 0.45-micron particulate filter. This filter should be pre-rinsed according to the manufacturer's instructions.
- Once purging is completed, reduce the pumping rate to its lowest steady rate and disconnect the tubing from the in-line flow-though cell(s).
- Collect groundwater samples directly from the end of the tubing into clean containers provided by the laboratory. The container requirements and preservatives for groundwater samples are specified in work plan addenda. Allowing the pump discharge to flow gently down the inside of the container with minimal turbulence should fill all sample containers. Volatile organic compound (VOC) and gas sensitive parameter samples should be collected first followed by other parameters.
- In general, samples should be collected and containerized in the order of the volatilization sensitivity of the parameters. A preferred collection order for some common parameters is VOCs, extractable organics, metals, cyanide, sulfate and chloride, turbidity, and nitrate and ammonia. The parameters to be collected at any well location are site-specific and are specified in work plan addenda.
- Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
- After the sample collection is complete, remove the pump, tubing, and associated lines. Note: sample tubing will be dedicated to each well.
- Measure and record the total depth of the well.
- Secure the well be replacing and locking the lid.

3.4 TYPE II SAMPLING PROCEDURES

- The work area outside the well will be prepared by placing plastic sheeting on the ground around the well casing to avoid cross-contamination.
- All equipment used to purge and sample the wells will be thoroughly decontaminated before and after use according to the requirements of the work plan addenda and SOP 80.1.
- All equipment to be used for monitoring water quality parameters will be calibrated before beginning purging according to the requirements of the work plan addenda and SOP 40.1.
- Note the condition of the well and well head.
- Monitor the headspace of the well with a photoionization detector as the well cap is removed.
- Measure and record the depth to water with an electronic water level indicator. The measurement of well depth will not be taken until after sampling is completed so that potential re-suspension of any settled solids at the bottom of the well is avoided.

- Well depth at the time of purging will be obtained from well construction and existing data.
- Calculate the standing water column in the well by subtracting the depth to water from the total depth of the well as recorded during completion of the well.
- From the water depth, well diameter, sand pack length, etc., calculate the equivalent volume (1 EV) of water in the well.

  1 EV = volume in casing + volume in saturated sand pack. Therefore; if the water table lies below the top of the sand pack, use the following equation:

  $1\ EV = (pR_w^2h_w) + (0.30p(R_s^2-R_w^2)h_w) * (0.0043)$

  If the water table lies above the top of the sand pack use this equation:

  $1\ EV = [(pR_w^2h_w) + (0.30p(R_s^2-R_w^2)h_s)] * (0.0043)$

  Where: R_s = radius of sand pack in inches
  R_w = radius of well casing in inches
  h_s = height of sand pack in inches
  h_w = water depth in inches

  $0.0043\ gal/in^3$
  Assumed filter pack porosity = 30%

Tables and graphs showing equivalent volumes for typical well constructions are available.

- Slowly lower a clean, stainless steel, adjustable flow rate, submersible pump and dedicated Teflon or Teflon-lined polyethylene tubing to the middle of the saturated screen interval or water column in an open borehole. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties.
- Connect the pump tubing to an in-line flow-through cell(s) and connect the multi-parameter probe to the cell(s). The end of the tubing exiting the in-line flow-through cell should be placed to discharge into an appropriate container to collect purge water.
- Start purging the well at the minimally achievable pumping rate. Gradually increase the pumping rate to achieve the maximum flow rate of the pump or the maximum sustainable flow rate that does not draw down the static water level to a point below the top of the first water bearing zone, whichever is achieved first.
- During purging, water level measurements should be collected periodically to verify water levels in the well.
- During purging, water quality indicator parameters will be monitored at the in-line flow-through cell(s) every 3 to 5 minutes. The parameters to be monitored include pH, specific conductance, oxidation/reduction potential (Eh), dissolved oxygen, and turbidity.
- Note when each indicator parameter stabilizes. Stabilization is defined as three consecutive readings that are within the following criteria:
  - ± 0.1 for pH;
  - ±3% for specific conductance;
  - ±10 mV for oxidation/reduction potential (Eh); and
  - ±10% for turbidity and dissolved oxygen.

- Three calculated eVs of water in the will be purged prior to sampling. It will be documented if stabilization of the indicator parameters has not occurred after three calculated well volumes have been removed and sampling procedures begin.
- If the turbidity is not in the range of 5 to 10 NTU when purging has been completed, then both filtered and unfiltered samples should be collected for any metals analysis. Filter metal samples should be collected with an in-line filter using a high capacity 0.45-micron particulate filter. This filter should be pre-rinsed according to the manufacturer's instructions.
- Once purging is completed, reduce the pumping rate to its lowest steady rate and disconnect the tubing from the in-line flow-though cell(s).
- Collect groundwater samples directly from the end of the tubing into clean containers provided by the laboratory. The container requirements and preservatives for groundwater samples are specified in work plan addenda. Allowing the pump discharge to flow gently down the inside of the container with minimal turbulence should fill all sample containers. Volatile organic compound (VOC) and gas sensitive parameter samples should be collected first followed by other parameters.
- Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
- After the sample collection is complete, remove the pump, tubing, and associated lines. Note: sample tubing will be dedicated to each well.
- Measure and record the total depth of the well.
- Secure the well be replacing and locking the lid.

3.5 INVESTIGATION-DERIVED MATERIAL

Investigation-derived material will be managed in accordance with procedures defined in the work plan addendum for the site being investigated and SOP 70.1.

4.0 MAINTENANCE

Refer to manufacturer's requirements for maintenance of pumps and generators.

5.0 PRECAUTIONS

Refer to the site-specific health and safety plan.

6.0 REFERENCES

ASTM Standard D 5903-96 (2006). 2006. *Planning and Preparing for a Groundwater Sampling Events.*

USACE. 2001. R*equirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3, 1 February.

USEPA. 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures United States Environmental Protection Agency*, Office of Solid Waste and Emergency Response, EPA/540/S-95/504, December 1995.

USEPA. 1997. *Recommended Procedure for Low-flow Purging and Sampling of Groundwater Monitoring Wells.* Bulletin No. QAD023, October.

STANDARD OPERATING PROCEDURE 30.6
CONTAINERIZED MATERIAL

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the opening and sampling of containerized liquids of potentially unknown substances.

2.0 MATERIALS

- Work Plans;
- Field logbooks;
- Personal protective equipment and clothing per the site-specific health and safety plan;
- Monitoring instruments per the site-specific health and safety plan;
- Decontamination equipment and supplies (SOP 80.1);
- Tools;
- Historical data, if available;
- Sampling tube; and
- Remote samplers, as required.

3.0 PROCEDURE

Sealed containers with unknown contents represent potential severely hazardous situations for sampling teams. Even when the original identity of the contents is reasonably certain, contents may be under pressure or in a decomposed state and may readily react (sometimes violently) with air or water vapor in the atmosphere.

Only hazardous material specialists that have appropriate training and experience will inspect and sample unidentifiable drums or containers. Specialist team members will use extreme caution and care when opening sealed drums or cans of unknown content for purposes of inspection and sampling.

Efforts will be made to determine the identity of the contents, through markings, history of activities at the site, and similarity and proximity to containers of known contents. The range of possible hazards will dictate which specific procedure will be followed, and specific procedures will be identified in work plan addenda. All predetermined procedures will be strictly followed as designated by the site-specific conditions.

Using this SOP and appropriate health and safety protocols, field personnel will use extreme caution and care in opening sealed drums or cans of unknown contents for purposes of inspection and sampling. Specific activities include the following:

- Determine the identity of the contents through markings, history of activities at the site, and similarity and proximity to containers of known contents. The range of possible hazards will dictate which specific procedure should be followed.

- Handle containers as little as possible; however, if it is necessary to reorient a drum to allow access to a bung or cap, perform this activity using remote-handling forklift equipment with special drum-holding attachments.
- If contents are deemed to be under pressure, highly reactive, or highly toxic (or if these possibilities cannot be disproven), perform initial opening of the container remotely.
- Air monitoring stations will be established as necessary, using the following procedures:
    1. Affix a remote bung opener to the drum.
    2. Evacuate personnel to a safe distance or station them behind a barricade.
    3. Activate the non-sparking motor of the opener.
    4. After the bung is removed, monitor the drum for potential activity of the contents, such as vapor emission, smoking, or audible reaction.
    5. Approach cautiously while monitoring for toxic levels of airborne contaminants.
- If the contents of the drum pose acceptable hazards, accomplish opening (or inspection if previously opened remotely) and sampling with one of three approved devices. The preferred method is to use a clean glass tube, with or without bottom stopper, which can be placed in the drum (breaking it if necessary) after sampling is complete. Alternately (if a bung has been removed), a well sampler such as a Kemmererbailer can be used (but would require removal and cleaning or disposal according to the nature of the waste). By opening either of these devices at a desirable depth, stratified sampling can be performed. Also, the sampling tubes can be made with a plunger rod and O-ring seals at selected intervals, allowing simultaneous collection of multiple samples in a stratified medium.
- Following sampling, the drum will be resealed and/or overpacked to prevent any possibility of leakage while analysis determines the identity of the contents.
- Drums that do not have removable bungs may be opened remotely with a solenoid-activated punch (this requires that the drum be recontainerized or overpacked after sampling is complete).

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Not applicable.

6.0 REFERENCE

USEPA, 1989. A Compendium of Superfund Field Operation Methods. EPA/540/P-87/001. December.

STANDARD OPERATING PROCEDURE 30.7
SAMPLING STRATEGIES

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate sampling strategies for sampling various media.

2.0 MATERIALS

- Historical site data;
- Site topography;
- Soil types; and
- Sampled media.

3.0 PROCEDURE

The primary goal of any investigation is to collect samples representative of existing site conditions. Statistics are generally used to ensure samples are as representative as possible. Sampling plans may employ more than one approach to ensure project data quality objectives are adequately addressed. A comparison of sampling strategies is presented in Table 1.

3.1 CLASSICAL STATISTICAL SAMPLING

Classical statistical sampling strategies are appropriately applied to either sites where the source of contamination is known or small sites where the entire area is remediated as one unit. Primary limitations of this sampling approach include (1) inability to address media variability; (2) inadequate characterization of heterogenous sites; and (3) inadequate characterization of sites with unknown contamination characteristics.

3.1.1 Simple Random Sampling

Simple random sampling is generally more costly than other approaches because of the number of samples required for site characterization. This approach is generally used when minimal site information is available and visible signs of contamination are not evident and includes the following features:

- Sampling locations are chosen using random chance probabilities.
- This strategy is most effective when the number of sampling points is large.

3.1.2 Stratified Random Sampling

This sampling approach is a modification to simple random sampling. This approach is suited for large site investigations that encompass a variety of soil types, topographic features, and/or land uses. By dividing the site into homogenous sampling strata based on background and historical data, individual random sampling techniques are applied across the site. Data acquired from each stratum can be used to determine the mean or total contaminant levels and provide these advantages:

- Increased sampling precision results due to sample point grouping and application of random sampling approach.
- Control of variances associated with contamination, location, and topography.

3.1.3 Systematic Grid

The most common statistical sampling strategy is termed either systematic grid or systematic random sampling. This approach is used when a large site must be sampled to characterize the nature and extent of contamination.

Samples are collected at predetermined intervals within a grid pattern according to the following approach:

- Select the first sampling point randomly; remaining sampling points are positioned systematically from the first point.
- Determine the grid design: one or two-dimensional. One-dimensional sample grids may be used for sampling along simple man-made features. Two-dimensional grid systems are ideal for most soil applications.
- Determine the grid type: square or triangular. Sampling is usually performed at each grid-line intersection. Other strategies include sampling within a grid center or obtaining composite samples within a grid.
- Each stratum is sampled based on using the simple random sampling approach but determined using a systematic approach.

3.1.4 Hot-Spot Sampling

Hot spots are small, localized areas of media characterized by high contaminant concentrations. Hot-spot detection is generally performed using a statistical sampling grid. The following factors should be addressed:

- Grid spacing and geometry. The efficiency of hot-spot searches is improved by using a triangular grid. An inverse relationship exists between detection and grid point spacing, e.g., the probability of hot-spot detection is increased as the spacing between grid points is decreased.
- Hot-spot shape/size. The larger the hot spot, the higher the probability of detection. Narrow or semi-circular patterns located between grid sampling locations may not be detected.
- False-negative probability. Estimate the false negative (β-error) associated with hot-spot analysis.

3.1.5 Geostatistical Approach

Geostatistics describe regional variability in sampling and analysis by identifying ranges of correlation or zones of influence. The general two-stage approach includes the following:

- Conducting a sampling survey to collect data defining representative sampling areas.
- Defining the shape, size, and orientation of the systematic grid used in the final sampling event.

3.2 NON-STATISTICAL SAMPLING

3.2.1 Biased Sampling

Specific, known sources of site contamination may be evaluated using biased sampling. Locations are chosen based on existing information.

3.2.2 Judgmental Sampling

This sampling approach entails the subjective selection of sampling locations that appear to be representative of average conditions. Because this method is highly biased, it is suggested that a measure of precision be included through the collection of multiple samples.

4.0 MAINTENANCE

Not applicable.

5.0 REFERENCES

Gilbert, R.O. 1987. *Statistical Methods for Environmental Pollution Monitoring.* John Wiley & Sons, Inc. 320 p.

USACE. 2001. *Requirements for the Preparation of Sampling and Analysis Plans.* EM200-1-3. 1 February.

TABLE 1
SAMPLING STRATEGIES

SAMPLING STRATEGY	DESCRIPTION	APPLICATION	LIMITATIONS
Classical Statistical Sampling Strategies			
Simple Random Sampling	Representative sampling locations are chosen using the theory of random chance probabilities.	Sites where background information is not available and no visible signs of contamination are present.	May not be cost-effective because samples may be located too close together. Does not take into account spatial variability of media.
Stratified Random Sampling	Site is divided into several sampling areas (strata) based on background or site survey information.	Large sites characterized by a number of soil types, topographic features, past/present uses, or manufacturing storage areas.	Often more cost-effective than random sampling. More difficult to implement in the field and analyze results. Does not take into account spatial variability of media.
Systematic Grid Sampling	Most common statistical strategy; involves collecting samples at predetermined, regular intervals within a grid pattern.	Best strategy for minimizing bias and providing complete site coverage. Can be used effectively at sites where no background information exists. Ensures that samples will not be taken too close together.	Does not take into account spatial variability of media.
Hot-Spot Sampling	Systematic grid sampling strategy tailored to search for hot spots.	Sites where background information or site survey data indicate that hot spots may exist.	Does not take into account spatial variability of media. Tradeoffs between number of samples, chance of missing a hot spot, and hot spot size/shape must be weighed carefully.
Geostatistical Approach	Representative sampling locations are chosen based on spatial variability of media. Resulting data are analyzed using kriging, which creates contour maps of the contaminant concentrations and the precision of concentration estimates.	More appropriate than other statistical sampling strategies because it takes into account spatial variability of media. Especially applicable to sites where presence of contamination is unknown.	Previous investigation data must be available and such data must be shown to have a spatial relationship.
Non-Statistical Sampling Strategies			
Biased Sampling	Sampling locations are chosen based on available information.	Sites with known contamination sources.	Contaminated areas can be overlooked if background information or visual signs of contamination do not indicate them. Best used if combined with a statistical approach, depending on the project objectives.
Judgmental Sampling	An individual subjectively selects sampling locations that appear to be representative of average conditions.	Homogenous, well-defined sites.	Not usually recommended due to bias imposed by individual, especially for final investigations.

STANDARD OPERATING PROCEDURE 30.9
COLLECTION OF SOIL SAMPLES BY USEPA SW 846 METHOD 5035 USING DISPOSABLE SAMPLERS

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) outlines the recommended protocol and equipment for collection of representative soil samples to monitor potential volatile organic contamination in soil samples.

This method of sampling is appropriate for surface or subsurface soils contaminated with low to high levels of volatile organic compounds (VOCs). This sampling procedure may be used in conjunction with any appropriate determinative gas chromatographic procedure, including, but not necessarily limited to, SW-846 Method 8015, 8021, and 8260.

2.0 MATERIALS

- Work Plans;
- Field Logbook;
- Photoionization Detector (PID) or other monitoring instrument(s) per site-specific health and safety plan;
- Personal protective equipment and clothing per site-specific health and safety plan;
- Soil sampling equipment, as applicable (SOP 30.1);
- Disposable sampler;
- T-handle and/or Extrusion Tool; and
- Decontamination equipment and supplies (SOP 80.1).

3.0 PROCEDURE

3.1 METHOD SUMMARY

Disposable samplers are sent to the field to be used to collect soil samples. Three samplers must be filled for each soil sampling location, two for the low-level method (sodium bisulfate preservation) and one for the high level method (methanol preservation). After sample collection, disposable samplers are immediately shipped back to the laboratory for preservation (adding soil sample into methanol and sodium bisulfate solution). The ratio of volume of methanol to weight of soil is 1:1 as specified in SW-846 Method 5035 (Section 2.2.2). The amount of preservative in the solution corresponds to approximately 0.2 g of preservative for each 1 g of sample. Enough sodium bisulfate should be present to ensure a sample pH of ≤ 2.

If quality assurance/quality control (QA/QC) samples are needed, seven samplers will be needed for the original, matrix spike, and matrix spike duplicate analysis. Soil samples are collected in the field using the disposable samplers, sealed and returned to the laboratory. A separate aliquot of soil is collected in a 125-mL container for dry weight determination.

3.2 SAMPLE CONTAINERS, PRESERVATION, HANDLING AND STORAGE

After sample collection, the disposable samplers must be cooled to and maintained at 4°C. The contents of the samplers will be analyzed using EPA methods 8015, 8021, and/or 8260. The **disposable** sampler is a single use device. It cannot be cleaned and/or reused.

Disposable samplers have a 48 hour holding time from sample collection to sample preparation in the laboratory. Return the samplers to the laboratory immediately after sampling.

3.3 SAMPLE PROCEDURES

Before sampling, the disposable sampler should be prepared as follows:

1. Unpack the cooler/sampling kit received from the laboratory. Disposable samplers are packed in sealed aluminized bags. These should be over packed in plastic zip lock bags. A T-Handle will also be needed to collect samples with the disposable sampler.
2. Hold coring body and push plunger rod down until small 0-ring rests against tabs. This will assure that plunger moves freely.
3. Depress locking lever on the sampler T-Handle (or other extraction device). Place coring body, plungers end first, into the open end of the T-Handle, aligning the two slots on the coring body with the two locking pins in the T-Handle. Twist the coring body clockwise to lock the pins in the slots. Check to ensure the sampler is locked in place. Sampler is ready for use.

The following procedure should be followed when using a disposable sampler to sample for VOCs in soil:

1. After the soil-sampling device (split spoon, corer, etc.) is opened, the sampling process should be completed in a minimum amount of time with the least amount of disruption.
2. Visual inspection and soil screening should be conducted after the sampler is opened and a fresh surface is exposed to the atmosphere. Soil screening should be conducted with an appropriate instrument (PID or FID).
3. Rough trimming of the sampling location surface should be considered if the sampling surface is not fresh or other waste, different soil strata, or vegetation may contaminate it. Surface layers can be removed using a clean stainless steel, spatula, scoop, or knife.
4. Orient the T-Handle with the T-up and the coring body down. This positions the plunger bottom flush with bottom of coring body (ensure that plunger bottom is in position). Using T-Handle, push sampler into soil until the coring body is completely full taking care not to trap air behind the sampler. When full, the small o-ring will be centered in the T-Handle viewing hole. Remove sampler from soil. Wipe excess soil from coring body exterior with a clean disposable paper towel.
5. Cap coring body while it is still on the T-Handle. ***Push*** cap over flat area of ridge ***and twist*** to lock cap in place. ***Cap must be seated to seal sampler.***
6. Remove the capped sampler by depressing locking lever on T-Handle while twisting and pulling sampler from T-Handle.
7. Lock plunger by rotating extended plunger rod fully counterclockwise until wings rest firmly against tabs.
8. Fill the 125-mL wide mouth jar for the non-preserved portion of the sample to be used for a moisture determination. These may be in a cardboard box. Retain all packaging to return the samples.
9. The disposable sampler should collect approximately 5 grams of soil (not necessary to weigh in the field). After a sample has been collected and capped, tear off the identification tag found at the bottom of the label on the aluminized bag. This tag is added to the sampler on the cap used to seal the sampler.

10. Place the sampler back in the aluminized bag and seal the top (a zip-lock seal). Make sure all the appropriate information is on the label. Record the sampler ID number on the chain-of-custody. Make sure each sampler and 125-mL container is labeled with the same location identification. The sampler should be placed inside the plastic zip-lock bags.
11. Place the 125-mL wide mouth jars in the cooler with the sampler on top. These should be sandwiched between bags of ice to maintain the correct temperature. If sent with the jars and samplers, a temperature bottle (used to evaluate the temperature on receipt) should be placed in the middle of the jars. The sample temperature should be 4ºC during shipment.
12. Ship the samples so that they will be received within 24 hours of sampling. The laboratory must receive the sampler within 40 hours of the collection so that they can be correctly preserved.

3.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

1. All data must be documented on chain-of-custody forms, field data sheets and in the field logbook.
2. An equipment blank is a QA/QC sample that will determine potential contamination from sampling equipment used to collect and transfer samples from the point of collection to the sample container. An equipment blank is performed by pouring demonstrated analyte free water from one sample container, over a sampler, and into a separate set of identical sample containers. The equipment blank is optional when sampling with the methanol preservation technique. It may be required on a site-specific basis if elevated analytical results are suspected to be due to cross contamination from sampling equipment.
3. A trip blank is a QA/QC sample, which will determine additional sources of contamination that may potentially influence the samples. The sources of the contamination may be from the laboratory, sample containers, or during shipment. The laboratory prepares a trip blank at the same time and in the same manner as the sample containers. The trip blank must accompany the sample containers to the field and back to the laboratory along with the collected samples for analysis. It must remain sealed at all times until it is analyzed at the laboratory. The frequency of collection for the trip blank must be at a rate of one per sample shipment.

3.5 LIMITATIONS IN SAMPLING

This sampling protocol will not be applicable to all solid environmental matrices, such as those that cannot be cored including non-cohesive granular material, gravel, or hard dry clay. In this case, the procedure for collecting VOC samples using Methanol Preservation should be used (see SOP 30.8).

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCES

En Novative Technologies, Inc. 2000. Users Manual for En Core® Sampler. February 2001.

USACE. 2001. *Requirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3, 1 February.

USEPA. 1997. *Test Methods for Evaluating Solid Waste, Volume IB: Laboratory Manual Physical/Chemical Methods,* Third Edition, (as updated through update IIIA). Office of Solid Waste and Emergency Response, Washington, DC.

STANDARD OPERATING PROCEDURE 40.1
MULTIPARAMETER WATER QUALITY MONITORING INSTRUMENT

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for field operation with the multiparameter water quality logging system (data transmitter and visual display). This system can monitor up to eleven basic parameters, including dissolved oxygen, percent saturation, temperature, pH, specific conductance, resistivity, salinity, total dissolved solids, redox, level, and depth.

2.0 MATERIALS

- Visual display;
- Data transmitter;
- Underwater cables; and
- Field logbooks.

3.0 PROCEDURE

3.1 CALIBRATION

Calibration will be performed in the field daily before use according to manufacturer's specifications. The following parameters are calibrated to the following standards:

- Temperature—none required;
- Specific conductance—KCl or seawater standards;
- pH—pH 7 buffer plus a slope buffer;
- Dissolved oxygen—saturated air or saturated water;
- Redox—quinhydrone or transfer;
- Depth—set zero in air;
- Level—set zero in air; and
- Salinity—uses calibration for specific conductance.

3.2 OPERATION

1. Attach the cable to the transmitter.
2. Connect the other end of the cable to the display.
3. Press the On/Off key on the display panel. Allow a few seconds for the transmitter to start sending data to the display screen.
4. Calibrate the transmitter.
5. Deploy the sensor into a minimum of 4 in. of water.
6. Write data values from the display screen in the appropriate field logbook.

7. Retrieve sensor and clean the transmitter to prevent cross-contamination.
8. Move to the next sampling location. If travel time is great, turn off display by pressing On/Off key. Check condition of probes after each deployment.
9. Disconnect the transmitter when finished sampling for the day.

4.0 MAINTENANCE

Maintain according to specific manufacturer's specifications.

5.0 PRECAUTIONS

- Check condition of probes frequently between sampling; and
- Do not force pins into the connectors; note the keying sequence.

6.0 REFERENCES

Manufacturer's Handbook.

STANDARD OPERATING PROCEDURE 40.2
WATER LEVEL AND WELL-DEPTH MEASUREMENTS

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for measuring water level and well depth. This procedure is applicable to the sampling of monitoring wells and must be performed before any activities that may disturb the water level, such as purging or aquifer testing.

2.0 MATERIALS

- Work Plans;
- Well construction diagrams;
- Field logbook;
- Photoionization detector (PID) or other monitoring instruments per site-specific health and safety plan;
- Decontamination equipment and supplies (SOP 80.1);
- Electric water level indicator (dipmeter) with cable measured at 0.01 ft increments;
- Oil-water interface probe (if non-aqueous phase liquid (NAPLs) are suspected to be present); and
- Plastic sheeting.

3.0 PROCEDURE

3.1 PRELIMINARY STEPS

1. Locate the well and verify its position on the site map. Record whether positive identification was obtained, including the well number and any identifying marks or codes contained on the well casing or protective casing. Gain access to the top of the well casing.
2. Locate the permanent reference mark at the top of the casing. This reference point will be scribed, notched, or otherwise noted on the top of the casing. If no such marks are present, measure to the top of the highest point of the well casing and so note this fact in field logbook. Determine from the records and record in the notebook the elevation of this point.
3. Record any observations and remarks regarding the completion characteristics and well condition, such as evidence of cracked casing or surface seals, security of the well (locked cap), and evidence of tampering.
4. Keep all equipment and supplies protected from gross contamination; use clean plastic sheeting. Keep the water level indicator probe in its protective case when not in use.

3.2 OPERATION

1. Sample the air in the well head for gross organic vapors by lifting the well cap only high enough for an organic vapor meter (PID or FID) probe to be entered into the well casing. This will indicate the presence of gross volatile contaminants as well as indicating potential sampler exposure.

2. Remove cap. Allow well to vent for 60–90 seconds. Resample headspace. Record both readings. If the second reading is lower than the first, use the second reading to determining whether respiratory protection will be required during subsequent water level and well depth determinations and sampling.
3. Note that all headspace sampling must be performed at arm's length and from the upwind side of the well if possible.
4. If NAPL contamination is suspected, use an interface probe to determine the existence and thickness of NAPLs.
    - Open the probe housing, turn the probe on, and test the alarm. Slowly lower the probe into the well until the alarm sounds. A continuous alarm indicates a NAPL, while an intermittent alarm indicates water. If a NAPL is detected, record the initial level (first alarm). Mark the spot by grasping the cable with the thumb and forefingers at the top of the casing. If a mark is present on the casing, use the mark as the reference point. If no mark is present, use the highest point on the casing as the reference point. Withdraw the cable sufficiently to record the depth.
    - Continue to slowly lower the probe until it passes into the water phase. Slowly retract the probe until the NAPL alarm sounds and record that level in the manner as described above.
    - Record the thickness of the LNAPL (see Section 3.3.1).
    - Continue to slowly lower the interface probe through the water column to check for the presence of DNAPL.
    - Measure and record the thickness of the DNAPL layer (if any) as described above.
    - Slowly raise the interface probe, recording the depth to each interface as the probe is withdrawn. If there is a discrepancy in depths, clean the probe sensors and re-check the depths.
    - NOTE: Air-liquid interface depth is more reliable if probe is lowered into liquid. NAPL-water depths are more accurate if probe is moved from water into NAPL.
    - Always lower and raise interface probe slowly to prevent undue mixing of media.
    - Always perform NAPL check in wells installed in areas with suspected NAPL contamination. Always perform NAPL check if headspace test reveals presence of volatiles. Always perform NAPL check the first time a well is sampled. If a well has been sampled previously and no NAPLs were present and none of the proceeding conditions are met, the NAPL check may be omitted.
5. If no NAPL is present, use an electronic water level detector as follows.
    - Remove the water level indicator probe from the case, turn on the sounder, and test check the battery and sensitivity scale by pushing the red button. Adjust the sensitivity scale until you can hear the buzzer.
    - Slowly lower the probe and cable into the well, allowing the cable reel to unwind. Continue lowering until the meter buzzes. Very slowly, raise and lower the probe until the point is reached where the meter just buzzes. Marking the spot by grasping the cable with the thumb and forefingers at the top of the casing. If a mark is present on the casing, use the mark as the reference point. If no mark is present, use the highest point on the casing as the reference point. Withdraw the cable and record the depth.
6. To measure the well depth, lower electric water level indicator probe or tape until slack is noted. Very slowly raise and lower the cable until the exact bottom of the well is “felt.” Measure (cable) or read the length (tape) and record the depth.

7. Note that if the electric water level indicator is used to determine depth of well, the offset distance between the tip of the probe and the electrode must be added to the reading to determine actual depth.
8. Withdraw the probe or tape.
9. Decontaminate the probe(s) and cable(s), in accordance with SOP 80.1.

3.3 DATA RECORDING AND MANIPULATION

Record the following information in the field logbook and appropriate sampling forms:

- Date and time;
- Weather;
- Method of measurement;
- Casing elevation;
- NAPL surface elevation = casing elevation - depth to NAPL;
- Apparent measured LNAPL thickness = depth to bottom of NAPL - depth to top of NAPL;
- Water level elevation = casing elevation - depth to water; and
- Well bottom elevation = casing elevation - depth to bottom (or read directly from tape).

4.0 CALIBRATION

No calibration is required. Ensure operability of electric water level indicator by testing sounder before use.

5.0 PRECAUTIONS

- Depending upon the device used, correction factors may be required for some measurements;
- Check instrument batteries before each use; and
- Exercise care not to break the seals at the top of the electric water level indicator probe.

6.0 REFERENCES

ASTM Standard D 4750-87 (2001). 2001. *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).*

M^{c}Alary, T. A., and Barker, J.F. 1987. "Volatilization Losses of Organics During Ground Water Sampling from Low Permeability Materials" in *Ground Water Monitoring Review.* Fall 1987.

Thornhill, Jerry T. 1989. Accuracy of Depth to Groundwater Measurements; in "EPA Superfund Ground Water Issue" EPA/540/4-89/002.

STANDARD OPERATING PROCEDURE 40.3
SLUG TESTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide information and technical guidance for performing falling- and rising-head *in situ* hydraulic conductivity tests and data analyses. The slug test method involves causing a sudden change in head in a control well and measuring the water level response within that control well. Head change may be induced by suddenly injecting into the well or removing from the well a known quantity of water, rapid removal of a mechanical "slug" from below the water level, increasing or decreasing the air pressure in the well casing, or emplacement of a mechanical slug into the water column.

The water level response in the well is a function of the mass of water in the well and the transmissivity and coefficient of storage of the aquifer. The results of the slug test may be used to determine an estimate of the hydraulic conductivity of the aquifer material near the well.

2.0 MATERIALS

- Work Plans;
- Field logbook;
- Well construction information and boring log;
- Photoionization detector (PID) or other monitoring instruments per site-specific health and safety plan;
- Decontamination equipment and supplies (SOP 80.1);
- Aquifer test data sheets;
- Personal protective equipment and clothing (PPE) per site-specific health and safety plan; and
- Slug-inducing equipment (solid slug, line, etc.) large enough to displace groundwater beyond the well filter pack.

3.0 PROCEDURE

Initially, an appropriate test methodology should be chosen. The selection of the appropriate test method (rising or falling head) is dependent primarily on saturated screen length, the well diameter, and the estimated hydraulic conductivity. If the screen extends above the water table, a rising-head test (water removal) should be used. The performance of a falling-head test (water added) in this circumstance would overstate the hydraulic conductivity value, as the measured response would reflect the equilibration rate of previously unsaturated material; unsaturated materials would equilibrate faster than saturated materials. When the measured water level in a monitoring well is above the screened portion of the well, a falling-head test methodology should be employed. A rising-head test may also be performed, but only if the initial water level reading (after the slug is removed) is above the screened interval.

For larger diameter and deeper wells, as a general rule and particularly for high conductivity materials, it is not feasible to remove a large enough slug or water volume to cause a sufficient change in head. In these cases the falling-head test method should be used.

It is recommended that a pressure transducer be used whenever possible to record water levels and time. A pressure transducer is required to record useful data when the hydraulic conductivity is high (greater than 10^{-3} cm/sec). The standard stopwatch and water-level indicator method is adequate for lower conductivity units.

The procedures outlined below assume use of a pressure transducer. Readings should be collected at intervals set on the data logger if used. If manual readings are collected, the following intervals should be applied:

- 0 to 5 minutes, every 10 seconds;
- 5 to 10 minutes, every 30 seconds;
- 10 to 30 minutes, every 1 minute; and
- 30 to 60 minutes, every 2 minutes.

3.1 Falling-Head Tests

1. Install pressure transducer near the total well depth and permit transducer and water levels to equilibrate to ambient conditions. Secure transducer cable to prevent movement during the test. Begin transducer readings.
2. Manually measure the static water level.
3. Insert slug completely below static water level or add a water "slug."
4. Intermittently measure water level and note the time of measurement with reference to the data logger.
5. Continue monitoring until water level is within 90% of the static level.

If a solid slug was used, stop the falling-head test recording at this point and begin a rising-head test by removing the solid slug from the well. If a solid slug was not used, simply end recording by the data logger at the completion of the falling-head test.

3.2 Rising-Head Tests

1. Install pressure transducer near the total well depth and permit transducer and water levels to equilibrate to ambient conditions. Secure transducer cable to prevent movement during testing.
2. Manually measure the static water level.
3. Remove sufficient volume of water to lower the water level a minimum of 1 ft below static water level, or
4. Install the solid slug fully below water level; permit static conditions to return and then remove the solid slug.
5. Begin readings with data logger.
6. Intermittently measure water level and note time of measurement with reference to data logger.
7. Continue monitoring until the water level is within 90% of the static level.

As a check on equipment operation and in the event that test data for a particular well are not usable, the data should be printed out in the field. If there is equipment failure (e.g., a non-attainment of a 1-foot minimum head change, unexplained fluctuations in water levels, etc.), the test can be rerun with minimum time lost.

The well numbers, static and subsequent water levels, programmed test numbers, and general comments should be recorded in the field notebook.

4.0 PRECAUTIONS

Not applicable.

5.0 REFERENCES

ASTM Standard D 4043-96 (2004). *Standard Guide for Selection of Aquifer-Test Method in Determining of Hydraulic Properties of Well Techniques.*

Hvorslev, M.J. 1951. *Time-Lag and Soil Permeability in Ground Water Observations.* U.S. Army Engineers, Bulletin 36 - This method can be applied to both unconfined and confined aquifers but provides only approximate conductivity values (Freezer R.A. and J.A. Cherry, 1979, Groundwater, Prentice-Hall, Inc.).

Cooper, H.H., J.D. Bredehoeft, I.S. Papadopulos. 1967. *Response of a Finite-Diameter Well to an Instantaneous Charge of Water.* Water Resources Division, U.S. Department of the Interior Geological Survey, Vol. 3, No. 1 - This method can be applied to aquifers under confined conditions and requires that the well completely penetrate the aquifer. This method is believed to produce most reliable data when applied to low-permeability materials.

Bouwer, H. 1989. *The Bouwer and Rice Slug Test -- An Update.* Ground Water, Vol. 27, No. 3; and Bouwer, H. and R.C. Rice. 1976. *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells.* Water Resources Research, Vol. 12, No. 3 - This method takes into account additional well and aquifer configuration data points not considered by Hvorslev's more simplistic method. Computer analyses are available.

Nguyen, V., G.F. Pinder. 1984. *Direct Calculation of Aquifer Parameters in Slug Test Analyses, Groundwater Hydraulics.* American Geophysical Union Water Resources Monograph 9 - This method can be applied to partially penetrating wells in both confined and unconfined aquifers it produces better values for low- to moderate-permeability materials.

STANDARD OPERATING PROCEDURE 50.1
SAMPLE LABELS

1.0 SCOPE AND APPLICATION

Every sample will have a sample label uniquely identifying the sampling point and analysis parameters. The purpose of this standard operating procedure (SOP) is to delineate protocols for the use of sample labels. An example label is included as Figure 50.1-A. Other formats with similar levels of detail are acceptable.

2.0 MATERIALS

- Sample label; and
- Indelible marker.

3.0 PROCEDURE

The use of preprinted sample labels is encouraged and should be requested from the analytical support laboratory during planning activities.
As each sample is collected, fill out a sample label ensuring the following information has been collected:

- Project name;
- Sample ID: enter the SWMU number and other pertinent information concerning where the sample was taken. This information should be included in site-specific work plan addenda;
- Date of sample collection;
- Time of sample collection;
- Initials of sampler(s);
- Analyses to be performed (NOTE: Due to number of analytes, details of analysis should be arranged with lab *a priori*); and
- Preservatives (water samples only).

Double-check the label information to make sure it is correct. Detach the label, remove the backing and apply the label to the sample container. Cover the label with clear tape, ensuring that the tape completely encircles the container.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCES

USEPA. 2001 (Reissued May 2006). *EPA Requirements for Quality Assurance Project Plans.* EPA/240/B-01/003, QA/R5, Final, Office of Research and Development, Washington, D.C. March 2001

FIGURE 50.1-A
SAMPLE LABEL

PROJECT NAME _____

SAMPLE ID _____

DATE: ____/____/____ TIME: _____:_____

ANALYTES: VOC SVOC P/P METALS CN
PAH D/F HERBs ANIONS TPH
ALK TSS

PRESERVATIVE: [HCl] [HNO_3] [NaOH] [H_2SO_4]

SAMPLER: _____

STANDARD OPERATING PROCEDURE 50.2
SAMPLE PACKAGING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the packing and shipping of samples to the laboratory for analysis.

2.0 MATERIALS

- Waterproof coolers (hard plastic or metal);
- Metal cans with friction-seal lids (e.g., paint cans);
- Chain-of-custody forms;
- Chain-of-custody seals (optional);
- Packing material;
- Sample documentation;
- Ice;
- Plastic garbage bags;
- Clear Tape;
- Zip-top plastic bags; and
- Temperature blanks provided by laboratory for each shipment.

3.0 PROCEDURE

1. Check cap tightness and verify that clear tape covers label and encircles container.
2. Wrap sample container in bubble wrap or closed cell foam sheets. Samples may be enclosed in a secondary container consisting of a clear zip-top plastic bag. Sample containers must be positioned upright and in such a manner that they will not touch during shipment.
3. Place several layers of bubble wrap, or at least 1 in. of vermiculite on the bottom of the cooler. Line cooler with open garbage bag, place all the samples upright inside the garbage bag and tie.
4. Double bag and seal loose ice to prevent melting ice from soaking the packing material. Place the ice outside the garbage bags containing the samples.
5. Pack shipping containers with packing material (closed-cell foam, vermiculite, or bubble wrap). Place this packing material around the sample bottles or metal cans to avoid breakage during shipment.
6. A temperature blank (provided by laboratory) will be included in each shipping container to monitor the internal temperature. Samples should be cooled to 4 degrees C on ice immediately after sampling.
7. Enclose all sample documentation (i.e., Field Parameter Forms, Chain-of-Custody forms) in a waterproof plastic bag and tape the bag to the underside of the cooler lid. If more than one cooler is being used, each cooler will have its own documentation. Add the total number of shipping containers included in each shipment on the chain-of-custody form.

8. Seal the coolers with signed and dated custody seals so that if the cooler were opened, the custody seal would be broken. Place clear tape over the custody seal to prevent damage to the seal.
9. Tape the cooler shut with packing tape over the hinges and place tape over the cooler drain.
10. Ship all samples via overnight delivery on the same day they are collected if possible.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

5.1 PERMISSIBLE PACKAGING MATERIALS

- Non-absorbent
  - — Bubble wrap; and
  - — Closed cell foam packing sheets.
- Absorbent
  - — Vermiculite.

5.2 NON-PERMISSIBLE PACKAGING MATERIALS

- Paper;
- Wood shavings (excelsior); and
- Cornstarch “peanuts”.

6.0 REFERENCES

USEPA. 1990. *Sampler's Guide to the Contract Laboratory Program.* EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C., December 1990.

USEPA. 1991. *User's Guide to the Contract Laboratory Program.* EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response. January 1991.

USEPA. 2001 (Reissued May 2006). *EPA Requirements for Quality Assurance Project Plans.* EPA/240/B-01/003, QA/R5, Final, Office of Research and Development, Washington, D.C. March 2001

STANDARD OPERATING PROCEDURE 70.1
INVESTIGATION-DERIVED MATERIAL

1.0 SCOPE AND APPLICATION

Management of investigation-derived material (IDM) minimizes the potential for the spread of waste material onsite or offsite through investigation activities. The purpose of this standard operating procedure (SOP) is to provide general guidelines for appropriate management of potentially contaminated materials derived from the field investigations. Specific procedures related to the transportation and disposal of hazardous waste are beyond the scope of this SOP.

2.0 INTRODUCTION

Investigation derived material (IDM) consists of waste materials that are known or suspected to be contaminated with waste substances through the actions of sample collection or personnel and equipment decontamination. These materials include decontamination solutions, disposable equipment, drill cuttings and fluids, and water from groundwater monitoring well development and purging. To the extent possible, the site manager will attempt to minimize the generation of these materials through careful design of decontamination schemes and groundwater sampling programs. Testing conducted on soil and water investigation-derived material will show if they are also hazardous wastes as defined by RCRA. This will determine the proper handling and ultimate disposal requirements.

The criteria for designating a substance as hazardous waste according to RCRA is provided in 40 CFR 261.3. If IDM meet these criteria, RCRA requirements will be followed for packaging, labeling, transporting, storing, and record keeping as described in 40 CFR 262.34. Those materials that are judged potentially to meet the criteria for a regulated solid or hazardous waste will be placed in DOT-approved 55-gallon steel drums or another type of DOT approved container; based on waste characteristics and volume.
Investigation-derived material will be appropriately placed in containers, labeled, and tested to determine disposal options in accordance with RCRA regulations and Virginia Hazardous Waste Management Regulations.

3.0 INVESTIGATION-DERIVED MATERIAL MANAGEMENT

Procedures that minimize potential for the spread of waste material include minimizing the volume of material generated, material segregation, appropriate storage, and disposal according to RCRA requirements.

3.1 WASTE MINIMIZATION

In the development of work plan addenda, each aspect of the investigation will be reviewed to identify areas where excess waste generation can be eliminated. General procedures that will eliminate waste include avoidance of unnecessary exposure of materials to hazardous material and coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment.

3.2 WASTE SEGREGATION

Waste accumulation and management procedures to be used depend upon the type of material generated. For this reason, IDM described below are segregated into separate 55-gallon storage drums or other appropriate DOT containers. Waste materials that are known to be free of potential hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings) must be collected separately for disposal to municipal systems. Large plastic garbage or "lawn and leaf" bags are useful for collecting this trash. Even "clean" sample bottles or Tyvek should be disposed of with care. Although they are not legally a problem, if

they are discovered by the public they may cause concern. Therefore, items that are known to be free from contamination but are also known to represent "hazardous or toxic waste" to the public must not be disposed of in any public trash receptacle, such as found at your hotel or park.

3.2.1 Decontamination Solutions

Solutions considered investigation-derived materials range from detergents, organic solvents, and acids used to decontaminate small hand samplers to steam-cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be placed in 55-gallon drums with bolt-sealed lids or other appropriate DOT approved containers. Residual liquid IDM from decontamination pads will be removed and appropriately placed in container(s) at the end of each field day.

3.2.2 Soil Cuttings and Drilling Muds

Soil cuttings are solid to semi-solid soils generated during trenching activities or drilling for the collection of subsurface soil samples or the installation of monitoring wells. Depending on the type of drilling, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Drill cuttings, whether generated with or without drilling fluids, are to be removed with a flat-bottomed shovel and placed in 55-gallon drums with bolt-sealed lids or other appropriate DOT containers, as conditions or volume of IDM dictate.

3.2.3 Well Development and Purge Water

Well development and purge water is removed from monitoring wells to repair damage to the aquifer following well installation, obtain characteristic aquifer groundwater samples, or measure aquifer hydraulic properties. The volume of groundwater to be generated will determine the appropriate container to be used for accumulation of IDM.

For well development and purging, 55-gallon drums are typically an efficient container for accumulation. When larger volumes of water are removed from wells, such as when pumping tests are conducted, the use of large-volume portable tanks such as "Baker Tanks" should be considered for IDM accumulation.

Analytical data for groundwater samples associated with the well development and purge water will be used to assist in characterizing IDM and evaluating disposal options.

3.2.4 Personal Protective Equipment and Disposable Sampling Equipment

Personal protective equipment and clothing (PPE) may include such items as Tyvek coveralls, gloves, booties, and APR cartridges. Disposable sampling equipment may include such items as plastic sheeting, bailers, disposable filters, disposable tubing and paper towels. PPE and disposable sampling equipment that have or may have contacted contaminated media (soil, water, etc.) will be segregated and placed in 55-gallon drums separate from soil and water IDM. Disposition of this type of IDM will be determined by the results of IDM testing of the media in which the PPE and sampling equipment contacted.

3.3 MATERIAL ACCUMULATION

The IDM in containers must be placed in an appropriate designated RCRA container accumulation area at RFAAP, where it is permissible to accumulate such waste. IDM placed into a designated 90-day accumulation area will be properly sealed, labeled and covered. All drums will be placed on pallets.

A secure and controlled waste staging area will be designated by the installation prior the commencement of field sampling activities. Per the facility's requirements as a RCRA large quantity generator, waste accumulation cannot exceed 90 days for materials presumed or shown to be RCRA-designated hazardous wastes; waste which is known not to be RCRA-designated waste should be promptly disposed to municipal waste systems or appropriate facility.

3.3.1 IDM Accumulation Containers

Containers will be DOT-approved (DOT 17H 18/16GA OH unlined) open-head steel drums or other DOT approved container, as appropriate.

Container lids should lift completely off be secured by a bolt ring (for drum). Order enough containers to accumulate all streams of expected IDM including soil, PPE and disposable sampling equipment, decontamination water, purge water, etc.

Solid and liquid waste streams will not be mixed in a container. PPE and expendable sampling equipment will be segregated from other IDM and placed in different containers than soil. Containers inside containers are not permitted. PPE must be placed directly in a drum not in a plastic bag.

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3×4 ft and will hold two to three 55-gallon drums depending on the filled weight. If pallets are required for drum transport or storage, field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on with the bolt-tighten ring after the drums are filled. Because the weight of one drum can exceed 500 lbs, under no circumstances should personnel attempt to move the drums by hand.

3.3.2 Container Labeling

Each container that is used to accumulate IDM will be appropriately labeled at the time of accumulation and assigned a unique identification number for tracking purposes. The following information will be written in permanent marker on a drum label affixed on the exterior side at a location at least two-thirds of the way up from the bottom of the drum.

- Facility name.
- Accumulation start date and completion date.
- Site identifier information (SWMU, boring, well, etc.).
- Description of IDM.
- Drum ID No.

4.0 MATERIAL CHARACTERIZATION AND DISPOSAL

IDM will be characterized and tested to determine whether it is a hazardous waste as defined by 40 CFR Part 261 and to determine what disposal options exist in accordance with RCRA regulations and the Virginia Hazardous Waste Management Regulations (VHWMR).

In general, IDM will be considered a hazardous waste if it contains a listed hazardous waste or if the IDM exhibits a characteristic of hazardous waste.

Work plan addenda will identify the appropriate characterization and testing program for IDM based on the following:

- Site-specific conditions related to chemicals of concern, etc.
- The nature and quantity of expected IDM to be generated during site-specific investigations.
- Applicable Federal, State, and local regulations, such as RCRA, VHWMR regulations and policies and procedures, and Army Regulation 200-1.

- RFAAP specific requirements and policies for IDM characterization and disposal at the time of the investigation.

In general, appropriate USEPA SW 846 Test Methods for Evaluating Solid Waste will be used for testing IDM and will be specified in work plan addenda. Other appropriate test methods may be specified by RFAAP in addition to SW 846 Methods that are specific to installation operations, the site of interest (percent explosive content, reactivity, etc.), or requirements for disposal at RFAAP water treatment facilities or publicly owned treatment works.

Responsibility for the final disposal of IDM will be determined before field activities are begun and will be described in work plan addenda. Off-site disposal of IDM will be coordinated with RFAAP (generator) to ensure appropriate disposition. The contractor will coordinate IDM transportation and disposal activities for RFAAP (generator).

At the direction of RFAAP, appropriate waste manifests will be prepared by the USACE contractor or Alliant Techsystems subcontractor for transportation and disposal. Alliant Techsystems or other appropriate RFAAP entity will be listed as the generator and an appointed representative from RFAAP will review and sign the manifest for offsite disposal.

RFAAP will make the final decision on the selection of the transporter, storage, and disposal facility (TSDFs) or recycling facility. RFAAP will provide the contractor a listing of previously used TSDFs for priority consideration. Proposed facilities that are not included on the listing are required to provide a copy of the TSDFs most recent state or federal inspection to the installation. Waste characterization and testing results will be submitted to RFAAP (generator) for review and approval before final disposition of the material.

Hazardous waste: Prior to final disposition, a hazardous waste manifest will be furnished by the TSDF to accompany transport to the disposal facility. Following final disposition, a certificate of disposal will be furnished by the disposal facility. Copies of the manifests and certificates of disposal are to be provided to RFAAP and retained on file by the contractor or subcontractor.

4.0 PRECAUTIONS

- Because the weight of one drum can exceed 500 lbs, under no circumstances should personnel attempt to move drums by hand.
- Refer to the site-specific health and safety plan when managing IDM.

5.0 REFERENCES

Safety Rules for Contractors and Subcontractors, (As Updated). Alliant Techsystems, Incorporated, Radford Army Ammunition Plant.

STANDARD OPERATING PROCEDURE 80.1
DECONTAMINATION

1.0 SCOPE AND APPLICATION

Before leaving the site, all personnel or equipment involved in intrusive sampling or having entered a hazardous waste site during intrusive sampling must be thoroughly decontaminated to prevent adverse health effects and minimize the spread of contamination. Equipment must be decontaminated between sites to preclude cross-contamination. Decontamination water will be free of contaminants as evidenced through either chemical analyses or certificates of analysis. This standard operating procedure (SOP) describes general decontamination requirements for site personnel and sampling equipment. Decontamination procedures for contaminants requiring a more stringent procedure, e.g., dioxins/furans, will be included in site-specific addenda.

2.0 MATERIALS

- Plastic sheeting, buckets or tubs, pressure sprayer, rinse bottles, and brushes;
- U.S. Army Corps of Engineers or installation approved decontamination water source;
- Deionized ultra-filtered, HPLC-grade organic free water (DIUF);
- Non-phosphate laboratory detergent;
- Nitric Acid, 0.1 Normal (N) solution;
- Pesticide-grade solvent, Methanol;
- Aluminum foil;
- Paper towels;
- Plastic garbage bags; and
- Appropriate containers for management of investigation-derived material (IDM).

3.0 PROCEDURE

3.1 SAMPLE BOTTLES

At the completion of each sampling activity the exterior surfaces of the sample bottles must be decontaminated as follows:

- Be sure that the bottle lids are on tight.
- Wipe the outside of the bottle with a paper towel to remove gross contamination.

3.2 PERSONNEL DECONTAMINATION

Review the site-specific health and safety plan for the appropriate decontamination procedures.

3.3 EQUIPMENT DECONTAMINATION

3.3.1 Drilling Rigs

Drilling rigs and associated equipment, such as augers, drill casing, rods, samplers, tools, recirculation tank, and water tank (inside and out), will be decontaminated before site entry, after over-the-road mobilization and immediately upon departure from a site after drilling a hole. Supplementary cleaning will be performed before site entry. There is a likelihood that contamination has accumulated on tires and as spatter or dust en route from one site to the next.

1. Place contaminated equipment in an enclosure designed to contain all decontamination residues (water, sludge, etc.).
2. Steam-clean equipment until all dirt, mud, grease, asphaltic, bituminous, or other encrusting coating materials (with the exception of manufacturer-applied paint) has been removed.
3. Water used will be taken from an approved source.
4. When cross-contamination from metals is a concern, rinse sampling components such as split spoons, geo-punch stems, and augers with nitric acid, 0.1N.
5. Rinse with DIUF water.
6. When semi-volatile and non-volatile organics may be present, rinse the sampling components with pesticide-grade solvent methanol.
7. Double rinse the sampling components with DIUF water.
8. Decontamination residues and fluids will be appropriately managed as IDM per work plan addenda and SOP 80.1.

3.3.2 Well Casing and Screen

Prior to use, well casing and screen materials will be decontaminated. This activity will be performed in the leak proof, decontamination pad, which will be constructed prior to commencement of the field investigation. The decontamination process will include:

- Steam cleaning with approved source water.
- Rinse with DUIF water.
- Air-dry on plastic sheeting.
- Wrap in plastic sheeting to prevent contamination during storage/transit.

3.3.3 Non Dedicated Submersible Pumps Used for Purging and Sampling

1. Scrub the exterior of the pump to remove gross (visible) contamination using appropriate brushes, approved water, and non-phosphate detergent (steam cleaning may be substituted for detergent scrub).
2. Pump an appropriate amount of laboratory detergent solution (minimum 10 gallons) to purge and clean the interior of the pump.
3. Rinse by pumping no less than 10 gallons of approved water to rinse.
4. Rinse the pump exterior with approved decontamination water.

5. When cross-contamination from metals is a concern, rinse the pump exterior with approved nitric acid 0.1N solution.
6. Rinse the pump exterior with DIUF water.
7. When semi-volatile and non-volatile organics may be present, rinse the pump exterior with pesticide-grade solvent methanol.
8. Double rinse the pump exterior with DIUF water.
9. Air-dry on aluminum foil or clean plastic sheeting.
10. Wrap pump in aluminum foil or clean plastic sheeting, or store in a clean, dedicated PVC or PTFE storage container.
11. Solutions and residuals generated from decontamination activities will be managed appropriately as IDM per work plan addenda and SOP 80.1.

3.3.4 Sample Equipment and Measuring Water Level Devices

1. Scrub the equipment to remove gross (visible) contamination using appropriate brush (es), approved water, and non-phosphate detergent.
2. Rinse with approved source water.
3. When cross-contamination from metals is a concern, rinse the sampling equipment with approved nitric acid 0.1N solution.
4. Rinse equipment with DIUF water.
5. When semi-volatile and non-volatile organics may be present, rinse the sampling equipment with pesticide-grade solvent methanol.
6. Double rinse the sampling equipment with DIUF water.
7. Air-dry on aluminum foil or clean plastic sheeting.
8. Wrap in aluminum foil, clean plastic sheeting, or zip top bag or store in a clean, dedicated PVC or PTFE storage container.
9. Solutions and residuals generated from decontamination activities will be managed appropriately as IDM per work plan addenda and SOP 80.1.

3.3.5 Other Sampling and Measurement Probes

Temperature, pH, conductivity, Redox, and dissolved oxygen probes will be decontaminated according to manufacturer's specifications. If no such specifications exist, remove gross contamination and triple-rinse probe with DIUF water.

4.0 PRECAUTIONS

- Manage IDM appropriately according to the requirements specified in work plan addenda.
- Follow appropriate procedures as specified in the site-specific health and safety plan.

5.0 REFERENCES

USACE. 2001. Requirements for the Preparation of Sampling and Analysis Plans. EM 200-1-3. 1 February.

STANDARD OPERATING PROCEDURE 90.1
PHOTOIONIZATION DETECTOR (HNu Model PI–101 and HW–101)

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for field operations with a photoionization detector (HNu Systems Model PI–101 or HW–101). The photoionization detector (PID) detects total ionizables; hence it is used to monitor both organic and inorganic vapors and gases to determine relative concentrations of air contaminants. This information is used to establish level of protection and other control measures such as action levels. The PID cannot effectively detect compounds having ionization potentials above the photon energy level of the lamp used; therefore, methane, which has an ionization potential of 12.98 eV, is undetectable by PIDs because the lamps produce 9.5, 10.2, or 11.7 eV.

Use of brand names in this SOP is in not intended as an endorsement or mandate that a given brand be used. Alternate equivalent brands of detectors, sensors, meters, etc., are acceptable. If alternate equipment is to be used, the contractor shall provide applicable and comparable SOPs for its maintenance and calibration.

2.0 MATERIALS

- HNu Systems Model PI–101 or HW–101 survey probe with 9.5, 10.2, or 11.7 eV lamp;
- Lead-acid gel-cell battery;
- Calibration gas (e.g., isobutylene, 101 ppm) with regulator;
- Tygon tubing;
- Tedlar bag (optional);
- Instrument logbook; and
- Field logbook.

3.0 PROCEDURE

These procedures are to be followed when using the HNu in the field.

3.1 STARTUP

1. Before attaching the probe, check the function switch on the control panel to ensure that it is in the off position. Attach the probe by plugging it into the interface on the top of the readout module.
2. Turn the function switch to the battery check position. The needle on the meter should read within or above the green battery arc on the scale; if not, recharge the battery. If the red indicator light comes on, the battery needs recharging or service may be indicated.
3. Turn the function switch to any range setting. Listen for the hum of the fan motor. Check meter function by holding a solvent-based marker pen near the sample intake. If there is no needle deflection, look briefly into the end of the probe (no more than 1 or 2 sec) to see if the lamp is on; if it is on, it will give a purple glow. Do not stare into the probe any longer than 2 sec. Long-term exposure to UV light can damage the eyes. (See further information in Section 5.)
4. To zero the instrument, turn the function switch to the standby position and rotate the zero adjustment until the meter reads zero. A calibration gas is not needed since this is an electronic zero adjustment. If

the span adjustment setting is changed after the zero is set, the zero should be rechecked and adjusted if necessary. Allow the instrument to warm up for 3–5 min to ensure that the zero reading is stable. If necessary, readjust the zero.

3.2 OPERATIONAL CHECK

Follow the startup procedure in Section 3.1.
With the instrument set on the 0–20 range, hold a solvent-based marker near the probe tip. If the meter deflects upscale, the instrument is working.

3.3 FIELD CALIBRATION PROCEDURE

1. Follow the startup procedures in Section 3.1 and the operational check in Section 3.2.
2. Set the function switch to the range setting for the concentration of the calibration gas.
3. Attach a regulator HNu P/N 101-351 or equivalent (flow = 200 to 300 ml/min) to a disposable cylinder of isobutylene (HNu 101-351 or equivalent). Connect the regulator to the probe of the HNu with a piece of clean Tygon tubing. Turn on the valve of the regulator.
4. After 5 sec, adjust the span dial until the meter reading equals the benzene concentration of the calibration gas used, corrected to its equivalence, which should be marked on the canister (Isobutylene ~0.7X benzene).
5. Record in the field log the instrument ID No., serial No., initial and final span settings, date, time, location, concentration and type of calibration gas used, and the signature of the person who calibrated the instrument.
6. If the HNu does not function or calibrate properly, the project equipment manager is to be notified as soon as possible. Under no circumstances is work requiring monitoring with a PI–101 or HW–101 to be done with a malfunctioning instrument.

3.4 CALIBRATION TO A GAS OTHER THAN ISOBUTYLENE

The HNu may be calibrated to any certified calibration gas. However, after calibration, all subsequent instrument readings will be relative to the calibration gas used. General procedures include the following:

1. Calibrate according to procedure 3.3.
2. Partially fill and flush one-to-two times a gas bag (Tedlar recommended) with the certified National Institute of Standards and Technology (NIST) (formerly NBS) traceable calibration gas. Then fill the bag with 1–3 L of the calibration gas. If the gas is toxic, this must be done in a fume hood.
3. Feed the calibration gas into the probe with the range set for the value of the gas. After 5 sec, adjust the span control until the meter reads the value of the calibration gas.
4. Record the results of the calibration on the calibration/maintenance log and attach a new calibration sticker (if available) or correct the existing sticker to reflect the new calibration data. All subsequent readings will be relative to the new calibration gas.

3.5 OPERATION

1. Follow the startup procedure, operational check, and calibration check (refer to Section 3.1).
2. Set the function switch to the appropriate range. If the concentration of gas vapors is unknown, set the function switch to 0-20 ppm range. Adjust if necessary.

3. Prevent exposing the HNu to excessive moisture, dirt, or contaminant while monitoring the work activity as specified in the Site Health and Safety Plan.
4. When the activity is completed, or at the end of the day, carefully clean the outside of the HNu with a damp disposable towel to remove all visible dirt. Return the HNu to a secure area and place on charge. Charge after each use; the lead acid batteries cannot be ruined by over charging.
5. With the exception of the probe's inlet and exhaust, the HNu can be wrapped in clear plastic to prevent it from becoming contaminated and to prevent water from getting inside in the event of precipitation. If the instrument becomes contaminated, make sure to take necessary steps to decontaminate it. Call the Equipment Administrator if necessary; under no circumstances should an instrument be returned from the field in a contaminated condition.

4.0 MAINTENANCE

Calibration/maintenance logs are to be filled in completely whenever a PI-101 or HW-101 receives servicing. This is true of both contractor-owned and rental instruments.

The equipment manager should be called to arrange for a fresh instrument when necessary. The contractor's equipment facility is responsible for arranging all repairs that cannot be performed by the project equipment manager.

4.1 ROUTINE SERVICE

The PID's performance is affected by a number of factors. These include but are not limited to the decay of the UV lamp output over time and the accumulation of dust and other particulate material and contaminates on the lamp and in the ion chamber. Because of these factors, the PID should not be left in the field for a period of more than 2 weeks before being replaced with a fresh instrument. If a site is going to be inactive for a period of more than a week, all monitoring instruments are to be returned to the project equipment manager or his trained designee for servicing and/or reassignment. The following procedures are to be performed at the designated intervals for routine service.

Procedure	Frequency
Operational check	Before use and at instrument return
Field calibration	Before use and at instrument return
Full calibration	Bi-weekly (return instrument to equipment manager for replacement with a fresh unit)
Clean UV lamp and	Bi-weekly or as needed ion chamber
Replace UV Lamp	As needed

4.1.1 UV Lamp and Ion Chamber Cleaning

During periods of analyzer operation, dust and other foreign materials are drawn into the probe forming deposits on the surface of the UV lamp and in the ion chamber. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, or drifting and show apparent moisture sensitivity. These deposits interfere with the ionization process and cause erroneous readings. Check for this condition regularly to ensure that the HNu is functioning properly. If the instrument is malfunctioning, call your equipment manager to arrange to have a fresh replacement.

4.1.2 Lamp eV Change

If different applications for the analyzer would require different eV lamps, separate probes, each with its own eV lamp, must be used. A single readout assembly will serve for any of the probes (9.5, 10.2, and 11.7 eV). A change in probe will require resetting of the zero control and recalibrating the instrument. The 11.7 eV lamp will detect more compounds than either of the two lower eV lamps. However, the 11.7 eV probe needs more frequent calibration; it burns out much faster than the lower eV lamps.

5.0 PRECAUTIONS

- The HNu PI–101 and HW–101 are designed to sample air or vapors only. *Do not allow any liquids or low boiling vapors to get into the probe or meter assembly.*
- High concentrations of any gas can cause erroneous readings. High humidity can also cause the instrument readings to vary significantly from the actual concentration of gases or vapors present. This is true even through the HNu cannot react to water vapor.
- High humidity, dust, and exposure to concentrations of low boiling vapors will contaminate the ion chamber, causing a steady decrease in sensitivity.
- Continued exposure to ultraviolet light generated by the light source can be harmful to eyesight. If a visual check of the UV lamp is performed *do not look at the light source from a distance closer than 6 inches with unprotected eyes.* Use eye protection (UV-blocking sunglasses or safety glasses). Only look briefly—never more than about 2 sec.
- Place the instrument on charge after each use; the lead batteries cannot be ruined by over charging.
- If at any time the instrument does not check out or calibrate properly in the field, the equipment manager is to be notified immediately and a replacement obtained for the malfunctioning instrument. Under no circumstances should fieldwork requiring continuous air monitoring for organic vapors and/or gases be done with a malfunctioning Hnu or without a HNu or an approved comparable instrument.

6.0 REFERENCES

Manufacturer's Equipment Manual.

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APPENDIX D

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APPENDIX D

List of Sub-Appendices

Appendix D.1 – Physical Sample Results

Appendix D.2 – Boring Logs
- **Appendix D.2.1 – Previous Investigation Boring Logs**
- **Appendix D.2.2 – Site Screening Process Boring Logs**

Appendix D.3 – Field Sampling Forms
- **Appendix D.3.1 – Soil Sampling Forms**
- **Appendix D.3.2 – Monitoring Well Development/Sampling Forms**
- **Appendix D.3.3 – Groundwater Re-Sampling Forms**

Appendix D.4 – Investigation-Derived Material Analytical Results

Appendix D.5 – Slug Test Data

Appendix D.6 – Site-Specific SSL Calculations

Appendix D.7 – Statistical Calculations
- **Appendix D.7.1 - Exposure Point Concentration Calculation Results – ProUCL 4.0**
- **Appendix D.7.2 - Background Means Comparison Summary/Results - ProUCL 4.0**

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APPENDIX D.1

PHYSICAL SOIL SAMPLE RESULTS

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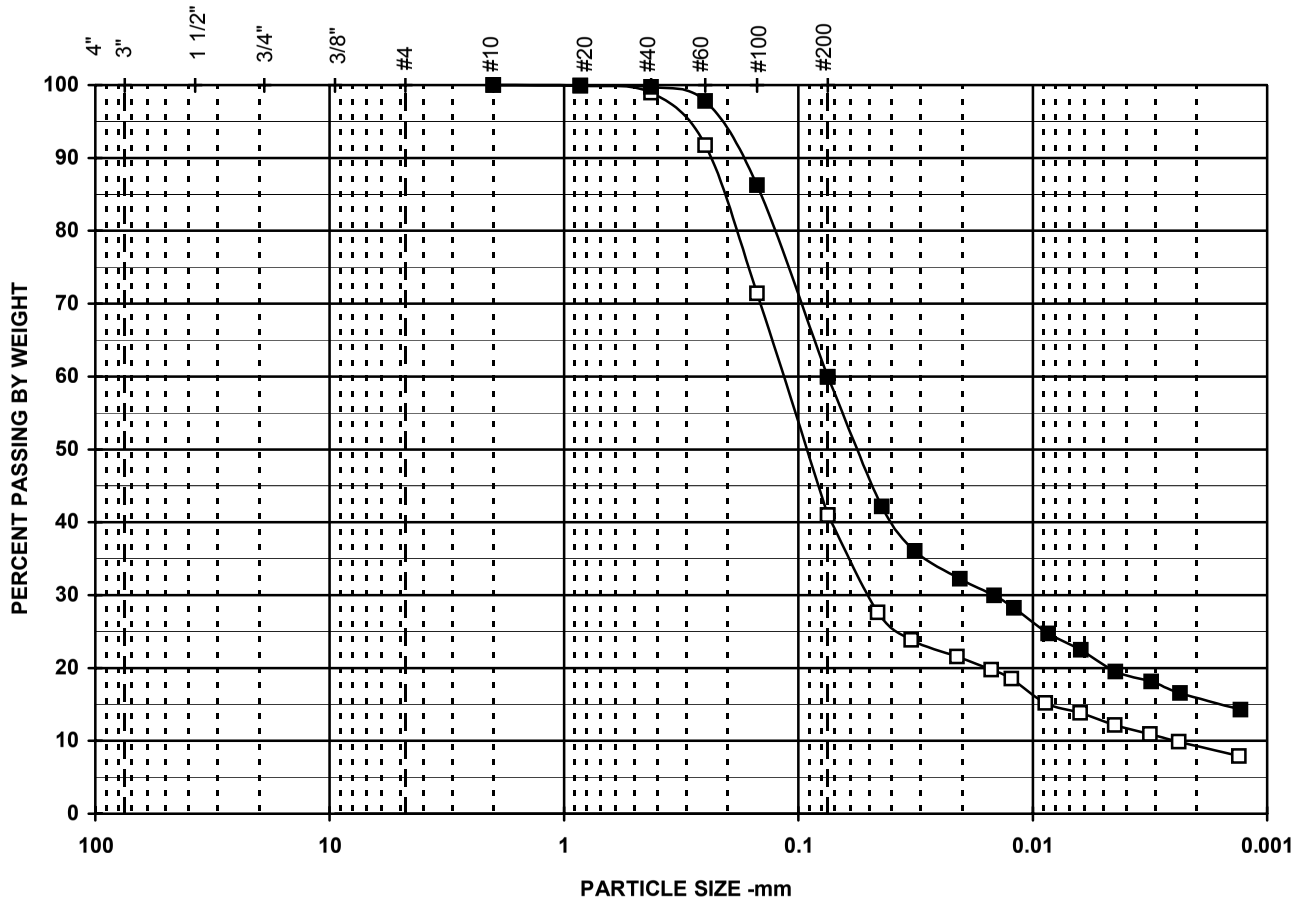
SWMU 45

LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS											REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 μm (%)	pH Distilled Water	pH 0.01 M CaCl Solution	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	
45SB	4A	1.5-4										91.5		voids in tube
45SB	4A	1.8	18.5											
45SB	4A	2.35	14.4											
45SB	4A	2.9	18.5											
45SB	4A-C	3.15								6.4	5.9			
45SB	4A	3.45	15.4											
45SB	4A-D	3.7	20.3	29	26	3	SM	41.0	9					
45SB	4B	5.5-8										114.8		
45SB	4B	5.7	20.9											
45SB	4B	6.25	20.1											
45SB	4B	6.8	20.7											
45SB	4B-C	7.05								4.5	4.0			
45SB	4B	7.35	22.4											
45SB	4B-D	7.6	20.8	28	21	7	CL-ML	59.9	16					
45SB	8A	0-2.5										85.1		
45SB	8A	0.3	19.9											
45SB	8A	0.85	15.3											
45SB	8A	1.4	11.5											
45SB	8A-C	1.65								6.2	5.7			
45SB	8A	1.95	14.2											
45SB	8A-D	2.2	14.9	36	26	10	ML	50.7	10					
45SB	8B	5.5-8										89.4		
45SB	8B	5.8	9.0											
45SB	8B	6.35	9.2											
45SB	8B	6.9	8.6											
45SB	8B-C	7.15								4.1	3.7			
45SB	8B	7.45	11.1											
45SB	8B-D	7.7	12.3	30	21	9	CL	61.1	17					

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Symbol	□	■	○
Boring	45SB	45SB	
Sample	4A-D	4B-D	
Spec			
Depth	3.7	7.6	
% +3"			
% Gravel			
% SAND	59.0	40.1	
% FINES	41.0	59.9	
% -2μ	9	16	
Cc			
Cu			
LL	29	28	
PL	26	21	
PI	3	7	
USCS	SM	CL-ML	
w (%)	20.3	20.8	

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			
3/4"			
3/8"			
4			
10	100.0	100.0	
20	99.9	99.9	
40	98.9	99.7	
60	91.7	97.8	
100	71.4	86.2	
200	41.0	59.9	

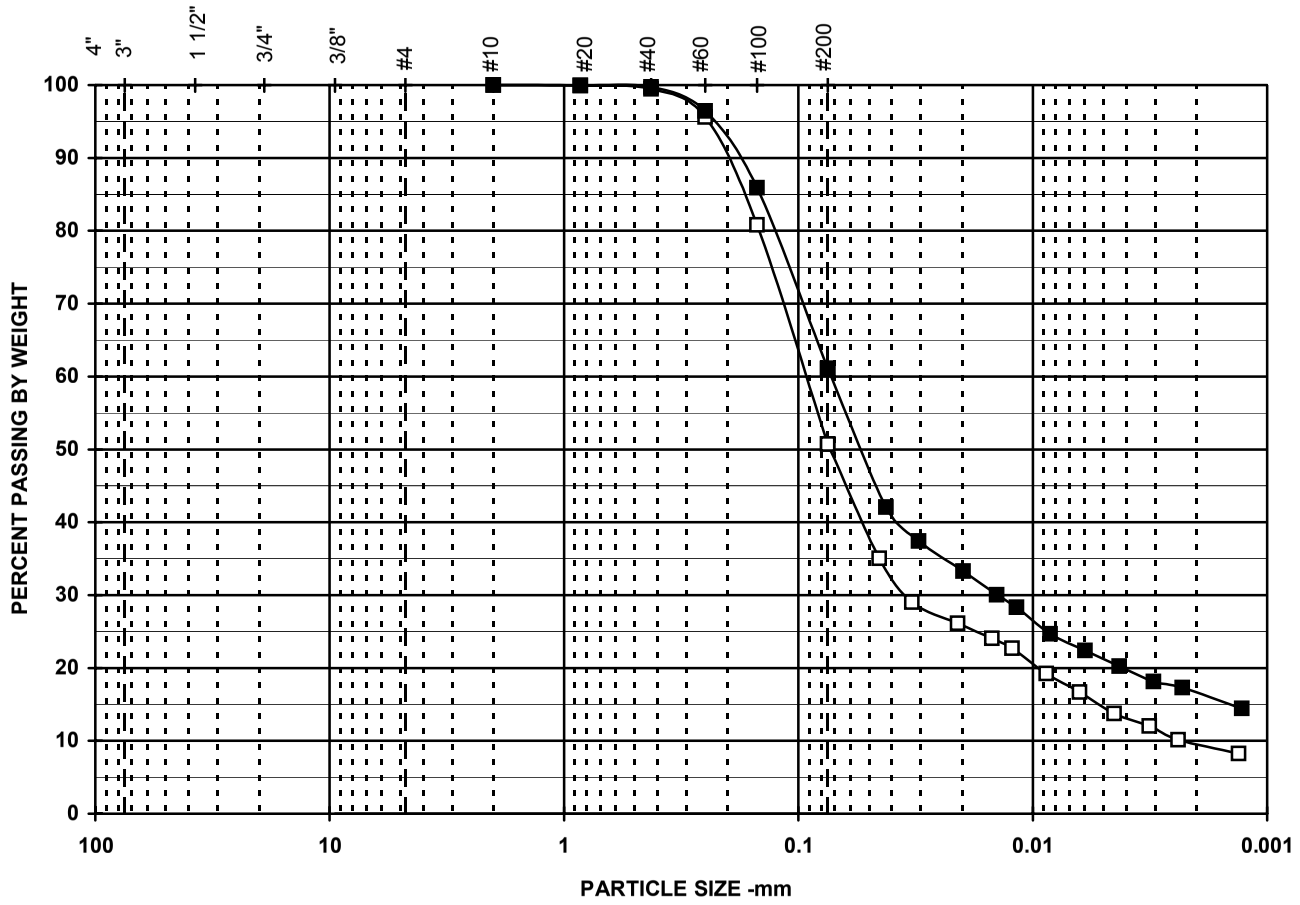
SYMBOL	DESCRIPTION AND REMARKS
□	brown silty f. SAND, trace m. sand.
■	brown f. sandy silty CLAY.
○	

PARTICLE SIZE DISTRIBUTION
SWMU 45

Project No.		
11656351	May 2008	Figure

URS Corporation

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



SYMBOL	DESCRIPTION AND REMARKS
□	brown f. sandy SILT.
■	brown f. sandy silty CLAY.
○	

Symbol	□	■	○
Boring	45SB	45SB	
Sample	8A-D	8B-D	
Spec			
Depth	2.2	7.7	
% +3"			
% Gravel			
% SAND	49.3	38.9	
% FINES	50.7	61.1	
% -2μ	10	17	
Cc			
Cu			
LL	36	30	
PL	26	21	
PI	10	9	
USCS	ML	CL	
w (%)	14.9	12.3	

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			
3/4"			
3/8"			
4			
10	100.0	100.0	
20	99.9	100.0	
40	99.5	99.7	
60	95.6	96.5	
100	80.8	85.9	
200	50.7	61.1	

PARTICLE SIZE DISTRIBUTION
SWMU 45

Project No.		Figure
11656351	May 2008	

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APPENDIX D.2

BORING LOGS

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APPENDIX D.2.1

PREVIOUS INVESTIGATION BORING LOGS

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BORING 45MW1

Surface Elevation: 0
Location: Radford AAP, Virginia
Start: 07:22 on 9-28-91
Finish: 12:20 on 9-28-91

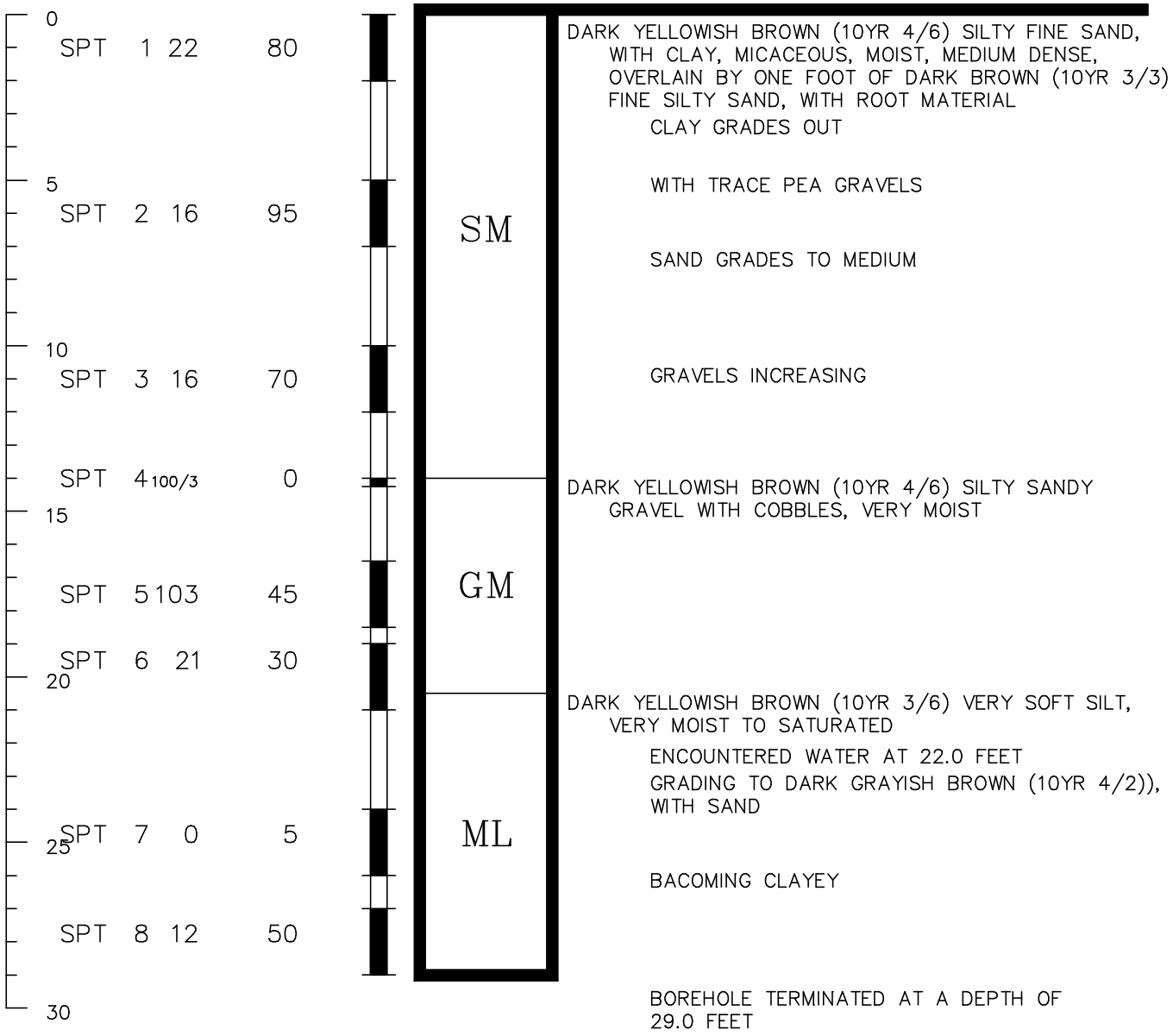

PLATE
LOG OF BORING

Dames & Moore

FILE

BORING 45MW2

Surface Elevation: 0
Location: Radford AAP, Virginia
Start: 07:22 on 9-29-91
Finish: 08:30 on 9-29-91

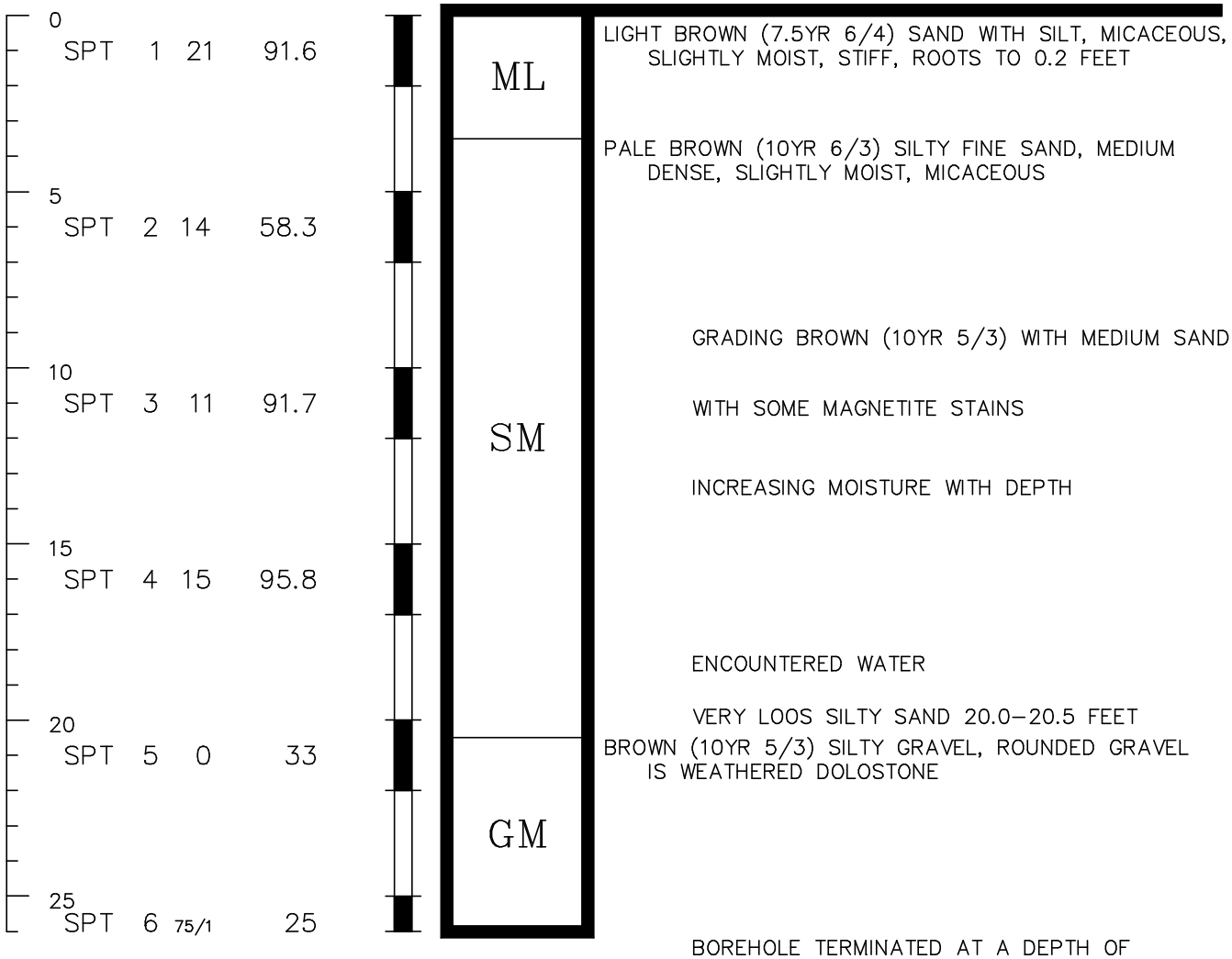

PLATE
LOG OF BORING

Dames & Moore

FILE

BORING 45MW3

Surface Elevation: 0
Location: Radford AAP, Virginia
Start: 10:41 on 9-29-91
Finish: 11:49 on 9-29-91

Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	RQD %	Sample Interval	Symbols	Description
0	SPT	1	18		87.5			ML	BROWN (10YR 5/3) FINE SANDY SILT, DRY, VERY STIFF, TRACE ORGANICS, FILL PENETRATED LANDFILL AT 1.0 FEET, OCCASIONAL SMALL BLACK RUBBER AND PAPER GRADING MOIST, NO PAPER BELOW 3.0 FEET
5	SPT	2	11		95.8			SM	VERY PALE BROWN (10YR 7/4) FINE TO MEDIUM SAND, MOIST, NATURAL UNDISTURBED SOILS, MEDIUM DENSE, MICACEOUS WITH SOME THINLY LAMINATED LENSES OF FINE BROWN SILT
10	SPT	3	13		91.7				INCREASING MOISTURE WITH DAPTH, SOME MAGNETITE STAINS
15	SPT	4	15		62.5				GRADING BROWN (10YR 5/3)
20	SPT	5	31		91.7			GM	BROWN (10YR 5/3) SILTY GRAVEL, VERY MOIST ENCOUNTERED WATER AT 22.0 FEET
25	SPT	6	9		66.7			SC	REDDISH BROWN (5YR 4/3) SILTY CLAY, HIGHLY PLASTIC, STICKY, SOME FINE SAND, SOME GRAY MOTTLING
	SPT	7	0		33.3				GRADING BROWN (10YR 5/3) VERY STIFF
30									BOREHOLE TERMINATED AT A DEPTH OF 30.5 FEET
35									

PLATE
LOG OF BORING

Dames & Moore

FILE

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APPENDIX D.2.2

SITE SCREENING PROCESS BORING LOGS

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Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SB1

Sheet 1 of 1

Date(s) Drilled	**May 7, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet / Downhole Depth, feet	SAMPLES Type	Number	Recovery (in)	PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
0						Topsoil	Topsoil	
				19.4			5YR 4/3 reddish brown, fine sandy SILT, dry, micaceous, soft	Collected 45SB1A and MS/MSD at 0.2-1.0 ft bgs
1							Moist at 1.0 ft bgs	
2		1	36.0					
3								
4								
5						ML		Collected 45SB1B at 5.0 - 7.0 ft bgs
6		2	48.0	60.3				
7								
8								
9		3	24.0	22.4				
10							Boring terminated at 10 ft bgs	
11								
12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SB1

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC2

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
	1							7.5YR 4/3 brown, fine sandy SILT, moist, micaceous, soft	
	2		1	40.0					
	3								
	4								
	5						ML		
	6		2	48.0					
	7							Grades to 7.5YR 4/6 strong brown	
	8								
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC3

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet / Downhole Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Recovery (in)	SAMPLES: PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
0						Topsoil	Topsoil	
							7.5YR 4/6 strong brown, fine sandy SILT, moist, micaceous, soft	
1								
2		1	40.0					
3								
4								
5						ML		
6		2	48.0					
7								
8							Grades to 7.5YR 5/6 strong brown	
9		3	24.0					
10							Boring terminated at 10 ft bgs	
11								
12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC3

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SB4

Sheet 1 of 1

Date(s) Drilled	**May 7, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	Number	Recovery (in)	PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
	1						ML	5YR 4/6 yellowish red, fine sandy SILT, dry, soft	
	2		1	48.0	1.7		SM	5YR 4/2 dark reddish gray, silty SAND with gravel, moist, loose, no apparent odor, contains debris (paper, wire, trash), ~10-15% of material	Collected 45SB4A-PS at 1.5 - 4.0 ft bgs
	3								
	4								
	5							5YR 4/1 dark gray, fine sandy SILT and CLAY, moist, micaceous, soft	
	6		2	48.0	1.1				Collected 45SB4B-PS at 5.5 - 8.0 ft bgs
	7						CL/ML		
	8								
	9		3	24.0	1.5				
	10							Very moist at 10 ft bgs	
								Boring terminated at 10 ft bgs.	
	11								
	12								

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SB4

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SB5

Sheet 1 of 1

Date(s) Drilled	**May 7, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								10YR 5/4 yellowish brown, fine sandy SILT, moist, soft to medium stiff	Collected 45SB5A at 0.2 - 1.0 ft
	1								
	2		1	40.0	0				
	3								
	4							Slightly moist	
	5						ML		Collected 45SB5B at 5.0 - 7.0 ft bgs
	6		2	48.0	0				
	7								
	8								
	9		3	24.0	0				
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC6

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil 10YR 3/3 dark brown, fine sandy SILT, moist, soft	
	1								
	2		1	40.0					
	3								
	4							Decreasing moisture	
	5						ML		
	6		2	24.0					
	7								
	8							7.5YR 6/4 light brown, SILT, very soft, slightly moist	
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC6

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC7

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								5YR 3/2 dark reddish brown, fine sandy SILT, dry, soft	
	1							Moist at 1.0 ft bgs	
	2		1	48.0					
	3								
	4								
	5						ML		
	6		2	48.0					
	7							Grades to 5YR 4/4 reddish brown	
	8								
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC7

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SB8

Sheet 1 of 1

Date(s) Drilled	**May 7, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	Collected 45SB8A-PS at 0.0-2.5 ft bgs
	1							10YR 3/3 dark brown, fine sandy SILT, dry, micaceous, soft	Collected 45SB8A at 0.2 - 1.0 ft bgs
	2		1	32.0	179		ML	Slightly moist	
	3								
	4							7.5YR 5/6 strong brown, fine sandy silty CLAY, slightly moist, micaceous, medium stiff, slightly plastic	
	5								Collected 45SB8B at 5.0-7.0 ft bgs
	6		2	40.0	111				Collected 45SB8B-PS at 5.5-8.0 ft bgs
	7						CL		
	8								
	9		3	24.0	9.1				
	10							Boring was terminated at 10 feet bgs.	
	11								
	12								

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SB8

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC9

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
							SM	5YR 4/6 yellowish red, silty fine to medium SAND, moist, loose	
	1							5YR 4/2 dark reddish gray, fine sandy SILT, moist, micaceous, soft, observed pieces of wood (roots, branches, etc)	
	2		1	36.0					
	3								
	4							Dry	
	5								
							ML		
	6		2	44.0					
	7								
	8								
								5YR 5/4 reddish brown, clayey sandy SILT, moist, medium stiff	
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC9

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC10

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								7.5YR 4/2 brown, fine sandy SILT, moist, micaceous, soft	
	1								
	2		1	36.0					
	3								
	4							5YR 5/4 reddish brown, clayey sandy SILT, moist, soft	
	5						ML		
	6		2	48.0					
	7								
	8								
	9		3	24.0				Observed pieces of rock/gravels at 9.5 ft bgs	
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC10

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC11

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								10YR 3/2 very dark grayish brown, silty SAND, moist, medium dense	
	1								
	2		1	40.0				10YR 4/4 dark yellowish brown, silty SAND with some clay, moist, medium dense	
	3								
	4							7.5YR 6/6 reddish yellow, silty SAND, moist, dense	
	5						SM		
	6		2	48.0					
	7								
	8							7.5YR 6/6 reddish yellow, silty SAND with some gravel, moist, loose	
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC11

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC12

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
	1							5YR 5/4 reddish brown, sandy SILT with trace clay, moist, soft	
	2		1	48.0					
	3								
	4								
	5						ML		
	6		2	48.0					
	7							5YR 5/4 reddish brown, sandy SILT with gravel, slightly moist, soft Gravel grades out at 7.25 ft bgs	
	8								
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC12

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC13

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								7.5YR 4/2 brown, fine sandy SILT, micaceous, moist, soft	
	1								
	2		1	48.0					
	3							7.5YR 5/3 brown, sandy SILT with trace clay, moist, soft	
	4						ML		
	5								
	6		2	48.0					
								7.5YR 5/6 strong brown, fine sandy SILT, slightly moist, micaceous, medium stiff	
	7								
								Gravelly at 7.5-7.9 ft bgs	
	8							7.5YR 5/6 strong brown, silty SAND, slightly moist, medium dense	
	9		3	24.0			SM	Gravelly at 9.0-10.0 ft bgs, large diameter	
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC13

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SB14

Sheet 1 of 1

Date(s) Drilled	May 7, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Drilling Method	Direct Push Technology	Drilling Contractor	Richard Simmons Drilling	Total Depth of Borehole	10.0 feet
Drill Rig Type	Tractor mounted Geoprobe	Drill Bit Size/Type	4' x 2" Macrocore Sampler	Ground Surface Elevation	
Groundwater Level(s)	NA	Sampling Method	4' Macrocore with disposable acetate liner	Hammer Data	Continuous hydraulic pressure
Borehole Backfill	Bentonite pellets	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
								10YR 4/4 dark yellowish brown, fine sandy SILT, moist, micaceous, soft	Collected 45SB14A and DUP-2 at 0.2-1.0 ft bgs
	1								
	2		1	38.0	0			Color grades to 10YR 5/4 yellowish brown	
	3								
	4						ML	Grades to dense	
	5								Collected 45SB14B at 5.0-7.0 ft bgs
	6		2	48.0	0				
	7							Gravelly at 6.5-6.75 ft bgs	
								Gravelly at 7.5-7.75 ft bgs	
	8							10YR 5/4 yellowish brown, sandy SILT with gravel, slightly moist, medium stiff	
	9		3	24.0	0				
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SB14

Project: RFAAP SWMU 45 SSP Project Location: Radford Army Ammunition Plant Project Number: 11656351	Log of Borehole 45SC15 Sheet 1 of 1

Date(s) Drilled	May 8, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Drilling Method	Direct Push Technology	Drilling Contractor	Richard Simmons Drilling	Total Depth of Borehole	10.0 feet
Drill Rig Type	Tractor mounted Geoprobe	Drill Bit Size/Type	4' x 2" Macrocore Sampler	Ground Surface Elevation	
Groundwater Level(s)	NA	Sampling Method	4' Macrocore with disposable acetate liner	Hammer Data	Continuous hydraulic pressure
Borehole Backfill	Bentonite pellets	Comments			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in)	PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
	0						Topsoil	Topsoil	
	1						ML	10YR 3/3 dark brown, clayey sandy SILT, very moist, soft	
	2		1	40.0					
	3								
	4								
	5							10YR 3/3 dark brown, sandy SILT with clay and gravel, moist, soft	
	6		2	48.0					
	7						SM	7.5YR 5/4 brown silty SAND, slightly moist, dense	
	8							7.5YR 5/4 strong brown, silty SAND with gravel, slightly moist, dense	
	9		3	24.0					
	10							Boring terminated at 10 ft bgs	
	11								
	12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC15

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Borehole 45SC16

Sheet 1 of 1

Date(s) Drilled	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push Technology**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**10.0 feet**
Drill Rig Type	**Tractor mounted Geoprobe**	Drill Bit Size/Type	**4' x 2" Macrocore Sampler**	Ground Surface Elevation	
Groundwater Level(s)	**NA**	Sampling Method	**4' Macrocore with disposable acetate liner**	Hammer Data	**Continuous hydraulic pressure**
Borehole Backfill	**Bentonite pellets**	Comments			

Elevation, feet / Downhole Depth, feet	SAMPLES: Type	Number	Recovery (in)	PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES
0						Topsoil	Topsoil	
							7.5YR 6/4 light brown, silty SAND, moist, dense	
1								
2		1	48.0					
3								
4							Gravelly at 4.0-7.0 ft bgs	
5						SM		
6		2	48.0					
7							7.5YR 6/6 reddish yellow, silty SAND, slightly moist, loose	
8								
9		3	24.0					
10							Boring terminated at 10 ft bgs	
11								
12								

URS

Report: ENV_12AS_CLEVELAND+/-USCS; File: SWMU 45 SSP.GPJ; 11/7/2008 45SC16

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Boring 45MW4

Sheet 1 of 2

Date(s) Drilled and Installed	**May 8, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Drilling Method	**Direct Push/Hollow Stem Auger (HSA)**	Drilling Contractor	**Richard Simmons Drilling**	Total Depth of Borehole	**32.5 feet**
Sampling Method	**4' Macrocore with disposable acetate liner**	Drill Bit Size/Type	**4.25 HSA**	Top of Casing Elevation	**1703.83 msl**
Size and Type of Well Casing	**2-inch I.D. Schedule 40 PVC**	Screen Perforation	**0.010-inch**	Surface Elevation	**1701.69 msl**
Seal or Backfill	**Bentonite pellets/Bentonite-cement grout**	Groundwater Level(s)	**Static Groundwater 19.4 ft bgs**	Coordinates	**N 3,599,655.0 E 10,885,987.3**

Elevation feet	Depth, feet	SAMPLES Type	Number	Recovery (in.)	PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES AND WELL DETAILS
	0							Topsoil	
								5YR 3/4 dark reddish brown, sandy SILT, dry, soft, micaceous	
	2		1	32					
	4							Grades to 5YR 4/3 reddish brown, moist, medium stiff	
	6		2	48					Grout: 10% Bentonite/Cement Slurry
	8						ML		
	10		3	48					
	12								
	14		4	48					3/8-inch Hydrated Bentonite Pellets
	16								

Report: ENV_12AW_CLEVELAND+/-USCS; File: SWMU 45 SSP WELL INSTALL.GPJ; 11/7/2008 45MW4

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Boring 45MW4

Sheet 2 of 2

Elevation feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Recovery (in.)	SAMPLES PID (ppm)	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	FIELD NOTES AND WELL DETAILS
	16								No. 2 Silica Quartz Sandpack
	18		5	44			SM	5YR 4/3 reddish brown, silty fine to medium SAND, moist, loose	
	20						SW	5YR 4/3 reddish brown, gravelly SAND, moist, medium dense Groundwater encountered during drilling at 21.0 ft bgs	Screen: 0.01-inch Factory Slotted, Sch 40, 2-inch PVC
	22		6	28				Direct-push Refusal at 23.0 ft bgs	
	24							Silty SAND, saturated	
	26								
	28						SM		
	30								
	32								
	34							Boring terminated at 32.5 ft bgs	

Report: ENV_12AW_CLEVELAND+/-USCS; File: SWMU 45 SSP WELL INSTALL.GPJ; 11/7/2008 45MW4

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Test Pit 45TP1

Date(s) Excavated	May 5, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	5.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	2.0 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
	45TP1A			5YR 3/2 dark reddish brown, sandy SILT, dry, soft		Collected grab sample 45TP1A 0.1-1.0 ft bgs
				5YR 3/2 dark reddish brown, sandy SILT with gravel and debris (tags, bucket lids, metal pieces, blocks), dry	330	
1			ML			
				5YR 5/3 reddish brown, sandy SILT with clay, moist, micaceous, soft		Collected grab sample 45TP1B at 1.4-2.0 ft bgs
	45TP1B				15.9	
2				Test Pit terminated at 2.0 ft bgs		
3						
4						
5						

URS

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 11/7/2008 45TP1

Project: RFAAP SWMU 45 SSP Project Location: Radford Army Ammunition Plant Project Number: 11656351	**Log of Test Pit 45TP2**

Date(s) Excavated	May 5, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	5.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	2.0 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
	45TP2A			5YR 4/3 reddish brown, sandy SILT, dry, micaceous, contains some debris (metal pieces, metal pipes, metal tools) at 0.25-1.0 ft bgs	2.9	Collected grab sample 45TP2A at 0.25-1.0 ft bgs
1			ML	5YR 4/3 reddish brown, sandy SILT, moist, stiff, micaceous		
	45TP2B				2.2	Collected grab sample 45TP2B at 1.5-2.0 ft bgs
2				Test Pit terminated at 2.0 ft bgs		
3						
4						
5						

URS

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 11/7/2008 45TP2

Project: RFAAP SWMU 45 SSP **Project Location:** Radford Army Ammunition Plant **Project Number:** 11656351	**Log of Test Pit 45TP3**

Date(s) Excavated	**May 5, 2008**	Logged By	**Jim Carter**	Reviewed By	**Kelly Hicks**
Length of Excavation	**6.0 ft**	Width of Excavation	**3.0 ft feet**	Depth of Excavation	**12.0 feet**
Excavation Equipment	**Mini-excavator**	Excavation Contractor	**Richard Simmons Drilling Co., Inc.**	Approximate Surface Elevation	
Water Observations	**Perched water encountered**			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
0	45TP3A			5YR 4/4 reddish brown, sandy SILT, moist, micaceous, soft	268	Collected grab sample 45TP3A at 0.25-1.0 ft bgs
1			ML			
2				7.5YR 2.5/2 very dark brown, sandy SILT with LANDFILL MATERIAL (metal pieces, wiring, plastic, bottles, paper, rags, etc), moist, soft		
3						
4						
5			Landfill Material			
6				Limit of mini-excavator at 6.0 ft bgs Direct-push boring 6.0-12.0 ft bgs		
7						
8				7.5YR 4/3 brown, sandy SILT with clay, moist, soft, slight petroleum odor		Collected 45TP3B and DUP-1 at 8.0-11.0 ft bgs
9						
10	45TP3B		ML		104	
11						
12				Test Pit terminated at 6.0 ft bgs Boring terminated at 12.0 ft bgs		
13						

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 1/21/2010 45TP3

URS

Project: RFAAP SWMU 45 SSP **Project Location:** Radford Army Ammunition Plant **Project Number:** 11656351	**Log of Test Pit 45TP4**

Date(s) Excavated	May 6, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	5.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	3.3 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		Collected grab sample 45TP4A 0.25-1.0 ft bgs
	45TP4A			5YR 4/2 dark reddish gray, sandy SILT with ~10 to 15% debris (paper, plastic, bottles, metal pieces) at 0.2-2.75 ft bgs, moist, medium stiff	3.1	
1						
						Collected grab sample 45TP4B and MS/MSD at 3.0-3.25 ft bgs
2			ML			
				5YR 4/2 dark reddish gray, sandy SILT, moist, medium dense		
3	45TP4B				0.2	
				Test Pit terminated at 3.25 ft bgs		
4						
5						

URS

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 11/7/2008 45TP4

Project: RFAAP SWMU 45 SSP Project Location: Radford Army Ammunition Plant Project Number: 11656351	Log of Test Pit 45TP5

Date(s) Excavated	May 6, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	5.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	5.3 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
	45TP5A			5YR 4/3 reddish brown, fine sandy SILT, dry, micaceous, medium stiff	0	Collected grab sample 45TP5A at 0.2-1.0 ft bgs
1				Moist at 1.0 ft bgs		
2			ML			
3						
4						
5	45TP5B				0	Collected grab sample 45TP5B 5.0-5.25 ft bgs
				Test Pit terminated at 5.25 ft bgs		
6						

URS

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Test Pit 45TP6

Date(s) Excavated	May 6, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	6.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	6.0 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
	45TP6A		ML	2.5YR 4/4 reddish brown, clayey SILT, moist, stiff 5YR 3/3 dark reddish brown, sandy SILT with clay, moist, medium stiff	151	Collected 45TP6A at 0.2-1.0 ft bgs
1						
2			Landfill Material	5YR 3/3 dark reddish brown, sandy SILT with LANDFILL MATERIAL (plastic, wood, rags, bottles, etc.), moist, medium stiff		
3						
4						
5	45TP6B		ML	5YR 3/3 dark reddish brown, clayey SILT, moist, medium stiff	60.3	Collected 45TP6B at 5.5-6.0 ft bgs
6				Test Pit terminated at 6.0 ft bgs		
7						

URS

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 11/7/2008 45TP6

Project: RFAAP SWMU 45 SSP
Project Location: Radford Army Ammunition Plant
Project Number: 11656351

Log of Test Pit 45TP7

Date(s) Excavated	May 6, 2008	Logged By	Jim Carter	Reviewed By	Kelly Hicks
Length of Excavation	5.0 ft	Width of Excavation	2.0 ft feet	Depth of Excavation	5.5 feet
Excavation Equipment	Mini-excavator	Excavation Contractor	Richard Simmons Drilling Co., Inc.	Approximate Surface Elevation	
Water Observations	Groundwater not encountered			Approximate Pit Trend	
Comments					

Elevation feet / Depth, feet	Sample Type / Sample Number	Graphic Log	Lithologic Log (USCS Code)	MATERIAL DESCRIPTION	PID (ppm)	FIELD NOTES
0			Topsoil	Topsoil		
	45TP7A			5YR 5/6 yellowish red, sandy SILT with clay, dry, micaceous, medium stiff	0.0	Collected 45TP7A at 0.2-1.0 ft bgs
1				Moist at 1.0 ft bgs		
2			ML			
3				Grades to very stiff/hard		
				Hand auger 3.5-5.5 ft bgs		
4						
5	45TP7B				5.2	Collected 45TP7B at 5.0-5.5 ft bgs
				Test Pit terminated at 3.5 ft bgs Hand auger 3.5-5.5 ft bgs		
6						

URS

Report: ENV_RIC_TEST_PIT; File: SWMU 45 SSP TEST PITS.GPJ; 11/7/2008 45TP7

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APPENDIX D.3

FIELD SAMPLING FORMS

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APPENDIX D.3.1

SOIL SAMPLING FORMS

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Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/5/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny @ 65°	Sampling Team:	MF,JC

Sample ID: **45TP1A** Sample Collection Time: 1115

Sampling Device: Backhoe excavator Depth (top): _____
Depth Interval: 0 - 1ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____
PID Reading: 330 ppm

Comments: _____

Field QC / Photo ID
Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Sample ID: **45TP1B** Sample Collection Time: 1140

Sampling Device: Backhoe excavator Depth (top): _____
Depth Interval: 2ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____
PID Reading: 15.9 ppm

Comments: _____

Field QC / Photo ID
Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____
Depth Interval: _____

Sample Containers/Preservatives

VOC	
SVOC	
Pesticides	
PCBs	
Explosives	
Metals	

Physical Analysis: _____
PID Reading: _____

Comments: _____

Field QC / Photo ID
Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Signature of Samplers: _____ Date Completed: 5/5/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/5/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~70°	Sampling Team:	MF,JC

Sample ID: **45TP2A** Sample Collection Time: 1215

Sampling Device: Backhoe excavator Depth (top): _____ Depth Interval: 0-1ft

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____ PID Reading: 2.9 ppm

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: **45TP2B** Sample Collection Time: 1240

Sampling Device: Backhoe excavator Depth (top): _____ Depth Interval: 1.5'

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____ PID Reading: 2.2 ppm

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____ Depth Interval: _____

Sample Containers/Preservatives

VOC	
SVOC	
Pesticides	
PCBs	
Explosives	
Metals	

Physical Analysis: _____ PID Reading: _____

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: [signature] Date Completed: 5/5/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	05-05-08 (A) 05-06-08 (B)
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~ 70°	Sampling Team:	MF,JC

Sample ID: **45TP3A** Sample Collection Time: 1320

Sampling Device: Backhoe excavator Depth (top): _____

Depth Interval: 0 - 1 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____

PID Reading: 268 ppm

Comments: Due to 6ft, ~~Staff~~ Still found native landfill material (trash). Stopped at 6ft - will probe for total fill depth with Geoprobe.

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: **45TP3B** Sample Collection Time: ~~1430~~ 5/7/08 @ 1010

Sampling Device: ~~Backhoe excavator~~ Geoprobe Depth (top): _____

Depth Interval: ~~3 - 5.25'~~ 8 - 12 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____

PID Reading: ~~0.0 ppm~~ 104 ppm

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: X Dup-1 Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____

Depth Interval: _____

Sample Containers/Preservatives

VOC	
SVOC	
Pesticides	
PCBs	
Explosives	
Metals	

Physical Analysis: _____

PID Reading: _____

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: _____ Date Completed: 45TP3A complete on 5/5/08 45TP3B complete on 5/7/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/6/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Partly Cloudy ~65°	Sampling Team:	MF, JC

Sample ID: **45TP4A** Sample Collection Time: 1400

Sampling Device: Backhoe excavator Depth (top): _____ Depth Interval: 0 - 1 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____ PID Reading: 3.1

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: **45TP4B** MS/MSD Sample Collection Time: 1430

Sampling Device: Backhoe excavator Depth (top): _____ Depth Interval: 3 - 3.25'

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: _____ PID Reading: 0.2 ppm

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: X

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____ Depth Interval: _____

Sample Containers/Preservatives

VOC	
SVOC	
Pesticides	
PCBs	
Explosives	
Metals	

Physical Analysis: _____ PID Reading: _____

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: _____ Date Completed: 5/6/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/6/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	partly cloudy ~65°	Sampling Team:	MF,JC

Sample ID: **45TP5A** Sample Collection Time: 1500

Sampling Device: Backhoe excavator Depth (top): _____ Depth Interval: 0-1ft

Sample Containers/Preservatives

VOC	X	Physical Analysis:	
SVOC	X	PID Reading:	0.0
Pesticides	X		
PCBs	X		
Explosives	X		
Metals	X		

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: **45TP5B** Sample Collection Time: 1525

Sampling Device: Backhoe excavator Depth (top): 5' Depth Interval: _____

Sample Containers/Preservatives

VOC	X	Physical Analysis:	
SVOC	X	PID Reading:	0.0 ppm
Pesticides	X		
PCBs	X		
Explosives	X		
Metals	X		

Comments: EQBK-1 taken after this last test pit

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____ Depth Interval: _____

Sample Containers/Preservatives

VOC		Physical Analysis:	
SVOC		PID Reading:	
Pesticides			
PCBs			
Explosives			
Metals			

Comments: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: _____ Date Completed: 5/6/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	05-06-08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Clear, ~65°F	Sampling Team:	MF,JC

Sample ID: **45TP6A** Sample Collection Time: 10:25

Sampling Device: Backhoe excavator Depth (top): .

Depth Interval: 0-1 ft

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis:

PID Reading: 168, 151 (0-.5 0.5-1)

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: **45TP6B** Sample Collection Time: 1110

Sampling Device: Backhoe excavator Depth (top): 5.5 ft

Depth Interval: _____

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis:

PID Reading: 60.3

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____

Depth Interval: _____

Sample Containers/Preservatives

VOC _____

SVOC _____ Physical Analysis: _____

Pesticides _____ PID Reading: _____

PCBs _____

Explosives _____

Metals _____

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: MF TU Date Completed: 5/6/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	05.06.08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Partly cloudy, ~ 70°F	Sampling Team:	MF,JC

Sample ID:	**45TP7A**	Sample Collection Time:	1305
Sampling Device:	Backhoe excavator	Depth (top):	0
		Depth Interval:	0 - 1

Sample Containers/Preservatives

VOC	X		
SVOC	X	Physical Analysis:	
Pesticides	X	PID Reading:	0.0
PCBs	X		
Explosives	X		
Metals	X		

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID:	**45TP7B**	Sample Collection Time:	1345
Sampling Device:	Backhoe excavator	Depth (top):	5
		Depth Interval:	5 - 5.5'

Sample Containers/Preservatives

VOC	X		
SVOC	X	Physical Analysis:	
Pesticides	X	PID Reading:	5.2
PCBs	X		
Explosives	X		
Metals	X		

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Sample ID:		Sample Collection Time:	
Sampling Device:		Depth (top):	
		Depth Interval:	

Sample Containers/Preservatives

VOC			
SVOC		Physical Analysis:	
Pesticides		PID Reading:	
PCBs			
Explosives			
Metals			

Comments:

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____

MS/MSD Samples Taken Here: _____

Signature of Samplers: _____ Date Completed: 5/6/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/7/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~ 65°	Sampling Team:	MF,JC

Sample ID: 45SB1A Sample Collection Time: 1100

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____ Depth Interval: 0 - 1 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: ____
PID Reading: 19.4 ppm

Comments: ____

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: X

Sample ID: 45SB1B Sample Collection Time: 1105

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____ Depth Interval: 5 - 7 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X

Physical Analysis: ____
PID Reading: 60.3

Comments: ____

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: ____

Sample ID: ____ Sample Collection Time: ____

Sampling Device: ____ Depth (top): ____ Depth Interval: ____

Sample Containers/Preservatives

VOC	____
SVOC	____
Pesticides	____
PCBs	____
Explosives	____
Metals	____

Physical Analysis: ____
PID Reading: ____

Comments: ____

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: ____

Signature of Samplers: [signature] Date Completed: 5/7/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/7/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~70°	Sampling Team:	MF,JC

Sample ID: 45505A Sample Collection Time: 1155

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____ Depth Interval: 0-1 ft.

Sample Containers/Preservatives

VOC X
SVOC X
Pesticides X
PCBs X
Explosives X
Metals X
Comments: ____

Physical Analysis: ____
PID Reading: 0.0

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: ____

Sample ID: 45505B Sample Collection Time: 1200

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____ Depth Interval: 5-7 ft.

Sample Containers/Preservatives

VOC X
SVOC X
Pesticides X
PCBs X
Explosives X
Metals X
Comments: ____

Physical Analysis: ____
PID Reading: 0.0

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: ____

Sample ID: ____ Sample Collection Time: ____

Sampling Device: ____ Depth (top): ____ Depth Interval: ____

Sample Containers/Preservatives

VOC ____
SVOC ____
Pesticides ____
PCBs ____
Explosives ____
Metals ____
Comments: ____

Physical Analysis: ____
PID Reading: ____

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____
MS/MSD Samples Taken Here: ____

Signature of Samplers: [signature] Date Completed: 5/7/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/7/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~ 70°	Sampling Team:	MF,JC

Sample ID: 45SB14A Sample Collection Time: 1255

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____

Depth Interval: 0 - 1 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X
Comments:	

Physical Analysis: ____

PID Reading: 0.0

Field QC / Photo ID

Duplicate Sample Taken Here: X DUP-2 Photo No: ____

MS/MSD Samples Taken Here: ____

Sample ID: 45SB14B Sample Collection Time: 1308

Sampling Device: 4' Geoprobe Macrocore Depth (top): ____

Depth Interval: 5 - 7 ft.

Sample Containers/Preservatives

VOC	X
SVOC	X
Pesticides	X
PCBs	X
Explosives	X
Metals	X
Comments:	

Physical Analysis: ____

PID Reading: 0.0 ppm

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____

MS/MSD Samples Taken Here: ____

Sample ID: ____ Sample Collection Time: ____

Sampling Device: ____ Depth (top): ____

Depth Interval: ____

Sample Containers/Preservatives

VOC	____
SVOC	____
Pesticides	____
PCBs	____
Explosives	____
Metals	____
Comments:	

Physical Analysis: ____

PID Reading: ____

Field QC / Photo ID

Duplicate Sample Taken Here: ____ Photo No: ____

MS/MSD Samples Taken Here: ____

Signature of Samplers: [signature] Date Completed: 5/7/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	05.07.08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Partly cloudy, 270°F	Sampling Team:	MF,JC

Sample ID: 45SB8A — Sample Collection Time: 1310

Sampling Device: 4' Geoprobe Macrocore — Depth (top): 0 — Depth Interval: 0-1

Sample Containers/Preservatives

VOC X
SVOC X
Pesticides X
PCBs X
Explosives X
Metals X
Comments: cyanide X

Physical Analysis: X 0-4 ft. — Sample ID 45SB8A-PS
PID Reading: 179

Field QC / Photo ID

Duplicate Sample Taken Here: _____ — Photo No: _____
MS/MSD Samples Taken Here: _____ Physical samples 0-4 & 4-8 ft

Sample ID: 45SB8B — Sample Collection Time: 1345

Sampling Device: 4' Geoprobe Macrocore — Depth (top): 5 — Depth Interval: 5-7

Sample Containers/Preservatives

VOC X
SVOC X
Pesticides X
PCBs X
Explosives X
Metals X
Comments: cyanide X

Physical Analysis: X - 4-8 ft. → Sample ID 45SB8B-PS
PID Reading: 111

Field QC / Photo ID

Duplicate Sample Taken Here: _____ — Photo No: _____
MS/MSD Samples Taken Here: _____

Sample ID: _____ — Sample Collection Time: _____

Sampling Device: _____ — Depth (top): _____ — Depth Interval: _____

Sample Containers/Preservatives

VOC _____
SVOC _____
Pesticides _____
PCBs _____
Explosives _____
Metals _____
Comments: _____

Physical Analysis: _____
PID Reading: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ — Photo No: _____
MS/MSD Samples Taken Here: _____

Signature of Samplers: [signature] — Date Completed: 5/7/08

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/7/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SSP at SWMU 45
Weather Conditions:	Sunny ~ 70°	Sampling Team:	MF,JC

Sample ID: 45SB34A Sample Collection Time: 1440

Sampling Device: 4' Geoprobe Macrocore Depth (top): _____ Depth Interval: 0-4 ft.

Sample Containers/Preservatives

VOC _____
SVOC _____
Pesticides _____
PCBs _____
Explosives _____
Metals _____
Comments: _____

Physical Analysis: X 0-4 ft Sample ID 45SB34A-PS
PID Reading: 1.7 ppm

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Sample ID: 45SB34B Sample Collection Time: 1445

Sampling Device: 4' Geoprobe Macrocore Depth (top): _____ Depth Interval: 5-7 ft

Sample Containers/Preservatives

VOC _____
SVOC _____
Pesticides _____
PCBs _____
Explosives _____
Metals _____
Comments: _____

Physical Analysis: X 5-7 ft Sample ID 45SB34B-PS
PID Reading: 1.1

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Sample ID: _____ Sample Collection Time: _____

Sampling Device: _____ Depth (top): _____ Depth Interval: _____

Sample Containers/Preservatives

VOC _____
SVOC _____
Pesticides _____
PCBs _____
Explosives _____
Metals _____
Comments: _____

Physical Analysis: _____
PID Reading: _____

Field QC / Photo ID

Duplicate Sample Taken Here: _____ Photo No: _____
MS/MSD Samples Taken Here: _____

Signature of Samplers: [signature] Date Completed: 5/7/08

APPENDIX D.3.2

MONITORING WELL DEVELOPMENT/SAMPLING FORMS

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INITIAL CALIBRATION	FINAL CALIBRATION
DATE: 5/21/08	DATE: 5/21/08
TIME: 1210	TIME: 1700

pH METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO: Auto Cal Sol. 4.0

METER ID Horiba U-22

pH STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
7.0			
10.0			
4.0	3.99	4.00	3.92

CONDUCTIVITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

COND. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	6.90	6.90	0.40

TEMPERATURE METER CALIBRATION

METER ID_____

TEMP. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
ICE WATER			
BOILING WATER			
OTHER Ambient Air	20.1	21.1	19.70

TURBIDITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	19.1	0.0	7.3

ORP METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	191	205	253

DISSOLVED OXYGEN METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	8.85	8.22	9.76

COMMENTS_____

SIGNATURE_____

MONITORING WELL INSPECTION LOG

PROJECT NAME: SWMU 45 SSP

URS PROJECT NO. 11656351

FACILITY NAME: RFAAP - SWMU 45

MONITORING WELL: 45 MW 1

A. Inspected by (full name): MARK FISHER

B. Date/Time of Inspection: 5/21/08 @ 1237

C. Inspection Observations:

1. Locking protective casing:
   Good
2. Concrete well Pad:
   Overgrown w/ weeds
3. Lock:
   Good
4. Erosion:
   ~~Good~~ None
5. Exterior well identification number:
   Need ID #

D. Inspection Comments:
   Replace ID #

MONITORING WELL INSPECTION LOG

E. Repair/remediation comments:

_____

_____

_____

_____

F. Repair/remediation Date: _____

Field Groundwater Sampling Log

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/21/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SWMU 45 SSP
Weather Conditions:	Sunny ~ 60°	Sampling Team:	Jim Carter / Mark Fisher
Monitoring Well ID:	45MW1	Depth to Water:	26.57'
		Total Well Depth:	29.76'

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[x]	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers: [X]4 [ ]7 [ ]10
Conductivity Meter: _____µs standard solution
DO Meter: _____
Turbidity Meter: _____

Purge Data

Purge Rate/Volume Units: 400
milliliters per minute [x]
gallons per minute [ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
1245	400	0	clear	6.54	.100	7.23	14.70	143	12.54
1247		800		6.57	.100	7.04	15.10	143	14.96
1249		1600		6.58	.099	7.23	15.80	136	16.06
1251		2400		6.59	.100	7.25	16.0	132	
1253		3200		6.60	.099	7.07	16.20	122	26.5
1255		4000		6.61	.099	7.00	17.30	87	30.5
1257		4800		6.62	.099	6.96	17.90	88	
1259		5600		Purged Dry	Had to let	recharge			
1318		6400		6.77	.099	7.29	18.90	105	27.5
1320		7200		6.73	.099	7.20	15.7	102	27.4
1322		8000		6.69	.099	7.01	19.6	96	29.8
	Dried	well	out	well	allow	recharge			
	Allow	recharge	overnight	will	sample	w/	bailer		
	in	morning.	Using	peri	pump	for	filtered	metals	

Sampling Data

Monitoring Well ID: 45mw1
Sample Collection Time: 5/22/08 @ 1030

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	for filtered metals collection
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:	Grundfos pump	Disposable Bailer:	for sample collection

Sample Containers/Preservatives

VOCs	x	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	x	(1 liter, amber glass, 4°C)	Metals (F)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	x	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	x	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	x	(1 liter, amber glass, 4°C)			
Perchlorate	x	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [x]Yes [ ]No

Final pH (SU):	6.69	Final Conductivity (µs):	.099	Final Turbidity:	29.8 ntu
Final Temperature (°C):	19.6	Final DO:	7.01	Final ORP:	96
				Date Completed:	5/22/08

Well Locked At: 1330 Signature of Samplers: [signature]

MONITORING WELL INSPECTION LOG

PROJECT NAME: SWMU 45 - SSP

URS PROJECT NO. 11656351

FACILITY NAME: RFAAP - SWMU 45

MONITORING WELL: 45MW2

A. Inspected by (full name): MARK FISHER

B. Date/Time of Inspection: 5/21/08 @ 1438

C. Inspection Observations:

1. Locking protective casing:
   Good
2. Concrete well Pad:
   Overgrown w/ weeds & dirt
3. Lock:
   Good
4. Erosion:
   None
5. Exterior well identification number:
   Needs new ID

D. Inspection Comments:
   Put ID # on well

MONITORING WELL INSPECTION LOG

E. Repair/remediation comments: _____

_____

_____

_____

_____

F. Repair/remediation Date: _____

Field Groundwater Sampling Log

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/21/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SWMU 45 SSP
Weather Conditions:	partly cloudy ~65°	Sampling Team:	Jim Carter / Mark Fisher
Monitoring Well ID:	45MW2	Depth to Water:	23.08
		Total Well Depth:	27.31

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[x] ~~for purge~~	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers:	[✓]4 [ ]7 [ ]10	DO Meter:	
Conductivity Meter:	_____µs standard solution	Turbidity Meter:	

Purge Data

Purge Rate/Volume Units:
400
milliliters per minute
[x]

gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
1445	400	0	clear	6.70	71.7	3.92	14.4	112	8.20
1447	↓	800	↓	6.65	70.6	3.73	14.6	119	7.71
1449		1600		6.60	69.3	3.71	15.0	128	5.43
1451		2400		6.58	68.8	3.74	15.1	132	
1453		3200		6.57	68.4	3.71	15.2	135	5.20
1455		4000		6.56	68.0	3.69	15.3	137	
1457		4800		6.55	67.6	3.63	15.4	139	5.24
1459		5600		6.54	67.1	3.56	15.6	142	5.53
1501		6400		6.54	67.1	3.53	15.6	143	
1503		7200		6.54	66.9	3.49	15.7	145	5.60
1505	↓	8000	↓	6.54	66.9	3.46	15.8	146	6.82

Sampling Data

Monitoring Well ID: 45mw2

Sample Collection Time: 1510

* DUP-3 collected here

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:	Grundfos Pump ~~for purging~~	Disposable Bailer:	

Sample Containers/Preservatives

VOCs	x	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	x	(1 liter, amber glass, 4°C)	Metals (F)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	x	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	x	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	x	(1 liter, amber glass, 4°C)			
Perchlorate	x	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [x]Yes [ ]No

Final pH (SU):	6.59	Final Conductivity (µs):	66.8	Final Turbidity:	6.40 ntu
Final Temperature (°C):	15.8	Final DO:	3.47	Final ORP:	147
				Date Completed:	5/21/08

Well Locked At: ~~1530~~ 1600 Signature of Samplers: [signature]

INITIAL CALIBRATION	FINAL CALIBRATION
DATE: 5/22/08	DATE: 5/22/08
TIME: 0813	TIME: 1500

pH METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO: Auto Cal Sol. 4.0

METER ID Horiba U-22

pH STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
7.0			
10.0			
4.0	3.90	4.00	3.86

CONDUCTIVITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

COND. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	0.4	0.4	0.63

TEMPERATURE METER CALIBRATION

METER ID_____

TEMP. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
ICE WATER			
BOILING WATER			
OTHER Ambient Air	12.0	12.1	15.8

TURBIDITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	7.6	0.0	12.1

ORP METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	268	263	292

DISSOLVED OXYGEN METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
	10.36	10.79	10.85

COMMENTS_____

SIGNATURE_____

MONITORING WELL INSPECTION LOG

PROJECT NAME: SWMU 45 - SSP

URS PROJECT NO. 11656351

FACILITY NAME: RFAAP - SWMU 45

MONITORING WELL: 45MW3

A. Inspected by (full name): Jim Carter

B. Date/Time of Inspection: 5-22-08 1300

C. Inspection Observations:

1. Locking protective casing:
   good
2. Concrete well Pad:
   Broken bollard
3. Lock:
   good
4. Erosion:
   none observed
5. Exterior well identification number:
   none

D. Inspection Comments:
   Needs well ID #

MONITORING WELL INSPECTION LOG

E. Repair/remediation comments:

_____

_____

_____

_____

F. Repair/remediation Date: _____

Field Groundwater Sampling Log

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5-22-08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SWMU 45 SSP
Weather Conditions:	Clear, ~75°F	Sampling Team:	Jim Carter / Mark Fisher
Monitoring Well ID:	45MW3	Depth to Water:	23.61
		Total Well Depth:	32.33

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[x]	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers: [ ]4 [ ]7 [ ]10
Conductivity Meter: _____µs standard solution
DO Meter: _____
Turbidity Meter: _____

Purge Data

Purge Rate/Volume Units:
~250
milliliters per minute
[x]

gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
1304	250	0	Clear	6.40	57.1	5.42	14.4	236	21.1
1306	↓	500	↓	6.35	56.9	5.16	14.5	225	17.70
1308		1,000		6.33	56.4	5.12	15.1	211	16.20
1310		1500		6.32	56.1	4.97	15.7	200	17.01
1312		2,000		6.32	56.2	4.96	16.2	193	17.44
1314		2,500		6.31	56.2	4.97	16.4	189	16.61
1316		3,000		6.32	56.2	4.97	16.6	184	14.28
1318		3,500		6.32	56.1	4.95	16.8	181	12.47
1320		4,000		6.32	56.1	4.95	16.9	179	11.50
1322		4,500		6.32	56.1	4.95	17.0	178	10.81
1324		5,000		6.33	56.2	4.96	17.1	176	10.34
1326		5,500		6.33	56.2	4.92	17.2	176	10.57
1328		6,000		6.34	56.2	4.96	17.3	174	9.98
1330	↓	6,500	↓	6.34	56.1	4.93	17.5	174	8.63
Stopped purging at 1330									

Sampling Data

Monitoring Well ID: 45MW3
Sample Collection Time: 13:40

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:	Grundfos pump	Disposable Bailer:	

Sample Containers/Preservatives

VOCs	x	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	x	(1 liter, amber glass, 4°C)	Metals (F)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	x	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	x	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	x	(1 liter, amber glass, 4°C)			
Perchlorate	x	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [x]Yes [ ]No

Final pH (SU):	6.33	Final Conductivity (µs):	56.2	Final Turbidity:	8.62 ntu
Final Temperature (°C):	17.5	Final DO:	4.94	Final ORP:	173
				Date Completed:	5-22-08

Well Locked At: 1400
Signature of Samplers: Jim Carter

MONITORING WELL INSPECTION LOG

PROJECT NAME: SWMU45 - SSP

URS PROJECT NO. 11656351

FACILITY NAME: RFAAP - SWMU45

MONITORING WELL: 45MW4

A. Inspected by (full name): MARK FISHER

B. Date/Time of Inspection: 5/22/08 @ 0830

C. Inspection Observations:

1. Locking protective casing:
   Good
2. Concrete well Pad:
   Good
3. Lock:
   Good
4. Erosion:
   None
5. Exterior well identification number:
   Need ID #

D. Inspection Comments:
Put ID # on well

MONITORING WELL INSPECTION LOG

E. Repair/remediation comments: ~~—~~

_____

_____

_____

_____

F. Repair/remediation Date: ~~—~~ _____

Field Groundwater Sampling Log

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/22/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SWMU 45 SSP
Weather Conditions:	Sunny ~ 50°	Sampling Team:	Jim Carter / Mark Fisher
Monitoring Well ID:	45MW4	Depth to Water:	21.96
		Total Well Depth:	

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[x]	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers: [X]4 [ ]7 [ ]10
Conductivity Meter: _____µs standard solution
DO Meter: _____
Turbidity Meter: _____

Purge Data

Purge Rate/Volume Units:
300
milliliters per minute
[x]

gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
0834	300	0	Cloudy	6.36	72.4	5.85	12.5	247	OR
0836		600	muddy	6.49	70.6	5.01	12.9	200	OR
0838		1200		6.56	69.9	4.84	13.5	152	OR
0840		1800		6.63	69.4	4.78	14.8	84	OR
0842		2400		6.65	69.2	4.83	15.1	77	OR
0844		3000		6.67	69.0	4.91	15.3	74	OR
0846		3600		6.69	69.1	5.01	15.4	71	~~30~~ OR
0848		4200		6.72	68.8	5.11	16.0	52	OR
0850		4800		6.71	69.1	5.16	16.1	51	
0852		5400	↓	6.72	69.0	5.32	16.2	71	OR
0854		6000	hazy	6.73	69.3	5.41	16.2	89	OR
0856		6600		6.73	69.6	5.50	16.0	99	67.9
0858		7200		6.74	69.6	5.62	15.9	115	43.4
0900		7800		6.75	69.5	5.63	16.0	123	29.9
0902		8400		6.75	69.5	5.59	16.0	131	21.6
0904		9000	↓	6.75	69.5	5.52	16.0	136	
0906		9600	light	6.76	69.4	5.49	16.0	139	18.0
0908		10200	haze	6.76	69.4	5.43	16.1	139	15.3
0910		10800		6.77	69.5	5.39	16.1	139	12.9
0912		11400		6.77	69.4	5.37	16.1	141	11.1
0914		12000		6.77	69.4	5.34	16.1	145	
0916		12600		6.77	69.4	5.38	16.1	143	9.5
0918		13200		6.77	69.5	5.37	16.0	144	
0920		13800		6.78	69.5	5.36	16.0	144	8.92
0922		14400		6.78	69.5	5.37	15.9	140	
0924		15000		6.78	69.4	5.35	15.9	143	7.07
0926		15600		6.78	69.4	5.32	15.9	144	
0928	↓	16200	↓	6.77	69.4	5.36	15.8	149	5.89

Sampling Data

Monitoring Well ID: 45mw4
Sample Collection Time: OVER →

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:		Disposable Bailer:	

Sample Containers/Preservatives

VOCs	x	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	x	(1 liter, amber glass, 4°C)	Metals (F)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	x	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	x	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	x	(1 liter, amber glass, 4°C)			
Perchlorate	x	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [x]Yes [ ]No

Final pH (SU):		Final Conductivity (µs):		Final Turbidity:	ntu
Final Temperature (°C):		Final DO:		Final ORP:	
				Date Completed:	

Well Locked At: _____ Signature of Samplers: _____

Field Groundwater Sampling Log

Project Information

Project Name:	RFAAP SWMU 45 SSP	Date:	5/22/08
Facility Name:	Radford Army Ammunition Plant	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	SWMU 45 SSP
Weather Conditions:	Sunny ~ 60°	Sampling Team:	Jim Carter / Mark Fisher
Monitoring Well ID:	45MW4 cont.	Depth to Water:	
		Total Well Depth:	

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[x]	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers:	[X]4 [ ]7 [ ]10	DO Meter:	
Conductivity Meter:	_____ µs standard solution	Turbidity Meter:	

Purge Data

Purge Rate/Volume Units:
300
milliliters per minute
[x]

gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
0930	300	16800	light haze	6.78	69.4	5.34	15.8	154	58.1
0932		17400		6.78	69.4	5.34	15.8	155	
0934		18000		6.79	69.4	5.35	15.8	154	50.3
0936		18600		6.79	69.3	5.34	15.8	149	
0938		19200		6.78	69.4	5.36	15.8	147	50.7
0940		19800		6.78	69.5	5.36	15.7	149	
0942		20400		6.79	69.4	5.37	15.7	151	60.8
0944		21000		6.79	69.5	5.36	15.7	153	
0946		21600		6.79	69.4	5.37	15.8	155	55.9
0948		22200		6.79	69.5	5.39	15.8	157	
0950		22800		6.79	69.5	5.39	15.8	160	48.7
0952		23400		6.79	69.5	5.39	15.7	162	
0954		24000		6.80	69.4	5.37	15.8	163	48.2
0956		24600	↓	6.80	69.4	5.36	15.8	162	
0958		25200	clear	6.80	69.5	5.40	15.7	163	39.9
1000		25800		6.80	69.5	5.40	15.7	164	
1002		26400		6.80	69.5	5.41	15.7	165	36.7
1004		27000		6.80	69.5	5.40	15.7	166	
1006		27600		6.80	69.5	5.39	15.6	170	39.6
1008		28200		6.80	69.5	5.39	15.7	172	
1010		28800		6.81	69.5	5.43	15.7	171	38.7
1015		30300		6.81	69.5	5.40	15.7	170	36.7
1020		31800		6.81	69.5	5.42	15.6	168	33.9
1025		33300		6.81	69.6	5.45	15.6	169	29.8
1030		34800		6.81	69.6	5.48	15.6	172	28.3
1035		36300		6.81	69.6	5.48	15.6	175	25.7
1040		37800		6.81	69.5	5.47	15.6	173	23.8
1045	↓	39300	↓	6.82	69.5	5.45	15.7	159	24.5

Everything stable w/ time on turbidity readings 5 min intervals

Sampling Data

Monitoring Well ID: 45mw4 Sample Collection Time: over →

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:		Disposable Bailer:	

Sample Containers/Preservatives

VOCs	x	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	x	(1 liter, amber glass, 4°C)	Metals (F)	x	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	x	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	x	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	x	(1 liter, amber glass, 4°C)			
Perchlorate	x	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [x]Yes [ ]No

Final pH (SU):		Final Conductivity (µs):		Final Turbidity:	ntu
Final Temperature (°C):		Final DO:		Final ORP:	
				Date Completed:	

Well Locked At: _____ Signature of Samplers: _____

Field Groundwater Sampling Log

Project Information

Project Name:	RAAP Sumw 45 SSP	Date:	5/22/08
Facility Name:	RFAAP	Client:	RFAAP
URS Project No.:	11656351	Sampling Event:	Sumw 45 SSP
Weather Conditions:	Sunny ~ 65°	Sampling Team:	MF, TC
Monitoring Well ID:	45mw4 cont.	Depth to Water:	
		Total Well Depth:	

Purge Equipment

Dedicated Bladder Pump:	[ ]	Peristaltic Pump:	[ ]
Dedicated Submersible Pump:	[ ]	Dedicated Bailer:	[ ]
Submersible Pump:	[X]	Disposable Bailer:	[ ]

Equipment Calibration

pH Meter Calibrated with Buffers: [X]4 [ ]7 [ ]10
Conductivity Meter: _____µs standard solution
DO Meter:
Turbidity Meter:

Purge Data

Purge Rate/Volume Units:
300
milliliters per minute
[X]

gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
1050	300	40800	clear	6.82	69.6	5.47	15.8	162	27.7
1055	↓	42300	↓	6.82	69.5	5.48	15.9	164	19.7
1100		43800		6.82	69.6	5.49	15.9	163	19.77
1105	↓	45300	↓	6.82	69.6	5.52	15.9	163	19.99

Sampling Data

Monitoring Well ID: 45mw4 cont
Sample Collection Time: 1130
* MS/MSD collected here

Sampling Device:

Dedicated Bladder Pump:		Peristaltic Pump:	
Dedicated Submersible Pump:		Dedicated Bailer:	
Submersible Pump:		Disposable Bailer:	

Sample Containers/Preservatives

VOCs	X	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)	X	(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	X	(1 liter, amber glass, 4°C)	Metals (F)	X	(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides	X	(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs	X	(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives	X	(1 liter, amber glass, 4°C)			
Perchlorate	X	(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments:

Field Filtering of Metals with 0.45 µ Disposable Filter [X]Yes [ ]No

Final pH (SU):	6.82	Final Conductivity (µs):	69.6	Final Turbidity:	19.99 ntu
Final Temperature (°C):	16.0	Final DO:	5.48	Final ORP:	162
				Date Completed:	5/22/08

Well Locked At: 1230 Signature of Samplers: MF TC

APPENDIX D.3.3

GROUNDWATER RE-SAMPLING FORMS

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Field Groundwater Sampling Log

Project Information

Project Name: RFAAP 45MW-2 Resample
Facility Name: RFAAP
URS Project No.: 11656351
Weather Conditions: Sunny ~ 82°
Monitoring Well ID: 45 MW-2

Date: 8/12/08
Client: RFAAP
Sampling Event: 45MW 2 Resample
Sampling Team: MK, BF
Depth to Water: 24.25'
Total Well Depth: 27.31'

Purge Equipment

Dedicated Bladder Pump: [ ]
Dedicated Submersible Pump: [ ]
Submersible Pump: [ ]
Peristaltic Pump: [X]
Dedicated Bailer: [ ]
Disposable Bailer: [ ]

Equipment Calibration

pH Meter Calibrated with Buffers: [ ]4 [ ]7 [ ]10
Conductivity Meter: _____ µs standard solution
DO Meter: _____
Turbidity Meter: _____

Purge Data

Purge Rate/Volume Units:
200
milliliters per minute
[X]
gallons per minute
[ ]

Time	Rate	Volume	Appearance	pH (SU)	Cond (ms)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (ntu)
1206	200	0	clear	6.54	67.6	12.71	11.90	204	
1208		400		6.67	67.3	15.08	12.10	195	
1210		800		6.73	67.1	15.65	12.27	186	
1212		1200		6.77	66.9	15.82	12.26	177	
1214		1600		6.81	66.7	16.03	12.27	167	
1216		2000		6.83	66.7	16.17	11.96	161	
1218		2400		6.84	66.7	16.34	11.75	158	
1220		2800		6.85	66.1	16.29	11.91	154	
1222		3200		6.85	65.9	16.28	11.91	153	
1224		3600		6.84	65.8	16.31	11.93	152	
1226		4000		6.84	65.6	16.31	11.94	152	

Sampling Data

Monitoring Well ID: 45 MW-2 Resample collected DUP-1 here
Sample Collection Time: 1230

Sampling Device:
Dedicated Bladder Pump: _____
Dedicated Submersible Pump: _____
Submersible Pump: _____
Peristaltic Pump: Solinst 410
Dedicated Bailer: _____
Disposable Bailer: _____

Sample Containers/Preservatives

VOCs	X	(40 ml, gl. Vial, HCL pH<2, 4°C)	Metals (UF)		(1 liter, plastic HNO_3, pH<2, 4°C)
SVOCs	X	(1 liter, amber glass, 4°C)	Metals (F)		(1 liter, plastic HNO_3, pH<2, 4°C)
Pesticides		(1 liter, amber glass, 4°C)	Sulfide		(250 ml, plastic, ZnAC+NaOH, pH>9, 4°C)
Herbicides		(1 liter, amber glass, 4°C)			
PCBs		(1 liter, amber glass, 4°C)			
PAHs		(1 liter, amber glass, 4°C)			
Explosives		(1 liter, amber glass, 4°C)			
Perchlorate		(125 ml, plastic, 4°C)			
Dioxin/Furans		(1 liter, amber glass, 4°C)			
Cyanide		(250 ml, plastic, NaOH, pH>12, 4°C)			

Comments: _____

Field Filtering of Metals with 0.45 µ Disposable Filter [ ]Yes [ ]No
Final pH (SU): 6.84
Final Temperature (°C): 11.92
Final Conductivity (µs): 65.6
Final DO: 16.34
Final Turbidity: _____ ntu
Final ORP: 152
Date Completed: 8/12/08

Well Locked At: _____ Signature of Samplers: MK BF

INITIAL CALIBRATION	FINAL CALIBRATION
DATE:	DATE: 8/12/08
TIME:	TIME: 1240

pH METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO: Auto cal 4.0

METER ID Horiba U-22

pH STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
7.0			
10.0			
4.0			3.98

CONDUCTIVITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

COND. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
			.446 S/m

TEMPERATURE METER CALIBRATION

METER ID_____

TEMP. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
ICE WATER			
BOILING WATER			
OTHER Ambient Air			18.44

TURBIDITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
			1.9

ORP METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
			228

DISSOLVED OXYGEN METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
			12.48

COMMENTS_____

SIGNATURE_____

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APPENDIX D.4

INVESTIGATION-DERIVED MATERIAL ANALYTICAL RESULTS

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-01**	Sampled By:	J. Carter; URS
Matrix:	Waste	Received:	05/10/08 09:00

Physical/Chemical Parameters by EPA/APHA/ASTM Methods

Analyte	Analytical Result	RL	MDL	Unit	Dilution Factor	Method	Date Analyzed	By	QC Batch
Paint Filter Liquids Test	Pass	1	1	mL	1	USEPA-9095	05/19/08	GEH	0805807
***pH**	**6.4**	0.1	0.1	pH Units	1	USEPA-9045C	05/14/08	CLB	0805551

*See Statement of Data Qualifications

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-01**	Sampled By:	J. Carter; URS
Matrix:	Waste	Received:	05/10/08 09:00

TCLP Metals by EPA 1311/6000/7000 Series Methods

Analyte	Analytical Result		RL	MDL	Unit	Dilution Factor	Method	Date Analyzed	By	QC Batch
Arsenic	0.20	U	0.20	0.054	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Barium	**0.92**		0.35	0.0021	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Cadmium	**0.0073**	**J**	0.020	0.0030	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Chromium	0.050	U	0.050	0.0091	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Lead	**0.059**	**J**	0.10	0.025	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Mercury	0.00020	U	0.00020	0.000046	mg/L	1	USEPA-7470A	05/16/08	AMD	0805665
Selenium	0.20	U	0.20	0.040	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557
Silver	0.010	U	0.010	0.0034	mg/L	1	USEPA-6010B	05/19/08	KLV	0805557

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-01**	Sampled By:	J. Carter; URS
Matrix:	Waste	Received:	05/10/08 09:00
Unit:	mg/L	Prepared:	05/17/08 By: DLV
Dilution Factor:	100	Date Analyzed:	05/17/08 By: DLV
QC Batch:	0805285	Analytical Batch:	8051919

TCLP Volatile Organics by EPA Method 1311/8260B

CAS Number	Analyte	Analytical Result	RL	MDL
71-43-2	Benzene	0.10 U	0.10	0.012
56-23-5	Carbon Tetrachloride	0.10 U	0.10	0.015
108-90-7	Chlorobenzene	0.10 U	0.10	0.012
67-66-3	Chloroform	**0.023 J**	0.10	0.0061
107-06-2	1,2-Dichloroethane	0.10 U	0.10	0.015
75-35-4	1,1-Dichloroethene	0.10 U	0.10	0.014
78-93-3	2-Butanone (MEK)	5.0 U	5.0	0.033
127-18-4	Tetrachloroethene	0.10 U	0.10	0.015
79-01-6	Trichloroethene	0.10 U	0.10	0.017
75-01-4	Vinyl Chloride	0.10 U	0.10	0.017

Surrogates	***% Recovery***	***Control Limits***
Dibromofluoromethane	95	*79-124*
1,2-Dichloroethane-d4	86	*75-128*
Toluene-d8	96	*87-113*
4-Bromofluorobenzene	84	*70-121*

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-01**	Sampled By:	J. Carter; URS
Matrix:	Waste	Received:	05/10/08 09:00
Unit:	mg/L	Prepared:	05/16/08 By: KB9
Dilution Factor:	1	Date Analyzed:	05/25/08 By: DMC
QC Batch:	0805841	Analytical Batch:	8052745

TCLP Semivolatile Organic Compounds by EPA Method 1311/8270C

	CAS Number	Analyte	Analytical Result	RL	MDL
	106-46-7	1,4-Dichlorobenzene	0.0050 U	0.0050	0.000015
	121-14-2	2,4-Dinitrotoluene	0.0050 U	0.0050	0.00021
	118-74-1	Hexachlorobenzene	0.0050 U	0.0050	0.000012
	87-68-3	Hexachlorobutadiene	0.0050 U	0.0050	0.00012
	67-72-1	Hexachloroethane	0.0050 U	0.0050	0.000038
	98-95-3	Nitrobenzene	0.0050 U	0.0050	0.000026
	110-86-1	Pyridine	0.050 U	0.050	0.00038
	87-86-5	Pentachlorophenol	0.0050 U	0.0050	0.00019
	88-06-2	2,4,6-Trichlorophenol	0.0050 U	0.0050	0.000027
	95-95-4	2,4,5-Trichlorophenol	0.0050 U	0.0050	0.00011
	95-48-7	2-Methylphenol	**0.00039 J**	0.0050	0.00014
	108-39-4	3-Methylphenol	0.0050 U	0.0050	0.000016
*	106-44-5	4-Methylphenol	**0.00061 J**	0.0050	0.000016
	58-89-9	gamma-BHC (Lindane)	0.0050 U	0.0050	0.000057
	72-20-8	Endrin	0.0050 U	0.0050	0.00028
	72-43-5	Methoxychlor	0.0050 U	0.0050	0.000072
	57-74-9	Technical Chlordane	0.0050 U	0.0050	0.00012
	76-44-8	Heptachlor	0.0050 U	0.0050	0.000091
	1024-57-3	Heptachlor Epoxide	0.0050 U	0.0050	0.000076
	8001-35-2	Toxaphene	0.50 U	0.50	0.00029

Surrogates	***% Recovery***	***Control Limits***
2-Fluorophenol	77	*30-120*
Phenol-d6	64	*20-109*
Nitrobenzene-d5	56	*20-140*
2-Fluorobiphenyl	41	*35-130*
2,4,6-Tribromophenol	92	*23-120*
o-Terphenyl	51	*34-130*

*See Statement of Data Qualifications

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-01**	Sampled By:	J. Carter; URS
Matrix:	Waste	Received:	05/10/08 09:00
Unit:	mg/L	Prepared:	05/16/08 By: ASC
Dilution Factor:	1	Date Analyzed:	05/22/08 By: DMC
QC Batch:	0805733	Analytical Batch:	8052750

TCLP Chlorinated Herbicides by EPA Method 1311/8270C

CAS Number	Analyte	Analytical Result	RL	MDL
94-75-7	2,4-D	0.10 U	0.10	0.0041
93-72-1	2,4,5-TP (Silvex)	0.10 U	0.10	0.0038

Surrogates	% Recovery	Control Limits
2,4,5-T	74	*50-150*

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-02**	Sampled By:	J. Carter; URS
Matrix:	Soil	Received:	05/10/08 09:00
Unit:	mg/kg dry wt.	Prepared:	05/21/08 By: BJH
Dilution Factor:	1	Date Analyzed:	05/27/08 By: FJA
QC Batch:	0805355	Analytical Batch:	8052372
Percent Solids:	n/a		

Nitroaromatics & Nitramines by EPA Method 8330

CAS Number	Analyte	Analytical Result	RL	MDL
99-35-4	1,3,5-Trinitrobenzene	2.5U	2.5	0.074
99-65-0	1,3-Dinitrobenzene	2.5U	2.5	0.076
118-96-7	2,4,6-Trinitrotoluene	2.5U	2.5	0.15
121-14-2	2,4-Dinitrotoluene	2.5U	2.5	0.10
606-20-2	2,6-Dinitrotoluene	2.5U	2.5	0.20
35572-78-2	2-Amino-4,6-dinitrotoluene	2.5U	2.5	0.22
88-72-2	2-Nitrotoluene	2.5U	2.5	0.17
99-08-1	3-Nitrotoluene	2.5U	2.5	0.21
1946-51-0	4-Amino-2,6-dinitrotoluene	2.5U	2.5	0.30
99-99-0	4-Nitrotoluene	2.5U	2.5	0.20
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	2.5U	2.5	0.048
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	2.5U	2.5	0.065
98-95-3	Nitrobenzene	2.5U	2.5	0.030
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazoc	2.5U	2.5	0.066

Surrogates	***% Recovery***	***Control Limits***
4-Nitroaniline	111	*57-139*

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805231**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	IDM Soils, 5/9/08, 36440-55
Client Sample ID:	**45 IDM Soil**	Sampled:	05/09/08 08:10
Lab Sample ID:	**0805231-02**	Sampled By:	J. Carter; URS
Matrix:	Soil	Received:	05/10/08 09:00
Unit:	mg/kg dry wt.	Prepared:	05/21/08 By: BJH
Dilution Factor:	1	Date Analyzed:	05/23/08 By: FJA
QC Batch:	0805356	Analytical Batch:	8052371
Percent Solids:	n/a		

Nitroglycerine by EPA Method 8332

CAS Number	Analyte	Analytical Result	RL	MDL
55-63-0	Nitroglycerin	5.0 U	5.0	0.39
78-11-5	Pentaerythritol Tetranitrate	5.0 U	5.0	0.23

Surrogates	*% Recovery*	*Control Limits*
1-Nitronaphthalene	103	*50-150*

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805558**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	5/22/08 IDM
Client Sample ID:	**45IDM - Water**	Sampled:	05/22/08 15:20
Lab Sample ID:	**0805558-01**	Sampled By:	J. Carter; URS
Matrix:	TCLP	Received:	05/23/08 10:15

TCLP Metals by EPA 1311/6000/7000 Series Methods

Analyte	Analytical Result		RL	MDL	Unit	Dilution Factor	Method	Date Analyzed	By	QC Batch
*Arsenic	1.0	U	1.0	0.27	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
***Barium**	**0.11**	**J**	1.8	0.010	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
*Cadmium	0.10	U	0.10	0.015	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
*Chromium	0.25	U	0.25	0.046	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
*Lead	0.50	U	0.50	0.13	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
Mercury	**0.00015**	**J**	0.00020	0.000046	mg/L	1	USEPA-7470A	06/03/08	AMD	0806477
*Selenium	1.0	U	1.0	0.20	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541
*Silver	0.050	U	0.050	0.017	mg/L	5	USEPA-6010B	06/05/08	JMF	0806541

*See Statement of Data Qualifications

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ANALYTICAL REPORT

Client:	**URS Corporation**	Work Order:	**0805558**
Project:	RFAAP SWMU 45 RFI/CMS, WO 002	Description:	5/22/08 IDM
Client Sample ID:	**45IDM - Water**	Sampled:	05/22/08 15:20
Lab Sample ID:	**0805558-02**	Sampled By:	J. Carter; URS
Matrix:	Water	Received:	05/23/08 10:15

Physical/Chemical Parameters by EPA/APHA/ASTM Methods

Analyte	Analytical Result	RL	MDL	Unit	Dilution Factor	Method	Date Analyzed	By	QC Batch
*pH	**7.4**	0.1	0.1	pH Units	1	USEPA-9040B	05/30/08	BAT	0806410
*Chemical Oxygen Demand	**82**	50	2.2	mg/L	1	SM 5220 D 20th	06/03/08	CKD	0806535

*See Statement of Data Qualifications

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APPENDIX D.5

SLUG TEST DATA

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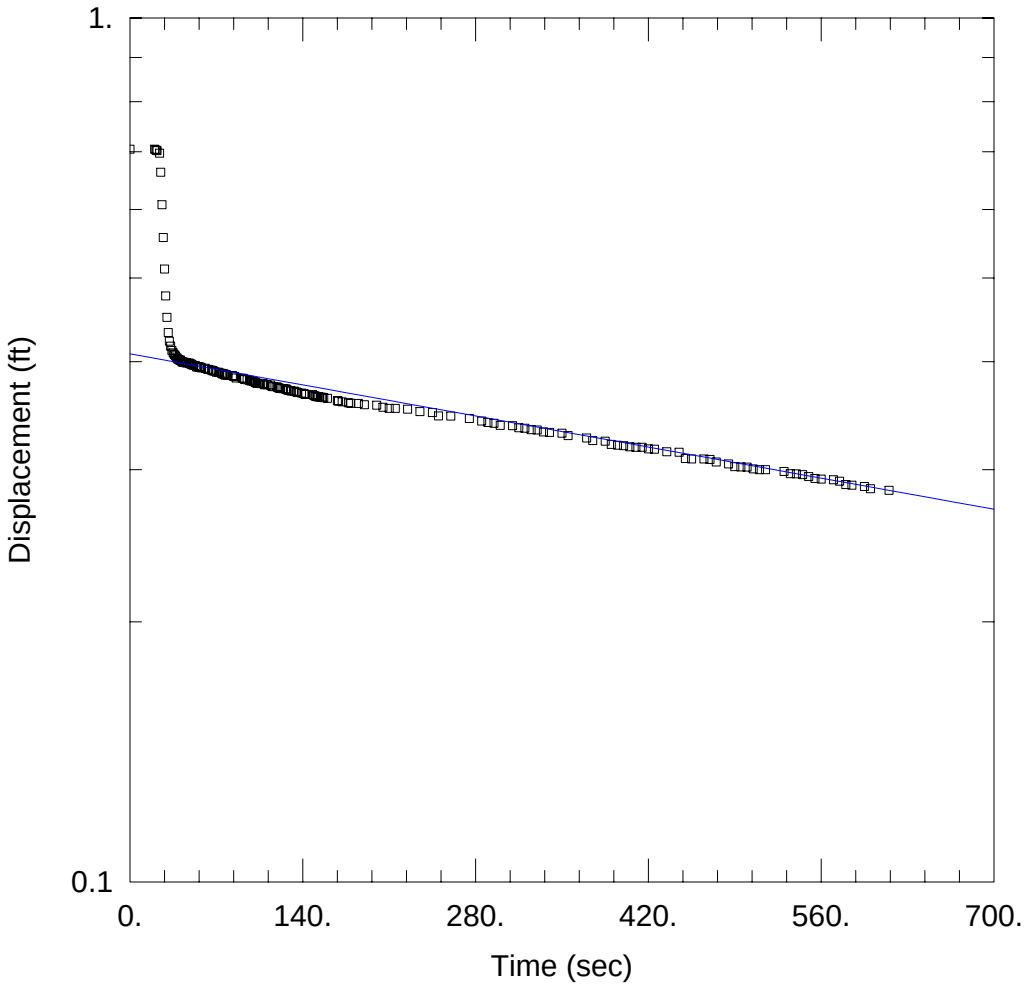


45MW1 RISING HEAD

Data Set: P:\...\45MW1 RISING HEAD.aqt
Date: 09/08/08 Time: 10:15:29

PROJECT INFORMATION

Company: URS Corporation
Client: RFAAP
Project: 11656351
Test Location: SWMU 45
Test Well: 45MW1
Test Date: 6/25/08

AQUIFER DATA

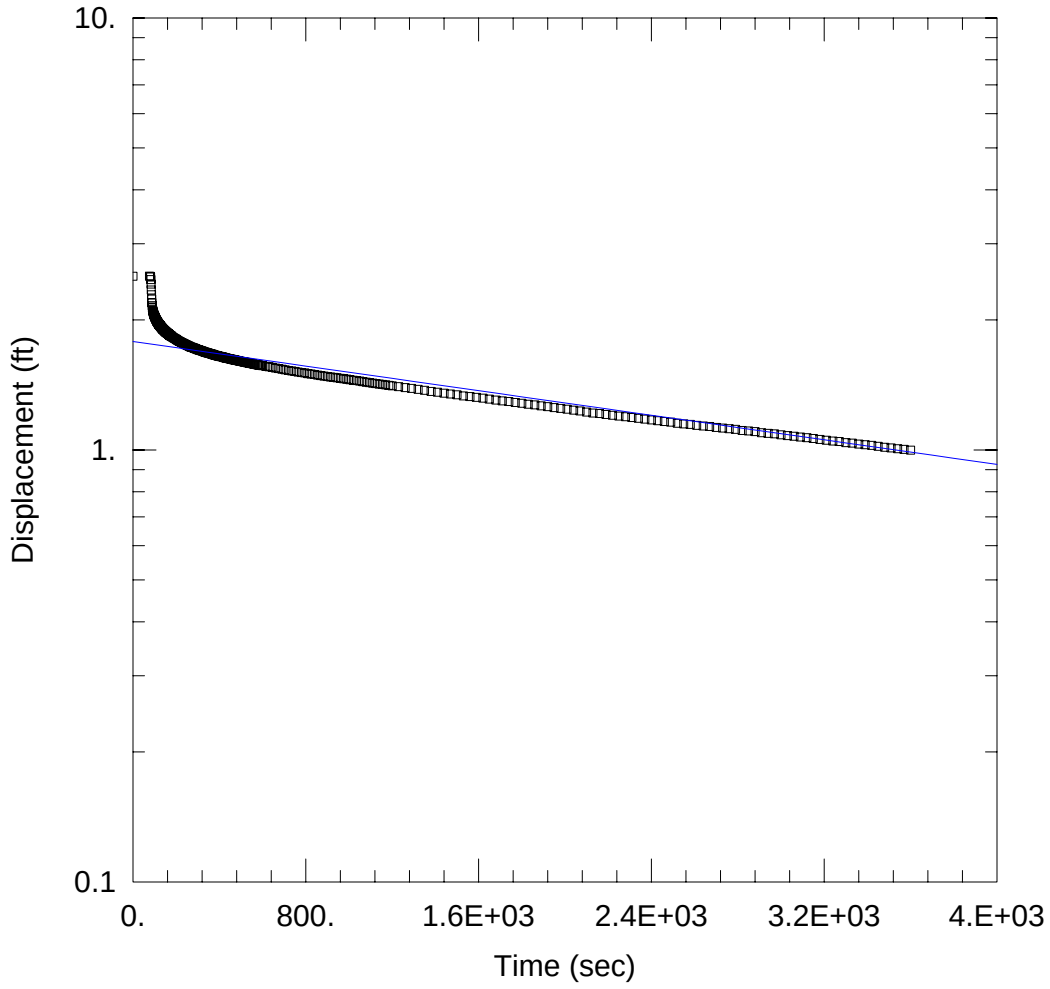
Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (45MW1)

Initial Displacement: 0.7049 ft
Wellbore Radius: 0.5 ft
Screen Length: 10. ft
Casing Radius: 0.166 ft
Well Skin Radius: 0.5 ft
Total Well Penetration Depth: 2.2 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.68E-05 cm/sec
y0 = 0.4085 ft



45MW2 RISING HEAD

Data Set: P:\...\45MW2 RISING HEAD.aqt
Date: 09/08/08 Time: 10:16:56

PROJECT INFORMATION

Company: URS Corporation
Client: RFAAP
Project: 11656351
Test Location: SWMU 45
Test Well: 45MW2
Test Date: 6/25/08

AQUIFER DATA

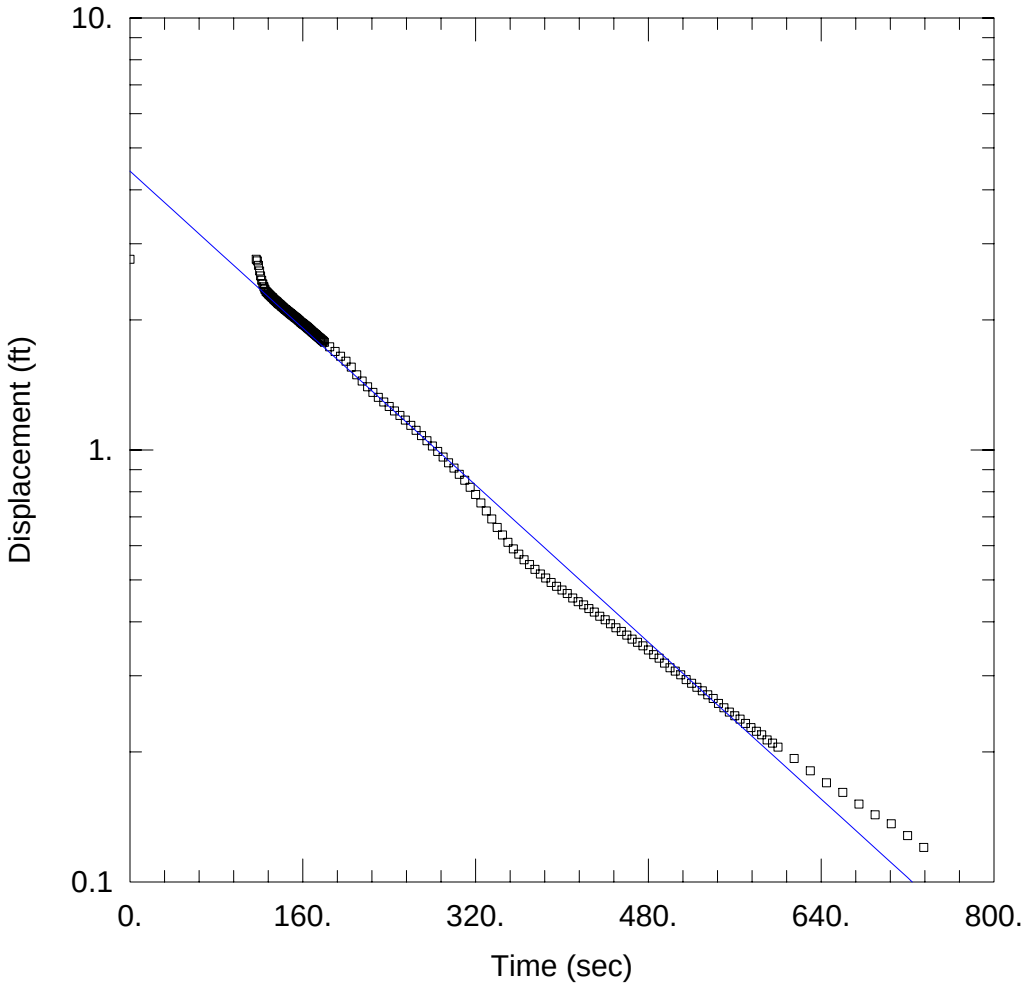
Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (45MW2)

Initial Displacement: 2.523 ft
Wellbore Radius: 0.5 ft
Screen Length: 10. ft
Casing Radius: 0.166 ft
Well Skin Radius: 0.5 ft
Total Well Penetration Depth: 4.01 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 9.657E-06 cm/sec
y0 = 1.782 ft



45MW3 RISING HEAD

Data Set: P:\...\45MW3 RISING HEAD.aqt
Date: 09/05/08 Time: 16:55:51

PROJECT INFORMATION

Company: URS Corporation
Client: RFAAP
Project: 11656351
Test Location: SWMU 45
Test Well: 45MW3
Test Date: 6/25/08

AQUIFER DATA

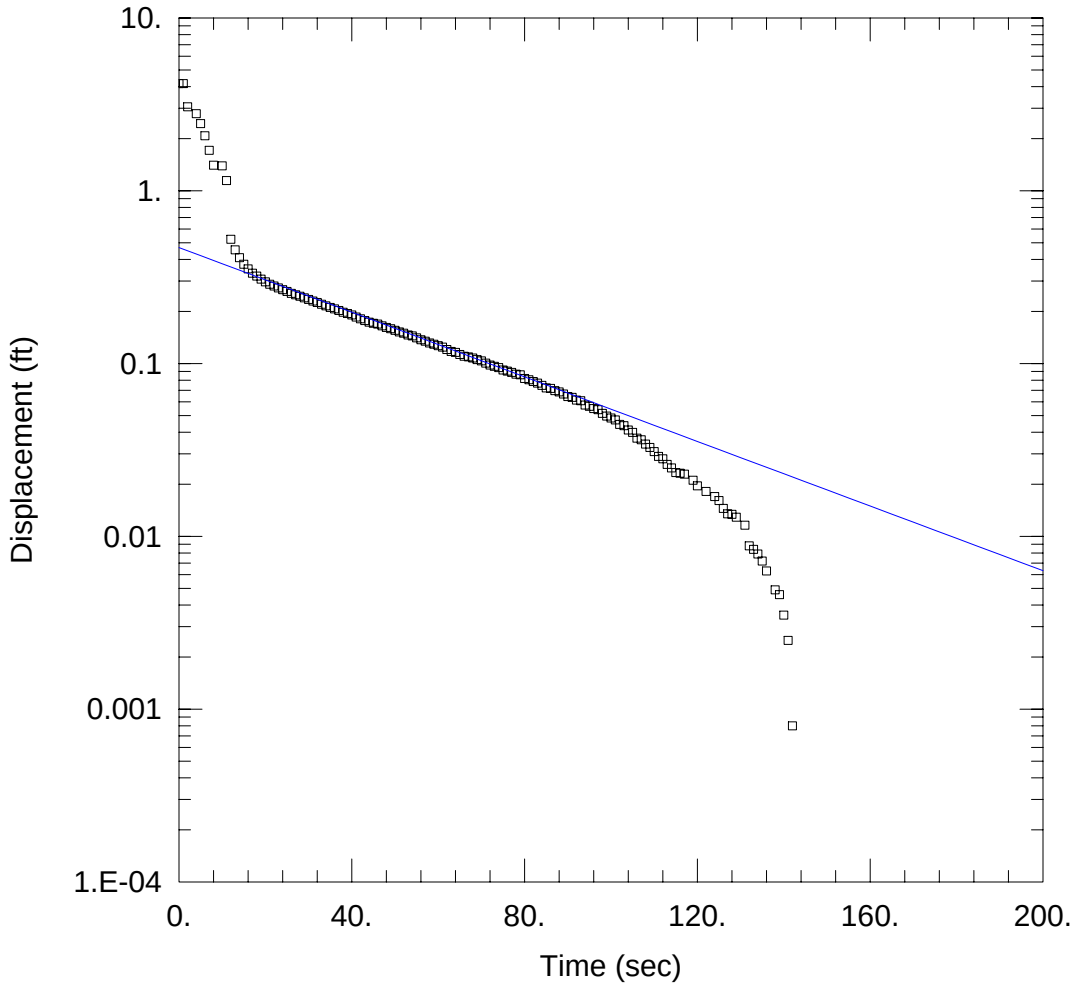
Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (45MW3)

Initial Displacement: 2.763 ft
Wellbore Radius: 0.5 ft
Screen Length: 10. ft
Casing Radius: 0.166 ft
Well Skin Radius: 0.5 ft
Total Well Penetration Depth: 8.03 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003797 cm/sec
y0 = 4.42 ft



45MW4 RISING HEAD

Data Set: P:\...\45MW4 RISING HEAD.aqt
Date: 09/05/08 Time: 16:56:21

PROJECT INFORMATION

Company: URS Corporation
Client: RFAAP
Project: 11656351
Test Location: SWMU 45
Test Well: 45MW4
Test Date: 6/25/08

AQUIFER DATA

Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (45MW4)

Initial Displacement: 4.172 ft
Wellbore Radius: 0.333 ft
Screen Length: 15. ft
Casing Radius: 0.0833 ft
Well Skin Radius: 0.333 ft
Total Well Penetration Depth: 12.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003623 cm/sec
y0 = 0.4688 ft

APPENDIX D.6

SITE-SPECIFIC SSL CALCULATIONS

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Site-Specific SSL(s) for Aroclor 1254 (using C_w = T-RBC)
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

			units
	Dilution Factor =	20	--
T-RBC	GW Concentration Source=	3.35E-05	mg/L
C_w =	Target Leachate Conc =	6.70E-04	mg/L
θ_w =	Water-Filled Soil Porosity =	0.3	--
θ_a=	Air-Filled Soil Porosity =	0.13	--
H' =	Henry's Law Constant =	1.160E-02	--
P_b =	Dry Soil Bulk Density =	1.5	kg/L
Koc=	Soil Organic Carbon/Water Partition Coefficient =	8.10E+05	L/kg

SSL (mg/kg) = $C_w [K_d + (\theta_w + \theta_a H')/Pb]$

foc* =	Fraction Organic Carbon =	0.0095	unitless
K_d =	Soil-Water Partition Coeff (K_{oc}*foc) =	7695	L/kg
	Site-specific SSL =	**5.15E+00**	**mg/kg**

Note:
* foc averaged from physical testing results (Appendix D.1)
A dilution attenuation factor of 20 was used for the site based on a source area (0.3 acre), depth to groundwater, and lack of detection in groundwater

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APPENDIX D.7

STATISTICAL CALCULATIONS

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APPENDIX D.7

STATISTICAL CALCULATIONS

Appendix D.7.1
Exposure Point Concentration Calculation Results – ProUCL 4.0

Table D.7.1-1a	EPC Calculation Results - SWMU 45 Surface Soil - ProUCL 4.0 for Full Data Sets
Table D.7.1-1b	EPC Calculation Results - SWMU 45 Surface Soil - ProUCL 4.0 for Data Sets with Non-Detects
Table D.7.1-2a	EPC Calculation Results - SWMU 45 Total Soil - ProUCL 4.0 for Full Data Sets
Table D.7.1-2b	EPC Calculation Results - SWMU 45 Total Soil - ProUCL 4.0 for Data Sets with Non-Detects

Appendix D.7.2
Background Means Comparison Summary/Results – ProUCL 4.0

Table D.7.2-1a	PROUCL 4.0 - Summary of Background vs. Site Means Comparison - SWMU 45 Surface Soil
Table D.7.2-1b	PROUCL 4.0 - Summary of Background vs. Site Means Comparison - SWMU 45 Total Soil
Table D.7.2-2a	Background Data Goodness of Fit - Surface Soil - ProUCL 4.0 for Full Data Sets
Table D.7.2-2b	Background Goodness of Fit - Surface Soil - ProUCL 4.0 for Data Sets with Non-Detects
Table D.7.2-2c	Background Data Goodness of Fit - Total Soil - ProUCL 4.0 for Full Data Sets
Table D.7.2-2d	Background Goodness of Fit - Total Soil - ProUCL 4.0 for Data Sets with Non-Detects
Table D.7.2-3a	Goodness of Fit - Surface Soil - ProUCL 4.0 for Full Data Sets
Table D.7.2-3b	Goodness of Fit - Surface Soil - ProUCL 4.0 for Data Sets with Non-Detects
Table D.7.2-3c	Goodness of Fit - Total Soil - ProUCL 4.0 for Full Data Sets
Table D.7.2-3d	Goodness of Fit - Total Soil - ProUCL 4.0 for Data Sets with Non-Detects
Table D.7.2-4a	Background versus Site Means Comparison - Surface Soil - ProUCL 4.0
Table D.7.2-4b	Background versus Site Means Comparison - Total Soil - ProUCL 4.0

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APPENDIX D.7.1

EXPOSURE POINT CONCENTRATION CALCULATION RESULTS – ProUCL 4.0

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Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

General UCL Statistics for Full Data Sets

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	9100	Minimum of Log Data	9.116
Maximum	18000	Maximum of Log Data	9.798
Mean	12355	Mean of log Data	9.397
Median	11000	SD of log Data	0.227
SD	2981		
Coefficient of Variation	0.241		
Skewness	0.992		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.853	Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	13984	95% H-UCL	14159
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16037
95% Adjusted-CLT UCL	14120	97.5% Chebyshev (MVUE) UCL	17636
95% Modified-t UCL	14028	99% Chebyshev (MVUE) UCL	20777

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	15.12	Data appear Normal at 5% Significance Level	
Theta Star	817.1		
nu star	332.7		
Approximate Chi Square Value (.05)	291.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	13833
Adjusted Chi Square Value	285.1	95% Jackknife UCL	13984
		95% Standard Bootstrap UCL	13736
Anderson-Darling Test Statistic	0.705	95% Bootstrap-t UCL	14640
Anderson-Darling 5% Critical Value	0.729	95% Hall's Bootstrap UCL	14413
Kolmogorov-Smirnov Test Statistic	0.308	95% Percentile Bootstrap UCL	13809
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	14009
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16272
		97.5% Chebyshev(Mean, Sd) UCL	17968
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	21298
95% Approximate Gamma UCL	14104		
95% Adjusted Gamma UCL	14416		

Potential UCL to Use		Use 95% Student's-t UCL	13984

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Arsenic

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.57	Minimum of Log Data	-0.562
Maximum	12	Maximum of Log Data	2.485
Mean	4.127	Mean of log Data	0.953
Median	2.8	SD of log Data	1.041
SD	4.06		
Coefficient of Variation	0.984		
Skewness	1.23		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.813	Shapiro Wilk Test Statistic	0.949
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	6.346	95% H-UCL	12.27
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.22
95% Adjusted-CLT UCL	6.626	97.5% Chebyshev (MVUE) UCL	12.83
95% Modified-t UCL	6.422	99% Chebyshev (MVUE) UCL	17.98
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.945	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.37		
nu star	20.78		
Approximate Chi Square Value (.05)	11.43	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	6.141
Adjusted Chi Square Value	10.31	95% Jackknife UCL	6.346
		95% Standard Bootstrap UCL	6.025
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL	8.077
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	7.727
Kolmogorov-Smirnov Test Statistic	0.171	95% Percentile Bootstrap UCL	6.13
Kolmogorov-Smirnov 5% Critical Value	0.261	95% BCA Bootstrap UCL	6.445
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.464
		97.5% Chebyshev(Mean, Sd) UCL	11.77
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.31
95% Approximate Gamma UCL	7.505		
95% Adjusted Gamma UCL	8.315		

Potential UCL to Use		
	Use 95% Approximate Gamma UCL	7.505

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Barium

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	62	Minimum of Log Data	4.127
Maximum	240	Maximum of Log Data	5.481
Mean	146.9	Mean of log Data	4.914
Median	160	SD of log Data	0.422
SD	56.61		
Coefficient of Variation	0.385		
Skewness	0.156		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.969	Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	177.8	95% H-UCL	196.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	230.8
95% Adjusted-CLT UCL	175.8	97.5% Chebyshev (MVUE) UCL	266.8
95% Modified-t UCL	178	99% Chebyshev (MVUE) UCL	337.4
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.995	**Data appear Normal at 5% Significance Level**	
Theta Star	29.41		
nu star	109.9		
Approximate Chi Square Value (.05)	86.69	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	175
Adjusted Chi Square Value	83.34	95% Jackknife UCL	177.8
		95% Standard Bootstrap UCL	173.7
Anderson-Darling Test Statistic	0.213	95% Bootstrap-t UCL	179.6
Anderson-Darling 5% Critical Value	0.731	95% Hall's Bootstrap UCL	175.3
Kolmogorov-Smirnov Test Statistic	0.183	95% Percentile Bootstrap UCL	174
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	173.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	221.3
		97.5% Chebyshev(Mean, Sd) UCL	253.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	316.7
95% Approximate Gamma UCL	186.2		
95% Adjusted Gamma UCL	193.7		
Potential UCL to Use		Use 95% Student's-t UCL	177.8

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Beryllium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.55	Minimum of Log Data	-0.598
Maximum	1.3	Maximum of Log Data	0.262
Mean	0.965	Mean of log Data	-0.0637
Median	1	SD of log Data	0.255
SD	0.223		
Coefficient of Variation	0.231		
Skewness	-0.492		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.086	95% H-UCL	1.131
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.293
95% Adjusted-CLT UCL	1.065	97.5% Chebyshev (MVUE) UCL	1.434
95% Modified-t UCL	1.085	99% Chebyshev (MVUE) UCL	1.711

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	13.35	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0722		
nu star	293.7		
Approximate Chi Square Value (.05)	255	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	1.075
Adjusted Chi Square Value	249.1	95% Jackknife UCL	1.086
		95% Standard Bootstrap UCL	1.071
Anderson-Darling Test Statistic	0.388	95% Bootstrap-t UCL	1.072
Anderson-Darling 5% Critical Value	0.729	95% Hall's Bootstrap UCL	1.063
Kolmogorov-Smirnov Test Statistic	0.197	95% Percentile Bootstrap UCL	1.065
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	1.062
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.258
		97.5% Chebyshev(Mean, Sd) UCL	1.385
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.634
95% Approximate Gamma UCL	1.111		
95% Adjusted Gamma UCL	1.137		

Potential UCL to Use		Use 95% Student's-t UCL	1.086

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Calcium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	210	Minimum of Log Data	5.347
Maximum	2100	Maximum of Log Data	7.65
Mean	1342	Mean of log Data	7.061
Median	1400	SD of log Data	0.659
SD	566.7		
Coefficient of Variation	0.422		
Skewness	-0.662		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk Test Statistic	0.785
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1652	95% H-UCL	2389
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2682
95% Adjusted-CLT UCL	1586	97.5% Chebyshev (MVUE) UCL	3230
95% Modified-t UCL	1646	99% Chebyshev (MVUE) UCL	4307

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.763	**Data appear Normal at 5% Significance Level**	
Theta Star	485.7		
nu star	60.78		
Approximate Chi Square Value (.05)	43.85	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	1623
Adjusted Chi Square Value	41.52	95% Jackknife UCL	1652
		95% Standard Bootstrap UCL	1608
Anderson-Darling Test Statistic	0.611	95% Bootstrap-t UCL	1612
Anderson-Darling 5% Critical Value	0.733	95% Hall's Bootstrap UCL	1599
Kolmogorov-Smirnov Test Statistic	0.213	95% Percentile Bootstrap UCL	1591
Kolmogorov-Smirnov 5% Critical Value	0.257	95% BCA Bootstrap UCL	1559
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2087
		97.5% Chebyshev(Mean, Sd) UCL	2409
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3042
95% Approximate Gamma UCL	1860		
95% Adjusted Gamma UCL	1964		

Potential UCL to Use		Use 95% Student's-t UCL	1652

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Chromium

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	16	Minimum of Log Data	2.773
Maximum	79	Maximum of Log Data	4.369
Mean	29.14	Mean of log Data	3.256
Median	22	SD of log Data	0.459
SD	18.02		
Coefficient of Variation	0.619		
Skewness	2.478		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.682	Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	38.99	95% H-UCL	39.25
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	46.07
95% Adjusted-CLT UCL	42.41	97.5% Chebyshev (MVUE) UCL	53.66
95% Modified-t UCL	39.66	99% Chebyshev (MVUE) UCL	68.56
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.321	Data appear Lognormal at 5% Significance Level	
Theta Star	8.775		
nu star	73.05		
Approximate Chi Square Value (.05)	54.37	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	38.07
Adjusted Chi Square Value	51.75	95% Jackknife UCL	38.99
		95% Standard Bootstrap UCL	37.8
Anderson-Darling Test Statistic	0.889	95% Bootstrap-t UCL	52.5
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL	69.44
Kolmogorov-Smirnov Test Statistic	0.262	95% Percentile Bootstrap UCL	39
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	41.55
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	52.82
		97.5% Chebyshev(Mean, Sd) UCL	63.07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	83.2
95% Approximate Gamma UCL	39.15		
95% Adjusted Gamma UCL	41.13		
Potential UCL to Use		Use 95% Student's-t UCL	38.99
		or 95% Modified-t UCL	39.66
		or 95% H-UCL	39.25

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Cobalt

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	3.8	Minimum of Log Data	1.335
Maximum	9.1	Maximum of Log Data	2.208
Mean	7.65	Mean of log Data	2.004
Median	8.4	SD of log Data	0.278
SD	1.715		
Coefficient of Variation	0.224		
Skewness	-1.618		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.78	Shapiro Wilk Test Statistic	0.719
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.587	95% H-UCL	9.137
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.51
95% Adjusted-CLT UCL	8.231	97.5% Chebyshev (MVUE) UCL	11.74
95% Modified-t UCL	8.545	99% Chebyshev (MVUE) UCL	14.14
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	12.16	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.629		
nu star	267.5		
Approximate Chi Square Value (.05)	230.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	8.5
Adjusted Chi Square Value	225	95% Jackknife UCL	8.587
		95% Standard Bootstrap UCL	8.438
Anderson-Darling Test Statistic	1.29	95% Bootstrap-t UCL	8.369
Anderson-Darling 5% Critical Value	0.729	95% Hall's Bootstrap UCL	8.288
Kolmogorov-Smirnov Test Statistic	0.297	95% Percentile Bootstrap UCL	8.427
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	8.314
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.904
		97.5% Chebyshev(Mean, Sd) UCL	10.88
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12.79
95% Approximate Gamma UCL	8.873		
95% Adjusted Gamma UCL	9.093		
Potential UCL to Use		Use 95% Student's-t UCL	8.587
		or 95% Modified-t UCL	8.545

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Copper

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	6.3	Minimum of Log Data	1.841
Maximum	1100	Maximum of Log Data	7.003
Mean	157.8	Mean of log Data	3.342
Median	12	SD of log Data	1.761
SD	339.8		
Coefficient of Variation	2.153		
Skewness	2.613		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.528	Shapiro Wilk Test Statistic	0.805
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	343.5	95% H-UCL	1736
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	352.6
95% Adjusted-CLT UCL	412.6	97.5% Chebyshev (MVUE) UCL	461.3
95% Modified-t UCL	357	99% Chebyshev (MVUE) UCL	674.8

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.341	Data do not follow a Discernable Distribution (0.05)	
Theta Star	463.3		
nu star	7.494		
Approximate Chi Square Value (.05)	2.445	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	326.3
Adjusted Chi Square Value	2.002	95% Jackknife UCL	343.5
		95% Standard Bootstrap UCL	315.7
Anderson-Darling Test Statistic	1.52	95% Bootstrap-t UCL	2628
Anderson-Darling 5% Critical Value	0.804	95% Hall's Bootstrap UCL	2548
Kolmogorov-Smirnov Test Statistic	0.31	95% Percentile Bootstrap UCL	333.9
Kolmogorov-Smirnov 5% Critical Value	0.273	95% BCA Bootstrap UCL	456.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	604.4
		97.5% Chebyshev(Mean, Sd) UCL	797.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1177
95% Approximate Gamma UCL	483.6		
95% Adjusted Gamma UCL	590.8		

Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	1177
Recommended UCL exceeds the maximum observation			

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Iron

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	14000	Minimum of Log Data	9.547
Maximum	47000	Maximum of Log Data	10.76
Mean	26091	Mean of log Data	10.1
Median	24000	SD of log Data	0.37
SD	10454		
Coefficient of Variation	0.401		
Skewness	1.236		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.83	Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	31804	95% H-UCL	33151
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	38794
95% Adjusted-CLT UCL	32531	97.5% Chebyshev (MVUE) UCL	44326
95% Modified-t UCL	32000	99% Chebyshev (MVUE) UCL	55193

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.781	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4513		
nu star	127.2		
Approximate Chi Square Value (.05)	102.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	31276
Adjusted Chi Square Value	98.48	95% Jackknife UCL	31804
		95% Standard Bootstrap UCL	30999
Anderson-Darling Test Statistic	0.631	95% Bootstrap-t UCL	36464
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	71907
Kolmogorov-Smirnov Test Statistic	0.233	95% Percentile Bootstrap UCL	31364
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	32818
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	39830
		97.5% Chebyshev(Mean, Sd) UCL	45776
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	57454
95% Approximate Gamma UCL	32490		
95% Adjusted Gamma UCL	33696		

Potential UCL to Use		Use 95% Approximate Gamma UCL	32490

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Lead

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	7.9	Minimum of Log Data	2.067
Maximum	760	Maximum of Log Data	6.633
Mean	163.1	Mean of log Data	4.262
Median	66	SD of log Data	1.367
SD	235.2		
Coefficient of Variation	1.442		
Skewness	2.082		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.684	Shapiro Wilk Test Statistic	0.977
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	291.6	95% H-UCL	910.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	461.6
95% Adjusted-CLT UCL	327.3	97.5% Chebyshev (MVUE) UCL	593.2
95% Modified-t UCL	299	99% Chebyshev (MVUE) UCL	851.7
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.586	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	278.2		
nu star	12.9		
Approximate Chi Square Value (.05)	5.825	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	279.7
Adjusted Chi Square Value	5.07	95% Jackknife UCL	291.6
		95% Standard Bootstrap UCL	274.9
Anderson-Darling Test Statistic	0.486	95% Bootstrap-t UCL	596.3
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	786.7
Kolmogorov-Smirnov Test Statistic	0.218	95% Percentile Bootstrap UCL	284.9
Kolmogorov-Smirnov 5% Critical Value	0.265	95% BCA Bootstrap UCL	325.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	472.2
		97.5% Chebyshev(Mean, Sd) UCL	606
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	868.8
95% Approximate Gamma UCL	361.1		
95% Adjusted Gamma UCL	414.9		
Potential UCL to Use		Use 95% Approximate Gamma UCL	361.1

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Magnesium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	940	Minimum of Log Data	6.846
Maximum	3000	Maximum of Log Data	8.006
Mean	2285	Mean of log Data	7.681
Median	2500	SD of log Data	0.374
SD	662.4		
Coefficient of Variation	0.29		
Skewness	-1.28		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.841	Shapiro Wilk Test Statistic	0.761
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2647	95% H-UCL	2951
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3455
95% Adjusted-CLT UCL	2532	97.5% Chebyshev (MVUE) UCL	3951
95% Modified-t UCL	2635	99% Chebyshev (MVUE) UCL	4926

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.99	Data do not follow a Discernable Distribution (0.05)	
Theta Star	327		
nu star	153.8		
Approximate Chi Square Value (.05)	126.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	2614
Adjusted Chi Square Value	122	95% Jackknife UCL	2647
		95% Standard Bootstrap UCL	2599
Anderson-Darling Test Statistic	1.091	95% Bootstrap-t UCL	2590
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	2536
Kolmogorov-Smirnov Test Statistic	0.288	95% Percentile Bootstrap UCL	2591
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	2527
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3156
		97.5% Chebyshev(Mean, Sd) UCL	3533
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4273
95% Approximate Gamma UCL	2787		
95% Adjusted Gamma UCL	2880		

Potential UCL to Use		Use 95% Student's-t UCL	2647
		or 95% Modified-t UCL	2635

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Manganese

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	250	Minimum of Log Data	5.521
Maximum	1100	Maximum of Log Data	7.003
Mean	684.1	Mean of log Data	6.446
Median	640	SD of log Data	0.446
SD	267.4		
Coefficient of Variation	0.391		
Skewness	0.0177		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.966	Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	830.2	95% H-UCL	937.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1101
95% Adjusted-CLT UCL	817.2	97.5% Chebyshev (MVUE) UCL	1279
95% Modified-t UCL	830.3	99% Chebyshev (MVUE) UCL	1628
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.632	**Data appear Normal at 5% Significance Level**	
Theta Star	147.7		
nu star	101.9		
Approximate Chi Square Value (.05)	79.61	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	816.7
Adjusted Chi Square Value	76.4	95% Jackknife UCL	830.2
		95% Standard Bootstrap UCL	804.2
Anderson-Darling Test Statistic	0.241	95% Bootstrap-t UCL	829.3
Anderson-Darling 5% Critical Value	0.731	95% Hall's Bootstrap UCL	819.1
Kolmogorov-Smirnov Test Statistic	0.166	95% Percentile Bootstrap UCL	816.4
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	806.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1036
		97.5% Chebyshev(Mean, Sd) UCL	1188
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1486
95% Approximate Gamma UCL	875.6		
95% Adjusted Gamma UCL	912.4		
Potential UCL to Use		Use 95% Student's-t UCL	830.2

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Mercury

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0135	Minimum of Log Data	-4.309
Maximum	0.22	Maximum of Log Data	-1.514
Mean	0.0868	Mean of log Data	-2.832
Median	0.088	SD of log Data	0.999
SD	0.069		
Coefficient of Variation	0.796		
Skewness	0.584		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.893	Shapiro Wilk Test Statistic	0.895
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.124	95% H-UCL	0.25
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.218
95% Adjusted-CLT UCL	0.125	97.5% Chebyshev (MVUE) UCL	0.273
95% Modified-t UCL	0.125	99% Chebyshev (MVUE) UCL	0.381
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.104	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0786		
nu star	24.29		
Approximate Chi Square Value (.05)	14.07	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	0.121
Adjusted Chi Square Value	12.81	95% Jackknife UCL	0.124
		95% Standard Bootstrap UCL	0.119
Anderson-Darling Test Statistic	0.544	95% Bootstrap-t UCL	0.129
Anderson-Darling 5% Critical Value	0.743	95% Hall's Bootstrap UCL	0.124
Kolmogorov-Smirnov Test Statistic	0.208	95% Percentile Bootstrap UCL	0.119
Kolmogorov-Smirnov 5% Critical Value	0.26	95% BCA Bootstrap UCL	0.122
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.178
		97.5% Chebyshev(Mean, Sd) UCL	0.217
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.294
95% Approximate Gamma UCL	0.15		
95% Adjusted Gamma UCL	0.164		
Potential UCL to Use		Use 95% Student's-t UCL	0.124

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
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Nickel

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	6.6	Minimum of Log Data	1.887
Maximum	24	Maximum of Log Data	3.178
Mean	12.55	Mean of log Data	2.45
Median	10	SD of log Data	0.4
SD	5.738		
Coefficient of Variation	0.457		
Skewness	1.456		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.782	Shapiro Wilk Test Statistic	0.889
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	15.68	95% H-UCL	16.29
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	19.11
95% Adjusted-CLT UCL	16.2	97.5% Chebyshev (MVUE) UCL	21.99
95% Modified-t UCL	15.81	99% Chebyshev (MVUE) UCL	27.64

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.773	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	2.628		
nu star	105		
Approximate Chi Square Value (.05)	82.36	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	15.39
Adjusted Chi Square Value	79.1	95% Jackknife UCL	15.68
		95% Standard Bootstrap UCL	15.24
Anderson-Darling Test Statistic	0.788	95% Bootstrap-t UCL	20.08
Anderson-Darling 5% Critical Value	0.731	95% Hall's Bootstrap UCL	35.17
Kolmogorov-Smirnov Test Statistic	0.23	95% Percentile Bootstrap UCL	15.43
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	16.1
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20.09
		97.5% Chebyshev(Mean, Sd) UCL	23.35
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.76
95% Approximate Gamma UCL	16		
95% Adjusted Gamma UCL	16.66		

Potential UCL to Use		
	Use 95% Approximate Gamma UCL	16

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Potassium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	730	Minimum of Log Data	6.593
Maximum	1700	Maximum of Log Data	7.438
Mean	1250	Mean of log Data	7.103
Median	1400	SD of log Data	0.255
SD	293.1		
Coefficient of Variation	0.234		
Skewness	-0.412		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.89
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1410	95% H-UCL	1465
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1674
95% Adjusted-CLT UCL	1384	97.5% Chebyshev (MVUE) UCL	1857
95% Modified-t UCL	1408	99% Chebyshev (MVUE) UCL	2216

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	13.22	**Data appear Normal at 5% Significance Level**	
Theta Star	94.53		
nu star	290.9		
Approximate Chi Square Value (.05)	252.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	1395
Adjusted Chi Square Value	246.5	95% Jackknife UCL	1410
		95% Standard Bootstrap UCL	1391
Anderson-Darling Test Statistic	0.664	95% Bootstrap-t UCL	1391
Anderson-Darling 5% Critical Value	0.729	95% Hall's Bootstrap UCL	1376
Kolmogorov-Smirnov Test Statistic	0.261	95% Percentile Bootstrap UCL	1388
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	1384
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1635
		97.5% Chebyshev(Mean, Sd) UCL	1802
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2129
95% Approximate Gamma UCL	1441		
95% Adjusted Gamma UCL	1475		

Potential UCL to Use		Use 95% Student's-t UCL	1410

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Selenium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	10

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.12	Minimum of Log Data	-2.12
Maximum	0.87	Maximum of Log Data	-0.139
Mean	0.315	Mean of log Data	-1.354
Median	0.26	SD of log Data	0.637
SD	0.23		
Coefficient of Variation	0.731		
Skewness	1.667		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.812	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.441	95% H-UCL	0.51
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.577
95% Adjusted-CLT UCL	0.466	97.5% Chebyshev (MVUE) UCL	0.693
95% Modified-t UCL	0.447	99% Chebyshev (MVUE) UCL	0.92

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.999	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.158		
nu star	43.98		
Approximate Chi Square Value (.05)	29.77	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	0.429
Adjusted Chi Square Value	27.88	95% Jackknife UCL	0.441
		95% Standard Bootstrap UCL	0.425
Anderson-Darling Test Statistic	0.412	95% Bootstrap-t UCL	0.555
Anderson-Darling 5% Critical Value	0.735	95% Hall's Bootstrap UCL	0.985
Kolmogorov-Smirnov Test Statistic	0.188	95% Percentile Bootstrap UCL	0.427
Kolmogorov-Smirnov 5% Critical Value	0.257	95% BCA Bootstrap UCL	0.458
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.618
		97.5% Chebyshev(Mean, Sd) UCL	0.749
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.006
95% Approximate Gamma UCL	0.465		
95% Adjusted Gamma UCL	0.497		

Potential UCL to Use		Use 95% Approximate Gamma UCL	0.465

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Silver

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.037	Minimum of Log Data	-3.297
Maximum	0.73	Maximum of Log Data	-0.315
Mean	0.162	Mean of log Data	-2.487
Median	0.049	SD of log Data	1.045
SD	0.242		
Coefficient of Variation	1.491		
Skewness	2.01		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.563	Shapiro Wilk Test Statistic	0.691
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.295	95% H-UCL	0.398
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.33
95% Adjusted-CLT UCL	0.33	97.5% Chebyshev (MVUE) UCL	0.414
95% Modified-t UCL	0.302	99% Chebyshev (MVUE) UCL	0.58

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.698	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.233		
nu star	15.35		
Approximate Chi Square Value (.05)	7.504	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	0.283
Adjusted Chi Square Value	6.629	95% Jackknife UCL	0.295
		95% Standard Bootstrap UCL	0.278
Anderson-Darling Test Statistic	2.008	95% Bootstrap-t UCL	1.699
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	1.582
Kolmogorov-Smirnov Test Statistic	0.339	95% Percentile Bootstrap UCL	0.285
Kolmogorov-Smirnov 5% Critical Value	0.264	95% BCA Bootstrap UCL	0.331
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.481
		97.5% Chebyshev(Mean, Sd) UCL	0.619
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.889
95% Approximate Gamma UCL	0.332		
95% Adjusted Gamma UCL	0.376		

Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	0.889
Recommended UCL exceeds the maximum observation			

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Thallium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.1	Minimum of Log Data	-2.303
Maximum	0.54	Maximum of Log Data	-0.616
Mean	0.326	Mean of log Data	-1.226
Median	0.35	SD of log Data	0.517
SD	0.138		
Coefficient of Variation	0.425		
Skewness	-0.171		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.973	Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.402	95% H-UCL	0.481
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.561
95% Adjusted-CLT UCL	0.392	97.5% Chebyshev (MVUE) UCL	0.661
95% Modified-t UCL	0.401	99% Chebyshev (MVUE) UCL	0.856

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.637	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0896		
nu star	80		
Approximate Chi Square Value (.05)	60.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	0.395
Adjusted Chi Square Value	57.62	95% Jackknife UCL	0.402
		95% Standard Bootstrap UCL	0.391
Anderson-Darling Test Statistic	0.294	95% Bootstrap-t UCL	0.399
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL	0.389
Kolmogorov-Smirnov Test Statistic	0.167	95% Percentile Bootstrap UCL	0.39
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	0.388
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.508
		97.5% Chebyshev(Mean, Sd) UCL	0.587
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.741
95% Approximate Gamma UCL	0.432		
95% Adjusted Gamma UCL	0.452		

Potential UCL to Use		Use 95% Student's-t UCL	0.402

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	10

Raw Statistics		**Log-transformed Statistics**	
Minimum	16	Minimum of Log Data	2.773
Maximum	46	Maximum of Log Data	3.829
Mean	25.36	Mean of log Data	3.167
Median	23	SD of log Data	0.37
SD	10.39		
Coefficient of Variation	0.41		
Skewness	1.252		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.826	Shapiro Wilk Test Statistic	0.894
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	31.04	95% H-UCL	32.19
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37.67
95% Adjusted-CLT UCL	31.78	97.5% Chebyshev (MVUE) UCL	43.04
95% Modified-t UCL	31.24	99% Chebyshev (MVUE) UCL	53.59

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.661	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.481		
nu star	124.5		
Approximate Chi Square Value (.05)	99.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	30.52
Adjusted Chi Square Value	96.15	95% Jackknife UCL	31.04
		95% Standard Bootstrap UCL	30.24
Anderson-Darling Test Statistic	0.555	95% Bootstrap-t UCL	35.18
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	54.27
Kolmogorov-Smirnov Test Statistic	0.163	95% Percentile Bootstrap UCL	30.64
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	31.45
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	39.03
		97.5% Chebyshev(Mean, Sd) UCL	44.94
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	56.55
95% Approximate Gamma UCL	31.66		
95% Adjusted Gamma UCL	32.85		

Potential UCL to Use		Use 95% Approximate Gamma UCL	31.66

Table D.7.1-1a
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	36	Minimum of Log Data	3.584
Maximum	2500	Maximum of Log Data	7.824
Mean	539.8	Mean of log Data	5.418
Median	160	SD of log Data	1.381
SD	783.1		
Coefficient of Variation	1.451		
Skewness	1.997		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.692	Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	967.8	95% H-UCL	3043
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1501
95% Adjusted-CLT UCL	1080	97.5% Chebyshev (MVUE) UCL	1930
95% Modified-t UCL	991.5	99% Chebyshev (MVUE) UCL	2774
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.565	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	956		
nu star	12.42		
Approximate Chi Square Value (.05)	5.507	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	928.2
Adjusted Chi Square Value	4.777	95% Jackknife UCL	967.8
		95% Standard Bootstrap UCL	907.4
Anderson-Darling Test Statistic	0.576	95% Bootstrap-t UCL	1783
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL	2460
Kolmogorov-Smirnov Test Statistic	0.212	95% Percentile Bootstrap UCL	936.4
Kolmogorov-Smirnov 5% Critical Value	0.266	95% BCA Bootstrap UCL	1028
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1569
		97.5% Chebyshev(Mean, Sd) UCL	2014
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2889
95% Approximate Gamma UCL	1218		
95% Adjusted Gamma UCL	1404		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1218

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony

General Statistics

Number of Valid Data	11	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	1
		Percent Non-Detects	9.09%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.074	Minimum Detected	-2.604
Maximum Detected	4.6	Maximum Detected	1.526
Mean of Detected	1.083	Mean of Detected	-0.87
SD of Detected	1.507	SD of Detected	1.485
Minimum Non-Detect	0.026	Minimum Non-Detect	-3.65
Maximum Non-Detect	0.026	Maximum Non-Detect	-3.65

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.729	Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.986	Mean	-1.186
SD	1.466	SD	1.755
95% DL/2 (t) UCL	1.787	95% H-Stat (DL/2) UCL	15.21
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.903	Mean in Log Scale	-1.198
SD	1.495	SD in Log Scale	1.78
95% MLE (t) UCL	1.72	Mean in Original Scale	0.986
95% MLE (Tiku) UCL	1.672	SD in Original Scale	1.466
		95% Percentile Bootstrap UCL	1.756
		95% BCA Bootstrap UCL	1.978

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.517
Theta Star	2.094
nu star	10.35
A-D Test Statistic	0.679
5% A-D Critical Value	0.765
K-S Test Statistic	0.765
5% K-S Critical Value	0.278
Data follow Appr. Gamma Distribution at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	4.6
Mean	0.985
Median	0.21
SD	1.467
k star	0.253
Theta star	3.891
Nu star	5.567
AppChi2	1.423
95% Gamma Approximate UCL	3.852
95% Adjusted Gamma UCL	4.931

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data Follow Appr. Gamma Distribution at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.991
SD	1.394
SE of Mean	0.443
95% KM (t) UCL	1.794
95% KM (z) UCL	1.72
95% KM (jackknife) UCL	1.79
95% KM (bootstrap t) UCL	2.535
95% KM (BCA) UCL	1.793
95% KM (Percentile Bootstrap) UCL	1.719
95% KM (Chebyshev) UCL	2.922
97.5% KM (Chebyshev) UCL	3.758
99% KM (Chebyshev) UCL	5.399
Potential UCLs to Use	
95% KM (Chebyshev) UCL	2.922

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cadmium

General Statistics

Number of Valid Data	11	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	6
		Percent Non-Detects	54.55%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.49	Minimum Detected	-0.713
Maximum Detected	6.2	Maximum Detected	1.825
Mean of Detected	2.144	Mean of Detected	0.331
SD of Detected	2.355	SD of Detected	1.015
Minimum Non-Detect	0.45	Minimum Non-Detect	-0.799
Maximum Non-Detect	0.45	Maximum Non-Detect	-0.799

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.776	Shapiro Wilk Test Statistic	0.948
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.097	Mean	-0.663
SD	1.795	SD	1.148
95% DL/2 (t) UCL	2.078	95% H-Stat (DL/2) UCL	1.549

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.511
		SD in Log Scale	2.038
		Mean in Original Scale	1.015
		SD in Original Scale	1.841
		95% Percentile Bootstrap UCL	2.017
		95% BCA Bootstrap UCL	2.628

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.653
Theta Star	3.284
nu star	6.529
A-D Test Statistic	0.341
5% A-D Critical Value	0.688
K-S Test Statistic	0.688
5% K-S Critical Value	0.363
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	6.979
Mean	2.61
Median	1.893
SD	2.454
k star	0.284
Theta star	9.195
Nu star	6.244
AppChi2	1.766
95% Gamma Approximate UCL	9.228
95% Adjusted Gamma UCL	11.59

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	1.242
SD	1.642
SE of Mean	0.553
95% KM (t) UCL	2.245
95% KM (z) UCL	2.152
95% KM (jackknife) UCL	2.136
95% KM (bootstrap t) UCL	3.581
95% KM (BCA) UCL	2.845
95% KM (Percentile Bootstrap) UCL	2.473
95% KM (Chebyshev) UCL	3.654
97.5% KM (Chebyshev) UCL	4.698
99% KM (Chebyshev) UCL	6.749
Potential UCLs to Use	
95% KM (t) UCL	2.245
95% KM (Percentile Bootstrap) UCL	2.473

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sodium

General Statistics

Number of Valid Data	11	Number of Detected Data	9
Number of Distinct Detected Data	8	Number of Non-Detect Data	2
		Percent Non-Detects	18.18%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	33	Minimum Detected	3.497
Maximum Detected	67	Maximum Detected	4.205
Mean of Detected	44.39	Mean of Detected	3.766
SD of Detected	11.56	SD of Detected	0.242
Minimum Non-Detect	18	Minimum Non-Detect	2.89
Maximum Non-Detect	18	Maximum Non-Detect	2.89

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.855	Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	37.95	Mean	3.481
SD	17.66	SD	0.67
95% DL/2 (t) UCL	47.6	95% H-Stat (DL/2) UCL	45.38
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	38.09	Mean in Log Scale	3.66
SD	16.88	SD in Log Scale	0.32
95% MLE (t) UCL	47.31	Mean in Original Scale	40.72
95% MLE (Tiku) UCL	47.79	SD in Original Scale	13.19
		95% Percentile Bootstrap UCL	46.94
		95% BCA Bootstrap UCL	48.21

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	12.42
Theta Star	3.575
nu star	223.5
A-D Test Statistic	0.571
5% A-D Critical Value	0.721
K-S Test Statistic	0.721
5% K-S Critical Value	0.279
Data follow Appr. Gamma Distribution at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	26.98
Maximum	67
Mean	41.77
Median	39.5
SD	11.94
k star	10.96
Theta star	3.811
Nu star	241.1
AppChi2	206.2
95% Gamma Approximate UCL	48.85
95% Adjusted Gamma UCL	50.13

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	42.32
SD	10.79
SE of Mean	3.451
95% KM (t) UCL	48.57
95% KM (z) UCL	48
95% KM (jackknife) UCL	48.42
95% KM (bootstrap t) UCL	52.29
95% KM (BCA) UCL	48.82
95% KM (Percentile Bootstrap) UCL	48.27
95% KM (Chebyshev) UCL	57.36
97.5% KM (Chebyshev) UCL	63.87
99% KM (Chebyshev) UCL	76.66
Potential UCLs to Use	
95% KM (t) UCL	48.57
95% KM (Percentile Bootstrap) UCL	48.27

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Aroclor 1254

General Statistics

Number of Valid Data	11	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	3
		Percent Non-Detects	27.27%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	9.7	Minimum Detected	2.272
Maximum Detected	730	Maximum Detected	6.593
Mean of Detected	172.3	Mean of Detected	3.788
SD of Detected	285.2	SD of Detected	1.707
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5.4	Maximum Non-Detect	1.686

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	27.27%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.637	Shapiro Wilk Test Statistic	0.804
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	126	Mean	3.014
SD	251.4	SD	1.949
95% DL/2 (t) UCL	263.4	95% H-Stat (DL/2) UCL	2715
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	67.85	Mean in Log Scale	2.689
SD	297.7	SD in Log Scale	2.363
95% MLE (t) UCL	230.5	Mean in Original Scale	125.6
95% MLE (Tiku) UCL	234.2	SD in Original Scale	251.7
		95% Percentile Bootstrap UCL	256.3
		95% BCA Bootstrap UCL	288.5

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.378
Theta Star	456.2
nu star	6.044
A-D Test Statistic	1.066
5% A-D Critical Value	0.767
K-S Test Statistic	0.767
5% K-S Critical Value	0.31
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	730
Mean	125.3
Median	12
SD	251.8
k star	0.137
Theta star	917.5
Nu star	3.005
AppChi2	0.374
95% Gamma Approximate UCL	1007
95% Adjusted Gamma UCL	1435
Warning: Recommended UCL exceeds the maximum observation	
Note: DL/2 is not a recommended method.	

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	128
SD	238.8
SE of Mean	76.96
95% KM (t) UCL	267.5
95% KM (z) UCL	254.6
95% KM (jackknife) UCL	264.4
95% KM (bootstrap t) UCL	2609
95% KM (BCA) UCL	261.8
95% KM (Percentile Bootstrap) UCL	257.3
95% KM (Chebyshev) UCL	463.4
97.5% KM (Chebyshev) UCL	608.6
99% KM (Chebyshev) UCL	893.7
Potential UCLs to Use	
99% KM (Chebyshev) UCL	893.7

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Benzo(a)pyrene

General Statistics

Number of Valid Data	11	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	7
		Percent Non-Detects	63.64%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	17	Minimum Detected	2.833
Maximum Detected	43	Maximum Detected	3.761
Mean of Detected	25.75	Mean of Detected	3.181
SD of Detected	11.76	SD of Detected	0.406
Minimum Non-Detect	1.2	Minimum Non-Detect	0.182
Maximum Non-Detect	5.9	Maximum Non-Detect	1.775

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	63.64%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.814	Shapiro Wilk Test Statistic	0.885
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9.968	Mean	0.991
SD	14.09	SD	1.81
95% DL/2 (t) UCL	17.67	95% H-Stat (DL/2) UCL	67.36
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	26.41	Mean in Log Scale	2.241
SD	10.18	SD in Log Scale	0.837
95% MLE (t) UCL	31.98	Mean in Original Scale	13.09
95% MLE (Tiku) UCL	35.55	SD in Original Scale	12.05
		95% Percentile Bootstrap UCL	19.17
		95% BCA Bootstrap UCL	21.45

Table D.7.1-1b
EPC Calculation Results - SWMU 45 Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	2.072
Theta Star	12.43
nu star	16.58
A-D Test Statistic	0.451
5% A-D Critical Value	0.658
K-S Test Statistic	0.658
5% K-S Critical Value	0.395
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	13.36
Maximum	43
Mean	25.91
Median	23
SD	8.926
k star	6.906
Theta star	3.752
Nu star	151.9
AppChi2	124.4
95% Gamma Approximate UCL	31.63
95% Adjusted Gamma UCL	N/A

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	20.18
SD	7.445
SE of Mean	2.592
95% KM (t) UCL	24.88
95% KM (z) UCL	24.45
95% KM (jackknife) UCL	24.12
95% KM (bootstrap t) UCL	29.69
95% KM (BCA) UCL	43
95% KM (Percentile Bootstrap) UCL	26.64
95% KM (Chebyshev) UCL	31.48
97.5% KM (Chebyshev) UCL	36.37
99% KM (Chebyshev) UCL	45.97
Potential UCLs to Use	
95% KM (t) UCL	24.88
95% KM (Percentile Bootstrap) UCL	26.64

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

General UCL Statistics for Full Data Sets

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	12

Raw Statistics		**Log-transformed Statistics**	
Minimum	9100	Minimum of Log Data	9.116
Maximum	19000	Maximum of Log Data	9.852
Mean	13155	Mean of log Data	9.461
Median	12500	SD of log Data	0.22
SD	2977		
Coefficient of Variation	0.226		
Skewness	0.614		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.918	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	14247	95% H-UCL	14336
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15857
95% Adjusted-CLT UCL	14287	97.5% Chebyshev (MVUE) UCL	17029
95% Modified-t UCL	14261	99% Chebyshev (MVUE) UCL	19332

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	18.55	Data appear Normal at 5% Significance Level	
Theta Star	709.1		
nu star	816.3		
Approximate Chi Square Value (.05)	751	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	14199
Adjusted Chi Square Value	746.3	95% Jackknife UCL	14247
		95% Standard Bootstrap UCL	14168
Anderson-Darling Test Statistic	0.575	95% Bootstrap-t UCL	14349
Anderson-Darling 5% Critical Value	0.74	95% Hall's Bootstrap UCL	14265
Kolmogorov-Smirnov Test Statistic	0.177	95% Percentile Bootstrap UCL	14209
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	14223
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15922
		97.5% Chebyshev(Mean, Sd) UCL	17119
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	19471
95% Approximate Gamma UCL	14298		
95% Adjusted Gamma UCL	14388		

Potential UCL to Use		Use 95% Student's-t UCL	14247

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Arsenic

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.57	Minimum of Log Data	-0.562
Maximum	12	Maximum of Log Data	2.485
Mean	2.525	Mean of log Data	0.412
Median	1.05	SD of log Data	0.931
SD	3.255		
Coefficient of Variation	1.289		
Skewness	2.22		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.624	Shapiro Wilk Test Statistic	0.845
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3.719	95% H-UCL	3.837
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.454
95% Adjusted-CLT UCL	4.017	97.5% Chebyshev (MVUE) UCL	5.4
95% Modified-t UCL	3.774	99% Chebyshev (MVUE) UCL	7.258
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.988	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2.554		
nu star	43.49		
Approximate Chi Square Value (.05)	29.37	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	3.666
Adjusted Chi Square Value	28.5	95% Jackknife UCL	3.719
		95% Standard Bootstrap UCL	3.613
Anderson-Darling Test Statistic	2.026	95% Bootstrap-t UCL	4.857
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	4.58
Kolmogorov-Smirnov Test Statistic	0.278	95% Percentile Bootstrap UCL	3.738
Kolmogorov-Smirnov 5% Critical Value	0.19	95% BCA Bootstrap UCL	4.14
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.55
		97.5% Chebyshev(Mean, Sd) UCL	6.859
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.43
95% Approximate Gamma UCL	3.739		
95% Adjusted Gamma UCL	3.853		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	5.55

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Barium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	16

Raw Statistics		**Log-transformed Statistics**	
Minimum	62	Minimum of Log Data	4.127
Maximum	300	Maximum of Log Data	5.704
Mean	144.5	Mean of log Data	4.909
Median	135	SD of log Data	0.366
SD	55.3		
Coefficient of Variation	0.383		
Skewness	1.197		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.986
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	164.8	95% H-UCL	168.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	194.6
95% Adjusted-CLT UCL	167.1	97.5% Chebyshev (MVUE) UCL	216.3
95% Modified-t UCL	165.3	99% Chebyshev (MVUE) UCL	258.9

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.853	Data appear Normal at 5% Significance Level	
Theta Star	21.09		
nu star	301.5		
Approximate Chi Square Value (.05)	262.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	163.9
Adjusted Chi Square Value	259.6	95% Jackknife UCL	164.8
		95% Standard Bootstrap UCL	163.2
Anderson-Darling Test Statistic	0.269	95% Bootstrap-t UCL	169.9
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	171.4
Kolmogorov-Smirnov Test Statistic	0.127	95% Percentile Bootstrap UCL	163.9
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	167.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	195.9
		97.5% Chebyshev(Mean, Sd) UCL	218.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	261.8
95% Approximate Gamma UCL	166.1		
95% Adjusted Gamma UCL	167.9		

Potential UCL to Use		Use 95% Student's-t UCL	164.8

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Beryllium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	14

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.55	Minimum of Log Data	-0.598
Maximum	1.6	Maximum of Log Data	0.47
Mean	1.063	Mean of log Data	0.0331
Median	1.1	SD of log Data	0.248
SD	0.245		
Coefficient of Variation	0.23		
Skewness	-0.0679		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.984	Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.153	95% H-UCL	1.175
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.312
95% Adjusted-CLT UCL	1.148	97.5% Chebyshev (MVUE) UCL	1.42
95% Modified-t UCL	1.152	99% Chebyshev (MVUE) UCL	1.63

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	15.75	Data appear Normal at 5% Significance Level	
Theta Star	0.0675		
nu star	692.9		
Approximate Chi Square Value (.05)	632.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	1.149
Adjusted Chi Square Value	628.5	95% Jackknife UCL	1.153
		95% Standard Bootstrap UCL	1.148
Anderson-Darling Test Statistic	0.357	95% Bootstrap-t UCL	1.153
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	1.149
Kolmogorov-Smirnov Test Statistic	0.135	95% Percentile Bootstrap UCL	1.146
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	1.146
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.29
		97.5% Chebyshev(Mean, Sd) UCL	1.389
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.582
95% Approximate Gamma UCL	1.164		
95% Adjusted Gamma UCL	1.172		

Potential UCL to Use		Use 95% Student's-t UCL	1.153

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Calcium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	210	Minimum of Log Data	5.347
Maximum	2700	Maximum of Log Data	7.901
Mean	1466	Mean of log Data	7.196
Median	1400	SD of log Data	0.517
SD	537.3		
Coefficient of Variation	0.366		
Skewness	-0.0541		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.977	Shapiro Wilk Test Statistic	0.794
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1663	95% H-UCL	1911
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2273
95% Adjusted-CLT UCL	1653	97.5% Chebyshev (MVUE) UCL	2601
95% Modified-t UCL	1663	99% Chebyshev (MVUE) UCL	3246

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.73	Data appear Normal at 5% Significance Level	
Theta Star	310		
nu star	208.1		
Approximate Chi Square Value (.05)	175.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	1655
Adjusted Chi Square Value	173.5	95% Jackknife UCL	1663
		95% Standard Bootstrap UCL	1651
Anderson-Darling Test Statistic	0.714	95% Bootstrap-t UCL	1665
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	1668
Kolmogorov-Smirnov Test Statistic	0.154	95% Percentile Bootstrap UCL	1661
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	1641
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1966
		97.5% Chebyshev(Mean, Sd) UCL	2182
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2606
95% Approximate Gamma UCL	1737		
95% Adjusted Gamma UCL	1759		

Potential UCL to Use		Use 95% Student's-t UCL	1663

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chromium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	17

Raw Statistics		**Log-transformed Statistics**	
Minimum	16	Minimum of Log Data	2.773
Maximum	170	Maximum of Log Data	5.136
Mean	32.32	Mean of log Data	3.261
Median	21.5	SD of log Data	0.546
SD	33.47		
Coefficient of Variation	1.036		
Skewness	3.747		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.46	Shapiro Wilk Test Statistic	0.715
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	44.6	95% H-UCL	38.52
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	45.97
95% Adjusted-CLT UCL	50.15	97.5% Chebyshev (MVUE) UCL	52.87
95% Modified-t UCL	45.55	99% Chebyshev (MVUE) UCL	66.42

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.171	Data do not follow a Discernable Distribution (0.05)	
Theta Star	14.89		
nu star	95.53		
Approximate Chi Square Value (.05)	73.99	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	44.06
Adjusted Chi Square Value	72.57	95% Jackknife UCL	44.6
		95% Standard Bootstrap UCL	43.64
Anderson-Darling Test Statistic	3.043	95% Bootstrap-t UCL	89.77
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	92.59
Kolmogorov-Smirnov Test Statistic	0.299	95% Percentile Bootstrap UCL	45.09
Kolmogorov-Smirnov 5% Critical Value	0.187	95% BCA Bootstrap UCL	52.73
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	63.42
		97.5% Chebyshev(Mean, Sd) UCL	76.88
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	103.3
95% Approximate Gamma UCL	41.73		
95% Adjusted Gamma UCL	42.54		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	63.42

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cobalt

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	3.8	Minimum of Log Data	1.335
Maximum	11	Maximum of Log Data	2.398
Mean	8.393	Mean of log Data	2.102
Median	8.5	SD of log Data	0.243
SD	1.729		
Coefficient of Variation	0.206		
Skewness	-0.83		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.914	Shapiro Wilk Test Statistic	0.824
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9.028	95% H-UCL	9.273
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.34
95% Adjusted-CLT UCL	8.93	97.5% Chebyshev (MVUE) UCL	11.17
95% Modified-t UCL	9.017	99% Chebyshev (MVUE) UCL	12.81
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	17.48	Data appear Normal at 5% Significance Level	
Theta Star	0.48		
nu star	769.2		
Approximate Chi Square Value (.05)	705.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	9
Adjusted Chi Square Value	701.4	95% Jackknife UCL	9.028
		95% Standard Bootstrap UCL	8.989
Anderson-Darling Test Statistic	0.992	95% Bootstrap-t UCL	8.985
Anderson-Darling 5% Critical Value	0.74	95% Hall's Bootstrap UCL	8.969
Kolmogorov-Smirnov Test Statistic	0.179	95% Percentile Bootstrap UCL	8.959
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	8.918
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10
		97.5% Chebyshev(Mean, Sd) UCL	10.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12.06
95% Approximate Gamma UCL	9.147		
95% Adjusted Gamma UCL	9.206		
Potential UCL to Use		Use 95% Student's-t UCL	9.028

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Copper

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	6.3	Minimum of Log Data	1.841
Maximum	1100	Maximum of Log Data	7.003
Mean	109.5	Mean of log Data	3.036
Median	11.5	SD of log Data	1.515
SD	265.5		
Coefficient of Variation	2.425		
Skewness	3.05		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.448	Shapiro Wilk Test Statistic	0.704
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	206.9	95% H-UCL	195.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	161
95% Adjusted-CLT UCL	241.9	97.5% Chebyshev (MVUE) UCL	205
95% Modified-t UCL	213	99% Chebyshev (MVUE) UCL	291.4
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.373	Data do not follow a Discernable Distribution (0.05)	
Theta Star	293.4		
nu star	16.42		
Approximate Chi Square Value (.05)	8.258	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	202.6
Adjusted Chi Square Value	7.828	95% Jackknife UCL	206.9
		95% Standard Bootstrap UCL	197.9
Anderson-Darling Test Statistic	4.17	95% Bootstrap-t UCL	320
Anderson-Darling 5% Critical Value	0.827	95% Hall's Bootstrap UCL	222.2
Kolmogorov-Smirnov Test Statistic	0.383	95% Percentile Bootstrap UCL	206
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	261.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	356.2
		97.5% Chebyshev(Mean, Sd) UCL	462.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	672.6
95% Approximate Gamma UCL	217.6		
95% Adjusted Gamma UCL	229.6		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	672.6

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Iron

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	14

Raw Statistics		**Log-transformed Statistics**	
Minimum	14000	Minimum of Log Data	9.547
Maximum	47000	Maximum of Log Data	10.76
Mean	24273	Mean of log Data	10.04
Median	23500	SD of log Data	0.322
SD	8784		
Coefficient of Variation	0.362		
Skewness	1.461		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.834	Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	27495	95% H-UCL	27601
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	31553
95% Adjusted-CLT UCL	27976	97.5% Chebyshev (MVUE) UCL	34741
95% Modified-t UCL	27592	99% Chebyshev (MVUE) UCL	41002

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8.312	Data appear Lognormal at 5% Significance Level	
Theta Star	2920		
nu star	365.7		
Approximate Chi Square Value (.05)	322.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	27353
Adjusted Chi Square Value	319.4	95% Jackknife UCL	27495
		95% Standard Bootstrap UCL	27301
Anderson-Darling Test Statistic	0.785	95% Bootstrap-t UCL	28529
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	28574
Kolmogorov-Smirnov Test Statistic	0.193	95% Percentile Bootstrap UCL	27455
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	28000
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	32436
		97.5% Chebyshev(Mean, Sd) UCL	35968
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	42907
95% Approximate Gamma UCL	27534		
95% Adjusted Gamma UCL	27795		

Potential UCL to Use		
	Use 95% Student's-t UCL	27495
	or 95% Modified-t UCL	27592
	or 95% H-UCL	27601

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Lead

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	7.7	Minimum of Log Data	2.041
Maximum	760	Maximum of Log Data	6.633
Mean	100.4	Mean of log Data	3.464
Median	21	SD of log Data	1.448
SD	184.6		
Coefficient of Variation	1.84		
Skewness	2.741		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.571	Shapiro Wilk Test Statistic	0.867
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	168.1	95% H-UCL	250.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	218.9
95% Adjusted-CLT UCL	189.7	97.5% Chebyshev (MVUE) UCL	277.5
95% Modified-t UCL	171.9	99% Chebyshev (MVUE) UCL	392.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.503	Data do not follow a Discernable Distribution (0.05)	
Theta Star	199.6		
nu star	22.12		
Approximate Chi Square Value (.05)	12.43	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	165.1
Adjusted Chi Square Value	11.89	95% Jackknife UCL	168.1
		95% Standard Bootstrap UCL	162.4
Anderson-Darling Test Statistic	1.827	95% Bootstrap-t UCL	248.5
Anderson-Darling 5% Critical Value	0.8	95% Hall's Bootstrap UCL	354
Kolmogorov-Smirnov Test Statistic	0.223	95% Percentile Bootstrap UCL	174.6
Kolmogorov-Smirnov 5% Critical Value	0.195	95% BCA Bootstrap UCL	195
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	271.9
		97.5% Chebyshev(Mean, Sd) UCL	346.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	492
95% Approximate Gamma UCL	178.6		
95% Adjusted Gamma UCL	186.8		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	492

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Magnesium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	16

Raw Statistics		**Log-transformed Statistics**	
Minimum	940	Minimum of Log Data	6.846
Maximum	4700	Maximum of Log Data	8.455
Mean	2963	Mean of log Data	7.932
Median	2900	SD of log Data	0.389
SD	967.2		
Coefficient of Variation	0.326		
Skewness	-0.0344		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Test Statistic	0.883
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3318	95% H-UCL	3524
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4097
95% Adjusted-CLT UCL	3301	97.5% Chebyshev (MVUE) UCL	4576
95% Modified-t UCL	3318	99% Chebyshev (MVUE) UCL	5516

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.088	Data appear Normal at 5% Significance Level	
Theta Star	418.1		
nu star	311.9		
Approximate Chi Square Value (.05)	271.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	3302
Adjusted Chi Square Value	269.2	95% Jackknife UCL	3318
		95% Standard Bootstrap UCL	3293
Anderson-Darling Test Statistic	0.554	95% Bootstrap-t UCL	3316
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	3345
Kolmogorov-Smirnov Test Statistic	0.18	95% Percentile Bootstrap UCL	3295
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	3273
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3862
		97.5% Chebyshev(Mean, Sd) UCL	4251
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5015
95% Approximate Gamma UCL	3398		
95% Adjusted Gamma UCL	3433		

Potential UCL to Use		Use 95% Student's-t UCL	3318

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Manganese

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	19

Raw Statistics		**Log-transformed Statistics**	
Minimum	250	Minimum of Log Data	5.521
Maximum	1100	Maximum of Log Data	7.003
Mean	621.4	Mean of log Data	6.368
Median	575	SD of log Data	0.37
SD	228.4		
Coefficient of Variation	0.368		
Skewness	0.667		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	705.1	95% H-UCL	726
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	840.3
95% Adjusted-CLT UCL	708.8	97.5% Chebyshev (MVUE) UCL	934.8
95% Modified-t UCL	706.3	99% Chebyshev (MVUE) UCL	1120

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.904	Data appear Normal at 5% Significance Level	
Theta Star	90		
nu star	303.8		
Approximate Chi Square Value (.05)	264.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	701.4
Adjusted Chi Square Value	261.7	95% Jackknife UCL	705.1
		95% Standard Bootstrap UCL	700.6
Anderson-Darling Test Statistic	0.364	95% Bootstrap-t UCL	717.7
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	710.6
Kolmogorov-Smirnov Test Statistic	0.118	95% Percentile Bootstrap UCL	703.9
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	707.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	833.6
		97.5% Chebyshev(Mean, Sd) UCL	925.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1106
95% Approximate Gamma UCL	713.9		
95% Adjusted Gamma UCL	721.4		

Potential UCL to Use			
		Use 95% Student's-t UCL	705.1

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Nickel

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	6.6	Minimum of Log Data	1.887
Maximum	34	Maximum of Log Data	3.526
Mean	13.72	Mean of log Data	2.545
Median	12.5	SD of log Data	0.375
SD	6.187		
Coefficient of Variation	0.451		
Skewness	2.049		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	15.99	95% H-UCL	15.94
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18.47
95% Adjusted-CLT UCL	16.51	97.5% Chebyshev (MVUE) UCL	20.57
95% Modified-t UCL	16.09	99% Chebyshev (MVUE) UCL	24.7

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.974	Data appear Lognormal at 5% Significance Level	
Theta Star	2.297		
nu star	262.9		
Approximate Chi Square Value (.05)	226.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	15.89
Adjusted Chi Square Value	223.8	95% Jackknife UCL	15.99
		95% Standard Bootstrap UCL	15.77
Anderson-Darling Test Statistic	0.876	95% Bootstrap-t UCL	17.14
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	18.07
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL	15.96
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	16.59
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	19.47
		97.5% Chebyshev(Mean, Sd) UCL	21.96
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	26.85
95% Approximate Gamma UCL	15.94		
95% Adjusted Gamma UCL	16.12		

Potential UCL to Use		
	Use 95% Student's-t UCL	15.99
	or 95% Modified-t UCL	16.09
	or 95% H-UCL	15.94

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Potassium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	730	Minimum of Log Data	6.593
Maximum	2400	Maximum of Log Data	7.783
Mean	1414	Mean of log Data	7.218
Median	1400	SD of log Data	0.275
SD	385.7		
Coefficient of Variation	0.273		
Skewness	0.642		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.951	Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1555	95% H-UCL	1580
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1781
95% Adjusted-CLT UCL	1561	97.5% Chebyshev (MVUE) UCL	1939
95% Modified-t UCL	1557	99% Chebyshev (MVUE) UCL	2251

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	12.32	Data appear Normal at 5% Significance Level	
Theta Star	114.7		
nu star	542.3		
Approximate Chi Square Value (.05)	489.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	1549
Adjusted Chi Square Value	485.5	95% Jackknife UCL	1555
		95% Standard Bootstrap UCL	1545
Anderson-Darling Test Statistic	0.438	95% Bootstrap-t UCL	1571
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	1577
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	1545
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	1552
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1772
		97.5% Chebyshev(Mean, Sd) UCL	1927
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2232
95% Approximate Gamma UCL	1567		
95% Adjusted Gamma UCL	1579		

Potential UCL to Use		Use 95% Student's-t UCL	1555

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Silver

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	19

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.024	Minimum of Log Data	-3.73
Maximum	0.73	Maximum of Log Data	-0.315
Mean	0.114	Mean of log Data	-2.798
Median	0.046	SD of log Data	0.943
SD	0.185		
Coefficient of Variation	1.623		
Skewness	2.68		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.504	Shapiro Wilk Test Statistic	0.754
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.182	95% H-UCL	0.158
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.183
95% Adjusted-CLT UCL	0.203	97.5% Chebyshev (MVUE) UCL	0.222
95% Modified-t UCL	0.186	99% Chebyshev (MVUE) UCL	0.299

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.831	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.138		
nu star	36.55		
Approximate Chi Square Value (.05)	23.71	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	0.179
Adjusted Chi Square Value	22.94	95% Jackknife UCL	0.182
		95% Standard Bootstrap UCL	0.177
Anderson-Darling Test Statistic	3.412	95% Bootstrap-t UCL	0.276
Anderson-Darling 5% Critical Value	0.774	95% Hall's Bootstrap UCL	0.199
Kolmogorov-Smirnov Test Statistic	0.347	95% Percentile Bootstrap UCL	0.184
Kolmogorov-Smirnov 5% Critical Value	0.191	95% BCA Bootstrap UCL	0.205
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.287
		97.5% Chebyshev(Mean, Sd) UCL	0.361
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.508
95% Approximate Gamma UCL	0.176		
95% Adjusted Gamma UCL	0.182		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.287

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Thallium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	17

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.1	Minimum of Log Data	-2.303
Maximum	0.54	Maximum of Log Data	-0.616
Mean	0.242	Mean of log Data	-1.545
Median	0.2	SD of log Data	0.509
SD	0.131		
Coefficient of Variation	0.539		
Skewness	0.971		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.868	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.29	95% H-UCL	0.303
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.36
95% Adjusted-CLT UCL	0.294	97.5% Chebyshev (MVUE) UCL	0.411
95% Modified-t UCL	0.291	99% Chebyshev (MVUE) UCL	0.512

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.553	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0682		
nu star	156.3		
Approximate Chi Square Value (.05)	128.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	0.288
Adjusted Chi Square Value	126.5	95% Jackknife UCL	0.29
		95% Standard Bootstrap UCL	0.286
Anderson-Darling Test Statistic	0.707	95% Bootstrap-t UCL	0.299
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	0.292
Kolmogorov-Smirnov Test Statistic	0.182	95% Percentile Bootstrap UCL	0.286
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	0.296
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.364
		97.5% Chebyshev(Mean, Sd) UCL	0.416
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.519
95% Approximate Gamma UCL	0.295		
95% Adjusted Gamma UCL	0.299		

Potential UCL to Use		Use 95% Approximate Gamma UCL	0.295

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	15	Minimum of Log Data	2.708
Maximum	46	Maximum of Log Data	3.829
Mean	24.36	Mean of log Data	3.141
Median	22	SD of log Data	0.319
SD	8.699		
Coefficient of Variation	0.357		
Skewness	1.358		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.845	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	27.55	95% H-UCL	27.67
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	31.6
95% Adjusted-CLT UCL	27.99	97.5% Chebyshev (MVUE) UCL	34.77
95% Modified-t UCL	27.64	99% Chebyshev (MVUE) UCL	41

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8.462	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.879		
nu star	372.3		
Approximate Chi Square Value (.05)	328.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	27.41
Adjusted Chi Square Value	325.5	95% Jackknife UCL	27.55
		95% Standard Bootstrap UCL	27.31
Anderson-Darling Test Statistic	0.707	95% Bootstrap-t UCL	28.48
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	28.31
Kolmogorov-Smirnov Test Statistic	0.135	95% Percentile Bootstrap UCL	27.59
Kolmogorov-Smirnov 5% Critical Value	0.185	95% BCA Bootstrap UCL	27.86
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	32.45
		97.5% Chebyshev(Mean, Sd) UCL	35.95
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	42.82
95% Approximate Gamma UCL	27.61		
95% Adjusted Gamma UCL	27.86		

Potential UCL to Use		Use 95% Approximate Gamma UCL	27.61

Table D.7.1-2a
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	36	Minimum of Log Data	3.584
Maximum	2500	Maximum of Log Data	7.824
Mean	350.4	Mean of log Data	4.982
Median	89	SD of log Data	1.195
SD	605.6		
Coefficient of Variation	1.728		
Skewness	2.706		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.563	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	572.5	95% H-UCL	620.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	648.3
95% Adjusted-CLT UCL	642.3	97.5% Chebyshev (MVUE) UCL	806.4
95% Modified-t UCL	584.9	99% Chebyshev (MVUE) UCL	1117
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.627	Data do not follow a Discernable Distribution (0.05)	
Theta Star	558.9		
nu star	27.58		
Approximate Chi Square Value (.05)	16.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	562.7
Adjusted Chi Square Value	15.97	95% Jackknife UCL	572.5
		95% Standard Bootstrap UCL	565.9
Anderson-Darling Test Statistic	2.441	95% Bootstrap-t UCL	892.3
Anderson-Darling 5% Critical Value	0.788	95% Hall's Bootstrap UCL	790.9
Kolmogorov-Smirnov Test Statistic	0.293	95% Percentile Bootstrap UCL	576.7
Kolmogorov-Smirnov 5% Critical Value	0.193	95% BCA Bootstrap UCL	669.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	913.1
		97.5% Chebyshev(Mean, Sd) UCL	1157
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1635
95% Approximate Gamma UCL	582		
95% Adjusted Gamma UCL	605.2		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	1635

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony

General Statistics

Number of Valid Data	22	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	6
		Percent Non-Detects	27.27%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.046	Minimum Detected	-3.079
Maximum Detected	33	Maximum Detected	3.497
Mean of Detected	2.761	Mean of Detected	-1.175
SD of Detected	8.162	SD of Detected	1.913
Minimum Non-Detect	0.026	Minimum Non-Detect	-3.65
Maximum Non-Detect	0.026	Maximum Non-Detect	-3.65

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.372	Shapiro Wilk Test Statistic	0.855
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.011	Mean	-2.039
SD	7.011	SD	2.168
95% DL/2 (t) UCL	4.583	95% H-Stat (DL/2) UCL	6.632
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.221	Mean in Log Scale	-2.423
SD	8.331	SD in Log Scale	2.693
95% MLE (t) UCL	3.278	Mean in Original Scale	2.009
95% MLE (Tiku) UCL	3.34	SD in Original Scale	7.012
		95% Percentile Bootstrap UCL	4.931
		95% BCA Bootstrap UCL	6.547

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.296
Theta Star	9.337
nu star	9.462
A-D Test Statistic	2.005
5% A-D Critical Value	0.835
K-S Test Statistic	0.835
5% K-S Critical Value	0.233
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	33
Mean	2.008
Median	0.0818
SD	7.012
k star	0.126
Theta star	15.89
Nu star	5.559
AppChi2	1.419
95% Gamma Approximate UCL	7.867
95% Adjusted Gamma UCL	8.788

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	2.02
SD	6.847
SE of Mean	1.508
95% KM (t) UCL	4.615
95% KM (z) UCL	4.5
95% KM (jackknife) UCL	4.589
95% KM (bootstrap t) UCL	23.22
95% KM (BCA) UCL	4.995
95% KM (Percentile Bootstrap) UCL	4.962
95% KM (Chebyshev) UCL	8.592
97.5% KM (Chebyshev) UCL	11.44
99% KM (Chebyshev) UCL	17.02
Potential UCLs to Use	
99% KM (Chebyshev) UCL	17.02

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cadmium

General Statistics

Number of Valid Data	22	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	14
		Percent Non-Detects	63.64%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.49	Minimum Detected	-0.713
Maximum Detected	6.2	Maximum Detected	1.825
Mean of Detected	1.719	Mean of Detected	0.127
SD of Detected	1.93	SD of Detected	0.918
Minimum Non-Detect	0.45	Minimum Non-Detect	-0.799
Maximum Non-Detect	0.45	Maximum Non-Detect	-0.799

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.695	Shapiro Wilk Test Statistic	0.867
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.768	Mean	-0.903
SD	1.335	SD	0.957
95% DL/2 (t) UCL	1.258	95% H-Stat (DL/2) UCL	0.765

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.881
		SD in Log Scale	1.895
		Mean in Original Scale	0.677
		SD in Original Scale	1.376
		95% Percentile Bootstrap UCL	1.185
		95% BCA Bootstrap UCL	1.513

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.927
Theta Star	1.855
nu star	14.83
A-D Test Statistic	0.627
5% A-D Critical Value	0.731
K-S Test Statistic	0.731
5% K-S Critical Value	0.3
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	8.178
Mean	3.022
Median	2.054
SD	2.629
k star	0.427
Theta star	7.074
Nu star	18.79
AppChi2	9.967
95% Gamma Approximate UCL	5.697
95% Adjusted Gamma UCL	5.985

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.937
SD	1.239
SE of Mean	0.282
95% KM (t) UCL	1.423
95% KM (z) UCL	1.401
95% KM (jackknife) UCL	1.397
95% KM (bootstrap t) UCL	2.293
95% KM (BCA) UCL	1.498
95% KM (Percentile Bootstrap) UCL	1.466
95% KM (Chebyshev) UCL	2.168
97.5% KM (Chebyshev) UCL	2.7
99% KM (Chebyshev) UCL	3.746
Potential UCLs to Use	
95% KM (t) UCL	1.423

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Mercury

General Statistics

Number of Valid Data	22	Number of Detected Data	21
Number of Distinct Detected Data	20	Number of Non-Detect Data	1
		Percent Non-Detects	4.55%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0087	Minimum Detected	-4.744
Maximum Detected	0.22	Maximum Detected	-1.514
Mean of Detected	0.0628	Mean of Detected	-3.293
SD of Detected	0.0634	SD of Detected	1.062
Minimum Non-Detect	0.0075	Minimum Non-Detect	-4.893
Maximum Non-Detect	0.0075	Maximum Non-Detect	-4.893

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.798	Shapiro Wilk Test Statistic	0.886
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0601	Mean	-3.397
SD	0.0631	SD	1.146
95% DL/2 (t) UCL	0.0832	95% H-Stat (DL/2) UCL	0.125
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0586	Mean in Log Scale	-3.409
SD	0.0637	SD in Log Scale	1.171
95% MLE (t) UCL	0.082	Mean in Original Scale	0.06
95% MLE (Tiku) UCL	0.0806	SD in Original Scale	0.0631
		95% Percentile Bootstrap UCL	0.084
		95% BCA Bootstrap UCL	0.0866

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.966
Theta Star	0.065
nu star	40.58
A-D Test Statistic	1.343
5% A-D Critical Value	0.768
K-S Test Statistic	0.768
5% K-S Critical Value	0.195
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	0.22
Mean	0.0599
Median	0.0225
SD	0.0633
k star	0.462
Theta star	0.13
Nu star	20.34
AppChi2	11.1
95% Gamma Approximate UCL	0.11
95% Adjusted Gamma UCL	0.115

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.0603
SD	0.0615
SE of Mean	0.0134
95% KM (t) UCL	0.0834
95% KM (z) UCL	0.0824
95% KM (jackknife) UCL	0.0833
95% KM (bootstrap t) UCL	0.0881
95% KM (BCA) UCL	0.0815
95% KM (Percentile Bootstrap) UCL	0.083
95% KM (Chebyshev) UCL	0.119
97.5% KM (Chebyshev) UCL	0.144
99% KM (Chebyshev) UCL	0.194
Potential UCLs to Use	
97.5% KM (Chebyshev) UCL	0.144

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Selenium

General Statistics

Number of Valid Data	22	Number of Detected Data	18
Number of Distinct Detected Data	15	Number of Non-Detect Data	4
		Percent Non-Detects	18.18%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.036	Minimum Detected	-3.324
Maximum Detected	0.87	Maximum Detected	-0.139
Mean of Detected	0.23	Mean of Detected	-1.781
SD of Detected	0.21	SD of Detected	0.8
Minimum Non-Detect	0.028	Minimum Non-Detect	-3.576
Maximum Non-Detect	0.028	Maximum Non-Detect	-3.576

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.765	Shapiro Wilk Test Statistic	0.978
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.19	Mean	-2.234
SD	0.207	SD	1.217
95% DL/2 (t) UCL	0.266	95% H-Stat (DL/2) UCL	0.277
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.167	Mean in Log Scale	-2.122
SD	0.233	SD in Log Scale	1.041
95% MLE (t) UCL	0.252	Mean in Original Scale	0.193
95% MLE (Tiku) UCL	0.252	SD in Original Scale	0.205
		95% Percentile Bootstrap UCL	0.265
		95% BCA Bootstrap UCL	0.293

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	1.503
Theta Star	0.153
nu star	54.1
A-D Test Statistic	0.5
5% A-D Critical Value	0.754
K-S Test Statistic	0.754
5% K-S Critical Value	0.207
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	0.87
Mean	0.191
Median	0.128
SD	0.207
k star	0.32
Theta star	0.595
Nu star	14.1
AppChi2	6.639
95% Gamma Approximate UCL	0.405
95% Adjusted Gamma UCL	0.43

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.194
SD	0.199
SE of Mean	0.0436
95% KM (t) UCL	0.27
95% KM (z) UCL	0.266
95% KM (jackknife) UCL	0.267
95% KM (bootstrap t) UCL	0.312
95% KM (BCA) UCL	0.277
95% KM (Percentile Bootstrap) UCL	0.273
95% KM (Chebyshev) UCL	0.385
97.5% KM (Chebyshev) UCL	0.467
99% KM (Chebyshev) UCL	0.628
Potential UCLs to Use	
95% KM (BCA) UCL	0.277

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Aroclor 1254

General Statistics

Number of Valid Data	22	Number of Detected Data	12
Number of Distinct Detected Data	11	Number of Non-Detect Data	10
		Percent Non-Detects	45.45%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	9.7	Minimum Detected	2.272
Maximum Detected	1200	Maximum Detected	7.09
Mean of Detected	226.7	Mean of Detected	3.971
SD of Detected	386.4	SD of Detected	1.752
Minimum Non-Detect	4.8	Minimum Non-Detect	1.569
Maximum Non-Detect	5.4	Maximum Non-Detect	1.686

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	10
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	45.45%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.642	Shapiro Wilk Test Statistic	0.83
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	124.8	Mean	2.585
SD	302.1	SD	2.006
95% DL/2 (t) UCL	235.7	95% H-Stat (DL/2) UCL	381.4

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.881
		SD in Log Scale	2.716
		Mean in Original Scale	124
		SD in Original Scale	302.5
		95% Percentile Bootstrap UCL	235.2
		95% BCA Bootstrap UCL	294.3

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.39
Theta Star	582.1
nu star	9.349
A-D Test Statistic	1.285
5% A-D Critical Value	0.796
K-S Test Statistic	0.796
5% K-S Critical Value	0.261
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	1200
Mean	165.9
Median	52.11
SD	294.8
k star	0.182
Theta star	911.9
Nu star	8.005
AppChi2	2.738
95% Gamma Approximate UCL	485.1
95% Adjusted Gamma UCL	528.5

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	128.1
SD	293.8
SE of Mean	65.43
95% KM (t) UCL	240.7
95% KM (z) UCL	235.7
95% KM (jackknife) UCL	237.6
95% KM (bootstrap t) UCL	371
95% KM (BCA) UCL	244.8
95% KM (Percentile Bootstrap) UCL	240.2
95% KM (Chebyshev) UCL	413.3
97.5% KM (Chebyshev) UCL	536.7
99% KM (Chebyshev) UCL	779.1
Potential UCLs to Use	
99% KM (Chebyshev) UCL	779.1

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Benzo(a)pyrene

General Statistics

Number of Valid Data	22	Number of Detected Data	6
Number of Distinct Detected Data	5	Number of Non-Detect Data	16
		Percent Non-Detects	72.73%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	11	Minimum Detected	2.398
Maximum Detected	43	Maximum Detected	3.761
Mean of Detected	22.33	Mean of Detected	3.02
SD of Detected	10.91	SD of Detected	0.444
Minimum Non-Detect	1.1	Minimum Non-Detect	0.0953
Maximum Non-Detect	5.9	Maximum Non-Detect	1.775

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	6
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	72.73%

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.833	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.664	Mean	0.559
SD	11.18	SD	1.599
95% DL/2 (t) UCL	10.77	95% H-Stat (DL/2) UCL	9.899
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	23.62	Mean in Log Scale	1.777
SD	9.961	SD in Log Scale	0.925
95% MLE (t) UCL	27.27	Mean in Original Scale	9.141
95% MLE (Tiku) UCL	30.5	SD in Original Scale	9.988
		95% Percentile Bootstrap UCL	12.77
		95% BCA Bootstrap UCL	13.5

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	3.092
Theta Star	7.223
nu star	37.11
A-D Test Statistic	0.407
5% A-D Critical Value	0.698
K-S Test Statistic	0.698
5% K-S Critical Value	0.333
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	11
Maximum	43
Mean	22.67
Median	22.9
SD	5.371
k star	18.18
Theta star	1.247
Nu star	800.1
AppChi2	735.5
95% Gamma Approximate UCL	24.66
95% Adjusted Gamma UCL	24.82

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	14.09
SD	7.248
SE of Mean	1.693
95% KM (t) UCL	17
95% KM (z) UCL	16.88
95% KM (jackknife) UCL	17.95
95% KM (bootstrap t) UCL	18.2
95% KM (BCA) UCL	22.5
95% KM (Percentile Bootstrap) UCL	21.45
95% KM (Chebyshev) UCL	21.47
97.5% KM (Chebyshev) UCL	24.66
99% KM (Chebyshev) UCL	30.93
Potential UCLs to Use	
95% KM (t) UCL	17
95% KM (Percentile Bootstrap) UCL	21.45

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sodium

General Statistics

Number of Valid Data	22	Number of Detected Data	20
Number of Distinct Detected Data	13	Number of Non-Detect Data	2
		Percent Non-Detects	9.09%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	33	Minimum Detected	3.497
Maximum Detected	220	Maximum Detected	5.394
Mean of Detected	52.78	Mean of Detected	3.839
SD of Detected	40.78	SD of Detected	0.428
Minimum Non-Detect	18	Minimum Non-Detect	2.89
Maximum Non-Detect	18	Maximum Non-Detect	2.89

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.45	Shapiro Wilk Test Statistic	0.69
5% Shapiro Wilk Critical Value	0.905	5% Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	48.8	Mean	3.69
SD	40.88	SD	0.632
95% DL/2 (t) UCL	63.79	95% H-Stat (DL/2) UCL	56.89
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	47.35	Mean in Log Scale	3.761
SD	42.05	SD in Log Scale	0.48
95% MLE (t) UCL	62.78	Mean in Original Scale	49.77
95% MLE (Tiku) UCL	62.05	SD in Original Scale	40
		95% Percentile Bootstrap UCL	65.44
		95% BCA Bootstrap UCL	74.84

Table D.7.1-2b
EPC Calculation Results - SWMU 45 Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	3.52
Theta Star	14.99
nu star	140.8
A-D Test Statistic	2.556
5% A-D Critical Value	0.745
K-S Test Statistic	0.745
5% K-S Critical Value	0.195
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	7.757
Maximum	220
Mean	49.06
Median	40
SD	40.63
k star	2.52
Theta star	19.47
Nu star	110.9
AppChi2	87.57
95% Gamma Approximate UCL	62.12
95% Adjusted Gamma UCL	63.24

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	50.98
SD	38.32
SE of Mean	8.383
95% KM (t) UCL	65.4
95% KM (z) UCL	64.77
95% KM (jackknife) UCL	65.29
95% KM (bootstrap t) UCL	98.57
95% KM (BCA) UCL	70
95% KM (Percentile Bootstrap) UCL	65.75
95% KM (Chebyshev) UCL	87.52
97.5% KM (Chebyshev) UCL	103.3
99% KM (Chebyshev) UCL	134.4
Potential UCLs to Use	
95% KM (Chebyshev) UCL	87.52

APPENDIX D.7.2

BACKGROUND MEANS COMPARISON SUMMARY/RESULTS – ProUCL 4.0

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Table D.7.2-1a
PROUCL 4.0 - Summary of Background vs Site Means Comparison - SWMU 45 Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	Is Site Data Distribution Normal?	Is Background Data Distibution Normal?	Means Test for Comparison	Background Comparison Results (Y/N)
Aluminum	Yes	No	Mann-Whitney	**Y**
Antimony	--	--	--	--
Arsenic	No	No	Mann-Whitney	N
Barium	Yes	Yes	Mann-Whitney**	**Y**
Beryllium	Yes	No	Mann-Whitney	**Y**
Cadmium	--	--	--	--
Calcium	Yes	No	Mann-Whitney	N
Chromium	No	No	Mann-Whitney	N
Cobalt	No	No	Mann-Whitney	N
Copper	No	No	Mann-Whitney	**Y**
Iron	No	No	Mann-Whitney	N
Lead	No	No	Mann-Whitney	**Y**
Magnesium	No	No	Mann-Whitney	N
Manganese	Yes	No	Mann-Whitney	N
Mercury	Yes	--	--	--
Nickel	No	No	Mann-Whitney	**Y**
Potassium	Yes	No	Mann-Whitney	**Y**
Selenium	--	--	--	--
Silver	No	--	--	--
Sodium	No	--	--	--
Thallium	Yes	--	--	--
Vanadium	No	No	Mann-Whitney	N
Zinc	No	No	Mann-Whitney	**Y**

Notes:
** Data set(s) included non-detects therefore Mann-Whitney test used
-- = Insufficient Detections to Conduct Background Comparison (i.e., < 8 detections in site and/or background data set)
N = Site <= Background
Y = Site > Background

Table D.7.2-1b
PROUCL 4.0 - Summary of Background vs Site Means Comparison - SWMU 45 Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	Is Site Data Distribution Normal?	Is Background Data Distibution Normal?	Means Test for Comparison	Background Comparison Results (Y/N)
Aluminum	Yes	No	Mann-Whitney	N
Antimony	No	--	--	--
Arsenic	No	No	Mann-Whitney	N
Barium	Yes	No	Mann-Whitney	**Y**
Beryllium	Yes	No	Mann-Whitney	**Y**
Cadmium	No	No	Mann-Whitney	N
Calcium	Yes	No	Mann-Whitney	**Y**
Chromium	No	Yes	Mann-Whitney	N
Cobalt	Yes	No	Mann-Whitney	N
Copper	No	No	Mann-Whitney	**Y**
Iron	No	Yes	Mann-Whitney	N
Lead	No	No	Mann-Whitney	**Y**
Magnesium	Yes	No	Mann-Whitney	**Y**
Manganese	Yes	No	Mann-Whitney	**Y**
Mercury	No	No	Mann-Whitney	N
Nickel	No	No	Mann-Whitney	N
Potassium	No	No	Mann-Whitney	**Y**
Selenium	No	--	--	--
Silver	No	--	--	--
Sodium	No	--	--	--
Thallium	No	Yes	Mann-Whitney**	N
Vanadium	No	Yes	Mann-Whitney	N
Zinc	No	No	Mann-Whitney	**Y**

Notes:
** Data set(s) included non-detects therefore Mann-Whitney test used
-- = Insufficient Detections to Conduct Background Comparison (i.e., < 8 detections in site and/or background data set)
N = Site <= Background
Y = Site > Background

Table D.7.2-2a
Background Data Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Chromium

Raw Statistics

Number of Valid Samples	28
Number of Unique Samples	27
Minimum	6.3
Maximum	53.3
Mean of Raw Data	21.09
Standard Deviation of Raw Data	10.5
Kstar	3.695
Mean of Log Transformed Data	2.922
Standard Deviation of Log Transformed Data	0.529

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.11
Lilliefors Critical (0.95) Value	0.167

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.612
A-D Critical (0.95) Value	0.75
K-S Test Statistic	0.145
K-S Critical(0.95) Value	0.166

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.17
Lilliefors Critical (0.95) Value	0.167

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2a
Background Data Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Iron

Raw Statistics

Number of Valid Samples	28
Number of Unique Samples	26
Minimum	7250
Maximum	63000
Mean of Raw Data	20108
Standard Deviation of Raw Data	11869
Kstar	3.069
Mean of Log Transformed Data	9.755
Standard Deviation of Log Transformed Data	0.57

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.139
Lilliefors Critical (0.95) Value	0.167

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.612
A-D Critical (0.95) Value	0.752
K-S Test Statistic	0.151
K-S Critical(0.95) Value	0.166

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.153
Lilliefors Critical (0.95) Value	0.167

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2a
Background Data Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Lead

Raw Statistics

Number of Valid Samples	28
Number of Unique Samples	26
Minimum	8.9
Maximum	225
Mean of Raw Data	26.96
Standard Deviation of Raw Data	41.34
Kstar	1.324
Mean of Log Transformed Data	2.913
Standard Deviation of Log Transformed Data	0.702

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.416
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.375
Lilliefors Critical (0.95) Value	0.167

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	3.163
A-D Critical (0.95) Value	0.764
K-S Test Statistic	0.253
K-S Critical(0.95) Value	0.169

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.798
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.192
Lilliefors Critical (0.95) Value	0.167

Data not Lognormal at (0.05) Significance Level

Table D.7.2-2a
Background Data Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

Raw Statistics

Number of Valid Samples	28
Number of Unique Samples	27
Minimum	12.2
Maximum	101
Mean of Raw Data	33.89
Standard Deviation of Raw Data	17.78
Kstar	3.946
Mean of Log Transformed Data	3.405
Standard Deviation of Log Transformed Data	0.497

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.832
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.141
Lilliefors Critical (0.95) Value	0.167

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.622
A-D Critical (0.95) Value	0.749
K-S Test Statistic	0.111
K-S Critical(0.95) Value	0.166

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.138
Lilliefors Critical (0.95) Value	0.167

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2a
Background Data Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

Raw Statistics

Number of Valid Samples	28
Number of Unique Samples	28
Minimum	7.1
Maximum	216
Mean of Raw Data	41.21
Standard Deviation of Raw Data	40.24
Kstar	1.654
Mean of Log Transformed Data	3.421
Standard Deviation of Log Transformed Data	0.761

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.665
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.203
Lilliefors Critical (0.95) Value	0.167

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.54
A-D Critical (0.95) Value	0.76
K-S Test Statistic	0.105
K-S Critical(0.95) Value	0.168

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical (0.95) Value	0.924
Lilliefors Test Statistic	0.1
Lilliefors Critical (0.95) Value	0.167

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Calcium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Calcium Data	28	0	28	23	5	17.86%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	5	4.6	6.6	5.12	4.8	0.844
Statistics (Detects Only)	23	116	7340	1197	885	1440
Statistics (All: NDs treated as DL value)	28	4.6	7340	983.9	761.5	1380
Statistics (All: NDs treated as DL/2 value)	28	2.3	7340	983.5	761.5	1380
Statistics (Normal ROS Estimated Data)	28	-1605	7340	751.5	761.5	1625
Statistics (Gamma ROS Estimated Data)	28	0	7340	984.5	761.5	1380
Statistics (Lognormal ROS Estimated Data)	28	104.3	7340	1007	761.5	1364

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	1.506	1.368	794.6	6.72	0.84	0.125
Statistics (NDs = DL)	0.575	0.537	1712	5.81	2.128	0.366
Statistics (NDs = DL/2)	0.523	0.491	1879	5.686	2.383	0.419
Statistics (Gamma ROS Estimates)	0.178	0.183	5519	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	6.391	1.047	0.164

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.553	0.914	Data Not Normal
Lilliefors (Detects Only)	0.275	0.185	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.587	0.924	Data Not Normal
Lilliefors (NDs = DL)	0.244	0.167	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.587	0.924	Data Not Normal
Lilliefors (NDs = DL/2)	0.244	0.167	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.761	0.924	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.207	0.167	Data Not Normal

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.694	0.76	
Kolmogorov-Smirnov (Detects Only)	0.152	0.185	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	1.232	0.803	
Kolmogorov-Smirnov (NDs = DL)	0.192	0.174	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.47	0.808	
Kolmogorov-Smirnov (NDs = DL/2)	0.211	0.175	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	6.572	0.907	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.417	0.184	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.967	0.914	Data Appear Lognormal
Lilliefors (Detects Only)	0.0979	0.185	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.779	0.924	Data Not Lognormal
Lilliefors (NDs = DL)	0.279	0.167	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.75	0.924	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.296	0.167	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.949	0.924	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.114	0.167	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cobalt

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Cobalt Data	28	0	28	20	8	28.57%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	8	0.11	0.75	0.501	0.72	0.319
Statistics (Detects Only)	20	5.9	45.4	15.95	12.1	10.07
Statistics (All: NDs treated as DL value)	28	0.11	45.4	11.53	10.15	11.04
Statistics (All: NDs treated as DL/2 value)	28	0.055	45.4	11.46	10.15	11.11
Statistics (Normal ROS Estimated Data)	28	-10.02	45.4	9.494	10.15	13.45
Statistics (Gamma ROS Estimated Data)	28	3.774	45.4	13.39	10.15	9.473
Statistics (Lognormal ROS Estimated Data)	28	3.134	45.4	12.48	10.15	10.13

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	3.439	3.095	4.636	2.617	0.545	0.208
Statistics (NDs = DL)	0.701	0.65	16.45	1.583	1.793	1.132
Statistics (NDs = DL/2)	0.588	0.549	19.49	1.385	2.092	1.51
Statistics (Gamma ROS Estimates)	2.851	2.569	4.697	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	2.25	0.749	0.333

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.819	0.905	Data Not Normal
Lilliefors (Detects Only)	0.236	0.198	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.867	0.924	Data Not Normal
Lilliefors (NDs = DL)	0.158	0.167	Data Appear Normal
Shapiro-Wilks (NDs = DL/2)	0.867	0.924	Data Not Normal
Lilliefors (NDs = DL/2)	0.156	0.167	Data Appear Normal
Shapiro-Wilks (Normal ROS Estimates)	0.936	0.924	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.128	0.167	Data Appear Normal

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.596	0.747	
Kolmogorov-Smirnov (Detects Only)	0.167	0.195	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	1.122	0.79	
Kolmogorov-Smirnov (NDs = DL)	0.195	0.172	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.507	0.801	
Kolmogorov-Smirnov (NDs = DL/2)	0.221	0.174	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.785	0.754	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.155	0.167	Data appear Approximate Gamma Distribution

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.96	0.905	Data Appear Lognormal
Lilliefors (Detects Only)	0.132	0.198	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.831	0.924	Data Not Lognormal
Lilliefors (NDs = DL)	0.257	0.167	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.802	0.924	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.288	0.167	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.954	0.924	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.126	0.167	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Magnesium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Magnesium Data	28	0	28	25	3	10.71%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	3	4.7	5	4.833	4.8	0.153
Statistics (Detects Only)	25	158	20400	2498	913	4334
Statistics (All: NDs treated as DL value)	28	4.7	20400	2231	741	4161
Statistics (All: NDs treated as DL/2 value)	28	2.35	20400	2230	741	4161
Statistics (Normal ROS Estimated Data)	28	-5148	20400	1678	741	4743
Statistics (Gamma ROS Estimated Data)	28	0	20400	2230	741	4161
Statistics (Lognormal ROS Estimated Data)	28	56.13	20400	2236	741	4158

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.694	0.643	3600	6.951	1.272	0.183
Statistics (NDs = DL)	0.479	0.451	4657	6.375	2.075	0.325
Statistics (NDs = DL/2)	0.457	0.432	4879	6.301	2.257	0.358
Statistics (Gamma ROS Estimates)	0.198	0.201	11267	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	6.638	1.512	0.228

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.558	0.918	Data Not Normal
Lilliefors (Detects Only)	0.303	0.177	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.546	0.924	Data Not Normal
Lilliefors (NDs = DL)	0.299	0.167	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.546	0.924	Data Not Normal
Lilliefors (NDs = DL/2)	0.299	0.167	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.729	0.924	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.267	0.167	Data Not Normal

Table D.7.2-2b
Background Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.247	0.789	
Kolmogorov-Smirnov (Detects Only)	0.183	0.182	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	0.674	0.815	
Kolmogorov-Smirnov (NDs = DL)	0.131	0.175	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.681	0.82	
Kolmogorov-Smirnov (NDs = DL/2)	0.141	0.176	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	3.847	0.898	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.366	0.183	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.95	0.918	Data Appear Lognormal
Lilliefors (Detects Only)	0.107	0.177	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.889	0.924	Data Not Lognormal
Lilliefors (NDs = DL)	0.195	0.167	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.856	0.924	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.22	0.167	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.973	0.924	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0849	0.167	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Aluminum

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	75
Minimum	3620
Maximum	47900
Mean of Raw Data	14204
Standard Deviation of Raw Data	9433
Kstar	2.689
Mean of Log Transformed Data	9.371
Standard Deviation of Log Transformed Data	0.618

Normal Distribution Test Results

Lilliefors Test Statistic	0.15
Lilliefors Critical (0.95) Value	0.0997

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.604
A-D Critical (0.95) Value	0.76
K-S Test Statistic	0.0772
K-S Critical(0.95) Value	0.101

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.0626
Lilliefors Critical (0.95) Value	0.0997

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chromium

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	70
Minimum	6.3
Maximum	75.8
Mean of Raw Data	26.86
Standard Deviation of Raw Data	12.51
Kstar	4.382
Mean of Log Transformed Data	3.177
Standard Deviation of Log Transformed Data	0.501

Normal Distribution Test Results

Lilliefors Test Statistic	0.0734
Lilliefors Critical (0.95) Value	0.0997

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.591
A-D Critical (0.95) Value	0.755
K-S Test Statistic	0.0909
K-S Critical(0.95) Value	0.101

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.122
Lilliefors Critical (0.95) Value	0.0997

Data not Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Iron

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	72
Minimum	7250
Maximum	67700
Mean of Raw Data	26963
Standard Deviation of Raw Data	11990
Kstar	4.441
Mean of Log Transformed Data	10.09
Standard Deviation of Log Transformed Data	0.508

Normal Distribution Test Results

Lilliefors Test Statistic	0.0648
Lilliefors Critical (0.95) Value	0.0997

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.831
A-D Critical (0.95) Value	0.755
K-S Test Statistic	0.082
K-S Critical(0.95) Value	0.101

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.115
Lilliefors Critical (0.95) Value	0.0997

Data not Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Lead

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	70
Minimum	2.1
Maximum	256
Mean of Raw Data	22.04
Standard Deviation of Raw Data	39.85
Kstar	1.149
Mean of Log Transformed Data	2.615
Standard Deviation of Log Transformed Data	0.783

Normal Distribution Test Results

Lilliefors Test Statistic	0.344
Lilliefors Critical (0.95) Value	0.0997

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	7.671
A-D Critical (0.95) Value	0.777
K-S Test Statistic	0.245
K-S Critical(0.95) Value	0.103

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.147
Lilliefors Critical (0.95) Value	0.0997

Data not Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Manganese

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	78
Minimum	16.7
Maximum	2040
Mean of Raw Data	471.4
Standard Deviation of Raw Data	467.1
Kstar	1.087
Mean of Log Transformed Data	5.647
Standard Deviation of Log Transformed Data	1.118

Normal Distribution Test Results

Lilliefors Test Statistic	0.165
Lilliefors Critical (0.95) Value	0.0997

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.359
A-D Critical (0.95) Value	0.779
K-S Test Statistic	0.0515
K-S Critical(0.95) Value	0.103

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.093
Lilliefors Critical (0.95) Value	0.0997

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

Raw Statistics

Number of Valid Samples	78
Number of Unique Samples	75
Minimum	12.2
Maximum	101
Mean of Raw Data	44.97
Standard Deviation of Raw Data	18.97
Kstar	5.086
Mean of Log Transformed Data	3.708
Standard Deviation of Log Transformed Data	0.466

Normal Distribution Test Results

Lilliefors Test Statistic	0.0902
Lilliefors Critical (0.95) Value	0.1

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.29
A-D Critical (0.95) Value	0.754
K-S Test Statistic	0.059
K-S Critical(0.95) Value	0.101

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.0891
Lilliefors Critical (0.95) Value	0.1

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2c
Background Data Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	76
Minimum	4.7
Maximum	598
Mean of Raw Data	54.94
Standard Deviation of Raw Data	87.15
Kstar	1.05
Mean of Log Transformed Data	3.478
Standard Deviation of Log Transformed Data	0.93

Normal Distribution Test Results

Lilliefors Test Statistic	0.291
Lilliefors Critical (0.95) Value	0.0997

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	3.363
A-D Critical (0.95) Value	0.78
K-S Test Statistic	0.145
K-S Critical(0.95) Value	0.103

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Lilliefors Test Statistic	0.0696
Lilliefors Critical (0.95) Value	0.0997

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Arsenic

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Arsenic Data	79	0	79	76	3	3.80%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	3	0.09	0.12	0.103	0.1	0.0153
Statistics (Detects Only)	76	1.2	35.9	4.989	3.2	5.36
Statistics (All: NDs treated as DL value)	79	0.09	35.9	4.804	3.1	5.339
Statistics (All: NDs treated as DL/2 value)	79	0.045	35.9	4.802	3.1	5.341
Statistics (Normal ROS Estimated Data)	79	-5.169	35.9	4.604	3.1	5.608
Statistics (Gamma ROS Estimated Data)	79	0	35.9	4.8	3.1	5.343
Statistics (Lognormal ROS Estimated Data)	79	0.728	35.9	4.828	3.1	5.32

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	1.819	1.759	2.742	1.308	0.692	0.529
Statistics (NDs = DL)	1.401	1.356	3.429	1.172	0.968	0.826
Statistics (NDs = DL/2)	1.323	1.281	3.631	1.146	1.067	0.932
Statistics (Gamma ROS Estimates)	0.568	0.555	8.454	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	1.246	0.748	0.6

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.282	0.102	Data Not Normal
Lilliefors (NDs = DL)	0.279	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.279	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.263	0.0997	Data Not Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	4.409	0.766	
Kolmogorov-Smirnov (Detects Only)	0.213	0.104	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	3.469	0.772	
Kolmogorov-Smirnov (NDs = DL)	0.182	0.102	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	3.587	0.774	
Kolmogorov-Smirnov (NDs = DL/2)	0.176	0.103	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	10.23	0.812	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.332	0.106	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.151	0.102	Data Not Lognormal
Lilliefors (NDs = DL)	0.159	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.187	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.134	0.0997	Data Not Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Beryllium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Beryllium Data	71	0	71	32	39	54.93%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	39	0.022	0.03	0.0286	0.03	0.00265
Statistics (Detects Only)	32	0.61	1.6	1.017	0.975	0.272
Statistics (All: NDs treated as DL value)	71	0.022	1.6	0.474	0.03	0.527
Statistics (All: NDs treated as DL/2 value)	71	0.011	1.6	0.466	0.015	0.534
Statistics (Normal ROS Estimated Data)	71	-0.475	1.6	0.59	0.557	0.472
Statistics (Gamma ROS Estimated Data)	71	0.61	1.6	1.031	1.052	0.198
Statistics (Lognormal ROS Estimated Data)	71	0.233	1.6	0.721	0.617	0.335

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	14.61	14	0.0696	-0.0179	0.268	-15
Statistics (NDs = DL)	0.519	0.507	0.913	-1.962	1.784	-0.909
Statistics (NDs = DL/2)	0.414	0.406	1.125	-2.343	2.13	-0.909
Statistics (Gamma ROS Estimates)	26.7	25.58	0.0386	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-0.429	0.456	-1.063

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.953	0.93	Data Appear Normal
Lilliefors (Detects Only)	0.118	0.157	Data Appear Normal
Lilliefors (NDs = DL)	0.349	0.105	Data Not Normal
Lilliefors (NDs = DL/2)	0.35	0.105	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.0495	0.105	Data Appear Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.268	0.746	
Kolmogorov-Smirnov (Detects Only)	0.0843	0.155	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	8.979	0.815	
Kolmogorov-Smirnov (NDs = DL)	0.36	0.112	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	9.326	0.838	
Kolmogorov-Smirnov (NDs = DL/2)	0.361	0.113	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.819	0.749	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.0939	0.105	Data appear Approximate Gamma Distribution

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.967	0.93	Data Appear Lognormal
Lilliefors (Detects Only)	0.0849	0.157	Data Appear Lognormal
Lilliefors (NDs = DL)	0.356	0.105	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.358	0.105	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0725	0.105	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cadmium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Cadmium Data	79	0	79	13	66	83.54%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	66	0.02	0.05	0.0256	0.02	0.00861
Statistics (Detects Only)	13	0.57	2.5	1.152	1.1	0.585
Statistics (All: NDs treated as DL value)	79	0.02	2.5	0.211	0.02	0.479
Statistics (All: NDs treated as DL/2 value)	79	0.01	2.5	0.2	0.01	0.483
Statistics (Normal ROS Estimated Data)	79	-4.148	2.5	-1.016	-1.143	1.342
Statistics (Gamma ROS Estimated Data)	79	0.197	2.987	1.943	2.175	0.717
Statistics (Lognormal ROS Estimated Data)	79	0.0167	2.5	0.338	0.174	0.444

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	5.194	5.005	0.222	0.0424	0.448	10.55
Statistics (NDs = DL)	0.424	0.416	0.498	-3.093	1.437	-0.465
Statistics (NDs = DL/2)	0.329	0.325	0.609	-3.672	1.69	-0.46
Statistics (Gamma ROS Estimates)	5.206	5.016	0.373	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-1.649	1.046	-0.634

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.82	0.866	Data Not Normal
Lilliefors (Detects Only)	0.246	0.246	Data Not Normal
Lilliefors (NDs = DL)	0.467	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.477	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.0689	0.0997	Data Appear Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.512	0.736	
Kolmogorov-Smirnov (Detects Only)	0.181	0.237	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	17.17	0.836	
Kolmogorov-Smirnov (NDs = DL)	0.422	0.107	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	18.08	0.858	
Kolmogorov-Smirnov (NDs = DL/2)	0.448	0.109	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	2.804	0.754	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.164	0.101	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.934	0.866	Data Appear Lognormal
Lilliefors (Detects Only)	0.158	0.246	Data Appear Lognormal
Lilliefors (NDs = DL)	0.327	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.348	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0689	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Calcium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Calcium Data	79	0	79	63	16	20.25%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	16	4.6	6.7	5.563	5.4	0.796
Statistics (Detects Only)	63	116	25700	1392	717	3322
Statistics (All: NDs treated as DL value)	79	4.6	25700	1111	534	3014
Statistics (All: NDs treated as DL/2 value)	79	2.3	25700	1111	534	3014
Statistics (Normal ROS Estimated Data)	79	-3726	25700	537.2	534	3423
Statistics (Gamma ROS Estimated Data)	79	0	25700	1110	534	3014
Statistics (Lognormal ROS Estimated Data)	79	60.37	25700	1129	534	3007

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.899	0.873	1548	6.588	0.949	0.144
Statistics (NDs = DL)	0.456	0.447	2437	5.599	2.149	0.384
Statistics (NDs = DL/2)	0.42	0.413	2643	5.459	2.409	0.441
Statistics (Gamma ROS Estimates)	0.131	0.135	8441	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	6.173	1.189	0.193

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.359	0.112	Data Not Normal
Lilliefors (NDs = DL)	0.357	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.357	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.289	0.0997	Data Not Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	4.055	0.785	
Kolmogorov-Smirnov (Detects Only)	0.223	0.116	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	2.78	0.829	
Kolmogorov-Smirnov (NDs = DL)	0.146	0.107	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	3.129	0.837	
Kolmogorov-Smirnov (NDs = DL/2)	0.149	0.107	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	17.18	0.972	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.418	0.114	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.108	0.112	Data Appear Lognormal
Lilliefors (NDs = DL)	0.224	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.251	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0933	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cobalt

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Cobalt Data	79	0	79	56	23	29.11%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	23	0.11	0.84	0.587	0.73	0.286
Statistics (Detects Only)	56	5.9	130	22.23	13.3	23.94
Statistics (All: NDs treated as DL value)	79	0.11	130	15.93	11.4	22.41
Statistics (All: NDs treated as DL/2 value)	79	0.055	130	15.84	11.4	22.47
Statistics (Normal ROS Estimated Data)	79	-40.83	130	8.784	11.4	29.44
Statistics (Gamma ROS Estimated Data)	79	0	130	17.57	11.9	21.54
Statistics (Lognormal ROS Estimated Data)	79	1.86	130	16.76	11.4	21.87

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	1.78	1.721	12.49	2.795	0.701	0.251
Statistics (NDs = DL)	0.61	0.595	26.11	1.758	1.787	1.017
Statistics (NDs = DL/2)	0.523	0.511	30.31	1.556	2.08	1.337
Statistics (Gamma ROS Estimates)	0.504	0.494	34.83	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	2.331	0.947	0.406

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.263	0.118	Data Not Normal
Lilliefors (NDs = DL)	0.24	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.241	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.17	0.0997	Data Not Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	3.203	0.765	
Kolmogorov-Smirnov (Detects Only)	0.162	0.121	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	2.127	0.807	
Kolmogorov-Smirnov (NDs = DL)	0.155	0.105	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	2.851	0.816	
Kolmogorov-Smirnov (NDs = DL/2)	0.171	0.106	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	9.036	0.818	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.36	0.106	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.13	0.118	Data Not Lognormal
Lilliefors (NDs = DL)	0.213	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.251	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0915	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Magnesium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Magnesium Data	79	0	79	72	7	8.86%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	7	3.8	5	4.686	4.8	0.402
Statistics (Detects Only)	72	139	58100	6394	1270	12925
Statistics (All: NDs treated as DL value)	79	3.8	58100	5828	1080	12466
Statistics (All: NDs treated as DL/2 value)	79	1.9	58100	5827	1080	12466
Statistics (Normal ROS Estimated Data)	79	-1911	58100	4438	1080	13862
Statistics (Gamma ROS Estimated Data)	79	0	58100	5827	1080	12466
Statistics (Lognormal ROS Estimated Data)	79	28.2	58100	5832	1080	12464

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.484	0.474	13216	7.443	1.571	0.211
Statistics (NDs = DL)	0.379	0.373	15366	6.92	2.257	0.326
Statistics (NDs = DL/2)	0.368	0.363	15828	6.859	2.409	0.351
Statistics (Gamma ROS Estimates)	0.198	0.199	29431	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	7.129	1.812	0.254

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.323	0.104	Data Not Normal
Lilliefors (NDs = DL)	0.321	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.321	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.29	0.0997	Data Not Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	4.255	0.821	
Kolmogorov-Smirnov (Detects Only)	0.17	0.111	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	2.668	0.847	
Kolmogorov-Smirnov (NDs = DL)	0.136	0.108	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	2.542	0.849	
Kolmogorov-Smirnov (NDs = DL/2)	0.129	0.108	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	7.068	0.912	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.298	0.111	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.0868	0.104	Data Appear Lognormal
Lilliefors (NDs = DL)	0.135	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.157	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0546	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Mercury

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Mercury Data	79	0	79	18	61	77.22%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	61	0.019	0.06	0.0484	0.06	0.0158
Statistics (Detects Only)	18	0.038	1.2	0.187	0.125	0.259
Statistics (All: NDs treated as DL value)	79	0.019	1.2	0.0799	0.06	0.135
Statistics (All: NDs treated as DL/2 value)	79	0.0095	1.2	0.0612	0.03	0.139
Statistics (Normal ROS Estimated Data)	79	-1.214	1.2	-0.361	-0.372	0.403
Statistics (Gamma ROS Estimated Data)	79	0.038	1.2	0.173	0.156	0.138
Statistics (Lognormal ROS Estimated Data)	79	0.0007952	1.2	0.0541	0.0171	0.141

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	1.552	1.501	0.12	-2.035	0.727	-0.358
Statistics (NDs = DL)	1.645	1.591	0.0485	-2.861	0.681	-0.238
Statistics (NDs = DL/2)	0.962	0.934	0.0636	-3.396	0.902	-0.266
Statistics (Gamma ROS Estimates)	3.073	2.965	0.0563	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-4.029	1.44	-0.357

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.442	0.897	Data Not Normal
Lilliefors (Detects Only)	0.384	0.209	Data Not Normal
Lilliefors (NDs = DL)	0.356	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.361	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.067	0.0997	Data Appear Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.702	0.756	
Kolmogorov-Smirnov (Detects Only)	0.274	0.207	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	6.715	0.768	
Kolmogorov-Smirnov (NDs = DL)	0.33	0.102	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	8.44	0.784	
Kolmogorov-Smirnov (NDs = DL/2)	0.377	0.104	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.725	0.759	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.0728	0.101	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.871	0.897	Data Not Lognormal
Lilliefors (Detects Only)	0.193	0.209	Data Appear Lognormal
Lilliefors (NDs = DL)	0.269	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.321	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.062	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Potassium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Potassium Data	79	0	79	67	12	15.19%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	12	201	271	223.1	217	20.78
Statistics (Detects Only)	67	123	10900	1690	694	2232
Statistics (All: NDs treated as DL value)	79	123	10900	1467	618	2120
Statistics (All: NDs treated as DL/2 value)	79	100.5	10900	1450	618	2131
Statistics (Normal ROS Estimated Data)	79	-1878	10900	1235	618	2322
Statistics (Gamma ROS Estimated Data)	79	0	10900	1433	618	2142
Statistics (Lognormal ROS Estimated Data)	79	104.7	10900	1456	618	2127

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.92	0.893	1837	6.798	1.115	0.164
Statistics (NDs = DL)	0.837	0.814	1752	6.586	1.143	0.174
Statistics (NDs = DL/2)	0.75	0.73	1933	6.481	1.273	0.196
Statistics (Gamma ROS Estimates)	0.163	0.165	8778	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	6.525	1.216	0.186

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.247	0.108	Data Not Normal
Lilliefors (NDs = DL)	0.263	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.263	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.21	0.0997	Data Not Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.945	0.784	
Kolmogorov-Smirnov (Detects Only)	0.153	0.112	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	3.288	0.789	
Kolmogorov-Smirnov (NDs = DL)	0.171	0.104	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	2.192	0.793	
Kolmogorov-Smirnov (NDs = DL/2)	0.147	0.104	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	14.88	0.944	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.392	0.113	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Lilliefors (Detects Only)	0.0982	0.108	Data Appear Lognormal
Lilliefors (NDs = DL)	0.106	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.0732	0.0997	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0941	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Thallium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Thallium Data	79	0	79	15	64	81.01%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	64	0.13	0.45	0.189	0.15	0.0931
Statistics (Detects Only)	15	1.3	5	2.527	2.2	0.932
Statistics (All: NDs treated as DL value)	79	0.13	5	0.633	0.16	1.007
Statistics (All: NDs treated as DL/2 value)	79	0.065	5	0.556	0.08	1.039
Statistics (Normal ROS Estimated Data)	79	-4.787	5	-0.573	-0.722	1.972
Statistics (Gamma ROS Estimated Data)	79	1.3	5	2.489	2.468	0.399
Statistics (Lognormal ROS Estimated Data)	79	0.155	5	0.998	0.707	0.884

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	8.698	8.377	0.29	0.868	0.352	0.405
Statistics (NDs = DL)	0.753	0.733	0.841	-1.253	1.097	-0.876
Statistics (NDs = DL/2)	0.515	0.504	1.08	-1.814	1.358	-0.748
Statistics (Gamma ROS Estimates)	44.1	42.44	0.0564	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-0.291	0.738	-2.538

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.893	0.881	Data Appear Normal
Lilliefors (Detects Only)	0.17	0.229	Data Appear Normal
Lilliefors (NDs = DL)	0.382	0.0997	Data Not Normal
Lilliefors (NDs = DL/2)	0.435	0.0997	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.0779	0.0997	Data Appear Normal

Table D.7.2-2d
Background Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.367	0.738	
Kolmogorov-Smirnov (Detects Only)	0.145	0.222	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	12.86	0.793	
Kolmogorov-Smirnov (NDs = DL)	0.361	0.104	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	14.62	0.817	
Kolmogorov-Smirnov (NDs = DL/2)	0.371	0.106	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	10.13	0.749	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.319	0.1	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.959	0.881	Data Appear Lognormal
Lilliefors (Detects Only)	0.134	0.229	Data Appear Lognormal
Lilliefors (NDs = DL)	0.334	0.0997	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.34	0.0997	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0779	0.0997	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Aluminum

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	11900
Maximum	33300
Mean of Raw Data	25663
Standard Deviation of Raw Data	5870
Kstar	13.33
Mean of Log Transformed Data	10.12
Standard Deviation of Log Transformed Data	0.271

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.125
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.593
A-D Critical (0.95) Value	0.736
K-S Test Statistic	0.161
K-S Critical(0.95) Value	0.221

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.856
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.185
Lilliefors Critical (0.95) Value	0.229

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Antimony

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	0.305
Maximum	340
Mean of Raw Data	59.63
Standard Deviation of Raw Data	107.1
Kstar	0.314
Mean of Log Transformed Data	2.079
Standard Deviation of Log Transformed Data	2.433

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.618
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.332
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.577
A-D Critical (0.95) Value	0.828
K-S Test Statistic	0.189
K-S Critical(0.95) Value	0.239

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.133
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Arsenic

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	14
Minimum	1.035
Maximum	5.2
Mean of Raw Data	3.202
Standard Deviation of Raw Data	1.405
Kstar	3.752
Mean of Log Transformed Data	1.052
Standard Deviation of Log Transformed Data	0.521

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.123
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.403
A-D Critical (0.95) Value	0.739
K-S Test Statistic	0.146
K-S Critical(0.95) Value	0.222

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.162
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Barium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	12
Minimum	51
Maximum	220
Mean of Raw Data	105.7
Standard Deviation of Raw Data	42.43
Kstar	5.953
Mean of Log Transformed Data	4.591
Standard Deviation of Log Transformed Data	0.384

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.888
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.22
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.362
A-D Critical (0.95) Value	0.738
K-S Test Statistic	0.177
K-S Critical(0.95) Value	0.222

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.152
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Beryllium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	12
Minimum	0.42
Maximum	2.2
Mean of Raw Data	0.852
Standard Deviation of Raw Data	0.498
Kstar	3.119
Mean of Log Transformed Data	-0.296
Standard Deviation of Log Transformed Data	0.523

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.822
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.193
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.651
A-D Critical (0.95) Value	0.741
K-S Test Statistic	0.188
K-S Critical(0.95) Value	0.223

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.182
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Calcium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	372
Maximum	4440
Mean of Raw Data	1776
Standard Deviation of Raw Data	1145
Kstar	2.128
Mean of Log Transformed Data	7.278
Standard Deviation of Log Transformed Data	0.687

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.161
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.193
A-D Critical (0.95) Value	0.745
K-S Test Statistic	0.133
K-S Critical(0.95) Value	0.224

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.976
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.147
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chromium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	20
Maximum	1500
Mean of Raw Data	187.7
Standard Deviation of Raw Data	380.9
Kstar	0.54
Mean of Log Transformed Data	4.242
Standard Deviation of Log Transformed Data	1.255

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.485
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.355
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.672
A-D Critical (0.95) Value	0.784
K-S Test Statistic	0.32
K-S Critical(0.95) Value	0.232

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.849
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.231
Lilliefors Critical (0.95) Value	0.229

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cobalt

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	1.8
Maximum	41.5
Mean of Raw Data	12.1
Standard Deviation of Raw Data	12.47
Kstar	1.26
Mean of Log Transformed Data	2.129
Standard Deviation of Log Transformed Data	0.844

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.677
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.31
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.937
A-D Critical (0.95) Value	0.754
K-S Test Statistic	0.227
K-S Critical(0.95) Value	0.225

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.166
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Copper

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	4.9
Maximum	110
Mean of Raw Data	27.74
Standard Deviation of Raw Data	30.97
Kstar	1.191
Mean of Log Transformed Data	2.935
Standard Deviation of Log Transformed Data	0.845

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.641
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.322
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.068
A-D Critical (0.95) Value	0.755
K-S Test Statistic	0.246
K-S Critical(0.95) Value	0.226

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.919
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.182
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Iron

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	7100
Maximum	78700
Mean of Raw Data	35590
Standard Deviation of Raw Data	20569
Kstar	2.28
Mean of Log Transformed Data	10.29
Standard Deviation of Log Transformed Data	0.687

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.148
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.189
A-D Critical (0.95) Value	0.745
K-S Test Statistic	0.12
K-S Critical(0.95) Value	0.224

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.148
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Lead

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	11
Minimum	13
Maximum	680
Mean of Raw Data	97.97
Standard Deviation of Raw Data	174.2
Kstar	0.611
Mean of Log Transformed Data	3.733
Standard Deviation of Log Transformed Data	1.192

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.539
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.344
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.636
A-D Critical (0.95) Value	0.778
K-S Test Statistic	0.276
K-S Critical(0.95) Value	0.231

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.826
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.265
Lilliefors Critical (0.95) Value	0.229

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Magnesium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	14
Minimum	710
Maximum	2700
Mean of Raw Data	1387
Standard Deviation of Raw Data	485.7
Kstar	7.7
Mean of Log Transformed Data	7.181
Standard Deviation of Log Transformed Data	0.335

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.189
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.419
A-D Critical (0.95) Value	0.737
K-S Test Statistic	0.157
K-S Critical(0.95) Value	0.222

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.153
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Manganese

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	85
Maximum	4400
Mean of Raw Data	1008
Standard Deviation of Raw Data	1218
Kstar	0.905
Mean of Log Transformed Data	6.383
Standard Deviation of Log Transformed Data	1.057

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.699
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.309
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.526
A-D Critical (0.95) Value	0.762
K-S Test Statistic	0.183
K-S Critical(0.95) Value	0.228

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.981
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.117
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Mercury

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	0.041
Maximum	0.76
Mean of Raw Data	0.15
Standard Deviation of Raw Data	0.175
Kstar	1.43
Mean of Log Transformed Data	-2.214
Standard Deviation of Log Transformed Data	0.727

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.531
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.387
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.984
A-D Critical (0.95) Value	0.751
K-S Test Statistic	0.269
K-S Critical(0.95) Value	0.225

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.205
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Nickel

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	5.5
Maximum	17
Mean of Raw Data	9.757
Standard Deviation of Raw Data	3.47
Kstar	6.963
Mean of Log Transformed Data	2.219
Standard Deviation of Log Transformed Data	0.356

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.165
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.38
A-D Critical (0.95) Value	0.738
K-S Test Statistic	0.163
K-S Critical(0.95) Value	0.222

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.943
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.148
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Potassium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	14
Minimum	528
Maximum	1700
Mean of Raw Data	1011
Standard Deviation of Raw Data	270.6
Kstar	12.39
Mean of Log Transformed Data	6.886
Standard Deviation of Log Transformed Data	0.267

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.163
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.334
A-D Critical (0.95) Value	0.736
K-S Test Statistic	0.143
K-S Critical(0.95) Value	0.221

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.161
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Silver

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	13
Minimum	0.023
Maximum	0.2
Mean of Raw Data	0.0733
Standard Deviation of Raw Data	0.0456
Kstar	2.66
Mean of Log Transformed Data	-2.773
Standard Deviation of Log Transformed Data	0.588

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.853
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.21
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.294
A-D Critical (0.95) Value	0.743
K-S Test Statistic	0.135
K-S Critical(0.95) Value	0.223

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.14
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sodium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	14
Minimum	33
Maximum	520
Mean of Raw Data	172
Standard Deviation of Raw Data	155.9
Kstar	1.382
Mean of Log Transformed Data	4.82
Standard Deviation of Log Transformed Data	0.819

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.773
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.273
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.615
A-D Critical (0.95) Value	0.751
K-S Test Statistic	0.199
K-S Critical(0.95) Value	0.225

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.143
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Thallium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	9
Minimum	0.17
Maximum	0.34
Mean of Raw Data	0.262
Standard Deviation of Raw Data	0.0531
Kstar	19.99
Mean of Log Transformed Data	-1.36
Standard Deviation of Log Transformed Data	0.211

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.189
Lilliefors Critical (0.95) Value	0.229

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.416
A-D Critical (0.95) Value	0.735
K-S Test Statistic	0.166
K-S Critical(0.95) Value	0.221

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.175
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	15
Minimum	20
Maximum	1200
Mean of Raw Data	145.8
Standard Deviation of Raw Data	300.6
Kstar	0.615
Mean of Log Transformed Data	4.138
Standard Deviation of Log Transformed Data	1.105

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.445
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.388
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.737
A-D Critical (0.95) Value	0.778
K-S Test Statistic	0.306
K-S Critical(0.95) Value	0.231

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.196
Lilliefors Critical (0.95) Value	0.229

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3a
Goodness of Fit - Surface Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

Raw Statistics

Number of Valid Samples	15
Number of Unique Samples	14
Minimum	34
Maximum	3700
Mean of Raw Data	611.3
Standard Deviation of Raw Data	995.5
Kstar	0.494
Mean of Log Transformed Data	5.306
Standard Deviation of Log Transformed Data	1.562

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.643
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.297
Lilliefors Critical (0.95) Value	0.229

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.796
A-D Critical (0.95) Value	0.789
K-S Test Statistic	0.214
K-S Critical(0.95) Value	0.233

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.915
Shapiro Wilk Critical (0.95) Value	0.881
Lilliefors Test Statistic	0.14
Lilliefors Critical (0.95) Value	0.229

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3b
Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Cadmium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Cadmium Data	15	0	15	14	1	6.67%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Detects Only)	14	0.118	120	17.61	3.4	33.05
Statistics (All: NDs treated as DL value)	15	0.11	120	16.44	1.8	32.16
Statistics (All: NDs treated as DL/2 value)	15	0.055	120	16.44	1.8	32.16
Statistics (Normal ROS Estimated Data)	15	-46.01	120	13.37	1.8	35.83
Statistics (Gamma ROS Estimated Data)	15	0	120	16.43	1.8	32.17
Statistics (Lognormal ROS Estimated Data)	15	0.023	120	16.43	1.8	32.17

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.411	0.373	42.87	1.273	2.049	1.61
Statistics (NDs = DL)	0.378	0.347	43.54	1.041	2.17	2.085
Statistics (NDs = DL/2)	0.369	0.34	44.51	0.995	2.25	2.262
Statistics (Gamma ROS Estimates)	0.239	0.236	68.75	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	0.936	2.366	2.526

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.593	0.874	Data Not Normal
Lilliefors (Detects Only)	0.344	0.237	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.574	0.881	Data Not Normal
Lilliefors (NDs = DL)	0.352	0.229	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.574	0.881	Data Not Normal
Lilliefors (NDs = DL/2)	0.352	0.229	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.735	0.881	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.307	0.229	Data Not Normal

Table D.7.2-3b
Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.553	0.811	
Kolmogorov-Smirnov (Detects Only)	0.211	0.244	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.588	0.819	
Kolmogorov-Smirnov (NDs = DL)	0.201	0.238	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.52	0.821	
Kolmogorov-Smirnov (NDs = DL/2)	0.196	0.238	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.56	0.861	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.173	0.243	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.969	0.874	Data Appear Lognormal
Lilliefors (Detects Only)	0.131	0.237	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.956	0.881	Data Appear Lognormal
Lilliefors (NDs = DL)	0.118	0.229	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.971	0.881	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.13	0.229	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.976	0.881	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.145	0.229	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3b
Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Selenium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Selenium Data	15	0	15	10	5	33.33%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	5	0.089	0.089	0.089	0.089	N/A
Statistics (Detects Only)	10	0.14	0.89	0.495	0.54	0.233
Statistics (All: NDs treated as DL value)	15	0.089	0.89	0.359	0.35	0.272
Statistics (All: NDs treated as DL/2 value)	15	0.0445	0.89	0.345	0.35	0.288
Statistics (Normal ROS Estimated Data)	15	-0.319	0.89	0.297	0.35	0.354
Statistics (Gamma ROS Estimated Data)	15	0.108	0.89	0.431	0.4	0.222
Statistics (Lognormal ROS Estimated Data)	15	0.0621	0.89	0.366	0.35	0.266

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	3.82	3.1	0.129	-0.841	0.604	-0.718
Statistics (NDs = DL)	1.602	1.326	0.224	-1.367	0.91	-0.665
Statistics (NDs = DL/2)	1.075	0.905	0.32	-1.598	1.209	-0.757
Statistics (Gamma ROS Estimates)	3.418	2.779	0.126	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-1.313	0.866	-0.659

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.964	0.842	Data Appear Normal
Lilliefors (Detects Only)	0.127	0.28	Data Appear Normal
Shapiro-Wilks (NDs = DL)	0.867	0.881	Data Not Normal
Lilliefors (NDs = DL)	0.223	0.229	Data Appear Normal
Shapiro-Wilks (NDs = DL/2)	0.878	0.881	Data Not Normal
Lilliefors (NDs = DL/2)	0.194	0.229	Data Appear Normal
Shapiro-Wilks (Normal ROS Estimates)	0.969	0.881	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.127	0.229	Data Appear Normal

Table D.7.2-3b
Goodness of Fit - Surface Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.44	0.73	
Kolmogorov-Smirnov (Detects Only)	0.192	0.268	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.96	0.752	
Kolmogorov-Smirnov (NDs = DL)	0.208	0.225	Data appear Approximate Gamma Distribution
Anderson-Darling (NDs = DL/2)	0.96	0.762	
Kolmogorov-Smirnov (NDs = DL/2)	0.226	0.228	Data appear Approximate Gamma Distribution
Anderson-Darling (Gamma ROS Estimates)	0.273	0.743	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.115	0.223	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.881	0.842	Data Appear Lognormal
Lilliefors (Detects Only)	0.209	0.28	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.835	0.881	Data Not Lognormal
Lilliefors (NDs = DL)	0.21	0.229	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.818	0.881	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.228	0.229	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.915	0.881	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.17	0.229	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Aluminum

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	25
Minimum	11900
Maximum	38000
Mean of Raw Data	24648
Standard Deviation of Raw Data	6377
Kstar	12.81
Mean of Log Transformed Data	10.08
Standard Deviation of Log Transformed Data	0.284

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.08
Lilliefors Critical (0.95) Value	0.138

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.541
A-D Critical (0.95) Value	0.748
K-S Test Statistic	0.105
K-S Critical(0.95) Value	0.138

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.125
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Arsenic

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	31
Minimum	0.82
Maximum	12
Mean of Raw Data	2.975
Standard Deviation of Raw Data	1.994
Kstar	2.686
Mean of Log Transformed Data	0.907
Standard Deviation of Log Transformed Data	0.615

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.804
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.14
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.504
A-D Critical (0.95) Value	0.755
K-S Test Statistic	0.101
K-S Critical(0.95) Value	0.139

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.111
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Barium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	32
Minimum	25
Maximum	230
Mean of Raw Data	84.79
Standard Deviation of Raw Data	43.49
Kstar	4.479
Mean of Log Transformed Data	4.333
Standard Deviation of Log Transformed Data	0.46

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.844
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.168
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.644
A-D Critical (0.95) Value	0.752
K-S Test Statistic	0.105
K-S Critical(0.95) Value	0.138

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.0817
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Beryllium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	25
Minimum	0.42
Maximum	2.6
Mean of Raw Data	1.151
Standard Deviation of Raw Data	0.54
Kstar	4.186
Mean of Log Transformed Data	0.0252
Standard Deviation of Log Transformed Data	0.502

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.123
Lilliefors Critical (0.95) Value	0.138

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.477
A-D Critical (0.95) Value	0.752
K-S Test Statistic	0.135
K-S Critical(0.95) Value	0.138

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.943
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.165
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chromium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	32
Minimum	9.3
Maximum	1500
Mean of Raw Data	90.51
Standard Deviation of Raw Data	238.4
Kstar	0.705
Mean of Log Transformed Data	3.698
Standard Deviation of Log Transformed Data	0.943

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.319
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.412
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	6.295
A-D Critical (0.95) Value	0.79
K-S Test Statistic	0.354
K-S Critical(0.95) Value	0.143

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.795
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.241
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cobalt

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	33
Minimum	1.8
Maximum	51
Mean of Raw Data	14.69
Standard Deviation of Raw Data	11.59
Kstar	1.771
Mean of Log Transformed Data	2.4
Standard Deviation of Log Transformed Data	0.783

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.162
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.379
A-D Critical (0.95) Value	0.761
K-S Test Statistic	0.0932
K-S Critical(0.95) Value	0.14

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.985
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.0729
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Copper

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	27
Minimum	1.4
Maximum	110
Mean of Raw Data	19.4
Standard Deviation of Raw Data	20.1
Kstar	1.915
Mean of Log Transformed Data	2.702
Standard Deviation of Log Transformed Data	0.691

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.538
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.327
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	2.572
A-D Critical (0.95) Value	0.759
K-S Test Statistic	0.217
K-S Critical(0.95) Value	0.14

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.89
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.165
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Iron

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	33
Minimum	7100
Maximum	87000
Mean of Raw Data	40160
Standard Deviation of Raw Data	18896
Kstar	3.827
Mean of Log Transformed Data	10.47
Standard Deviation of Log Transformed Data	0.549

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.162
Lilliefors Critical (0.95) Value	0.138

Data appear Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.58
A-D Critical (0.95) Value	0.752
K-S Test Statistic	0.109
K-S Critical(0.95) Value	0.139

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.14
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Lead

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	27
Minimum	0.86
Maximum	680
Mean of Raw Data	45.63
Standard Deviation of Raw Data	110.9
Kstar	0.661
Mean of Log Transformed Data	2.952
Standard Deviation of Log Transformed Data	1.127

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.364
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.387
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	4.503
A-D Critical (0.95) Value	0.794
K-S Test Statistic	0.296
K-S Critical(0.95) Value	0.144

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.191
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Magnesium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	34
Minimum	487
Maximum	4280
Mean of Raw Data	1291
Standard Deviation of Raw Data	763.4
Kstar	3.593
Mean of Log Transformed Data	7.028
Standard Deviation of Log Transformed Data	0.51

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.82
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.172
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.613
A-D Critical (0.95) Value	0.753
K-S Test Statistic	0.108
K-S Critical(0.95) Value	0.139

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.968
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.0865
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Manganese

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	40
Minimum	79
Maximum	7700
Mean of Raw Data	1372
Standard Deviation of Raw Data	1693
Kstar	0.89
Mean of Log Transformed Data	6.607
Standard Deviation of Log Transformed Data	1.136

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.718
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.273
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.055
A-D Critical (0.95) Value	0.781
K-S Test Statistic	0.161
K-S Critical(0.95) Value	0.142

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.0821
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Nickel

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	27
Minimum	4.9
Maximum	28
Mean of Raw Data	10.67
Standard Deviation of Raw Data	4.429
Kstar	6.534
Mean of Log Transformed Data	2.295
Standard Deviation of Log Transformed Data	0.379

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.882
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.146
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.405
A-D Critical (0.95) Value	0.75
K-S Test Statistic	0.103
K-S Critical(0.95) Value	0.138

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.0837
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Potassium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	27
Minimum	528
Maximum	3020
Mean of Raw Data	1127
Standard Deviation of Raw Data	425.5
Kstar	8.875
Mean of Log Transformed Data	6.974
Standard Deviation of Log Transformed Data	0.316

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.8
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.196
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.02
A-D Critical (0.95) Value	0.748
K-S Test Statistic	0.145
K-S Critical(0.95) Value	0.138

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.122
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Silver

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	31
Minimum	0.014
Maximum	0.2
Mean of Raw Data	0.0521
Standard Deviation of Raw Data	0.0359
Kstar	2.622
Mean of Log Transformed Data	-3.143
Standard Deviation of Log Transformed Data	0.616

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.817
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.168
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.395
A-D Critical (0.95) Value	0.756
K-S Test Statistic	0.0917
K-S Critical(0.95) Value	0.139

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.978
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.105
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sodium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	37
Minimum	33
Maximum	1100
Mean of Raw Data	282.3
Standard Deviation of Raw Data	307.9
Kstar	1.084
Mean of Log Transformed Data	5.15
Standard Deviation of Log Transformed Data	0.977

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.725
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.252
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	1.824
A-D Critical (0.95) Value	0.775
K-S Test Statistic	0.171
K-S Critical(0.95) Value	0.142

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.126
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Thallium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	28
Minimum	0.041
Maximum	0.77
Mean of Raw Data	0.237
Standard Deviation of Raw Data	0.123
Kstar	4.01
Mean of Log Transformed Data	-1.56
Standard Deviation of Log Transformed Data	0.517

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.141
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	0.479
A-D Critical (0.95) Value	0.752
K-S Test Statistic	0.0969
K-S Critical(0.95) Value	0.138

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.102
Lilliefors Critical (0.95) Value	0.138

Data appear Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Vanadium

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	31
Minimum	11
Maximum	1200
Mean of Raw Data	73.89
Standard Deviation of Raw Data	187.2
Kstar	0.819
Mean of Log Transformed Data	3.624
Standard Deviation of Log Transformed Data	0.862

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.304
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.381
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	5.286
A-D Critical (0.95) Value	0.784
K-S Test Statistic	0.288
K-S Critical(0.95) Value	0.143

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.818
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.202
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3c
Goodness of Fit - Total Soil
ProUCL 4.0 for Full Data Sets
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Zinc

Raw Statistics

Number of Valid Samples	41
Number of Unique Samples	35
Minimum	9.3
Maximum	3700
Mean of Raw Data	256.1
Standard Deviation of Raw Data	650.6
Kstar	0.475
Mean of Log Transformed Data	4.262
Standard Deviation of Log Transformed Data	1.34

Normal Distribution Test Results

Shapiro Wilk Test Statistic	0.413
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.376
Lilliefors Critical (0.95) Value	0.138

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

A-D Test Statistic	5.248
A-D Critical (0.95) Value	0.814
K-S Test Statistic	0.302
K-S Critical(0.95) Value	0.146

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Shapiro Wilk Test Statistic	0.852
Shapiro Wilk Critical (0.95) Value	0.941
Lilliefors Test Statistic	0.239
Lilliefors Critical (0.95) Value	0.138

Data not Lognormal at (0.05) Significance Level

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95

Antimony

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Antimony Data	41	0	41	40	1	2.44%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Detects Only)	40	0.045	340	23.82	0.53	70.14
Statistics (All: NDs treated as DL value)	41	0.045	340	23.24	0.52	69.35
Statistics (All: NDs treated as DL/2 value)	41	0.0259	340	23.24	0.52	69.35
Statistics (Normal ROS Estimated Data)	41	-69.8	340	21.54	0.52	70.78
Statistics (Gamma ROS Estimated Data)	41	0	340	23.24	0.52	69.35
Statistics (Lognormal ROS Estimated Data)	41	0.00988	340	23.24	0.52	69.35

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.254	0.251	93.85	0.379	2.339	6.176
Statistics (NDs = DL)	0.249	0.247	93.17	0.297	2.368	7.964
Statistics (NDs = DL/2)	0.248	0.246	93.65	0.28	2.394	8.537
Statistics (Gamma ROS Estimates)	0.221	0.221	105.3	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	0.257	2.438	9.49

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.387	0.94	Data Not Normal
Lilliefors (Detects Only)	0.414	0.14	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.382	0.941	Data Not Normal
Lilliefors (NDs = DL)	0.414	0.138	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.382	0.941	Data Not Normal
Lilliefors (NDs = DL/2)	0.414	0.138	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.445	0.941	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.404	0.138	Data Not Normal

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	4.045	0.879	
Kolmogorov-Smirnov (Detects Only)	0.261	0.153	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	4.126	0.881	
Kolmogorov-Smirnov (NDs = DL)	0.263	0.151	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	4.038	0.882	
Kolmogorov-Smirnov (NDs = DL/2)	0.261	0.151	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	3.248	0.894	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.227	0.152	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.9	0.94	Data Not Lognormal
Lilliefors (Detects Only)	0.196	0.14	Data Not Lognormal
Shapiro-Wilks (NDs = DL)	0.904	0.941	Data Not Lognormal
Lilliefors (NDs = DL)	0.192	0.138	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.916	0.941	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.188	0.138	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.931	0.941	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.182	0.138	Data Not Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Cadmium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Cadmium Data	41	0	41	24	17	41.46%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	17	0.11	0.11	0.11	0.11	0
Statistics (Detects Only)	24	0.118	120	11.24	1.7	26.1
Statistics (All: NDs treated as DL value)	41	0.11	120	6.627	0.24	20.56
Statistics (All: NDs treated as DL/2 value)	41	0.055	120	6.604	0.24	20.56
Statistics (Normal ROS Estimated Data)	41	-76.82	120	-10.25	0.24	34.21
Statistics (Gamma ROS Estimated Data)	41	0	120	7.776	1.5	20.47
Statistics (Lognormal ROS Estimated Data)	41	0.00050559	120	6.595	0.24	20.57

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.396	0.383	28.41	0.754	1.875	2.488
Statistics (NDs = DL)	0.293	0.288	22.64	-0.474	2.05	-4.325
Statistics (NDs = DL/2)	0.266	0.262	24.87	-0.761	2.312	-3.036
Statistics (Gamma ROS Estimates)	0.122	0.13	63.56	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-1.283	3.002	-2.34

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.472	0.916	Data Not Normal
Lilliefors (Detects Only)	0.361	0.181	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.367	0.941	Data Not Normal
Lilliefors (NDs = DL)	0.379	0.138	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.368	0.941	Data Not Normal
Lilliefors (NDs = DL/2)	0.378	0.138	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.888	0.941	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.204	0.138	Data Not Normal

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.321	0.83	
Kolmogorov-Smirnov (Detects Only)	0.228	0.191	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	4.614	0.862	
Kolmogorov-Smirnov (NDs = DL)	0.234	0.15	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	3.884	0.874	
Kolmogorov-Smirnov (NDs = DL/2)	0.218	0.151	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	3.23	0.95	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.223	0.156	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.97	0.916	Data Appear Lognormal
Lilliefors (Detects Only)	0.108	0.181	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.812	0.941	Data Not Lognormal
Lilliefors (NDs = DL)	0.252	0.138	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.84	0.941	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.237	0.138	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.983	0.941	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0916	0.138	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Calcium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Calcium Data	41	0	41	39	2	4.88%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	2	16.6	16.6	16.6	16.6	N/A
Statistics (Detects Only)	39	57	4440	1014	640	1113
Statistics (All: NDs treated as DL value)	41	16.6	4440	965.2	600	1107
Statistics (All: NDs treated as DL/2 value)	41	8.3	4440	964.8	600	1107
Statistics (Normal ROS Estimated Data)	41	-1657	4440	892.1	600	1215
Statistics (Gamma ROS Estimated Data)	41	0	4440	964.4	600	1107
Statistics (Lognormal ROS Estimated Data)	41	20.23	4440	965.6	600	1106

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	0.893	0.844	1136	6.266	1.261	0.201
Statistics (NDs = DL)	0.77	0.73	1254	6.097	1.442	0.236
Statistics (NDs = DL/2)	0.742	0.704	1301	6.064	1.526	0.252
Statistics (Gamma ROS Estimates)	0.35	0.341	2756	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	6.117	1.398	0.229

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.8	0.939	Data Not Normal
Lilliefors (Detects Only)	0.2	0.142	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.792	0.941	Data Not Normal
Lilliefors (NDs = DL)	0.201	0.138	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.793	0.941	Data Not Normal
Lilliefors (NDs = DL/2)	0.2	0.138	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.891	0.941	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.197	0.138	Data Not Normal

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.431	0.783	
Kolmogorov-Smirnov (Detects Only)	0.0875	0.146	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.29	0.788	
Kolmogorov-Smirnov (NDs = DL)	0.0797	0.143	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.232	0.79	
Kolmogorov-Smirnov (NDs = DL/2)	0.0709	0.143	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	3.138	0.847	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.239	0.149	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.951	0.939	Data Appear Lognormal
Lilliefors (Detects Only)	0.0887	0.142	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.957	0.941	Data Appear Lognormal
Lilliefors (NDs = DL)	0.0945	0.138	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.945	0.941	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.0986	0.138	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.962	0.941	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0914	0.138	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Mercury

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Mercury Data	41	0	41	40	1	2.44%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Detects Only)	40	0.012	0.76	0.091	0.06	0.12
Statistics (All: NDs treated as DL value)	41	0.0075	0.76	0.0889	0.058	0.119
Statistics (All: NDs treated as DL/2 value)	41	0.00375	0.76	0.0888	0.058	0.119
Statistics (Normal ROS Estimated Data)	41	-0.124	0.76	0.0857	0.058	0.123
Statistics (Gamma ROS Estimated Data)	41	0	0.76	0.0887	0.058	0.119
Statistics (Lognormal ROS Estimated Data)	41	0.00707	0.76	0.0889	0.058	0.119

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	1.402	1.316	0.0649	-2.795	0.851	-0.304
Statistics (NDs = DL)	1.316	1.236	0.0676	-2.846	0.902	-0.317
Statistics (NDs = DL/2)	1.273	1.196	0.0698	-2.863	0.946	-0.331
Statistics (Gamma ROS Estimates)	0.741	0.703	0.12	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-2.847	0.905	-0.318

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.52	0.94	Data Not Normal
Lilliefors (Detects Only)	0.255	0.14	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.524	0.941	Data Not Normal
Lilliefors (NDs = DL)	0.247	0.138	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.527	0.941	Data Not Normal
Lilliefors (NDs = DL/2)	0.237	0.138	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.589	0.941	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.25	0.138	Data Not Normal

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.962	0.768	
Kolmogorov-Smirnov (Detects Only)	0.137	0.142	Data appear Approximate Gamma Distribution
Anderson-Darling (NDs = DL)	0.846	0.771	
Kolmogorov-Smirnov (NDs = DL)	0.129	0.141	Data appear Approximate Gamma Distribution
Anderson-Darling (NDs = DL/2)	0.81	0.772	
Kolmogorov-Smirnov (NDs = DL/2)	0.125	0.141	Data appear Approximate Gamma Distribution
Anderson-Darling (Gamma ROS Estimates)	2.248	0.79	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.206	0.143	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.967	0.94	Data Appear Lognormal
Lilliefors (Detects Only)	0.0772	0.14	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.976	0.941	Data Appear Lognormal
Lilliefors (NDs = DL)	0.0855	0.138	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.974	0.941	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.102	0.138	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.977	0.941	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.0868	0.138	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Selenium

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Selenium Data	41	0	41	25	16	39.02%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	16	0.089	0.089	0.089	0.089	0
Statistics (Detects Only)	25	0.095	0.89	0.37	0.33	0.205
Statistics (All: NDs treated as DL value)	41	0.089	0.89	0.26	0.17	0.211
Statistics (All: NDs treated as DL/2 value)	41	0.0445	0.89	0.243	0.17	0.226
Statistics (Normal ROS Estimated Data)	41	-0.512	0.89	0.164	0.17	0.321
Statistics (Gamma ROS Estimated Data)	41	0	0.89	0.329	0.33	0.189
Statistics (Lognormal ROS Estimated Data)	41	0.026	0.89	0.256	0.17	0.216

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log C.V.
Statistics (Detects Only)	3.259	3.037	0.113	-1.157	0.603	-0.522
Statistics (NDs = DL)	1.801	1.686	0.144	-1.649	0.779	-0.472
Statistics (NDs = DL/2)	1.13	1.063	0.215	-1.92	1.073	-0.559
Statistics (Gamma ROS Estimates)	0.939	0.887	0.351	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-1.739	0.918	-0.528

Normal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.935	0.918	Data Appear Normal
Lilliefors (Detects Only)	0.178	0.177	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.803	0.941	Data Not Normal
Lilliefors (NDs = DL)	0.209	0.138	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.833	0.941	Data Not Normal
Lilliefors (NDs = DL/2)	0.2	0.138	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.988	0.941	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.0635	0.138	Data Appear Normal

Table D.7.2-3d
Goodness of Fit - Total Soil
ProUCL 4.0 for Data Sets with Non-Detects
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Gamma Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.317	0.751	
Kolmogorov-Smirnov (Detects Only)	0.108	0.176	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	2.535	0.762	
Kolmogorov-Smirnov (NDs = DL)	0.229	0.14	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	2.158	0.775	
Kolmogorov-Smirnov (NDs = DL/2)	0.248	0.142	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	3.977	0.781	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.237	0.142	Data Not Gamma Distributed

Lognormal Distribution Test Results

	Test value	Crit. (0.95)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.961	0.918	Data Appear Lognormal
Lilliefors (Detects Only)	0.132	0.177	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.829	0.941	Data Not Lognormal
Lilliefors (NDs = DL)	0.232	0.138	Data Not Lognormal
Shapiro-Wilks (NDs = DL/2)	0.829	0.941	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.257	0.138	Data Not Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.961	0.941	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.12	0.138	Data Appear Lognormal

Note: DL/2 is not a recommended method.

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Aluminum(site)

Background Data: Aluminum(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	7	28
Minimum	9100	3620
Maximum	18000	20100
Mean	12355	8300
Median	11000	6705
SD	2981	4279
SE of Mean	898.8	808.6

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	311
WMW Test U-Stat	245
WMW Critical Value (0.050)	238
Approximate P-Value	0.00237

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Arsenic(site)

Background Data: Arsenic(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	10	24
Minimum	0.57	1.5
Maximum	12	10.2
Mean	4.127	3.732
Median	2.8	2.75
SD	4.06	2.33
SE of Mean	1.224	0.44

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	200.5
WMW Test U-Stat	134.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.734

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Barium(site)

Background Data: Barium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	4
Number of Detect Data	11	24
Minimum Non-Detect	N/A	0.36
Maximum Non-Detect	N/A	1
Percent Non detects	0.00%	14.29%
Minimum Detected	62	23.4
Maximum Detected	240	174
Mean of Detected Data	146.9	75.55
Median of Detected Data	160	61.85
SD of Detected Data	56.61	43.2

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 1 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	333.5
WMW Test U-Stat	267.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.00021042

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Beryllium(site)

Background Data: Beryllium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	13
Number of Detect Data	11	15
Minimum Non-Detect	N/A	0.022
Maximum Non-Detect	N/A	0.03
Percent Non detects	0.00%	46.43%
Minimum Detected	0.55	0.61
Maximum Detected	1.3	1.5
Mean of Detected Data	0.965	0.887
Median of Detected Data	1	0.87
SD of Detected Data	0.223	0.246

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.03 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	313
WMW Test U-Stat	247
WMW Critical Value (0.050)	238
Approximate P-Value	0.00195

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Cadmium(site)

Background Data: Cadmium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	6	26
Number of Detect Data	5	2
Minimum Non-Detect	0.45	0.02
Maximum Non-Detect	0.45	0.05
Percent Non detects	54.55%	92.86%
Minimum Detected	0.49	0.67
Maximum Detected	6.2	0.82
Mean of Detected Data	2.144	0.745
Median of Detected Data	1.3	0.745
SD of Detected Data	2.355	0.106

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.45 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	280
WMW Test U-Stat	214
WMW Critical Value (0.050)	238
Approximate P-Value	0.0317

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Calcium(site)

Background Data: Calcium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	5
Number of Detect Data	11	23
Minimum Non-Detect	N/A	4.6
Maximum Non-Detect	N/A	6.6
Percent Non detects	0.00%	17.86%
Minimum Detected	210	116
Maximum Detected	2100	7340
Mean of Detected Data	1342	1197
Median of Detected Data	1400	885
SD of Detected Data	566.7	1440

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 6.6 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	295.5
WMW Test U-Stat	229.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.00962

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Chromium(site)

Background Data: Chromium(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	11	27
Minimum	16	6.3
Maximum	79	53.3
Mean	29.14	21.09
Median	22	22.4
SD	18.02	10.5
SE of Mean	5.434	1.985

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	258
WMW Test U-Stat	192
WMW Critical Value (0.050)	238
Approximate P-Value	0.121

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Cobalt(site)

Background Data: Cobalt(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	8
Number of Detect Data	11	20
Minimum Non-Detect	N/A	0.11
Maximum Non-Detect	N/A	0.75
Percent Non detects	0.00%	28.57%
Minimum Detected	3.8	5.9
Maximum Detected	9.1	45.4
Mean of Detected Data	7.65	15.95
Median of Detected Data	8.4	12.1
SD of Detected Data	1.715	10.07

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.75 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	187.5
WMW Test U-Stat	121.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.848

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Copper(site)

Background Data: Copper(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	11	23
Minimum	6.3	0.17
Maximum	1100	13.6
Mean	157.8	6.437
Median	12	5.2
SD	339.8	3.973
SE of Mean	102.5	0.751

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	328.5
WMW Test U-Stat	262.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.000375

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Iron(site)

Background Data: Iron(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	8	26
Minimum	14000	7250
Maximum	47000	63000
Mean	26091	20108
Median	24000	19750
SD	10454	11869
SE of Mean	3152	2243

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	274.5
WMW Test U-Stat	208.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.046

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Lead(site)

Background Data: Lead(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	11	26
Minimum	7.9	8.9
Maximum	760	225
Mean	163.1	26.96
Median	66	15.15
SD	235.2	41.34
SE of Mean	70.92	7.813

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	319
WMW Test U-Stat	253
WMW Critical Value (0.050)	238
Approximate P-Value	0.00106

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Magnesium(site)

Background Data: Magnesium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	3
Number of Detect Data	11	25
Minimum Non-Detect	N/A	4.7
Maximum Non-Detect	N/A	5
Percent Non detects	0.00%	10.71%
Minimum Detected	940	158
Maximum Detected	3000	20400
Mean of Detected Data	2285	2498
Median of Detected Data	2500	913
SD of Detected Data	662.4	4334

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 5 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	302
WMW Test U-Stat	236
WMW Critical Value (0.050)	238
Approximate P-Value	0.00549

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Manganese(site)

Background Data: Manganese(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	11	28
Minimum	250	43
Maximum	1100	2040
Mean	684.1	695.9
Median	640	490
SD	267.4	591.5
SE of Mean	80.63	111.8

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	250
WMW Test U-Stat	184
WMW Critical Value (0.050)	238
Approximate P-Value	0.179

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Nickel(site)

Background Data: Nickel(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	11
Number of Detect Data	11	17
Minimum Non-Detect	N/A	0.21
Maximum Non-Detect	N/A	1.3
Percent Non detects	0.00%	39.29%
Minimum Detected	6.6	4.6
Maximum Detected	24	18.1
Mean of Detected Data	12.55	9.935
Median of Detected Data	10	9.4
SD of Detected Data	5.738	4.294

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 1.3 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	305.5
WMW Test U-Stat	239.5
WMW Critical Value (0.050)	238
Approximate P-Value	0.00399

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Potassium(site)

Background Data: Potassium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	11	28
Number of Non-Detect Data	0	6
Number of Detect Data	11	22
Minimum Non-Detect	N/A	201
Maximum Non-Detect	N/A	271
Percent Non detects	0.00%	21.43%
Minimum Detected	730	166
Maximum Detected	1700	2350
Mean of Detected Data	1250	735.4
Median of Detected Data	1400	509.5
SD of Detected Data	293.1	632.6

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 271 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	322
WMW Test U-Stat	256
WMW Critical Value (0.050)	238
Approximate P-Value	0.00076811

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Vanadium(site)

Background Data: Vanadium(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	10	27
Minimum	16	12.2
Maximum	46	101
Mean	25.36	33.89
Median	23	33.8
SD	10.39	17.78
SE of Mean	3.134	3.36

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	181
WMW Test U-Stat	115
WMW Critical Value (0.050)	238
Approximate P-Value	0.891

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

Table D.7.2-4a
Background Versus Site Means Comparison - Surface Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Zinc(site)

Background Data: Zinc(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	11	28
Number of Distinct Observations	11	28
Minimum	36	7.1
Maximum	2500	216
Mean	539.8	41.21
Median	160	29.7
SD	783.1	40.24
SE of Mean	236.1	7.605

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	351
WMW Test U-Stat	285
WMW Critical Value (0.050)	238
Approximate P-Value	2.3223E-05

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Aluminum(site)

Background Data: Aluminum(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	12	75
Minimum	9100	3620
Maximum	19000	47900
Mean	13155	14204
Median	12500	12100
SD	2977	9433
SE of Mean	634.8	1061

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1206
WMW Test U-Stat	0.687
WMW Critical Value (0.050)	1.645
P-Value	0.246

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Arsenic(site)

Background Data: Arsenic(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	20	49
Minimum	0.57	0.09
Maximum	12	35.9
Mean	2.525	4.804
Median	1.05	3.1
SD	3.255	5.339
SE of Mean	0.694	0.601

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	659
WMW Test U-Stat	-3.813
WMW Critical Value (0.050)	1.645
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Barium(site)

Background Data: Barium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	16
Number of Detect Data	22	63
Minimum Non-Detect	N/A	0.36
Maximum Non-Detect	N/A	1.1
Percent Non detects	0.00%	20.25%
Minimum Detected	62	23.4
Maximum Detected	300	174
Mean of Detected Data	144.5	68.4
Median of Detected Data	135	56.7
SD of Detected Data	55.3	40.39

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 1.1 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1822
WMW Test U-Stat	5.755
WMW Critical Value (0.050)	1.645
P-Value	4.3294E-09

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Beryllium(site)

Background Data: Beryllium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	39
Number of Detect Data	22	40
Minimum Non-Detect	N/A	0.022
Maximum Non-Detect	N/A	0.03
Percent Non detects	0.00%	49.37%
Minimum Detected	0.55	0.61
Maximum Detected	1.6	5.4
Mean of Detected Data	1.063	1.449
Median of Detected Data	1.1	1.1
SD of Detected Data	0.245	1.086

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.03 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1513
WMW Test U-Stat	3.209
WMW Critical Value (0.050)	1.645
P-Value	0.00066666

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Cadmium(site)

Background Data: Cadmium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	14	66
Number of Detect Data	8	13
Minimum Non-Detect	0.45	0.02
Maximum Non-Detect	0.45	0.05
Percent Non detects	63.64%	83.54%
Minimum Detected	0.49	0.57
Maximum Detected	6.2	2.5
Mean of Detected Data	1.719	1.152
Median of Detected Data	0.965	1.1
SD of Detected Data	1.93	0.585

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.45 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1291
WMW Test U-Stat	1.382
WMW Critical Value (0.050)	1.645
P-Value	0.0835

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Calcium(site)

Background Data: Calcium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	16
Number of Detect Data	22	63
Minimum Non-Detect	N/A	4.6
Maximum Non-Detect	N/A	6.7
Percent Non detects	0.00%	20.25%
Minimum Detected	210	116
Maximum Detected	2700	25700
Mean of Detected Data	1466	1392
Median of Detected Data	1400	717
SD of Detected Data	537.3	3322

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 6.7 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1686
WMW Test U-Stat	4.636
WMW Critical Value (0.050)	1.645
P-Value	1.7746E-06

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Chromium(site)

Background Data: Chromium(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	17	70
Minimum	16	6.3
Maximum	170	75.8
Mean	32.32	26.86
Median	21.5	26
SD	33.47	12.51
SE of Mean	7.136	1.408

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1044
WMW Test U-Stat	-0.65
WMW Critical Value (0.050)	1.645
P-Value	0.742

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Cobalt(site)

Background Data: Cobalt(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	23
Number of Detect Data	22	56
Minimum Non-Detect	N/A	0.11
Maximum Non-Detect	N/A	0.84
Percent Non detects	0.00%	29.11%
Minimum Detected	3.8	5.9
Maximum Detected	11	130
Mean of Detected Data	8.393	22.23
Median of Detected Data	8.5	13.3
SD of Detected Data	1.729	23.94

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.84 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	944
WMW Test U-Stat	-1.469
WMW Critical Value (0.050)	1.645
P-Value	0.929

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Copper(site)

Background Data: Copper(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	2
Number of Detect Data	22	77
Minimum Non-Detect	N/A	0.17
Maximum Non-Detect	N/A	0.17
Percent Non detects	0.00%	2.53%
Minimum Detected	6.3	1.6
Maximum Detected	1100	38.7
Mean of Detected Data	109.5	12.25
Median of Detected Data	11.5	9.1
SD of Detected Data	265.5	9.397

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1396
WMW Test U-Stat	2.25
WMW Critical Value (0.050)	1.645
P-Value	0.0122

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Iron(site)

Background Data: Iron(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	14	72
Minimum	14000	7250
Maximum	47000	67700
Mean	24273	26963
Median	23500	25200
SD	8784	11990
SE of Mean	1873	1349

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	974.5
WMW Test U-Stat	-1.218
WMW Critical Value (0.050)	1.645
P-Value	0.888

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Lead(site)

Background Data: Lead(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	20	70
Minimum	7.7	2.1
Maximum	760	256
Mean	100.4	22.04
Median	21	12
SD	184.6	39.85
SE of Mean	39.36	4.483

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1385
WMW Test U-Stat	2.156
WMW Critical Value (0.050)	1.645
P-Value	0.0156

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Magnesium(site)

Background Data: Magnesium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	7
Number of Detect Data	22	72
Minimum Non-Detect	N/A	3.8
Maximum Non-Detect	N/A	5
Percent Non detects	0.00%	8.86%
Minimum Detected	940	139
Maximum Detected	4700	58100
Mean of Detected Data	2963	6394
Median of Detected Data	2900	1270
SD of Detected Data	967.2	12925

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 5 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1418
WMW Test U-Stat	2.431
WMW Critical Value (0.050)	1.645
P-Value	0.00752

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Manganese(site)

Background Data: Manganese(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	19	78
Minimum	250	16.7
Maximum	1100	2040
Mean	621.4	471.4
Median	575	359
SD	228.4	467.1
SE of Mean	48.69	52.55

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1494
WMW Test U-Stat	3.057
WMW Critical Value (0.050)	1.645
P-Value	0.00112

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Mercury(site)

Background Data: Mercury(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	1	61
Number of Detect Data	21	18
Minimum Non-Detect	0.0075	0.019
Maximum Non-Detect	0.0075	0.06
Percent Non detects	4.55%	77.22%
Minimum Detected	0.0087	0.038
Maximum Detected	0.22	1.2
Mean of Detected Data	0.0628	0.187
Median of Detected Data	0.023	0.125
SD of Detected Data	0.0634	0.259

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.06 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1257
WMW Test U-Stat	1.107
WMW Critical Value (0.050)	1.645
P-Value	0.134

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Nickel(site)

Background Data: Nickel(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	18
Number of Detect Data	22	61
Minimum Non-Detect	N/A	0.21
Maximum Non-Detect	N/A	1.4
Percent Non detects	0.00%	22.78%
Minimum Detected	6.6	4.6
Maximum Detected	34	94.2
Mean of Detected Data	13.72	17.95
Median of Detected Data	12.5	13.2
SD of Detected Data	6.187	15.68

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 1.4 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1299
WMW Test U-Stat	1.448
WMW Critical Value (0.050)	1.645
P-Value	0.0738

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Potassium(site)

Background Data: Potassium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	12
Number of Detect Data	22	67
Minimum Non-Detect	N/A	201
Maximum Non-Detect	N/A	271
Percent Non detects	0.00%	15.19%
Minimum Detected	730	123
Maximum Detected	2400	10900
Mean of Detected Data	1414	1690
Median of Detected Data	1400	694
SD of Detected Data	385.7	2232

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 271 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1486
WMW Test U-Stat	2.987
WMW Critical Value (0.050)	1.645
P-Value	0.00141

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Thallium(site)

Background Data: Thallium(bkd)

Raw Statistics

	Site	Background
Number of Valid Data	22	79
Number of Non-Detect Data	0	64
Number of Detect Data	22	15
Minimum Non-Detect	N/A	0.13
Maximum Non-Detect	N/A	0.45
Percent Non detects	0.00%	81.01%
Minimum Detected	0.1	1.3
Maximum Detected	0.54	5
Mean of Detected Data	0.242	2.527
Median of Detected Data	0.2	2.2
SD of Detected Data	0.131	0.932

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.45 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1021
WMW Test U-Stat	-0.835
WMW Critical Value (0.050)	1.645
P-Value	0.798

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Vanadium(site)

Background Data: Vanadium(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	15	76
Minimum	15	12.2
Maximum	46	114
Mean	24.36	45.84
Median	22	41.4
SD	8.699	20.38
SE of Mean	1.855	2.293

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	540
WMW Test U-Stat	-4.792
WMW Critical Value (0.050)	1.645
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Table D.7.2-4b
Background Versus Site Means Comparison - Total Soil
ProUCL 4.0
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Zinc(site)

Background Data: Zinc(bkd)

Raw Statistics

	Site	Background
Number of Valid Observations	22	79
Number of Distinct Observations	20	76
Minimum	36	4.7
Maximum	2500	598
Mean	350.4	54.94
Median	89	30.2
SD	605.6	87.15
SE of Mean	129.1	9.805

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1780
WMW Test U-Stat	5.405
WMW Critical Value (0.050)	1.645
P-Value	3.2325E-08

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

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APPENDIX E

HUMAN HEALTH RISK ASSESSMENT

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APPENDIX E.1

SWMU 45 HHRA – RAGS D TABLES

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Table E.1-1
Selection of Exposure Pathways
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Surface Soil	Maintenance Worker	Adult	Ingestion	Quant	Receptor could ingest surface soil from the site while conducting routine maintenance activities (i.e., mowing lawns).
						Dermal Absorption	Quant	Receptor could come into contact with surface soil from the site while conducting routine maintenance activities (i.e., mowing lawns).
		Air	Ambient Air Above Surface Soil (Particulates) [1]	Maintenance Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil. [1]
	Subsurface Soil	Subsurface Soil	Subsurface Soil	Maintenance Worker	Adult	Ingestion	None	Receptor is not likely to ingest subsurface soil from the site since maintenance does not include excavation.
						Dermal Absorption	None	Receptor is not likely to come in contact with subsurface soil from the site since maintenance does not include excavation.
		Air	Ambient Air Above Subsurface Soil (Particulates) [1]	Maintenance Worker	Adult	Inhalation	None	Receptor is not likely to inhale particulates from ambient air above the subsurface soil since maintenance activities do not include excavation. [1]
	Groundwater [2]	Groundwater	Groundwater	Maintenance Worker	Adult	Ingestion	None	Receptor is not likely to ingest groundwater from the site during maintenance activities.
						Dermal Absorption	None	Receptor is not likely to contact groundwater from the site during maintenance activities.
		Air	Upward Migration of Vapors from Groundwater (Outdoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is not likely to inhale vapors that migrated upward from groundwater to ambient air in any significant quantities.
			Upward Migration of Vapors from Groundwater (Indoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors.
			Vapors while Showering	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed not to shower on-site.
Future	Surface Soil	Surface Soil	Surface Soil	Maintenance Worker	Adult	Ingestion	Quant	Receptor could ingest surface soil from the site while conducting routine maintenance activities (i.e., mowing lawns).
						Dermal Absorption	Quant	Receptor could come into contact with surface soil from the site while conducting routine maintenance activities (i.e., mowing lawns).
				Commerical/Industrial Worker	Adult	Ingestion	Quant	Receptor could ingest surface soil while working on site.
						Dermal Absorption	Quant	Receptor could contact surface soil while working on site.
				Construction Worker	Adult	Ingestion	Quant	Receptor could ingest surface soil from the site during construction activities.
						Dermal Absorption	Quant	Receptor could come into contact with surface soil from the site during construction activities.
				Resident	Child	Ingestion	Quant	Receptor could ingest surface soil while living on site.
						Dermal Absorption	Quant	Receptor could come into contact with surface soil while living on site.
					Adult	Ingestion	Quant	Receptor could ingest surface soil while living on site.
						Dermal Absorption	Quant	Receptor could come into contact with surface soil while living on site.
					Child/Adult	Ingestion	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to surface soil. The non-cancer hazard evaluations are treated separately for child and adult resident.
						Dermal Absorption	Quant	
		Air	Ambient Air Above Surface Soil (Particulates) [1]	Maintenance Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil while working on site. [1]
				Commerical/Industrial Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil while working on site. [1]
				Construction Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil while working on site. [1]
				Resident	Child	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil while living on site. [1]
					Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the surface soil while living on site. [1]
					Child/Adult	Inhalation	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to surface soil. The non-cancer hazard evaluations are treated separately for child and adult resident. [1]

Table E.1-1
Selection of Exposure Pathways
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future Cont.	Surface Soil Cont.	Air Cont.	Upward Migration of Vapors from Soil (Indoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors. [1]
				Commercial/Industrial Worker	Adult	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into building. [1]
				Construction Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors. [1]
				Resident	Adult	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into residence. [1]
					Child	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into residence. [1]
					Child/Adult	Inhalation	None	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to surface soil. The non-cancer hazard evaluations are treated separately for child and adult resident. [1]
	Subsurface Soil	Subsurface Soil	Subsurface Soil	Maintenance Worker	Adult	Ingestion	Quant	Receptor could ingest subsurface soil when mixed with surface soil from construction activities while conducting routine maintenance activities.
						Dermal Absorption	Quant	Receptor could come in contact with subsurface soil when mixed with surface soil from construction activities while conducting routine maintenance activities.
				Commerical/Industrial Worker	Adult	Ingestion	Quant	Receptor could ingest subsurface soil when mixed with surface soil from construction of a commercial/industrial facility.
						Dermal Absorption	Quant	Receptor could contact subsurface soil when mixed with surface soil from construction of a commercial/industrial facility.
				Construction Worker	Adult	Ingestion	Quant	Receptor could ingest subsurface soil from the site while during construction activities.
						Dermal Absorption	Quant	Receptor could come into contact with subsurface soil from the site during construction activities.
				Resident	Child	Ingestion	Quant	Receptor could ingest subsurface soil when mixed with surface soil from construction of a residence.
						Dermal Absorption	Quant	Receptor could come in contact with subsurface soil when mixed with surface soil from construction of a residence.
					Adult	Ingestion	Quant	Receptor could ingest subsurface soil when mixed with surface soil from construction of a residence.
						Dermal Absorption	Quant	Receptor could come in contact with subsurface soil when mixed with surface soil from construction of a residence.
					Child/Adult	Ingestion	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to subsurface soil. The non-cancer hazard evaluations are treated separately for child and adult resident.
						Dermal Absorption	Quant	
		Air	Ambient Air Above Subsurface Soil (Particulates) [1]	Maintenance Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the subsurface soil when mixed with surface soil from construction activities while conducting routine maintenance activities. [1]
				Commerical/Industrial Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the subsurface soil when mixed with surface soil from construction of a commercial/industrial facility. [1]
				Construction Worker	Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the subsurface soil during construction activities. [1]
				Resident	Child	Inhalation	Quant	Receptor could inhale particulates from ambient air above the subsurface soil when mixed with surface soil from construction of a residence. [1]
					Adult	Inhalation	Quant	Receptor could inhale particulates from ambient air above the subsurface soil when mixed with surface soil from construction of a residence. [1]
					Child/Adult	Inhalation	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to subsurface soil. The non-cancer hazard evaluations are treated separately for child and adult resident. [1]

Table E.1-1
Selection of Exposure Pathways
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future Cont.	Subsurface Soil Cont.	Air Cont.	Upward Migration of Vapors from Soil (Indoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors. [1]
				Commercial/Industrial Worker	Adult	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into building.[1]
				Construction Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors. [1]
				Resident	Adult	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into residence. [1]
					Child	Inhalation	None	Receptor not likely to inhale VOCs from soil via vapor intrusion into residence.[1]
					Child/Adult	Inhalation	None	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to subsurface soil. The non-cancer hazard evaluations are treated separately for child and adult resident. [1]
	Groundwater [2]	Groundwater	Groundwater	Maintenance Worker	Adult	Ingestion	None	Receptor is not likely to ingest groundwater from the site during maintenance activities.
						Dermal Absorption	None	Receptor is not likely to contact groundwater from the site during maintenance activities.
				Commercial/Industrial Worker	Adult	Ingestion	Quant	Receptor could ingest groundwater used as a water supply.
						Dermal Absorption	Quant	Receptor could come into contact with groundwater used as a water supply for industrial process.
				Construction Worker	Adult	Ingestion	None	Due to the depth to groundwater (approximately 20-25 ft bgs), the receptor is not likely to ingest groundwater during excavation activities.
						Dermal Absorption	None	Due to the depth to groundwater (approximately 20-25 ft bgs), the receptor is not likely to contact groundwater during excavation activities.
				Resident	Adult	Ingestion	Quant	Receptor could ingest groundwater used as a water supply.
						Dermal Absorption	Quant	Receptor could come into contact with groundwater used as a water supply.
					Child	Ingestion	Quant	Receptor could ingest groundwater used as a water supply.
						Dermal Absorption	Quant	Receptor could come into contact with groundwater used as a water supply.
					Child/Adult	Ingestion	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to groundwater. The non-cancer hazard evaluations are treated separately for child and adult resident.
						Dermal Absorption	Quant	
		Air	Upward Migration of Vapors from Groundwater (Outdoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is not likely to inhale vapors that migrated upward from groundwater to ambient air in any significant quantities.
				Commercial/Industrial Worker	Adult	Inhalation	None	Receptor is not likely to inhale vapors that migrated upward from groundwater to ambient air in any significant quantities.
				Construction Worker	Adult	Inhalation	Quant	Receptor could inhale vapors that migrated upward from groundwater to during excavation activities.
				Resident	Adult	Inhalation	None	Receptor is not likely to inhale vapors that migrated upward from groundwater to ambient air in any significant quantities.
					Child	Inhalation	None	Receptor is not likely to inhale vapors that migrated upward from groundwater to ambient air in any significant quantities.
					Child/Adult	Inhalation	None	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to groundwater. The non-cancer hazard evaluations are treated separately for child and adult resident.[2]
			Upward Migration of Vapors from Groundwater (Indoors)	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors.
				Commercial/Industrial Worker	Adult	Inhalation	Quant	Receptor could inhale VOCs from groundwater via vapor intrusion into building.
				Construction Worker	Adult	Inhalation	None	Receptor is assumed to be outdoors.
				Resident	Adult	Inhalation	Quant	Receptor could inhale VOCs from groundwater via vapor intrusion into residence.
					Child	Inhalation	Quant	Receptor could inhale VOCs from groundwater via vapor intrusion into residence.

Table E.1-1
Selection of Exposure Pathways
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future Cont.	Groundwater Cont.	Air Cont.	Upward Migration of Vapors from Groundwater (Indoors) Cont.	Resident Cont.	Child/Adult	Inhalation	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to groundwater. The non-cancer hazard evaluations are treated separately for child and adult resident.[2]
			Vapors while Showering	Maintenance Worker	Adult	Inhalation	None	Receptor is assumed not to shower on-site.
				Commercial/Industrial Worker	Adult	Inhalation	None	Receptor is assumed not to shower on-site.
				Construction Worker	Adult	Inhalation	None	Receptor is assumed not to shower on-site.
				Resident	Adult	Inhalation	Quant	Receptor could inhale vapors from groundwater while showering.
					Child	Inhalation	None	Receptor is assumed not to shower.
					Child/Adult	Inhalation	Quant	The cancer risk estimates for the adult resident (24 years) and child resident (6 years) are added together (30 years) to address lifetime exposure to groundwater. Since the shower scenario applies only to the adult resident, the lifetime resident exposure will be equivalent to that of the adult resident.[2]

Notes:
[1] VOCs not identified as COPCs in soil; therefore, vapors via inhalation pathway not assessed

[2] Groundwater from the surface aquifer is not currently used at the sites for potable or non-potable water supply.

Table E.1-2.1
SWMU 45 COPC Determination - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
Surface Soil		**TAL Metals**														
	7429-90-5	Aluminum	9,100	18,000	mg/kg	45TP3A	11/11	2 - 200	18,000	7,821	N	102,200	N	IND	Y	**ARES**
	7440-36-0	Antimony	0.074	4.6	mg/kg	45TP4A	10/11	0.026 - 0.026	4.6	3.13	N	40.88	N	IND	Y	**ARES**
	7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	11/11	0.026 - 0.026	12	0.426	C	1.91	C	IND	Y	***ARES/IND***
	7440-39-3	Barium	62	240	mg/kg	45TP4A	11/11	0.33 - 0.33	240	1,564	N	20,440	N	IND	N	BSL
	7440-41-7	Beryllium	0.55	1.3	mg/kg	45SB14A DUP AVG	11/11	0.061 - 0.061	1.3	15.64	N	204.4	N	IND	N	BSL
	7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	5/11	0.45 - 0.45	6.2	3.911	N	51.1	N	IND	Y	**ARES**
	7440-47-3	Chromium [1]	16	79	mg/kg	45TP4A	11/11	0.8 - 0.8	79	23.46	N	306.6	N	IND	Y	**ARES**
	7440-48-4	Cobalt	3.8	9.1	mg/kg	45TP5A	11/11	0.53 - 0.53	9.1	--	--	--	--	--	Y	NSV
	7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	11/11	0.027 - 1.1	1,100	312.9	N	4,088	N	IND	Y	**ARES**
	7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	11/11	0.98 - 490	47,000	5,475	N	71,540	N	IND	Y	**ARES**
	7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	11/11	0.18 - 3.5	1,100	156.4	N	2,044	N	IND	Y	**ARES**
	7439-97-6	Mercury [3]	0.01345	0.22	mg/kg	45TP2A	11/11	0.0075 - 0.0075	0.22	2.35	--	30.66	--	IND	N	BSL
	7440-02-0	Nickel	6.6	24	mg/kg	45TP2A	11/11	0.035 - 0.035	24	156.4	N	2,044	N	IND	N	BSL
	7782-49-2	Selenium	0.12	0.87	mg/kg	45TP6A	11/11	0.028 - 0.028	0.87	39.11	N	511	N	IND	N	BSL
	7440-22-4	Silver	0.037	0.73	mg/kg	45TP2A	11/11	0.0093 - 0.0093	0.73	39.11	N	511	N	IND	N	BSL
	7440-28-0	Thallium	0.1	0.54	mg/kg	45TP3A	11/11	0.0068 - 0.0068	0.54	0.548	N	7.154	N	IND	N	BSL
	7440-62-2	Vanadium	16	46	mg/kg	45TP4A	11/11	0.032 - 0.032	46	7.821	N	102.2	N	IND	Y	**ARES**
	7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	11/11	0.49 - 0.49	2,500	2,346	N	30,660	N	IND	Y	**ARES**
		Cyanide														
	57-12-5	Cyanide	0.11	0.24	mg/kg	45TP6A	8/11	0.092 - 0.11	2.4E-01	156	N	2,044	N	IND	N	BSL
		Pesticides/PCBs														
	50-29-3	4,4'-DDT	2.1E-02	2.1E-02	mg/kg	45TP1A	1/11	0.0012 - 0.0014	2.1E-02	1.9E+00	C	8.4E+00	C	IND	N	BSL
	33213-65-9	Endosulfan II	3.6E-02	3.6E-02	mg/kg	45TP2A	1/11	0.00098 - 0.0012	3.6E-02	4.7E+01	N	6.1E+02	N	IND	N	BSL
	5103-74-2	gamma-Chlordane	1.4E-03	1.4E-03	mg/kg	45SB8A	1/11	0.00054 - 0.00065	1.4E-03	1.8E+00	C	8.2E+00	C	IND	N	BSL
	11097-69-1	Aroclor 1254 [4]	9.7E-03	7.3E-01	mg/kg	45TP2A	8/11	0.005 - 0.0061	7.3E-01	1.6E-01	N	1.4E+00	C	IND	Y	**ARES**
	11096-82-5	Aroclor 1260	6.3E-01	6.3E-01	mg/kg	45TP2A	1/11	0.018 - 0.022	6.3E-01	3.2E-01	C	1.4E+00	C	IND	Y	**ARES**
		TCL VOCs														
	78-93-3	2-Butanone	1.1E-02	3.2E-01	mg/kg	45TP1A	10/11	0.0028 - 0.0033	3.2E-01	4.7E+03	N	6.1E+04	N	IND	N	BSL
	67-64-1	Acetone	1.5E-01	9.2E-01	mg/kg	45TP1A	11/11	0.0048 - 0.0058	9.2E-01	7.0E+03	N	9.2E+04	N	IND	N	BSL
	71-43-2	Benzene	2.1E-04	5.1E-04	mg/kg	45TP4A	3/11	0.00015 - 0.00018	5.1E-04	1.2E+01	C	5.2E+01	C	IND	N	BSL
	75-15-0	Carbon Disulfide	1.9E-03	4.2E-03	mg/kg	45TP5A	9/11	0.0003 - 0.00036	4.2E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	67-66-3	Chloroform	2.8E-04	3.7E-04	mg/kg	45SB14A DUP AVG	2/11	0.00017 - 0.0002	3.7E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	79-20-9	Methyl Acetate	5.5E-03	1.6E-02	mg/kg	45SB1A	11/11	0.00095 - 0.0011	1.6E-02	7.8E+03	N	1.0E+05	N	IND	N	BSL
	108-88-3	Toluene	2.1E-03	2.1E-03	mg/kg	45SB5A	1/11	0.00046 - 0.00055	2.1E-03	6.3E+02	N	8.2E+03	N	IND	N	BSL
		TCL SVOCs														
	92-52-4	1,1'-Biphenyl	7.7E-04	1.5E-03	mg/kg	45TP7A	8/11	0.00053 - 0.0026	1.5E-03	3.9E+02	N	5.1E+03	N	IND	N	BSL
	91-57-6	2-Methylnaphthalene	7.6E-04	4.1E-03	mg/kg	45TP1A	9/11	0.00055 - 0.0027	4.1E-03	3.1E+01	N	4.1E+02	N	IND	N	BSL
	83-32-9	Acenaphthene	9.2E-04	1.8E-03	mg/kg	45TP2A	3/11	0.00046 - 0.0023	1.8E-03	4.7E+02	N	6.1E+03	N	IND	N	BSL
	208-96-8	Acenaphthylene [5]	8.6E-04	3.1E-03	mg/kg	45TP7A	5/11	0.00069 - 0.0034	3.1E-03	2.3E+02	N	3.1E+03	N	IND	N	BSL
	120-12-7	Anthracene	8.6E-04	5.0E-03	mg/kg	45TP2A	5/11	0.00049 - 0.0024	5.0E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	100-52-7	Benzaldehyde	4.0E-02	4.0E-02	mg/kg	45TP7A	1/11	0.03 - 0.15	4.0E-02	7.8E+02	N	1.0E+04	N	IND	N	BSL
	56-55-3	Benzo(a)anthracene	1.2E-03	4.9E-02	mg/kg	45TP2A	11/11	0.00061 - 0.0031	4.9E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	50-32-8	Benzo(a)pyrene	1.7E-02	4.3E-02	mg/kg	45TP2A	4/11	0.0012 - 0.0059	4.3E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	205-99-2	Benzo(b)fluoranthene	1.6E-02	8.2E-02	mg/kg	45TP2A	8/11	0.00097 - 0.0049	8.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	191-24-2	Benzo(g,h,i)perylene [5]	1.7E-02	3.8E-02	mg/kg	45TP2A	3/11	0.0026 - 0.013	3.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	207-08-9	Benzo(k)fluoranthene	1.3E-03	2.0E-02	mg/kg	45TP2A	10/11	0.00082 - 0.0041	2.0E-02	2.2E+00	C	3.9E+01	C	IND	N	BSL
	117-81-7	Bis(2-ethylhexyl)phthalate	1.3E-03	1.2E-01	mg/kg	45TP1A	8/11	0.0015 - 0.0074	1.2E-01	4.6E+01	C	2.0E+02	C	IND	N	BSL
	85-68-7	Butyl Benzyl Phthalate	3.0E-03	1.8E-02	mg/kg	45TP1A	6/11	0.0024 - 0.012	1.8E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
	218-01-9	Chrysene	7.7E-04	3.0E-02	mg/kg	45TP2A	11/11	0.00054 - 0.0027	3.0E-02	2.2E+01	C	3.9E+02	C	IND	N	BSL
	53-70-3	Dibenz(a,h)anthracene	2.8E-02	2.8E-02	mg/kg	45TP2A	1/11	0.00061 - 0.0031	2.8E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	132-64-9	Dibenzofuran	4.3E-04	2.3E-03	mg/kg	45TP1A	6/11	0.0003 - 0.0015	2.3E-03	7.8E+00	N	1.0E+02	N	IND	N	BSL
	84-66-2	Diethyl Phthalate	8.1E-04	4.2E-03	mg/kg	45TP7A	10/11	0.00043 - 0.0021	4.2E-03	6.3E+03	N	8.2E+04	N	IND	N	BSL
	131-11-3	Dimethyl Phthalate	8.3E-04	8.3E-04	mg/kg	45TP4A	1/11	0.00039 - 0.0019	8.3E-04	--	--	--	--	IND	Y	NSV
	84-74-2	Di-n-butyl Phthalate	1.1E-02	3.4E+00	mg/kg	45SB8A	11/11	0.0014 - 0.0069	3.4E+00	7.8E+02	N	1.0E+04	N	IND	N	BSL
	117-84-0	Di-n-octyl Phthalate	2.7E-02	2.7E-02	mg/kg	45TP1A	1/11	0.011 - 0.056	2.7E-02	--	--	--	--	IND	Y	NSV
	206-44-0	Fluoranthene	5.2E-03	6.0E-02	mg/kg	45TP2A	6/11	0.0043 - 0.022	6.0E-02	3.1E+02	N	4.1E+03	N	IND	N	BSL
	86-73-7	Fluorene	3.9E-04	1.8E-03	mg/kg	45TP1A	5/11	0.00032 - 0.0016	1.8E-03	3.1E+02	N	4.1E+03	N	IND	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.6E-02	4.2E-02	mg/kg	45TP2A	3/11	0.0008 - 0.004	4.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	78-59-1	Isophorone	8.3E-04	4.6E-03	mg/kg	45SB5A	11/11	0.00046 - 0.0023	4.6E-03	6.7E+02	C	3.0E+03	C	IND	N	BSL
	91-20-3	Naphthalene	5.4E-03	1.4E-02	mg/kg	45TP1A	11/11	0.00027 - 0.0013	1.4E-02	1.6E+02	N	2.0E+03	N	IND	N	BSL

Table E.1-2.1
SWMU 45 COPC Determination - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
	86-30-6	N-Nitrosodiphenylamine	1.8E-02	3.7E-01	mg/kg	45SB8A	2/11	0.00092 - 0.0046	3.7E-01	1.3E+02	C	5.8E+02	C	IND	N	BSL
	85-01-8	Phenanthrene [5]	5.0E-03	2.8E-02	mg/kg	45TP2A	4/11	0.0041 - 0.021	2.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	108-95-2	Phenol	1.2E-03	3.8E-03	mg/kg	45TP3A	9/11	0.0008 - 0.004	3.8E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	129-00-0	Pyrene	7.7E-04	5.2E-02	mg/kg	45TP2A	11/11	0.00036 - 0.0018	5.2E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
		Nitroglycerin/PETN														
	55-63-0	Nitroglycerin	3.8E+00	3.8E+00	mg/kg	45TP2A	1/11	0.39 - 0.39	3.8E+00	7.8E-01	N	1.0E+01	N	IND	Y	**ARES**

Notes:

COPC = Chemical of Potential Concern
mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
PETN = Pentaerythritol Tetranitrate
RBC = USEPA Region III Risk-Based Concentration
(RBC) values from the October 11, 2007,
RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
(N/C) = Noncarcinogenic/Carcinogenic per EPA RBC Table (October 2007)
-- = No Value Available
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance
[3] = Mercuric chloride soil RBC value used
[4] = Noncarcinogenic Residential RBC value for Aroclor 1254 was used for screening
[5] = Pyrene RBCs used

ARAR = Applicable, Relevant, and Appropriate Requirement
TBC = To-Be-Considered
IND = Adjusted Industrial RBC
AL = USEPA Action Level
RDA = Recommended Daily Allowance

ARES = Above Residential RBC
ARES/IND = Above Residential RBC/Industrial RBC
BSL = Below Residential/Industrial RBC Screening Levels
NSV = No Screening Value Available

Table E.1-2.2
SWMU 45 COPC Determination - Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Total Soil

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
Total Soil		**TAL Metals**														
	7429-90-5	Aluminum	9,100	19,000	mg/kg	45SB14B	22/22	2 - 200	19,000	7,821	N	102,200	N	IND	Y	**ARES**
	7440-36-0	Antimony	0.046	33	mg/kg	45TP4B	16/22	0.026 - 0.026	33	3.13	N	40.88	N	IND	Y	**ARES**
	7440-38-2	Arsenic	0.57	12	mg/kg	45TP3A	22/22	0.026 - 0.026	12	0.426	C	1.91	C	IND	Y	***ARES/IND***
	7440-39-3	Barium	62	300	mg/kg	45TP4B	22/22	0.33 - 1.7	300	1,564	N	20,440	N	IND	N	BSL
	7440-41-7	Beryllium	0.55	1.6	mg/kg	45TP4B	22/22	0.061 - 0.061	1.6	15.6	N	204.4	N	IND	N	BSL
	7440-43-9	Cadmium	0.49	6.2	mg/kg	45TP2A	8/22	0.45 - 0.45	6.2	3.911	N	51.1	N	IND	Y	**ARES**
	7440-47-3	Chromium [1]	16	170	mg/kg	45TP4B	22/22	0.8 - 0.8	170	23.46	N	306.6	N	IND	Y	**ARES**
	7440-48-4	Cobalt	3.8	11	mg/kg	45SB14B	22/22	0.53 - 0.53	11	--	--	--	--	--	Y	NSV
	7440-50-8	Copper	6.3	1,100	mg/kg	45TP2A	22/22	0.027 - 1.1	1,100	312.9	N	4,088	N	IND	Y	**ARES**
	7439-89-6	Iron	14,000	47,000	mg/kg	45TP4A	22/22	0.98 - 980	47,000	5,475	N	71,540	N	IND	Y	**ARES**
	7439-96-5	Manganese	250	1,100	mg/kg	45TP4A	22/22	0.18 - 3.5	1,100	156.4	N	2,044	N	IND	Y	**ARES**
	7439-97-6	Mercury [3]	0.0087	0.22	mg/kg	45TP2A	21/22	0.0075 - 0.0075	0.22	2.35	--	30.66	--	IND	N	BSL
	7440-02-0	Nickel	6.6	34	mg/kg	45TP4B	22/22	0.035 - 0.035	34	156.4	N	2,044	N	IND	N	BSL
	7782-49-2	Selenium	0.036	0.87	mg/kg	45TP6A	18/22	0.028 - 0.028	0.87	39.11	N	511	N	IND	N	BSL
	7440-22-4	Silver	0.024	0.73	mg/kg	45TP2A	22/22	0.0093 - 0.0093	0.73	39.11	N	511	N	IND	N	BSL
	7440-28-0	Thallium	0.1	0.54	mg/kg	45TP3A	22/22	0.0068 - 0.0068	0.54	0.548	N	7.154	N	IND	N	BSL
	7440-62-2	Vanadium	15	46	mg/kg	45TP4A	22/22	0.032 - 0.063	46	7.821	N	102.2	N	IND	Y	**ARES**
	7440-66-6	Zinc	36	2,500	mg/kg	45TP2A	22/22	0.49 - 9.7	2,500	2,346.429	N	30,660	N	IND	Y	**ARES**
		Cyanide														
	57-12-5	Cyanide	0.11	0.24	mg/kg	45TP6A	10/22	0.088 - 0.11	2.4E-01	156.429	N	2,044	N	IND	N	BSL
		Pesticides/PCBs														
	50-29-3	4,4'-DDT	4.2E-03	2.1E-02	mg/kg	45TP1A	2/22	0.0011 - 0.0014	2.1E-02	1.9E+00	C	8.4E+00	C	IND	N	BSL
	33213-65-9	Endosulfan II	3.6E-02	3.6E-02	mg/kg	45TP2A	1/22	0.00093 - 0.0012	3.6E-02	4.7E+01	N	6.1E+02	N	IND	N	BSL
	5103-74-2	gamma-Chlordane	1.4E-03	1.4E-03	mg/kg	45SB8A	1/22	0.00051 - 0.00065	1.4E-03	1.8E+00	C	8.2E+00	C	IND	N	BSL
	11097-69-1	Aroclor 1254 [4]	9.7E-03	1.2E+00	mg/kg	45TP4B	12/22	0.0048 - 0.011	1.2E+00	1.6E-01	N	1.4E+00	C	IND	Y	**ARES**
	11096-82-5	Aroclor 1260	6.3E-01	6.3E-01	mg/kg	45TP2A	1/22	0.017 - 0.041	6.3E-01	3.2E-01	C	1.4E+00	C	IND	Y	**ARES**
		TCL VOCs														
	120-82-1	1,2,4-Trichlorobenzene	4.8E-04	4.8E-04	mg/kg	45TP6B	1/22	0.00026 - 0.00033	4.8E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	78-93-3	2-Butanone	6.8E-03	3.2E-01	mg/kg	45TP1A	16/22	0.0026 - 0.0033	3.2E-01	4.7E+03	N	6.1E+04	N	IND	N	BSL
	67-64-1	Acetone	3.8E-02	9.2E-01	mg/kg	45TP1A	22/22	0.0046 - 0.0058	9.2E-01	7.0E+03	N	9.2E+04	N	IND	N	BSL
	71-43-2	Benzene	1.8E-04	5.1E-04	mg/kg	45TP4A	6/22	0.00014 - 0.00018	5.1E-04	1.2E+01	C	5.2E+01	C	IND	N	BSL
	74-83-9	Bromomethane	1.8E-03	1.8E-03	mg/kg	45TP4B	1/22	0.0013 - 0.0017	1.8E-03	1.1E+01	N	1.4E+02	N	IND	N	BSL
	75-15-0	Carbon Disulfide	1.9E-03	9.8E-03	mg/kg	45TP6B	19/22	0.00029 - 0.00036	9.8E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	108-90-7	Chlorobenzene	5.1E-04	5.1E-04	mg/kg	45TP6B	1/22	0.00022 - 0.00028	5.1E-04	1.6E+02	N	2.0E+03	N	IND	N	BSL
	67-66-3	Chloroform	2.8E-04	4.2E-04	mg/kg	45SB14B	5/22	0.00016 - 0.0002	4.2E-04	7.8E+01	N	1.0E+03	N	IND	N	BSL
	98-82-8	Isopropylbenzene	4.6E-03	4.6E-03	mg/kg	45TP6B	1/22	0.00013 - 0.00017	4.6E-03	7.8E+02	N	1.0E+04	N	IND	N	BSL
	79-20-9	Methyl Acetate	1.6E-03	1.6E-02	mg/kg	45SB1A	17/22	0.00091 - 0.0011	1.6E-02	7.8E+03	N	1.0E+05	N	IND	N	BSL
	75-09-2	Methylene Chloride	4.5E-03	5.4E-03	mg/kg	45TP6B	2/22	0.0043 - 0.0054	5.4E-03	8.5E+01	C	3.8E+02	C	IND	N	BSL
	108-88-3	Toluene	2.1E-03	2.1E-03	mg/kg	45SB5A	1/22	0.00044 - 0.00055	2.1E-03	6.3E+02	N	8.2E+03	N	IND	N	BSL
	1330-20-7	Xylenes	1.3E-02	1.3E-02	mg/kg	45TP6B	1/22	0.00064 - 0.00081	1.3E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
		TCL SVOCs														
	92-52-4	1,1'-Biphenyl	5.5E-04	3.3E-03	mg/kg	45TP6B	11/22	0.0005 - 0.0026	3.3E-03	3.9E+02	N	5.1E+03	N	IND	N	BSL
	91-57-6	2-Methylnaphthalene	7.6E-04	2.8E-02	mg/kg	45TP6B	12/22	0.00052 - 0.0027	2.8E-02	3.1E+01	N	4.1E+02	N	IND	N	BSL
	83-32-9	Acenaphthene	5.3E-04	1.8E-03	mg/kg	45TP2A	6/22	0.00043 - 0.0023	1.8E-03	4.7E+02	N	6.1E+03	N	IND	N	BSL
	208-96-8	Acenaphthylene [5]	8.6E-04	3.1E-03	mg/kg	45TP7A	6/22	0.00065 - 0.0034	3.1E-03	2.3E+02	N	3.1E+03	N	IND	N	BSL
	120-12-7	Anthracene	5.4E-04	5.0E-03	mg/kg	45TP2A	8/22	0.00046 - 0.0024	5.0E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	100-52-7	Benzaldehyde	4.0E-02	8.1E-02	mg/kg	45TP6B	3/22	0.028 - 0.15	8.1E-02	7.8E+02	N	1.0E+04	N	IND	N	BSL
	56-55-3	Benzo(a)anthracene	1.1E-03	4.9E-02	mg/kg	45TP2A	16/22	0.00058 - 0.0031	4.9E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	50-32-8	Benzo(a)pyrene	1.1E-02	4.3E-02	mg/kg	45TP2A	6/22	0.0011 - 0.0059	4.3E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	205-99-2	Benzo(b)fluoranthene	1.1E-02	8.2E-02	mg/kg	45TP2A	10/22	0.00092 - 0.0049	8.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	191-24-2	Benzo(g,h,i)perylene [5]	1.7E-02	3.8E-02	mg/kg	45TP2A	4/22	0.0025 - 0.013	3.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	207-08-9	Benzo(k)fluoranthene	1.3E-03	2.0E-02	mg/kg	45TP2A	11/22	0.00078 - 0.0041	2.0E-02	2.2E+00	C	3.9E+01	C	IND	N	BSL
	117-81-7	Bis(2-ethylhexyl)phthalate	1.3E-03	1.2E-01	mg/kg	45TP1A	12/22	0.0014 - 0.0074	1.2E-01	4.6E+01	C	2.0E+02	C	IND	N	BSL
	85-68-7	Butyl Benzyl Phthalate	2.9E-03	1.8E-02	mg/kg	45TP1A	10/22	0.0023 - 0.012	1.8E-02	1.6E+03	N	2.0E+04	N	IND	N	BSL
	218-01-9	Chrysene	7.6E-04	3.0E-02	mg/kg	45TP2A	15/22	0.00052 - 0.0027	3.0E-02	2.2E+01	C	3.9E+02	C	IND	N	BSL
	53-70-3	Dibenz(a,h)anthracene	2.8E-02	2.8E-02	mg/kg	45TP2A	1/22	0.00058 - 0.0031	2.8E-02	2.2E-02	C	3.9E-01	C	IND	Y	**ARES**
	132-64-9	Dibenzofuran	4.3E-04	2.3E-03	mg/kg	45TP1A	7/22	0.00029 - 0.0015	2.3E-03	7.8E+00	N	1.0E+02	N	IND	N	BSL
	84-66-2	Diethyl Phthalate	7.2E-04	7.8E-03	mg/kg	45TP6B	20/22	0.0004 - 0.0021	7.8E-03	6.3E+03	N	8.2E+04	N	IND	N	BSL
	131-11-3	Dimethyl Phthalate	8.3E-04	8.3E-04	mg/kg	45TP4A	1/22	0.00037 - 0.0019	8.3E-04	--	--	--	--	--	Y	NSV
	84-74-2	Di-n-butyl Phthalate	6.7E-03	3.4E+00	mg/kg	45SB8A	22/22	0.0013 - 0.0069	3.4E+00	7.8E+02	N	1.0E+04	N	IND	N	BSL
	117-84-0	Di-n-octyl Phthalate	2.7E-02	3.3E-02	mg/kg	45TP6B	3/22	0.011 - 0.056	3.3E-02	--	--	--	--	--	Y	NSV
	206-44-0	Fluoranthene	5.2E-03	6.0E-02	mg/kg	45TP2A	7/22	0.0041 - 0.022	6.0E-02	3.1E+02	N	4.1E+03	N	IND	N	BSL

Table E.1-2.2
SWMU 45 COPC Determination - Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Total Soil

Exposure point	CAS #	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening Toxicity Value (N/C)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
	86-73-7	Fluorene	2.9E-04	3.7E-03	mg/kg	45TP6B	7/22	0.0003 - 0.0016	3.7E-03	3.1E+02	N	4.1E+03	N	IND	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.6E-02	4.2E-02	mg/kg	45TP2A	4/22	0.00076 - 0.004	4.2E-02	2.2E-01	C	3.9E+00	C	IND	N	BSL
	78-59-1	Isophorone	7.3E-04	7.4E-03	mg/kg	45TP6B	20/22	0.00044 - 0.0023	7.4E-03	6.7E+02	C	3.0E+03	C	IND	N	BSL
	91-20-3	Naphthalene	5.1E-03	4.7E-02	mg/kg	45TP6B	22/22	0.00025 - 0.0013	4.7E-02	1.6E+02	N	2.0E+03	N	IND	N	BSL
	86-30-6	N-Nitrosodiphenylamine	7.7E-03	3.7E-01	mg/kg	45SB8A	5/22	0.00087 - 0.0046	3.7E-01	1.3E+02	C	5.8E+02	C	IND	N	BSL
	85-01-8	Phenanthrene [5]	5.0E-03	2.8E-02	mg/kg	45TP2A	5/22	0.0039 - 0.021	2.8E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
	108-95-2	Phenol	1.1E-03	3.8E-03	mg/kg	45TP3A	16/22	0.00076 - 0.004	3.8E-03	2.3E+03	N	3.1E+04	N	IND	N	BSL
	129-00-0	Pyrene	3.8E-04	5.2E-02	mg/kg	45TP2A	16/22	0.00034 - 0.0018	5.2E-02	2.3E+02	N	3.1E+03	N	IND	N	BSL
		Nitroglycerin/PETN														
	55-63-0	Nitroglycerin	3.8E+00	3.8E+00	mg/kg	45TP2A	1/22	0.39 - 0.39	3.8E+00	7.8E-01	N	1.0E+01	N	IND	Y	**ARES**

Notes:

COPC = Chemical of Potential Concern
mg/kg = Milligram Per Kilogram
CAS = Chemical Abstracts Service
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
PETN = Pentaerythritol Tetranitrate
RBC = USEPA Region III Risk-Based Concentration
(RBC) values from the October 11, 2007,
RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
(N/C) = Noncarcinogenic/Carcinogenic per EPA RBC Table (October 2007)
-- = No Value Available
[1] = Chromium VI RBC value was used
[2] = Lead criteria are Action Levels; see USEPA Region III guidance
[3] = Mercuric chloride soil RBC value used
[4] = Noncarcinogenic Residential RBC value for Aroclor 1254 was used for screening
[5] = Pyrene RBCs used

ARAR = Applicable, Relevant, and Appropriate Requirement
TBC = To-Be-Considered
IND = Adjusted Industrial RBC
AL = USEPA Action Level
RDA = Recommended Daily Allowance

ARES = Above Residential RBC
ARES/IND = Above Residential RBC/Industrial RBC
BSL = Below Residential/Industrial RBC Screening Levels
NSV = No Screening Value Available

Table E.1-2.3
Non-detected Chemicals MDL Screening - Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted R-RBC	Maximum MDL Above SL
TAL Metals								
Antimony	7440-36-0	mg/kg	6	22	0.026	0.026	3.13	N
Cadmium	7440-43-9	mg/kg	14	22	0.45	0.45	3.91	N
Mercury [1]	7439-97-6	mg/kg	1	22	0.0075	0.0075	2.35	N
Selenium	7782-49-2	mg/kg	4	22	0.028	0.028	39.11	N
Sodium	7440-23-5	mg/kg	2	22	18	18	--	NS
Cyanide								
Cyanide	57-12-5	mg/kg	12	22	0.088	0.097	156.43	N
Pesticides/PCBs								
4,4'-DDD	72-54-8	ug/kg	22	22	1.2	1.5	2.7E+03	N
4,4'-DDE	72-55-9	ug/kg	22	22	0.98	1.2	1.9E+03	N
4,4'-DDT	50-29-3	ug/kg	20	22	1.1	1.4	1.9E+03	N
Aldrin	309-00-2	ug/kg	22	22	0.59	0.75	3.8E+01	N
alpha-BHC	319-84-6	ug/kg	22	22	0.38	0.48	1.0E+02	N
alpha-Chlordane [2]	5103-71-9	ug/kg	22	22	0.74	0.94	1.8E+03	N
beta-BHC	319-85-7	ug/kg	22	22	0.73	0.93	3.5E+02	N
delta-BHC [3]	319-86-8	ug/kg	22	22	1	1.3	1.0E+02	N
Dieldrin	60-57-1	ug/kg	22	22	0.5	0.64	4.0E+01	N
Endosulfan I [4]	959-98-8	ug/kg	22	22	0.97	1.2	4.7E+04	N
Endosulfan II [4]	33213-65-9	ug/kg	21	22	0.93	1.2	4.7E+04	N
Endosulfan Sulfate [4]	1031-07-8	ug/kg	22	22	1.1	1.4	4.7E+04	N
Endrin	72-20-8	ug/kg	22	22	0.58	0.74	2.3E+03	N
Endrin Aldehyde [5]	7421-93-4	ug/kg	22	22	1.1	1.4	2.3E+03	N
Endrin Ketone [5]	53494-70-5	ug/kg	22	22	1.1	1.4	2.3E+03	N
gamma-BHC (Lindane)	58-89-9	ug/kg	22	22	0.7	0.89	4.9E+02	N
gamma-Chlordane [2]	5103-74-2	ug/kg	21	22	0.51	0.65	1.8E+03	N
Heptachlor	76-44-8	ug/kg	22	22	1.3	1.7	1.4E+02	N
Heptachlor Epoxide	1024-57-3	ug/kg	22	22	0.45	0.57	7.0E+01	N
Methoxychlor	72-43-5	ug/kg	22	22	1.4	1.8	3.9E+04	N
Toxaphene	8001-35-2	ug/kg	22	22	24	31	5.8E+02	N
Aroclor 1016	12674-11-2	ug/kg	22	22	4.6	11	5.5E+02	N
Aroclor 1221	11104-28-2	ug/kg	22	22	8	19	3.2E+02	N
Aroclor 1232	11141-16-5	ug/kg	22	22	9.1	22	3.2E+02	N
Aroclor 1242	53469-21-9	ug/kg	22	22	18	42	3.2E+02	N
Aroclor 1248	12672-29-6	ug/kg	22	22	5.8	14	3.2E+02	N
Aroclor 1254 [6]	11097-69-1	ug/kg	10	22	4.8	5.4	1.6E+02	N
Aroclor 1260	11096-82-5	ug/kg	21	22	17	41	3.2E+02	N
Aroclor 1262	37324-23-5	ug/kg	22	22	5.7	13	--	NS
Aroclor 1268	11100-14-4	ug/kg	22	22	4.8	11	--	NS
TCL VOCs								
1,1,1-Trichloroethane	71-55-6	ug/kg	22	22	0.22	0.28	1.6E+07	N
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	22	22	0.22	0.28	3.2E+03	N
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/kg	22	22	0.36	0.46	2.3E+08	N
1,1,2-Trichloroethane	79-00-5	ug/kg	22	22	0.75	0.95	1.1E+04	N
1,1-Dichloroethane	75-34-3	ug/kg	22	22	0.21	0.27	1.6E+06	N
1,1-Dichloroethene	75-35-4	ug/kg	22	22	0.4	0.51	3.9E+05	N
1,2,3-Trichlorobenzene	87-61-6	ug/kg	22	22	0.22	0.28	--	NS
1,2,4-Trichlorobenzene	120-82-1	ug/kg	21	22	0.26	0.33	7.8E+04	N
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	22	22	0.89	1.1	2.0E+02	N
1,2-Dibromoethane	106-93-4	ug/kg	22	22	0.92	1.2	3.2E+02	N
1,2-Dichlorobenzene	95-50-1	ug/kg	22	22	0.27	0.34	7.0E+05	N
1,2-Dichloroethane	107-06-2	ug/kg	22	22	0.32	0.41	7.0E+03	N
1,2-Dichloropropane	78-87-5	ug/kg	22	22	1	1.3	9.4E+03	N
1,3-Dichlorobenzene	541-73-1	ug/kg	22	22	0.26	0.33	2.3E+04	N
1,4-Dichlorobenzene	106-46-7	ug/kg	22	22	0.24	0.3	2.7E+04	N
2-Butanone	78-93-3	ug/kg	6	22	2.6	3	4.7E+06	N
2-Hexanone	591-78-6	ug/kg	22	22	3.3	4.1	--	NS
4-Methyl-2-pentanone	108-10-1	ug/kg	22	22	2	2.6	--	NS
Benzene	71-43-2	ug/kg	16	22	0.14	0.17	1.2E+04	N
Bromochloromethane	74-97-5	ug/kg	22	22	0.14	0.18	--	NS
Bromodichloromethane	75-27-4	ug/kg	22	22	0.27	0.34	1.0E+04	N
Bromoform	75-25-2	ug/kg	22	22	0.53	0.67	8.1E+04	N
Bromomethane	74-83-9	ug/kg	21	22	1.3	1.7	1.1E+04	N
Carbon Disulfide	75-15-0	ug/kg	3	22	0.3	0.32	7.8E+05	N
Carbon Tetrachloride	56-23-5	ug/kg	22	22	0.31	0.4	4.9E+03	N
Chlorobenzene	108-90-7	ug/kg	21	22	0.22	0.28	1.6E+05	N
Chloroethane	75-00-3	ug/kg	22	22	0.38	0.48	2.2E+05	N
Chloroform	67-66-3	ug/kg	17	22	0.16	0.2	7.8E+04	N
Chloromethane	74-87-3	ug/kg	22	22	0.26	0.34	--	NS
cis-1,2-Dichloroethene	156-59-2	ug/kg	22	22	0.18	0.22	7.8E+04	N
cis-1,3-Dichloropropene [7]	10061-01-5	ug/kg	22	22	0.28	0.35	6.4E+03	N
Cyclohexane	110-82-7	ug/kg	22	22	0.75	0.95	--	NS
Dibromochloromethane	124-48-1	ug/kg	22	22	0.38	0.48	7.6E+03	N

Table E.1-2.3
Non-detected Chemicals MDL Screening - Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted R-RBC	Maximum MDL Above SL
Dichlorodifluoromethane	75-71-8	ug/kg	22	22	0.36	0.46	1.6E+06	N
Ethylbenzene	100-41-4	ug/kg	22	22	0.14	0.17	7.8E+05	N
Isopropylbenzene	98-82-8	ug/kg	21	22	0.13	0.17	7.8E+05	N
Methyl Acetate	79-20-9	ug/kg	5	22	0.91	1	7.8E+06	N
Methyl tert-Butyl Ether	1634-04-4	ug/kg	22	22	0.25	0.32	1.6E+05	N
Methylcyclohexane	108-87-2	ug/kg	22	22	0.87	1.1	--	NS
Methylene Chloride	75-09-2	ug/kg	20	22	4.3	5.4	8.5E+04	N
Styrene	100-42-5	ug/kg	22	22	0.24	0.3	1.6E+06	N
Tetrachloroethene	127-18-4	ug/kg	22	22	0.48	0.61	1.2E+03	N
Toluene	108-88-3	ug/kg	21	22	0.44	0.55	6.3E+05	N
trans-1,2-Dichloroethene	156-60-5	ug/kg	22	22	0.25	0.31	1.6E+05	N
trans-1,3-Dichloropropene[7]	10061-02-6	ug/kg	22	22	0.91	1.2	6.4E+03	N
Trichloroethene	79-01-6	ug/kg	22	22	0.61	0.77	1.6E+03	N
Trichlorofluoromethane	75-69-4	ug/kg	22	22	0.23	0.3	2.3E+06	N
Vinyl Chloride	75-01-4	ug/kg	22	22	0.5	0.63	9.0E+01	N
Xylenes	1330-20-7	ug/kg	21	22	0.64	0.81	1.6E+06	N
TCL SVOCs								
1,1'-Biphenyl	92-52-4	ug/kg	11	22	0.5	2.6	3.9E+05	N
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	22	22	0.87	4.6	2.3E+03	N
2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	22	22	18	93	2.3E+05	N
2,4,5-Trichlorophenol	95-95-4	ug/kg	22	22	6.5	34	7.8E+05	N
2,4,6-Trichlorophenol[8]	88-06-2	ug/kg	22	22	5	26	7.8E+03	N
2,4-Dichlorophenol	120-83-2	ug/kg	22	22	7.2	38	2.3E+04	N
2,4-Dimethylphenol	105-67-9	ug/kg	22	22	6.2	33	1.6E+05	N
2,4-Dinitrophenol	51-28-5	ug/kg	22	22	36	190	1.6E+04	N
2,4-Dinitrotoluene	121-14-2	ug/kg	19	22	0.1	18	1.6E+04	N
2,6-Dinitrotoluene	606-20-2	ug/kg	20	22	0.2	2.2	7.8E+03	N
2-Chloronaphthalene	91-58-7	ug/kg	22	22	0.47	2.5	6.3E+05	N
2-Chlorophenol	95-57-8	ug/kg	22	22	0.42	2.2	3.9E+04	N
2-Methylnaphthalene	91-57-6	ug/kg	10	22	0.52	2.7	3.1E+04	N
2-Methylphenol	95-48-7	ug/kg	22	22	8.8	46	3.9E+05	N
2-Nitroaniline	88-74-4	ug/kg	22	22	14	75	--	NS
2-Nitrophenol	88-75-5	ug/kg	22	22	13	70	--	NS
3,3'-Dichlorobenzidine	91-94-1	ug/kg	22	22	85	450	1.4E+03	N
3-Nitroaniline	99-09-2	ug/kg	22	22	12	63	--	NS
4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	22	22	40	210	--	NS
4-Bromophenyl-PhenylEther	101-55-3	ug/kg	22	22	1.4	7.1	--	NS
4-Chloro-3-methylphenol[9]	59-50-7	ug/kg	22	22	1.9	10	3.9E+05	N
4-Chloroaniline	106-47-8	ug/kg	22	22	21	110	3.1E+04	N
4-Chlorophenyl-PhenylEther	7005-72-3	ug/kg	22	22	0.49	2.6	--	NS
4-Methylphenol	106-44-5	ug/kg	22	22	9.9	52	3.9E+04	N
4-Nitroaniline	100-01-6	ug/kg	22	22	25	130	--	NS
4-Nitrophenol	100-02-7	ug/kg	22	22	12	64	--	NS
Acenaphthene	83-32-9	ug/kg	16	22	0.43	2.3	4.7E+05	N
Acenaphthylene[10]	208-96-8	ug/kg	16	22	0.65	3.4	2.3E+05	N
Acetophenone	98-86-2	ug/kg	22	22	7.3	38	7.8E+05	N
Anthracene	120-12-7	ug/kg	14	22	0.46	2.4	2.3E+06	N
Atrazine	1912-24-9	ug/kg	22	22	1.6	8.5	--	NS
Benzaldehyde	100-52-7	ug/kg	19	22	28	150	--	NS
Benzo(a)anthracene	56-55-3	ug/kg	6	22	0.58	1.2	--	NS
Benzo(a)pyrene	50-32-8	ug/kg	16	22	1.1	5.9	--	NS
Benzo(b)fluoranthene	205-99-2	ug/kg	12	22	0.92	4.9	--	NS
Benzo(g,h,i)perylene[10]	191-24-2	ug/kg	18	22	2.5	13	--	NS
Benzo(k)fluoranthene	207-08-9	ug/kg	11	22	0.78	1.7	2.2E+03	N
Bis(2-chloroethoxy)methane	111-91-1	ug/kg	22	22	0.87	4.6	--	NS
Bis(2-chloroethyl)ether	111-44-4	ug/kg	22	22	0.98	5.1	5.8E+02	N
Bis(2-chloroisopropyl)ether	39638-32-9	ug/kg	22	22	0.34	1.8	--	NS
Bis(2-ethylhexyl)phthalate	117-81-7	ug/kg	10	22	1.4	7.4	4.6E+04	N
Butylbenzylphthalate	85-68-7	ug/kg	12	22	2.3	12	1.6E+06	N
Caprolactam	105-60-2	ug/kg	22	22	25	130	3.9E+06	N
Carbazole	86-74-8	ug/kg	22	22	0.54	2.8	3.2E+04	N
Chrysene	218-01-9	ug/kg	7	22	0.52	1.1	2.2E+04	N
Di-n-octylphthalate	117-84-0	ug/kg	19	22	11	56	--	NS
Dibenz(a,h)anthracene	53-70-3	ug/kg	21	22	0.58	3.1	2.2E+01	N
Dibenzofuran	132-64-9	ug/kg	15	22	0.29	1.5	7.8E+03	N
Diethylphthalate	84-66-2	ug/kg	2	22	0.86	2.1	6.3E+06	N
Dimethylphthalate	131-11-3	ug/kg	21	22	0.37	1.9	--	NS
Fluoranthene	206-44-0	ug/kg	15	22	4.1	22	3.1E+05	N
Fluorene	86-73-7	ug/kg	15	22	0.3	1.6	3.1E+05	N
Hexachlorobenzene	118-74-1	ug/kg	22	22	0.87	4.6	4.0E+02	N
Hexachlorobutadiene[11]	87-68-3	ug/kg	22	22	0.75	3.9	7.8E+03	N
Hexachlorocyclopentadiene	77-47-4	ug/kg	22	22	4.3	22	4.7E+04	N
Hexachloroethane[12]	67-72-1	ug/kg	22	22	0.87	4.6	7.8E+03	N
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	18	22	0.76	4	2.2E+02	N

Table E.1-2.3
Non-detected Chemicals MDL Screening - Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted R-RBC	Maximum MDL Above SL
Isophorone	78-59-1	ug/kg	2	22	0.45	0.93	6.7E+05	N
N-Nitrosodi-n-propylamine	621-64-7	ug/kg	22	22	0.78	4.1	9.1E+01	N
N-Nitrosodiphenylamine	86-30-6	ug/kg	17	22	0.87	1.1	1.3E+05	N
Nitrobenzene	98-95-3	ug/kg	22	22	1.6	8.5	3.9E+03	N
Pentachlorophenol	87-86-5	ug/kg	22	22	4	21	5.3E+03	N
Phenanthrene[10]	85-01-8	ug/kg	17	22	3.9	21	2.3E+05	N
Phenol	108-95-2	ug/kg	6	22	0.76	4	2.3E+06	N
Pyrene	129-00-0	ug/kg	6	22	0.34	0.74	2.3E+05	N
Explosives								
1,3,5-Trinitrobenzene	99-35-4	mg/kg	22	22	0.074	0.074	2.3E+02	N
1,3-Dinitrobenzene	99-65-0	mg/kg	22	22	0.076	0.076	7.8E-01	N
2,4,6-Trinitrotoluene[13]	118-96-7	mg/kg	22	22	0.15	0.15	3.9E+00	N
2,4-Dinitrotoluene	121-14-2	mg/kg	22	22	0.1	17	1.6E+01	**Y**
2,6-Dinitrotoluene	606-20-2	mg/kg	22	22	0.2	2.1	7.8E+00	N
2-Amino-4,6-dinitrotoluene	35572-78-2	mg/kg	22	22	0.22	0.22	1.6E+01	N
2-Nitrotoluene	88-72-2	mg/kg	22	22	0.17	0.17	7.8E+01	N
3-Nitrotoluene	99-08-1	mg/kg	22	22	0.21	0.21	--	NS
4-Amino-2,6-dinitrotoluene	1946-51-0	mg/kg	22	22	0.3	0.3	1.6E+01	N
4-Nitrotoluene[14]	99-99-0	mg/kg	22	22	0.2	0.2	3.1E+01	N
HMX	2691-41-0	mg/kg	22	22	0.066	0.066	3.9E+02	N
Nitrobenzene	98-95-3	mg/kg	22	22	0.03	0.03	3.9E+00	N
RDX	121-82-4	mg/kg	22	22	0.048	0.048	5.8E+00	N
Tetryl	479-45-8	mg/kg	22	22	0.065	0.065	3.1E+01	N
Nitroglycerin/PETN								
Nitroglycerin	55-63-0	mg/kg	21	22	0.39	0.39	0.782	N
PETN	78-11-5	mg/kg	22	22	0.23	0.23	--	NS

Notes:

CAS = Chemical Abstracts Service
mg/kg = Milligram Per Kilogram
ug/kg = Microgram Per Kilogram
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
SVOC = Semi-volatile Organic Compound
PAH = Polynuclear Aromatic Hydrocarbon
PETN = Pentaerythritol Tetranitrate
MDL = Method Detection Limit
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
R-RBC = Residential RBC
SL = Screening Level
-- = No Screening Value Available

Y = MDL exceeds screening level
N = MDL does not exceed screening level
NS = No screening level available

[1] = Mercuric chloride soil RBC value used
[2] = Chlordane RBC value was used
[3] = Alpha-BHC RBC value was used
[4] = Endosulfan RBC value was used
[5] = Endrin RBC value was used
[6] = Noncarcinogenic RBC value for Aroclor 1254 was used
[7] = 1,3-Dichloropropene RBC value was used
[8] = Noncarcinogenic RBC value for 2,4,6-Trichlorophenol was used
[9] = 3-Methylphenol RBC value was used
[10] = Pyrene RBC value was used
[11] = Noncarcinogenic RBC value for Hexachlorobutadiene was used
[12] = Noncarcinogenic RBC value for Hexachloroethane was used
[13] = Noncarcinogenic RBC value for 2,4,6-Trinitrotoluene was used
[14] = Noncarcinogenic RBC value for 4-Nitrotoluene was used

Table E.1-2.4
Groundwater COPC Selection
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	C/N	Adjusted Tap Water RBC	MCL	COPC Flag (Y/N)	Rationale for Selection or Deletion
Perchlorate													
Perchlorate	14797-73-0	0.645	4.7	ug/L	45MW1	4/4	0.015 - 0.015	4.7	N	2.555	--	Y	**ARBC**
TAL Metals													
Aluminum, Total	7429-90-5	210	2,400	ug/L	45MW4	4/4	20 - 20	2,400	N	3,650	--	N	BSL
Antimony, Dissolved	7440-36-0	0.43	1.1	ug/L	45MW3	2/4	0.32 - 0.32	1.1	N	1.46	--	N	BSL
Antimony, Total	7429-90-5	0.6	0.6	ug/L	45MW1	1/4	0.32 - 0.32	0.6	N	3,650	--	N	BSL
Arsenic, Total	7440-38-2	0.56	0.56	ug/L	45MW4	1/4	0.24 - 0.24	0.56	C	0.0446	10	Y	**ARBC**
Barium, Dissolved	7440-39-3	42	66	ug/L	45MW1	4/4	0.23 - 0.23	66	N	730	2,000	N	BSL
Barium, Total	7440-39-3	46	80	ug/L	45MW4	4/4	0.23 - 0.23	80	N	730	2,000	N	BSL
Cadmium, Total	7440-43-9	0.046	0.11	ug/L	45MW4	3/4	0.056 - 0.056	0.11	N	1.825	5	N	BSL
Chromium, Dissolved [1]	7440-47-3	1.6	3.8	ug/L	45MW1	4/4	0.33 - 0.33	3.8	C	10.95	100	N	BSL
Chromium, Total [1]	7440-47-3	4.2	11	ug/L	45MW4	4/4	0.33 - 0.33	11	C	10.95	100	Y	**ARBC**
Cobalt, Dissolved	7440-48-4	0.43	1.9	ug/L	45MW3	4/4	0.05 - 0.05	1.9	--	--	--	Y	NSV
Cobalt, Total	7440-48-4	2.9	7.3	ug/L	45MW2 DUP AVG	4/4	0.05 - 0.05	7.3	--	--	--	Y	NSV
Copper, Dissolved	7440-50-8	0.31	0.79	ug/L	45MW1	3/4	0.29 - 0.29	0.79	N	146	1,300	N	BSL
Copper, Total	7440-50-8	0.86	4.8	ug/L	45MW1	4/4	0.29 - 0.29	4.8	N	146	1,300	N	BSL
Iron, Dissolved	7439-89-6	7.4	26	ug/L	45MW4	2/4	9.6 - 9.6	26	N	2,555	--	N	BSL
Iron, Total	7439-89-6	480	4,100	ug/L	45MW4	4/4	9.6 - 9.6	4,100	N	2,555	--	Y	**ARBC**
Lead, Dissolved [2]	7439-92-1	0.36	0.36	ug/L	45MW1	1/4	0.29 - 0.29	0.36	--	15	--	N	BSL
Lead, Total [2]	7439-92-1	0.985	7.9	ug/L	45MW1	3/4	0.29 - 0.29	7.9	--	15	--	N	BSL
Manganese, Dissolved	7439-96-5	1.3	9.5	ug/L	45MW4	4/4	0.3 - 0.3	9.5	N	73	--	N	BSL
Manganese, Total	7439-96-5	32	190	ug/L	45MW4	4/4	0.3 - 0.3	190	N	73	--	Y	**ARBC**
Nickel, Dissolved	7440-02-0	0.75	8.1	ug/L	45MW4	4/4	0.35 - 0.35	8.1	N	73	--	N	BSL
Nickel, Total	7440-02-0	2.6	9.5	ug/L	45MW4	4/4	0.35 - 0.35	9.5	N	73	--	N	BSL
Selenium, Dissolved	7782-49-2	0.38	0.58	ug/L	45MW2 DUP AVG	3/4	0.3 - 0.3	0.58	N	18.25	--	N	BSL
Selenium, Total	7782-49-2	0.38	0.775	ug/L	45MW2 DUP AVG	4/4	0.3 - 0.3	0.775	N	18.25	--	N	BSL
Silver, Total	7440-22-4	0.19	0.4	ug/L	45MW2 DUP AVG	2/4	0.061 - 0.061	0.4	N	18.25	--	N	BSL
Vanadium, Dissolved	7440-62-2	0.31	0.5	ug/L	45MW4	4/4	0.27 - 0.27	0.5	N	3.65	--	N	BSL
Vanadium, Total	7440-62-2	0.83	6.6	ug/L	45MW4	4/4	0.27 - 0.27	6.6	N	3.65	--	Y	**ARBC**
Zinc, Dissolved	7440-66-6	2.7	7.55	ug/L	45MW2 DUP AVG	4/4	1.8 - 1.8	7.55	N	1,095	--	N	BSL
Zinc, Total	7440-66-6	3.9	10	ug/L	45MW4	4/4	1.8 - 1.8	10	N	1,095	--	N	BSL
Cyanide													
Cyanide, Total	57-12-5	2.21	2.855	ug/L	45MW2 DUP AVG	4/4	1.9 - 1.9	2.855	N	73	--	N	BSL
TCL VOCs													
Chloroform	67-66-3	0.7	0.7	ug/L	45MW1	1/4	0.061 - 0.061	0.7	C	0.155	80	Y	**ARBC**
Toluene	108-88-3	0.1	0.148	ug/L	45MW2 DUP AVG	2/4	0.072 - 0.072	0.148	N	227.1	1,000	N	BSL
TCL SVOCs													
1,1'-Biphenyl	92-52-4	0.03	0.03	ug/L	45MW4	1/4	0.015 - 0.015	0.03	N	30.42	--	N	BSL
2-Chlorophenol	95-57-8	0.06	0.06	ug/L	45MW4	1/4	0.016 - 0.016	0.06	N	3.042	--	N	BSL
2-Methylnaphthalene	91-57-6	0.03	0.03	ug/L	45MW4	1/4	0.015 - 0.015	0.03	N	2.433	--	N	BSL
Acenaphthene	83-32-9	0.02	0.02	ug/L	45MW4	1/4	0.013 - 0.013	0.02	N	36.5	--	N	BSL
Acenaphthylene [3]	208-96-8	0.02	0.02	ug/L	45MW4	1/4	0.012 - 0.012	0.02	N	18.25	--	N	BSL
Acetophenone	98-86-2	0.06	0.06	ug/L	45MW4	1/4	0.043 - 0.043	0.06	N	60.83	--	N	BSL
Bis(2-chloroethoxy)methane	111-91-1	0.03	0.03	ug/L	45MW4	1/4	0.016 - 0.016	0.03	--	--	--	Y	NSV
Bis(2-ethylhexyl) Phthalate	117-81-7	0.47	0.87	ug/L	45MW1	4/4	0.41 - 0.41	0.87	C	4.784	--	N	BSL
Butyl Benzyl Phthalate	85-68-7	0.25	0.41	ug/L	45MW4	3/4	0.029 - 0.029	0.41	N	730	--	N	BSL
Dibenzofuran	132-64-9	0.02	0.02	ug/L	45MW4	1/4	0.016 - 0.016	0.02	N	3.65	--	N	BSL
Diethylphthalate	84-66-2	0.05	0.165	ug/L	45MW2 DUP AVG	4/4	0.034 - 0.034	0.165	N	2,920	--	N	BSL
Di-n-butylphthalate	84-74-2	3.55	3.55	ug/L	45MW2 DUP AVG	1/4	0.38 - 0.38	3.55	N	365	--	N	BSL
Hexachloroethane	67-72-1	0.07	0.07	ug/L	45MW4	1/4	0.038 - 0.038	0.07	C	3.65	--	N	BSL
Naphthalene	91-20-3	0.04	0.04	ug/L	45MW4	1/4	0.023 - 0.023	0.04	N	0.651	--	N	BSL
Phenol	108-95-2	0.03	0.04	ug/L	45MW4	2/4	0.028 - 0.028	0.04	N	1,095	--	N	BSL
Explosives													
HMX	2691-41-0	0.77	0.77	ug/L	45MW3	1/4	0.2 - 0.2	0.77	N	182.5	--	N	BSL

Table E.1-2.4
Groundwater COPC Selection
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Notes:

CAS = Chemical Abstracts Service
µg/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
C = Carcinogenic per EPA RBC Table (October 2007)
N = Noncarcinogenic per EPA RBC Table (October 2007)
MCL = Maximum Contaminant Level
DUP AVG = averaged result for duplicate samples

ARBC = Above Tap Water RBC
BSL = Below Tap Water RBC/MCL

[1] = Chromium VI RBC used for screening
[2] = USEPA Action Level used for screening
[3] = Pyrene RBC used for screening

Table E.1-2.5
Non-detected Chemicals MDL Screening - Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted T-RBC	Maximum MDL Above SL
TAL Metals (ug/L)								
Aluminum, Dissolved	7429-90-5	ug/L	4	4	20	20	3,650	N
Antimony, Dissolved	7440-36-0	ug/L	2	4	0.32	0.32	1.46	N
Antimony, Total	7440-36-0	ug/L	3	4	0.32	0.32	1.46	N
Arsenic, Dissolved	7440-38-0	ug/L	4	4	0.24	0.24	--	NS
Arsenic, Total	7440-38-0	ug/L	3	4	0.24	0.24	--	NS
Beryllium, Dissolved	7440-41-7	ug/L	4	4	0.23	0.23	7.3	N
Beryllium, Total	7440-41-7	ug/L	4	4	0.23	0.23	7.3	N
Cadmium, Dissolved	7440-43-9	ug/L	4	4	0.056	0.056	1.83	N
Cadmium, Total	7440-43-9	ug/L	1	4	0.056	0.056	1.83	N
Copper, Dissolved	7440-50-8	ug/L	1	4	0.29	0.29	146	N
Iron, Dissolved	7439-89-6	ug/L	2	4	9.6	9.6	2,555	N
Lead, Dissolved [1]	7439-92-1	ug/L	3	4	0.29	0.29	15	N
Lead, Total [1]	7439-92-1	ug/L	1	4	0.29	0.29	15	N
Mercury, Dissolved [2]	7439-97-6	ug/L	4	4	0.046	0.046	0.37	N
Mercury, Total [2]	7439-97-6	ug/L	4	4	0.046	0.046	0.37	N
Selenium, Dissolved	7782-49-2	ug/L	1	4	0.3	0.3	18.25	N
Silver, Dissolved	7440-22-4	ug/L	4	4	0.061	0.061	18.25	N
Silver, Total	7440-22-4	ug/L	2	4	0.061	0.061	18.25	N
Thallium, Dissolved	7440-28-0	ug/L	4	4	0.05	0.05	0.256	N
Thallium, Total	7440-28-0	ug/L	4	4	0.05	0.05	0.256	N
Pesticides/PCBs (ug/L)								
4,4'-DDD	72-54-8	ug/L	4	4	0.0019	0.0019	0.279	N
4,4'-DDE	72-55-9	ug/L	4	4	0.0027	0.0027	0.197	N
4,4'-DDT	50-29-3	ug/L	4	4	0.002	0.002	0.197	N
Aldrin	309-00-2	ug/L	4	4	0.0079	0.0079	0.0039	**Y**
alpha-BHC	319-84-6	ug/L	4	4	0.0019	0.0019	0.0106	N
alpha-Chlordane [3]	5103-71-9	ug/L	4	4	0.0021	0.0021	0.191	N
beta-BHC	319-85-7	ug/L	4	4	0.0032	0.0032	0.0372	N
delta-BHC [4]	319-86-8	ug/L	4	4	0.0023	0.0023	0.0106	N
Dieldrin	60-57-1	ug/L	4	4	0.002	0.002	0.0042	N
Endosulfan I [5]	959-98-8	ug/L	4	4	0.0023	0.0023	21.9	N
Endosulfan II [5]	33213-65-9	ug/L	4	4	0.0018	0.0018	21.9	N
Endosulfan Sulfate [5]	1031-07-8	ug/L	4	4	0.0033	0.0033	21.9	N
Endrin	72-20-8	ug/L	4	4	0.002	0.002	1.095	N
Endrin Aldehyde [6]	7421-93-4	ug/L	4	4	0.0029	0.0029	1.095	N
Endrin Ketone [6]	53494-70-5	ug/L	4	4	0.0033	0.0033	1.095	N
gamma-BHC (Lindane)	58-89-9	ug/L	4	4	0.0018	0.0018	0.0515	N
gamma-Chlordane [3]	5103-74-2	ug/L	4	4	0.0021	0.0021	0.191	N
Heptachlor	76-44-8	ug/L	4	4	0.003	0.003	0.0149	N
Heptachlor Epoxide	1024-57-3	ug/L	4	4	0.0021	0.0021	0.0074	N
Methoxychlor	72-43-5	ug/L	4	4	0.0052	0.0052	18.25	N
Toxaphene	8001-35-2	ug/L	4	4	0.1	0.1	0.0609	**Y**
Aroclor 1016 [7]	12674-11-2	ug/L	4	4	0.05	0.05	0.255	N
Aroclor 1221	11104-28-2	ug/L	4	4	0.068	0.068	0.033	**Y**
Aroclor 1232	11141-16-5	ug/L	4	4	0.031	0.031	0.033	N
Aroclor 1242	53469-21-9	ug/L	4	4	0.035	0.035	0.033	**Y**
Aroclor 1248	12672-29-6	ug/L	4	4	0.04	0.04	0.033	**Y**
Aroclor 1254	11097-69-1	ug/L	4	4	0.034	0.034	0.033	**Y**
Aroclor 1260	11096-82-5	ug/L	4	4	0.034	0.034	0.033	**Y**
Aroclor 1262	37324-23-5	ug/L	4	4	0.022	0.022	--	NS
Aroclor 1268	11100-14-4	ug/L	4	4	0.049	0.049	--	NS
TCL VOCs (ug/L)								
1,1,1-Trichloroethane	71-55-6	ug/L	4	4	0.11	0.11	913.3	N
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	4	4	0.1	0.1	0.053	**Y**
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	4	4	0.14	0.14	5,938	N
1,1,2-Trichloroethane	79-00-5	ug/L	4	4	0.21	0.21	0.188	**Y**
1,1-Dichloroethane	75-34-3	ug/L	4	4	0.076	0.076	89.65	N
1,1-Dichloroethene	75-35-4	ug/L	4	4	0.14	0.14	35.32	N
1,2,3-Trichlorobenzene	87-61-6	ug/L	4	4	0.13	0.13	--	NS
1,2,4-Trichlorobenzene	120-82-1	ug/L	4	4	0.16	0.16	6.083	N
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	4	4	0.29	0.29	0.0002	**Y**
1,2-Dibromoethane	106-93-4	ug/L	4	4	0.22	0.22	0.0053	**Y**
1,2-Dichlorobenzene	95-50-1	ug/L	4	4	0.065	0.065	26.82	N
1,2-Dichloroethane	107-06-2	ug/L	4	4	0.15	0.15	0.116	**Y**
1,2-Dichloropropane	78-87-5	ug/L	4	4	0.1	0.1	0.257	N
1,3-Dichlorobenzene	541-73-1	ug/L	4	4	0.12	0.12	1.825	N
1,4-Dichlorobenzene	106-46-7	ug/L	4	4	0.13	0.13	0.281	N
2-Butanone	78-93-3	ug/L	4	4	0.33	0.33	696.8	N
2-Hexanone	591-78-6	ug/L	4	4	0.42	0.42	--	NS
4-Methyl-2-pentanone	108-10-1	ug/L	4	4	0.38	0.38	627.8	N
Acetone	67-64-1	ug/L	4	4	1.2	1.2	547.5	N
Benzene	71-43-2	ug/L	4	4	0.12	0.12	0.34	N

Table E.1-2.5
Non-detected Chemicals MDL Screening - Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted T-RBC	Maximum MDL Above SL
Bromochloromethane	74-97-5	ug/L	4	4	0.2	0.2	--	NS
Bromodichloromethane	75-27-4	ug/L	4	4	0.19	0.19	0.17	**Y**
Bromoform	75-25-2	ug/L	4	4	0.23	0.23	8.478	N
Bromomethane	74-83-9	ug/L	4	4	0.19	0.19	0.852	N
Carbon Disulfide	75-15-0	ug/L	4	4	0.28	0.28	104.3	N
Carbon Tetrachloride	56-23-5	ug/L	4	4	0.15	0.15	0.162	N
Chlorobenzene	108-90-7	ug/L	4	4	0.12	0.12	8.965	N
Chloroethane	75-00-3	ug/L	4	4	0.2	0.2	3.64	N
Chloroform	67-66-3	ug/L	3	4	0.061	0.061	0.155	N
Chloromethane	74-87-3	ug/L	4	4	0.06	0.06	18.98	N
cis-1,2-Dichloroethene	156-59-2	ug/L	4	4	0.17	0.17	6.083	N
cis-1,3-Dichloropropene	10061-01-5	ug/L	4	4	0.14	0.14	0.436	N
Cyclohexane	110-82-7	ug/L	4	4	0.14	0.14	1,241	N
Dibromochloromethane	124-48-1	ug/L	4	4	0.14	0.14	0.126	**Y**
Dichlorodifluoromethane	75-71-8	ug/L	4	4	0.17	0.17	34.76	N
Ethylbenzene	100-41-4	ug/L	4	4	0.13	0.13	134	N
Isopropylbenzene	98-82-8	ug/L	4	4	0.12	0.12	65.82	N
Methyl Acetate	79-20-9	ug/L	4	4	0.16	0.16	608.3	N
Methyl tert-Butyl Ether	1634-04-4	ug/L	4	4	0.096	0.096	2.637	N
Methylcyclohexane	108-87-2	ug/L	4	4	0.15	0.15	627.8	N
Methylene Chloride	75-09-2	ug/L	4	4	0.051	0.051	4.102	N
Styrene	100-42-5	ug/L	4	4	0.11	0.11	162.35	N
Tetrachloroethene	127-18-4	ug/L	4	4	0.15	0.15	0.104	**Y**
Toluene	108-88-3	ug/L	2	4	0.072	0.072	227.1	N
trans-1,2-Dichloroethene	156-60-5	ug/L	4	4	0.16	0.16	10.61	N
trans-1,3-Dichloropropene	10061-02-6	ug/L	4	4	0.16	0.16	0.436	N
Trichloroethene	79-01-6	ug/L	4	4	0.17	0.17	0.0264	**Y**
Trichlorofluoromethane	75-69-4	ug/L	4	4	0.18	0.18	128.82	N
Vinyl Chloride	75-01-4	ug/L	4	4	0.17	0.17	0.015	**Y**
Xylenes	1330-20-7	ug/L	4	4	0.36	0.36	21.26	N
TCL SVOCs (ug/L)								
1,1'-Biphenyl	92-52-4	ug/L	4	5	0.015	0.015	30.42	N
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/L	5	5	0.024	0.024	1.095	N
2,3,4,6-Tetrachlorophenol	58-90-2	ug/L	5	5	0.16	0.16	109.5	N
2,4,5-Trichlorophenol	95-95-4	ug/L	5	5	0.11	0.11	365	N
2,4,6-Trichlorophenol [8]	88-06-2	ug/L	5	5	0.027	0.027	3.6	N
2,4-Dichlorophenol	120-83-2	ug/L	5	5	0.015	0.015	10.95	N
2,4-Dimethylphenol	105-67-9	ug/L	5	5	0.33	0.33	73	N
2,4-Dinitrophenol	51-28-5	ug/L	5	5	1.5	1.5	7.3	N
2,4-Dinitrotoluene	121-14-2	ug/L	5	5	0.21	0.21	7.3	N
2,6-Dinitrotoluene	606-20-2	ug/L	5	5	0.05	0.05	3.65	N
2-Chloronaphthalene	91-58-7	ug/L	5	5	0.012	0.012	48.67	N
2-Chlorophenol	95-57-8	ug/L	4	5	0.016	0.016	3.042	N
2-Methylnaphthalene	91-57-6	ug/L	4	5	0.015	0.015	2.433	N
2-Methylphenol	95-48-7	ug/L	5	5	0.14	0.14	182.5	N
2-Nitroaniline	88-74-4	ug/L	5	5	0.12	0.12	--	NS
2-Nitrophenol	88-75-5	ug/L	5	5	0.026	0.026	--	NS
3,3'-Dichlorobenzidine	91-94-1	ug/L	5	5	0.21	0.21	--	NS
3-Nitroaniline	99-09-2	ug/L	5	5	0.13	0.13	--	NS
4,6-Dinitro-2-methylphenol	534-52-1	ug/L	5	5	0.12	0.12	--	NS
4-Bromophenyl-PhenylEther	101-55-3	ug/L	5	5	0.026	0.026	--	NS
4-Chloro-3-methylphenol [9]	59-50-7	ug/L	5	5	0.021	0.021	--	NS
4-Chloroaniline	106-47-8	ug/L	5	5	0.021	0.021	--	NS
4-Chlorophenyl-PhenylEther	7005-72-3	ug/L	5	5	0.016	0.016	--	NS
4-Methylphenol	106-44-5	ug/L	5	5	0.16	0.16	18.25	N
4-Nitroaniline	100-01-6	ug/L	5	5	0.14	0.14	--	NS
4-Nitrophenol	100-02-7	ug/L	5	5	1.3	1.3	--	NS
Acenaphthene	83-32-9	ug/L	4	5	0.013	0.013	36.5	N
Acenaphthylene [10]	208-96-8	ug/L	4	5	0.012	0.012	18.25	N
Acetophenone	98-86-2	ug/L	4	5	0.043	0.043	60.83	N
Anthracene	120-12-7	ug/L	5	5	0.014	0.014	182.5	N
Atrazine	1912-24-9	ug/L	5	5	0.026	0.026	0.304	N
Benzaldehyde	100-52-7	ug/L	5	5	0.051	0.051	365	N
Benzo(a)anthracene	56-55-3	ug/L	4	5	0.037	0.037	0.03	**Y**
Benzo(a)pyrene	50-32-8	ug/L	5	5	0.023	0.023	0.003	**Y**
Benzo(b)fluoranthene	205-99-2	ug/L	5	5	0.04	0.04	0.03	**Y**
Benzo(g,h,i)perylene [10]	191-24-2	ug/L	5	5	0.022	0.022	18.25	N
Benzo(k)fluoranthene	207-08-9	ug/L	5	5	0.036	0.036	0.3	N
Bis(2-chloroethoxy)methane	111-91-1	ug/L	4	5	0.016	0.016	--	NS
Bis(2-chloroethyl)Ether	111-44-4	ug/L	5	5	0.016	0.016	0.0096	**Y**
Bis(2-chloroisopropyl)Ether	39638-32-9	ug/L	5	5	0.047	0.047	--	NS
ButylBenzylPhthalate	85-68-7	ug/L	1	5	0.029	0.029	730	N
Caprolactam	105-60-2	ug/L	5	5	0.14	0.14	1,825	N
Carbazole	86-74-8	ug/L	5	5	0.018	0.018	3.349	N

Table E.1-2.5
Non-detected Chemicals MDL Screening - Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Adjusted T-RBC	Maximum MDL Above SL
Chrysene	218-01-9	ug/L	4	5	0.02	0.02	3	N
Di-n-butylphthalate	84-74-2	ug/L	3	5	0.38	0.38	365	N
Di-n-octylphthalate	117-84-0	ug/L	4	5	0.34	0.34	--	NS
Dibenz(a,h)anthracene	53-70-3	ug/L	5	5	0.026	0.026	0.003	**Y**
Dibenzofuran	132-64-9	ug/L	4	5	0.016	0.016	3.65	N
Dimethylphthalate	131-11-3	ug/L	5	5	0.016	0.016	--	NS
Fluoranthene	206-44-0	ug/L	4	5	0.016	0.016	146	N
Fluorene	86-73-7	ug/L	5	5	0.011	0.011	24.33	N
Hexachlorobenzene	118-74-1	ug/L	5	5	0.019	0.019	0.042	N
Hexachlorobutadiene	87-68-3	ug/L	5	5	0.018	0.018	0.859	N
Hexachlorocyclopentadiene	77-47-4	ug/L	5	5	0.13	0.13	21.9	N
Hexachloroethane[11]	67-72-1	ug/L	4	5	0.038	0.038	3.65	N
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	5	5	0.014	0.014	0.03	N
Isophorone	78-59-1	ug/L	5	5	0.031	0.031	70.5	N
N-Nitrosodi-n-propylamine	621-64-7	ug/L	5	5	0.03	0.03	0.0096	**Y**
N-Nitrosodiphenylamine	86-30-6	ug/L	5	5	0.019	0.019	13.67	N
Naphthalene	91-20-3	ug/L	4	5	0.023	0.023	0.651	N
Nitrobenzene	98-95-3	ug/L	5	5	0.026	0.026	0.353	N
Pentachlorophenol	87-86-5	ug/L	5	5	0.19	0.19	0.558	N
Phenanthrene[10]	85-01-8	ug/L	4	5	0.015	0.015	18.25	N
Phenol	108-95-2	ug/L	3	5	0.028	0.028	1,095	N
Pyrene	129-00-0	ug/L	5	5	0.047	0.047	18.25	N
Explosives (ug/L)								
1,3,5-Trinitrobenzene	99-35-4	ug/L	4	4	0.045	0.045	109.5	N
1,3-Dinitrobenzene	99-65-0	ug/L	4	4	0.071	0.071	0.365	N
2,4,6-Trinitrotoluene[12]	118-96-7	ug/L	4	4	0.1	0.1	1.83	N
2,4-Dinitrotoluene	121-14-2	ug/L	4	4	0.092	0.092	7.3	N
2,6-Dinitrotoluene	606-20-2	ug/L	4	4	0.16	0.16	3.65	N
2-Amino-4,6-dinitrotoluene	35572-78-2	ug/L	4	4	0.24	0.24	7.3	N
2-Nitrotoluene	88-72-2	ug/L	4	4	0.28	0.28	6.083	N
3-Nitrotoluene	99-08-1	ug/L	4	4	0.17	0.17	--	NS
4-Amino-2,6-dinitrotoluene	1946-51-0	ug/L	4	4	0.22	0.22	7.3	N
4-Nitrotoluene	99-99-0	ug/L	4	4	0.49	0.49	4.186	N
HMX	2691-41-0	ug/L	3	4	0.2	0.2	182.5	N
Nitrobenzene	98-95-3	ug/L	4	4	0.15	0.15	0.353	N
RDX	121-82-4	ug/L	4	4	0.092	0.092	0.609	N
Tetryl	479-45-8	ug/L	4	4	0.15	0.15	14.6	N
Nitroglycerin/PETN (ug/L)								
Nitroglycerin	55-63-0	ug/L	4	4	0.58	0.58	0.365	**Y**
PETN	78-11-5	ug/L	4	4	0.61	0.61	--	NS

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
SVOC = Semi-volatile Organic Compound
PETN = Pentaerythritol Tetranitrate
MDL = Method Detection Limit
RBC = USEPA Region III Risk-Based Concentration (RBC) values from the October 11, 2007, RBC Table and October 11, 2007, Alternate RBC Table
Adjusted RBCs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
T-RBC = Tap Water RBC
SL = Screening Level
-- = No Screening Value Available

Y = MDL exceeds screening level
N = MDL does not exceed screening level
NS = No screening level available

[1] = Lead Action Level used for screening
[2] = T-RBC for methylmercury used for screening
[3] = Chlordane T-RBC value was used
[4] = Alpha-BHC T-RBC value was used
[5] = Endosulfan T-RBC value was used
[6] = Endrin T-RBC value was used
[7] = Noncarcinogenic T-RBC value for Aroclor 1016 used for screening
[8] = Noncarcinogenic T-RBC value for 2,4,6-Trichlorophenol used for screening
[9] = 3-Methylphenol T-RBC value used for screening
[10] = Pyrene T-RBC value used for screening
[11] = Noncarcinogenic T-RBC value for Hexachloroethane was used
[12] = Noncarcinogenic T-RBC values for 2,4,6-Trinitrotoluene used for screening

Table E.1-3.1
Exposure Point Concentration Summary for Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Point		Chemical of Potential Concern	Units	Arithmetic Mean of Detects	UCL	Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil	7429-90-5	Aluminum	mg/kg	12,355	13,984	18,000	13,984	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-36-0	Antimony	mg/kg	1.083	2.922	4.6	2.922	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.0
	7440-38-2	Arsenic	mg/kg	4.127	7.505	12	7.505	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-43-9	Cadmium	mg/kg	2.144	2.245	6.2	2.245	mg/kg	95% KM (t) UCL	ProUCL 4.0
	7440-47-3	Chromium	mg/kg	29.14	38.99	79	38.99	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-48-4	Cobalt	mg/kg	7.65	8.587	9.1	8.587	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-50-8	Copper	mg/kg	157.8	1,177	1,100	1,100	mg/kg	Maximum Detected Concentration	EPC>MDC
	7439-89-6	Iron	mg/kg	26,091	32,490	47,000	32,490	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-92-1	Lead	mg/kg	163.1	361.1	760	361.1	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-96-5	Manganese	mg/kg	684.1	830.2	1,100	830.2	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-62-2	Vanadium	mg/kg	25.36	31.66	46	31.66	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-66-6	Zinc	mg/kg	539.8	1,218	2,500	1,218	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	11097-69-1	Aroclor 1254	mg/kg	0.1723	0.8937	0.73	0.73	mg/kg	Maximum Detected Concentration	EPC>MDC
	11096-82-5	Aroclor 1260*	mg/kg	--	--	0.63	0.63	mg/kg	Maximum Detected Concentration	--
	50-32-8	Benzo(a)pyrene	mg/kg	0.0258	0.0249	0.043	0.0249	mg/kg	95% KM (t) UCL	ProUCL 4.0
	53-70-3	Dibenz(a,h)anthracene*	mg/kg	--	--	0.028	0.028	mg/kg	Maximum Detected Concentration	--
	131-11-3	Dimethyl Phthalate*	mg/kg	--	--	0.00083	0.00083	mg/kg	Maximum Detected Concentration	--
	117-84-0	Di-n-octyl Phthalate*	mg/kg	--	--	0.027	0.027	mg/kg	Maximum Detected Concentration	--
	55-63-0	Nitroglycerin*	mg/kg	--	--	3.8	3.8	mg/kg	Maximum Detected Concentration	--

Notes:

UCL = Upper Confidence Limit

mg/kg = Milligram Per Kilogram

* Due to the low frequency of detection, a mean and UCL were not calculated.

EPC = Exposure Point Concentration

MDC = Maximum Detected Concentration

Table E.1-3.2
Exposure Point Concentration Summary for Total Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Point		Chemical of Potential Concern	Units	Arithmetic Mean of Detects	UCL	Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Total Soil	7429-90-5	Aluminum	mg/kg	13,155	14,247	19,000	14,247	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-36-0	Antimony	mg/kg	2.761	17.02	33	17.02	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.0
	7440-38-2	Arsenic	mg/kg	2.525	5.55	12	5.55	mg/kg	95% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7440-43-9	Cadmium	mg/kg	1.719	1.423	6.2	1.423	mg/kg	95% KM (t) UCL	ProUCL 4.0
	7440-47-3	Chromium	mg/kg	32.32	63.42	170	63.42	mg/kg	95% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7440-48-4	Cobalt	mg/kg	8.393	9.028	11	9.028	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-50-8	Copper	mg/kg	109.5	672.6	1,100	672.6	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7439-89-6	Iron	mg/kg	24,273	27,495	47,000	27,495	mg/kg	95% Student's t UCL	ProUCL 4.0
	7439-92-1	Lead	mg/kg	100.4	492	760	492	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	7439-96-5	Manganese	mg/kg	621.4	705.1	1,100	705.1	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-62-2	Vanadium	mg/kg	24.36	27.61	46	27.61	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-66-6	Zinc	mg/kg	350.4	1,635	2,500	1,635	mg/kg	99% Chebyshev (Mean,Sd) UCL	ProUCL 4.0
	11097-69-1	Aroclor 1254	mg/kg	0.2267	0.7791	1.2	0.7791	mg/kg	99% KM (Chebyshev) UCL	ProUCL 4.0
	11096-82-5	Aroclor 1260*	mg/kg	--	--	0.63	0.63	mg/kg	Maximum Detected Concentration	--
	50-32-8	Benzo(a)pyrene	mg/kg	0.02233	0.017	0.043	0.0170	mg/kg	95% KM (t) UCL	ProUCL 4.0
	53-70-3	Dibenz(a,h)anthracene*	mg/kg	--	--	0.028	0.028	mg/kg	Maximum Detected Concentration	--
	131-11-3	Dimethyl Phthalate*	mg/kg	--	--	0.00083	0.00083	mg/kg	Maximum Detected Concentration	--
	117-84-0	Di-n-octyl Phthalate*	mg/kg	--	--	0.033	0.033	mg/kg	Maximum Detected Concentration	--
	55-63-0	Nitroglycerin*	mg/kg	--	--	3.8	3.8	mg/kg	Maximum Detected Concentration	--

Notes:

UCL = Upper Confidence Limit

mg/kg = Milligram Per Kilogram

* Due to the low frequency of detection, a mean and UCL were not calculated.

MDC = Maximum Detected Concentration

Table E.1-4.1a
Values used for Daily Intake Equations for Current/Future Scenario - Surface Soil - Exposure Medium Soil - SWMU 45
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Current
Medium:	Surface Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Maintenance Worker	Adult	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = $\frac{CS \times IRS \times EF \times ED \times FI \times CF1}{BW \times AT}$
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 2004	
				EF	Exposure Frequency	50	days/year	(1)	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	100	mg/day	USEPA, 1991	
Dermal Absorption *	Maintenance Worker	Adult	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.1	mg/(cm^2-event)	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 2004	
				EF	Exposure Frequency	50	days/year	(1)	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	3,300	cm^2	USEPA, 2004	

Notes:

(1) Best professional judgement. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation. This is considered a conservative exposure frequency based on the nature of maintenance activities likely conducted at the site which would include occasional mowing since the site not active.

(2) Fraction ingested assumed 100%.

*See Table E.1-4.3 for chemical specific dermal absorption fractions

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

USEPA, 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment. Final. EPA/540/R/99/005.

kg/mg = Kilogram Per Millogram

mg/kg = Milligram Per Kilogram

hr/day = hour per day

cm^2 = square centimeter

USEPA = U.S. Environmental Protection Agency

EPC = Exposure Point Concentration

Table E.1-4.1b
Values used for Daily Intake Equations for Current/Future Scenario - Surface Soil - Exposure Medium Air
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Current
Medium:	Surface Soil
Exposure Medium:	Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Inhalation	Maintenance Worker	Adult	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	50	days/year	(1)	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	1.5	m^3/hr	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	(2)	

Notes:

(1) Best professional judgement. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation.

(2) PEFs provided on Table E.1-4.4

Note: VOCs not identified as COPC in soil; therefore, vapor inhalation pathway not assessed.

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002.

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

kg/mg = Kilogram Per Millogram

mg/kg = Milligram Per Kilogram

hr/day = hour per day

m^3/hour = cubic meters per hour

USEPA = U.S. Environmental Protection Agency

Table E.1-4.1c
Values used for Daily Intake Equations for Future Scenarios - Total Soil - Exposure Pathway Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Maintenance Worker	Adult	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = CS x IRS x EF x ED x FI x CF1 / BW X AT
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 2004	
				EF	Exposure Frequency	50	days/year	(1)	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	100	mg/day	USEPA, 1991	
	Construction Worker	Adult	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = CS x IRS x EF x ED x FI x CF1 / BW X AT
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	1	years	USEPA, 2002	
				EF	Exposure Frequency	250	days/year	USEPA, 2002	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	330	mg/day	USEPA, 2002	
	Commercial Worker	Adult	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = CS x IRS x EF x ED x FI x CF1 / BW X AT
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	50	mg/day	USEPA, 2002	
	Resident	Adult	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = CS x IRS x EF x ED x FI x CF1 / BW X AT
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	100	mg/day	USEPA, 1991	
		Child	Soil	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	CDI (mg/kg-day) = CS x IRS x EF x ED x FI x CF1 / BW X AT
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				FI	Fraction Ingested	1	(unitless)	(2)	
				IRS	Ingestion Rate of Soil	200	mg/day	USEPA, 1991	

Table E.1-4.1c
Values used for Daily Intake Equations for Future Scenarios - Total Soil - Exposure Pathway Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Dermal Absorption *	Maintenance Worker	Adult	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.1	mg/(cm^2-event)	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 2004	
				EF	Exposure Frequency	50	days/year	(1)	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	3,300	cm^2	USEPA, 2004	
	Construction Worker	Adult	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.3	mg/(cm^2-event)	USEPA, 2002	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 2002	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	1	years	USEPA, 2002	
				EF	Exposure Frequency	250	days/year	USEPA, 2002	
				EV	Event Frequency	1	events/day	USEPA, 2002	
				SA	Skin Surface Area Available for Contact	3,300	cm^2	USEPA, 2004	
	Commercial Worker	Adult	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.1	mg/(cm^2-event)	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	3,300	cm^2	USEPA, 2004	
	Resident	Adult	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.07	mg/(cm^2-event)	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	5,700	cm^2	USEPA, 2004	

Table E.1-4.1c
Values used for Daily Intake Equations for Future Scenarios - Total Soil - Exposure Pathway Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Dermal Absorption Cont.*	Resident Cont.	Child	Soil	ABS_d	Dermal Absorption Fraction	Chemical Specific	(unitless)	USEPA, 2004	
				AF	Soil-to-Skin Adherence Factor	0.2	mg/(cm^2-event)	USEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	CDI (mg/kg-day) = $\frac{CS \times EF \times ED \times CF1 \times AF \times ABS_d \times SA \times EV}{BW \times AT}$
				BW	Body Weight	15	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				EV	Event Frequency	1	events/day	USEPA, 2002	
				SA	Skin Surface Area Available for Contact	2,800	cm^2	USEPA, 2004	

Notes:

(1) Best professional judgement. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation.

(2) Fraction ingested assumed 100%.

*See Table E.1-4.3 for chemical specific dermal absorption fractions

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment. Final. EPA/540/R/99/005.

kg/mg = Kilogram Per Millogram

mg/kg = Milligram Per Kilogram

hr/day = hour per day

cm^2 = square centimeter

USEPA = U.S. Environmental Protection Agency

EPC = Exposure Point Concentration

Table E.1-4.1d
Values used for Daily Intake Equations for Future Scenarios - Total Soil - Exposure Pathway Air
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Total Soil
Exposure Medium:	Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Inhalation	Maintenance Worker	Adult	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	50	days/year	(1)	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	1.5	m^3/hr	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m^3/kg	(2)	
	Construction Worker	Adult	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	1	years	USEPA, 2002	
				EF	Exposure Frequency	250	days/year	USEPA, 2002	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	2.5	m^3/hr	USEPA, 1991	
				PEF	Particulate Emission Factor	1.17E+06	m^3/kg	(2)	
	Commercial Worker	Adult	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	25	years	USEPA, 2002	
				EF	Exposure Frequency	250	days/year	USEPA, 2002	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	1.0	m^3/hr	USEPA, 1989	
				PEF	Particulate Emission Factor	6.61E+08	m^3/kg	(2)	
	Resident	Adult	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ET	Exposure Time	2	hr/day	USEPA, 1997	
				IR	Inhalation Rate	0.83	m^3/hr	(3)	
				PEF	Particulate Emission Factor	6.61E+08	m^3/kg	(2)	
		Child	Fugitive Dust	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1991	
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	EPC	CDI (mg/kg-day) = $\frac{CS \times IR \times EF \times ED \times ET \times 1/PEF}{BW \times AT}$
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ET	Exposure Time	6	hr/day	USEPA, 1997	
				IR	Inhalation Rate	0.5	m^3/hr	(4)	
				PEF	Particulate Emission Factor	6.61E+08	m^3/kg	(2)	

Table E.1-4.1d
Values used for Daily Intake Equations for Future Scenarios - Total Soil - Exposure Pathway Air
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Notes:

(1) Best professional judgement. Based on site maintenance conducted 1 day/week with 2 weeks/year vacation.

(2) PEFs provided on Table E.1-4.4

(3) The inhalation rate is calculated using a daily long term rate of 20 m^3/day (USEPA, 1991) divided by 24 hours to derive hourly inhalation rate of 0.83 m^3/hour.

(4) The inhalation rate is calculated using a daily long term rate of 12 m^3/day (USEPA, 2003) divided by 24 hours to derive hourly inhalation rate of 0.5 m^3/hour.

Note: VOCs not identified as COPC in soil; therefore, vapor inhalation pathway not assessed.

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002.

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

USEPA, 1997. Exposure Factors Handbook. Office of Research and Development. EPA/600/P-95/002Fa through Fc.

kg/mg = Kilogram Per Millogram

mg/kg = Milligram Per Kilogram

hr/day = hour per day

m^3/hour = cubic meters per hour

USEPA = U.S. Environmental Protection Agency

Table E.1-4.2a
Values used for Daily Intake Equations for Future Scenarios - Groundwater - Exposure Pathway Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Commercial Worker	Adult	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	CDI (mg/kg-day) = $\frac{CW \times IRW \times EF \times ED \times CF1}{BW \times AT}$
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				IR-W	Ingestion Rate of Tap Water	1	L/day	USEPA, 1991	
	Resident	Adult	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	CDI (mg/kg-day) = $\frac{CW \times IRW \times EF \times ED \times CF1}{BW \times AT}$
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				IR-W	Ingestion Rate of Tap Water	2	L/day	USEPA, 1991	
		Child	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	CDI (mg/kg-day) = $\frac{CW \times IRW \times EF \times ED \times CF1}{BW \times AT}$
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				IR-W	Ingestion Rate of Tap Water	1	L/day	USEPA, 1991	
Dermal Absorption*	Commercial Worker	Adult	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				B	Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	dimensionless	USEPA, 2004	Dermal Absorbed Dose (mg/kg-day) = $\frac{DA_{event} \times EV \times ED \times EF \times SA}{BW \times AT}$
									where
				BW	Body Weight	70	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	*Organics:*
				CF2	Conversion Factor 2	1.00E-03	L/cm^3	unit conversion	if $t_{event} \le t^*$, $DA_{event} = 2 \times CF1 \times CF2 \times FA \times Kp \times CW \times [(6 \times \tau_{event} \times t_{event})/\pi]^{1/2}$
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				DA_{event}	Absorbed Dose per Event	Chemical Specific	mg/cm^2-event	USEPA, 2004	
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	if $t_{event} > t^*$, $DA_{event} = CF1 \times CF2 \times FA \times Kp \times CW \times [(t_{event}/(1+B)) + 2 \times \tau_{event}(1+3B+3B^2)/(1+B)^2]$
				EV	Event Frequency	1	events/day	USEPA, 2004	
				FA	Fraction Absorbed Water	Chemical Specific	dimensionless	USEPA, 2004	
				Kp	Skin Permeability Constant	Chemical Specific	cm/hr	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	800	cm^2	(1)	*Inorganics:*
				t*	Time to Reach Steady State	Chemical Specific	hr	USEPA, 2004	$DA_{event} = CF1 \times CF2 \times Kp \times CW \times t_{event}$
				t_{event}	Event Duration	1	hr/event	USEPA, 2004	
				τ_{event}	Lag Time per Event	Chemical Specific	hr/event	USEPA, 2004	

Table E.1-4.2a
Values used for Daily Intake Equations for Future Scenarios - Groundwater - Exposure Pathway Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Dermal Absorption Continued*	Resident	Adult	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	
				B	Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	dimensionless	USEPA, 2004	Dermal Absorbed Dose (mg/kg-day) = $\frac{DA_{event} \times EV \times ED \times EF \times SA}{BW \times AT}$
									where
				BW	Body Weight	70	kg	USEPA, 1991	*Organics:*
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	if $t_{event} \le t^*$, DA_{event} = 2 x CF1 x CF2 x FA x Kp x CW x $[(6 \times \tau_{event} \times t_{event})/\pi]^{1/2}$
				CF2	Conversion Factor 2	1.00E-03	L/cm^3	unit conversion	
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				DA_{event}	Absorbed Dose per Event	Chemical Specific	mg/cm^2-event	USEPA, 2004	
				ED	Exposure Duration	24	years	USEPA, 1991	if $t_{event} > t^*$, DA_{event} = CF1 x CF2 x FA x Kp x CW x $[(t_{event}/(1+B))+ 2 \times \tau_{event}(1+3B+3B^2)/(1+B)^2]$
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				FA	Fraction Absorbed Water	Chemical Specific	dimensionless	USEPA, 2004	
				Kp	Skin Permeability Constant	Chemical Specific	cm/hr	USEPA, 2004	*Inorganics:*
				SA	Skin Surface Area Available for Contact	18,000	cm^2	USEPA, 2004	DA_{event} = CF1 x CF2 x Kp x CW x t_{event}
				t*	Time to Reach Steady State	Chemical Specific	hr	USEPA, 2004	
				t_{event}	Event Duration	0.58	hr/event	USEPA, 2004	
				τ_{event}	Lag Time per Event	Chemical Specific	hr/event	USEPA, 2004	
		Child	Tap Water	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				B	Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	dimensionless	USEPA, 2004	Dermal Absorbed Dose (mg/kg-day) = $\frac{DA_{event} \times EV \times ED \times EF \times SA}{BW \times AT}$
									where
				BW	Body Weight	15	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-03	mg/µg	unit conversion	*Organics:*
				CF2	Conversion Factor 2	1.00E-03	L/cm^3	unit conversion	if $t_{event} \le t^*$, DA_{event} = 2 x CF1 x CF2 x FA x Kp x CW x $[(6 \times \tau_{event} \times t_{event})/\pi]^{1/2}$
				CW	Chemical Concentration in Water	Chemical Specific	µg/L	EPC	
				DA_{event}	Absorbed Dose per Event	Chemical Specific	mg/cm^2-event	USEPA, 2004	
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	if $t_{event} > t^*$, DA_{event} = CF1 x CF2 x FA x Kp x CW x $[(t_{event}/(1+B))+ 2 \times \tau_{event}(1+3B+3B^2)/(1+B)^2]$
				EV	Event Frequency	1	events/day	USEPA, 2004	
				FA	Fraction Absorbed Water	Chemical Specific	dimensionless	USEPA, 2004	
				Kp	Skin Permeability Constant	Chemical Specific	cm/hr	USEPA, 2004	
				SA	Skin Surface Area Available for Contact	6,600	cm^2	USEPA, 2004	*Inorganics:*
				t*	Time to Reach Steady State	Chemical Specific	hr	USEPA, 2004	DA_{event} = CF1 x CF2 x Kp x CW x t_{event}
				t_{event}	Event Duration	1	hr/event	USEPA, 2004	
				τ_{event}	Lag Time per Event	Chemical Specific	hr/event	USEPA, 2004	

Table E.1-4.2a
Values used for Daily Intake Equations for Future Scenarios - Groundwater - Exposure Pathway Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Notes:

(1) Best Professional Judgement. Based on the mean surface area for hands for men and women (USEPA, 2004).

*See Table E.1-4.6 for chemical specific parameters used to calculate absorbed dose per event

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

USEPA, 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment. Final.

kg = Kilogram

ug/L = Microgram Per Liter

mg/kg = milligram per kilogram

cm^2 = square centimeter

cm^3 = Cubic Centimeter

L/day = liter/day

USEPA = U.S. Environmental Protection Agency

VDEQ = Virginia Department of Environmental Quality

EPC = Exposure Point Concentration

Table E.1-4.2b
Values used for Daily Intake Equations for Future Scenarios - Groundwater - Exposure Pathway Air
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Inhalation	Construction Worker	Adult	Trench Vapors	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CA	Chemical Concentration in Outdoor Air	calculated	mg/m^3	(1)	CDI (mg/kg-day) = $\frac{CA \times IR \times EF \times ED \times ET \times FI}{BW \times AT}$
				ED	Exposure Duration	1	years	USEPA, 1991	
				EF	Exposure Frequency	125	days/year	VDEQ, 2006	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	2.5	m^3/hr	USEPA, 2002	
				FI	Fraction of Exposure, Air	1	unitless	(2)	
	Commercial Worker	Adult	Indoor Vapors	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CA	Chemical Concentration in Indoor Air	calculated	mg/m^3	(3)	CDI (mg/kg-day) = $\frac{CA \times IR \times EF \times ED \times ET \times FI}{BW \times AT}$
				ED	Exposure Duration	25	years	USEPA, 1991	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ET	Exposure Time	8	hr/day	USEPA, 1991	
				IR	Inhalation Rate	1.0	m^3/hr	USEPA, 1997	
				FI	Fraction of Exposure, Air	1	unitless	(2)	
	Resident	Adult	Indoor Vapors	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CA	Chemical Concentration in Indoor Air	calculated	mg/m^3	(3)	CDI (mg/kg-day) = $\frac{CA \times IR \times EF \times ED \times ET \times FI}{BW \times AT}$
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ET	Exposure Time	16.4	hr/day	USEPA, 1997	
				IR	Inhalation Rate	0.83	m^3/hr	(4)	
				FI	Fraction of Exposure, Air	1	unitless	(2)	
			Vapors while showering with groundwater	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	10,950	days	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1991	
				CA	Chemical Concentration in Shower Air	calculated	mg/m^3	(5)	CDI (mg/kg-day) = $\frac{CA \times IR \times EF \times ED \times ET \times FI}{BW \times AT}$
				ED	Exposure Duration	24	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ET	Exposure Time	0.261	hr/day	(6)	
				IR	Inhalation Rate	0.83	m^3/hr	USEPA, 1997	
				FI	Fraction of Exposure, Air	1	unitless	(2)	

Table E.1-4.2b
Values used for Daily Intake Equations for Future Scenarios - Groundwater - Exposure Pathway Air
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Inhalation Cont.	Resident Cont.	Child	Indoor Vapors	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1991	
				CA	Chemical Concentration in Indoor Air	calculated	mg/m^3	(3)	CDI (mg/kg-day) = $\frac{CA \times IR \times EF \times ED \times ET \times FI}{BW \times AT}$
				ED	Exposure Duration	6	years	USEPA, 1991	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ET	Exposure Time	18	hr/day	USEPA, 1997	
				IR	Inhalation Rate	0.5	m^3/hr	(7)	
				FI	Fraction of Exposure, Air	1	unitless	(2)	

Notes:

(1) See Table E.1-4.8 for trench air calculations.

(2) Best Professional Judgement. Based on 100% inhalation fraction.

(3) Chemical Concentration in Air for Indoor Vapors calculated using Johnson and Ettinger Model (See Table E.1-4.6).

(4) The inhalation rate is calculated using a daily long term rate of 20 m^3/day (USEPA, 1991) divided by 24 hours to derive hourly inhalation rate of 0.83 m^3/hour.

(5) Chemical Concentration in Air for Vapors while showering with groundwater calculated using Foster and Chrostowski Inhalation Model (See Table E.1-4.7).

(6) ET calculated using ET=(Ds+((exp(-Ra*t))/Ra - ((exp(Ra(Ds-t))/Ra)))*1hr/60min

Ds (shower time) =	30	min
t (total time in shower room) =	60	min
Ra (air exchange rate) =	0.01667	per min
ET=	0.261	hour/day

(7) The inhalation rate is calculated using a daily long term rate of 12 m^3/day (USEPA, 2003) divided by 24 hours to derive hourly inhalation rate of 0.5 m^3/hour.

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

USEPA, 1997. Exposure Factors Handbook. Office of Research and Development. EPA/600/P-95/002Fa.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2003. EPA Region III Risk-based Concentration Table: Technical Background Information. Revised 4/16/2003.

VDEQ, 2006. Voluntary Remediation Program Risk Assessment Guidance. www.deq.virginia.gov/vrprisk/raguide.html.

kg = Kilogram

ug/L = Microgram Per Liter

mg/kg = milligram per kilogram

cm^3 = Cubic Centimeter

L/day = liter/day

USEPA = U.S. Environmental Protection Agency

VDEQ = Virginia Department of Environmental Quality

Table E.1-4.3.RME
Dermal Absorption Fractions and Volatilization Factors for Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Analyte	CAS	ABSd * (m^3/kg)	$VF_{C/I\ Worker}$/ $VF_{Maint.\ Worker}$ (m^3/kg)	$VF_{Const.\ Worker}$ (m^3/kg)	$VF_{Adult\ Resident}$ (m^3/kg)	$VF_{Child\ Resident}$ (m^3/kg)
Aluminum	7429-90-5	1.00E-02	--	--	--	--
Antimony	7440-36-0	1.00E-02	--	--	--	--
Arsenic	7440-38-2	3.00E-02	--	--	--	--
Cadmium	7440-43-9	1.00E-03	--	--	--	--
Chromium(2)	7440-47-3	1.00E-02	--	--	--	--
Cobalt	7440-48-4	1.00E-02	--	--	--	--
Copper	7440-50-8	1.00E-02	--	--	--	--
Iron	7439-89-6	1.00E-02	--	--	--	--
Manganese	7439-96-5	1.00E-02	--	--	--	--
Vanadium	7440-62-2	1.00E-02	--	--	--	--
Zinc	7440-66-6	1.00E-02	--	--	--	--
Aroclor 1254	11097-69-1	1.40E-01	--	--	--	--
Aroclor 1260	11096-82-5	1.40E-01	--	--	--	--
Nitroglycerin	55-63-0	1.00E-02	--	--	--	--
Benzo(a)pyrene	50-32-8	1.30E-01	--	--	--	--
Dibenz(a,h)anthracene	53-70-3	1.30E-01	--	--	--	--
Dimethyl Phthalate	131-11-3	1.00E-01	--	--	--	--
Di-n-octyl Phthalate	117-84-0	1.00E-01	--	--	--	--

Notes:

CAS = Chemical Abstract Service

ABS_d = Dermal Absorption Fraction

VF = Volatilization Factor

D_a = Apparent Diffusivity

m^3/kg = cubic meters per kilogram

cm2/s = centimeter squared per second

*ABS_d values are taken from Exhibit 3-4, Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation and Manual, Part E; Supplemental Guidance for Dermal Risk Assessment, July 2004, and Region III Technical Guidance, Assessing Dermal Exposure in Soil, December 1995.

Volatiles were not identified as COPCs in soil; therefore, VFs not calculated

Table E.1-4.4.RME
PEF Calculations
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Commercial/Industrial Worker

Equation 4-5 from Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. USEPA, 2002.

$$PEF = Q / C_{wind} \cdot \frac{3{,}600 s/h}{0.036 \cdot (1-V) \cdot (U_m / U_t)\text{^}3 \cdot F(x)}$$

Parameter	Value	
PEF	9.27E+08	
Q/C_{wind}	63.94	calculated below
V	0.5	default
U_m	4.69	default
U_t	11.32	default
F(x)	0.194	default

PEF = particulate emission factor (m^3/kg)
s/h = seconds per hour
Q/Cwind = Inverse of the ratio of the geometric mean air concentration to the emission flux at the center of a square source (g/m^3-s per kg/m^3)
V = fraction of vegatative cover (unitless)
U_m = mean annual windspeed (m/s)
U_t = equivalent threshold value of windspeed at 7m (m/s)
F(x) = function dependent on U_m/U_t derived using Cowherd et al. (1985)
Site Area = 0.3 acres

Q/C_{wind} calculated in accordance with Exhibit D-2 from USEPA, 2002 using A, B, and C values for Huntington, WV:
$Q/C_{wind} = A*e\text{^}((\ln A_{site} - B)^2/C))$

Q/C_{wind}=	63.94	
A =	9.9253	unitless
B =	18.6636	unitless
C =	211.8862	unitless
A_{site}=	0.3	acres

Table E.1-4.4.RME
PEF Calculations
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Construction Worker

Equation 5-5 from Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. USEPA, 2002.

$$PEF_{sc} = Q / C_{sr} \cdot \frac{1}{F_D} \cdot \left[\frac{T \cdot A_R}{556 \cdot (W/3)^{0.4} \cdot \frac{(365\ d/yr - p)}{365\ d/yr} \cdot \sum VKT} \right]$$

Parameter	Value	
PEF_{sc}	1.61E+06	
Q/C_{sr}	25.32	calculated
F_D	0.185	default
T (sec)	7,488,000	assumed-see below
A_R (m^2)	212	calculated
W (tons)	8	assumed-see below
p (days/yr)	140	determined-see below
sumVKT (km)	267	assumed-see below

PEF_{sr} = subchronic road particulate emission factor (m^3/kg)

Q/C_{sr} = Inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m2-s per kg/m3)

F_D = dispersion correction factor (unitless)

T = total time over which construction occurs-total time period assumed to be 6 months (52wks x 5days per week x 8 hours per day x 3,600 s per hour)

A_R = surface area of contaminated road segment (m^2)

L_R = length of road segment (assumed to equal to (0.3 acres*43,560 ft^2/acre)$^{1/2}$)

W_R = width of road segment (assumed to be 20 ft)

$A_R = L_R \times W_R \times 0.092903 m^2/ft^2$

A_R= 212 m^2

W = mean vehicle weight assumed to be 8 tons ([(20 cars * 2 tons/car)+(10 trucks*20 tons/truck)]/30 vehicles)

p = number of days with at least 0.01 inches of precipitation (from Exhibit 5-2 140 days/year)

sumVKT = sum of fleet vehicle kilometers traveled during the exposure duration (km)
(30 of vehicles x 0.034 km/day x 52wks x 5 days/wk)

Q/C_{sr} calculated in accordance with Equation 5-6:

using A, B, and C default values:

$Q/C_{sr} = A*e^{((\ln A_s - B)^2/C)}$

Q/C_{sr}=	25.32	g/m^2-s per kg/m^3
A =	12.9351	unitless
B =	5.7383	unitless
C =	71.7711	unitless
A_s =	0.3	acres

Table E.1-4.5
Parameter Values Used for Groundwater
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Analyte	CAS	FA	Kp (cm/hr)	tau $_{event}$ (hr)	B	t* (hr)
Perchlorate	14797-73-0	--	1.0E-03	--	--	--
Iron	7439-89-6	--	1.0E-03	--	--	--
Cobalt	7440-48-4	--	4.0E-04	--	--	--
Benzo(a)anthracene	56-55-3	1.0	4.7E-01	2.0E+00	2.8E+00	8.5E+00
Bis(2-chloroethoxy)methane	111-91-1	1.0	1.2E-03	1.0E+00	6.2E-03	2.4E+00
Chloroform	67-66-3	1.0	6.8E-03	5.0E-01	2.9E-02	1.2E+00

Notes:

Organic parameter values are taken from Organic values from Organic Chemicals in Water Spreadsheet (http://www.epa.gov/oswer/riskassessment/ragse/index.htm)

Inorganic parameters were taken from Exhibit 3-1, Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part E; Supplemental Guidance for Dermal Risk Assessment. July 2004.

TABLE E.1-4.6
Groundwater Inhalation Indoor Air Concentration Summary
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Analyte	CAS	C_W ug/L	C_a mg/m^3
Chloroform	67-66-3	7.00E-01	3.26E-06

Notes:

Indoor Air Concentrations Modeled Using Johnson and Ettinger Model.

Non-default Model Inputs: Depth below grade to bottom of enclosed floor space (15 cm)
Depth below grade to water table (670 cm)
Soil Type Immediately Above Water Table (SC)
Soil Type Vadose Zone (SL)

TABLE E.1-4.7
Groundwater Inhalation Shower Stall Air Concentration Calculations
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Analyte	CAS	C_W ug/L	MW g/mole	H atm-m^3/mole	k_l cm/hour	k_g cm/hour	K_L cm/hour	K_{aL} cm/hour	C_{wd} ug/L	S ug/m^3-min	C_a mg/m^3
Chloroform	67-66-3	7.00E-01	119.4	3.7E-03	12.14	1164.91	1.14E+01	1.52E+01	2.78E-01	9.27E-01	5.56E-02

Equations:

k_l (liquid-film transfer coefficient) = $20*(44/MW)^{0.5}$

k_g (gas-film transfer coefficient) = $3000*(18/MW)^{0.5}$

K_L (overall mass transfer coefficient) = $(1/k_l+(R*t/H*k_g))^{-1}$

K_{aL} (overall mass transfer coefficient adjusted to shower water temperature) = $K_L*((T*u_s/T_s*u_l)^{-0.5}$

C_{wd} (VOC concentration leaving shower droplet) = $C_w*(1-\exp(-K_{aL}*t_s/60*d)$

S (VOC generation rate) = C_{wd}*FR/SV

C_a (VOC concentration in shower air) =(S/R_a)*(1mg/1000ug)

Constants:

R (gas constant)	8.20E-05	atm-m^3/mole-K
T (room temperature)	298	K
T_s (water temp)	318	K
u_s (water viscosity at T_s)	0.596	centapoise
u_l (water viscosity at T)	1.002	centapoise
t_s (shower droplet drop time)	2	sec
d (droplet diameter)	1	mm
FR (shower flow rate)	20	L/min
SV (shower room air volume)	6	m^3
R_a (air exchange rate)	0.01667	permin

TABLE E.1-4.8
Groundwater Inhalation Construction Worker Trench Gas Concentration Calculations
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Analyte	CAS	C_W ug/L	H_i atm-m^3/mole	D_{air} cm^2/sec	VF L/m^3	C_a mg/m^3
Chloroform	67-66-3	7.00E-01	3.67E-03	1.04E-01	1.48E-02	1.03E-05

Notes:

Exposure-point Concentrations calculated using VDEQ VRP Model for construction/utility workers in a trench: deep Goundwater greater than 15 feet

Equations:

$VF = (H_i*D_{air}*AC_{vad}^{3.33}*A*F*CF1*CF2*CF3)/(R*T*L_d*ACH*V*Por_{vad}^{2})$

$C_a = C_W*VF*CF4$

Constants:

H_i (Henry's Law Constant)	chem spec	atm-m^3/mol
D_{air} (diffusion coefficient in air)	chem spec	cm^2/s
AC_{vad} (volumetric air content in vadose zone soil)	0.25	cm^3/cm^3
L (length of trench)	2.44	m
W (width of trench)	0.91	m
A (area of trench - L*W)	2.23	m^2
F (fraction of floor through which contaminant can enter)	1	untiless
R (gas constant)	8.2E-05	atm-m^3/mole-K
T (average system absolute temp)	298	K
L_d (dist. b/w trench bottom and groundwater)	213	cm
d (depth of trench)	4.57	m
V (volume of trench)	10.19	m^3
ACH (air changes per hour)	2	per hour
Por_{vad} (total soil porosity in vadose zone)	0.44	cm^3/cm^3
CF1	0.001	L/cm^3
CF2	10,000	cm^2/m^2
CF3	3600	sec/hour
CF4	0.001	mg/ug

Table E.1-5.1
Non-Cancer Toxicity Data - Oral/Dermal
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical of Potential Concern	CAS	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
			Value	Units		Value	Units			Source(s)	Date(s)
Aluminum	7429-90-5	Chronic	1.00E+00	mg/kg-day	1	1.00E+00	mg/kg-day	developmental CNS	100	PPRTV	07/26/2001
Antimony	7440-36-0	Chronic	4.00E-04	mg/kg-day	0.15	6.00E-05	mg/kg-day	blood	1000	IRIS	06/17/2008
Antimony	7440-36-0	Subchronic	2.00E-04	mg/kg-day	0.15	3.00E-05	mg/kg-day	blood	300	PPRTV	07/26/1999
Arsenic	7440-38-2	Chronic	3.00E-04	mg/kg-day	1	3.00E-04	mg/kg-day	skin/ vascular	3	IRIS	06/17/2008
Arsenic	7440-38-2	Subchronic	3.00E-04	mg/kg-day	1	3.00E-04	mg/kg-day	skin	3	HEAST	07/31/1997
Cadmium	7440-43-9	Chronic	1.00E-03	mg/kg-day	0.025	2.50E-05	mg/kg-day	kidney	10	IRIS	06/17/2008
Chromium[(2)]	7440-47-3	Chronic	3.00E-03	mg/kg-day	0.025	7.50E-05	mg/kg-day	GI tract/fetus/bone marrow/liver	900	IRIS	06/17/2008
Chromium[(2)]	7440-47-3	Subchronic	2.00E-02	mg/kg-day	0.025	5.00E-04	mg/kg-day	GI tract/fetus/bone marrow/liver	100	HEAST	07/31/1997
Cobalt	7440-48-4	Chronic	2.00E-02	mg/kg-day	1	2.00E-02	mg/kg-day	blood	10	PPRTV	01/15/2002
Copper	7440-50-8	Chronic	4.00E-02	mg/kg-day	1	4.00E-02	mg/kg-day	GI tract	NA	HEAST	07/31/1997
Copper	7440-50-8	Subchronic	4.00E-02	mg/kg-day	1	4.00E-02	mg/kg-day	GI tract	NA	HEAST	07/31/1997
Iron	7439-89-6	Chronic	7.00E-01	mg/kg-day	1	7.00E-01	mg/kg-day	blood/ liver/ GI tract	1	PPTRV	01/05/1999
Manganese	7439-96-5	Chronic	2.00E-02	mg/kg-day	0.04	8.00E-04	mg/kg-day	CNS	1	IRIS	06/17/2008
Vanadium	7440-62-2	Chronic	1.00E-03	mg/kg-day	0.026	2.60E-05	mg/kg-day	kidney	NA	NCEA, Region III	10/25/2005
Vanadium	7440-62-2	Subchronic	7.00E-03	mg/kg-day	0.026	1.80E-04	mg/kg-day	kidney/ blood	100	HEAST	07/31/1997
Zinc	7440-66-6	Subchronic	3.00E-01	mg/kg-day	1	3.00E-01	mg/kg-day	blood	3	HEAST	07/31/1997
Zinc	7440-66-6	Subchronic	3.00E-01	mg/kg-day	1	3.00E-01	mg/kg-day	blood	3	HEAST	07/31/1997
Aroclor 1254	11097-69-1	Chronic	2.00E-05	mg/kg-day	1	2.00E-05	mg/kg-day	eyes	300	IRIS	06/17/2008
Aroclor 1254	11097-69-1	Subchronic	5.00E-05	mg/kg-day	1	5.00E-05	mg/kg-day	immune system	100	HEAST	07/31/1997
Aroclor 1260	11096-82-5	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Nitroglycerin	55-63-0	Chronic	1.00E-04	mg/kg-day	1	1.00E-04	mg/kg-day	vascular	NA	PPRTV, Region III	04/10/2007
Benzo(a)anthracene	56-55-3	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	131-11-3	Chronic	1.00E+01	mg/kg-day	1	1.00E+01	mg/kg-day	NA	NA	VDEQ	06/19/2006
Di-n-octyl Phthalate	117-84-0	Chronic	4.00E-02	mg/kg-day	1	4.00E-02	mg/kg-day	liver/thyroid	1000	PPRTV	09/11/2002
Di-n-octyl Phthalate	117-84-0	Subchronic	4.00E-01	mg/kg-day	1	4.00E-01	mg/kg-day	liver/thyroid	100	PPRTV	09/11/2002
Perchlorate	14797-73-0	Chronic	7.00E-04	mg/kg-day	1	7.00E-04	mg/kg-day	thyroid	10	IRIS	06/17/2008
Chloroform	67-66-3	Chronic	1.00E-02	mg/kg-day	1	1.00E-02	mg/kg-day	liver	100	IRIS	06/17/2008
Chloroform	67-66-3	Subchronic	1.00E-02	mg/kg-day	1	1.00E-02	mg/kg-day	liver	1000	HEAST	07/31/1997

Notes:

CAS = Chemical Abstract Service
RfD = Reference Dose
mg/(kg-d) = milligrams per kilogram day
Region III = U.S. Environmental Protection Agency, Region III
NCEA = National Center for Environmental Assessment
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables

PPRTV = Provisional Peer Reviewed Toxicity Values
NA = Not Available
(1) Oral absorption efficiency for dermal from Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment. Final. EPA/540/R/99/005. 2004.
(2) Chromium VI toxicity value used

Source Date:
The hierarchy of toxicity values used is:
IRIS, PPRTVs (if available), Region III, and HEAST.
For IRIS values, the date of the IRIS search is provided.
For HEAST values, the date of HEAST is provided.
For Region III values, the date of the Region III RBC Table is provided.
For PPRTV/NCEA, date of paper is provided.

Table E.1-5.2
Non-Cancer Toxicity Data - Inhalation
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical of Potential Concern	CAS	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
			Value	Units	Value	Units			Source(s)	Date(s)
Aluminum	7429-90-5	Chronic	1.00E-03	mg/m3	1.00E-03	mg/kg-day	CNS	300	PPRTV, Region III	10/11/2007
Antimony	7440-36-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	Subchronic	4.00E-04	mg/m3	1.10E-04	mg/kg-day	respiratory	100	PPRTV	07/26/1999
Arsenic	7440-38-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	Chronic	2.00E-04	mg/m3	5.70E-05	mg/kg-day	respiratory/ kidney/ liver	NA	NCEA	03/20/1996
Chromium(2)	7440-47-3	Chronic	1.00E-04	mg/m3	2.90E-05	mg/kg-day	respiratory	300	IRIS	06/17/2008
Chromium(2)	7440-47-3	Chronic	1.00E-04	mg/m3	2.90E-05	mg/kg-day	respiratory	300	IRIS	06/17/2008
Cobalt	7440-48-4	Chronic	2.00E-05	mg/m3	5.70E-06	mg/kg-day	respiratory	100	PPRTV	01/15/2002
Copper	7440-50-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	Chronic	5.00E-05	mg/m3	1.43E-05	mg/kg-day	CNS	1000	IRIS	06/17/2008
Vanadium	7440-62-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	55-63-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	56-55-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	131-11-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	117-84-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	117-84-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	14797-73-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	67-66-3	Chronic	4.90E-02	mg/m3	1.40E-02	mg/kg-day	respiratory	NA	NCEA, Region III	10/11/2007
Chloroform	67-66-3	Chronic	4.90E-02	mg/m3	1.40E-02	mg/kg-day	respiratory	NA	NCEA, Region III	10/11/2007

Notes:

RfC = Reference Concentration
RfD = Reference Dose
mg/m^3 = milligrams per cubic meter
mg/(kg-d) = milligrams per kilogram day
Region III = U.S. Environmental Protection Agency, Region III
NCEA = National Center for Environmental Assessment
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
PPRTV = Provisional Peer Reviewed Toxicity Values
NA = Not Available

(1) Toxicity data for chromium VI particulates
Source Date:
The hierarchy of toxicity values used is:
IRIS, PPRTVs (if available), Region III, VDEQ, and HEAST.
For IRIS values, the date of the IRIS search is provided.
For PPRTV values, the date of the paper is provided.
For NCEA, Region III values, the date of the Region III RBC Table is provided.
RfDi (mg/kg-day) = RfC (mg/m3) x 20 m3/day x 1/70 kg

Table E.1-6.1
Cancer Toxicity Data - Oral/Dermal
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical of Potential Concern	CAS	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source(s)	Date(s)
Aluminum	7429-90-5	NA	NA	1	NA	NA	NA	NA	NA
Antimony	7440-36-0	NA	NA	0.15	NA	NA	NA	NA	NA
Arsenic	7440-38-2	1.50E+00	1/(mg/kg-day)	1	1.50E+00	1/(mg/kg-day)	A	IRIS	06/17/2008
Cadmium	7440-43-9	NA	NA	0.025	NA	NA	NA	NA	NA
Chromium(2)	7440-47-3	NA	NA	0.025	NA	NA	Cannot Be Determined	NA	NA
Cobalt	7440-48-4	NA	NA	1	NA	NA	NA	NA	NA
Copper	7440-50-8	NA	NA	1	NA	NA	D	NA	NA
Iron	7439-89-6	NA	NA	1	NA	NA	NA	NA	NA
Manganese	7439-96-5	NA	NA	0.04	NA	NA	D	NA	NA
Vanadium	7440-62-2	NA	NA	0.026	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	1	NA	NA	D	NA	NA
Aroclor 1254	11097-69-1	2.00E+00	1/(mg/kg-day)	1	2.00E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Aroclor 1260	11096-82-5	2.00E+00	1/(mg/kg-day)	1	2.00E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Nitroglycerin	55-63-0	1.70E-02	1/(mg/kg-day)	1	1.70E-02	1/(mg/kg-day)	C	PPRTV, Region III	04/10/2007
Benzo(a)anthracene	56-55-3	7.30E-01	1/(mg/kg-day)	1	7.30E-01	1/(mg/kg-day)	B2	IRIS/NCEA	06/17/2008
Benzo(a)pyrene	50-32-8	7.30E+00	1/(mg/kg-day)	1	7.30E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	1	NA	NA	D	IRIS	06/17/2008
Dibenz(a,h)anthracene	53-70-3	7.30E+00	1/(mg/kg-day)	1	7.30E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Dimethyl Phthalate	131-11-3	NA	NA	1	NA	NA	D	IRIS	06/17/2008
Di-n-octyl Phthalate	117-84-0	NA	NA	1	NA	NA	NA	NA	NA
Perchlorate	14797-73-0	NA	NA	1	NA	NA	NA	NA	NA
Chloroform	67-66-3	NA	NA	1	NA	NA	B2	NA	NA

Notes:

CSF = Cancer Slope Factor
mg/(kg-d) = Milligrams Per Kilogram Day
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
NA = Not Available
1986 Cancer Guideline Description:
A = Human carcinogen
B1 = Probable human carcinogen - indicates that limited human data are available.
B2 = Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C = Possible human carcinogen
D = Not classifiable as a human carcinogen

Source Date:
The hierarchy of toxicity values used is:
IRIS, PPRTVs (if available), Region III and VDEQ.
For IRIS values, the date of the IRIS search is provided.
For PPRTV values, the date of the paper is provided.

(1) Oral absorption efficiency for dermal from Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment. Final. . EPA/540/R/99/005. 2004
(2) Chromium VI toxicity data used.

Table E.1-6.2
Cancer Toxicity Data - Inhalation
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical of Potential Concern	CAS	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	CSF	
		Value	Units	Value	Units		Source(s)	Date(s)
Aluminum	7429-90-5	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	4.30E+00	1/(mg/m3)	1.50E+01	1/(mg/kg-day)	A	IRIS	06/17/2008
Cadmium	7440-43-9	1.80E+00	1/(mg/m3)	6.30E+00	1/(mg/kg-day)	B1	IRIS	06/17/2008
Chromium(2)	7440-47-3	1.20E+01	1/(mg/m3)	4.10E+01	1/(mg/kg-day)	A	IRIS	06/17/2008
Cobalt	7440-48-4	2.80E+00	1/(mg/m3)	9.80E+00	1/(mg/kg-day)	B1	PPRTV	01/15/2002
Copper	7440-50-8	NA	NA	NA	NA	D	NA	NA
Iron	7439-89-6	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	NA	NA	NA	NA	D	NA	NA
Vanadium	7440-62-2	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	NA	NA	D	NA	NA
Aroclor 1254	11097-69-1	5.71E-01	1/(mg/m3)	2.00E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Aroclor 1260	11096-82-5	5.71E-01	1/(mg/m3)	2.00E+00	1/(mg/kg-day)	B2	IRIS	06/17/2008
Nitroglycerin	55-63-0	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	56-55-3	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	8.86E-01	1/(mg/m3)	3.10E+00	1/(mg/kg-day)	B2	NCEA, Region III	10/11/2007
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	NA	NA	D	IRIS	06/17/2008
Dibenz(a,h)anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	131-11-3	NA	NA	NA	NA	D	IRIS	06/17/2008
Di-n-octyl Phthalate	117-84-0	NA	NA	NA	NA	NA	NA	NA
Perchlorate	14797-73-0	NA	NA	NA	NA	NA	NA	NA
Chloroform	67-66-3	2.31E-02	1/(mg/m3)	8.10E-02	1/(mg/kg-day)	B2	IRIS	06/17/2008

Notes:

CSF = Cancer Slope Factor
mg/(kg-d) = Milligrams Per Kilogram Day
USEPA = U.S. Environmental Protection Agency
Region III = U.S. Environmental Protection Agency, Region III
NCEA = National Center for Environmental Assessment
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
PPRTV = Provisional Peer Reviewed Toxicity Values
NA = Not Available
(1) = Chromium VI toxicity data used
CSF = Unit Risk ($1/mg/m^3$) x 70 kg x 1 day/20 m^3

1986 Cancer Guideline Description:
A = Human carcinogen
B1 = Probable human carcinogen - indicates that limited human data are available.
B2 = Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C = Possible human carcinogen
D = Not classifiable as a human carcinogen

Source Date:
The hierarchy of toxicity values used is:
IRIS, PPRTVs (if available), Region III and VDEQ.
For IRIS values, the date of the IRIS search is provided.
For NCEA, Region III values, the date of the Region III RBC Table is provided.
For PPRTV values, the date of the paper is provided.

TABLE E.1-7.1.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Soil	Soil	Ingestion	Aluminum	13,984	mg/kg	9.77E-04	mg/kg-day	--	--	--	2.74E-03	mg/kg-day	1.00E+00	mg/kg-day	3.E-03
				Antimony	2.922	mg/kg	2.04E-07	mg/kg-day	--	--	--	5.72E-07	mg/kg-day	4.00E-04	mg/kg-day	1.E-03
				Arsenic	7.505	mg/kg	5.25E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	8.E-07	1.47E-06	mg/kg-day	3.00E-04	mg/kg-day	5.E-03
				Cadmium	2.245	mg/kg	1.57E-07	mg/kg-day	--	--	--	4.39E-07	mg/kg-day	1.00E-03	mg/kg-day	4.E-04
				Chromium	38.99	mg/kg	2.73E-06	mg/kg-day	--	--	--	7.63E-06	mg/kg-day	3.00E-03	mg/kg-day	3.E-03
				Cobalt	8.587	mg/kg	6.00E-07	mg/kg-day	--	--	--	1.68E-06	mg/kg-day	2.00E-02	mg/kg-day	8.E-05
				Copper	1,100	mg/kg	7.69E-05	mg/kg-day	--	--	--	2.15E-04	mg/kg-day	4.00E-02	mg/kg-day	5.E-03
				Iron	32,490	mg/kg	2.27E-03	mg/kg-day	--	--	--	6.36E-03	mg/kg-day	7.00E-01	mg/kg-day	9.E-03
				Manganese	830.2	mg/kg	5.80E-05	mg/kg-day	--	--	--	1.62E-04	mg/kg-day	2.00E-02	mg/kg-day	8.E-03
				Vanadium	31.66	mg/kg	2.21E-06	mg/kg-day	--	--	--	6.20E-06	mg/kg-day	1.00E-03	mg/kg-day	6.E-03
				Zinc	1218	mg/kg	8.51E-05	mg/kg-day	--	--	--	2.38E-04	mg/kg-day	3.00E-01	mg/kg-day	8.E-04
				Aroclor 1254	0.73	mg/kg	5.10E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	1.E-07	1.43E-07	mg/kg-day	2.00E-05	mg/kg-day	7.E-03
				Aroclor 1260	0.63	mg/kg	4.40E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	9.E-08	1.23E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.02488	mg/kg	1.74E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	1.E-08	4.87E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	1.96E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	1.E-08	5.48E-09	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	5.80E-11	mg/kg-day	--	--	--	1.62E-10	mg/kg-day	1.00E+01	mg/kg-day	2.E-11
				Di-n-octyl Phthalate	0.027	mg/kg	1.89E-09	mg/kg-day	--	--	--	5.28E-09	mg/kg-day	4.00E-02	mg/kg-day	1.E-07
				Nitroglycerin	3.8	mg/kg	2.66E-07	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	5.E-09	7.44E-07	mg/kg-day	1.00E-04	mg/kg-day	7.E-03
			Exp. Route Total								1.E-06					6.E-02
			Dermal Absorption	Aluminum	13,984	mg/kg	3.23E-05	mg/kg-day	--	--	--	9.03E-05	mg/kg-day	1.00E+00	mg/kg-day	9.E-05
				Antimony	2.922	mg/kg	6.74E-09	mg/kg-day	--	--	--	1.89E-08	mg/kg-day	6.00E-05	mg/kg-day	3.E-04
				Arsenic	7.505	mg/kg	5.19E-08	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	8.E-08	1.45E-07	mg/kg-day	3.00E-04	mg/kg-day	5.E-04
				Cadmium	2.245	mg/kg	5.18E-10	mg/kg-day	--	--	--	1.45E-09	mg/kg-day	2.50E-05	mg/kg-day	6.E-05
				Chromium	38.99	mg/kg	8.99E-08	mg/kg-day	--	--	--	2.52E-07	mg/kg-day	7.50E-05	mg/kg-day	3.E-03
				Cobalt	8.587	mg/kg	1.98E-08	mg/kg-day	--	--	--	5.55E-08	mg/kg-day	2.00E-02	mg/kg-day	3.E-06
				Copper	1100	mg/kg	2.54E-06	mg/kg-day	--	--	--	7.10E-06	mg/kg-day	4.00E-02	mg/kg-day	2.E-04
				Iron	32490	mg/kg	7.49E-05	mg/kg-day	--	--	--	2.10E-04	mg/kg-day	7.00E-01	mg/kg-day	3.E-04
				Manganese	830.2	mg/kg	1.91E-06	mg/kg-day	--	--	--	5.36E-06	mg/kg-day	8.00E-04	mg/kg-day	7.E-03
				Vanadium	31.66	mg/kg	7.30E-08	mg/kg-day	--	--	--	2.04E-07	mg/kg-day	2.60E-05	mg/kg-day	8.E-03
				Zinc	1218	mg/kg	2.81E-06	mg/kg-day	--	--	--	7.87E-06	mg/kg-day	3.00E-01	mg/kg-day	3.E-05
				Aroclor 1254	0.73	mg/kg	2.36E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	5.E-08	6.60E-08	mg/kg-day	2.00E-05	mg/kg-day	3.E-03
				Aroclor 1260	0.63	mg/kg	2.03E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	4.E-08	5.70E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.02488	mg/kg	7.46E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	5.E-09	2.09E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	8.40E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	6.E-09	2.35E-09	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.91E-11	mg/kg-day	--	--	--	5.36E-11	mg/kg-day	1.00E+01	mg/kg-day	5.E-12
				Di-n-octyl Phthalate	0.027	mg/kg	6.23E-10	mg/kg-day	--	--	--	1.74E-09	mg/kg-day	4.00E-02	mg/kg-day	4.E-08
				Nitroglycerin	3.8	mg/kg	8.76E-09	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	1.E-10	2.45E-08	mg/kg-day	1.00E-04	mg/kg-day	2.E-04
			Exp. Route Total								2.E-07					2.E-02
		Exposure Point Total									1.E-06					8.E-02
	Exposure Medium Total										1.2.E-06					8.E-02

TABLE E.1-7.1.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil Cont.	Air	Fugitive Dust	Inhalation	Aluminum	13,984	mg/kg	8.89E-08	mg/kg-day	--	--	--	2.49E-07	mg/kg-day	1.00E-03	mg/kg-day	2.E-04
				Antimony	2.922	mg/kg	1.86E-11	mg/kg-day	--	--	--	5.20E-11	mg/kg-day	--	--	--
				Arsenic	7.505	mg/kg	4.77E-11	mg/kg-day	1.50E+01	mg/kg-day $^{-1}$	7.E-10	1.34E-10	mg/kg-day	--	--	--
				Cadmium	2.245	mg/kg	1.43E-11	mg/kg-day	6.30E+00	mg/kg-day $^{-1}$	9.E-11	3.99E-11	mg/kg-day	5.70E-05	mg/kg-day	7.E-07
				Chromium	38.99	mg/kg	2.48E-10	mg/kg-day	4.10E+01	mg/kg-day $^{-1}$	1.E-08	6.94E-10	mg/kg-day	2.90E-05	mg/kg-day	2.E-05
				Cobalt	8.587	mg/kg	5.46E-11	mg/kg-day	9.80E+00	mg/kg-day $^{-1}$	5.E-10	1.53E-10	mg/kg-day	5.70E-06	mg/kg-day	3.E-05
				Copper	1100	mg/kg	6.99E-09	mg/kg-day	--	--	--	1.96E-08	mg/kg-day	--	--	--
				Iron	32490	mg/kg	2.06E-07	mg/kg-day	--	--	--	5.78E-07	mg/kg-day	--	--	--
				Manganese	830.2	mg/kg	5.27E-09	mg/kg-day	--	--	--	1.48E-08	mg/kg-day	1.43E-05	mg/kg-day	1.E-03
				Vanadium	31.66	mg/kg	2.01E-10	mg/kg-day	--	--	--	5.63E-10	mg/kg-day	--	--	--
				Zinc	1218	mg/kg	7.74E-09	mg/kg-day	--	--	--	2.17E-08	mg/kg-day	--	--	--
				Aroclor 1254	0.73	mg/kg	4.64E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	9.E-12	1.30E-11	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	4.00E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	8.E-12	1.12E-11	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.02488	mg/kg	1.58E-13	mg/kg-day	3.10E+00	mg/kg-day $^{-1}$	5.E-13	4.43E-13	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	1.78E-13	mg/kg-day	--	--	--	4.98E-13	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	5.27E-15	mg/kg-day	--	--	--	1.48E-14	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.027	mg/kg	1.72E-13	mg/kg-day	--	--	--	4.80E-13	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	2.41E-11	mg/kg-day	--	--	--	6.76E-11	mg/kg-day	--	--	--
			Exp. Route Total								1.E-08					1.E-03
		Exposure Point Total									1.E-08					1.E-03
	Exposure Medium Total										1.E-08					1.E-03
Soil Total											1.E-06					8.E-02
											Total of Receptor Risks Across All Media	1.E-06		Total of Receptor Hazards Across All Media		8.E-02

TABLE E.1-7.2.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Soil	Soil	Ingestion	Aluminum	14,247	mg/kg	9.96E-04	mg/kg-day	--	--	--	2.79E-03	mg/kg-day	1.00E+00	mg/kg-day	3.E-03
				Antimony	17.02	mg/kg	1.19E-06	mg/kg-day	--	--	--	3.33E-06	mg/kg-day	4.00E-04	mg/kg-day	8.E-03
				Arsenic	5.55	mg/kg	3.88E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	6.E-07	1.09E-06	mg/kg-day	3.00E-04	mg/kg-day	4.E-03
				Cadmium	1.423	mg/kg	9.95E-08	mg/kg-day	--	--	--	2.78E-07	mg/kg-day	1.00E-03	mg/kg-day	3.E-04
				Chromium	63.42	mg/kg	4.43E-06	mg/kg-day	--	--	--	1.24E-05	mg/kg-day	3.00E-03	mg/kg-day	4.E-03
				Cobalt	9.028	mg/kg	6.31E-07	mg/kg-day	--	--	--	1.77E-06	mg/kg-day	2.00E-02	mg/kg-day	9.E-05
				Copper	672.6	mg/kg	4.70E-05	mg/kg-day	--	--	--	1.32E-04	mg/kg-day	4.00E-02	mg/kg-day	3.E-03
				Iron	27,495	mg/kg	1.92E-03	mg/kg-day	--	--	--	5.38E-03	mg/kg-day	7.00E-01	mg/kg-day	8.E-03
				Manganese	705.1	mg/kg	4.93E-05	mg/kg-day	--	--	--	1.38E-04	mg/kg-day	2.00E-02	mg/kg-day	7.E-03
				Vanadium	27.61	mg/kg	1.93E-06	mg/kg-day	--	--	--	5.40E-06	mg/kg-day	1.00E-03	mg/kg-day	5.E-03
				Zinc	1635	mg/kg	1.14E-04	mg/kg-day	--	--	--	3.20E-04	mg/kg-day	3.00E-01	mg/kg-day	1.E-03
				Aroclor 1254	0.7791	mg/kg	5.45E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	1.E-07	1.52E-07	mg/kg-day	2.00E-05	mg/kg-day	8.E-03
				Aroclor 1260	0.63	mg/kg	4.40E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	9.E-08	1.23E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	1.19E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	9.E-09	3.33E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	1.96E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	1.E-08	5.48E-09	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	5.80E-11	mg/kg-day	--	--	--	1.62E-10	mg/kg-day	1.00E+01	mg/kg-day	2.E-11
				Di-n-octyl Phthalate	0.033	mg/kg	2.31E-09	mg/kg-day	--	--	--	6.46E-09	mg/kg-day	4.00E-02	mg/kg-day	2.E-07
				Nitroglycerin	3.8	mg/kg	2.66E-07	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	5.E-09	7.44E-07	mg/kg-day	1.00E-04	mg/kg-day	7.E-03
			Exp. Route Total								8.E-07					6.E-02
			Dermal Absorption	Aluminum	14,247	mg/kg	3.29E-05	mg/kg-day	--	--	--	9.20E-05	mg/kg-day	1.00E+00	mg/kg-day	9.E-05
				Antimony	17.02	mg/kg	3.93E-08	mg/kg-day	--	--	--	1.10E-07	mg/kg-day	6.00E-05	mg/kg-day	2.E-03
				Arsenic	5.55	mg/kg	3.84E-08	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	6.E-08	1.08E-07	mg/kg-day	3.00E-04	mg/kg-day	4.E-04
				Cadmium	1.423	mg/kg	3.28E-10	mg/kg-day	--	--	--	9.19E-10	mg/kg-day	2.50E-05	mg/kg-day	4.E-05
				Chromium	63.42	mg/kg	1.46E-07	mg/kg-day	--	--	--	4.10E-07	mg/kg-day	7.50E-05	mg/kg-day	5.E-03
				Cobalt	9.028	mg/kg	2.08E-08	mg/kg-day	--	--	--	5.83E-08	mg/kg-day	2.00E-02	mg/kg-day	3.E-06
				Copper	672.6	mg/kg	1.55E-06	mg/kg-day	--	--	--	4.34E-06	mg/kg-day	4.00E-02	mg/kg-day	1.E-04
				Iron	27,495	mg/kg	6.34E-05	mg/kg-day	--	--	--	1.78E-04	mg/kg-day	7.00E-01	mg/kg-day	3.E-04
				Manganese	705.1	mg/kg	1.63E-06	mg/kg-day	--	--	--	4.55E-06	mg/kg-day	8.00E-04	mg/kg-day	6.E-03
				Vanadium	27.61	mg/kg	6.37E-08	mg/kg-day	--	--	--	1.78E-07	mg/kg-day	2.60E-05	mg/kg-day	7.E-03
				Zinc	1635	mg/kg	3.77E-06	mg/kg-day	--	--	--	1.06E-05	mg/kg-day	3.00E-01	mg/kg-day	4.E-05
				Aroclor 1254	0.7791	mg/kg	2.52E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	5.E-08	7.04E-08	mg/kg-day	2.00E-05	mg/kg-day	4.E-03
				Aroclor 1260	0.63	mg/kg	2.03E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	4.E-08	5.70E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	5.10E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	4.E-09	1.43E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	8.40E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	6.E-09	2.35E-09	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.91E-11	mg/kg-day	--	--	--	5.36E-11	mg/kg-day	1.00E+01	mg/kg-day	5.E-12
				Di-n-octyl Phthalate	0.033	mg/kg	7.61E-10	mg/kg-day	--	--	--	2.13E-09	mg/kg-day	4.00E-02	mg/kg-day	5.E-08
				Nitroglycerin	3.8	mg/kg	8.76E-09	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	1.E-10	2.45E-08	mg/kg-day	1.00E-04	mg/kg-day	2.E-04
			Exp. Route Total								2.E-07					2.E-02
		Exposure Point Total									1.E-06					8.E-02
	Exposure Medium Total										9.6.E-07					8.E-02

TABLE E.1-7.2.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil Cont.	Air	Fugitive Dust	Inhalation	Aluminum	14,247	mg/kg	9.05E-08	mg/kg-day	--	--	--	2.53E-07	mg/kg-day	1.00E-03	mg/kg-day	3.E-04
				Antimony	17.02	mg/kg	1.08E-10	mg/kg-day	--	--	--	3.03E-10	mg/kg-day	--	--	--
				Arsenic	5.55	mg/kg	3.53E-11	mg/kg-day	1.50E+01	mg/kg-day $^{-1}$	5.E-10	9.87E-11	mg/kg-day	--	--	--
				Cadmium	1.423	mg/kg	9.04E-12	mg/kg-day	6.30E+00	mg/kg-day $^{-1}$	6.E-11	2.53E-11	mg/kg-day	5.70E-05	mg/kg-day	4.E-07
				Chromium	63.42	mg/kg	4.03E-10	mg/kg-day	4.10E+01	mg/kg-day $^{-1}$	2.E-08	1.13E-09	mg/kg-day	2.90E-05	mg/kg-day	4.E-05
				Cobalt	9.028	mg/kg	5.74E-11	mg/kg-day	9.80E+00	mg/kg-day $^{-1}$	6.E-10	1.61E-10	mg/kg-day	5.70E-06	mg/kg-day	3.E-05
				Copper	672.6	mg/kg	4.27E-09	mg/kg-day	--	--	--	1.20E-08	mg/kg-day	--	--	--
				Iron	27,495	mg/kg	1.75E-07	mg/kg-day	--	--	--	4.89E-07	mg/kg-day	--	--	--
				Manganese	705.1	mg/kg	4.48E-09	mg/kg-day	--	--	--	1.25E-08	mg/kg-day	1.43E-05	mg/kg-day	9.E-04
				Vanadium	27.61	mg/kg	1.75E-10	mg/kg-day	--	--	--	4.91E-10	mg/kg-day	--	--	--
				Zinc	1635	mg/kg	1.04E-08	mg/kg-day	--	--	--	2.91E-08	mg/kg-day	--	--	--
				Aroclor 1254	0.7791	mg/kg	4.95E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	1.E-11	1.39E-11	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	4.00E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	8.E-12	1.12E-11	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	1.08E-13	mg/kg-day	3.10E+00	mg/kg-day $^{-1}$	3.E-13	3.02E-13	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	1.78E-13	mg/kg-day	--	--	--	4.98E-13	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	5.27E-15	mg/kg-day	--	--	--	1.48E-14	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.033	mg/kg	2.10E-13	mg/kg-day	--	--	--	5.87E-13	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	2.41E-11	mg/kg-day	--	--	--	6.76E-11	mg/kg-day	--	--	--
			Exp. Route Total								2.E-08					1.E-03
		Exposure Point Total									2.E-08					1.E-03
	Exposure Medium Total										2.E-08					1.E-03
Soil Total											1.E-06					8.E-02
										Total of Receptor Risks Across All Media	1.E-06	Total of Receptor Hazards Across All Media				8.E-02

TABLE E.1-7.3.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Commercial Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Soil	Soil	Ingestion	Aluminum	14,247	mg/kg	2.49E-03	mg/kg-day	--	--	--	6.97E-03	mg/kg-day	1.00E+00	mg/kg-day	7.E-03
				Antimony	17.02	mg/kg	2.97E-06	mg/kg-day	--	--	--	8.33E-06	mg/kg-day	4.00E-04	mg/kg-day	2.E-02
				Arsenic	5.55	mg/kg	9.70E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	1.E-06	2.72E-06	mg/kg-day	3.00E-04	mg/kg-day	9.E-03
				Cadmium	1.423	mg/kg	2.49E-07	mg/kg-day	--	--	--	6.96E-07	mg/kg-day	1.00E-03	mg/kg-day	7.E-04
				Chromium	63.42	mg/kg	1.11E-05	mg/kg-day	--	--	--	3.10E-05	mg/kg-day	3.00E-03	mg/kg-day	1.E-02
				Cobalt	9.028	mg/kg	1.58E-06	mg/kg-day	--	--	--	4.42E-06	mg/kg-day	2.00E-02	mg/kg-day	2.E-04
				Copper	672.6	mg/kg	1.18E-04	mg/kg-day	--	--	--	3.29E-04	mg/kg-day	4.00E-02	mg/kg-day	8.E-03
				Iron	27495	mg/kg	4.80E-03	mg/kg-day	--	--	--	1.35E-02	mg/kg-day	7.00E-01	mg/kg-day	2.E-02
				Manganese	705.1	mg/kg	1.23E-04	mg/kg-day	--	--	--	3.45E-04	mg/kg-day	2.00E-02	mg/kg-day	2.E-02
				Vanadium	27.61	mg/kg	4.82E-06	mg/kg-day	--	--	--	1.35E-05	mg/kg-day	1.00E-03	mg/kg-day	1.E-02
				Zinc	1635	mg/kg	2.86E-04	mg/kg-day	--	--	--	8.00E-04	mg/kg-day	3.00E-01	mg/kg-day	3.E-03
				Aroclor 1254	0.7791	mg/kg	1.36E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	3.E-07	3.81E-07	mg/kg-day	2.00E-05	mg/kg-day	2.E-02
				Aroclor 1260	0.63	mg/kg	1.10E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	2.E-07	3.08E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	2.97E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	2.E-08	8.32E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	4.89E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	4.E-08	1.37E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.45E-10	mg/kg-day	--	--	--	4.06E-10	mg/kg-day	1.00E+01	mg/kg-day	4.E-11
				Di-n-octyl Phthalate	0.033	mg/kg	5.77E-09	mg/kg-day	--	--	--	1.61E-08	mg/kg-day	4.00E-02	mg/kg-day	4.E-07
				Nitroglycerin	3.8	mg/kg	6.64E-07	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	1.E-08	1.86E-06	mg/kg-day	1.00E-04	mg/kg-day	2.E-02
			Exp. Route Total								2.0.E-06					1.E-01
			Dermal Absorption	Aluminum	14,247	mg/kg	1.64E-04	mg/kg-day	--	--	--	4.60E-04	mg/kg-day	1.00E+00	mg/kg-day	5.E-04
				Antimony	17.02	mg/kg	1.96E-07	mg/kg-day	--	--	--	5.50E-07	mg/kg-day	6.00E-05	mg/kg-day	9.E-03
				Arsenic	5.55	mg/kg	1.92E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	3.E-07	5.38E-07	mg/kg-day	3.00E-04	mg/kg-day	2.E-03
				Cadmium	1.423	mg/kg	1.64E-09	mg/kg-day	--	--	--	4.59E-09	mg/kg-day	2.50E-05	mg/kg-day	2.E-04
				Chromium	63.42	mg/kg	7.31E-07	mg/kg-day	--	--	--	2.05E-06	mg/kg-day	7.50E-05	mg/kg-day	3.E-02
				Cobalt	9.028	mg/kg	1.04E-07	mg/kg-day	--	--	--	2.92E-07	mg/kg-day	2.00E-02	mg/kg-day	1.E-05
				Copper	672.6	mg/kg	7.76E-06	mg/kg-day	--	--	--	2.17E-05	mg/kg-day	4.00E-02	mg/kg-day	5.E-04
				Iron	27495	mg/kg	3.17E-04	mg/kg-day	--	--	--	8.88E-04	mg/kg-day	7.00E-01	mg/kg-day	1.E-03
				Manganese	705.1	mg/kg	8.13E-06	mg/kg-day	--	--	--	2.28E-05	mg/kg-day	8.00E-04	mg/kg-day	3.E-02
				Vanadium	27.61	mg/kg	3.18E-07	mg/kg-day	--	--	--	8.92E-07	mg/kg-day	2.60E-05	mg/kg-day	3.E-02
				Zinc	1635	mg/kg	1.89E-05	mg/kg-day	--	--	--	5.28E-05	mg/kg-day	3.00E-01	mg/kg-day	2.E-04
				Aroclor 1254	0.7791	mg/kg	1.26E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	3.E-07	3.52E-07	mg/kg-day	2.00E-05	mg/kg-day	2.E-02
				Aroclor 1260	0.63	mg/kg	1.02E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	2.E-07	2.85E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	2.55E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	2.E-08	7.14E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	4.20E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	3.E-08	1.18E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	9.57E-11	mg/kg-day	--	--	--	2.68E-10	mg/kg-day	1.00E+01	mg/kg-day	3.E-11
				Di-n-octyl Phthalate	0.033	mg/kg	3.81E-09	mg/kg-day	--	--	--	1.07E-08	mg/kg-day	4.00E-02	mg/kg-day	3.E-07
				Nitroglycerin	3.8	mg/kg	4.38E-08	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	7.E-10	1.23E-07	mg/kg-day	1.00E-04	mg/kg-day	1.E-03
			Exp. Route Total								8.E-07					1.E-01
		Exposure Point Total									3.E-06					3.E-01
	Exposure Medium Total										3.E-06					3.E-01

TABLE E.1-7.3.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Commercial Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Commercial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Fugitive Dust	Inhalation	Aluminum	14,247	mg/kg	4.30E-07	mg/kg-day	--	--	--	1.20E-06	mg/kg-day	1.00E-03	mg/kg-day	1.E-03
				Antimony	17.02	mg/kg	5.13E-10	mg/kg-day	--	--	--	1.44E-09	mg/kg-day	--	--	--
				Arsenic	5.55	mg/kg	1.67E-10	mg/kg-day	1.50E+01	mg/kg-day $^{-1}$	3.E-09	4.69E-10	mg/kg-day	--	--	--
				Cadmium	1.423	mg/kg	4.29E-11	mg/kg-day	6.30E+00	mg/kg-day $^{-1}$	3.E-10	1.20E-10	mg/kg-day	5.70E-05	mg/kg-day	2.E-06
				Chromium	63.42	mg/kg	1.91E-09	mg/kg-day	4.10E+01	mg/kg-day $^{-1}$	8.E-08	5.36E-09	mg/kg-day	2.90E-05	mg/kg-day	2.E-04
				Cobalt	9.028	mg/kg	2.72E-10	mg/kg-day	9.80E+00	mg/kg-day $^{-1}$	3.E-09	7.62E-10	mg/kg-day	5.70E-06	mg/kg-day	1.E-04
				Copper	672.6	mg/kg	2.03E-08	mg/kg-day	--	--	--	5.68E-08	mg/kg-day	--	--	--
				Iron	27495	mg/kg	8.29E-07	mg/kg-day	--	--	--	2.32E-06	mg/kg-day	--	--	--
				Manganese	705.1	mg/kg	2.13E-08	mg/kg-day	--	--	--	5.95E-08	mg/kg-day	1.43E-05	mg/kg-day	4.E-03
				Vanadium	27.61	mg/kg	8.33E-10	mg/kg-day	--	--	--	2.33E-09	mg/kg-day	--	--	--
				Zinc	1635	mg/kg	4.93E-08	mg/kg-day	--	--	--	1.38E-07	mg/kg-day	--	--	--
				Aroclor 1254	0.7791	mg/kg	2.35E-11	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	5.E-11	6.58E-11	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	1.90E-11	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	4.E-11	5.32E-11	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	5.13E-13	mg/kg-day	3.10E+00	mg/kg-day $^{-1}$	2.E-12	1.44E-12	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	8.45E-13	mg/kg-day	--	--	--	2.36E-12	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	2.50E-14	mg/kg-day	--	--	--	7.01E-14	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.033	mg/kg	9.95E-13	mg/kg-day	--	--	--	2.79E-12	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	1.15E-10	mg/kg-day	--	--	--	3.21E-10	mg/kg-day	--	--	--
			Exp. Route Total								8.E-08					6.E-03
		Exposure Point Total									8.E-08					6.E-03
	Exposure Medium Total										8.E-08					6.E-03
Soil Total											3.E-06					3.E-01
Groundwater	Groundwater	Groundwater used for Tap Water	Ingestion	Perchlorate	4.7	ug/L	1.64E-05	mg/kg-day	--	--	--	4.60E-05	mg/kg-day	7.00E-04	mg/kg-day	7.E-02
				Cobalt	1.9	ug/L	6.64E-06	mg/kg-day	--	--	--	1.86E-05	mg/kg-day	2.00E-02	mg/kg-day	9.E-04
				Iron	26	ug/L	9.09E-05	mg/kg-day	--	--	--	2.54E-04	mg/kg-day	7.00E-01	mg/kg-day	4.E-04
				Chloroform	0.7	ug/L	2.45E-06	mg/kg-day	--	--	--	6.85E-06	mg/kg-day	1.00E-02	mg/kg-day	7.E-04
				Bis(2-chloroethoxy)methane	0.03	ug/L	1.05E-07	mg/kg-day	--	--	--	2.94E-07	mg/kg-day	--	--	--
			Exp. Route Total								--					7.E-02
			Dermal Absorption	Perchlorate	4.7	ug/L	1.31E-08	mg/kg-day	--	--	--	3.68E-08	mg/kg-day	7.00E-04	mg/kg-day	5.E-05
				Cobalt	1.9	ug/L	2.12E-09	mg/kg-day	--	--	--	5.95E-09	mg/kg-day	2.00E-02	mg/kg-day	3.E-07
				Iron	26	ug/L	7.27E-08	mg/kg-day	--	--	--	2.04E-07	mg/kg-day	7.00E-01	mg/kg-day	3.E-07
				Chloroform	0.7	ug/L	3.73E-09	mg/kg-day	--	--	--	1.04E-08	mg/kg-day	1.00E-02	mg/kg-day	1.E-06
				Bis(2-chloroethoxy)methane	0.03	ug/L	3.24E-11	mg/kg-day	--	--	--	9.08E-11	mg/kg-day	--	--	--
			Exp. Route Total								--					5.E-05
		Exposure Point Total									--					7.E-02
	Exposure Medium Total										--					7.E-02
	Air	Upward Migration of Vapors from Groundwater (Indoor) (1)	Inhalation	Chloroform	3.26E-06	mg/m^3	9.11E-08	mg/kg-day	8.10E-02	mg/kg-day $^{-1}$	7.E-09	2.55E-07	mg/kg-day	1.40E-02	mg/kg-day	2.E-05
			Exp. Route Total								7.E-09					2.E-05
		Exposure Point Total									7.E-09					2.E-05
	Exposure Medium Total										7.E-09					2.E-05
Groundwater Total											7.E-09					7.E-02
											Total of Receptor Risks Across All Media					3.E-01
											3.E-06	Total of Receptor Hazards Across All Media				

(1) Receptor assessed using the Johnson and Ettinger Model (see Table E.1-4.6)

TABLE E.1-7.4.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Construction Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Soil	Soil	Ingestion	Aluminum	14,247	mg/kg	6.57E-04	mg/kg-day	--	--	--	4.60E-02	mg/kg-day	1.00E+00	mg/kg-day	5.E-02
				Antimony	17.02	mg/kg	7.85E-07	mg/kg-day	--	--	--	5.50E-05	mg/kg-day	2.00E-04	mg/kg-day	3.E-01
				Arsenic	5.55	mg/kg	2.56E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	4.E-07	1.79E-05	mg/kg-day	3.00E-04	mg/kg-day	6.E-02
				Cadmium	1.423	mg/kg	6.56E-08	mg/kg-day	--	--	--	4.59E-06	mg/kg-day	1.00E-03	mg/kg-day	5.E-03
				Chromium	63.42	mg/kg	2.93E-06	mg/kg-day	--	--	--	2.05E-04	mg/kg-day	2.00E-02	mg/kg-day	1.E-02
				Cobalt	9.028	mg/kg	4.16E-07	mg/kg-day	--	--	--	2.92E-05	mg/kg-day	2.00E-02	mg/kg-day	1.E-03
				Copper	672.6	mg/kg	3.10E-05	mg/kg-day	--	--	--	2.17E-03	mg/kg-day	4.00E-02	mg/kg-day	5.E-02
				Iron	27495	mg/kg	1.27E-03	mg/kg-day	--	--	--	8.88E-02	mg/kg-day	3.00E-01	mg/kg-day	3.E-01
				Manganese	705.1	mg/kg	3.25E-05	mg/kg-day	--	--	--	2.28E-03	mg/kg-day	2.00E-02	mg/kg-day	1.E-01
				Vanadium	27.61	mg/kg	1.27E-06	mg/kg-day	--	--	--	8.92E-05	mg/kg-day	7.00E-03	mg/kg-day	1.E-02
				Zinc	1635	mg/kg	7.54E-05	mg/kg-day	--	--	--	5.28E-03	mg/kg-day	3.00E-01	mg/kg-day	2.E-02
				Aroclor 1254	0.7791	mg/kg	3.59E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	7.E-08	2.52E-06	mg/kg-day	5.00E-05	mg/kg-day	5.E-02
				Aroclor 1260	0.63	mg/kg	2.91E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	6.E-08	2.03E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	7.84E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	6.E-09	5.49E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	1.29E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	9.E-09	9.04E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	3.83E-11	mg/kg-day	--	--	--	2.68E-09	mg/kg-day	1.00E+01	mg/kg-day	3.E-10
				Di-n-octyl Phthalate	0.033	mg/kg	1.52E-09	mg/kg-day	--	--	--	1.07E-07	mg/kg-day	4.00E-01	mg/kg-day	3.E-07
				Nitroglycerin	3.8	mg/kg	1.75E-07	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	3.E-09	1.23E-05	mg/kg-day	1.00E-04	mg/kg-day	1.E-01
			Exp. Route Total								5.E-07					1.E+00
			Dermal Absorption	Aluminum	14,247	mg/kg	1.97E-05	mg/kg-day	--	--	--	1.38E-03	mg/kg-day	1.00E+00	mg/kg-day	1.E-03
				Antimony	17.02	mg/kg	2.36E-08	mg/kg-day	--	--	--	1.65E-06	mg/kg-day	3.00E-05	mg/kg-day	5.E-02
				Arsenic	5.55	mg/kg	2.30E-08	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	3.E-08	1.61E-06	mg/kg-day	3.00E-04	mg/kg-day	5.E-03
				Cadmium	1.423	mg/kg	1.97E-10	mg/kg-day	--	--	--	1.38E-08	mg/kg-day	2.50E-05	mg/kg-day	6.E-04
				Chromium	63.42	mg/kg	8.78E-08	mg/kg-day	--	--	--	6.14E-06	mg/kg-day	5.00E-04	mg/kg-day	1.E-02
				Cobalt	9.028	mg/kg	1.25E-08	mg/kg-day	--	--	--	8.75E-07	mg/kg-day	2.00E-02	mg/kg-day	4.E-05
				Copper	672.6	mg/kg	9.31E-07	mg/kg-day	--	--	--	6.52E-05	mg/kg-day	4.00E-02	mg/kg-day	2.E-03
				Iron	27495	mg/kg	3.80E-05	mg/kg-day	--	--	--	2.66E-03	mg/kg-day	3.00E-01	mg/kg-day	9.E-03
				Manganese	705.1	mg/kg	9.76E-07	mg/kg-day	--	--	--	6.83E-05	mg/kg-day	8.00E-04	mg/kg-day	9.E-02
				Vanadium	27.61	mg/kg	3.82E-08	mg/kg-day	--	--	--	2.67E-06	mg/kg-day	1.80E-04	mg/kg-day	1.E-02
				Zinc	1635	mg/kg	2.26E-06	mg/kg-day	--	--	--	1.58E-04	mg/kg-day	3.00E-01	mg/kg-day	5.E-04
				Aroclor 1254	0.7791	mg/kg	1.51E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	3.E-08	1.06E-06	mg/kg-day	5.00E-05	mg/kg-day	2.E-02
				Aroclor 1260	0.63	mg/kg	1.22E-08	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	2.E-08	8.54E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	3.06E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	2.E-09	2.14E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	5.04E-10	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	4.E-09	3.53E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.15E-11	mg/kg-day	--	--	--	8.04E-10	mg/kg-day	1.00E+01	mg/kg-day	8.E-11
				Di-n-octyl Phthalate	0.033	mg/kg	4.57E-10	mg/kg-day	--	--	--	3.20E-08	mg/kg-day	4.00E-01	mg/kg-day	8.E-08
				Nitroglycerin	3.8	mg/kg	5.26E-09	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	9.E-11	3.68E-07	mg/kg-day	1.00E-04	mg/kg-day	4.E-03
			Exp. Route Total								1.E-07					2.E-01
		Exposure Point Total									6.E-07					1.E+00
	Exposure Medium Total										6.E-07					1.E+00

TABLE E.1-7.4.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Construction Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Fugitive Dust	Inhalation	Aluminum	14,247	mg/kg	2.48E-05	mg/kg-day	--	--	--	1.74E-03	mg/kg-day	1.00E-03	mg/kg-day	2.E+00
				Antimony	17.02	mg/kg	2.96E-08	mg/kg-day	--	--	--	2.07E-06	mg/kg-day	1.10E-04	mg/kg-day	2.E-02
				Arsenic	5.55	mg/kg	9.66E-09	mg/kg-day	1.50E+01	mg/kg-day $^{-1}$	1.E-07	6.76E-07	mg/kg-day	--	--	--
				Cadmium	1.423	mg/kg	2.48E-09	mg/kg-day	6.30E+00	mg/kg-day $^{-1}$	2.E-08	1.73E-07	mg/kg-day	5.70E-05	mg/kg-day	3.E-03
				Chromium	63.42	mg/kg	1.10E-07	mg/kg-day	4.10E+01	mg/kg-day $^{-1}$	5.E-06	7.73E-06	mg/kg-day	2.90E-05	mg/kg-day	3.E-01
				Cobalt	9.028	mg/kg	1.57E-08	mg/kg-day	9.80E+00	mg/kg-day $^{-1}$	2.E-07	1.10E-06	mg/kg-day	5.70E-06	mg/kg-day	2.E-01
				Copper	672.6	mg/kg	1.17E-06	mg/kg-day	--	--	--	8.19E-05	mg/kg-day	--	--	--
				Iron	27495	mg/kg	4.78E-05	mg/kg-day	--	--	--	3.35E-03	mg/kg-day	--	--	--
				Manganese	705.1	mg/kg	1.23E-06	mg/kg-day	--	--	--	8.59E-05	mg/kg-day	1.43E-05	mg/kg-day	6.E+00
				Vanadium	27.61	mg/kg	4.80E-08	mg/kg-day	--	--	--	3.36E-06	mg/kg-day	--	--	--
				Zinc	1635	mg/kg	2.85E-06	mg/kg-day	--	--	--	1.99E-04	mg/kg-day	--	--	--
				Aroclor 1254	0.7791	mg/kg	1.36E-09	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	3.E-09	9.49E-08	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	1.10E-09	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	2.E-09	7.67E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	0.017	mg/kg	2.96E-11	mg/kg-day	3.10E+00	mg/kg-day $^{-1}$	9.E-11	2.07E-09	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	0.028	mg/kg	4.87E-11	mg/kg-day	--	--	--	3.41E-09	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.44E-12	mg/kg-day	--	--	--	1.01E-10	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.033	mg/kg	5.74E-11	mg/kg-day	--	--	--	4.02E-09	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	6.61E-09	mg/kg-day	--	--	--	4.63E-07	mg/kg-day	--	--	--
			Exp. Route Total								5.E-06					8.E+00
		Exposure Point Total									5.E-06					8.E+00
	Exposure Medium Total										5.E-06					8.E+00
Soil Total											5.E-06					9.E+00
Groundwater	Air	Upward Migration of Vapors from Groundwater Trench Vapors (1)	Inhalation	Chloroform	1.03E-05	mg/m^3	1.44E-08	mg/kg-day	8.10E-02	mg/kg-day $^{-1}$	1.E-09	1.01E-06	mg/kg-day	1.40E-02	mg/kg-day	7.E-05
			Exp. Route Total								1.E-09					--
		Exposure Point Total									1.E-09					--
	Exposure Medium Total										1.E-09					--
Groundwater Total											1.E-09					--
										Total of Receptor Risks Across All Media	5.E-06			Total of Receptor Hazards Across All Media		9.E+00

(1) See Table E.1-4.8 for trench vapor calculations

TABLE E.1-7.5.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards - SWMU 45
Reasonable Maximum Exposure - Adult Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Soil	Soil	Ingestion	Aluminum	14,247	mg/kg	6.69E-03	mg/kg-day	--	--	--	1.95E-02	mg/kg-day	1.00E+00	mg/kg-day	2.E-02
				Antimony	17.02	mg/kg	7.99E-06	mg/kg-day	--	--	--	2.33E-05	mg/kg-day	4.00E-04	mg/kg-day	6.E-02
				Arsenic	5.55	mg/kg	2.61E-06	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	4.E-06	7.60E-06	mg/kg-day	3.00E-04	mg/kg-day	3.E-02
				Cadmium	1.423	mg/kg	6.68E-07	mg/kg-day	--	--	--	1.95E-06	mg/kg-day	1.00E-03	mg/kg-day	2.E-03
				Chromium	63.42	mg/kg	2.98E-05	mg/kg-day	--	--	--	8.69E-05	mg/kg-day	3.00E-03	mg/kg-day	3.E-02
				Cobalt	9.028	mg/kg	4.24E-06	mg/kg-day	--	--	--	1.24E-05	mg/kg-day	2.00E-02	mg/kg-day	6.E-04
				Copper	672.6	mg/kg	3.16E-04	mg/kg-day	--	--	--	9.21E-04	mg/kg-day	4.00E-02	mg/kg-day	2.E-02
				Iron	27495	mg/kg	1.29E-02	mg/kg-day	--	--	--	3.77E-02	mg/kg-day	7.00E-01	mg/kg-day	5.E-02
				Manganese	705.1	mg/kg	3.31E-04	mg/kg-day	--	--	--	9.66E-04	mg/kg-day	2.00E-02	mg/kg-day	5.E-02
				Vanadium	27.61	mg/kg	1.30E-05	mg/kg-day	--	--	--	3.78E-05	mg/kg-day	1.00E-03	mg/kg-day	4.E-02
				Zinc	1635	mg/kg	7.68E-04	mg/kg-day	--	--	--	2.24E-03	mg/kg-day	3.00E-01	mg/kg-day	7.E-03
				Aroclor 1254	0.7791	mg/kg	3.66E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	7.E-07	1.07E-06	mg/kg-day	2.00E-05	mg/kg-day	5.E-02
				Aroclor 1260	0.63	mg/kg	2.96E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	6.E-07	8.63E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	7.98E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	6.E-08	2.33E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	1.32E-08	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	1.E-07	3.84E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	3.90E-10	mg/kg-day	--	--	--	1.14E-09	mg/kg-day	1.00E+01	mg/kg-day	1.E-10
				Di-n-octyl Phthalate	0.033	mg/kg	1.55E-08	mg/kg-day	--	--	--	4.52E-08	mg/kg-day	4.00E-02	mg/kg-day	1.E-06
				Nitroglycerin	3.8	mg/kg	1.78E-06	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	3.E-08	5.21E-06	mg/kg-day	1.00E-04	mg/kg-day	5.E-02
			Exp. Route Total								5.E-06					4.E-01
			Dermal Absorption	Aluminum	14,247	mg/kg	2.67E-04	mg/kg-day	--	--	--	7.79E-04	mg/kg-day	1.00E+00	mg/kg-day	8.E-04
				Antimony	17.02	mg/kg	3.19E-07	mg/kg-day	--	--	--	9.30E-07	mg/kg-day	6.00E-05	mg/kg-day	2.E-02
				Arsenic	5.55	mg/kg	3.12E-07	mg/kg-day	1.50E+00	mg/kg-day $^{-1}$	5.E-07	9.10E-07	mg/kg-day	3.00E-04	mg/kg-day	3.E-03
				Cadmium	1.423	mg/kg	2.67E-09	mg/kg-day	--	--	--	7.78E-09	mg/kg-day	2.50E-05	mg/kg-day	3.E-04
				Chromium	63.42	mg/kg	1.19E-06	mg/kg-day	--	--	--	3.47E-06	mg/kg-day	7.50E-05	mg/kg-day	5.E-02
				Cobalt	9.028	mg/kg	1.69E-07	mg/kg-day	--	--	--	4.93E-07	mg/kg-day	2.00E-02	mg/kg-day	2.E-05
				Copper	672.6	mg/kg	1.26E-05	mg/kg-day	--	--	--	3.68E-05	mg/kg-day	4.00E-02	mg/kg-day	9.E-04
				Iron	27495	mg/kg	5.15E-04	mg/kg-day	--	--	--	1.50E-03	mg/kg-day	7.00E-01	mg/kg-day	2.E-03
				Manganese	705.1	mg/kg	1.32E-05	mg/kg-day	--	--	--	3.85E-05	mg/kg-day	8.00E-04	mg/kg-day	5.E-02
				Vanadium	27.61	mg/kg	5.17E-07	mg/kg-day	--	--	--	1.51E-06	mg/kg-day	2.60E-05	mg/kg-day	6.E-02
				Zinc	1635	mg/kg	3.06E-05	mg/kg-day	--	--	--	8.94E-05	mg/kg-day	3.00E-01	mg/kg-day	3.E-04
				Aroclor 1254	0.7791	mg/kg	2.04E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	4.E-07	5.96E-07	mg/kg-day	2.00E-05	mg/kg-day	3.E-02
				Aroclor 1260	0.63	mg/kg	1.65E-07	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	3.E-07	4.82E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	4.14E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	6.E-08	1.21E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	6.82E-09	mg/kg-day	7.30E+00	mg/kg-day $^{-1}$	9.E-08	1.99E-08	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.56E-10	mg/kg-day	--	--	--	4.54E-10	mg/kg-day	1.00E+01	mg/kg-day	5.E-11
				Di-n-octyl Phthalate	0.033	mg/kg	6.18E-09	mg/kg-day	--	--	--	1.80E-08	mg/kg-day	4.00E-02	mg/kg-day	5.E-07
				Nitroglycerin	3.8	mg/kg	7.12E-08	mg/kg-day	1.70E-02	mg/kg-day $^{-1}$	1.E-09	2.08E-07	mg/kg-day	1.00E-04	mg/kg-day	2.E-03
			Exp. Route Total								1.E-06					2.E-01
		Exposure Point Total									7.E-06					6.E-01
	Exposure Medium Total										7.E-06					6.E-01

TABLE E.1-7.5.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards - SWMU 45
Reasonable Maximum Exposure - Adult Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Air	Fugitive Dust	Inhalation	Aluminum	14,247	mg/kg	1.20E-07	mg/kg-day	--	--	--	3.50E-07	mg/kg-day	1.00E-03	mg/kg-day	3.E-04
				Antimony	17.02	mg/kg	1.43E-10	mg/kg-day	--	--	--	4.18E-10	mg/kg-day	--	--	--
				Arsenic	5.55	mg/kg	4.67E-11	mg/kg-day	1.50E+01	mg/kg-day $^{-1}$	7.E-10	1.36E-10	mg/kg-day	--	--	--
				Cadmium	1.423	mg/kg	1.20E-11	mg/kg-day	6.30E+00	mg/kg-day $^{-1}$	8.E-11	3.49E-11	mg/kg-day	5.70E-05	mg/kg-day	6.E-07
				Chromium	63.42	mg/kg	5.33E-10	mg/kg-day	4.10E+01	mg/kg-day $^{-1}$	2.E-08	1.56E-09	mg/kg-day	2.90E-05	mg/kg-day	5.E-05
				Cobalt	9.028	mg/kg	7.59E-11	mg/kg-day	9.80E+00	mg/kg-day $^{-1}$	7.E-10	2.21E-10	mg/kg-day	5.70E-06	mg/kg-day	4.E-05
				Copper	672.6	mg/kg	5.66E-09	mg/kg-day	--	--	--	1.65E-08	mg/kg-day	--	--	--
				Iron	27495	mg/kg	2.31E-07	mg/kg-day	--	--	--	6.75E-07	mg/kg-day	--	--	--
				Manganese	705.1	mg/kg	5.93E-09	mg/kg-day	--	--	--	1.73E-08	mg/kg-day	1.43E-05	mg/kg-day	1.E-03
				Vanadium	27.61	mg/kg	2.32E-10	mg/kg-day	--	--	--	6.77E-10	mg/kg-day	--	--	--
				Zinc	1635	mg/kg	1.38E-08	mg/kg-day	--	--	--	4.01E-08	mg/kg-day	--	--	--
				Aroclor 1254	0.7791	mg/kg	6.55E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	1.E-11	1.91E-11	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	5.30E-12	mg/kg-day	2.00E+00	mg/kg-day $^{-1}$	1.E-11	1.55E-11	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	1.43E-13	mg/kg-day	3.10E+00	mg/kg-day $^{-1}$	8.E-13	4.17E-13	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	2.36E-13	mg/kg-day	--	--	--	6.87E-13	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	6.98E-15	mg/kg-day	--	--	--	2.04E-14	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.033	mg/kg	2.78E-13	mg/kg-day	--	--	--	8.10E-13	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	3.20E-11	mg/kg-day	--	--	--	9.32E-11	mg/kg-day	--	--	--
			Exp. Route Total								2.E-08					2.E-03
		Exposure Point Total									2.E-08					2.E-03
	Exposure Medium Total										2.E-08					2.E-03
Soil Total											7.E-06					6.E-01
Groundwater	Groundwater	Groundwater used for Tap Water	Ingestion	Perchlorate	4.7	ug/L	4.41E-05	mg/kg-day	--	--	--	1.29E-04	mg/kg-day	7.00E-04	mg/kg-day	2.E-01
				Cobalt	1.9	ug/L	1.78E-05	mg/kg-day	--	--	--	5.21E-05	mg/kg-day	2.00E-02	mg/kg-day	3.E-03
				Iron	26	ug/L	2.44E-04	mg/kg-day	--	--	--	7.12E-04	mg/kg-day	7.00E-01	mg/kg-day	1.E-03
				Chloroform	0.7	ug/L	6.58E-06	mg/kg-day	--	--	--	1.92E-05	mg/kg-day	1.00E-02	mg/kg-day	2.E-03
				Bis(2-chloroethoxy)methane	0.03	ug/L	2.82E-07	mg/kg-day	--	--	--	8.22E-07	mg/kg-day	--	--	--
			Exp. Route Total								--					1.9.E-01
			Dermal Absorption	Perchlorate	4.7	ug/L	2.30E-07	mg/kg-day	--	--	--	6.72E-07	mg/kg-day	7.00E-04	mg/kg-day	1.E-03
				Cobalt	1.9	ug/L	3.73E-08	mg/kg-day	--	--	--	1.09E-07	mg/kg-day	2.00E-02	mg/kg-day	5.E-06
				Iron	26	ug/L	1.27E-06	mg/kg-day	--	--	--	3.72E-06	mg/kg-day	7.00E-01	mg/kg-day	5.E-06
				Chloroform	0.7	ug/L	7.44E-08	mg/kg-day	--	--	--	2.17E-07	mg/kg-day	1.00E-02	mg/kg-day	2.E-05
				Bis(2-chloroethoxy)methane	0.03	ug/L	6.04E-10	mg/kg-day	--	--	--	1.76E-09	mg/kg-day	--	--	--
			Exp. Route Total								--					1.E-03
		Exposure Point Total									--					1.9.E-01
	Exposure Medium Total										--					1.9.E-01

TABLE E.1-7.5.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards - SWMU 45
Reasonable Maximum Exposure - Adult Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Upward Migration of Vapors from Groundwater (Indoor) (1)	Inhalation	Chloroform	3.26E-06	mg/m^3	2.08E-07	mg/kg-day	8.10E-02	$mg/kg\text{-}day^{-1}$	2.E-08	6.08E-07	mg/kg-day	1.40E-02	mg/kg-day	4.E-05
			Exp. Route Total								2.E-08					4.E-05
		Exposure Point Total									2.E-08					4.E-05
		Vapors While Showering with Groundwater (2)	Inhalation	Chloroform	5.56E-02	mg/m^3	5.67E-05	mg/kg-day	8.10E-02	$mg/kg\text{-}day^{-1}$	5.E-06	1.32E-04	mg/kg-day	1.40E-02	mg/kg-day	9.E-03
			Exp. Route Total								5.E-06					9.E-03
		Exposure Point Total									5.E-06					9.E-03
	Exposure Medium Total										5.E-06					9.E-03
Groundwater Total											5.E-06					2.0.E-01
											Total of Receptor Risks Across All Media					
											1.E-05	Total of Receptor Hazards Across All Media				8.E-01

* Compounds are carcinogens that act via a mutagenic mode of action; therefore, carcinogenic risk for these compounds were calculated in accordance with "Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens" (USEPA 2005) and example calculations from "Derivation of RBCs for Carcinogens that Act Via a Mutagenic Mode of Action and Incorporate Default ADAFS" (USEPA 2006, Appendix E.3)."

(1) Receptor assessed using the Johnson and Ettinger Model (see Table E.1-4.6)

(2) Receptor assessed using shower model from Foster and Chrostowski (1989) (See Table E.1-4.7)

TABLE E.1-7.6.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Child Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Total Soil	Soil	Soil	Ingestion	Aluminum	14247	mg/kg	1.56E-02	mg/kg-day	--	--	--	1.82E-01	mg/kg-day	1.00E+00	mg/kg-day	2.E-01
				Antimony	17.02	mg/kg	1.87E-05	mg/kg-day	--	--	--	2.18E-04	mg/kg-day	4.00E-04	mg/kg-day	5.E-01
				Arsenic	5.55	mg/kg	6.08E-06	mg/kg-day	1.50E+00	mg/kg-day^{-1}	9.E-06	7.10E-05	mg/kg-day	3.00E-04	mg/kg-day	2.E-01
				Cadmium	1.423	mg/kg	1.56E-06	mg/kg-day	--	--	--	1.82E-05	mg/kg-day	1.00E-03	mg/kg-day	2.E-02
				Chromium	63.42	mg/kg	6.95E-05	mg/kg-day	--	--	--	8.11E-04	mg/kg-day	3.00E-03	mg/kg-day	3.E-01
				Cobalt	9.028	mg/kg	9.89E-06	mg/kg-day	--	--	--	1.15E-04	mg/kg-day	2.00E-02	mg/kg-day	6.E-03
				Copper	672.6	mg/kg	7.37E-04	mg/kg-day	--	--	--	8.60E-03	mg/kg-day	4.00E-02	mg/kg-day	2.E-01
				Iron	27495	mg/kg	3.01E-02	mg/kg-day	--	--	--	3.52E-01	mg/kg-day	7.00E-01	mg/kg-day	5.E-01
				Manganese	705.1	mg/kg	7.73E-04	mg/kg-day	--	--	--	9.01E-03	mg/kg-day	2.00E-02	mg/kg-day	5.E-01
				Vanadium	27.61	mg/kg	3.03E-05	mg/kg-day	--	--	--	3.53E-04	mg/kg-day	1.00E-03	mg/kg-day	4.E-01
				Zinc	1635	mg/kg	1.79E-03	mg/kg-day	--	--	--	2.09E-02	mg/kg-day	3.00E-01	mg/kg-day	7.E-02
				Aroclor 1254	0.7791	mg/kg	8.54E-07	mg/kg-day	2.00E+00	mg/kg-day^{-1}	2.E-06	9.96E-06	mg/kg-day	2.00E-05	mg/kg-day	5.E-01
				Aroclor 1260	0.63	mg/kg	6.90E-07	mg/kg-day	2.00E+00	mg/kg-day^{-1}	1.E-06	8.05E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	1.86E-08	mg/kg-day	7.30E+00	mg/kg-day^{-1}	7.E-07	2.17E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	3.07E-08	mg/kg-day	7.30E+00	mg/kg-day^{-1}	1.E-06	3.58E-07	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	9.10E-10	mg/kg-day	--	--	--	1.06E-08	mg/kg-day	1.00E+01	mg/kg-day	1.E-09
				Di-n-octyl Phthalate	0.033	mg/kg	3.62E-08	mg/kg-day	--	--	--	4.22E-07	mg/kg-day	4.00E-02	mg/kg-day	1.E-05
				Nitroglycerin	3.8	mg/kg	4.16E-06	mg/kg-day	1.70E-02	mg/kg-day^{-1}	7.E-08	4.86E-05	mg/kg-day	1.00E-04	mg/kg-day	5.E-01
			Exp. Route Total								1.E-05					3.8.E+00
			Dermal Absorption	Aluminum	14247	mg/kg	4.37E-04	mg/kg-day	--	--	--	5.10E-03	mg/kg-day	1.00E+00	mg/kg-day	5.E-03
				Antimony	17.02	mg/kg	5.22E-07	mg/kg-day	--	--	--	6.09E-06	mg/kg-day	6.00E-05	mg/kg-day	1.E-01
				Arsenic	5.55	mg/kg	5.11E-07	mg/kg-day	1.50E+00	mg/kg-day^{-1}	8.E-07	5.96E-06	mg/kg-day	3.00E-04	mg/kg-day	2.E-02
				Cadmium	1.423	mg/kg	4.37E-09	mg/kg-day	--	--	--	5.09E-08	mg/kg-day	2.50E-05	mg/kg-day	2.E-03
				Chromium	63.42	mg/kg	1.95E-06	mg/kg-day	--	--	--	2.27E-05	mg/kg-day	7.50E-05	mg/kg-day	3.E-01
				Cobalt	9.028	mg/kg	2.77E-07	mg/kg-day	--	--	--	3.23E-06	mg/kg-day	2.00E-02	mg/kg-day	2.E-04
				Copper	672.6	mg/kg	2.06E-05	mg/kg-day	--	--	--	2.41E-04	mg/kg-day	4.00E-02	mg/kg-day	6.E-03
				Iron	27495	mg/kg	8.44E-04	mg/kg-day	--	--	--	9.84E-03	mg/kg-day	7.00E-01	mg/kg-day	1.E-02
				Manganese	705.1	mg/kg	2.16E-05	mg/kg-day	--	--	--	2.52E-04	mg/kg-day	8.00E-04	mg/kg-day	3.E-01
				Vanadium	27.61	mg/kg	8.47E-07	mg/kg-day	--	--	--	9.88E-06	mg/kg-day	2.60E-05	mg/kg-day	4.E-01
				Zinc	1635	mg/kg	5.02E-05	mg/kg-day	--	--	--	5.85E-04	mg/kg-day	3.00E-01	mg/kg-day	2.E-03
				Aroclor 1254	0.7791	mg/kg	3.35E-07	mg/kg-day	2.00E+00	mg/kg-day^{-1}	7.E-07	3.90E-06	mg/kg-day	2.00E-05	mg/kg-day	2.E-01
				Aroclor 1260	0.63	mg/kg	2.71E-07	mg/kg-day	2.00E+00	mg/kg-day^{-1}	5.E-07	3.16E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	6.78E-09	mg/kg-day	7.30E+00	mg/kg-day^{-1}	3.E-07	7.91E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	1.12E-08	mg/kg-day	7.30E+00	mg/kg-day^{-1}	4.E-07	1.30E-07	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	2.55E-10	mg/kg-day	--	--	--	2.97E-09	mg/kg-day	1.00E+01	mg/kg-day	3.E-10
				Di-n-octyl Phthalate	0.033	mg/kg	1.01E-08	mg/kg-day	--	--	--	1.18E-07	mg/kg-day	4.00E-02	mg/kg-day	3.E-06
				Nitroglycerin	3.8	mg/kg	1.17E-07	mg/kg-day	1.70E-02	mg/kg-day^{-1}	2.E-09	1.36E-06	mg/kg-day	1.00E-04	mg/kg-day	1.E-02
			Exp. Route Total								3.E-06					1.E+00
		Exposure Point Total									2.E-05					5.2.E+00
	Exposure Medium Total										2.E-05					5.2.E+00

TABLE E.1-7.6.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Child Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Fugitive Dust	Inhalation	Aluminum	14247	mg/kg	2.53E-07	mg/kg-day	--	--	--	2.95E-06	mg/kg-day	1.00E-03	mg/kg-day	3.E-03
				Antimony	17.02	mg/kg	3.02E-10	mg/kg-day	--	--	--	3.52E-09	mg/kg-day	--	--	--
				Arsenic	5.55	mg/kg	9.84E-11	mg/kg-day	1.50E+01	mg/kg-day^{-1}	1.E-09	1.15E-09	mg/kg-day	--	--	--
				Cadmium	1.423	mg/kg	2.52E-11	mg/kg-day	6.30E+00	mg/kg-day^{-1}	2.E-10	2.94E-10	mg/kg-day	5.70E-05	mg/kg-day	5.E-06
				Chromium	63.42	mg/kg	1.12E-09	mg/kg-day	4.10E+01	mg/kg-day^{-1}	5.E-08	1.31E-08	mg/kg-day	2.90E-05	mg/kg-day	5.E-04
				Cobalt	9.028	mg/kg	1.60E-10	mg/kg-day	9.80E+00	mg/kg-day^{-1}	2.E-09	1.87E-09	mg/kg-day	5.70E-06	mg/kg-day	3.E-04
				Copper	672.6	mg/kg	1.19E-08	mg/kg-day	--	--	--	1.39E-07	mg/kg-day	--	--	--
				Iron	27495	mg/kg	4.88E-07	mg/kg-day	--	--	--	5.69E-06	mg/kg-day	--	--	--
				Manganese	705.1	mg/kg	1.25E-08	mg/kg-day	--	--	--	1.46E-07	mg/kg-day	1.43E-05	mg/kg-day	1.E-02
				Vanadium	27.61	mg/kg	4.90E-10	mg/kg-day	--	--	--	5.71E-09	mg/kg-day	--	--	--
				Zinc	1635	mg/kg	2.90E-08	mg/kg-day	--	--	--	3.38E-07	mg/kg-day	--	--	--
				Aroclor 1254	0.7791	mg/kg	1.38E-11	mg/kg-day	2.00E+00	mg/kg-day^{-1}	3.E-11	1.61E-10	mg/kg-day	--	--	--
				Aroclor 1260	0.63	mg/kg	1.12E-11	mg/kg-day	2.00E+00	mg/kg-day^{-1}	2.E-11	1.30E-10	mg/kg-day	--	--	--
				Benzo(a)pyrene*	0.017	mg/kg	3.01E-13	mg/kg-day	3.10E+00	mg/kg-day^{-1}	5.E-12	3.52E-12	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene*	0.028	mg/kg	4.97E-13	mg/kg-day	--	--	--	5.79E-12	mg/kg-day	--	--	--
				Dimethyl Phthalate	0.00083	mg/kg	1.47E-14	mg/kg-day	--	--	--	1.72E-13	mg/kg-day	--	--	--
				Di-n-octyl Phthalate	0.033	mg/kg	5.85E-13	mg/kg-day	--	--	--	6.83E-12	mg/kg-day	--	--	--
				Nitroglycerin	3.8	mg/kg	6.74E-11	mg/kg-day	--	--	--	7.86E-10	mg/kg-day	--	--	--
			Exp. Route Total								5.E-08					1.E-02
		Exposure Point Total									5.E-08					1.E-02
	Exposure Medium Total										5.E-08					1.E-02
Soil Total											2.E-05					5.2.E+00
Groundwater	Groundwater	Groundwater used Upward Migration of	Ingestion	Perchlorate	4.7	ug/L	2.58E-05	mg/kg-day	--	--	--	3.00E-04	mg/kg-day	7.00E-04	mg/kg-day	4.E-01
				Cobalt	1.9	ug/L	1.04E-05	mg/kg-day	--	--	--	1.21E-04	mg/kg-day	2.00E-02	mg/kg-day	6.E-03
				Iron	26	ug/L	1.42E-04	mg/kg-day	--	--	--	1.66E-03	mg/kg-day	7.00E-01	mg/kg-day	2.E-03
				Chloroform	0.7	ug/L	3.84E-06	mg/kg-day	--	--	--	4.47E-05	mg/kg-day	1.00E-02	mg/kg-day	4.E-03
				Bis(2-chloroethoxy)methane	0.03	ug/L	1.64E-07	mg/kg-day	--	--	--	1.92E-06	mg/kg-day	--	--	--
			Exp. Route Total								--					4.E-01
			Dermal Absorption	Perchlorate	4.7	ug/L	1.70E-07	mg/kg-day	--	--	--	1.98E-06	mg/kg-day	7.00E-04	mg/kg-day	3.E-03
				Cobalt	1.9	ug/L	2.75E-08	mg/kg-day	--	--	--	3.21E-07	mg/kg-day	2.00E-02	mg/kg-day	2.E-05
				Iron	26	ug/L	9.40E-07	mg/kg-day	--	--	--	1.10E-05	mg/kg-day	7.00E-01	mg/kg-day	2.E-05
				Chloroform	0.7	ug/L	4.83E-08	mg/kg-day	--	--	--	5.63E-07	mg/kg-day	1.00E-02	mg/kg-day	6.E-05
				Bis(2-chloroethoxy)methane	0.03	ug/L	4.20E-10	mg/kg-day	--	--	--	4.89E-09	mg/kg-day	--	--	--
			Exp. Route Total								--					3.E-03
		Exposure Point Total									--					4.E-01
	Exposure Medium Total										--					4.E-01
	Air	Upward Migration of Vapors from Groundwater (Indoor) (1)	Inhalation	Chloroform	3.26E-06	mg/m^3	1.61E-07	mg/kg-day	8.10E-02	mg/kg-day^{-1}	1.E-08	1.88E-06	mg/kg-day	1.40E-02	mg/kg-day	1.E-04
			Exp. Route Total								1.E-08					1.E-04
		Exposure Point Total									1.E-08					1.E-04
	Exposure Medium Total										1.E-08					1.E-04
Groundwater Total											1.E-08					4.E-01
											Total of Receptor Risks Across All Media					2.E-05
												Total of Receptor Hazards Across All Media				5.6.E+00

* Compounds are carcinogens that act via a mutagenic mode of action; therefore, carcinogenic risk for these compounds were calculated in accordance with "Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens" (USEPA 2005) and example calculations from "Derivation of RBCs for Carcinogens that Act Via a Mutagenic Mode of Action and Incorporate Default ADAFS" (USEPA 2006, Appendix E.3)."
(1) Receptor assessed using the Johnson and Ettinger Model (see Table E.1-4.6)

TABLE E.1-7.7.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Lifetime Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe Future
Receptor Population Resident
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk
Total Soil	Soil	Soil	Ingestion	Aluminum	14247	mg/kg	--
				Antimony	17.02	mg/kg	--
				Arsenic	5.55	mg/kg	1.E-05
				Cadmium	1.423	mg/kg	--
				Chromium	63.42	mg/kg	--
				Cobalt	9.028	mg/kg	--
				Copper	672.6	mg/kg	--
				Iron	27495	mg/kg	--
				Manganese	705.1	mg/kg	--
				Vanadium	27.61	mg/kg	--
				Zinc	1635	mg/kg	--
				Aroclor 1254	0.7791	mg/kg	2.E-06
				Aroclor 1260	0.63	mg/kg	2.E-06
				Benzo(a)pyrene*	0.017	mg/kg	8.E-07
				Dibenz(a,h)anthracene*	0.028	mg/kg	1.E-06
				Dimethyl Phthalate	0.00083	mg/kg	--
				Di-n-octyl Phthalate	0.033	mg/kg	--
				Nitroglycerin	3.8	mg/kg	1.E-07
			Exp. Route Total				2.E-05
			Dermal Absorption	Aluminum	14247	mg/kg	--
				Antimony	17.02	mg/kg	--
				Arsenic	5.55	mg/kg	1.E-06
				Cadmium	1.423	mg/kg	--
				Chromium	63.42	mg/kg	--
				Cobalt	9.028	mg/kg	--
				Copper	672.6	mg/kg	--
				Iron	27495	mg/kg	--
				Manganese	705.1	mg/kg	--
				Vanadium	27.61	mg/kg	--
				Zinc	1635	mg/kg	--
				Aroclor 1254	0.7791	mg/kg	1.E-06
				Aroclor 1260	0.63	mg/kg	9.E-07
				Benzo(a)pyrene*	0.017	mg/kg	3.E-07
				Dibenz(a,h)anthracene*	0.028	mg/kg	5.E-07
				Dimethyl Phthalate	0.00083	mg/kg	--
				Di-n-octyl Phthalate	0.033	mg/kg	--
				Nitroglycerin	3.8	mg/kg	3.E-09
			Exp. Route Total				4.E-06
		Exposure Point Total					2.E-05
	Exposure Medium Total						2.E-05
Total Soil Cont.	Air	Fugitive Dust	Inhalation	Aluminum	14247	mg/kg	--
				Antimony	17.02	mg/kg	--
				Arsenic	5.55	mg/kg	2.E-09
				Cadmium	1.423	mg/kg	2.E-10
				Chromium	63.42	mg/kg	7.E-08
				Cobalt	9.028	mg/kg	2.E-09
				Copper	672.6	mg/kg	--
				Iron	27495	mg/kg	--
				Manganese	705.1	mg/kg	--
				Vanadium	27.61	mg/kg	--
				Zinc	1635	mg/kg	--
				Aroclor 1254	0.7791	mg/kg	4.E-11
				Aroclor 1260	0.63	mg/kg	3.E-11
				Benzo(a)pyrene*	0.017	mg/kg	6.E-12
				Dibenz(a,h)anthracene*	0.028	mg/kg	--
				Dimethyl Phthalate	0.00083	mg/kg	--
				Di-n-octyl Phthalate	0.033	mg/kg	--
				Nitroglycerin	3.8	mg/kg	--
			Exp. Route Total				7.E-08
		Exposure Point Total					7.E-08
	Exposure Medium Total						7.E-08
Soil Total							2.E-05

TABLE E.1-7.7.RME
Calculation of Chemical Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure - Lifetime Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe	Future
Receptor Population	Resident
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk
Groundwater	Groundwater	Groundwater used for Tap Water	Ingestion	Perchlorate	4.7	ug/L	--
				Cobalt	1.9	ug/L	--
				Iron	26	ug/L	--
				Chloroform	0.7	ug/L	--
				Bis(2-chloroethoxy)methane	0.03	ug/L	--
			Exp. Route Total				--
			Dermal Absorption	Perchlorate	4.7	ug/L	--
				Cobalt	1.9	ug/L	--
				Iron	26	ug/L	--
				Chloroform	0.7	ug/L	--
				Bis(2-chloroethoxy)methane	0.03	ug/L	--
			Exp. Route Total				--
		Exposure Point Total					--
	Exposure Medium Total						--
	Air	Upward Migration of Vapors from Groundwater (Indoor) (1)	Inhalation	Chloroform	3.26E-06	mg/m^3	3.E-08
			Exp. Route Total				3.E-08
		Exposure Point Total					3.E-08
		Vapors While Showering with Groundwater (2)	Inhalation	Chloroform	0.06	mg/m^3	5.E-06
			Exp. Route Total				5.E-06
		Exposure Point Total					5.E-06
	Exposure Medium Total						5.E-06
Groundwater Total							5.E-06
							3.E-05

* Compounds are carcinogens that act via a mutagenic mode of action; therefore, carcinogenic risk for these compounds were calculated in accordance with "Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens" (USEPA 2005) and example calculations from "Derivation of RBCs for Carcinogens that Act Via a Mutagenic Mode of Action and Incorporate Default ADAFS" (USEPA 2006, Appendix E.3)."

(1) Receptor assessed using the Johnson and Ettinger Model (see Table E.1-4.6)

(2) Receptor assessed using shower model from Foster and Chrostowski (1989) (See Table E.1-4.7)

TABLE E.1-9.1.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Current
Receptor Population:	Maintenance Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	3.E-03	--	9.E-05	3.E-03
			Antimony	--	--	--	--	Antimony	blood	1.E-03	--	3.E-04	2.E-03
			Arsenic	7.9.E-07	--	8.E-08	9.E-07	Arsenic	skin/ vascular	5.E-03	--	5.E-04	5.E-03
			Cadmium	--	--	--	--	Cadmium	kidney	4.E-04	--	6.E-05	5.E-04
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	3.E-03	--	3.E-03	6.E-03
			Cobalt	--	--	--	--	Cobalt	blood	8.E-05	--	3.E-06	9.E-05
			Copper	--	--	--	--	Copper	GI tract	5.E-03	--	2.E-04	6.E-03
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	9.E-03	--	3.E-04	9.E-03
			Manganese	--	--	--	--	Manganese	CNS	8.E-03	--	7.E-03	1.E-02
			Vanadium	--	--	--	--	Vanadium	kidney	6.E-03	--	8.E-03	1.E-02
			Zinc	--	--	--	--	Zinc	blood	8.E-04	--	3.E-05	8.E-04
			Aroclor 1254	1.0.E-07	--	5.E-08	1.E-07	Aroclor 1254	eyes	7.E-03	--	3.E-03	1.E-02
			Aroclor 1260	8.8.E-08	--	4.E-08	1.E-07	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	1.3.E-08	--	5.E-09	2.E-08	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.4.E-08	--	6.E-09	2.E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	2.E-11	--	5.E-12	2.E-11
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	1.E-07	--	4.E-08	2.E-07
			Nitroglycerin	4.5.E-09	--	1.E-10	5.E-09	Nitroglycerin	vascular	7.E-03	--	2.E-04	8.E-03
				1.E-06	--	2.E-07	1.2.E-06			6.E-02	--	2.E-02	8.E-02
		Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	2.E-04	--	2.E-04
			Antimony	--	--	--	--	Antimony	NA	--	--	--	--
			Arsenic	--	7.E-10	--	7.E-10	Arsenic	NA	--	--	--	--
			Cadmium	--	9.E-11	--	9.E-11	Cadmium	respiratory/ kidney/ liver	--	7.E-07	--	7.E-07
			Chromium	--	1.E-08	--	1.E-08	Chromium	respiratory	--	2.E-05	--	2.E-05
			Cobalt	--	5.E-10	--	5.E-10	Cobalt	respiratory	--	3.E-05	--	3.E-05
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	1.E-03	--	1.E-03
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	9.E-12	--	9.E-12	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	8.E-12	--	8.E-12	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	--	5.E-13	--	5.E-13	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
				--	1.E-08	--	1.E-08			--	1.E-03	--	1.E-03
						Total Risk Across Soil	1.E-06					Total Hazard Index Across Soil	8.E-02

Total Risk Across All Media and All Exposure Routes	1.E-06
Total Hazard Index Across All Media and All Exposure Routes	8.E-02

Total blood HI across all media =	1.E-02
Total CNS HI across all media =	2.E-02
Total thyroid HI across all media =	2.E-07
Total skin HI across all media =	5.E-03
Total respiratory HI across all media =	5.E-05
Total GI tract HI across all media =	2.E-02
Total kidney HI across all media =	1.E-02
Total liver HI across all media =	2.E-02
Total vascular HI across all media =	1.E-02
Total eyes HI across all media =	1.E-02
Total bone marrow HI across all media =	6.E-03
Total fetus HI across all media =	6.E-03

TABLE E.1-9.2.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Maintenance Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Maintenance Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	3.E-03	--	9.E-05	3.E-03
			Antimony	--	--	--	--	Antimony	blood	8.E-03	--	2.E-03	1.E-02
			Arsenic	5.8.E-07	--	6.E-08	6.E-07	Arsenic	skin/ vascular	4.E-03	--	4.E-04	4.E-03
			Cadmium	--	--	--	--	Cadmium	kidney	3.E-04	--	4.E-05	3.E-04
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	4.E-03	--	5.E-03	1.E-02
			Cobalt	--	--	--	--	Cobalt	blood	9.E-05	--	3.E-06	9.E-05
			Copper	--	--	--	--	Copper	GI tract	3.E-03	--	1.E-04	3.E-03
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	8.E-03	--	3.E-04	8.E-03
			Manganese	--	--	--	--	Manganese	CNS	7.E-03	--	6.E-03	1.E-02
			Vanadium	--	--	--	--	Vanadium	kidney	5.E-03	--	7.E-03	1.E-02
			Zinc	--	--	--	--	Zinc	blood	1.E-03	--	4.E-05	1.E-03
			Aroclor 1254	1.1.E-07	--	5.E-08	2.E-07	Aroclor 1254	eyes	8.E-03	--	4.E-03	1.E-02
			Aroclor 1260	8.8.E-08	--	4.E-08	1.E-07	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	8.7.E-09	--	4.E-09	1.E-08	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.4.E-08	--	6.E-09	2.E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	2.E-11	--	5.E-12	2.E-11
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	2.E-07	--	5.E-08	2.E-07
			Nitroglycerin	4.5.E-09	--	1.E-10	5.E-09	Nitroglycerin	vascular	7.E-03	--	2.E-04	8.E-03
				8.E-07	--	2.E-07	9.6.E-07			6.E-02	--	2.E-02	8.E-02
		Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	3.E-04	--	3.E-04
			Antimony	--	--	--	--	Antimony	NA	--	--	--	--
			Arsenic	--	5.E-10	--	5.E-10	Arsenic	NA	--	--	--	--
			Cadmium	--	6.E-11	--	6.E-11	Cadmium	respiratory/ kidney/ liver	--	4.E-07	--	4.E-07
			Chromium	--	2.E-08	--	2.E-08	Chromium	respiratory	--	4.E-05	--	4.E-05
			Cobalt	--	6.E-10	--	6.E-10	Cobalt	respiratory	--	3.E-05	--	3.E-05
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	9.E-04	--	9.E-04
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	1.E-11	--	1.E-11	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	8.E-12	--	8.E-12	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	--	3.E-13	--	3.E-13	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
				--	2.E-08	--	2.E-08			--	1.E-03	--	1.E-03
						Total Risk Across Soil	1.E-06					Total Hazard Index Across Soil	8.E-02

Total Risk Across All Media and All Exposure Routes	1.E-06

Total Hazard Index Across All Media and All Exposure Routes	8.E-02

Total blood HI across all media =	2.E-02
Total CNS HI across all media =	2.E-02
Total thyroid HI across all media =	2.E-07
Total skin HI across all media =	4.E-03
Total respiratory HI across all media =	7.E-05
Total GI tract HI across all media =	2.E-02
Total kidney HI across all media =	1.E-02
Total liver HI across all media =	2.E-02
Total vascular HI across all media =	1.E-02
Total eyes HI across all media =	1.E-02
Total bone marrow HI across all media =	1.E-02
Total fetus HI across all media =	1.E-02

TABLE E.1-9.3.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Commercial Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Commercial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	7.E-03	--	5.E-04	7.E-03
			Antimony	--	--	--	--	Antimony	blood	2.E-02	--	9.E-03	3.E-02
			Arsenic	1.E-06	--	3.E-07	2.E-06	Arsenic	skin/ vascular	9.E-03	--	2.E-03	1.E-02
			Cadmium	--	--	--	--	Cadmium	kidney	7.E-04	--	2.E-04	9.E-04
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	1.E-02	--	3.E-02	4.E-02
			Cobalt	--	--	--	--	Cobalt	blood	2.E-04	--	1.E-05	2.E-04
			Copper	--	--	--	--	Copper	GI tract	8.E-03	--	5.E-04	9.E-03
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	2.E-02	--	1.E-03	2.E-02
			Manganese	--	--	--	--	Manganese	CNS	2.E-02	--	3.E-02	5.E-02
			Vanadium	--	--	--	--	Vanadium	kidney	1.E-02	--	3.E-02	5.E-02
			Zinc	--	--	--	--	Zinc	blood	3.E-03	--	2.E-04	3.E-03
			Aroclor 1254	3.E-07	--	3.E-07	5.E-07	Aroclor 1254	eyes	2.E-02	--	2.E-02	4.E-02
			Aroclor 1260	2.E-07	--	2.E-07	4.E-07	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	2.E-08	--	2.E-08	4.E-08	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	4.E-08	--	3.E-08	7.E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	4.E-11	--	3.E-11	7.E-11
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	4.E-07	--	3.E-07	7.E-07
			Nitroglycerin	1.E-08	--	7.E-10	1.E-08	Nitroglycerin	vascular	2.E-02	--	1.E-03	2.E-02
			Total	2.0.E-06	--	8.E-07	3.E-06	Total		1.E-01	--	1.E-01	3.E-01
	Air	Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	1.E-03	--	1.E-03
			Antimony	--	--	--	--	Antimony	NA	--	--	--	--
			Arsenic	--	3.E-09	--	3.E-09	Arsenic	NA	--	--	--	--
			Cadmium	--	3.E-10	--	3.E-10	Cadmium	respiratory/ kidney/ liver	--	2.E-06	--	2.E-06
			Chromium	--	8.E-08	--	8.E-08	Chromium	respiratory	--	2.E-04	--	2.E-04
			Cobalt	--	3.E-09	--	3.E-09	Cobalt	respiratory	--	1.E-04	--	1.E-04
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	4.E-03	--	4.E-03
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	5.E-11	--	5.E-11	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	4.E-11	--	4.E-11	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	--	2.E-12	--	2.E-12	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
			Total	--	8.E-08	--	8.E-08	Total		--	6.E-03	--	6.E-03
Groundwater	Groundwater	Groundwater used as tapwater	Perchlorate	--	--	--	--	Perchlorate	thyroid	7.E-02	--	5.E-05	7.E-02
			Cobalt	--	--	--	--	Cobalt	blood	9.E-04	--	3.E-07	9.E-04
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	4.E-04	--	3.E-07	4.E-04
			Chloroform	--	--	--	--	Chloroform	liver	7.E-04	--	1.E-06	7.E-04
			Bis(2-chloroethoxy)methane	--	--	--	--	Bis(2-chloroethoxy)methane	NA	--	--	--	--
			Total	--	--	--	--	Total		7.E-02	--	5.E-05	7.E-02
	Air	Air (Indoor Air)	Chloroform	--	7.E-09	--	7.E-09	Chloroform	respiratory	--	2.E-05	--	2.E-05
				--	7.E-09	--	7.E-09			--	2.E-05	--	2.E-05
							Total Risk Across Soil						Total Hazard Index Across Soil
							3.E-06						3.E-01
							Total Risk Across Groundwater						Total Hazard Index Across Groundwater
							7.E-09						7.E-02

Total Risk Across All Media and All Exposure Routes	3.E-06
Total Hazard Index Across All Media and All Exposure Routes	3.E-01

Total blood HI across all media =	5.E-02
Total CNS HI across all media =	6.E-02
Total thyroid HI across all media =	7.E-02
Total skin HI across all media =	1.E-02
Total respiratory HI across all media =	3.E-04
Total GI tract HI across all media =	7.E-02
Total kidney HI across all media =	5.E-02
Total liver HI across all media =	6.E-02
Total vascular HI across all media =	3.E-02
Total eyes HI across all media =	4.E-02
Total bone marrow HI across all media =	4.E-02
Total fetus HI across all media =	4.E-02

TABLE E.1-9.4.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Construction Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	5.E-02	--	1.E-03	5.E-02
			Antimony	--	--	--	--	Antimony	blood	3.E-01	--	5.E-02	3.E-01
			Arsenic	4.E-07	--	3.E-08	4.E-07	Arsenic	skin/ vascular	6.E-02	--	5.E-03	7.E-02
			Cadmium	--	--	--	--	Cadmium	kidney	5.E-03	--	6.E-04	5.E-03
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	1.E-02	--	1.E-02	2.E-02
			Cobalt	--	--	--	--	Cobalt	blood	1.E-03	--	4.E-05	2.E-03
			Copper	--	--	--	--	Copper	GI tract	5.E-02	--	2.E-03	6.E-02
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	3.E-01	--	9.E-03	3.E-01
			Manganese	--	--	--	--	Manganese	CNS	1.E-01	--	9.E-02	2.E-01
			Vanadium	--	--	--	--	Vanadium	kidney	1.E-02	--	1.E-02	3.E-02
			Zinc	--	--	--	--	Zinc	blood	2.E-02	--	5.E-04	2.E-02
			Aroclor 1254	7.E-08	--	3.E-08	1.E-07	Aroclor 1254	eyes	5.E-02	--	2.E-02	7.E-02
			Aroclor 1260	6.E-08	--	2.E-08	8.E-08	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	6.E-09	--	2.E-09	8.E-09	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	9.E-09	--	4.E-09	1.E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	3.E-10	--	8.E-11	3.E-10
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	3.E-07	--	8.E-08	3.E-07
			Nitroglycerin	3.E-09	--	9.E-11	3.E-09	Nitroglycerin	vascular	1.E-01	--	4.E-03	1.E-01
			Total	5.E-07	--	1.E-07	6.E-07	Total		1.E+00	--	2.E-01	1.E+00
	Air	Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	1.7.E+00	--	1.7.E+00
			Antimony	--	--	--	--	Antimony	NA	--	2.E-02	--	2.E-02
			Arsenic	--	1.E-07	--	1.E-07	Arsenic	NA	--	--	--	--
			Cadmium	--	2.E-08	--	2.E-08	Cadmium	respiratory/ kidney/ liver	--	3.E-03	--	3.E-03
			Chromium	--	5.E-06	--	5.E-06	Chromium	respiratory	--	3.E-01	--	3.E-01
			Cobalt	--	2.E-07	--	2.E-07	Cobalt	respiratory	--	2.E-01	--	2.E-01
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	6.E+00	--	6.E+00
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	3.E-09	--	3.E-09	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	2.E-09	--	2.E-09	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene	--	9.E-11	--	9.E-11	Benzo(a)pyrene	NA	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
			Total	--	5.E-06	--	5.E-06	Total		--	8.2.E+00	--	8.E+00
Groundwater	Air	Groundwater Air (Trench Air)	Chloroform	--	1.E-09	--	1.E-09	Chloroform	respiratory	--	7.E-05	--	7.E-05
				--	1.E-09	--	1.E-09			--	7.E-05	--	7.E-05
						Total Risk Across Soil	5.E-06					Total Hazard Index Across Soil	9.E+00
						Total Risk Across Groundwater	1.E-09					Total Hazard Index Across Groundwater	7.E-05
						Total Risk Across All Media and All Exposure Routes	5.E-06					Total Hazard Index Across All Media and All Exposure Routes	9.E+00

Total blood HI across all media =	7.E-01
Total CNS HI across all media =	8.E+00
Total thyriod HI across all media =	3.E-07
Total skin HI across all media =	7.E-02
Total respiratory HI across all media =	5.E-01
Total GI tract HI across all media =	4.E-01
Total kidney HI across all media =	4.E-02
Total liver HI across all media =	3.E-01
Total vascular HI across all media =	2.E-01
Total eyes HI across all media =	7.E-02
Total bone marrow HI across all media =	2.E-02
Total fetus HI across all media =	2.E-02

TABLE E.1-9.5.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Adult Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	2.E-02	--	8.E-04	2.E-02
			Antimony	--	--	--	--	Antimony	blood	6.E-02	--	2.E-02	7.E-02
			Arsenic	4.E-06	--	5.E-07	4.E-06	Arsenic	skin/ vascular	3.E-02	--	3.E-03	3.E-02
			Cadmium	--	--	--	--	Cadmium	kidney	2.E-03	--	3.E-04	2.E-03
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	3.E-02	--	5.E-02	8.E-02
			Cobalt	--	--	--	--	Cobalt	blood	6.E-04	--	2.E-05	6.E-04
			Copper	--	--	--	--	Copper	GI tract	2.E-02	--	9.E-04	2.E-02
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	5.E-02	--	2.E-03	6.E-02
			Manganese	--	--	--	--	Manganese	CNS	5.E-02	--	5.E-02	1.E-01
			Vanadium	--	--	--	--	Vanadium	kidney	4.E-02	--	6.E-02	1.E-01
			Zinc	--	--	--	--	Zinc	blood	7.E-03	--	3.E-04	8.E-03
			Aroclor 1254	7.E-07	--	4.E-07	1.E-06	Aroclor 1254	eyes	5.E-02	--	3.E-02	8.E-02
			Aroclor 1260	6.E-07	--	3.E-07	9.E-07	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene*	6.E-08	--	6.E-08	1.E-07	Benzo(a)pyrene*	NA	--	--	--	--
			Dibenz(a,h)anthracene*	1.E-07	--	9.E-08	2.E-07	Dibenz(a,h)anthracene*	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	1.E-10	--	5.E-11	2.E-10
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	1.E-06	--	5.E-07	2.E-06
			Nitroglycerin	3.E-08	--	1.E-09	3.E-08	Nitroglycerin	vascular	5.E-02	--	2.E-03	5.E-02
			Total	5.E-06	--	1.E-06	7.E-06	Total		4.E-01	--	2.E-01	6.E-01
	Air	Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	3.E-04	--	3.E-04
			Antimony	--	--	--	--	Antimony	NA	--	--	--	--
			Arsenic	--	7.E-10	--	7.E-10	Arsenic	NA	--	--	--	--
			Cadmium	--	8.E-11	--	8.E-11	Cadmium	respiratory/ kidney/ liver	--	6.E-07	--	6.E-07
			Chromium	--	2.E-08	--	2.E-08	Chromium	respiratory	--	5.E-05	--	5.E-05
			Cobalt	--	7.E-10	--	7.E-10	Cobalt	respiratory	--	4.E-05	--	4.E-05
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	1.E-03	--	1.E-03
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	1.E-11	--	1.E-11	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	1.E-11	--	1.E-11	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene*	--	8.E-13	--	8.E-13	Benzo(a)pyrene*	NA	--	--	--	--
			Dibenz(a,h)anthracene*	--	--	--	--	Dibenz(a,h)anthracene*	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
			Total	--	2.E-08	--	2.E-08	Total		--	2.E-03	--	2.E-03
Groundwater	Groundwater	Groundwater used as tapwater	Perchlorate	--	--	--	--	Perchlorate	thyroid	2.E-01	--	1.E-03	2.E-01
			Cobalt	--	--	--	--	Cobalt	blood	3.E-03	--	5.E-06	3.E-03
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	1.E-03	--	5.E-06	1.E-03
			Chloroform	--	--	--	--	Chloroform	liver	2.E-03	--	2.E-05	2.E-03
			Bis(2-chloroethoxy)methane	--	--	--	--	Bis(2-chloroethoxy)methane	NA	--	--	--	--
			Total	--	--	--	--	Total		1.9.E-01	--	1.E-03	2.E-01
	Air	Air (Indoor Air)	Chloroform	--	2.E-08	--	2.E-08	Chloroform	respiratory	--	4.E-05	--	4.E-05
				--	2.E-08	--	2.E-08			--	4.E-05	--	4.E-05
		Air (Shower Air)	Chloroform	--	5.E-06	--	5.E-06	Chloroform	respiratory	--	9.E-03	--	9.E-03
				--	5.E-06	--	5.E-06			--	9.E-03	--	9.E-03
							Total Risk Across Soil	7.E-06					Total Hazard Index Across Soil	6.E-01
							Total Risk Across Groundwater	5.E-06					Total Hazard Index Across Groundwater	2.E-01

Total Risk Across All Media and All Exposure Routes	1.E-05

Total Hazard Index Across All Media and All Exposure Routes	8.E-01

Total blood HI across all media =	1.E-01
Total CNS HI across all media =	1.E-01
Total thyroid HI across all media =	2.E-01
Total skin HI across all media =	3.E-02
Total respiratory HI across all media =	1.E-02
Total GI tract HI across all media =	2.E-01
Total kidney HI across all media =	1.E-01
Total liver HI across all media =	1.E-01
Total vascular HI across all media =	8.E-02
Total eyes HI across all media =	8.E-02
Total bone marrow HI across all media =	8.E-02
Total fetus HI across all media =	8.E-02

TABLE E.1-9.6.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Child Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--	Aluminum	developmental CNS	2.E-01	--	5.E-03	2.E-01
			Antimony	--	--	--	--	Antimony	blood	5.E-01	--	1.E-01	6.E-01
			Arsenic	9.E-06	--	8.E-07	1.E-05	Arsenic	skin/ vascular	2.E-01	--	2.E-02	3.E-01
			Cadmium	--	--	--	--	Cadmium	kidney	2.E-02	--	2.E-03	2.E-02
			Chromium	--	--	--	--	Chromium	GI tract/fetus/bone marrow/liver	3.E-01	--	3.E-01	6.E-01
			Cobalt	--	--	--	--	Cobalt	blood	6.E-03	--	2.E-04	6.E-03
			Copper	--	--	--	--	Copper	GI tract	2.E-01	--	6.E-03	2.E-01
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	5.E-01	--	1.E-02	5.E-01
			Manganese	--	--	--	--	Manganese	CNS	5.E-01	--	3.E-01	8.E-01
			Vanadium	--	--	--	--	Vanadium	kidney	4.E-01	--	4.E-01	7.E-01
			Zinc	--	--	--	--	Zinc	blood	7.E-02	--	2.E-03	7.E-02
			Aroclor 1254	2.E-06	--	7.E-07	2.E-06	Aroclor 1254	eyes	5.E-01	--	2.E-01	7.E-01
			Aroclor 1260	1.E-06	--	5.E-07	2.E-06	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene*	7.E-07	--	3.E-07	1.E-06	Benzo(a)pyrene*	NA	--	--	--	--
			Dibenz(a,h)anthracene*	1.E-06	--	4.E-07	2.E-06	Dibenz(a,h)anthracene*	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	1.E-09	--	3.E-10	1.E-09
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	liver/thyroid	1.E-05	--	3.E-06	1.E-05
			Nitroglycerin	7.E-08	--	2.E-09	7.E-08	Nitroglycerin	vascular	5.E-01	--	1.E-02	5.E-01
			Total	1.E-05	--	3.E-06	2.E-05	Total		4.E+00	--	1.E+00	5.2.E+00
	Air	Air (Fugitive Dust)	Aluminum	--	--	--	--	Aluminum	CNS	--	3.E-03	--	3.E-03
			Antimony	--	--	--	--	Antimony	NA	--	--	--	--
			Arsenic	--	1.E-09	--	1.E-09	Arsenic	NA	--	--	--	--
			Cadmium	--	2.E-10	--	2.E-10	Cadmium	respiratory/ kidney/ liver	--	5.E-06	--	5.E-06
			Chromium	--	5.E-08	--	5.E-08	Chromium	respiratory	--	5.E-04	--	5.E-04
			Cobalt	--	2.E-09	--	2.E-09	Cobalt	respiratory	--	3.E-04	--	3.E-04
			Copper	--	--	--	--	Copper	NA	--	--	--	--
			Iron	--	--	--	--	Iron	NA	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	1.E-02	--	1.E-02
			Vanadium	--	--	--	--	Vanadium	NA	--	--	--	--
			Zinc	--	--	--	--	Zinc	NA	--	--	--	--
			Aroclor 1254	--	3.E-11	--	3.E-11	Aroclor 1254	NA	--	--	--	--
			Aroclor 1260	--	2.E-11	--	2.E-11	Aroclor 1260	NA	--	--	--	--
			Benzo(a)pyrene*	--	5.E-12	--	5.E-12	Benzo(a)pyrene*	NA	--	--	--	--
			Dibenz(a,h)anthracene*	--	--	--	--	Dibenz(a,h)anthracene*	NA	--	--	--	--
			Dimethyl Phthalate	--	--	--	--	Dimethyl Phthalate	NA	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--	Di-n-octyl Phthalate	NA	--	--	--	--
			Nitroglycerin	--	--	--	--	Nitroglycerin	NA	--	--	--	--
			Total	--	5.E-08	--	5.E-08	Total		--	1.E-02	--	1.E-02
Groundwater	Groundwater	Groundwater used as tapwater	Perchlorate	--	--	--	--	Perchlorate	thyroid	4.E-01	--	3.E-03	4.E-01
			Cobalt	--	--	--	--	Cobalt	blood	6.E-03	--	2.E-05	6.E-03
			Iron	--	--	--	--	Iron	blood/ liver/ GI tract	2.E-03	--	2.E-05	2.E-03
			Chloroform	--	--	--	--	Chloroform	liver	4.E-03	--	6.E-05	5.E-03
			Bis(2-chloroethoxy)methane	--	--	--	--	Bis(2-chloroethoxy)methane	NA	--	--	--	--
			Total	--	--	--	--	Total		4.E-01	--	3.E-03	4.E-01
	Air	Air (Indoor Air)	Chloroform	--	1.E-08	--	1.E-08	Chloroform	respiratory	--	1.E-04	--	1.E-04
				--	1.E-08	--	1.E-08			--	1.E-04	--	1.E-04
						Total Risk Across Soil	2.E-05					Total Hazard Index Across Soil	5.2.E+00
						Total Risk Across Groundwater	1.E-08					Total Hazard Index Across Groundwater	4.E-01
						Total Risk Across All Media and All Exposure Routes	2.E-05					Total Hazard Index Across All Media and All Exposure Routes	5.6.E+00

Total blood HI across all media =	1.E+00
Total CNS HI across all media =	1.E+00
Total thyroid HI across all media =	4.E-01
Total skin HI across all media =	3.E-01
Total respiratory HI across all media =	9.E-04
Total GI tract HI across all media =	1.E+00
Total kidney HI across all media =	8.E-01
Total liver HI across all media =	1.E+00
Total vascular HI across all media =	8.E-01
Total eyes HI across all media =	7.E-01
Total bone marrow HI across all media =	6.E-01
Total fetus HI across all media =	6.E-01

TABLE E.1-9.7.RME
RME Summary of Cancer Risks and Non-Cancer Hazards for COPCs: Lifetime Resident
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	Aluminum	--	--	--	--
			Antimony	--	--	--	--
			Arsenic	1.E-05	--	1.E-06	1.E-05
			Cadmium	--	--	--	--
			Chromium	--	--	--	--
			Cobalt	--	--	--	--
			Copper	--	--	--	--
			Iron	--	--	--	--
			Manganese	--	--	--	--
			Vanadium	--	--	--	--
			Zinc	--	--	--	--
			Aroclor 1254	2.E-06	--	1.E-06	4.E-06
			Aroclor 1260	2.E-06	--	9.E-07	3.E-06
			Benzo(a)pyrene*	8.E-07	--	3.E-07	1.E-06
			Dibenz(a,h)anthracene*	1.E-06	--	5.E-07	2.E-06
			Dimethyl Phthalate	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--
			Nitroglycerin	1.E-07	--	3.E-09	1.E-07
			Total	2.E-05	--	4.E-06	2.E-05
	Air	Air (Fugitive Dust)	Aluminum	--	--	--	--
			Antimony	--	--	--	--
			Arsenic	--	2.E-09	--	2.E-09
			Cadmium	--	2.E-10	--	2.E-10
			Chromium	--	7.E-08	--	7.E-08
			Cobalt	--	2.E-09	--	2.E-09
			Copper	--	--	--	--
			Iron	--	--	--	--
			Manganese	--	--	--	--
			Vanadium	--	--	--	--
			Zinc	--	--	--	--
			Aroclor 1254	--	4.E-11	--	4.E-11
			Aroclor 1260	--	3.E-11	--	3.E-11
			Benzo(a)pyrene*	--	6.E-12	--	6.E-12
			Dibenz(a,h)anthracene*	--	--	--	--
			Dimethyl Phthalate	--	--	--	--
			Di-n-octyl Phthalate	--	--	--	--
			Nitroglycerin	--	--	--	--
			Total	--	7.E-08	--	7.E-08
Groundwater	Groundwater	Groundwater used as tapwater	Perchlorate	--	--	--	--
			Cobalt	--	--	--	--
			Iron	--	--	--	--
			Chloroform	--	--	--	--
			Bis(2-chloroethoxy)methane	--	--	--	--
			Total	--	--	--	--
	Air	Air (Indoor Air)	Chloroform	--	3.E-08	--	3.E-08
				--	3.E-08	--	3.E-08
		Air (Shower Air)	Chloroform	--	5.E-06	--	5.E-06
				--	5.E-06	--	5.E-06
						Total Risk Across Soil	2.E-05
						Total Risk Across Groundwater	5.E-06

Total Risk Across All Media and All Exposure Routes	3.E-05

TABLE E.1-10.1.RME
RME Risk Assessment Summary: Construction Worker
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Total Soil	Soil	Soil	None Identified					None Identified					
			Total	--	--	--	--	Total		--	--	--	--
	Air	Air	None Identified					Aluminum	CNS	--	2.E+00	--	2.E+00
								Manganese	CNS	--	6.E+00	--	6.E+00
			Total	--	--	--	--	Total		--	8.E+00	--	8.E+00
Groundwater	Groundwater	Groundwater	None Identified					None Identified					
			Total	--	--	--	--	Total		--	--	--	--
							Total Risk Across Soil	--					Total Hazard Index Across Soil	8.E+00
							Total Risk Across Groundwater	--					Total Hazard Index Across Groundwater	--
							Total Risk Across All Media and All Exposure Routes	--					Total Hazard Index Across All Media and All Exposure Routes	8.E+00
													Total CNS HI across all media =	8.E+00

APPENDIX E.2

IRON "MARGIN OF EXPOSURE" EVALUATION
and
LEAD IEUBK MODEL RESULTS

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Table 1
Iron "Margin of Exposure" Evaluation
SMWU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Total Soil - Child Resident				
Iron EPC (mg/kg)	Child Daily Intake Estimate* (mg/day)	RDA for Child 6 mths to 4 years Old	Child Daily Intake** (mg/kg-day)	Provisional RfD (mg/kg-day)
27,495	5.3	10 mg/day	0.35	0.7
Surface Soil - Child Resident				
Iron EPC (mg/kg)	Child Daily Intake Estimate* (mg/day)	RDA for Child 6 mths to 4 years Old	Child Daily Intake** (mg/kg-day)	Provisional RfD (mg/kg-day)
32,490	6.2	10 mg/day	0.42	0.7

* See Table 2 for equations used to calculated daily intake estimates.
** Default weight of 15 kg used for child

Table 2
Iron "Margin of Exposure" Evaluation
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion-Total Soil	Resident	Child	SWMU 57	AT-NC	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1991	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	unit conversion	Chronic
				CS	Chemical Concentration in Soil	Chemical Specific	mg/kg	MDC or EPC	Daily = CS*IRS*EF*ED*FI*CF1 / BW*AT
				ED	Exposure Duration	6	years	USEPA, 1991	Intake
				EF	Exposure Frequency	350	days/year	USEPA, 1991	(mg/day)
				FI	Fraction Ingested	1	(unitless)	default	
				IRS	Ingestion Rate of Soil	200	mg/day	USEPA, 1991	

Notes:

MDC = Maximum Detected Concentration

EPC = Exposure Point Concentration

kg = kilogram

mg/kg = milligram per kilogram

mg/day = milligram per day

kg/mg = kilogram per milligram

USEPA, 1991. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors". OSWER 9285.6-03.

LEAD MODEL FOR WINDOWS Version 1.0

==========
Model Version: 1.0 Build 264
User Name: Tina DeVine
Date: 11/11/2008
Site Name: SWMU 45
Operable Unit: SWMU 45
Run Mode: Site Risk Assessment

Water Data
Maximum Detected Groundwater Concentration
Soil/Dust Data
Mean Lead Concentration in Total Soil
==========
The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 0.360 ug Pb/L

****** Soil & Dust ****** Multiple Source Analysis Used

Average multiple source concentration: 80.280 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	100.400	80.280
1-2	100.400	80.280
2-3	100.400	80.280
3-4	100.400	80.280
4-5	100.400	80.280
5-6	100.400	80.280
6-7	100.400	80.280

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

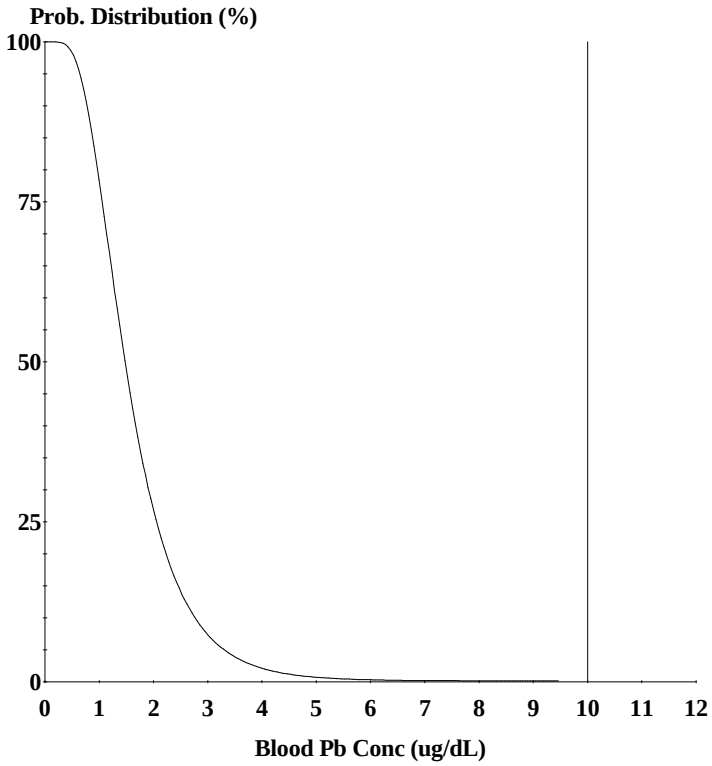
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/day)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	1.088	0.000	0.035
1-2	0.034	0.942	0.000	0.087
2-3	0.062	1.029	0.000	0.090
3-4	0.067	0.991	0.000	0.093
4-5	0.067	0.956	0.000	0.097
5-6	0.093	1.008	0.000	0.103
6-7	0.093	1.093	0.000	0.105

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	2.194	3.338	1.8
1-2	3.479	4.542	1.9
2-3	3.496	4.678	1.8
3-4	3.514	4.665	1.6
4-5	2.627	3.746	1.3
5-6	2.372	3.576	1.1
6-7	2.244	3.535	1.0



Cutoff = 10.000 ug/dl
Geo Mean = 1.549
GSD = 1.600
% Above = 0.004

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Site Risk Assessment

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APPENDIX E.3

DERIVATION OF RBCs FOR CARCINOGENS THAT ACT VIA A MUTAGENIC MODE OF ACTION AND INCORPORATE DEFAULT ADAFs – EXAMPLE CALCULATIONS (USEPA 2006)

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

SUBJECT: Derivation of RBCs for Carcinogens that Act Via a Mutagenic Mode of Action and Incorporate Default ADAFs

FROM: Jennifer Hubbard, Toxicologist
Technical Support Branch (3HS41)

TO: RBC Table Users

DATE: October 19, 2006
*corrected November 8, 2006**

Because of the special considerations for carcinogens that act via a mutagenic mode of action, this memo includes a demonstration of the assumptions behind the Region III RBCs for those chemicals that incorporate the default age-dependent adjustment factors (ADAFs). A sample calculation for each medium is provided below.

On March 29, 2005, EPA Administrator Stephen Johnson provided general direction on implementing EPA's 2005 Guidelines for Carcinogen Risk Assessment and Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. This was followed by an announcement in the April 7, 2005 Federal Register, and by the release of additional guidance documents concerning the implementation of the new cancer guidelines.

The aspect of the new guidelines that most directly affects Region III RBCs is the use of ADAFs to adjust cancer risk for receptors whose exposure includes early life. For chemicals that EPA has determined to be carcinogenic via a mutagenic mode of action, special adjustments are applied in estimating cancer risks. Vinyl chloride has a chemical-specific adjustment, described in its IRIS file. The impact of vinyl chloride's adjustment on Region III RBCs was discussed in the May 6, 2001 memo, "Derivation of Vinyl Chloride RBCs," found at http://www.epa.gov/reg3hwmd/risk/human/info/vcrbc.pdf. For the other chemicals, where no chemical-specific ADAFs have been developed, default ADAFs are used: 10 for age 0-2, 3 for age 2-16, and no adjustment for ages 16 and up. These chemicals are now marked with an "m" on the Region III RBC Table.

One example for each medium is provided below. The exposure factors are consistent with the defaults used in the other RBCs.

**The original October 19 version of this memo contained a typographical error in Section 2A: "mg/L" was used instead of "ug/L" for the concentration term in three of the equations. The units have now been corrected.*

SAMPLE EQUATIONS - RBCs

1. Soil, Residential

Sample Chemical: Benzo[a]pyrene
PRG = 0.022 mg/kg

Age 0-2

$$\frac{0.022 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/yr} \times 2 \text{ yrs} \times 1\text{E-}6 \text{ kg/mg}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{7.3}{\text{mg/kg/day}} \times 10 = \mathbf{5.9E\text{-}7}$$

Age 2-6

$$\frac{0.022 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/yr} \times 4 \text{ yrs} \times 1\text{E-}6 \text{ kg/mg}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{7.3}{\text{mg/kg/day}} \times 3 = \mathbf{3.5E\text{-}7}$$

Age 6-16

$$\frac{0.022 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/yr} \times 10 \text{ yrs} \times 1\text{E-}6 \text{ kg/mg}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{7.3}{\text{mg/kg/day}} \times 3 = \mathbf{9.4E\text{-}8}$$

Age 16-30

$$\frac{0.022 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/yr} \times 14 \text{ yrs} \times 1\text{E-}6 \text{ kg/mg}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{7.3}{\text{mg/kg/day}} \times 1 = \mathbf{4.4E\text{-}8}$$

Total Risk
5.9E-7 + 3.5E-7 + 9.4E-8 + 4.4E-8 = 1E-6

2. Tap water

Sample chemical = Dibromochloropropane (VOC)
PRG = 2E-4 ug/L

A. Ingestion risk

Age 0-2

$$\frac{0.0002 \text{ ug/L} \times 1 \text{ L/day} \times 350 \text{ days/yr} \times 2 \text{ yrs} \times 1\text{E-}3 \text{ mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{0.8}{\text{mg/kg/day}} \times 10 = \mathbf{2.9E\text{-}9}$$

Age 2-6

$$\frac{0.0002 \text{ ug/L} \times 1 \text{ L/day} \times 350 \text{ days/yr} \times 4 \text{ yrs} \times 1\text{E-}3 \text{ mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{0.8}{\text{mg/kg/day}} \times 3 = \mathbf{1.8E\text{-}9}$$

Age 6-16

$$\frac{0.0002 \text{ ug/L} \times 2 \text{ L/day} \times 350 \text{ days/yr} \times 10 \text{ yrs} \times 1\text{E-}3 \text{ mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{0.8}{\text{mg/kg/day}} \times 3 = \mathbf{1.9E\text{-}9}$$

Age 16-30

$$\frac{0.0002 \text{ ug/L} \times 2 \text{ L/day} \times 350 \text{ days/yr} \times 14 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{0.8}{\text{mg/kg/day}} \times 1 = \mathbf{8.8E\text{-}10}$$

Total Ingestion Risk

2.9E-9 + 1.8E-9 + 1.9E-9 + 8.8E-10 = 7.5E-9

B. Inhalation risk

Age 0-2

$$\frac{2\text{E-4 ug/L} \times 0.5 \text{ L/m}^3 \times 12 \text{ m}^3\text{/dy} \times 350 \text{ dy/yr} \times 2 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{21}{\text{mg/kg/day}} \times 10 = \mathbf{4.6E\text{-}7}$$

Age 2-6

$$\frac{2\text{E-4 ug/L} \times 0.5 \text{ L/m}^3 \times 12 \text{ m}^3\text{/dy} \times 350 \text{ dy/yr} \times 4 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{21}{\text{mg/kg/day}} \times 3 = \mathbf{2.8E\text{-}7}$$

Age 6-16

$$\frac{2\text{E-4 ug/L} \times 0.5 \text{ L/m}^3 \times 20 \text{ m}^3\text{/dy} \times 350 \text{ dy/yr} \times 10 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{21}{\text{mg/kg/day}} \times 3 = \mathbf{2.5E\text{-}7}$$

Age 16-30

$$\frac{2\text{E-4 ug/L} \times 0.5 \text{ L/m}^3 \times 20 \text{ m}^3\text{/dy} \times 350 \text{ dy/yr} \times 14 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 70 \text{ kg}} \times \frac{21}{\text{mg/kg/day}} \times 1 = \mathbf{1.2E\text{-}7}$$

Total Inhalation Risk

4.6E-7 + 2.8E-7 + 2.5E-7 + 1.2E-7 = 1E-6

Total Tap Water Risk

7.5E-9 + 1E-6 = 1E-6

3. Air

Sample chemical = Benzidine

A. Dose-Based Method (Using CSF in 1/mg/kg/day)

PRG = 1E-5 ug/m^3

Age 0-2

$$\frac{1\text{E-5 ug/m}^3 \times 12 \text{ m}^3\text{/day} \times 350 \text{ days/yr} \times 2 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{230}{\text{mg/kg/day}} \times 10 = \mathbf{5E\text{-}7}$$

Age 2-6

$$\frac{1\text{E-5 ug/m}^3 \times 12 \text{ m}^3\text{/day} \times 350 \text{ days/yr} \times 4 \text{ yrs} \times 1\text{E-3 mg/ug}}{365 \text{ days/yr} \times 70 \text{ yr} \times 15 \text{ kg}} \times \frac{230}{\text{mg/kg/day}} \times 3 = \mathbf{3E\text{-}7}$$

Age 6-16

$$\frac{1E\text{-}5\ ug/m^3 \times 20\ m^3/day \times 350\ days/yr \times 10\ yrs \times 1E\text{-}3\ mg/ug}{365\ days/yr \times 70\ yr \times 70\ kg} \times \frac{230}{mg/kg/day} \times 3 = \mathbf{2.7E\text{-}7}$$

Age 16-30

$$\frac{1E\text{-}5\ ug/m^3 \times 20\ m^3/day \times 350\ days/yr \times 14\ yrs \times 1E\text{-}3\ mg/ug}{365\ days/yr \times 70\ yr \times 70\ kg} \times \frac{230}{mg/kg/day} \times 1 = \mathbf{1.3E\text{-}7}$$

Total Risk

5E-7 + 3E-7 + 2.7E-7 + 1.3E-7 = 1E-6

B. Concentration-Based Method (Using IUR in m^3/ug).

PRG = 1.5E-5 ug/m^3

Age 0-2

$$\frac{1.5E\text{-}5\ ug/m^3 \times 350\ days/yr \times 2\ yrs}{365\ days/yr \times 70\ yr} \times \frac{0.067}{ug/m^3} \times 10 = \mathbf{2.8E\text{-}7}$$

Age 2-6

$$\frac{1.5E\text{-}5\ ug/m^3 \times 350\ days/yr \times 4\ yrs}{365\ days/yr \times 70\ yr} \times \frac{0.067}{ug/m^3} \times 3 = \mathbf{1.7E\text{-}7}$$

Age 6-16

$$\frac{1.5E\text{-}5\ ug/m^3 \times 350\ days/yr \times 10\ yrs}{365\ days/yr \times 70\ yr} \times \frac{0.067}{ug/m^3} \times 3 = \mathbf{4.1E\text{-}7}$$

Age 16-30

$$\frac{1.5E\text{-}5\ ug/m^3 \times 350\ days/yr \times 14\ yrs}{365\ days/yr \times 70\ yr} \times \frac{0.067}{ug/m^3} \times 1 = \mathbf{1.9E\text{-}7}$$

Total Risk

2.8E-7 + 1.7E-7 + 4.1E-7 + 1.9E-7 = 1E-6

Fish Tissue and Industrial Soil RBCs:
Because these RBC scenarios involve adults only, the ADAFs for early-life exposure do not apply. Therefore, these RBCs are derived in the traditional manner and are not shown in this memo.

APPENDIX E.4

JOHNSON AND ETTINGER MODEL – GROUNDWATER TO INDOOR AIR

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Table E.4-1
Data Entry Sheet
Johnson and Ettinger Model
Groundwater to Indoor Air - Chloroform
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

GW-SCREEN Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
67663	7.00E-01	Chloroform

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	670	SC	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SL			SL	1.48	0.442	0.168

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

Table E.4-2
Chemical Properties Sheet
Johnson and Ettinger Model
Groundwater to Indoor Air - Chloroform
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	0.0E+00

END

Table E.4-3
Intermediate Calculations Sheet
Johnson and Ettinger Model
Groundwater to Indoor Air - Chloroform
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
655	0.274	0.320	5.93E-09	0.812	4.81E-09	30.00	0.385	0.030	0.355	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	7.14E-03	3.28E-05	6.53E-04

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
655	15	5.61E+01	0.10	8.33E+01	7.14E-03	4.00E+02	4.28E+126	5.81E-05	3.26E-03	2.3E-05	NA

Table E.4-4
Results Sheet
Johnson and Ettinger Model
Groundwater to Indoor Air - Chloroform
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	7.92E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.1E-08	NA

MESSAGE SUMMARY BELOW:

END

APPENDIX F

ECOLOGICAL RISK ASSESSMENT

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APPENDIX F.1

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROCESS

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APPENDIX F.1
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROCESS
SWMU 45 SSP REPORT

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LIST OF ABBREVIATIONS AND ACRONYMS

% ..... Percent
ADD..... Average Daily Dose
AF ..... Area Use Factor
BAF..... Bioaccumulation Factor
BTAG..... Biological Technical Assistance Group
BW ..... Body Weight
C_{TRV}..... NOAEL- or LOAEL-based TRV concentration
COPC ..... Chemical of Potential Concern
COPEC..... Chemical of Potential Ecological Concern
DF ..... Dietary Fraction
DW:WW ..... Dry weight to wet weight
ECO-SSL ..... Ecological Soil Screening Level
EF..... Extrapolation Factor
EPC ..... Exposure Point Concentration
HQ..... Hazard Quotient
IR ..... Ingestion Rate
kg ..... Kilogram
LD_{50}..... Lethal Dose to 50% of the test population
LOAEL ..... Lowest Observable Adverse Effects Level
MDC ..... Maximum Detected Concentration
mg ..... Milligram
mg/kg ..... Milligrams Per Kilogram
NOAEL..... No Observable Adverse Effects Level
ORNL..... Oak Ridge National Laboratory
PAH ..... Polynuclear Aromatic Hydrocarbon
SLERA..... Screening Level Ecological Risk Assessment
TOC ..... Total Organic Carbon
TRV ..... Toxicity Reference Value
UF ..... Uncertainty Factor
UF_{plant} ..... Plant Uptake Factor
USACHPPM..... U.S. Army Center for Health Promotion and Preventive Medicine
USEPA..... U.S. Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this appendix is to present and describe development of exposure assessment models for the receptors presented in Section 7.0, the Screening Level Ecological Risk Assessment (SLERA) at SWMU 45. The following sections provide a summary of parameters used in the models and a detailed description of the direct contact and dose rate modeling approachs used in the SLERA. The complete SLERA for SWMU 45 is presented in Appendix F.2.

2.0 MODEL PARAMETERS

The direct contact and dose rate models include parameters relating to receptor-specific exposure, chemical of potential concern (COPC) toxicity, and bioaccumulation rates. The following sections describe the estimation of these parameters and major assumptions of parameterization.

2.1 TOXICITY REFERENCE VALUES

MDCs for detected chemicals in soil are used as the preliminary exposure estimate to evaluate a conservative risk scenario for the direct contact pathway to soil invertebrates. Other potentially complete exposure pathways to soil invertebrate and microbial communities include direct ingestion of soil and biota. Due to insufficient information to quantify these pathways, likely secondary to the direct contact/absorption pathway, their omission should not substantially alter the risk characterization.

To evaluate the preliminary exposure estimates, the Toxicity Reference Values (TRVs) that were protective of terrestrial plants and soil invertebrate/microbial communities, were selected from a review of toxicological benchmarks for soil. TRVs for direct contact of soil to invertebrates/microbes and soil to plants were determined from the following guidance:

- USEPA Ecological Soil Screening Level (ECO-SSL): soil invertebrate and plant;
- Oak Ridge National Laboratory (ORNL): plant, microbial community, earthworm values (Efroymson *et al*. 1997a, Efroymson *et al*. 1997b, Efroymson *et al*. 1997c); and
- USEPA Region III Biological Technical Assistance Group (BTAG) soil screening values (USEPA 1995), BTAG freshwater screening benchmarks (USEPA 2006a), and BTAG freshwater sediment screening levels (USEPA 2006b)

Selected screening levels and sources are reported on Table F.2-5 for terrestrial plants and Table F.2-7 for soil invertebrates and microbial communities.

2.2 RECEPTOR-SPECIFIC EXPOSURE PARAMETERS

Wildlife receptors selected to characterize exposure at SWMU 45 include:

- Herbivorous mammals: Meadow Vole (*Microtus pennsylvanicus*);
- Invertivorous mammals: Short-tailed Shrew (*Blarina brevicauda*);
- Invertivorous birds: American Robin (*Turdus migratorius*);
- Carnivorous birds: Red-tailed Hawk (*Buteo jamaicensis*); and
- Carnivorous mammals: Red Fox (*Vulpes vulpes*).

Exposure parameters used to derive TRV-based substrate concentrations for each receptor include body weight (kg), food ingestion rate (kg dry weight/day), dietary fraction, incidental substrate ingestion rate (kg dry weight/day), and area use factor. Both preliminary and refinement level exposure parameters are presented in Table F.2-9.

2.3 LITERATURE-BASED NOAEL AND LOAEL VALUES

The dose-response relationships for chemicals of potential concern are expressed as NOAELs and LOAELs for wildlife receptors, which are defined as a daily ingested amount (mg/kg body weight-day) that is associated with a specified effect. This process involves the determination of a "test species dose" for a critical endpoint from a particular experimental combination of exposure concentration, exposure duration, test species, and chemical. Endpoints may be based on growth, reproductive, developmental, and survival effects. Such effects are important because they may affect the abundance or reproductive success of receptor populations. The test-species dose from the selected study is then modified using extrapolation and uncertainty factors (EFs and UFs).

For this evaluation, EFs and UFs are used to modify laboratory study results, based on the methodology of Sample et al. (1996). This process involves the determination of a "test species dose" for a critical endpoint from a particular experimental combination of exposure concentration, exposure duration, test species, and chemical. The test-species dose from the selected study is then modified to account for the various extrapolations and uncertainties inherent in applying results from a controlled setting to an ecologically relevant setting, as in:

$$\text{NOAEL or LOAEL} = \frac{\text{Test-Species Dose}}{\text{Duration UF} \times \text{Endpoint UF}} \times \text{Body-Weight EF}$$

EFs and UFs are based on: (1) the duration of exposure, (2) the endpoint measured, and (3) differences in body weights among test and receptor species (Calabrese and Baldwin 1993, Ford et al. 1992, Opresko et al. 1994, Sample et al. 1996, USEPA 1996, Wentsel et al. 1994). EFs and UFs derivation and use is described in the following subsections. The use of surrogate chemical data is also discussed. NOAEL and LOAELs for COPCs are summarized in Table F.2-10.

2.3.1 The Test-Species Dose

Critical toxicological values are identified from carefully qualified primary and secondary literature references. The selection of particular studies and endpoints used for the derivation of NOAELs and LOAELs is based on the evaluation of the applicable studies and the dose-response data contained therein. In cases where preferred toxicological endpoints are not available, other toxicity values are used, but additional uncertainty factors may be incorporated. All toxicological values chosen for NOAEL and LOAEL derivation are presented on a mg chemical per kg body weight per day (mg/kg BW-day) basis. These units allow comparisons among organisms of different body sizes (Sample et al. 1996).

2.3.2 Duration Uncertainty Factors

Exposure durations of interest include (1) chronic, (2) subchronic, and (3) acute. Chronic studies occur over the lifetime or a majority of the lifespan of the test organism, generally longer than one year for mammals and 10 weeks for birds. Additionally, studies in which the test organism is dosed during a critical life stage (e.g., gestation) are included with chronic duration studies. Subchronic studies include exposures of two weeks to one year in duration that do not occur during a critical life stage. Acute studies typically have exposures of less than two weeks. NOAELs and LOAELs are usually reported from chronic and subchronic studies, with acute studies often reporting LD_{50} levels (LD_{50}; doses corresponding to the overt expression of a serious adverse effect such as mortality in 50% of test animals). Test-species doses from chronic studies are used preferentially over data from acute and subchronic studies. In cases where chronic data are not available as test-species doses, studies involving less-than-chronic exposures are used to in NOAEL and LOAEL derivation with the addition of a duration uncertainty factor.

For this study, duration uncertainty factors are applied according to USACHPPM 2000:

- Subchronic NOAEL to Chronic NOAEL: 10
- Subchronic LOAEL to Chronic NOAEL: 20

- Subchronic LOAEL to Chronic LOAEL: 4
- Acute NOAEL to Chronic NOAEL: 30
- Acute LOAEL to Chronic NOAEL: 50
- Acute LOAEL to Chronic LOAEL: 10

2.3.3 Endpoint Uncertainty Factors

Additional UFs are used to account for uncertainties in extrapolation between effect- and no-effect levels. Specifically, a NOAEL test-species dose may be estimated from a LOAEL (or LD_{50}) value, or a LOAEL may be estimated from a LD_{50}.

Extrapolation from a LOAEL or LD_{50t} to a NOAEL: Consistent with USACHPPM 2000, a UF of 10 is used with chronic LOAEL values to estimate the chronic NOAEL, which is considered conservative (Sample et al. 1996, USEPA 1996). When a LOAEL value is not available, a LD_{50} is used, although chronic NOAELs may range from 1/10 to 1/10,000 of the corresponding acute LD_{50} value (Opresko et al. 1994). For this report, an uncertainty factor of 100 is used to estimate a NOAEL value from a LD_{50} value (USACHPPM 2000).

Extrapolation from an LD_{50} to a LOAEL: Consistent with USACHPPM 2000, an UF of 20 is used conservatively to estimate a LOAEL value from a LD_{50} value (USACHPPM 2000).

2.3.4 Body-Weight Extrapolation Factor

This extrapolation is accomplished using a body weight-scaling factor to account for differences in body size (Sample et al. 1996). Numerous studies have shown that many physiological functions such as metabolic rates and responses to chemicals are a function of body size for mammals. Smaller mammals have higher metabolic rates and are usually more resistant to chemicals because of more rapid rates of detoxification. It has been shown that the best measure of body size is one based on body surface-area, which can be expressed in terms of body weight raised to a fractional power (Opresko et al. 1994, Sample et al. 1996, USEPA 1980). Dosimetric differences between the mammalian test species and wildlife receptors are accounted for using:

$$\mathrm{NOAEL}_w = \mathrm{NOAEL}_t \times \left(\frac{\mathrm{BW}_t}{\mathrm{BW}_w} \right)^{0.25}$$

where:

$NOAEL_w$	= NOAEL for the mammalian wildlife receptor (mg/kg BW-day)
$NOAEL_t$	= NOAEL for the mammalian test species (mg/kg BW-day)
BW_t	= Test species body weight (kg)
BW_w	= Wildlife receptor body weight (kg)

Scaling factors may not be appropriate for avian interspecies extrapolations. Information has shown that adjustment factors based on body size for interspecies extrapolation among avian species range from 0.63 to 1.55 (Sample et al. 1996). Therefore, a body-weight extrapolation factor is not used to derive avian NOAELs and LOAELs.

Mammalian wildlife receptor body weights are presented on Table F.2-9 and laboratory test species body weights are presented on Table F.2-10.

2.4 BIOACCUMULATION FACTORS

Bioaccumulation factors (BAFs) provide quantitative indicators of the tendency for a chemical to partition into terrestrial organisms, relative to the concentrations present in terrestrial exposure media. Exposure-point concentrations of chemicals in terrestrial prey (soil invertebrates and small mammals) and terrestrial plants are estimated using BAFs derived from the literature. The derivation of BAFs is described for organic and inorganic chemicals in the following subsections.

2.4.1 Terrestrial Plants

Exposure-point concentrations of chemicals in terrestrial plants are estimated using soil-to-plant bioaccumulation factors (uptake factors for plants, UF_{plant}) derived from the literature. UF_{plant} values are used to estimate wet-weight chemical concentrations in terrestrial plants using the same equation for invertebrates and a dry weight to wet weight conversion factor assuming plants are 80% water (Salisbury and Ross 1992). Table F.2-11 presents the uptake factors for plants.

Organic Chemicals: Organic chemicals may enter the plant by partitioning from contaminated soil to the roots and then translocating throughout the plant via the xylem tissue. Most bioaccumulative, lipophilic organic chemicals partition to the epidermis of the root or adhere to soil particles and are not drawn into the inner root or xylem (Paterson et al. 1990). Uptake factors for estimating concentrations of organic chemicals in plant tissues are derived from the following equation:

$$UF_{plant} = 10^{[1.588-(0.578\times \log K_{ow})]}$$

where:

UF_{plant} = Plant uptake factor (kg soil, dry weight / kg plant, dry weight)

$\log K_{ow}$ = Logarithm of the octanol:water partition coefficient

This relationship is based on a linear regression of bioaccumulation factors for 29 organic chemicals (Travis and Arms 1988). The correlation coefficient for the regression is 0.73, indicating that a majority of the variability in bioaccumulation is explained by the log K_{ow}. UF_{plant} values are derived for organic chemicals using this equation.

Inorganic Chemicals: Concentrations of inorganic chemicals in plant tissues are estimated based on generalized soil-to-plant transfer coefficients reported in a literature review. The soil-to-plant transfer factors for inorganic chemicals are equivalent to UF_{plant} values for organic chemicals and represent the ratio of the dry weight concentrations in plant tissue to the dry weight concentration of the element in root-zone soils. Bechtel-Jacobs 1998 C_p regression equation: $C_p = e^{(slope*\ln(Cs) - intercept)}$

2.4.2 Terrestrial Prey

Organic Chemicals: BAFs for estimating concentrations of organic chemicals in prey tissues are derived from linear regression equations presented in Travis and Arms (1998) and Beyer and Stafford (1993). The dry weight to wet weight (DW:WW) conversion factor is 0.2 for soil invertebrates (kg soil invertebrate dry weight per soil invertebrate wet weight; assumes invertebrates are 80% water), based on data reported in USEPA (1993). No DW:WW conversion factor was applied for small mammals. The BAF values used in to estimate concentrations of organic chemicals in soil invertebrates and small mammals are shown in Tables F.2-12 and F.2-13.

Inorganic Chemicals: Inorganic bioaccumulation factors for terrestrial prey (Table F.2-13) are wet-weight-based and are used to predict concentrations in invertebrates and small mammals according to:

$$BAF_{si} = C_{si} / C_{soil}$$

where:

BAF_{si} = Soil invertebrate uptake factor for inorganic chemicals

C_{si} = Chemical concentration predicted in soil invertebrates (mg chemical / kg soil invertebrate, dry weight)

C_{soil} = Concentration of inorganic chemical in soil (mg chemical / kg soil, dry weight)

3.0 DIRECT CONTACT APPROACH

3.1 PRELIMINARY DIRECT CONTACT TOXICITY EVALUATION

Risk is assessed by comparing the preliminary exposure estimate (maximum detected concetrations - MDC) of each detected chemical to the established TRV (detailed in Section 2.1). The preliminary risk is characterized in terms of a hazard quotient (HQ), which is expressed as:

HQ = MDC/TRV

where:

HQ = Hazard Quotient for the contaminant (unitless)
MDC = Maximum Detected Concentration for contaminant (mg/kg)
TRV = Screening Level for contaminant (mg/kg)

3.2 REFINED DIRECT CONTACT TOXICITY EVALUATION

For the refined evaluation, risk is assessed by comparing the exposure point concentration (EPC) of each detected chemical to the TRV (Section 4.3.6 details EPC development). The refined risk HQ is expressed as:

HQ = EPC/TRV

where:

HQ = Hazard Quotient for the contaminant (unitless)
EPC = Calculated Exposure Point Concentration for contaminant (mg/kg)
TRV = Screening Level for contaminant (mg/kg)

An HQ of less than 1 indicates no or negligible risk. The potential for risk increases as the HQ increases above unity. However, this result should be considered in the context of other characteristics of the exposure area.

Results of the direct contact toxicity evaluation for SWMU 45 are presented in Tables F.2-6 (terrestrial plants) and F.2-8 (soil and microbial communities).

4.0 DOSE RATE MODELING APPROACH

A simplified food web model is utilized to calculate TRVs for each chemical and wildlife receptor. TRVs quantify COPC concentrations in exposure media that may result in no observable adverse effects or low observable adverse effects. The NOAEL corresponds to the greatest exposure associated with no observed adverse effects on growth, reproduction, or survival. The LOAEL corresponds to the smallest exposure associated with observed adverse effects on growth, reproduction or survival. TRVs developed by dose rate models are used to evaluate ecological effects associated with COPEC concentrations in exposure media.

4.1 PRELIMINARY DOSE RATE MODEL

Preliminary risk characterization for wildlife receptors uses the conservative preliminary exposure estimate and ecological effects evaluation to characterize risk to potential terrestrial receptors.

The simplified food web model considers the ingestion of prey, the incidental ingestion of media, and the primary routes of exposure to wildlife receptors. Chemical concentrations in prey are expressed as a function of chemical concentrations in exposure media using BAFs for terrestrial prey items. Other important parameters in the model include receptor body weight and an estimate of receptor use. As shown in the equation below, literature-derived NOAEL and LOAEL values are input into the model as the ADD variable to calculate the concentration in exposure media (C_{TRV}) that would result in a dose equivalent to a NOAEL or LOAEL.

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \ (BAF_{food} \cdot DF) + IR_s)AF}$$

where:

C_{TRV} = NOAEL or LOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg COPC/kg body weight-day)

BW = Minimum Body Weight of the receptor (kg)

IR_{food} = Maximum Ingestion Rate of food (kg food ingested per day, dry weight)

BAF_{food} = BAF of most contaminated dietary component used, specific to prey type and COPC (ratio of mg of COPC/kg fauna, wet weight to mg COPC/ kg substrate, dry weight)

DF = Dietary Fraction (most contaminated dietary component assumed to be 100% of diet)

IR_s = Maximum Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)

AF = 100% Area Use Factor

Preliminary receptor parameters for SWMU 45 are presented on Table F.2-9. The resulting risk is characterized in terms of an HQ and is presented for wildlife receptors in Appendix F.2 and summarized in Table F.2-24 for SWMU 45.

4.2 REFINED EXPOSURE ESTIMATE AND RISK CHARACTERIZATION

The refined exposure and risk characterization, Step 3a of the ecological risk assessment guidance (ERAGS), reviews and refines the conservative assumptions used in the risk calculation (USEPA 1997). In Step 3a, conservative assumptions used in the preliminary exposure and risk characterization are replaced with more environmentally realistic assumptions to evaluate risk posed by COPECs identified in the preliminary risk characterization. The addition of Step 3a focuses the outcome of the ecological screening, streamlines the review process and functions as the initial basis for ecological risk management decision-making at each site.

4.3 REFINED DOSE RATE MODEL

This step replaces the conservative assumptions used in the preliminary exposure estimate and ecological effects evaluation with more environmentally realistic assumptions including the use of average body weight, average food and substrate ingestion rates, and the use of realistic area use factor, resulting in a more realistic estimate of potential risk.

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \ \sum \ (BAF_i \cdot DF_i) + IR_s)AF}$$

where:

C_{TRV} = NOAEL or LOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg COPC/kg body weight-day)

BW = Average Body Weight of the receptor (kg)

IR_{food} = Average Ingestion Rate of food (kg food ingested per day, dry weight)

BAF_i = BAF of dietary component used for the i_{th} food item, specific to prey type (i.e., plant, invetebrate, or mammal) and COPEC (ratio of mg of COPEC/kg fauna, wet weight to mg COPEC/ kg substrate, dry weight)

DF_i = Dietary Fraction for i_{th} Food Item

IR_s = Average Incidental Ingestion Rate of soil (kg substrate ingested per day, dry weight)

$AF_{refined}$ = Refined Area Use Factor (detailed below)

In the refined model, a realistic area use factor ($AF_{refined}$) was used to calculate the ratio of the site area (0.3 acres) to the average home range of the receptor:

$AF_{refined}$ = Study Area/Home Range Area

Other receptor parameters in the refined model remain conservative. The conservative assumptions are summarized as follows:

- Receptors assimilate 100% of COPECs detected in the food and soil; and
- Receptors forage in the site area 100% of the time.

Refined receptor parameters for SWMU 45 are presented on Table F.2-9. The resulting risk is characterized in terms of an HQ and is presented for wildlife receptors in Appendix F.2 and summarized in Table F.2-24.

4.4 EXAMPLE C_{TRV} EQUATION CALCULATION – PRELIMINARY AND REFINED

The following example C_{TRV} equation details the arsenic NOAEL-based screening level (SL) calculated for the short-tailed shrew at SWMU 45 (Tables F.2-16 and F.2-17) and resulting HQs:

Preliminary

- ADD = 0.15 mg/kg bw-day (NOAEL)
- BW = 0.0125 kg (minimum body weight)
- IR_{food} = 0.003 kg dw/day (maximum ingestion rate)
- BAF_{food} = 1.1 (for the most contaminated dietary component in this case plant)
- DF = 1 (100% most contaminated dietary component in this case 100% plants)
- IR_{soil} = 0.00039 kg dw/day (maximum soil ingestion rate)
- AF = 1 (default used)

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}\ (BAF_{food} \cdot DF) + IR_s)AF} = \frac{0.15 \cdot 0.0125}{(0.003\,(1.1 \cdot 1) + 0.00039) \cdot 1} = \textbf{5.08E-01 mg/kg}$$

NOAEL HQ = MDC (mg/kg)/NOAEL-based SL (mg/kg) = $\frac{12}{5.1E-01}$ = **2.36E+01**

EPC NOAEL HQ = NOAEL HQ * (EPC (mg/kg) / MDC (mg/kg)) = 2.36E+01*($\frac{7.505}{12}$) = **1.5E+01**

Refined

- ADD = 0.15 mg/kg bw-day
- BW = 0.015 kg
- IR_{food} = 0.002 kg dw/day

- BAF_{plant} = 0.038
- BAF_{inv} = 0.134
- DF_{plant} = 0.14
- DF_{inv} = 0.86
- IR_{soil} = 0.00026 kg dw/day
- $AF_{refined}$ = 0.31

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_i \cdot DF_i) + IR_s)AF}$$

$$= \frac{0.15 \cdot 0.015}{(0.002\,(0.038 \cdot 0.14 + 0.134 \cdot 0.86) + 0.00026) \cdot 0.31} = \textbf{1.45+01 mg/kg}$$

NOAEL HQ = EPC (mg/kg)/NOAEL-based SL (mg/kg) = $\frac{7.505}{1.45E+01}$ = **5.2E-01**

Table F.2-24 provides a summary of preliminary and refined HQs developed for terrestrial receptors at SWMU 45.

5.0 SUMMARY

Receptor-specific exposure parameters are obtained from life history studies found in the literature. Important receptor-specific exposure parameters input into the model include: body weight, food ingestion rate, diet composition, incidental substrate ingestion rate, and area use factor.

The dose-response relationships for chemicals of potential interest are expressed as NOAELs and LOAELs for wildlife receptors, which are defined as a daily ingested amount (mg COPC/kg body weight-day) that is associated with a specified growth, reproductive, developmental, or survival effect. Extrapolation and uncertainty factors are applied to literature-based toxicological endpoints to account for differences in a controlled laboratory setting and an ecologically relevant setting. Extrapolation and uncertainty factors are based on: (1) the duration of exposure, (2) the endpoint measured, and (3) differences in body weights among test and receptor species.

Bioaccumulation accumulation factors provide quantitative indicators of the tendency for a chemical to partition into organisms, relative to the concentrations present in exposure media. Exposure-point concentrations of chemicals in terrestrial prey (soil invertebrates and small mammals) are estimated using several BAFs derived from the literature.

COPC concentrations in prey and media, receptor-specific exposure parameters, literature-based NOAEL and LOAEL values, and bioaccumulation factors are used in the model to calculate the concentration in exposure media (C_{TRV}) that would result in a dose equivalent to a NOAEL or LOAEL. The dose rate modeling approach is used to evaluate the potential mobility of COPCs through varying trophic associations.

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APPENDIX F.2

SWMU 45 SLERA

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Table F.2-1
SLERA Occurence/Distribution - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Units	Location of Maximum Concentration	Total Samples Analyzed	Detection Frequency	Concentration Used for Screening
TAL Metals								
Aluminum	7429-90-5	9,100	18,000	mg/kg	45TP3A	11	11/11	18,000
Antimony	7440-36-0	0.074	4.6	mg/kg	45TP4A	11	10/11	4.6
Arsenic	7440-38-2	0.57	12	mg/kg	45TP3A	11	11/11	12
Barium	7440-39-3	62	240	mg/kg	45TP4A	11	11/11	240
Beryllium	7440-41-7	0.55	1.3	mg/kg	45SB14A DUP AVG	11	11/11	1.3
Cadmium	7440-43-9	0.49	6.2	mg/kg	45TP2A	11	5/11	6.2
Calcium	7440-70-2	210	2,100	mg/kg	45TP2A	11	11/11	2,100
Chromium	7440-47-3	16	79	mg/kg	45TP4A	11	11/11	79
Cobalt	7440-48-4	3.8	9.1	mg/kg	45TP5A	11	11/11	9.1
Copper	7440-50-8	6.3	1,100	mg/kg	45TP2A	11	11/11	1,100
Iron	7439-89-6	14,000	47,000	mg/kg	45TP4A	11	11/11	47,000
Lead	7439-92-1	7.9	760	mg/kg	45TP4A	11	11/11	760
Magnesium	7439-95-4	940	3,000	mg/kg	45TP5A	11	11/11	3,000
Manganese	7439-96-5	250	1,100	mg/kg	45TP4A	11	11/11	1,100
Mercury	7439-97-6	0.01345	0.22	mg/kg	45TP2A	11	11/11	0.22
Nickel	7440-02-0	6.6	24	mg/kg	45TP2A	11	11/11	24
Potassium	7440-09-7	730	1,700	mg/kg	45TP5A	11	11/11	1,700
Selenium	7782-49-2	0.12	0.87	mg/kg	45TP6A	11	11/11	0.87
Silver	7440-22-4	0.037	0.73	mg/kg	45TP2A	11	11/11	0.73
Sodium	7440-23-5	33	67	mg/kg	45TP1A	11	9/11	67
Thallium	7440-28-0	0.1	0.54	mg/kg	45TP3A	11	11/11	0.54
Vanadium	7440-62-2	16	46	mg/kg	45TP4A	11	11/11	46
Zinc	7440-66-6	36	2,500	mg/kg	45TP2A	11	11/11	2,500
Cyanide								
Cyanide	57-12-5	0.11	0.24	mg/kg	45TP6A	11	8/11	0.24
Pesticides/PCBs								
4,4'-DDT	50-29-3	2.1E-02	2.1E-02	mg/kg	45TP1A	11	1/11	0.021
Endosulfan II	33213-65-9	3.6E-02	3.6E-02	mg/kg	45TP2A	11	1/11	0.036
gamma-Chlordane	5103-74-2	1.4E-03	1.4E-03	mg/kg	45SB8A	11	1/11	0.0014
Aroclor 1254	11097-69-1	9.7E-03	7.3E-01	mg/kg	45TP2A	11	8/11	0.73
Aroclor 1260	11096-82-5	6.3E-01	6.3E-01	mg/kg	45TP2A	11	1/11	0.63
TCL VOCs								
2-Butanone	78-93-3	1.1E-02	3.2E-01	mg/kg	45TP1A	11	10/11	0.32
Acetone	67-64-1	1.5E-01	9.2E-01	mg/kg	45TP1A	11	11/11	0.92
Benzene	71-43-2	2.1E-04	5.1E-04	mg/kg	45TP4A	11	3/11	0.00051
Carbon Disulfide	75-15-0	1.9E-03	4.2E-03	mg/kg	45TP5A	11	9/11	0.0042
Chloroform	67-66-3	2.8E-04	3.7E-04	mg/kg	45SB14A DUP AVG	11	2/11	0.000365
Methyl Acetate	79-20-9	5.5E-03	1.6E-02	mg/kg	45SB1A	11	11/11	0.016
Toluene	108-88-3	2.1E-03	2.1E-03	mg/kg	45SB5A	11	1/11	0.0021
TCL SVOCs								
1,1'-Biphenyl	92-52-4	7.7E-04	1.5E-03	mg/kg	45TP7A	11	8/11	0.0015
2,4-Dinitrotoluene	121-14-2	2.6E-02	3.1E+00	mg/kg	45SB8A	11	2/11	3.1
2,6-Dinitrotoluene	606-20-2	1.7E-01	1.7E-01	mg/kg	45SB8A	11	1/11	0.17
2-Methylnaphthalene	91-57-6	7.6E-04	4.1E-03	mg/kg	45TP1A	11	9/11	0.0041
Acenaphthene	83-32-9	9.2E-04	1.8E-03	mg/kg	45TP2A	11	3/11	0.0018
Acenaphthylene	208-96-8	8.6E-04	3.1E-03	mg/kg	45TP7A	11	5/11	0.0031
Anthracene	120-12-7	8.6E-04	5.0E-03	mg/kg	45TP2A	11	5/11	0.005
Benzaldehyde	100-52-7	4.0E-02	4.0E-02	mg/kg	45TP7A	11	1/11	0.04
Benzo(a)anthracene	56-55-3	1.2E-03	4.9E-02	mg/kg	45TP2A	11	11/11	0.049
Benzo(a)pyrene	50-32-8	1.7E-02	4.3E-02	mg/kg	45TP2A	11	4/11	0.043
Benzo(b)fluoranthene	205-99-2	1.6E-02	8.2E-02	mg/kg	45TP2A	11	8/11	0.082
Benzo(g,h,i)perylene	191-24-2	1.7E-02	3.8E-02	mg/kg	45TP2A	11	3/11	0.038
Benzo(k)fluoranthene	207-08-9	1.3E-03	2.0E-02	mg/kg	45TP2A	11	10/11	0.02
Bis(2-ethylhexyl)phthalate	117-81-7	1.3E-03	1.2E-01	mg/kg	45TP1A	11	8/11	0.12
Butyl Benzyl Phthalate	85-68-7	3.0E-03	1.8E-02	mg/kg	45TP1A	11	6/11	0.018
Chrysene	218-01-9	7.7E-04	3.0E-02	mg/kg	45TP2A	11	11/11	0.03
Dibenz(a,h)anthracene	53-70-3	2.8E-02	2.8E-02	mg/kg	45TP2A	11	1/11	0.028
Dibenzofuran	132-64-9	4.3E-04	2.3E-03	mg/kg	45TP1A	11	6/11	0.0023
Diethyl Phthalate	84-66-2	8.1E-04	4.2E-03	mg/kg	45TP7A	11	10/11	0.0042
Dimethyl Phthalate	131-11-3	8.3E-04	8.3E-04	mg/kg	45TP4A	11	1/11	0.00083
Di-n-butyl Phthalate	84-74-2	1.1E-02	3.4E+00	mg/kg	45SB8A	11	11/11	3.4
Di-n-octyl Phthalate	117-84-0	2.7E-02	2.7E-02	mg/kg	45TP1A	11	1/11	0.027
Fluoranthene	206-44-0	5.2E-03	6.0E-02	mg/kg	45TP2A	11	6/11	0.06
Fluorene	86-73-7	3.9E-04	1.8E-03	mg/kg	45TP1A	11	5/11	0.0018
Indeno(1,2,3-cd)pyrene	193-39-5	2.6E-02	4.2E-02	mg/kg	45TP2A	11	3/11	0.042
Isophorone	78-59-1	8.3E-04	4.6E-03	mg/kg	45SB5A	11	11/11	0.0046
Naphthalene	91-20-3	5.4E-03	1.4E-02	mg/kg	45TP1A	11	11/11	0.014
N-Nitrosodiphenylamine	86-30-6	1.8E-02	3.7E-01	mg/kg	45SB8A	11	2/11	0.37
Phenanthrene	85-01-8	5.0E-03	2.8E-02	mg/kg	45TP2A	11	4/11	0.028
Phenol	108-95-2	1.2E-03	3.8E-03	mg/kg	45TP3A	11	9/11	0.0038
Pyrene	129-00-0	7.7E-04	5.2E-02	mg/kg	45TP2A	11	11/11	0.052
Nitroglycerin/PETN								
Nitroglycerin	55-63-0	3.8E+00	3.8E+00	mg/kg	45TP2A	11	1/11	3.8

Notes:
CAS = Chemical Abstracts Service
mg/kg = Milligram Per Kilogram
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound

Table F.2-2
Non-detected Chemicals MDL Screening - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Plant SL	Source	Maximum MDL Exceeds SL	Inverte-brate SL	Source	Maximum MDL Exceeds SL	Avian ECO SSL	Source	Maximum MDL Exceeds SL	Mammalian ECO SSL	Source	Maximum MDL Exceeds SL
TAL Metals																		
Antimony	7440-36-0	mg/kg	1	11	0.026	0.026	5	F	N	78	A	N	--	--	NS	0.27	A	N
Cadmium	7440-43-9	mg/kg	6	11	0.45	0.45	32	A	N	140	A	N	0.77	A	N	0.36	A	**Y**
Sodium	7440-23-5	mg/kg	2	11	18	18	NV	--	NS	NV	--	NS	--	--	NS	--	--	NS
Cyanide																		
Cyanide	57-12-5	mg/kg	3	11	0.092	0.094	NV	--	NS	0.9	D	N	--	--	NS	--	--	NS
Pesticides/PCBs																		
4,4'-DDD	72-54-8	ug/kg	11	11	1.3	1.5	100	G	N	100	C	N	--	--	NS	--	--	NS
4,4'-DDE	72-55-9	ug/kg	11	11	1	1.2	100	G	N	--	--	NS	--	--	NS	--	--	NS
4,4'-DDT	50-29-3	ug/kg	10	11	1.2	1.4	100	G	N	--	--	NS	93	A	N	21	A	N
Aldrin	309-00-2	ug/kg	11	11	0.62	0.75	100	G	N	100	C	N	--	--	NS	--	--	NS
alpha-BHC	319-84-6	ug/kg	11	11	0.4	0.48	--	--	NS	--	--	NS	--	--	NS	--	--	NS
alpha-Chlordane	5103-71-9	ug/kg	11	11	0.78	0.94	--	--	NS	--	--	NS	--	--	NS	--	--	NS
beta-BHC	319-85-7	ug/kg	11	11	0.77	0.93	--	--	NS	--	--	NS	--	--	NS	--	--	NS
delta-BHC	319-86-8	ug/kg	11	11	1.1	1.3	100,000	G	N	--	--	NS	--	--	NS	--	--	NS
Dieldrin	60-57-1	ug/kg	11	11	0.53	0.64	100	G	N	100	C	N	22	A	N	4.9	A	N
Endosulfan I	959-98-8	ug/kg	11	11	1	1.2	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Endosulfan II	33213-65-9	ug/kg	10	11	0.98	1.2	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Endosulfan Sulfate	1031-07-8	ug/kg	11	11	1.1	1.4	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Endrin	72-20-8	ug/kg	11	11	0.61	0.74	100	G	N	100	C	N	--	--	NS	--	--	NS
Endrin Aldehyde	7421-93-4	ug/kg	11	11	1.2	1.4	100	G	N	100	C	N	--	--	NS	--	--	NS
Endrin Ketone	53494-70-5	ug/kg	11	11	1.2	1.4	100	G	N	100	C	N	--	--	NS	--	--	NS
gamma-BHC (Lindane)	58-89-9	ug/kg	11	11	0.73	0.89	100	G	N	--	--	NS	--	--	NS	--	--	NS
gamma-Chlordane	5103-74-2	ug/kg	10	11	0.54	0.65	100	G	N	--	--	NS	--	--	NS	--	--	NS
Heptachlor	76-44-8	ug/kg	11	11	1.4	1.7	100	G	N	--	--	NS	--	--	NS	--	--	NS
Heptachlor Epoxide	1024-57-3	ug/kg	11	11	0.47	0.57	100	G	N	--	--	NS	--	--	NS	--	--	NS
Methoxychlor	72-43-5	ug/kg	11	11	1.5	1.8	100	G	N	--	--	NS	--	--	NS	--	--	NS
Toxaphene	8001-35-2	ug/kg	11	11	26	31	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Aroclor 1016	12674-11-2	ug/kg	11	11	4.8	5.8	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1221	11104-28-2	ug/kg	11	11	8.5	10	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1232	11141-16-5	ug/kg	11	11	9.6	12	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1242	53469-21-9	ug/kg	11	11	19	22	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1248	12672-29-6	ug/kg	11	11	6.1	7.3	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1254	11097-69-1	ug/kg	3	11	5	5.4	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1260	11096-82-5	ug/kg	10	11	18	22	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1262	37324-23-5	ug/kg	11	11	5.9	7.2	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
Aroclor 1268	11100-14-4	ug/kg	11	11	5	6.1	40,000	F	N	--	--	NS	--	--	NS	--	--	NS
TCL VOCs																		
1,1,1-Trichloroethane	71-55-6	ug/kg	11	11	0.23	0.28	300	G	N	300	C	N	--	--	NS	--	--	NS
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	11	11	0.23	0.28	300	G	N	300	C	N	--	--	NS	--	--	NS
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/kg	11	11	0.38	0.46	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,1,2-Trichloroethane	79-00-5	ug/kg	11	11	0.79	0.95	300	G	N	300	C	N	--	--	NS	--	--	NS
1,1-Dichloroethane	75-34-3	ug/kg	11	11	0.22	0.27	300	G	N	300	C	N	--	--	NS	--	--	NS
1,1-Dichloroethene	75-35-4	ug/kg	11	11	0.42	0.51	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,2,3-Trichlorobenzene	87-61-6	ug/kg	11	11	0.24	0.28	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,2,4-Trichlorobenzene	120-82-1	ug/kg	11	11	0.28	0.33	100	G	N	100	C	N	--	--	NS	--	--	NS
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	11	11	0.93	1.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,2-Dibromoethane	106-93-4	ug/kg	11	11	0.96	1.2	--	--	NS	5,000	C	N	--	--	NS	--	--	NS
1,2-Dichlorobenzene	95-50-1	ug/kg	11	11	0.28	0.34	100	G	N	100	C	N	--	--	NS	--	--	NS
1,2-Dichloroethane	107-06-2	ug/kg	11	11	0.34	0.41	870,000	G	N	--	--	NS	--	--	NS	--	--	NS
1,2-Dichloropropane	78-87-5	ug/kg	11	11	1	1.3	300	G	N	300	C	N	--	--	NS	--	--	NS
1,3-Dichlorobenzene	541-73-1	ug/kg	11	11	0.27	0.33	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,4-Dichlorobenzene	106-46-7	ug/kg	11	11	0.25	0.3	100	G	N	20,000	B	N	--	--	NS	--	--	NS
2-Butanone	78-93-3	ug/kg	1	11	2.8	2.8	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2-Hexanone	591-78-6	ug/kg	11	11	3.4	4.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Methyl-2-pentanone	108-10-1	ug/kg	11	11	2.1	2.6	100,000	G	N	--	--	NS	--	--	NS	--	--	NS
Benzene	71-43-2	ug/kg	8	11	0.15	0.17	100	G	N	100	C	N	--	--	NS	--	--	NS
Bromochloromethane	74-97-5	ug/kg	11	11	0.15	0.18	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Bromodichloromethane	75-27-4	ug/kg	11	11	0.28	0.34	450,000	G	N	--	--	NS	--	--	NS	--	--	NS
Bromoform	75-25-2	ug/kg	11	11	0.55	0.67	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Bromomethane	74-83-9	ug/kg	11	11	1.4	1.7	--	--	NS	--	--	NS	--	--	NS	--	--	NS

Table F.2-2
Non-detected Chemicals MDL Screening - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Plant SL	Source	Maximum MDL Exceeds SL	Inverte-brate SL	Source	Maximum MDL Exceeds SL	Avian ECO SSL	Source	Maximum MDL Exceeds SL	Mammalian ECO SSL	Source	Maximum MDL Exceeds SL
Carbon Disulfide	75-15-0	ug/kg	2	11	0.3	0.32	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Carbon Tetrachloride	56-23-5	ug/kg	11	11	0.33	0.4	300	G	N	300	C	N	--	--	NS	--	--	NS
Chlorobenzene	108-90-7	ug/kg	11	11	0.23	0.28	100	G	N	40,000	B	N	--	--	NS	--	--	NS
Chloroethane	75-00-3	ug/kg	11	11	0.4	0.48	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Chloroform	67-66-3	ug/kg	9	11	0.17	0.2	300	G	N	300	C	N	--	--	NS	--	--	NS
Chloromethane	74-87-3	ug/kg	11	11	0.28	0.34	--	--	NS	--	--	NS	--	--	NS	--	--	NS
cis-1,2-Dichloroethene	156-59-2	ug/kg	11	11	0.18	0.22	300	G	N	300	C	N	--	--	NS	--	--	NS
cis-1,3-Dichloropropene	10061-01-5	ug/kg	11	11	0.29	0.35	300	G	N	300	C	N	--	--	NS	--	--	NS
Cyclohexane	110-82-7	ug/kg	11	11	0.79	0.95	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Dibromochloromethane	124-48-1	ug/kg	11	11	0.4	0.48	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Dichlorodifluoromethane	75-71-8	ug/kg	11	11	0.38	0.46	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Ethylbenzene	100-41-4	ug/kg	11	11	0.14	0.17	100	G	N	100	C	N	--	--	NS	--	--	NS
Isopropylbenzene	98-82-8	ug/kg	11	11	0.14	0.17	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Methyl tert-Butyl Ether	1634-04-4	ug/kg	11	11	0.27	0.32	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Methylcyclohexane	108-87-2	ug/kg	11	11	0.91	1.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Methylene Chloride	75-09-2	ug/kg	11	11	4.5	5.4	300	G	N	300	C	N	--	--	NS	--	--	NS
Styrene	100-42-5	ug/kg	11	11	0.25	0.3	300,000	F	N	100	C	N	--	--	NS	--	--	NS
Tetrachloroethene	127-18-4	ug/kg	11	11	0.51	0.61	300	G	N	300	C	N	--	--	NS	--	--	NS
Toluene	108-88-3	ug/kg	10	11	0.46	0.55	200,000	F	N	100	C	N	--	--	NS	--	--	NS
trans-1,2-Dichloroethene	156-60-5	ug/kg	11	11	0.26	0.31	300	G	N	300	C	N	--	--	NS	--	--	NS
trans-1,3-Dichloropropene	10061-02-6	ug/kg	11	11	0.95	1.2	300	G	N	300	C	N	--	--	NS	--	--	NS
Trichloroethene	79-01-6	ug/kg	11	11	0.64	0.77	300	G	N	300	C	N	--	--	NS	--	--	NS
Trichlorofluoromethane	75-69-4	ug/kg	11	11	0.24	0.3	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Vinyl Chloride	75-01-4	ug/kg	11	11	0.52	0.63	300	G	N	300	C	N	--	--	NS	--	--	NS
Xylenes	1330-20-7	ug/kg	11	11	0.67	0.81	100	G	N	--	--	NS	--	--	NS	--	--	NS
TCL SVOCs																		
1,1'-Biphenyl	92-52-4	ug/kg	3	11	0.53	2.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	11	11	0.92	4.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	11	11	19	93	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2,4,5-Trichlorophenol	95-95-4	ug/kg	11	11	6.9	34	4,000	F	N	9,000	B	N	--	--	NS	--	--	NS
2,4,6-Trichlorophenol	88-06-2	ug/kg	11	11	5.3	26	100	G	N	10,000	B	N	--	--	NS	--	--	NS
2,4-Dichlorophenol	120-83-2	ug/kg	11	11	7.5	38	100	G	N	100	C	N	--	--	NS	--	--	NS
2,4-Dimethylphenol	105-67-9	ug/kg	11	11	6.5	33	100	G	N	100	C	N	--	--	NS	--	--	NS
2,4-Dinitrophenol	51-28-5	ug/kg	11	11	38	190	20,000	F	N	100	C	**Y**	--	--	NS	--	--	NS
2,4-Dinitrotoluene	121-14-2	ug/kg	9	11	0.1	18	--	I	NS	--	I	NS	--	--	NS	--	--	NS
2,6-Dinitrotoluene	606-20-2	ug/kg	10	11	0.2	2.2	--	I	NS	--	I	NS	--	--	NS	--	--	NS
2-Chloronaphthalene	91-58-7	ug/kg	11	11	0.49	2.5	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2-Chlorophenol	95-57-8	ug/kg	11	11	0.44	2.2	7,000	F	N	10,000	B	N	--	--	NS	--	--	NS
2-Methylnaphthalene	91-57-6	ug/kg	2	11	0.55	2.7	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2-Methylphenol	95-48-7	ug/kg	11	11	9.3	46	100	G	N	100	C	N	--	--	NS	--	--	NS
2-Nitroaniline	88-74-4	ug/kg	11	11	15	75	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2-Nitrophenol	88-75-5	ug/kg	11	11	14	70	--	--	NS	--	--	NS	--	--	NS	--	--	NS
3,3'-Dichlorobenzidine	91-94-1	ug/kg	11	11	90	450	--	--	NS	--	--	NS	--	--	NS	--	--	NS
3-Nitroaniline	99-09-2	ug/kg	11	11	13	63	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	11	11	42	210	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Bromophenyl-PhenylEther	101-55-3	ug/kg	11	11	1.4	7.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Chloro-3-methylphenol	59-50-7	ug/kg	11	11	2	10	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Chloroaniline	106-47-8	ug/kg	11	11	22	110	20,000	F	N	--	--	NS	--	--	NS	--	--	NS
4-Chlorophenyl-PhenylEther	7005-72-3	ug/kg	11	11	0.51	2.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Methylphenol	106-44-5	ug/kg	11	11	10	52	100	G	N	100	C	N	--	--	NS	--	--	NS
4-Nitroaniline	100-01-6	ug/kg	11	11	26	130	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Nitrophenol	100-02-7	ug/kg	11	11	13	64	100	G	N	7,000	B	N	--	--	NS	--	--	NS
Acenaphthene	83-32-9	ug/kg	8	11	0.46	2.3	100	G	N	100	C	N	--	--	NS	--	--	NS
Acenaphthylene	208-96-8	ug/kg	6	11	0.7	3.4	100	G	N	100	C	N	--	--	NS	--	--	NS
Acetophenone	98-86-2	ug/kg	11	11	7.7	38	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Anthracene	120-12-7	ug/kg	6	11	0.49	2.4	100	G	N	100	C	N	--	--	NS	--	--	NS
Atrazine	1912-24-9	ug/kg	11	11	1.7	8.5	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Benzaldehyde	100-52-7	ug/kg	10	11	30	150	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Benzo(a)pyrene	50-32-8	ug/kg	7	11	1.2	5.9	100	G	N	--	--	NS	--	--	NS	--	--	NS
Benzo(b)fluoranthene	205-99-2	ug/kg	3	11	0.99	4.9	100	G	N	100	C	N	--	--	NS	--	--	NS
Benzo(g,h,i)perylene	191-24-2	ug/kg	8	11	2.6	13	100	G	N	100	C	N	--	--	NS	--	--	NS

Table F.2-2
Non-detected Chemicals MDL Screening - Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Parameter Name	CAS #	Units	Number of Non-Detects	Number of Samples	Minimum MDL	Maximum MDL	Plant SL	Source	Maximum MDL Exceeds SL	Inverte-brate SL	Source	Maximum MDL Exceeds SL	Avian ECO SSL	Source	Maximum MDL Exceeds SL	Mammalian ECO SSL	Source	Maximum MDL Exceeds SL
Benzo(k)fluoranthene	207-08-9	ug/kg	1	11	0.83	0.83	100	G	N	100	C	N	--	--	NS	--	--	NS
Bis(2-chloroethoxy)methane	111-91-1	ug/kg	11	11	0.92	4.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Bis(2-chloroethyl)ether	111-44-4	ug/kg	11	11	1	5.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Bis(2-chloroisopropyl)ether	39638-32-9	ug/kg	11	11	0.36	1.8	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Bis(2-ethylhexyl)phthalate	117-81-7	ug/kg	3	11	1.5	7.4	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Butylbenzylphthalate	85-68-7	ug/kg	5	11	2.4	12	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Caprolactam	105-60-2	ug/kg	11	11	26	130	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Carbazole	86-74-8	ug/kg	11	11	0.57	2.8	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Di-n-octylphthalate	117-84-0	ug/kg	10	11	11	56	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Dibenz(a,h)anthracene	53-70-3	ug/kg	10	11	0.61	3.1	100	G	N	100	C	N	--	--	NS	--	--	NS
Dibenzofuran	132-64-9	ug/kg	5	11	0.3	1.5	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Diethylphthalate	84-66-2	ug/kg	1	11	2.1	2.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Dimethylphthalate	131-11-3	ug/kg	10	11	0.39	1.9	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Fluoranthene	206-44-0	ug/kg	5	11	4.4	22	100	G	N	100	C	N	--	--	NS	--	--	NS
Fluorene	86-73-7	ug/kg	6	11	0.32	1.6	100	G	N	100	C	N	--	--	NS	--	--	NS
Hexachlorobenzene	118-74-1	ug/kg	11	11	0.91	4.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Hexachlorobutadiene	87-68-3	ug/kg	11	11	0.79	3.9	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Hexachlorocyclopentadiene	77-47-4	ug/kg	11	11	4.5	22	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Hexachloroethane	67-72-1	ug/kg	11	11	0.92	4.6	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	8	11	0.8	4	100	G	N	100	C	N	--	--	NS	--	--	NS
N-Nitrosodi-n-propylamine	621-64-7	ug/kg	11	11	0.82	4.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
N-Nitrosodiphenylamine	86-30-6	ug/kg	9	11	0.92	1.1	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Nitrobenzene	98-95-3	ug/kg	11	11	1.7	8.5	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Pentachlorophenol	87-86-5	ug/kg	11	11	4.2	21	5,000	A	N	31,000	A	N	2,100	A	N	2,800	A	N
Phenanthrene	85-01-8	ug/kg	7	11	4.1	21	100	G	N	100	C	N	--	--	NS	--	--	NS
Phenol	108-95-2	ug/kg	2	11	0.8	4	100	G	N	30,000	B	N	--	--	NS	--	--	NS
Explosives																		
1,3,5-Trinitrobenzene	99-35-4	mg/kg	11	11	0.074	0.074	8.6	I	N	18.1	I	N	--	--	NS	--	--	NS
1,3-Dinitrobenzene	99-65-0	mg/kg	11	11	0.076	0.076	--	--	NS	--	--	NS	--	--	NS	--	--	NS
2,4,6-Trinitrotoluene	118-96-7	mg/kg	11	11	0.15	0.15	2.4	H	N	1.2	H	N	--	--	NS	--	--	NS
2,4-Dinitrotoluene	121-14-2	mg/kg	11	11	0.1	17	5.3	I	**Y**	19.8	I	N	--	--	NS	--	--	NS
2,6-Dinitrotoluene	606-20-2	mg/kg	11	11	0.2	2.1	4.5	I	N	6.9	I	N	--	--	NS	--	--	NS
2-Amino-4,6-dinitrotoluene	35572-78-2	mg/kg	11	11	0.22	0.22	80	J	N	--	--	NS	--	--	NS	--	--	NS
2-Nitrotoluene	88-72-2	mg/kg	11	11	0.17	0.17	--	--	NS	--	--	NS	--	--	NS	--	--	NS
3-Nitrotoluene	99-08-1	mg/kg	11	11	0.21	0.21	--	--	NS	--	--	NS	--	--	NS	--	--	NS
4-Amino-2,6-dinitrotoluene	1946-51-0	mg/kg	11	11	0.3	0.3	80	J	N	--	--	NS	--	--	NS	--	--	NS
4-Nitrotoluene	99-99-0	mg/kg	11	11	0.2	0.2	--	--	NS	--	--	NS	--	--	NS	--	--	NS
HMX	2691-41-0	mg/kg	11	11	0.066	0.066	--	--	NS	6.3	I	N	--	--	NS	--	--	NS
Nitrobenzene	98-95-3	mg/kg	11	11	0.03	0.03	--	--	NS	--	--	NS	--	--	NS	--	--	NS
RDX	121-82-4	mg/kg	11	11	0.048	0.048	100	K	N	98.6	I	N	--	--	NS	--	--	NS
Tetryl	479-45-8	mg/kg	11	11	0.065	0.065	--	--	NS	--	--	NS	--	--	NS	--	--	NS
Nitroglycerin/PETN																		
Nitroglycerin	55-63-0	mg/kg	10	11	0.39	0.39	--	--	NS	--	--	NS	--	--	NS	--	--	NS
PETN	78-11-5	mg/kg	11	11	0.23	0.23	NV	--	NS	NV	--	NS	--	--	NS	--	--	NS

Notes:

CAS = Chemical Abstracts Service
mg/kg = Milligram Per Kilogram
ug/kg = Microgram Per Kilogram
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
SVOC = Semi-volatile Organic Compound
PAH = Polynuclear Aromatic Hydrocarbon
PETN = Pentaerythritol Tetranitrate
MDL = Method Detection Limit
SL = Screening Level
Eco SSL = Ecological Soil Screening Level

Sources:
A = USEPA Eco SSL - Soil Invertebrates, Plants, Avian, Mammalian (http://www.epa.gov/ecotox/ecossl)
B = ORNL - Earthworms - (Toxilogical Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision, Efroymson et al.)
C = BTAG - Fauna - (Region III Biological Technical Assistance Group - Draft Screening Levels - 1995)
E = ORNL - Microbial Processes - (Toxilogical Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision, Efroymson et al.)
F = ORNL - Plants - Toxilogical Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision Efroymson et al.)
G = BTAG - Flora - (Region III Biological Technical Assistance Group - Draft Screening Levels - 1995)
H = Best, E.P.H., H.E. Tatem, K.N. Geter, M.L. Wells and B.K. Lane. 2004. Toxicity and Metabolites of 2,4,6 Trinitrotoluene (TNT) in Plants and Worms from Exposure to Aged Soil.
I = Kuperman. R. 2003. Development of Ecological Toxicity and Biomagnification Data for Explosives Contaminants in Soil.
J = Pennington, Judith C. 1988. Plant Uptake of 2,4,6-Trinitrotoluene, 4-Amino-2,6-Dinitrotoluene, and 2-Amino-4,6-Dinitrotoluene Using 14C-Labeled and Unlabeled Compounds.
K = Simini, M., R.S. Wentsel, R.T. Checkai, C.T. Phillips, N.A. Chester, M.A. Major, and J.C. Amos. 1995. Evaluation of Soil Toxicity at Joliet Army Ammunition Plant.

Y = MDL exceeds screening level
N = MDL does not exceed screening level
NS = No screening level available

Table F.2-3a
Summary of Total PCBs
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID Sample Date Sample Depth (ft bgs)	CAS #	45SB1A 5/7/2008 0-1		45SB5A 5/7/2008 0-1		45SB8A 5/7/2008 0-1		45SB14A DUP AVG 5/7/2008 0-1		45TP1A 5/5/2008 0-1		45TP2A 5/5/2008 0-1	
		Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r
PCBs (ug/kg)													
Aroclor 1254	11097-69-1	<40	U	12	J	<38	U	<39	U	37	J	730	
Aroclor 1260	11096-82-5	<82	U	<78	U	<77	U	<78	U	<92	U	630	
Total PCBs	--	ND		12		ND		ND		37		1,360	

Notes:
CAS = Chemical Abstract Service
ug/kg = Microgram per kilogram
ft bgs = Feet Below Ground Surface
PBC = Polychlorinated Biphenyl
See Table 4-1 for flag definitions

Table F.2-3a
Summary of Total PCBs
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID Sample Date Sample Depth (ft bgs)	CAS #	45TP3A 5/5/2008 0-1		45TP4A 5/6/2008 0-1		45TP5A 5/6/2008 0-1		45TP6A 5/6/2008 0-1		45TP7A 5/6/2008 0-1	
		Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r
PCBs (ug/kg)											
Aroclor 1254	11097-69-1	9.7	J	520		19	J	39		12	J
Aroclor 1260	11096-82-5	<86	U	<83	U	<86	U	<78	U	<77	U
Total PCBs	--	9.7		520		19		39		12	

Notes:
CAS = Chemical Abstract Service
ug/kg = Microgram per kilogram
ft bgs = Feet Below Ground Surface
PBC = Polychlorinated Biphenyl
See Table 4-1 for flag definitions

Table F.2-3b
Summary of Low and High Molecular Weight PAHs
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID		45SB1A		45SB5A		45SB8A		45SB14A DUP AVG		45TP1A		45TP2A		45TP3A		45TP4A		45TP5A		45TP6A		45TP7A	
Sample Date		5/7/2008		5/7/2008		5/7/2008		5/7/2008		5/5/2008		5/5/2008		5/5/2008		5/6/2008		5/6/2008		5/6/2008		5/6/2008	
Sample Depth (ft bgs)		0-1		0-1		0-1		0-1		0-1		0-1		0-1		0-1		0-1		0-1		0-1	
	CAS #	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r	Result	LQ, VQ, r
TCL PAHs (ug/kg)																							
Acenaphthene	83-32-9	<21	U	<20	U	<97	U	<20	U	0.92	J	1.8	J	<22	U	<21	U	1.3	J	<20	U	<19	U
Acenaphthylene	208-96-8	<21	U	<20	U	<97	U	<20	U	2.3	J	<23	U	<22	U	1.2	J	0.86	J	2.3	J	3.1	J
Anthracene	120-12-7	<21	U	<20	U	<97	U	<20	U	1.4	J	5	J	<22	U	1.2	J	0.86	J	1.5	J	<19	U
Fluorene	86-73-7	<21	U	0.39	J	<97	U	<20	U	1.8	J	1.8	J	<22	U	0.41	J	0.43	J	<20	U	<19	U
Naphthalene	91-20-3	6.1	J,B,z	5.4	J,B,z	7.6	J,B,z	5.65	J,B,z	14	J,B,z	9.1	J,B,z	7.7	J,B,z	6.6	J,B,z	6.9	J,B,z	7	J,B,z	6.9	J,B,z
Phenanthrene	85-01-8	<21	U	<20	U	<97	U	<20	U	13	J	28		<22	U	7.4	J	<22	U	5	J	<19	U
Low Molecular Weight PAHs	--	6.1		5.79		7.6		5.65		33.42		45.7		7.7		16.81		10.35		15.8		10	
Benzo(a)anthracene	56-55-3	3.3	J	1.2	J	15	J	2.15	J	13	J	49		4.7	J	17	J	6.9	J	4.6	J	5.3	J
Benzo(a)pyrene	50-32-8	<21	U	<20	U	<97	U	<20	U	20	J	43		<22	U	23		17	J	<20	U	<19	U
Benzo(b)fluoranthene	205-99-2	16	J	<20	U	<97	U	<20	U	31		82		18	J	38		23		20		18	J
Benzo(g,h,i)perylene	191-24-2	<82	U	<78	U	<380	U	<78	U	19	J	38	J	<86	U	17	J	<86	U	<78	U	<77	U
Benzo(k)fluoranthene	207-08-9	2.8	J	<20	U	17	J	1.36	J	6.4	J	20	J	1.3	J	5	J	4.3	J	2.7	J	2.7	J
Chrysene	218-01-9	4.1	J	0.77	J	15	J	2.3	J	13	J	30		4.3	J	12	J	7.7	J	6.6	J	4.6	J
Dibenz(a,h)anthracene	53-70-3	<82	U	<78	U	<380	U	<78	U	<92	U	28	J	<86	U	<83	U	<86	U	<78	U	<77	U
Fluoranthene	206-44-0	<21	U	<20	U	<97	U	<20	U	17	J	60		<22	U	19	J	5.2	J	7	J	5.7	J
Indeno(1,2,3-cd)pyrene	193-39-5	<82	U	<78	U	<380	U	<78	U	27	J	42	J	<86	U	26	J	<86	U	<78	U	<77	U
Pyrene	129-00-0	3.3	J	0.77	J	7.6	J	1.75	J	18	J	52		4.3	J	19	J	8.2	J	10	J	6.5	J
High Molecular Weight PAHs	--	29.5		2.74		54.6		7.56		164.4		444		32.6		176		72.3		50.9		42.8	

Notes:
CAS = Chemical Abstract Service
ug/kg = Microgram per kilogram
ND = Not Detected
TAL = Target Analyte List
PAH = Polynuclear Aromatic Hydrocarbon
See Table 4-1 for flag definitions

Table F.2-4
Exposure Point Concentration Summary for Surface Soil
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Exposure Point		Chemical of Potential Concern	Units	Arithmetic Mean of Detects	UCL	Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil	7429-90-5	Aluminum	mg/kg	12,355	13,984	18,000	13,984	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-36-0	Antimony	mg/kg	1.083	2.922	4.6	2.922	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.0
	7440-38-2	Arsenic	mg/kg	4.127	7.505	12	7.505	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-43-9	Cadmium	mg/kg	2.144	2.245	6.2	2.245	mg/kg	95% KM (t) UCL	ProUCL 4.0
	7440-47-3	Chromium	mg/kg	29.14	38.99	79	38.99	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-48-4	Cobalt	mg/kg	7.65	8.587	9.1	8.587	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-50-8	Copper	mg/kg	157.8	1,177	1,100	1,100	mg/kg	Maximum Detected Concentration	EPC>MDC
	7439-89-6	Iron	mg/kg	26,091	32,490	47,000	32,490	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-92-1	Lead	mg/kg	163.1	361.1	760	361.1	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7439-96-5	Manganese	mg/kg	684.1	830.2	1,100	830.2	mg/kg	95% Student's t UCL	ProUCL 4.0
	7440-62-2	Vanadium	mg/kg	25.36	31.66	46	31.66	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	7440-66-6	Zinc	mg/kg	539.8	1,218	2,500	1,218	mg/kg	95% Approximate Gamma UCL	ProUCL 4.0
	11097-69-1	Aroclor 1254	mg/kg	0.1723	0.8937	0.73	0.73	mg/kg	Maximum Detected Concentration	EPC>MDC
	11096-82-5	Aroclor 1260*	mg/kg	--	--	0.63	0.63	mg/kg	Maximum Detected Concentration	--
	50-32-8	Benzo(a)pyrene	mg/kg	0.0258	0.0249	0.043	0.0249	mg/kg	95% KM (t) UCL	ProUCL 4.0
	53-70-3	Dibenz(a,h)anthracene*	mg/kg	--	--	0.028	0.028	mg/kg	Maximum Detected Concentration	--
	131-11-3	Dimethyl Phthalate*	mg/kg	--	--	0.00083	0.00083	mg/kg	Maximum Detected Concentration	--
	117-84-0	Di-n-octyl Phthalate*	mg/kg	--	--	0.027	0.027	mg/kg	Maximum Detected Concentration	--
	55-63-0	Nitroglycerin*	mg/kg	--	--	3.8	3.8	mg/kg	Maximum Detected Concentration	--

Notes:

UCL = Upper Confidence Limit

mg/kg = Milligram Per Kilogram

* Due to the low frequency of detection, a mean and UCL were not calculated.

EPC = Exposure Point Concentration

MDC = Maximum Detected Concentration

Table F.2-5
Plant Screening Level Sources - Soil
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Screening Level (mg/kg)	Source
TAL Metals			
Aluminum	7429-90-5	50	ORNL-Plants
Antimony	7440-36-0	5	ORNL-Plants
Arsenic	7440-38-2	18	ECO SSL
Barium	7440-39-3	500	ORNL-Plants
Beryllium	7440-41-7	10	ORNL-Plants
Cadmium	7440-43-9	32	ECO SSL
Chromium	7440-47-3	1	ORNL-Plants
Cobalt	7440-48-4	13	ECO SSL
Copper	7440-50-8	70	ECO SSL
Iron	7439-89-6	NV	--
Lead	7439-92-1	120	ECO SSL
Manganese	7439-96-5	220	ECO SSL
Mercury	7439-97-6	0.3	ORNL-Plants
Nickel	7440-02-0	38	ECO SSL
Selenium	7782-49-2	0.52	ECO SSL
Silver	7440-22-4	560	ECO SSL
Thallium	7440-28-0	1	ORNL-Plants
Vanadium	7440-62-2	2	ORNL-Plants
Zinc	7440-66-6	160	ECO SSL
Cyanide			
Cyanide	57-12-5	NV	--
Pesticides/PCBs			
4,4'-DDT	50-29-3	0.1	BTAG - Flora
Endosulfan II	33213-65-9	NV	--
gamma-Chlordane	5103-74-2	0.1	BTAG - Flora
Aroclor 1254	11097-69-1	NV	--
Aroclor 1260	11096-82-5	NV	--
TCL VOCs			
2-Butanone	78-93-3	NV	--
Acetone	67-64-1	NV	--
Benzene	71-43-2	0.1	BTAG - Flora
Carbon Disulfide	75-15-0	NV	--
Chloroform	67-66-3	0.3	BTAG - Flora
Methyl Acetate	79-20-9	NV	--
Toluene	108-88-3	200	ORNL-Plants
TCL SVOCs			
1,1'-Biphenyl	92-52-4	NV	--
2,4-Dinitrotoluene	121-14-2	5.3	Kuperman 2003
2,6-Dinitrotoluene	606-20-2	4.5	Kuperman 2003
2-Methylnaphthalene	91-57-6	NV	--
Benzaldehyde	100-52-7	NV	--
Bis(2-ethylhexyl)phthalate	117-81-7	NV	--
Butyl Benzyl Phthalate	85-68-7	NV	--
Dibenzofuran	132-64-9	NV	--
Diethyl Phthalate	84-66-2	NV	--
Dimethyl Phthalate	131-11-3	NV	--
Di-n-butyl Phthalate	84-74-2	200	ORNL-Plants
Di-n-octyl Phthalate	117-84-0	NV	--
Isophorone	78-59-1	NV	--
N-Nitrosodiphenylamine	86-30-6	NV	--
Phenol	108-95-2	0.1	BTAG - Flora
Low Molecular Weight PAHs	--	NV	--
High Molecular Weight PAHs	--	NV	--
Nitroglycerin/PETN			
Nitroglycerin	55-63-0	NV	--

Notes:
CAS = Chemical Abstract Service
mg/kg = Milligram per Kilogram
NV = No Value Available
TAL = Target Analyte List
TCL = Target Compound List
USEPA Eco SSL - Soil Invertebrates, Plants, Avian, Mammalian (http://www.epa.gov/ecotox/ecossl)
ORNL - Plants - Toxilogical Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision Efroymson et al.)
BTAG - Flora - (Region III Biological Technical Assistance Group - Draft Screening Levels - 1995)
Kuperman. R. 2003. Development of Ecological Toxicity and Biomagnification Data for Explosives Contaminants in Soil. U.S. Army Edgewood Chemical Biological Center. Final Techinical Report. Project CU-1221.
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound

Table F.2-6
Plant Screening - Soil
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Constituent of Potential Ecological Concern	CAS #	Maximum Soil Concentration (mg/kg)	Screening Level (mg/kg)	Hazard Quotient (unitless)	EPC (mg/kg)	EPC Hazard Quotient (unitless)
Inorganics						
Aluminum	7429-90-5	18,000	50	**3.6E+02**	13,984	**2.8E+02**
Antimony	7440-36-0	4.6	5	9.2E-01	NC	NC
Arsenic	7440-38-2	12	18	6.7E-01	NC	NC
Barium	7440-39-3	240	500	4.8E-01	NC	NC
Beryllium	7440-41-7	1.3	10	1.3E-01	NC	NC
Cadmium	7440-43-9	6.2	32	1.9E-01	NC	NC
Chromium	7440-47-3	79	1	**7.9E+01**	38.99	**3.9E+01**
Cobalt	7440-48-4	9.1	13	7.0E-01	NC	NC
Copper	7440-50-8	1,100	70	**1.6E+01**	1,100	**1.6E+01**
Iron	7439-89-6	47,000	NV	NC	NC	NC
Lead	7439-92-1	760	120	**6.3E+00**	361.1	**3.0E+00**
Manganese	7439-96-5	1,100	220	**5.0E+00**	830.2	**3.8E+00**
Mercury	7439-97-6	0.22	0.3	7.3E-01	NC	NC
Nickel	7440-02-0	24	38	6.3E-01	NC	NC
Selenium	7782-49-2	0.87	0.52	**1.7E+00**	0.465	8.9E-01
Silver	7440-22-4	0.73	560	1.3E-03	NC	NC
Thallium	7440-28-0	0.54	1	5.4E-01	NC	NC
Vanadium	7440-62-2	46	2	**2.3E+01**	31.66	**1.6E+01**
Zinc	7440-66-6	2,500	160	**1.6E+01**	1,218	**7.6E+00**
Cyanide						
Cyanide	57-12-5	0.24	NV	NC	NC	NC
Pesticides/PCBs						
4,4'-DDT	50-29-3	0.021	0.1	2.1E-01	NC	NC
Endosulfan II	33213-65-9	0.036	NV	NC	NC	NC
gamma-Chlordane	5103-74-2	0.0014	0.1	1.4E-02	NC	NC
Aroclor 1254	11097-69-1	0.73	NV	NC	NC	NC
Aroclor 1260	11096-82-5	0.63	NV	NC	NC	NC
Total PCBs	--	1.36	NV	NC	NC	NC
TCL VOCs						
2-Butanone	78-93-3	0.32	NV	NC	NC	NC
Acetone	67-64-1	0.92	NV	NC	NC	NC
Benzene	71-43-2	0.00051	0.1	5.1E-03	NC	NC
Carbon Disulfide	75-15-0	0.0042	NV	NC	NC	NC
Chloroform	67-66-3	0.000365	0.3	1.2E-03	NC	NC
Methyl Acetate	79-20-9	0.016	NV	NC	NC	NC
Toluene	108-88-3	0.0021	200	1.1E-05	NC	NC
TCL SVOCs						
1,1'-Biphenyl	92-52-4	0.0015	NV	NC	NC	NC
2,4-Dinitrotoluene	121-14-2	3.1	5.3	5.8E-01	NC	NC
2,6-Dinitrotoluene	606-20-2	0.17	4.5	3.8E-02	NC	NC
2-Methylnaphthalene	91-57-6	0.0041	NV	NC	NC	NC
Benzaldehyde	100-52-7	0.04	NV	NC	NC	NC
Bis(2-ethylhexyl)phthalate	117-81-7	0.12	NV	NC	NC	NC
Butyl Benzyl Phthalate	85-68-7	0.018	NV	NC	NC	NC
Dibenzofuran	132-64-9	0.0023	NV	NC	NC	NC
Diethyl Phthalate	84-66-2	0.0042	NV	NC	NC	NC
Dimethyl Phthalate	131-11-3	0.00083	NV	NC	NC	NC
Di-n-butyl Phthalate	84-74-2	3.4	200	1.7E-02	NC	NC
Di-n-octyl Phthalate	117-84-0	0.027	NV	NC	NC	NC
Isophorone	78-59-1	0.0046	NV	NC	NC	NC
N-Nitrosodiphenylamine	86-30-6	0.37	NV	NC	NC	NC
Phenol	108-95-2	0.0038	0.1	3.8E-02	NC	NC
Low Molecular Weight PAHs	--	0.0457	NV	NC	NC	NC
High Molecular Weight PAHs	--	0.444	NV	NC	NC	NC
Nitroglycerin/PETN						
Nitroglycerin	55-63-0	3.8	NV	NC	NC	NC

Notes:

CAS = Chemical Abstract Service
mg/kg = Milligram per Kilogram
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
NV = No Value Available
NC = Not Calculated
Hazard Quotient = Soil Concentration/Screening Level
EPC = Exposure Point Concentration
See Table F.2-3a for Total PCBs
See Table F.2-3b for Total Low and High Molecular Weight PAHs

Table F.2-7
Invertebrate and Microbial Screening Level Sources - Soil
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS #	Screening Level (mg/kg)	Source
TAL Metals			
Aluminum	7429-90-5	NV	--
Antimony	7440-36-0	78	ECO SSL
Arsenic	7440-38-2	60	ORNL-Earthworm
Barium	7440-39-3	330	ECO SSL
Beryllium	7440-41-7	40	ECO SSL
Cadmium	7440-43-9	140	ECO SSL
Chromium	7440-47-3	0.4	ORNL-Earthworm
Cobalt	7440-48-4	200	BTAG - Fauna
Copper	7440-50-8	80	ECO SSL
Iron	7439-89-6	200	ORNL - Microbial
Lead	7439-92-1	1,700	ECO SSL
Manganese	7439-96-5	450	ECO SSL
Mercury	7439-97-6	0.1	ORNL-Earthworm
Nickel	7440-02-0	280	ECO SSL
Selenium	7782-49-2	4.1	ECO SSL
Silver	7440-22-4	50	ORNL - Microbial
Thallium	7440-28-0	NV	--
Vanadium	7440-62-2	20	ORNL - Microbial
Zinc	7440-66-6	120	Eco SSL
Cyanide			
Cyanide	57-12-5	0.9	CCME-2006
Pesticides/PCBs			
4,4'-DDT	50-29-3	0.1	BTAG - Fauna
Endosulfan II	33213-65-9	NV	--
gamma-Chlordane	5103-74-2	0.1	BTAG - Fauna
Aroclor 1254	11097-69-1	NV	--
Aroclor 1260	11096-82-5	NV	--
TCL VOCs			
2-Butanone	78-93-3	NV	--
Acetone	67-64-1	NV	--
Benzene	71-43-2	0.1	BTAG - Fauna
Carbon Disulfide	75-15-0	NV	--
Chloroform	67-66-3	0.3	BTAG - Fauna
Methyl Acetate	79-20-9	NV	--
Toluene	108-88-3	0.1	BTAG - Fauna
TCL SVOCs			
1,1'-Biphenyl	92-52-4	NV	--
2,4-Dinitrotoluene	121-14-2	19.8	Kuperman 2003
2,6-Dinitrotoluene	606-20-2	6.9	Kuperman 2003
2-Methylnaphthalene	91-57-6	NV	--
Benzaldehyde	100-52-7	NV	--
Bis(2-ethylhexyl)phthalate	117-81-7	NV	--
Butyl Benzyl Phthalate	85-68-7	NV	--
Dibenzofuran	132-64-9	NV	--
Diethyl Phthalate	84-66-2	NV	--
Dimethyl Phthalate	131-11-3	NV	--
Di-n-butyl Phthalate	84-74-2	NV	--
Di-n-octyl Phthalate	117-84-0	NV	--
Isophorone	78-59-1	NV	--
N-Nitrosodiphenylamine	86-30-6	NV	--
Phenol	108-95-2	30	ORNL-Earthworm
Low Molecular Weight PAHs	--	29	ECO SSL
High Molecular Weight PAHs	--	18	ECO SSL
Nitroglycerin/PETN			
Nitroglycerin	55-63-0	NV	--

Table F.2-7
Invertebrate and Microbial Screening Level Sources - Soil
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Notes:
CAS = Chemical Abstract Service
mg/kg = Milligram per Kilogram
NV = No Value Available
TAL = Target Analyte List
TCL = Target Compound List
USEPA Eco SSL - Soil Invertebrates, Plants, Avian, Mammalian (http://www.epa.gov/ecotox/ecossl)
ORNL - Earthworms - (Toxilogical Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision, Efroymson et al.)
ORNL - Microbial Processes - (Toxilogical Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision, Efroymson et al.)
BTAG - Fauna - (Region III Biological Technical Assistance Group - Draft Screening Levels - 1995)
Kuperman. R. 2003. Development of Ecological Toxicity and Biomagnification Data for Explosives Contaminants in Soil. U.S. Army Edgewood Chemical Biological Center. Final Techinical Report. Project CU-1221.

PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound

Table F.2-8
Invertebrate and Microbial Screening - Soil
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Constituent of Potential Ecological Concern	CAS #	Maximum Soil Concentration (mg/kg)	Screening Level (mg/kg)	Hazard Quotient (unitless)	EPC (mg/kg)	EPC Hazard Quotient (unitless)
Inorganics						
Aluminum	7429-90-5	18,000	NV	NC	NC	NC
Antimony	7440-36-0	4.6	78	5.9E-02	NC	NC
Arsenic	7440-38-2	12	60	2.0E-01	NC	NC
Barium	7440-39-3	240	330	7.3E-01	NC	NC
Beryllium	7440-41-7	1.3	40	3.3E-02	NC	NC
Cadmium	7440-43-9	6.2	140	4.4E-02	NC	NC
Chromium	7440-47-3	79	0.4	**2.0E+02**	38.99	**9.7E+01**
Cobalt	7440-48-4	9.1	200	4.6E-02	NC	NC
Copper	7440-50-8	1,100	80	**1.4E+01**	1,100	**1.4E+01**
Iron	7439-89-6	47,000	200	**2.4E+02**	32,490	**1.6E+02**
Lead	7439-92-1	760	1,700	4.5E-01	NC	NC
Manganese	7439-96-5	1,100	450	**2.4E+00**	830.2	**1.8E+00**
Mercury	7439-97-6	0.22	0.1	**2.2E+00**	0.124	**1.2E+00**
Nickel	7440-02-0	24	280	8.6E-02	NC	NC
Selenium	7782-49-2	0.87	4	2.1E-01	NC	NC
Silver	7440-22-4	0.73	50	1.5E-02	NC	NC
Thallium	7440-28-0	0.54	NV	NC	NC	NC
Vanadium	7440-62-2	46	20	**2.3E+00**	31.66	**1.6E+00**
Zinc	7440-66-6	2,500	120	**2.1E+01**	1,218	**1.0E+01**
Cyanide						
Cyanide	57-12-5	0.24	0.9	2.7E-01	NC	NC
Pesticides/PCBs						
4,4'-DDT	50-29-3	0.021	0.1	2.1E-01	NC	NC
Endosulfan II	33213-65-9	0.036	NV	NC	NC	NC
gamma-Chlordane	5103-74-2	0.0014	0.1	1.4E-02	NC	NC
Aroclor 1254	11097-69-1	0.73	NV	NC	NC	NC
Aroclor 1260	11096-82-5	0.63	NV	NC	NC	NC
Total PCBs	--	1.36	NV	NC	NC	NC
TCL VOCs						
2-Butanone	78-93-3	0.32	NV	NC	NC	NC
Acetone	67-64-1	0.92	NV	NC	NC	NC
Benzene	71-43-2	0.00051	0.1	5.1E-03	NC	NC
Carbon Disulfide	75-15-0	0.0042	NV	NC	NC	NC
Chloroform	67-66-3	0.000365	0.3	1.2E-03	NC	NC
Methyl Acetate	79-20-9	0.016	NV	NC	NC	NC
Toluene	108-88-3	0.0021	0.1	2.1E-02	NC	NC
TCL SVOCs						
1,1'-Biphenyl	92-52-4	0.0015	NV	NC	NC	NC
2,4-Dinitrotoluene	121-14-2	3.1	19.8	1.6E-01	NC	NC
2,6-Dinitrotoluene	606-20-2	0.17	6.9	2.5E-02	NC	NC
2-Methylnaphthalene	91-57-6	0.0041	NV	NC	NC	NC
Benzaldehyde	100-52-7	0.04	NV	NC	NC	NC
Bis(2-ethylhexyl)phthalate	117-81-7	0.12	NV	NC	NC	NC
Butyl Benzyl Phthalate	85-68-7	0.018	NV	NC	NC	NC
Dibenzofuran	132-64-9	0.0023	NV	NC	NC	NC
Diethyl Phthalate	84-66-2	0.0042	NV	NC	NC	NC
Dimethyl Phthalate	131-11-3	0.00083	NV	NC	NC	NC
Di-n-butyl Phthalate	84-74-2	3.4	NV	NC	NC	NC
Di-n-octyl Phthalate	117-84-0	0.027	NV	NC	NC	NC
Isophorone	78-59-1	0.0046	NV	NC	NC	NC
N-Nitrosodiphenylamine	86-30-6	0.37	NV	NC	NC	NC
Phenol	108-95-2	0.0038	30	1.3E-04	NC	NC
Low Molecular Weight PAHs	--	0.0457	29	1.6E-03	NC	NC
High Molecular Weight PAHs	--	0.444	18	2.5E-02	NC	NC
Nitroglycerin/PETN						
Nitroglycerin	55-63-0	3.8	NV	NC	NC	NC

Notes:

CAS = Chemical Abstract Service
mg/kg = Milligram per Kilogram
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
NV = No Value Available
NC = Not Calculated
Hazard Quotient = Soil Concentration/Screening Level
EPC = Exposure Point Concentration
See Table F.2-3a for Total PCBs
See Table F.2-3b for Total Low and High Molecular Weight PAHs

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Table F.2-9
Wildlife Profiles
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

							Preliminary Assessment					Refined Assessment					
Representative Species			Composition of Diet [1] (%)				Minimum Body Weight [1]	Maximum Body Weight [1]	Maximum Food Ingestion Rate[2]	Maximum Substrate Ingestion Rate [3]		Average Body Weight [1]	Average Food Ingestion Rate [2]	Average Substrate Ingestion Rate [3]	Home Range (ha)	Proportion of Year Species Active	AUFs
Food-web Classification	Common Name	Scientific Name	Plants (incl. fungi)	Inverte-brates	Small mammals	Fish	kg	kg	kg dw/day	% of dry intake	kg dry wt./day	kg	kg dw/day	kg dry wt./day			Study Area (0.12) hectares
Birds																	
soil-probing invertivore	American robin	*Turdus migratorius*	62%	38%			0.0635	0.103	0.02	5%	0.001	0.077	0.016	0.0008	0.48	1	0.25
large carnivore	Red-tailed hawk	*Buteo jamaicensis*			100%		0.957	1.235	0.063	0%	0	1.134	0.059	0	250	1	0.0005
Mammals																	
small herbivore	Meadow vole	*Microtus pennsylvanicus*	100%				0.017	0.0524	0.01	2.4%	0.00024	0.037	0.008	0.00019	0.037	1	1
medium carnivore	Red fox	*Vulpes vulpes*	17%	4%	79%		2.95	7.04	0.342	2.8%	0.0096	4.53	0.238	0.0067	96	1	0.0013
small invertivore	Short-tailed shrew	*Blarina brevicauda*	14%	86%			0.0125	0.0225	0.003	13%	0.00039	0.015	0.002	0.00026	0.39	1	0.31

Notes:
kg = Kilogram
kg dw/day = Kilogram Dry-weight per Day
L/day = Liter per Day
ha = Hectares
AUF = Area Use Factor

[1]Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency (EPA). 1993. Office of Research and Development. 2 Volumes. EPA/600/R93/187a&b. December.
[2] Estimated food intake rate (kg [dw]/day) calculated as follows:
FI ((kg/day) = 0.0687 $Wt.^{0.882}$ for mammals (red fox and short-tailed shrew)
FI ((g/day) = 0.577 $Wt.^{0.727}$ for herbivores (meadow vole)
FI ((g/day) = 0.301 $Wt.^{0.751}$ for non-passerine birds (red-tailed hawk)
FI ((g/day) = 0.398 $Wt.^{0.850}$ for passerine birds (american robin)
[3]Estimating Exposure to Terrestrial Wildlife to Contaminants. Sample and Sutter. 1994. ES/ER/TM-125.
The soil ingestion rate for the american robin set equal to 38% of the american woodcock value (0.34*10.4%=4%), based on a robin diet of 38% invertbrates.

Table F.2-10
Wildlife TRVs
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

	CAS #	AVIAN TEST SPECIES				MAMMALIAN TEST SPECIES					AVIAN RECEPTORS				MAMMALIAN RECEPTORS					
											American Robin		Red-tailed Hawk		Meadow Vole		Red Fox		Short-tailed Shrew	
		Chronic LOAEL	Chronic NOAEL	Test Animal	Source	Chronic LOAEL	Chronic NOAEL	Test Animal	Test Animal Body Weight (kg)	Source	Chronic LOAEL	Chronic NOAEL	Chronic LOAEL	Chronic NOAEL	Chronic LOAEL	Chronic NOAEL	Chronic LOAEL	Chronic NOAEL	Chronic LOAEL	Chronic NOAEL
		(mg/kg-bw/d)				(mg/kg-bw/d)					(mg/kg-bw/d)		(mg/kg-bw/d)		(mg/kg-bw/d)		(mg/kg-bw/d)		(mg/kg-bw/d)	
Arsenic	7440-38-2	1.28E+01	5.14E+00	mallard duck	ORNL 1996	1.26	0.126	mouse	0.03	ORNL 1996	1.28E+01	5.14E+00	1.28E+01	5.14E+00	1.20E+00	1.20E-01	3.59E-01	3.59E-02	1.50E+00	1.50E-01
Cadmium	7440-43-9	2.00E+01	1.45E+00	mallard duck	ORNL 1996	10	1	rat	0.3	ORNL 1996	2.00E+01	1.45E+00	2.00E+01	1.45E+00	1.69E+01	1.69E+00	5.07E+00	5.07E-01	2.11E+01	2.11E+00
Chromium	7440-47-3	5.00E+00	1.00E+00	black duck	ORNL 1996	32.8	3.28	rat	0.35	ORNL 1996	5.00E+00	1.00E+00	5.00E+00	1.00E+00	5.75E+01	5.75E+00	1.73E+01	1.73E+00	7.21E+01	7.21E+00
Copper	7440-50-8	6.17E+01	4.70E+01	1 day old chicks	ORNL 1996	15.4	11.7	mink	1	ORNL 1996	6.17E+01	4.70E+01	6.17E+01	4.70E+01	3.51E+01	2.67E+01	1.06E+01	8.02E+00	4.40E+01	3.34E+01
Lead	7439-92-1	1.13E+01	1.13E+00	Japanese quail	ORNL 1996	80	8	rat	0.35	ORNL 1996	1.13E+01	1.13E+00	1.13E+01	1.13E+00	1.40E+02	1.40E+01	4.22E+01	4.22E+00	1.76E+02	1.76E+01
Mercury	7439-97-6	9.00E-01	4.50E-01	Japanese Quail	ORNL 1996	132	13.2	mink	1	ORNL 1996	9.00E-01	4.50E-01	9.00E-01	4.50E-01	3.01E+02	3.01E+01	9.05E+01	9.05E+00	3.77E+02	3.77E+01
Nickel	7440-02-0	1.07E+02	7.74E+01	mallard duckling	ORNL 1996	80	40	rat	0.35	ORNL 1996	1.07E+02	7.74E+01	1.07E+02	7.74E+01	1.40E+02	7.01E+01	4.22E+01	2.11E+01	1.76E+02	8.79E+01
Selenium	7782-49-2	8.00E-01	4.00E-01	mallard duck	ORNL 1996	0.33	0.2	rat	0.35	ORNL 1996	8.00E-01	4.00E-01	8.00E-01	4.00E-01	5.79E-01	3.51E-01	1.74E-01	1.05E-01	7.25E-01	4.40E-01
Silver	7440-22-4	1.24E+02	1.66E+01	turkey	Matuk et al. 1981	222	22.2	rat	0.35	Matuk et al. 1981	1.24E+02	1.66E+01	1.24E+02	1.66E+01	3.89E+02	3.89E+01	1.17E+02	1.17E+01	4.88E+02	4.88E+01
Zinc	7440-66-6	1.31E+02	1.45E+01	white leghorn hen	ORNL 1996	320	160	rat	0.35	ORNL 1996	1.31E+02	1.45E+01	1.31E+02	1.45E+01	5.61E+02	2.81E+02	1.69E+02	8.44E+01	7.03E+02	3.52E+02
PAHs																				
Acenaphthene	83-32-9	5.05E+00	1.01E+00	red-winged blackbird	USACE 1998	87.5	17.5	mouse	0.03	USACE 1998	5.05E+00	1.01E+00	5.05E+00	1.01E+00	8.30E+01	1.66E+01	2.50E+01	4.99E+00	1.04E+02	2.08E+01
Acenaphthylene	208-96-8	--	--	--	USACE 1998	500	100	rat	0.35	USACE 1998	NV	NV	NV	NV	8.77E+02	1.75E+02	2.64E+02	5.27E+01	1.10E+03	2.20E+02
Benzo(a)anthracene	56-55-3	--	--	--	USACE 1998	2	0.2	rodents	0.165	USACE 1998	NV	NV	NV	NV	2.91E+00	2.91E-01	8.74E-01	8.74E-02	3.64E+00	3.64E-01
Benzo(a)pyrene	50-32-8	2.50E+00	5.00E-01	duck	ORNL 1996	10	1	mouse	0.03	ORNL 1996	2.50E+00	5.00E-01	2.50E+00	5.00E-01	9.49E+00	9.49E-01	2.85E+00	2.85E-01	1.19E+01	1.19E+00
Benzo(b)fluoranthene	205-99-2	--	--	--	ORNL 1996	10	1	mouse	0.03	ORNL 1996	NV	NV	NV	NV	9.49E+00	9.49E-01	2.85E+00	2.85E-01	1.19E+01	1.19E+00
Benzo(g,h,i)perylene	191-24-2	--	--	--	USACE 1998	2.5	0.5	mouse	0.03	USACE 1998	NV	NV	NV	NV	2.37E+00	4.74E-01	7.13E-01	1.43E-01	2.97E+00	5.95E-01
Benzo(k)fluoranthene	207-08-9	--	--	--	USACE 1998	72	7.2	rodents	0.165	USACE 1998	NV	NV	NV	NV	1.05E+02	1.05E+01	3.15E+01	3.15E+00	1.31E+02	1.31E+01
Chrysene	218-01-9	--	--	--	USACE 1998	99	9.9	rodents	0.165	USACE 1998	NV	NV	NV	NV	1.44E+02	1.44E+01	4.32E+01	4.32E+00	1.80E+02	1.80E+01
Dibenzo(a,h)anthracene	53-70-3	--	--	--	USACE 1998	13.33	1.333	rodents	0.165	USACE 1998	NV	NV	NV	NV	1.94E+01	1.94E+00	5.82E+00	5.82E-01	2.43E+01	2.43E+00
Fluoranthene	206-44-0	--	--	--	USACE 1998	100	20	rodents	0.165	USACE 1998	NV	NV	NV	NV	1.45E+02	2.91E+01	4.37E+01	8.74E+00	1.82E+02	3.64E+01
Fluorene	86-73-7	5.05E+00	1.01E+00	red-winged blackbird	USACE 1998	2.5	0.5	mouse	0.03	USACE 1998	5.05E+00	1.01E+00	5.05E+00	1.01E+00	2.37E+00	4.74E-01	7.13E-01	1.43E-01	2.97E+00	5.95E-01
Indeno(1,2,3-cd)pyrene	193-39-5	--	--	--	USACE 1998	72	7.2	rodents	0.165	USACE 1998	NV	NV	NV	NV	1.05E+02	1.05E+01	3.15E+01	3.15E+00	1.31E+02	1.31E+01
Phenanthrene	85-01-8	5.65E+00	1.13E+00	red-winged blackbird	USACE 1998	35	7	mouse	0.03	USACE 1998	5.65E+00	1.13E+00	5.65E+00	1.13E+00	3.32E+01	6.64E+00	9.98E+00	2.00E+00	4.16E+01	8.32E+00
Pyrene	129-00-0	--	--	--	USACE 1998	40	8	mouse	0.03	USACE 1998	NV	NV	NV	NV	3.80E+01	7.59E+00	1.14E+01	2.28E+00	4.76E+01	9.51E+00
Pesticides																				
4,4'-DDT	50-29-3	2.80E-02	2.80E-03	brown pelican	ORNL 1996	4	0.8	rat	0.35	ORNL 1996	2.80E-02	2.80E-03	2.80E-02	2.80E-03	7.01E+00	1.40E+00	2.11E+00	4.22E-01	8.79E+00	1.76E+00
Chlordane	#N/A	1.06E+01	2.14E+00	red-winged blackbird	ORNL 1996	9.2	4.6	mouse	0.03	ORNL 1996	1.06E+01	2.14E+00	1.06E+01	2.14E+00	8.73E+00	4.37E+00	2.62E+00	1.31E+00	1.09E+01	5.47E+00
Endosulfan	#N/A	1.00E+02	1.00E+01	gray partridge	ORNL 1996	1.5	0.15	rat	0.35	ORNL 1996	1.00E+02	1.00E+01	1.00E+02	1.00E+01	2.63E+00	2.63E-01	7.91E-01	7.91E-02	3.30E+00	3.30E-01
Endosulfan II	33213-65-9	1.00E+02	1.00E+01	gray partridge	Endosulfan Value	1.5	0.15	rat	0.35	Endosulfan Value	1.00E+02	1.00E+01	1.00E+02	1.00E+01	2.63E+00	2.63E-01	7.91E-01	7.91E-02	3.30E+00	3.30E-01
gamma-Chlordane	5103-74-2	1.06E+01	2.14E+00	red-winged blackbird	Chlordane Value	3.9	0.39	mouse	0.03	ATSDR 1994	1.06E+01	2.14E+00	1.06E+01	2.14E+00	3.70E+00	3.70E-01	1.11E+00	1.11E-01	4.64E+00	4.64E-01
PCBs																				
Aroclor 1254	11097-69-1	1.80E+00	1.80E-01	ring-necked pheasant	ORNL 1996	3.43	1.37	mink	1	Aroclor 1016 Value	1.80E+00	1.80E-01	1.80E+00	1.80E-01	7.82E+00	3.12E+00	2.35E+00	9.39E-01	9.80E+00	3.91E+00
Aroclor 1260	11096-82-5	1.80E+00	1.80E-01	ring-necked pheasant	Aroclor 1254 Value	3.43	1.37	mink	1	Aroclor 1016 Value	1.80E+00	1.80E-01	1.80E+00	1.80E-01	7.82E+00	3.12E+00	2.35E+00	9.39E-01	9.80E+00	3.91E+00
Explosives																				
Nitroglycerin[4]	55-63-0	--	--	--	--	32	3	Rat	0.325	USCHPPM 2007	NV	NV	NV	NV	5.51E+01	5.16E+00	1.66E+01	1.55E+00	6.90E+01	6.47E+00

Notes:
CAS = Chemical Abstract Service
TRV = Toxic Reference Value
NOAEL = No observable adverse effects level
LOAEL = Lowest observable adverse effects level
mg/kg = Milligram Per Kilogram
bw/d = Body Weight Per Day
kg = kilogram
PAH = Polynuclear Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
USACE = U.S. Army Corps of Engineers
ORNL = Oak Ridge National Laboratory
NOAEL and LOAEL values were derived from acute values by applying an uncertainty factor of 150.
LD_{50} = Lethal Dose for 50% of test organisms

Sources:
Matuk et al. 1981. Matuk, Y., M. Gosh and C. McCulloch. 1981. Distribution of silver in the eyes and plasma proteins of the albino rat. Can. J. Ophthalmol. 16: 145-150. (Cited in ATSDR, 1990)
ORNL 1996. Sample, B.E., D.M. Opresko and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. ES/ER/TM-86/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee.
USACE 1998. U.S. Army Corps of Engineers (USACE). 1998. Final Ecological Risk Assessment, RCRA Facility Investigation, for Sunflower Army Ammunition Plant, De Soto, Kansas. USACE Kansas City District.
USCHPPM 2007. U.S. Army Center for Health Promotion and Preventive Medicine (USCHPPM) 2007, Wildlife Toxicity Assessment for Nitroglycerine (NG). USACHPPM Document No: 37-EJ-1138-01F. November.
U.S. EPA 1988. Recommendations for and documentation of biological values for use in risk assessment. Environmental Criteria and Assessment Office. Cincinnati, OH. EPA/600/6-87/008.
[4]- Mature rat body weight (average male & female) = 0.325 kg (U.S. EPA, 1988).

Table F.2-11
Soil Biocaccumulation/Bioconcentration Factors- Soil to Plant Pathway
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

					Preliminary Assessment		Refined Assessment			
Chemical	**CAS**	**Log K_{ow} Range**	**Selected K_{ow}**	**Source**	**BAF**	**Basis**	**C_s EPC (mg/kg)**	**BAF[1]**	**Basis**	**Source**
Inorganics										
ARSENIC	7440-38-2	-- - --	--	--	1.103	90th percentile	7.505	0.0375	Median	Bechtel Jacobs 1998
CADMIUM	7440-43-9	-- - --	--	--	3.25	90th percentile	2.245	0.4308	$C_p = e^{(0.546*\ln(Cs) - 0.475)}$	Bechtel Jacobs 1998
CHROMIUM	7440-47-3	-- - --	--	--	0.084	90th percentile	38.99	0.0410	Median	Bechtel Jacobs 1998
COPPER	7440-50-8	-- - --	--	--	0.625	90th percentile	1,100	0.0280	$C_p = e^{(0.394*\ln(Cs) + 0.668)}$	Bechtel Jacobs 1998
LEAD	7439-92-1	-- - --	--	--	0.468	90th percentile	361.1	0.0200	$C_p = e^{(0.561*\ln(Cs) - 1.328)}$	Bechtel Jacobs 1998
MERCURY	7439-97-6	-- - --	--	--	5	90th percentile	0.124	0.9578	$C_p = e^{(0.544*\ln(Cs) - 0.995)}$	Bechtel Jacobs 1998
NICKEL	7440-02-0	-- - --	--	--	1.411	90th percentile	16	0.0538	$C_p = e^{(0.748*\ln(Cs) + 2.223)}$	Bechtel Jacobs 1998
SELENIUM	7782-49-2	-- - --	--	--	3.012	90th percentile	0.47	0.4692	$C_p = e^{(1.104*\ln(Cs) - 0.677)}$	Bechtel Jacobs 1998
SILVER	7440-22-4	-- - --	--	--	0.037	90th percentile	0.73	0.0140	Median	Bechtel Jacobs 1998
ZINC	7440-66-6	-- - --	--	--	1.82	90th percentile	1,218	0.2031	$C_p = e^{(0.554*\ln(Cs) + 1.575)}$	Bechtel Jacobs 1998
Pesticides										
DIELDRIN	60-57-1	3.63 - 6.2	5.37	USEPA 1995	1	Default Value	NC	0.41	Median	USEPA 2005
ENDOSULFAN II	33213-65-9	3.62 - 4.52	4.52	USEPA 1995	1	Default Value	0.04	0.0945	K_{ow} Regression Eq.	Travis and Arms 1988
ENDRIN	72-20-8	2.92 - 5.2	5.06	USEPA 1995	1	Default Value	NC	0.0461	K_{ow} Regression Eq.	Travis and Arms 1988
HEPTACHLOR EPOXIDE	1024-57-3	3.5 - 5.4	5	USEPA 1995	1	Default Value	NC	0.0499	K_{ow} Regression Eq.	Travis and Arms 1988
PCBs										
AROCLOR-1254	11097-69-1	-- - --	6.5	Jones et al. 1997	0.0068	K_{ow} Regression Eq.	0.73	0.0068	K_{ow} Regression Eq.	Travis and Arms 1988
AROCLOR-1260	11096-82-5	-- - --	6.8	Jones et al. 1997	0.0045	K_{ow} Regression Eq.	0.63	0.0045	K_{ow} Regression Eq.	Travis and Arms 1988
VOCs and SVOCs										
ACENAPHTHENE	83-32-9	3.77 - 4.49	3.92	USEPA 1995	4.6	Anthracene as Surrogate	NC	NC	$C_p = e^{(-0.8556*\ln(Cs) - 5.562)}$	USEPA 2005
ACENAPHTHYLENE	208-96-8	-- - --	4.1	USEPA 1995	4.6	Anthracene as Surrogate	NC	NC	$C_p = e^{(0.791*\ln(Cs) - 1.144)}$	USEPA 2005
ANTHRACENE	120-12-7	4.44 - 4.8	4.55	USEPA 1995	4.6	Maximum	NC	NC	$C_p = e^{(0.778*\ln(Cs) - 0.989)}$	USEPA 2005
BENZO(A)ANTHRACENE	56-55-3	5.61 - 5.79	5.7	USEPA 1995	0.54	Maximum	NC	NC	$C_p = e^{(0.5944*\ln(Cs) - 2.708)}$	USEPA 2005
BENZO(A)PYRENE	50-32-8	5.98 - 6.34	6.11	USEPA 1995	3.3	Maximum	0.02	0.1396	$C_p = e^{(0.975*\ln(Cs) - 2.0615)}$	USEPA 2005
BENZO(B)FLUORANTHENE	205-99-2	5.79 - 6.4	6.2	USEPA 1995	0.48	Maximum	NC	0.31	Median BAF	USEPA 2005
BENZO(G,H,I)PERYLENE	191-24-2	6.58 - 7.05	6.7	USEPA 1995	1.6	Maximum	NC	NC	$C_p = e^{(1.183*\ln(Cs) - 0.931)}$	USEPA 2005
BENZO(K)FLUORANTHENE	207-08-9	6.12 - 6.27	6.2	USEPA 1995	1	Maximum	NC	NC	$C_p = e^{(0.860*\ln(Cs) - 2.158)}$	USEPA 2005
CHRYSENE	218-01-9	5.41 - 5.79	5.7	USEPA 1995	1.05	Maximum	NC	NC	$C_p = e^{(0.594*\ln(Cs) - 2.708)}$	USEPA 2005
DIBENZO(A,H)ANTHRACENE	53-70-3	6.5 - 6.88	6.69	USEPA 1995	0.23	Maximum	0.03	0.13	Median BAF	USEPA 2005
FLUORANTHENE	206-44-0	4.84 - 5.39	5.12	USEPA 1995	6	Maximum	NC	0.50	Median BAF	USEPA 2005
FLUORENE	86-73-7	4.04 - 4.4	4.21	USEPA 1995	0.057	Maximum	NC	NC	$C_p = e^{(-0.856*\ln(Cs) - 5.562)}$	USEPA 2005
INDENO(1,2,3-CD)PYRENE	193-39-5	6.58 - 6.72	6.65	USEPA 1995	0.15	Maximum	NC	0.11	Median BAF	USEPA 2005
PHENANTHRENE	85-01-8	4.37 - 4.57	4.55	USEPA 1995	11	Maximum	NC	NC	$C_p = e^{(0.620*\ln(Cs) - 0.167)}$	USEPA 2005
PYRENE	129-00-0	4.76 - 5.52	5.11	USEPA 1995	3.7	Maximum	NC	0.72	Median BAF	USEPA 2005
Explosives										
NITROGLYCERIN	55-63-0	-- - --	1.6	SRC	1	Default Value	3.8	1	Default Value	USEPA 2005

Notes:
CAS = Chemical Abstract Services
BAF = Bioaccumulation Factor
K_{ow} = Chemical octanol-water coefficient
NC = Not Calculated
C_s = Chemical Concentration in Soil
C_p = Chemical Concentration in Plant Matter (dry weight)
[1] = BAFs for chemical using Cp regression equation calculated by as follows: BAF = C_p/C_s

Source(s):

USEPA 1995: United States Environmental Protection Agency. 1995. Karickhoff, S.W. , and J.M. Long. Summary of Measured, Calculated, and Recommended Log K_{ow} Values. Environmental Research Laboratory. Athens, Georgia.
Jones et al. 1997: Jones et al. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision
Bechtel Jacobs 1998: Bechtel Jacobs Company. September 1998. Emperical Models for the Uptake of Inorganic Chemical from Soil by Plants.
USEPA 2005: United States Environmental Protection Agency (USEPA). February 2005. Guidance for Developing Ecological Soil Screening Levels.
Travis and Arms 1988: Travis and Arms. 1988. Bioconcentration of Organics in Beef, Milk, and Vegetation. BAF values calculated for Tier I using lowest Kow value and for Tier II using the selected Kow value.
K_{ow} Regression Equation: BAF =10^((-0.578*K_{ow})+1.588))

Table F.2-12
Soil Biocaccumulation/Bioconcentration Factors - Soil to Invertebrate Pathway
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

							Preliminary Assessment		Refined Assessment			
Chemical	**CAS**	**Log K_{ow} Range**	**Selected Log K_{ow}**	**Reference**	**K_{oc}**	**Reference**	**Value**	**Basis**	**C_s EPC (mg/kg)**	**BAF[1]**	**Basis**	**Source**
Inorganics												
ARSENIC	7440-38-2	-- - --	--	--	--	--	0.523	90th percentile	7.505	0.1335	$C_e = e^{(0.706*\ln(Cs) - 1.421)}$	Sample et al. 1998
CADMIUM	7440-43-9	-- - --	--	--	--	--	40.69	90th percentile	2.245	7.0162	$C_e = e^{(0.795*\ln(Cs) + 2.114)}$	Sample et al. 1998
CHROMIUM	7440-47-3	-- - --	--	--	--	--	3.162	90th percentile	38.99	0.31	Median	Sample et al. 1998
COPPER	7440-50-8	-- - --	--	--	--	--	1.531	90th percentile	1,100	0.52	Median	Sample et al. 1998
LEAD	7439-92-1	-- - --	--	--	--	--	1.522	90th percentile	361.1	0.2580	$C_e = e^{(0.807*\ln(Cs) - 0.218)}$	Sample et al. 1998
MERCURY	7439-97-6	-- - --	--	--	--	--	20.625	90th percentile	0.124	1.69	Median	Sample et al. 1998
NICKEL	7440-02-0	-- - --	--	--	--	--	4.73	90th percentile	16	1.06	Median	Sample et al. 1998
SELENIUM	7782-49-2	-- - --	--	--	--	--	1.34	90th percentile	0.465	1.1382	$C_e = e^{(0.733*\ln(Cs) - 0.075)}$	Sample et al. 1998
SILVER	7440-22-4	-- - --	--	--	--	--	15.3	90th percentile	0.73	2.05	Median	Sample et al. 1998
ZINC	7440-66-6	-- - --	--	--	--	--	12.885	90th percentile	1,218	0.7221	$C_e = e^{(0.328*\ln(Cs) + 4.449)}$	Sample et al. 1998
Pesticides												
4,4'-DDT	50-29-3	5.56 - 7.01	6.53	USEPA 1995	--	--	29.4	90th percentile	0.021	10.2772	$C_e = e^{(0.8689*\ln(Cs) + 2.1287)}$	USEPA 2005
ENDOSULFAN II	33213-65-9	3.62 - 4.52	4.52	USEPA 1995	6.77E+03	SRC, CF	8.32	Jager Model	0.036	8.32	Jager Model	USEPA 2005
GAMMA-CHLORDANE	5103-74-2	5.8 - 6.41	6.32	USEPA 1995	5.89E+04	SRC, CF	4	Not Specified	NC	4.00	Not Specified	Edwards and Bohlen 1992
PCBs												
AROCLOR-1254	11097-69-1	-- - --	6.5	Jones et al. 1997	--	--	15.9	90th percentile	0.73	6.67	Median	Sample et al. 1998
AROCLOR-1260	11096-82-5	-- - --	6.8	Jones et al. 1997	--	--	15.9	90th percentile	0.63	6.67	Median	Sample et al. 1998
VOCs and SVOCs												
ACENAPHTHENE	83-32-9	3.77 - 4.49	3.92	USEPA 1995	1.09E+04	USEPA 2005	4.86	Jager Model	NC	1.55	Jager Model	USEPA 2005
ACENAPHTHYLENE	208-96-8	-- - --	4.07	USEPA 1995	9.47E+02	USEPA 2005	24.14	Jager Model	NC	24.14	Jager Model	USEPA 2005
ANTHRACENE	120-12-7	4.44 - 4.8	4.55	USEPA 1995	2.35E+04	USEPA 2005	4.20	Jager Model	NC	2.54	Jager Model	USEPA 2005
BENZO(A)ANTHRACENE	56-55-3	5.61 - 5.79	5.7	USEPA 1995	3.58E+05	USEPA 2005	2.003	Jager Model	NC	1.67	Jager Model	USEPA 2005
BENZO(A)PYRENE	50-32-8	5.98 - 6.34	6.11	USEPA 1995	9.69E+05	USEPA 2005	2	Jager Model	0.0249	1.40	Jager Model	USEPA 2005
BENZO(B)FLUORANTHENE	205-99-2	5.79 - 6.4	6.2	USEPA 1995	5.96E+05	USEPA 2005	4.1	Jager Model	NC	2.73	Jager Model	USEPA 2005
BENZO(G,H,I)PERYLENE	191-24-2	6.58 - 7.05	6.7	USEPA 1995	1.43E+06	USEPA 2005	6.26	Jager Model	NC	3.10	Jager Model	USEPA 2005
BENZO(K)FLUORANTHENE	207-08-9	6.12 - 6.27	6.2	USEPA 1995	5.96E+05	USEPA 2005	3.15	Jager Model	NC	2.73	Jager Model	USEPA 2005
CHRYSENE	218-01-9	5.41 - 5.79	5.7	USEPA 1995	2.48E+05	USEPA 2005	2.89	Jager Model	NC	2.41	Jager Model	USEPA 2005
DIBENZO(A,H)ANTHRACENE	53-70-3	6.5 - 6.88	6.69	USEPA 1995	1.79E+06	USEPA 2005	3.56	Jager Model	0.028	2.43	Jager Model	USEPA 2005
FLUORANTHENE	206-44-0	4.84 - 5.39	4.95	USEPA 1995	4.17E+04	USEPA 2005	7.71	Jager Model	NC	3.20	Jager Model	USEPA 2005
FLUORENE	86-73-7	4.04 - 4.4	4.18	USEPA 1995	2.83E+03	USEPA 2005	15.64	Jager Model	NC	10.07	Jager Model	USEPA 2005
INDENO(1,2,3-CD)PYRENE	193-39-5	6.58 - 6.72	6.58	USEPA 1995	1.17E+06	USEPA 2005	3.95	Jager Model	NC	3.01	Jager Model	USEPA 2005
PHENANTHRENE	85-01-8	4.37 - 4.57	4.55	USEPA 1995	3.30E+04	USEPA 2005	1.89	Jager Model	NC	1.81	Jager Model	USEPA 2005
PYRENE	129-00-0	4.76 - 5.52	4.88	USEPA 1995	6.27E+04	USEPA 2005	6.66	Jager Model	NC	1.85	Jager Model	USEPA 2005
Explosives												
NITROGLYCERIN	55-63-0	-- - --	--	--	--	--	1	Default Value	3.8	1	Default Value	--

Notes:
CAS = Chemical Abstract Services
C_s = Chemical Concentration in Soil
C_e = Chemical Concentration in Earthworm (dry weight)
K_{ow} = Chemical octanol-water coefficient
K_{oc} = Chemical water to soil partitioning coefficient
K_{ww} = Chemical worm to soil partitioning coefficient
foc = mean fraction organic content in soil (0.0095 mean from physical samples - see Table 2-1)
[1] = BAFs for chemical using Ce regression equation calculated by as follows: BAF = C_e/C_s

Source(s):
USEPA 1995: United States Environmental Protection Agency. Karickhoff, S.W. , and J.M. Long. 1995. Summary of Measured, Calculated, and Recommended Log K_{ow} Values. Environmental Research Laboratory. Athens, Georgia.
Jones et al. 1997: Jones et al. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision
Sample et al. 1998: Sample, B.E., Beauchamp, J.J., Efroymson, R.A., Sutter, G.W., Ashwood, T.L., February 1998. Development and Validation of Bioaccumulation Models for Earthworms.
Jager Model: As presented in USEPA 2005, Guidance for Developing Ecological Screening Levels, Appendix 4-1, Table 5.
BAF = K_{ww}(L/kg worm dw)/K_d (L/kg soil dw)
K_{ww} (dry weight) = 10^(0.87*logK_{ow} - 2.0) / 0.16
Wet weight to dry weight assuming 16% solids
$K_d = f_{oc} * K_{oc}$
foc = 0.0095 from site specific physical soil data
Note: The maximum Kow utilized for the preliminary calculation and the Selected Kow utilized for the refined calculation.
Edwards and Bohlen 1992: Edwards, C.A. and Bohlen, P.J. 1992. The effects of toxic chemicals on earthworms. Reviews of Environmental Contamination and Toxicology, 125: 23-99.
USEPA 2005: United States Environmental Protection Agency (USEPA). February 2005. Guidance for Developing Ecological Soil Screening Levels.
SRC/CF: Syracuse Research Corporation (SRC). Physical Properties Database. http://www.syrres.com/esc/physdemo.htm

Table F.2-13
Soil Bioaccumulation/Bioconcentration Factors - Soil to Mammal Pathway
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS	Log K_{ow} Range	Selected K_{ow}	Reference	Preliminary Assessment		Refined Assessment			Source
					Value	Basis	C_s (mg/kg)	BAF[1]	Basis	
Inorganics										
ARSENIC	7440-38-2	-- - --	--	--	0.0149	90th percentile	7.505	0.0054	$C_m = e^{(0.819*ln(Cs) - 4.847)}$	Sample et al. 1998
CADMIUM	7440-43-9	-- - --	--	--	3.991	90th percentile	2.245	0.1857	$C_m = e^{(0.472*ln(Cs) - 1.257)}$	Sample et al. 1998
CHROMIUM	7440-47-3	-- - --	--	--	0.333	90th percentile	38.99	0.0876	$C_m = e^{(0.734*ln(Cs) - 1.46)}$	Sample et al. 1998
COPPER	7440-50-8	-- - --	--	--	1.045	90th percentile	1,100	0.0193	$C_m = e^{(0.144*ln(Cs) + 2.042)}$	Sample et al. 1998
LEAD	7439-92-1	-- - --	--	--	0.286	90th percentile	361.1	0.0404	$C_m = e^{(0.442*ln(Cs) + 0.0761)}$	Sample et al. 1998
MERCURY	7439-97-6	-- - --	--	--	0.192	90th percentile	0.124	0.0543	Median	Sample et al. 1998
NICKEL	7440-02-0	-- - --	--	--	0.589	90th percentile	16	0.1778	$C_m = e^{(0.466*ln(Cs) - 0.246)}$	Sample et al. 1998
SELENIUM	7782-49-2	-- - --	--	--	1.187	90th percentile	0.465	1.0636	$C_m = e^{(0.376*ln(Cs) -0.416)}$	Sample et al. 1998
SILVER	7440-22-4	-- - --	--	--	0.501	90th percentile	0.73	0.004	Median	Sample et al. 1998
ZINC	7440-66-6	-- - --	--	--	2.69	90th percentile	1,218	0.1064	$C_m = e^{(0.071*ln(Cs) + 4.363)}$	Sample et al. 1998
Pesticides										
4,4'-DDT	50-29-3	5.56 - 7.01	6.53	USEPA 1995	1	Default Value	NC	NC	$C_m = e^{(0.725*ln(Cd) + 1.179)}$	USEPA 2005
ENDOSULFAN II	33213-65-9	3.62 - 4.52	4.52	USEPA 1995	1	Default Value	0.036	1	Default Value	--
GAMMA-CHLORDANE	5103-74-2	5.8 - 6.41	6.32	USEPA 1995	1	Default Value	NC	1	Default Value	--
PCBs										
AROCLOR-1254	11097-69-1	-- - --	6.5	Jones et al. 1997	1	Default Value	0.73	1	Default Value	--
AROCLOR-1260	11096-82-5	-- - --	6.8	Jones et al. 1997	1	Default Value	0.63	1	Default Value	--
VOCs and SVOCs										
ACENAPHTHENE	83-32-9	3.77 - 4.49	3.92	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
ACENAPHTHYLENE	208-96-8	-- - --	4.07	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
ANTHRACENE	120-12-7	4.44 - 4.8	4.55	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
BENZO(A)ANTHRACENE	56-55-3	5.61 - 5.79	5.7	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
BENZO(A)PYRENE	50-32-8	5.98 - 6.34	6.11	USEPA 1995	1	Default Value	0.0249	0	--	USEPA 2005
BENZO(B)FLUORANTHENE	205-99-2	5.79 - 6.4	6.2	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
BENZO(G,H,I)PERYLENE	191-24-2	6.58 - 7.05	6.7	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
BENZO(K)FLUORANTHENE	207-08-9	6.12 - 6.27	6.2	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
CHRYSENE	218-01-9	5.41 - 5.79	5.7	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
DIBENZO(A,H)ANTHRACENE	53-70-3	6.5 - 6.88	6.69	USEPA 1995	1	Default Value	0.028	0	--	USEPA 2005
FLUORANTHENE	206-44-0	4.84 - 5.39	5.12	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
FLUORENE	86-73-7	4.04 - 4.4	4.21	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
INDENO(1,2,3-CD)PYRENE	193-39-5	6.58 - 6.72	6.65	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
PHENANTHRENE	85-01-8	4.37 - 4.57	4.55	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
PYRENE	129-00-0	4.76 - 5.52	5.11	USEPA 1995	1	Default Value	NC	0	--	USEPA 2005
Explosives										
NITROGLYCERIN	55-63-0	-- - --	--	--	1	Default Value	3.8	0	--	USEPA 2005

Notes:

CAS = Chemical Abstract Services

C_s = Chemical Concentration in Soil

C_d = Chemical Concentration in Prey (assumed to be 100% earthworms (dry weight))

C_m = Chemical Concentration in Mammal (dry weight)

K_{ow} = Chemical octanol to water partitioning coefficient

[1] = BAFs for chemical using Ce regression equation calculated by as follows: $BAF = C_m/C_s$

Source(s):

USEPA 1995: United States Environmental Protection Agency. Karickhoff, S.W. , and J.M. Long. 1995. Summary of Measured, Calculated, and Recommended Log K_{ow} Values. Environmental Research Laboratory. Athens, Georgia.

Sample et al. 1998: Sample et al. 1998. Development and Validation of Bioaccumulation Models for Small Mammals.

Jones et al. 1997: Jones et al. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision

USEPA 2005: United States Environmental Protection Agency (USEPA). February 2005. Guidance for Developing Ecological Soil Screening Levels.

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Table F.2-14
Preliminary Wildlife Risk Characterization - Meadow Vole
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Preliminary Assessment – Soil: Maximum Detected Concentration (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)	NOAEL HQ >1 (Y/N)	EPC (mg/kg)	EPC NOAEL HQ (unitless)
Inorganics													
Arsenic	7440-38-2	1.20E-01	1.20E+00	12	1.1E+00	1.3E+01	1.8E-01	1.8E+00	**6.65E+01**	**6.7E+00**	**Y**	7.505	**4.2E+01**
Cadmium	7440-43-9	1.69E+00	1.69E+01	6.2	3.3E+00	2.0E+01	8.8E-01	8.8E+00	**7.08E+00**	7.1E-01	**Y**	2.245	**2.6E+00**
Chromium	7440-47-3	5.75E+00	5.75E+01	79	8.4E-02	6.6E+00	9.1E+01	9.1E+02	8.72E-01	8.7E-02	N	--	--
Copper	7440-50-8	2.67E+01	3.51E+01	1,100	6.3E-01	6.9E+02	7.0E+01	9.2E+01	**1.57E+01**	**1.2E+01**	**Y**	1100	**1.6E+01**
Lead	7439-92-1	1.40E+01	1.40E+02	760	4.7E-01	3.6E+02	4.8E+01	4.8E+02	**1.57E+01**	**1.6E+00**	**Y**	361.1	**7.4E+00**
Mercury	7439-97-6	3.01E+01	3.01E+02	0.22	5.0E+00	1.1E+00	1.0E+01	1.0E+02	2.16E-02	2.2E-03	N	--	--
Nickel	7440-02-0	7.01E+01	1.40E+02	24	1.4E+00	3.4E+01	8.3E+01	1.7E+02	2.89E-01	1.4E-01	N	--	--
Selenium	7782-49-2	3.51E-01	5.79E-01	0.87	3.0E+00	2.6E+00	2.0E-01	3.2E-01	**4.43E+00**	**2.7E+00**	**Y**	0.465	**2.4E+00**
Silver	7440-22-4	3.89E+01	3.89E+02	0.73	3.7E-02	2.7E-02	1.1E+03	1.1E+04	6.73E-04	6.7E-05	N	--	--
Zinc	7440-66-6	2.81E+02	5.61E+02	2,500	1.8E+00	4.6E+03	2.6E+02	5.2E+02	**9.66E+00**	**4.8E+00**	**Y**	1218	**4.7E+00**
Pesticides/PCBs													
4,4'-DDT	50-29-3	1.40E+00	7.01E+00	0.021	6.2E-01	1.3E-02	3.7E+00	1.9E+01	5.67E-03	1.1E-03	N	--	--
Endosulfan II	33213-65-9	2.63E-01	2.63E+00	0.036	1.0E+00	3.6E-02	4.4E-01	4.4E+00	8.24E-02	8.2E-03	N	--	--
gamma-Chlordane	5103-74-2	3.70E-01	3.70E+00	0.0014	1.0E+00	1.4E-03	6.1E-01	6.1E+00	2.28E-03	2.3E-04	N	--	--
Aroclor 1254	11097-69-1	6.45E-02	6.45E-01	0.73	6.8E-03	4.9E-03	3.6E+00	3.6E+01	2.05E-01	2.0E-02	N	--	--
Aroclor 1260	11096-82-5	6.45E-02	6.45E-01	0.63	4.5E-03	2.9E-03	3.8E+00	3.8E+01	1.64E-01	1.6E-02	N	--	--
TCL SVOCs													
Acenaphthene	83-32-9	1.66E+01	8.30E+01	0.0018	4.6E+00	8.3E-03	6.1E+00	3.1E+01	2.95E-04	5.9E-05	N	--	--
Acenaphthylene	208-96-8	1.75E+02	8.77E+02	0.0031	4.6E+00	1.4E-02	6.4E+01	3.2E+02	4.81E-05	9.6E-06	N	--	--
Anthracene	120-12-7	4.80E+02	4.80E+03	0.005	4.6E+00	2.3E-02	1.8E+02	1.8E+03	2.84E-05	2.8E-06	N	--	--
Benzo(a)anthracene	56-55-3	2.91E-01	2.91E+00	0.049	5.4E-01	2.6E-02	8.8E-01	8.8E+00	5.59E-02	5.6E-03	N	--	--
Benzo(a)pyrene	50-32-8	9.49E-01	9.49E+00	0.043	3.3E+00	1.4E-01	4.9E-01	4.9E+00	8.86E-02	8.9E-03	N	--	--
Benzo(b)fluoranthene	205-99-2	9.49E-01	9.49E+00	0.082	4.8E-01	3.9E-02	3.2E+00	3.2E+01	2.56E-02	2.6E-03	N	--	--
Benzo(g,h,i)perylene	191-24-2	4.74E-01	2.37E+00	0.038	1.6E+00	6.1E-02	5.0E-01	2.5E+00	7.65E-02	1.5E-02	N	--	--
Benzo(k)fluoranthene	207-08-9	1.05E+01	1.05E+02	0.02	1.0E+00	2.0E-02	1.7E+01	1.7E+02	1.15E-03	1.2E-04	N	--	--
Chrysene	218-01-9	1.44E+01	1.44E+02	0.03	1.1E+00	3.2E-02	2.3E+01	2.3E+02	1.32E-03	1.3E-04	N	--	--
Dibenz(a,h)anthracene	53-70-3	1.94E+00	1.94E+01	0.028	2.3E-01	6.4E-03	1.3E+01	1.3E+02	2.16E-03	2.2E-04	N	--	--
Fluoranthene	206-44-0	2.91E+01	1.45E+02	0.06	6.0E+00	3.6E-01	8.2E+00	4.1E+01	7.32E-03	1.5E-03	N	--	--
Fluorene	86-73-7	4.74E-01	2.37E+00	0.0018	5.7E-02	1.0E-04	1.0E+01	5.0E+01	1.81E-04	3.6E-05	N	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	1.05E+01	1.05E+02	0.042	1.5E-01	6.3E-03	1.0E+02	1.0E+03	4.11E-04	4.1E-05	N	--	--
Phenanthrene	85-01-8	6.64E+00	3.32E+01	0.028	1.1E+01	3.1E-01	1.0E+00	5.1E+00	2.73E-02	5.5E-03	N	--	--
Pyrene	129-00-0	7.59E+00	3.80E+01	0.052	3.7E+00	1.9E-01	3.5E+00	1.7E+01	1.50E-02	3.0E-03	N	--	--
Nitroglycerin/PETN													
Nitroglycerin	55-63-0	5.16E+00	5.51E+01	3.8	1.0E+00	3.8E+00	8.6E+00	9.1E+01	4.43E-01	4.2E-02	N	--	--

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soi)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Minimum Body Weigth of Receptor (kg)

IR_{food} = Maximum Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor (Most contaminated dietary component BSAF used)

DF = Dietary fraction (Most contaminated dietary component assumed to be 100% of diet)

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = 100% Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

EPC = Exposure Point Concentration

Meadow Vole Specific Data from Table F.2-9

BW=	0.017	kg
IR_{food} =	0.010	kg dw/day
BAF_{food}=	Chem Specific	unitless
IR_{soil} =	0.00024	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}(BAF_{food} \cdot DF) + IR_s)AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = Maximum Detected Concentration/Calculated NOAEL-Based Concentration

LOAEL HQ = Maximum Detected Concentration/Calculated LOAEL-Based Concentration

EPC NOAEL HQ = NOAEL HQ * (EPC/Maximum Detected Concentration)

Table F.2-15
Refined Wildlife Risk Characterization - Meadow Vole
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Refined Assessment						
				Soil						
				EPC (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)
Inorganics										
Arsenic	7440-38-2	1.20E-01	1.20E+00	7.505	3.8E-02	2.8E-01	9.0E+00	9.0E+01	8.3E-01	8.3E-02
Cadmium	7440-43-9	1.69E+00	1.69E+01	2.245	4.3E-01	9.7E-01	1.7E+01	1.7E+02	1.3E-01	1.3E-02
Copper	7440-50-8	2.67E+01	3.51E+01	1,100	2.8E-02	3.1E+01	2.4E+03	3.1E+03	4.6E-01	3.5E-01
Lead	7439-92-1	1.40E+01	1.40E+02	361.1	2.0E-02	7.2E+00	1.5E+03	1.5E+04	2.4E-01	2.4E-02
Selenium	7782-49-2	3.51E-01	5.79E-01	0.465	4.7E-01	2.2E-01	3.3E+00	5.4E+00	1.4E-01	8.6E-02
Zinc	7440-66-6	2.81E+02	5.61E+02	1,218	2.0E-01	2.5E+02	5.7E+03	1.1E+04	2.1E-01	1.1E-01

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soi)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Average Body Weigth of Receptor (kg)

IR_{food} = Average Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor, specific to prey type and chemical

DF = Dietary fraction

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

BDL = Below Detection Limit

EPC = Exposure Point Concentration

Meadow Vole Specific Data from Table F.2-9

BW=	0.037	kg
IR_{food} =	0.008	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{plants} =	1.00	unitless
IR_{soil} =	0.00019	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_{food} \cdot DF) + (IR_s)) \cdot AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = EPC/Calculated NOAEL-Based Screening Level

LOAEL HQ = EPC/Calculated LOAEL-Based Screening Level

Table F.2-16
Preliminary Wildlife Risk Characterization - Short-tailed Shrew
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Preliminary Assessment – Soil: Maximum Detected Concentration (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Most Contaminated Dietary Component	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)	NOAEL HQ >1 (Y/N)	EPC (mg/kg)	EPC NOAEL HQ (unitless)
Inorganics																
Arsenic	7440-38-2	1.50E-01	1.50E+00	12	1.1E+00	1.3E+01	5.2E-01	6.3E+00	Plant	5.1E-01	5.1E+00	**2.4E+01**	**2.4E+00**	**Y**	7.505	**1.5E+01**
Cadmium	7440-43-9	2.11E+00	2.11E+01	6.2	3.3E+00	2.0E+01	4.1E+01	2.5E+02	Invertebrate	2.2E-01	2.2E+00	**2.9E+01**	**2.9E+00**	**Y**	2.245	**1.0E+01**
Chromium	7440-47-3	7.21E+00	7.21E+01	79	8.4E-02	6.6E+00	3.2E+00	2.5E+02	Invertebrate	9.1E+00	9.1E+01	**8.7E+00**	8.7E-01	**Y**	38.99	**4.3E+00**
Copper	7440-50-8	3.34E+01	4.40E+01	1,100	6.3E-01	6.9E+02	1.5E+00	1.7E+03	Invertebrate	8.4E+01	1.1E+02	**1.3E+01**	**1.0E+01**	**Y**	1100	**1.3E+01**
Lead	7439-92-1	1.76E+01	1.76E+02	760	4.7E-01	3.6E+02	1.5E+00	1.2E+03	Invertebrate	4.4E+01	4.4E+02	**1.7E+01**	**1.7E+00**	**Y**	361.1	**8.1E+00**
Mercury	7439-97-6	3.77E+01	3.77E+02	0.22	5.0E+00	1.1E+00	2.1E+01	4.5E+00	Invertebrate	7.6E+00	7.6E+01	2.9E-02	2.9E-03	N	--	--
Nickel	7440-02-0	8.79E+01	1.76E+02	24	1.4E+00	3.4E+01	4.7E+00	1.1E+02	Invertebrate	7.5E+01	1.5E+02	3.2E-01	1.6E-01	N	--	--
Selenium	7782-49-2	4.40E-01	7.25E-01	0.87	3.0E+00	2.6E+00	1.3E+00	1.2E+00	Plant	5.8E-01	9.6E-01	**1.5E+00**	9.0E-01	**Y**	0.465	8.0E-01
Silver	7440-22-4	4.88E+01	4.88E+02	0.73	3.7E-02	2.7E-02	1.5E+01	1.1E+01	Invertebrate	1.3E+01	1.3E+02	5.5E-02	5.5E-03	N	--	--
Zinc	7440-66-6	3.52E+02	7.03E+02	2,500	1.8E+00	4.6E+03	1.3E+01	3.2E+04	Invertebrate	1.1E+02	2.3E+02	**2.2E+01**	**1.1E+01**	**Y**	1218	**1.1E+01**
Pesticides/PCBs																
4,4'-DDT	50-29-3	1.76E+00	8.79E+00	0.021	6.2E-01	1.3E-02	2.9E+01	6.2E-01	Invertebrate	2.5E-01	1.2E+00	8.5E-02	1.7E-02	N	--	--
Endosulfan II	33213-65-9	3.30E-01	3.30E+00	0.036	1.0E+00	3.6E-02	8.3E+00	3.0E-01	Invertebrate	1.6E-01	1.6E+00	2.2E-01	2.2E-02	N	--	--
gamma-Chlordane	5103-74-2	4.64E-01	4.64E+00	0.0014	1.0E+00	1.4E-03	4.0E+00	5.6E-03	Invertebrate	4.7E-01	4.7E+00	3.0E-03	3.0E-04	N	--	--
Aroclor 1254	11097-69-1	8.09E-02	8.09E-01	0.73	6.8E-03	4.9E-03	1.6E+01	1.2E+01	Invertebrate	2.1E-02	2.1E-01	**3.5E+01**	**3.5E+00**	**Y**	0.73	**3.5E+01**
Aroclor 1260	11096-82-5	8.09E-02	8.09E-01	0.63	4.5E-03	2.9E-03	1.6E+01	1.0E+01	Invertebrate	2.1E-02	2.1E-01	**3.0E+01**	**3.0E+00**	**Y**	0.63	**3.0E+01**
TCL SVOCs																
Acenaphthene	83-32-9	2.08E+01	1.04E+02	0.0018	4.6E+00	8.3E-03	4.9E+00	8.8E-03	Invertebrate	1.7E+01	8.7E+01	1.0E-04	2.1E-05	N	--	--
Acenaphthylene	208-96-8	2.20E+02	1.10E+03	0.0031	4.6E+00	1.4E-02	2.4E+01	7.5E-02	Invertebrate	3.8E+01	1.9E+02	8.2E-05	1.6E-05	N	--	--
Anthracene	120-12-7	6.01E+02	6.01E+03	0.005	4.6E+00	2.3E-02	4.2E+00	2.1E-02	Plant	5.3E+02	5.3E+03	9.4E-06	9.4E-07	N	--	--
Benzo(a)anthracene	56-55-3	3.64E-01	3.64E+00	0.049	5.4E-01	2.6E-02	2.0E+00	9.8E-02	Invertebrate	7.1E-01	7.1E+00	6.9E-02	6.9E-03	N	--	--
Benzo(a)pyrene	50-32-8	1.19E+00	1.19E+01	0.043	3.3E+00	1.4E-01	2.2E+00	9.6E-02	Plant	1.4E+00	1.4E+01	3.0E-02	3.0E-03	N	--	--
Benzo(b)fluoranthene	205-99-2	1.19E+00	1.19E+01	0.082	4.8E-01	3.9E-02	4.1E+00	3.3E-01	Invertebrate	1.2E+00	1.2E+01	7.0E-02	7.0E-03	N	--	--
Benzo(g,h,i)perylene	191-24-2	5.95E-01	2.97E+00	0.038	1.6E+00	6.1E-02	6.3E+00	2.4E-01	Invertebrate	3.9E-01	1.9E+00	9.8E-02	2.0E-02	N	--	--
Benzo(k)fluoranthene	207-08-9	1.31E+01	1.31E+02	0.02	1.0E+00	2.0E-02	3.1E+00	6.3E-02	Invertebrate	1.7E+01	1.7E+02	1.2E-03	1.2E-04	N	--	--
Chrysene	218-01-9	1.80E+01	1.80E+02	0.03	1.1E+00	3.2E-02	2.9E+00	8.7E-02	Invertebrate	2.5E+01	2.5E+02	1.2E-03	1.2E-04	N	--	--
Dibenz(a,h)anthracene	53-70-3	2.43E+00	2.43E+01	0.028	2.3E-01	6.4E-03	3.6E+00	1.0E-01	Invertebrate	2.7E+00	2.7E+01	1.0E-02	1.0E-03	N	--	--
Fluoranthene	206-44-0	3.64E+01	1.82E+02	0.06	6.0E+00	3.6E-01	7.7E+00	4.6E-01	Invertebrate	1.9E+01	9.7E+01	3.1E-03	6.2E-04	N	--	--
Fluorene	86-73-7	5.95E-01	2.97E+00	0.0018	5.7E-02	1.0E-04	1.6E+01	2.8E-02	Invertebrate	1.6E-01	7.9E-01	1.1E-02	2.3E-03	N	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	1.31E+01	1.31E+02	0.042	1.5E-01	6.3E-03	3.9E+00	1.7E-01	Invertebrate	1.3E+01	1.3E+02	3.1E-03	3.1E-04	N	--	--
Phenanthrene	85-01-8	8.32E+00	4.16E+01	0.028	1.1E+01	3.1E-01	1.9E+00	5.3E-02	Plant	3.1E+00	1.6E+01	9.0E-03	1.8E-03	N	--	--
Pyrene	129-00-0	9.51E+00	4.76E+01	0.052	3.7E+00	1.9E-01	6.7E+00	3.5E-01	Invertebrate	5.8E+00	2.9E+01	8.9E-03	1.8E-03	N	--	--
Nitroglycerin/PETN																
Nitroglycerin	55-63-0	6.47E+00	6.90E+01	3.8	1.0E+00	3.8E+00	1.0E+00	3.8E+00	Plant	2.4E+01	2.5E+02	1.6E-01	1.5E-02	N	--	--

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Minimum Body Weigth of Receptor (kg)

IR_{food} = Maximum Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor (Most contaminated dietary component BSAF used)

DF = Dietary fraction (Most contaminated dietary component assumed to be 100% of diet)

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = 100% Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

EPC = Exposure Point Concentration

Short-tailed Shrew Specific Data from Table F.2-9

BW=	0.0125	kg
IR_{food} =	0.003	kg dw/day
BAF_{food}=	Chem Specific	unitless
IR_{soil} =	0.00039	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate soil screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}(BAF_{food} \cdot DF) + IR_s)AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = Maximum Detected Concentration/Calculated NOAEL-Based Screening Level

LOAEL HQ = Maximum Detected Concentration/Calculated LOAEL-Based Screening Level

EPC NOAEL HQ = NOAEL HQ * (EPC/Maximum Detected Concentration)

Table F.2-17
Refined Wildlife Risk Characterization - Short-tailed Shrew
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Refined Assessment								
				Soil								
				EPC (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)
Inorganics												
Arsenic	7440-38-2	1.50E-01	1.50E+00	7.505	3.8E-02	2.8E-01	1.34E-01	1.0E+00	1.4E+01	1.4E+02	5.2E-01	5.2E-02
Cadmium	7440-43-9	2.11E+00	2.11E+01	2.245	4.3E-01	9.7E-01	7.02E+00	1.6E+01	8.2E+00	8.2E+01	2.7E-01	2.7E-02
Chromium	7440-47-3	7.21E+00	7.21E+01	38.99	4.1E-02	1.6E+00	3.06E-01	1.2E+01	4.4E+02	4.4E+03	8.9E-02	8.9E-03
Copper	7440-50-8	3.34E+01	4.40E+01	1,100	2.8E-02	3.1E+01	5.15E-01	5.7E+02	1.4E+03	1.8E+03	7.8E-01	6.0E-01
Lead	7439-92-1	1.76E+01	1.76E+02	361.1	2.0E-02	7.2E+00	2.58E-01	9.3E+01	1.2E+03	1.2E+04	3.0E-01	3.0E-02
Selenium	7782-49-2	4.40E-01	7.25E-01	0.465	4.7E-01	2.2E-01	1.14E+00	5.3E-01	9.1E+00	1.5E+01	5.1E-02	3.1E-02
Zinc	7440-66-6	3.52E+02	7.03E+02	1,218	2.0E-01	2.5E+02	7.22E-01	8.8E+02	1.1E+04	2.2E+04	1.1E-01	5.6E-02
Pesticides/PCBs												
Aroclor 1254	11097-69-1	8.09E-02	8.09E-01	0.73	6.8E-03	4.9E-03	6.67E+00	4.9E+00	3.3E-01	3.3E+00	**2.2E+00**	2.2E-01
Aroclor 1260	11096-82-5	8.09E-02	8.09E-01	0.63	4.5E-03	2.9E-03	6.67E+00	4.2E+00	3.3E-01	3.3E+00	**1.9E+00**	1.9E-01

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Average Body Weigth of Receptor (kg)

IR_{food} = Average Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor, specific to prey type and chemical

DF = Dietary fraction

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

BDL = Below Detection Limit

EPC = Exposure Point Concentration

Short-tailed Shrew Specific Data from Table F.2-9

BW=	0.015	kg
IR_{food} =	0.002	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{plants} =	0.14	unitless
DF_{inv} =	0.86	unitless
IR_{soil} =	0.00026	kg dw/day
AF =	0.310	unitless

[a] = The following equation was used to calculate soil screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_{food} \cdot DF) + (IR_s)) \cdot AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = EPC/Calculated NOAEL-Based Screening Level

LOAEL HQ = EPC/Calculated LOAEL-Based Screening Level

Table F.2-18
Preliminary Wildlife Risk Characterization - Red Fox
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Preliminary Assessment – Soil: Maximum Detected Concentration (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Mammal BAF (unitless)	Mammal Concentration (mg/kg)	Most Contaminated Dietary Component	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)	NOAEL HQ >1 (Y/N)	EPC (mg/kg)	EPC NOAEL HQ (unitless)
Inorganics																		
Arsenic	7440-38-2	3.59E-02	3.59E-01	12	1.1E+00	1.3E+01	5.2E-01	6.3E+00	1.5E-02	1.8E-01	Plant	2.7E-01	2.7E+00	**4.4E+01**	**4.4E+00**	**Y**	7.505	**2.7E+01**
Cadmium	7440-43-9	5.07E-01	5.07E+00	6.2	3.3E+00	2.0E+01	4.1E+01	2.5E+02	4.0E+00	2.5E+01	Invertebrate	1.1E-01	1.1E+00	**5.8E+01**	**5.8E+00**	**Y**	2.245	**2.1E+01**
Chromium	7440-47-3	1.73E+00	1.73E+01	79	8.4E-02	6.6E+00	3.2E+00	2.5E+02	3.3E-01	2.6E+01	Invertebrate	4.7E+00	4.7E+01	**1.7E+01**	**1.7E+00**	**Y**	38.99	**8.3E+00**
Copper	7440-50-8	8.02E+00	1.06E+01	1,100	6.3E-01	6.9E+02	1.5E+00	1.7E+03	1.0E+00	1.1E+03	Invertebrate	4.4E+01	5.8E+01	**2.5E+01**	**1.9E+01**	**Y**	1100	**2.5E+01**
Lead	7439-92-1	4.22E+00	4.22E+01	760	4.7E-01	3.6E+02	1.5E+00	1.2E+03	2.9E-01	2.2E+02	Invertebrate	2.3E+01	2.3E+02	**3.2E+01**	**3.2E+00**	**Y**	361.1	**1.5E+01**
Mercury	7439-97-6	9.05E+00	9.05E+01	0.22	5.0E+00	1.1E+00	2.1E+01	4.5E+00	1.9E-01	4.2E-02	Invertebrate	3.8E+00	3.8E+01	5.8E-02	5.8E-03	N	--	--
Nickel	7440-02-0	2.11E+01	4.22E+01	24	1.4E+00	3.4E+01	4.7E+00	1.1E+02	5.9E-01	1.4E+01	Invertebrate	3.8E+01	7.6E+01	6.3E-01	3.1E-01	N	--	--
Selenium	7782-49-2	1.05E-01	1.74E-01	0.87	3.0E+00	2.6E+00	1.3E+00	1.2E+00	1.2E+00	1.0E+00	Plant	3.0E-01	4.9E-01	**2.9E+00**	**1.8E+00**	**Y**	0.465	**1.6E+00**
Silver	7440-22-4	1.17E+01	1.17E+02	0.73	3.7E-02	2.7E-02	1.5E+01	1.1E+01	5.0E-01	3.7E-01	Invertebrate	6.6E+00	6.6E+01	1.1E-01	1.1E-02	N	--	--
Zinc	7440-66-6	8.44E+01	1.69E+02	2,500	1.8E+00	4.6E+03	1.3E+01	3.2E+04	2.7E+00	6.7E+03	Invertebrate	5.6E+01	1.1E+02	**4.4E+01**	**2.2E+01**	**Y**	1218	**2.2E+01**
Pesticides/PCBs																		
4,4'-DDT	50-29-3	4.22E-01	2.11E+00	0.021	6.2E-01	1.3E-02	2.9E+01	6.2E-01	1.0E+00	2.1E-02	Invertebrate	1.2E-01	6.2E-01	1.7E-01	3.4E-02	N	--	--
Endosulfan II	33213-65-9	7.91E-02	7.91E-01	0.036	1.0E+00	3.6E-02	8.3E+00	3.0E-01	1.0E+00	3.6E-02	Invertebrate	8.2E-02	8.2E-01	4.4E-01	4.4E-02	N	--	--
gamma-Chlordane	5103-74-2	1.11E-01	1.11E+00	0.0014	1.0E+00	1.4E-03	4.0E+00	5.6E-03	1.0E+00	1.4E-03	Invertebrate	2.4E-01	2.4E+00	5.9E-03	5.9E-04	N	--	--
Aroclor 1254	11097-69-1	1.94E-02	1.94E-01	0.73	6.8E-03	4.9E-03	1.6E+01	1.2E+01	1.0E+00	7.3E-01	Invertebrate	1.1E-02	1.1E-01	**6.9E+01**	**6.9E+00**	**Y**	0.73	**6.9E+01**
Aroclor 1260	11096-82-5	1.94E-02	1.94E-01	0.63	4.5E-03	2.9E-03	1.6E+01	1.0E+01	1.0E+00	6.3E-01	Invertebrate	1.1E-02	1.1E-01	**6.0E+01**	**6.0E+00**	**Y**	0.63	**6.0E+01**
TCL SVOCs																		
Acenaphthene	83-32-9	4.99E+00	2.50E+01	0.0018	4.6E+00	8.3E-03	4.9E+00	8.8E-03	1.0E+00	1.8E-03	Invertebrate	8.8E+00	4.4E+01	2.0E-04	4.1E-05	N	--	--
Acenaphthylene	208-96-8	5.27E+01	2.64E+02	0.0031	4.6E+00	1.4E-02	2.4E+01	7.5E-02	1.0E+00	3.1E-03	Invertebrate	1.9E+01	9.4E+01	1.6E-04	3.3E-05	N	--	--
Anthracene	120-12-7	1.44E+02	1.44E+03	0.005	4.6E+00	2.3E-02	4.2E+00	2.1E-02	1.0E+00	5.0E-03	Plant	2.7E+02	2.7E+03	1.9E-05	1.9E-06	N	--	--
Benzo(a)anthracene	56-55-3	8.74E-02	8.74E-01	0.049	5.4E-01	2.6E-02	2.0E+00	9.8E-02	1.0E+00	4.9E-02	Invertebrate	3.7E-01	3.7E+00	1.3E-01	1.3E-02	N	--	--
Benzo(a)pyrene	50-32-8	2.85E-01	2.85E+00	0.043	3.3E+00	1.4E-01	2.2E+00	9.6E-02	1.0E+00	4.3E-02	Plant	7.4E-01	7.4E+00	5.8E-02	5.8E-03	N	--	--
Benzo(b)fluoranthene	205-99-2	2.85E-01	2.85E+00	0.082	4.8E-01	3.9E-02	4.1E+00	3.3E-01	1.0E+00	8.2E-02	Invertebrate	6.0E-01	6.0E+00	1.4E-01	1.4E-02	N	--	--
Benzo(g,h,i)perylene	191-24-2	1.43E-01	7.13E-01	0.038	1.6E+00	6.1E-02	6.3E+00	2.4E-01	1.0E+00	3.8E-02	Invertebrate	2.0E-01	9.8E-01	1.9E-01	3.9E-02	N	--	--
Benzo(k)fluoranthene	207-08-9	3.15E+00	3.15E+01	0.02	1.0E+00	2.0E-02	3.1E+00	6.3E-02	1.0E+00	2.0E-02	Invertebrate	8.5E+00	8.5E+01	2.3E-03	2.3E-04	N	--	--
Chrysene	218-01-9	4.32E+00	4.32E+01	0.03	1.1E+00	3.2E-02	2.9E+00	8.7E-02	1.0E+00	3.0E-02	Invertebrate	1.3E+01	1.3E+02	2.3E-03	2.3E-04	N	--	--
Dibenz(a,h)anthracene	53-70-3	5.82E-01	5.82E+00	0.028	2.3E-01	6.4E-03	3.6E+00	1.0E-01	1.0E+00	2.8E-02	Invertebrate	1.4E+00	1.4E+01	2.0E-02	2.0E-03	N	--	--
Fluoranthene	206-44-0	8.74E+00	4.37E+01	0.06	6.0E+00	3.6E-01	7.7E+00	4.6E-01	1.0E+00	6.0E-02	Invertebrate	9.7E+00	4.9E+01	6.2E-03	1.2E-03	N	--	--
Fluorene	86-73-7	1.43E-01	7.13E-01	0.0018	5.7E-02	1.0E-04	1.6E+01	2.8E-02	1.0E+00	1.8E-03	Invertebrate	7.9E-02	3.9E-01	2.3E-02	4.6E-03	N	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	3.15E+00	3.15E+01	0.042	1.5E-01	6.3E-03	3.9E+00	1.7E-01	1.0E+00	4.2E-02	Invertebrate	6.8E+00	6.8E+01	6.2E-03	6.2E-04	N	--	--
Phenanthrene	85-01-8	2.00E+00	9.98E+00	0.028	1.1E+01	3.1E-01	1.9E+00	5.3E-02	1.0E+00	2.8E-02	Plant	1.6E+00	7.8E+00	1.8E-02	3.6E-03	N	--	--
Pyrene	129-00-0	2.28E+00	1.14E+01	0.052	3.7E+00	1.9E-01	6.7E+00	3.5E-01	1.0E+00	5.2E-02	Invertebrate	2.9E+00	1.5E+01	1.8E-02	3.5E-03	N	--	--
Nitroglycerin/PETN																		
Nitroglycerin	55-63-0	1.55E+00	1.66E+01	3.8	1.0E+00	3.8E+00	1.0E+00	3.8E+00	1.0E+00	3.8E+00	Mammal	1.3E+01	1.4E+02	2.9E-01	2.7E-02	N	--	--

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Minimum Body Weigth of Receptor (kg)

IR_{food} = Maximum Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor (Most contaminated dietary component BSAF used)

DF = Dietary fraction (Most contaminated dietary component assumed to be 100% of diet)

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = 100% Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

EPC = Exposure Point Concentration

Red FoxSpecific Data from Table F.2-9

BW=	2.9500	kg
IR_{food} =	0.342	kg dw/day
BAF_{food}=	Chem Specific	unitless
IR_{soil} =	0.00960	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}(BAF_{food} \cdot DF) + IR_s)AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = Maximum Detected Concentration/Calculated NOAEL-Based Screening Level

LOAEL HQ = Maximum Detected Concentration/Calculated LOAEL-Based Screening Level

EPC NOAEL HQ = NOAEL HQ * (EPC/Maximum Detected Concentration)

Table F.2-19
Refined Wildlife Risk Characterization - Red Fox
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Refined Assessment										
				Soil										
				EPC (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Mammal BAF (unitless)	Mammal Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)
Inorganics														
Arsenic	7440-38-2	3.59E-02	3.59E-01	7.505	3.8E-02	2.8E-01	1.3E-01	1.0E+00	5.4E-03	4.1E-02	1.2E+04	1.2E+05	6.3E-04	6.3E-05
Cadmium	7440-43-9	5.07E-01	5.07E+00	2.245	4.3E-01	9.7E-01	7.0E+00	1.6E+01	1.9E-01	4.2E-01	1.4E+04	1.4E+05	1.6E-04	1.6E-05
Chromium	7440-47-3	1.73E+00	1.73E+01	38.99	4.1E-02	1.6E+00	3.1E-01	1.2E+01	8.8E-02	3.4E+00	2.2E+05	2.2E+06	1.8E-04	1.8E-05
Copper	7440-50-8	8.02E+00	1.06E+01	1,100	2.8E-02	3.1E+01	5.2E-01	5.7E+02	1.9E-02	2.1E+01	1.7E+06	2.2E+06	6.4E-04	4.9E-04
Lead	7439-92-1	4.22E+00	4.22E+01	361.1	2.0E-02	7.2E+00	2.6E-01	9.3E+01	4.0E-02	1.5E+01	8.4E+05	8.4E+06	4.3E-04	4.3E-05
Selenium	7782-49-2	1.05E-01	1.74E-01	0.465	4.7E-01	2.2E-01	1.1E+00	5.3E-01	1.1E+00	4.9E-01	1.6E+03	2.6E+03	3.0E-04	1.8E-04
Zinc	7440-66-6	8.44E+01	1.69E+02	1,218	2.0E-01	2.5E+02	7.2E-01	8.8E+02	1.1E-01	1.3E+02	7.0E+06	1.4E+07	1.7E-04	8.7E-05
Pesticides/PCBs														
Aroclor 1254	11097-69-1	1.94E-02	1.94E-01	0.73	6.8E-03	4.9E-03	6.7E+00	4.9E+00	1.0E+00	7.3E-01	2.6E+02	2.6E+03	2.8E-03	2.8E-04
Aroclor 1260	11096-82-5	1.94E-02	1.94E-01	0.63	4.5E-03	2.9E-03	6.7E+00	4.2E+00	1.0E+00	6.3E-01	2.6E+02	2.6E+03	2.4E-03	2.4E-04

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Average Body Weigth of Receptor (kg)

IR_{food} = Average Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor, specific to prey type and chemical

DF = Dietary fraction

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

BDL = Below Detection Limit

EPC = Exposure Point Concentration

Red FoxSpecific Data from Table F.2-9

BW=	4.5300	kg
IR_{food} =	0.238	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{plants} =	0.17	unitless
DF_{inv} =	0.04	unitless
DF_{mam} =	0.79	unitless
IR_{soil} =	0.00670	kg dw/day
AF =	0.0013	unitless

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_{food} \cdot DF) + (IR_s)) \cdot AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = EPC/Calculated NOAEL-Based Screening Level

LOAEL HQ = EPC/Calculated LOAEL-Based Screening Level

Table F.2-20
Preliminary Wildlife Risk Characterization - American Robin
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Preliminary Assessment – Soil: Maximum Detected Concentration (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Most Contaminated Dietary Component	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)	NOAEL HQ >1 (Y/N)	EPC (mg/kg)	EPC NOAEL HQ (unitless)
Inorganics																
Arsenic	7440-38-2	5.14E+00	1.28E+01	12	1.1E+00	1.3E+01	5.2E-01	6.3E+00	Plant	1.4E+01	3.5E+01	8.5E-01	3.4E-01	N	--	--
Cadmium	7440-43-9	1.45E+00	2.00E+01	6.2	3.3E+00	2.0E+01	4.1E+01	2.5E+02	Invertebrate	1.1E-01	1.6E+00	**5.5E+01**	**4.0E+00**	**Y**	2.245	**2.0E+01**
Chromium	7440-47-3	1.00E+00	5.00E+00	79	8.4E-02	6.6E+00	3.2E+00	2.5E+02	Invertebrate	9.9E-01	4.9E+00	**8.0E+01**	**1.6E+01**	**Y**	38.99	**3.9E+01**
Copper	7440-50-8	4.70E+01	6.17E+01	1,100	6.3E-01	6.9E+02	1.5E+00	1.7E+03	Invertebrate	9.4E+01	1.2E+02	**1.2E+01**	**8.9E+00**	**Y**	1100	**1.2E+01**
Lead	7439-92-1	1.13E+00	1.13E+01	760	4.7E-01	3.6E+02	1.5E+00	1.2E+03	Invertebrate	2.3E+00	2.3E+01	**3.3E+02**	**3.3E+01**	**Y**	361.1	**1.6E+02**
Mercury	7439-97-6	4.50E-01	9.00E-01	0.22	5.0E+00	1.1E+00	2.1E+01	4.5E+00	Invertebrate	6.9E-02	1.4E-01	**3.2E+00**	**1.6E+00**	**Y**	0.124	**1.8E+00**
Nickel	7440-02-0	7.74E+01	1.07E+02	24	1.4E+00	3.4E+01	4.7E+00	1.1E+02	Invertebrate	5.1E+01	7.1E+01	4.7E-01	3.4E-01	N	--	--
Selenium	7782-49-2	4.00E-01	8.00E-01	0.87	3.0E+00	2.6E+00	1.3E+00	1.2E+00	Plant	4.1E-01	8.3E-01	**2.1E+00**	**1.0E+00**	**Y**	0.465	**1.1E+00**
Silver	7440-22-4	1.66E+01	1.24E+02	0.73	3.7E-02	2.7E-02	1.5E+01	1.1E+01	Invertebrate	3.4E+00	2.6E+01	2.1E-01	2.8E-02	N	--	--
Zinc	7440-66-6	1.45E+01	1.31E+02	2,500	1.8E+00	4.6E+03	1.3E+01	3.2E+04	Invertebrate	3.6E+00	3.2E+01	**7.0E+02**	**7.8E+01**	**Y**	1218	**3.4E+02**
Pesticides/PCBs																
4,4'-DDT	50-29-3	2.80E-03	2.80E-02	0.021	6.2E-01	1.3E-02	2.9E+01	6.2E-01	Invertebrate	3.0E-04	3.0E-03	**7.0E+01**	**7.0E+00**	**Y**	0.021	**7.0E+01**
Endosulfan II	33213-65-9	1.00E+01	1.00E+02	0.036	1.0E+00	3.6E-02	8.3E+00	3.0E-01	Invertebrate	3.8E+00	3.8E+01	9.5E-03	9.5E-04	N	--	--
gamma-Chlordane	5103-74-2	2.14E+00	1.06E+01	0.0014	1.0E+00	1.4E-03	4.0E+00	5.6E-03	Invertebrate	1.7E+00	8.3E+00	8.3E-04	1.7E-04	N	--	--
Aroclor 1254	11097-69-1	4.10E-01	4.10E+00	0.73	6.8E-03	4.9E-03	1.6E+01	1.2E+01	Invertebrate	8.2E-02	8.2E-01	**8.9E+00**	8.9E-01	**Y**	0.73	**8.9E+00**
Aroclor 1260	11096-82-5	4.10E-01	4.10E+00	0.63	4.5E-03	2.9E-03	1.6E+01	1.0E+01	Invertebrate	8.2E-02	8.2E-01	**7.7E+00**	7.7E-01	**Y**	0.63	**7.7E+00**
TCL SVOCs																
Acenaphthene	83-32-9	1.01E+00	5.05E+00	0.0018	4.6E+00	8.3E-03	4.9E+00	8.8E-03	Invertebrate	6.5E-01	3.3E+00	2.8E-03	5.5E-04	N	--	--
Acenaphthylene	208-96-8	NV	NV	0.0031	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Anthracene	120-12-7	NV	NV	0.005	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Benzo(a)anthracene	56-55-3	NV	NV	0.049	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Benzo(a)pyrene	50-32-8	5.00E-01	2.50E+00	0.043	3.3E+00	1.4E-01	2.2E+00	9.6E-02	Plant	4.7E-01	2.4E+00	9.1E-02	1.8E-02	N	--	--
Benzo(b)fluoranthene	205-99-2	NV	NV	0.082	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Benzo(g,h,i)perylene	191-24-2	NV	NV	0.038	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Benzo(k)fluoranthene	207-08-9	NV	NV	0.02	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Chrysene	218-01-9	NV	NV	0.03	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Dibenz(a,h)anthracene	53-70-3	NV	NV	0.028	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Fluoranthene	206-44-0	NV	NV	0.06	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Fluorene	86-73-7	1.01E+00	5.05E+00	0.0018	5.7E-02	1.0E-04	1.6E+01	2.8E-02	Invertebrate	2.0E-01	1.0E+00	8.8E-03	1.8E-03	N	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	NV	NV	0.042	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Phenanthrene	85-01-8	1.13E+00	5.65E+00	0.028	1.1E+01	3.1E-01	1.9E+00	5.3E-02	Plant	3.2E-01	1.6E+00	8.6E-02	1.7E-02	N	--	--
Pyrene	129-00-0	NV	NV	0.052	--	--	--	--	--	--	--	**--**	**--**	--	--	--
Nitroglycerin/PETN																
Nitroglycerin	55-63-0	NV	NV	3.8	--	--	--	--	--	--	--	**--**	**--**	--	--	--

Notes:

CAS = Chemical Abstract Services
C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)
ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10
BW = Minimum Body Weigth of Receptor (kg)
IR_{food} = Maximum Ingestion Rate for Food
BAF_{food} = Bioaccumulation factor (Most contaminated dietary component BSAF used)
DF = Dietary fraction (Most contaminated dietary component assumed to be 100% of diet)
IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)
AF = 100% Area Use Factor
NOAEL = No observable adverse effects level
LOAEL = Lowest observable adverse effects level
mg/kg = Milligram Per Kilogram
bw - day = Body Weight - Day
HQ = Hazard Quotient
TRV = Toxicity Reference Value
EPC = Exposure Point Concentration

American Robin Specific Data from Table F.2-9

BW=	0.0635	kg
IR_{food} =	0.020	kg dw/day
BAF_{food}=	Chem Specific	unitless
IR_{soil} =	0.00100	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate soil screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}(BAF_{food} \cdot DF) + IR_s)AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = Maximum Detected Concentration/Calculated NOAEL-Based Concentration
LOAEL HQ = Maximum Detected Concentration/Calculated LOAEL-Based Concentration
EPC NOAEL HQ = NOAEL HQ * (EPC/Maximum Detected Concentration)

Table F.2-21
Refined Wildlife Risk Characterization - American Robin
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Refined Assessment								
				Soil								
				EPC (mg/kg)	Plant BAF (unitless)	Plant Concentration (mg/kg)	Invertebrate BAF (unitless)	Invertebrate Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)
Inorganics												
Cadmium	7440-43-9	1.45E+00	2.00E+01	2.245	4.3E-01	9.7E-01	7.0E+00	1.6E+01	9.4E+00	1.3E+02	2.4E-01	1.7E-02
Chromium	7440-47-3	1.00E+00	5.00E+00	38.99	4.1E-02	1.6E+00	3.1E-01	1.2E+01	1.0E+02	5.0E+02	3.9E-01	7.7E-02
Copper	7440-50-8	4.70E+01	6.17E+01	1,100	2.8E-02	3.1E+01	5.2E-01	5.7E+02	3.5E+03	4.5E+03	3.2E-01	2.4E-01
Lead	7439-92-1	1.13E+00	1.13E+01	361.1	2.0E-02	7.2E+00	2.6E-01	9.3E+01	1.4E+02	1.4E+03	**2.7E+00**	2.7E-01
Mercury	7439-97-6	4.50E-01	9.00E-01	0.124	9.6E-01	1.2E-01	1.7E+00	2.1E-01	6.8E+00	1.4E+01	1.8E-02	9.2E-03
Selenium	7782-49-2	4.00E-01	8.00E-01	0.465	4.7E-01	2.2E-01	1.1E+00	5.3E-01	1.0E+01	2.0E+01	4.7E-02	2.3E-02
Zinc	7440-66-6	1.45E+01	1.31E+02	1,218	2.0E-01	2.5E+02	7.2E-01	8.8E+02	6.2E+02	5.6E+03	**2.0E+00**	2.2E-01
Pesticides/PCBs												
4,4'-DDT	50-29-3	2.80E-03	2.80E-02	0.021	2.1E-01	4.4E-03	1.0E+01	2.2E-01	1.3E-02	1.3E-01	**1.6E+00**	1.6E-01
Aroclor 1254	11097-69-1	4.10E-01	4.10E+00	0.73	6.8E-03	4.9E-03	6.7E+00	4.9E+00	3.1E+00	3.1E+01	2.4E-01	2.4E-02
Aroclor 1260	11096-82-5	4.10E-01	4.10E+00	0.63	4.5E-03	2.9E-03	6.7E+00	4.2E+00	3.1E+00	3.1E+01	2.1E-01	2.1E-02

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Average Body Weigth of Receptor (kg)

IR_{food} = Average Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor, specific to prey type and chemical

DF = Dietary fraction

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

BDL = Below Detection Limit

EPC = Exposure Point Concentration

American Robin Specific Data from Table F.2-9

BW=	0.0773	kg
IR_{food} =	0.016	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{plants} =	0.62	unitless
DF_{inv} =	0.38	unitless
IR_{soil} =	0.0008	kg dw/day
AF =	0.250	unitless

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_{food} \cdot DF) + (IR_s)) \cdot AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = EPC/Calculated NOAEL-Based Screening Level

LOAEL HQ = EPC/Calculated LOAEL-Based Screening Level

Table F.2-22
Preliminary Wildlife Risk Characterization - Red-tailed Hawk
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Preliminary Assessment									
				Soil									
				Maximum Detected Concentration (mg/kg)	Mammal BAF (unitless)	Mammal Concentration (mg/kg)	Calculated NOAEL-Based Screening Level[a] (mg/kg)	Calculated LOAEL-Based Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)	NOAEL HQ >1 (Y/N)	EPC (mg/kg)	EPC NOAEL HQ (unitless)
Inorganics													
Arsenic	7440-38-2	5.14E+00	1.28E+01	12	1.5E-02	1.8E-01	5.2E+03	2.1E+03	2.3E-03	9.2E-04	N	--	--
Cadmium	7440-43-9	1.45E+00	2.00E+01	6.2	4.0E+00	2.5E+01	5.5E+00	4.0E-01	**1.1E+00**	8.1E-02	**Y**	2.245	4.1E-01
Chromium	7440-47-3	1.00E+00	5.00E+00	79	3.3E-01	2.6E+01	4.6E+01	9.1E+00	**1.7E+00**	3.5E-01	**Y**	38.99	8.5E-01
Copper	7440-50-8	4.70E+01	6.17E+01	1,100	1.0E+00	1.1E+03	6.8E+02	5.2E+02	**1.6E+00**	**1.2E+00**	**Y**	1100	**1.6E+00**
Lead	7439-92-1	1.13E+00	1.13E+01	760	2.9E-01	2.2E+02	6.0E+01	6.0E+00	**1.3E+01**	**1.3E+00**	**Y**	361.1	**6.0E+00**
Mercury	7439-97-6	4.50E-01	9.00E-01	0.22	1.9E-01	4.2E-02	3.6E+01	1.8E+01	6.2E-03	3.1E-03	N	--	--
Nickel	7440-02-0	7.74E+01	1.07E+02	24	5.9E-01	1.4E+01	2.0E+03	1.4E+03	1.2E-02	8.7E-03	N	--	--
Selenium	7782-49-2	4.00E-01	8.00E-01	0.87	1.2E+00	1.0E+00	5.1E+00	2.6E+00	1.7E-01	8.5E-02	N	--	--
Silver	7440-22-4	1.66E+01	1.24E+02	0.73	5.0E-01	3.7E-01	5.0E+02	6.7E+01	1.5E-03	1.9E-04	N	--	--
Zinc	7440-66-6	1.45E+01	1.31E+02	2,500	2.7E+00	6.7E+03	8.2E+01	9.1E+00	**3.1E+01**	**3.4E+00**	**Y**	1218	**1.5E+01**
Pesticides/PCBs													
4,4'-DDT	50-29-3	2.80E-03	2.80E-02	0.021	1.0E+00	2.1E-02	4.3E-02	4.3E-03	4.9E-01	4.9E-02	N	--	--
Endosulfan II	33213-65-9	1.00E+01	1.00E+02	0.036	1.0E+00	3.6E-02	1.5E+02	1.5E+01	2.4E-04	2.4E-05	N	--	--
gamma-Chlordane	5103-74-2	2.14E+00	1.06E+01	0.0014	1.0E+00	1.4E-03	3.3E+01	6.6E+00	4.3E-05	8.7E-06	N	--	--
Aroclor 1254	11097-69-1	4.10E-01	4.10E+00	0.73	1.0E+00	7.3E-01	6.2E+00	6.2E-01	1.2E-01	1.2E-02	N	--	--
Aroclor 1260	11096-82-5	4.10E-01	4.10E+00	0.63	1.0E+00	6.3E-01	6.2E+00	6.2E-01	1.0E-01	1.0E-02	N	--	--
TCL SVOCs													
Acenaphthene	83-32-9	1.01E+00	5.05E+00	0.0018	1.0E+00	1.8E-03	1.5E+01	3.1E+00	1.2E-04	2.3E-05	N	--	--
Acenaphthylene	208-96-8	NV	NV	0.0031	--	--	--	--	--	--	--	--	--
Anthracene	120-12-7	NV	NV	0.005	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	56-55-3	NV	NV	0.049	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	5.00E-01	2.50E+00	0.043	1.0E+00	4.3E-02	7.6E+00	1.5E+00	5.7E-03	1.1E-03	N	--	--
Benzo(b)fluoranthene	205-99-2	NV	NV	0.082	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	191-24-2	NV	NV	0.038	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	207-08-9	NV	NV	0.02	--	--	--	--	--	--	--	--	--
Chrysene	218-01-9	NV	NV	0.03	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	53-70-3	NV	NV	0.028	--	--	--	--	--	--	--	--	--
Fluoranthene	206-44-0	NV	NV	0.06	--	--	--	--	--	--	--	--	--
Fluorene	86-73-7	1.01E+00	5.05E+00	0.0018	1.0E+00	1.8E-03	1.5E+01	3.1E+00	1.2E-04	2.3E-05	N	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	NV	NV	0.042	--	--	--	--	--	--	--	--	--
Phenanthrene	85-01-8	1.13E+00	5.65E+00	0.028	1.0E+00	2.8E-02	1.7E+01	3.4E+00	1.6E-03	3.3E-04	N	--	--
Pyrene	129-00-0	NV	NV	0.052	--	--	--	--	--	--	--	--	--
Nitroglycerin/PETN													
Nitroglycerin	55-63-0	NV	NV	3.8	--	--	--	--	--	--	--	--	--

Notes:

CAS = Chemical Abstract Services
C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)
ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10
BW_i = Minimum Body Weigth of Receptor (kg)
IR_{food} = Maximum Ingestion Rate for Food
BAF_{food} = Bioaccumulation factor (Most contaminated dietary component BSAF used)
DF = Dietary fraction (Most contaminated dietary component assumed to be 100% of diet)
IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)
AF = 100% Area Use Factor
NOAEL = No observable adverse effects level
LOAEL = Lowest observable adverse effects level
mg/kg = Milligram Per Kilogram
bw - day = Body Weight - Day
HQ = Hazard Quotient
TRV = Toxicity Reference Value
EPC = Exposure Point Concentration

Red-tailed Hawk Specific Data from Table F.2-9

BW=	0.957	kg
IR_{food} =	0.063	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{mam} =	1.00	unitless
IR_{soil} =	0.00	kg dw/day
AF =	1	unitless

[a] = The following equation was used to calculate screenning levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food}(BAF_{food} \cdot DF) + IR_s)AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = Maximum Detected Concentration/Calculated NOAEL-Based Concentration
LOAEL HQ = Maximum Detected Concentration/Calculated LOAEL-Based Concentration
EPC NOAEL HQ = NOAEL HQ * (EPC/Maximum Detected Concentration)

Table F.2-23
Refined Wildlife Risk Characterization - Red-tailed Hawk
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

PARAMETER	CAS #	NOAEL (mg/kg bw-day)	LOAEL (mg/kg bw-day)	Refined Assessment						
				Soil						
				EPC (mg/kg)	Mammal BAF (unitless)	Mammal Concentration (mg/kg)	Calculated NOAEL-Based Soil Screening Level[a] (mg/kg)	Calculated LOAEL-Based Soil Screening Level[a] (mg/kg)	NOAEL HQ (unitless)	LOAEL HQ (unitless)
Inorganics										
Cadmium	7440-43-9	1.45E+00	2.00E+01	2.245	1.9E-01	4.2E-01	3.1E+05	4.3E+06	7.2E-06	5.2E-07
Chromium	7440-47-3	1.00E+00	5.00E+00	38.99	8.8E-02	3.4E+00	4.6E+05	2.3E+06	8.5E-05	1.7E-05
Copper	7440-50-8	4.70E+01	6.17E+01	1,100	1.9E-02	2.1E+01	9.8E+07	1.3E+08	1.1E-05	8.6E-06
Lead	7439-92-1	1.13E+00	1.13E+01	361.1	4.0E-02	1.5E+01	1.1E+06	1.1E+07	3.2E-04	3.2E-05
Zinc	7440-66-6	1.45E+01	1.31E+02	1,218	1.1E-01	1.3E+02	5.5E+06	4.9E+07	2.2E-04	2.5E-05

Notes:

CAS = Chemical Abstract Services

C_{TRV}= NOAEL-based screening level (mg chemical/kg soil)

ADD = NOAEL or LOAEL (mg chemical/kg body weight-day) from Table F.2-10

BW = Average Body Weigth of Receptor (kg)

IR_{food} = Average Ingestion Rate for Food

BAF_{food} = Bioaccumulation factor, specific to prey type and chemical

DF = Dietary fraction

IRs = Incidental Ingestion Rate of soil (kg soil ingested per day, dry weight)

AF = Area Use Factor

NOAEL = No observable adverse effects level

LOAEL = Lowest observable adverse effects level

mg/kg = Milligram Per Kilogram

bw - day = Body Weight - Day

HQ = Hazard Quotient

TRV = Toxicity Reference Value

BDL = Below Detection Limit

EPC = Exposure Point Concentration

[a] = The following equation was used to calculate screening levels:

$$C_{TRV} = \frac{ADD \cdot BW}{(IR_{food} \sum (BAF_{food} \cdot DF) + (IR_s)) \cdot AF}$$

See Appendix F.1 for an example C_{TRV} calculation.

NOAEL HQ = EPC/Calculated NOAEL-Based Screening Level

LOAEL HQ = EPC/Calculated LOAEL-Based Screening Level

Red-tailed Hawk Specific Data from Table F.2-9

BW=	1.134	kg
IR_{food} =	0.059	kg dw/day
BAF_{food}=	Chem Specific	unitless
DF_{mam} =	1.00	unitless
IR_{soil} =	0.0	kg dw/day
AF =	0.0005	unitless

Table F.2-24
Wildlife Summary
Screening Level Ecological Risk Assessment
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Chemical	CAS#	Meadow Vole					Short-tailed Shrew					Red Fox					American Robin					Red-tailed Hawk				
		Preliminary NOAEL-based HQ	Preliminary LOAEL-based HQ	Preliminary EPC NOAEL HQ	Refined NOAEL-based HQ	Refined LOAEL-based HQ	Preliminary NOAEL-based HQ	Preliminary LOAEL-based HQ	Preliminary EPC NOAEL HQ	Refined NOAEL-based HQ	Refined LOAEL-based HQ	Preliminary NOAEL-based HQ	Preliminary LOAEL-based HQ	Preliminary EPC NOAEL HQ	Refined NOAEL-based HQ	Refined LOAEL-based HQ	Preliminary NOAEL-based HQ	Preliminary LOAEL-based HQ	Preliminary EPC NOAEL HQ	Refined NOAEL-based HQ	Refined LOAEL-based HQ	Preliminary NOAEL-based HQ	Preliminary LOAEL-based HQ	Preliminary EPC NOAEL HQ	Refined NOAEL-based HQ	Refined LOAEL-based HQ
Inorganics																										
Arsenic	7440-38-2	**6.7E+01**	**6.7E+00**	**4.2E+01**	8.3E-01	8.3E-02	**2.4E+01**	**2.4E+00**	**1.5E+01**	5.2E-01	5.2E-02	**4.4E+01**	**4.4E+00**	**2.7E+01**	6.3E-04	6.3E-05	8.5E-01	3.4E-01	NC	NC	NC	2.3E-03	9.2E-04	NC	NC	NC
Cadmium	7440-43-9	**7.1E+00**	7.1E-01	**2.6E+00**	1.3E-01	1.3E-02	**2.9E+01**	**2.9E+00**	**1.0E+01**	2.7E-01	2.7E-02	**5.8E+01**	**5.8E+00**	**2.1E+01**	1.6E-04	1.6E-05	**5.5E+01**	**4.0E+00**	**2.0E+01**	2.4E-01	1.7E-02	**1.1E+00**	8.1E-02	4.1E-01	7.2E-06	5.2E-07
Chromium	7440-47-3	8.7E-01	8.7E-02	NC	NC	NC	**8.7E+00**	8.7E-01	**4.3E+00**	8.9E-02	8.9E-03	**1.7E+01**	**1.7E+00**	**8.3E+00**	1.8E-04	1.8E-05	**8.0E+01**	**1.6E+01**	**3.9E+01**	3.9E-01	7.7E-02	**1.7E+00**	3.5E-01	8.5E-01	8.5E-05	1.7E-05
Copper	7440-50-8	**1.6E+01**	**1.2E+01**	**1.6E+01**	4.6E-01	3.5E-01	**1.3E+01**	**1.0E+01**	**1.3E+01**	7.8E-01	6.0E-01	**2.5E+01**	**1.9E+01**	**2.5E+01**	6.4E-04	4.9E-04	**1.2E+01**	**8.9E+00**	**1.2E+01**	3.2E-01	2.4E-01	**1.6E+00**	**1.2E+00**	**1.6E+00**	1.1E-05	8.6E-06
Lead	7439-92-1	**1.6E+01**	**1.6E+00**	**7.4E+00**	2.4E-01	2.4E-02	**1.7E+01**	**1.7E+00**	**8.1E+00**	3.0E-01	3.0E-02	**3.2E+01**	**3.2E+00**	**1.5E+01**	4.3E-04	4.3E-05	**3.3E+02**	**3.3E+01**	**1.6E+02**	**2.7E+00**	2.7E-01	**1.3E+01**	**1.3E+00**	**6.0E+00**	3.2E-04	3.2E-05
Mercury	7439-97-6	2.2E-02	2.2E-03	NC	NC	NC	2.9E-02	2.9E-03	NC	NC	NC	5.8E-02	5.8E-03	NC	NC	NC	**3.2E+00**	**1.6E+00**	**1.8E+00**	1.8E-02	9.2E-03	6.2E-03	3.1E-03	NC	NC	NC
Nickel	7440-02-0	2.9E-01	1.4E-01	NC	NC	NC	3.2E-01	1.6E-01	NC	NC	NC	6.3E-01	3.1E-01	NC	NC	NC	4.7E-01	3.4E-01	NC	NC	NC	1.2E-02	8.7E-03	NC	NC	NC
Selenium	7782-49-2	**4.4E+00**	**2.7E+00**	**2.4E+00**	1.4E-01	8.6E-02	**1.5E+00**	9.0E-01	8.0E-01	5.1E-02	3.1E-02	**2.9E+00**	**1.8E+00**	**1.6E+00**	3.0E-04	1.8E-04	**2.1E+00**	**1.0E+00**	**1.1E+00**	4.7E-02	2.3E-02	1.7E-01	8.5E-02	NC	NC	NC
Silver	7440-22-4	6.7E-04	6.7E-05	NC	NC	NC	5.5E-02	5.5E-03	NC	NC	NC	1.1E-01	1.1E-02	NC	NC	NC	2.1E-01	2.8E-02	NC	NC	NC	1.5E-03	1.9E-04	NC	NC	NC
Zinc	7440-66-6	**9.7E+00**	**4.8E+00**	**4.7E+00**	2.1E-01	1.1E-01	**2.2E+01**	**1.1E+01**	**1.1E+01**	1.1E-01	5.6E-02	**4.4E+01**	**2.2E+01**	**2.2E+01**	1.7E-04	8.7E-05	**7.0E+02**	**7.8E+01**	**3.4E+02**	**2.0E+00**	2.2E-01	**3.1E+01**	**3.4E+00**	**1.5E+01**	2.2E-04	2.5E-05
Pesticides/PCBs																										
4,4'-DDT	50-29-3	5.7E-03	1.1E-03	NC	NC	NC	8.5E-02	1.7E-02	NC	NC	NC	1.7E-01	3.4E-02	NC	NC	NC	**7.0E+01**	**7.0E+00**	**7.0E+01**	**1.6E+00**	1.6E-01	4.9E-01	4.9E-02	NC	NC	NC
Endosulfan II	33213-65-9	8.2E-02	8.2E-03	NC	NC	NC	2.2E-01	2.2E-02	NC	NC	NC	4.4E-01	4.4E-02	NC	NC	NC	9.5E-03	9.5E-04	NC	NC	NC	2.4E-04	2.4E-05	NC	NC	NC
gamma-Chlordane	5103-74-2	2.3E-03	2.3E-04	NC	NC	NC	3.0E-03	3.0E-04	NC	NC	NC	5.9E-03	5.9E-04	NC	NC	NC	8.3E-04	1.7E-04	NC	NC	NC	4.3E-05	8.7E-06	NC	NC	NC
Aroclor 1254	11097-69-1	2.0E-01	2.0E-02	NC	NC	NC	**3.5E+01**	**3.5E+00**	**3.5E+01**	**2.2E+00**	2.2E-01	**6.9E+01**	**6.9E+00**	**6.9E+01**	2.8E-03	2.8E-04	**8.9E+00**	8.9E-01	**8.9E+00**	2.4E-01	2.4E-02	1.2E-01	1.2E-02	NC	NC	NC
Aroclor 1260	11096-82-5	1.6E-01	1.6E-02	NC	NC	NC	**3.0E+01**	**3.0E+00**	**3.0E+01**	**1.9E+00**	1.9E-01	**6.0E+01**	**6.0E+00**	**6.0E+01**	2.4E-03	2.4E-04	**7.7E+00**	7.7E-01	**7.7E+00**	2.1E-01	2.1E-02	1.0E-01	1.0E-02	NC	NC	NC
TCL SVOCs																										
Acenaphthene	83-32-9	2.9E-04	5.9E-05	NC	NC	NC	1.0E-04	2.1E-05	NC	NC	NC	2.0E-04	4.1E-05	NC	NC	NC	2.8E-03	5.5E-04	NC	NC	NC	1.2E-04	2.3E-05	NC	NC	NC
Acenaphthylene	208-96-8	4.8E-05	9.6E-06	NC	NC	NC	8.2E-05	1.6E-05	NC	NC	NC	1.6E-04	3.3E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Anthracene	120-12-7	2.8E-05	2.8E-06	NC	NC	NC	9.4E-06	9.4E-07	NC	NC	NC	1.9E-05	1.9E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)anthracene	56-55-3	5.6E-02	5.6E-03	NC	NC	NC	6.9E-02	6.9E-03	NC	NC	NC	1.3E-01	1.3E-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	50-32-8	8.9E-02	8.9E-03	NC	NC	NC	3.0E-02	3.0E-03	NC	NC	NC	5.8E-02	5.8E-03	NC	NC	NC	9.1E-02	1.8E-02	NC	NC	NC	5.7E-03	1.1E-03	NC	NC	NC
Benzo(b)fluoranthene	205-99-2	2.6E-02	2.6E-03	NC	NC	NC	7.0E-02	7.0E-03	NC	NC	NC	1.4E-01	1.4E-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	7.7E-02	1.5E-02	NC	NC	NC	9.8E-02	2.0E-02	NC	NC	NC	1.9E-01	3.9E-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(k)fluoranthene	207-08-9	1.2E-03	1.2E-04	NC	NC	NC	1.2E-03	1.2E-04	NC	NC	NC	2.3E-03	2.3E-04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chrysene	218-01-9	1.3E-03	1.3E-04	NC	NC	NC	1.2E-03	1.2E-04	NC	NC	NC	2.3E-03	2.3E-04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Dibenz(a,h)anthracene	53-70-3	2.2E-03	2.2E-04	NC	NC	NC	1.0E-02	1.0E-03	NC	NC	NC	2.0E-02	2.0E-03	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Fluoranthene	206-44-0	7.3E-03	1.5E-03	NC	NC	NC	3.1E-03	6.2E-04	NC	NC	NC	6.2E-03	1.2E-03	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Fluorene	86-73-7	1.8E-04	3.6E-05	NC	NC	NC	1.1E-02	2.3E-03	NC	NC	NC	2.3E-02	4.6E-03	NC	NC	NC	8.8E-03	1.8E-03	NC	NC	NC	1.2E-04	2.3E-05	NC	NC	NC
Indeno(1,2,3-cd)pyrene	193-39-5	4.1E-04	4.1E-05	NC	NC	NC	3.1E-03	3.1E-04	NC	NC	NC	6.2E-03	6.2E-04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Phenanthrene	85-01-8	2.7E-02	5.5E-03	NC	NC	NC	9.0E-03	1.8E-03	NC	NC	NC	1.8E-02	3.6E-03	NC	NC	NC	8.6E-02	1.7E-02	NC	NC	NC	1.6E-03	3.3E-04	NC	NC	NC
Pyrene	129-00-0	1.5E-02	3.0E-03	NC	NC	NC	8.9E-03	1.8E-03	NC	NC	NC	1.8E-02	3.5E-03	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitroglycerin/PETN																										
Nitroglycerin	55-63-0	4.4E-01	4.2E-02	NC	NC	NC	1.6E-01	1.5E-02	NC	NC	NC	2.9E-01	2.7E-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Notes:
CAS = Chemical Abstract Services
NC = Not Calculated
NOAEL = No observable adverse effects level
LOAEL = Lowest observable adverse effects level
HQ = Hazard Quotient
EPC = Exposure Point Concentration

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APPENDIX F.3

ECOLOGICAL SITE RECONNAISSANCE
JULY 2005

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Memorandum

To:	Darren Renne	From:	Gary Long
cc:	Jim Spencer	Office:	Fort Washington
		Date:	July 29, 2005

Subject: RFAAP Ecological Reconnaissance
Project No. 11656351.10000

On July 21, 2005 an ecological reconnaissance was conducted for SWMUs 45, 54, and 57 at the Radford Army Ammunition Plant in Radford, Virginia. The objectives of the reconnaissance were to: 1) gather information and photo documentation to sufficiently characterize ecological resources associated with the SWMUs; and 2) gather information to support the development of ecological conceptual site models (ECSMs) for the SWMUs, including identifying potential ecological receptors. Bulleted summaries of general observations made at each SWMU are provided below and a photographic log of the reconnaissance is attached.

SWMU 45

- Former waste management area (sanitary landfill) adjacent to New River;
- Pine plantation community with nearly complete vegetative cover;
- Characterized by a tall stands of loblolly pine *(Pinus taeda);* understory species include wingstem (*Verbesina alternifolia*), boxelder (*Acer negundo*), foxtail (*Alopecurus sp.*), deer tongue (*Dichanthelium clandestinum*), and immature sycamore (*Platanus occidentalis*);
- Pines approximately 40 to 50 years old based on aerial photos; successional habitat provides cover for some habitat but less cover relative to hardwood forest;
- *In situ* soil pH measurements*:*
    - 45A: 6.6 with 60% moisture;
    - 45B: 6.7 with 50% moisture.
- GPS Coordinates (NAD83 Zone 17 in meters) of monitoring wells within SWMU 45*:*
    - MW1: 4116096.56149 N; 539930.37501 E;
    - MW2: 4116164.80394 N; 539894.54883 E;
    - MW3: 4116174.21090 N; 539928.52689 E.

SWMU 54

- Disposal area for ash from propellant burning operations adjacent to New River (investigated as areas A and B);

- SWMU supports complete vegetative cover of successional/transitional species typical of open habitats including: various grasses, broomsedge (*Andropogon virginicus*), wingstem, mullien (*Verbascum thapsus*), ironweed (*Vernonia*), Queen Anne's lace (*Daucus carota*), deer tongue, thistle, and pine saplings;

- Trees harvested from area approximately 4 years ago; prior to harvesting, SWMU characterized as a pine plantation (1999 Biological Survey of RFAAP); vegetation is maintained (bush-hogged) approximately annually;

- *In situ* soil pH measurements*:*
    - 54 Area A: 6.2 with 40% moisture;
    - 54 Area B: 6.8 with 60% moisture.
- Adjacent habitats: To the east, there is a narrow riparian corridor containing sycamore and ash separates the open habitat of SWMU 54 from the New River. South of the SWMU, a stand of mixed hardwoods and pines is present. To the west and north, there is additional open successional/transitional habitat similar to SWMU 54 with intermittent stands of pines.

- Drainage feature: A drainage feature is present flowing west to east to the south of SWMU 54. The drainage is likely intermittent and does not support permanent aquatic communities; no invertebrates or fish were observed. At the time of the reconnaissance, the feature consisted of a 1-foot wide incised channel with flowing water that was approximately 3" deep. The substrate in the drainage is predominately sand-silt; there is little instream cover.

<u>SWMU 57</u>

- A former asphalt-lined lagoon that received acidic (chromic acid) wastewater;

- Hydrophytic vegetation has established in the bottom of the former lagoon, consisting primarily of cattail (*Typha*), black willow (*Salix nigra*), and rush (*Juncus*);

- Some standing water observed in the bottom of the lagoon with duckweed (*Lemna*) on the surface;

- Amphibian activity observed in the lagoon;

- Edges of the lagoon within the fenced area have upland species (primarily blackberry (*Rubus*)). Upland species dominate the vegetation outside the fenced area and include: broomsedge, thistle, Queen Anne's Lace, mullien, and various grasses.

- Drainage feature runs from SWMU 57 west towards SWMUs 68 and 69. Feature did not convey water at the time of the reconnaissance and did not support hydrophytic vegetation.

- *In situ* soil pH measurement made outside of the fence area of SWMU 57:
    - 57: 6.2 with 100% moisture.

The observations made during the July 21, 2005 ecological site reconnaissance should be sufficient to characterize ecological resources within and adjacent to SWMUs 45, 54, and 57. The observations will facilitate the development of ECSMs and the selection of potential ecological receptors.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
1	7/21/05

Direction Photo Taken:

S

Description:

SWMU 54: View looking south along fence line towards Area A; New River flows north to the left of the frame.

Photo No.	Date:
2	7/21/05

Direction Photo Taken:

SSW

Description:

SWMU 54: View across SWMU 54; Area A is towards the left side of the frame and Area B is to the right.

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PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
3	7/21/05

Direction Photo Taken:
W

Description:

SWMU 54: View of Area B in SWMU 54

Photo No.	Date:
4	7/21/05

Direction Photo Taken:
S

Description:

SWMU 54: View of Area A in SWMU 54

URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
5	7/21/05

Direction Photo Taken:
W

Description:

SWMU 54: View of drainage running west-east to the New River south of SWMU 54. Drainage had flowing water during the time of the recon but does not appear to support a permanent aquatic community as no invertebrates nor fish were observed.

Photo No.	Date:
6	7/21/05

Direction Photo Taken:
SE

Description:

SWMU 54: Overview of SWMU 54 from road on the top of the ridge to the west.

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PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
7	7/21/05

Direction Photo Taken:
NW

Description:

SWMU 57: View of SWMU 57 from road to the east of the SWMU. Note hydrophytic vegetation (Typha and Salix) within the former lagoon area..

Photo No.	Date:
8	7/21/05

Direction Photo Taken:
SSW

Description:

SWMU 57: View of SWMU 57 looking SSW.

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PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
9	7/21/05

Direction Photo Taken:
E

Description:

SWMU 57: View of drainage from SWMU 57 (in background)

Photo No.	Date:
10	7/21/05

Direction Photo Taken:

SE

Description:

View of drainage from area south of SWMU 57. Hydrophytic vegetation (Typha and Juncus) observed in drainage pattern.

URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
11	7/21/05

Direction Photo Taken:

WSW

Description:

SWMU 69: View of SWMU 69 looking WSW from an area just north of SWMU 68.

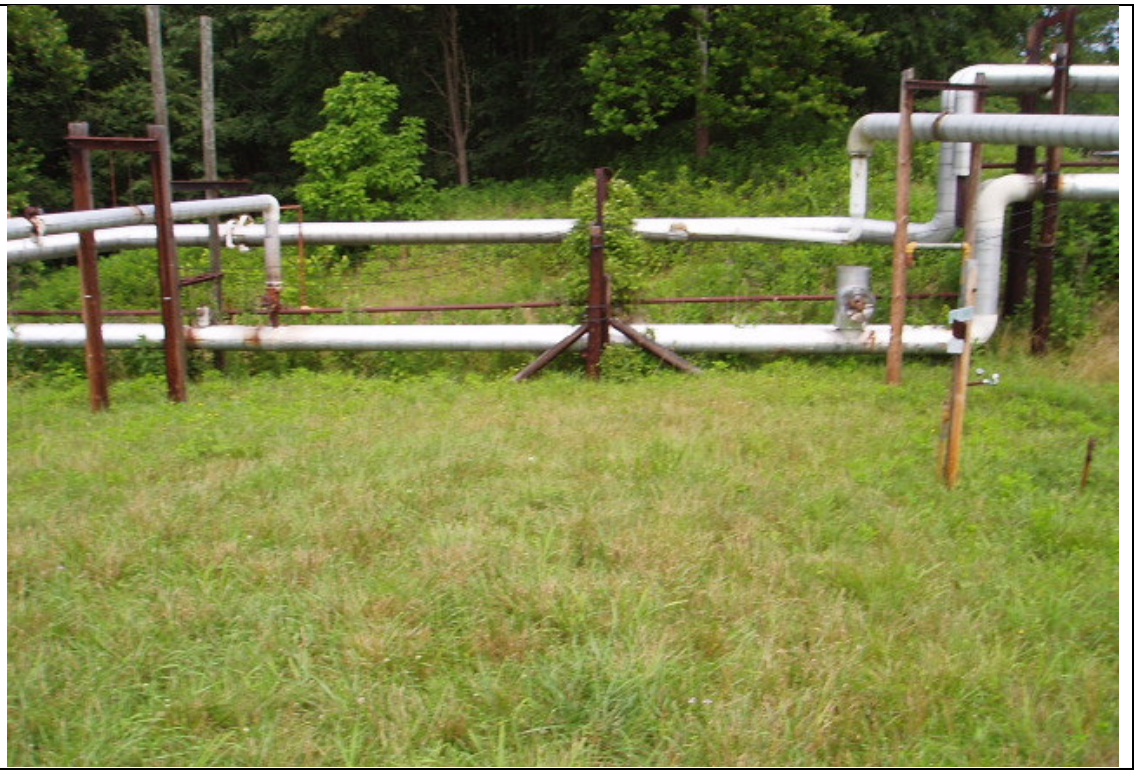
Photo No.	Date:
12	7/21/05

Direction Photo Taken:

NNW

Description:

SWMU 68: Looking across SWMU 68 towards SWMU 69 (background). Note vegetation covering SWMU 68 is regularly maintained.



URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
13	7/21/05

Direction Photo Taken:
NW

Description:

SWMU 45: Looking NW towards SWMU 45 along road (left). Note MW-1 in the foreground of the frame.

Photo No.	Date:
14	7/21/05

Direction Photo Taken:

NW

Description:

SWMU 45: Looking towards SWMU 45 from a point NW of MW-1.

URS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
15	7/21/05

Direction Photo Taken:

NW

Description:

SWMU 45: Looking across potential waste area in SWMU 45. Note security fence along New River riparian zone in the background of the frame.

Photo No.	Date:
16	7/21/05

Direction Photo Taken:

WSW

Description:

SWMU 45: View of clearing along New River (right of frame) security fence from MW-3 (left foreground).

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
RFAAP	Radford, Virginia	11656351.10000

Photo No.	Date:
17	7/21/05

Direction Photo Taken:

SE

Description:

SWMU 45: View from clearing along New River security fence looking across SWMU 54 towards the plant area.

Photo No.	Date:
18	7/21/05

Direction Photo Taken:

NW

Description:

SWMU 45: View from SWMU 45 looking towards New River security fence across MW-2 (middle of frame).

APPENDIX G

ANALYTICAL DATA EVALUATION

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APPENDIX G.1

DATA QUALITY OBJECTIVES

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TABLE G.1-1
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Soil

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data usability.	There were no problems identified during field sampling that affected data usability.
Are samples representative of receptor exposure for this medium (e.g., sample depth, grab vs. composite, filtered vs. unfiltered, low flow, etc.)?	Yes. Samples are representative of receptor exposure. Surface soil samples and subsurface soil samples were collected from discrete intervals.
Assess the effect of field QC results on data usability.	Field duplicate samples were collected at the rate of 1 per 10 soil samples. The average concentration of the soil sample and its duplicate sample were used in the risk assessments. Equipment rinsate blank samples were collected at the rate of 1 per 20 soil samples. Low-level detections at concentrations below the laboratory reporting limit were reported in one or more of the equipment blank samples for selected metals, VOCs, and SVOCs. No significant impact on data usability resulted from these detections. Matrix spike (MS)/matrix spike duplicate (MSD) samples were at the rate of 1 per 20 soil samples. No significant impact on data usability was identified based on the matrix spike results.
Summarize the effect of field sampling issues on the risk assessment, if applicable.	No significant sampling issues were noted. See Sections 4.0 and 5.0 of the SSP Report discuss the uncertainty analysis for the human health and ecological risk assessments for sampling and analysis.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	Yes. Low-level SW-846 analytical methods were used for soil analysis in accordance with the MWP and WPA 022. Soil samples were analyzed for VOCs by SW-846 Method 8260B, SVOCs by SW-846 Method 8270C, explosives by SW-846 Methods 8330 and 8332, pesticides by SW-846 Method 8081A, PCBs by SW-846 Method 8082, and metals by SW-846 6010B, 6020, 7471A, and 9012A.
Were detection limits adequate?	Low-level SW-846 Methods were used. The detection limits were adequate for screening against adjusted RBCs except as noted in Table E.1-2.3. As discussed in the uncertainties in Sections 4.0 and 5.0, the lack of sensitivity could lead to an underestimation of risk at the site.
Summarize the effect of analytical technique	There were no analytical technical issues which significantly affected the risk assessments. Sections

TABLE G.1-1
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Soil

Activity	Comment
issues on risk assessment, if applicable.	4.0 and 5.0 of the SSP Report discuss the uncertainty analysis for the human health and ecological risk assessments for sampling and analysis.
Data Quality Objectives	
Precision – How were duplicates handled?	Field duplicate samples were collected at the rate of 1 per 10 soil samples. The average concentration of the soil sample and its duplicate sample were used in the risk assessments.
Accuracy – How were split samples handled?	Split samples were not collected.
Representativeness – Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, COC problems, etc.).	No significant issues regarding data representativeness were noted.
Completeness – Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	No significant issues regarding completeness of the data were noted. The overall completeness goal of 90±2% for field activities was exceeded for analytical analysis and field data collection.
Comparability – Indicate any problems associated with data comparability.	No significant issues regarding comparability of the data were noted.
Were the DQOs specified in the QAPP satisfied?	Yes, the DQOs specified in the QAPP were satisfied.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Not applicable.
Data Validation and Interpretation	
What are the data validation requirements for this region?	EPA Region III modifications to the National Functional Guidelines for Data Validation.
What method or guidance was used to validate the data?	EPA Region III National Functional Guidelines for Data Validation.
Was the data validation method consistent with regional guidance? Discuss any discrepancies.	Yes, there were no discrepancies.
Were all data qualifiers defined? Discuss those which were not.	Yes, they were defined in the guidance document, data validation reports included in Appendix G.2 of the SSP Report, and in the data tables included in Section 4.0 of the SSP Report.
Which qualifiers represent usable data?	B, E, J, K, L, U, UJ, UL
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	Detected tentatively identified compounds are qualified NJ. These compounds are not used in the

TABLE G.1-1
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Soil

Activity	Comment
	risk assessments.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Section 4.0 of the SSP Report discusses uncertainties associated with qualified data.
Additional notes:	None.

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Table G.1-1
Detected Analytes in Soil Field Blanks
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date	Units	EQBK-1 5/5/2008 Result	LQ, VQ, r	MDL	RL	EQBK-2 5/6/2008 Result	LQ, VQ, r	MDL	RL
TAL Metals									
Antimony	ug/L	0.5	J,B,o	0.32	3	<3	U	0.32	3
Calcium	ug/L	350	J	69	500	<500	U	69	500
Manganese	ug/L	<3	U	0.3	3	0.36	J	0.3	3
Selenium	ug/L	<3	U	0.3	3	0.75	J	0.3	3
Zinc	ug/L	5.7	J,B,p	1.8	10	7.5	J,B,p	1.8	10
Cyanide									
Cyanide	ug/L	4.51	J,B,p	1.9	10	3.64	J,B,p	1.9	10
TCL VOCs									
Toluene	ug/L	0.09	J	0.072	1	0.08	J	0.072	1
TCL SVOCs									
Acenaphthene	ug/L	0.02	J	0.013	0.5	<0.5	U	0.013	0.5
Benzo(a)anthracene	ug/L	0.08	J,B,z	0.037	0.5	0.06	J	0.037	0.5
Benzo(b)fluoranthene	ug/L	0.33	J	0.04	0.5	<0.5	U	0.04	0.5
Benzo(k)fluoranthene	ug/L	0.07	J	0.036	0.5	<0.5	U	0.036	0.5
Bis(2-ethylhexyl)phthalate	ug/L	3.7	J	0.41	5	<5	U	0.41	5
Butyl Benzyl Phthalate	ug/L	0.29	J,B,z	0.029	5	0.07	J	0.029	5
Chrysene	ug/L	0.07	J,B,z	0.02	0.5	0.06	J	0.02	0.5
Diethyl Phthalate	ug/L	0.07	J,B,z	0.034	5	<5	U	0.034	5
Di-n-butyl Phthalate	ug/L	5.6		0.38	5	<5	U	0.38	5
Fluoranthene	ug/L	0.03	J	0.016	0.5	0.02	J	0.016	0.5
Naphthalene	ug/L	<0.5	U	0.023	0.5	0.03	J,B,z	0.023	0.5
Phenanthrene	ug/L	0.02	J	0.015	0.5	<0.5	U	0.015	0.5

Notes:

CAS = Chemical Abstracts Service
µg/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
MDL = Method Detection Limit
RL = Reporting Limit
LQ = Laboratory Qualifier
VQ = Validation Qualifier
r = Reason Code

Data Qualifiers

B = Analyte found in associated blank as well as in the sample.
J = Estimated value.
,J = Analyte present. Reported value may not be accurate or precise.
U = The compound was analyzed for but not detected. The reporting limit will be adjusted to reflect any dilution, and for soil, the percent moisture.
o = Calibration blank contamination
p = Preparation blank contamination
z = Method blank and/or storage blank contamination

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TABLE G.1-2
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Groundwater

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data usability.	There were no problems identified during field sampling that affected data usability.
Are samples representative of receptor exposure for this medium (e.g., sample depth, grab vs. composite, filtered vs. unfiltered, low flow, etc.)?	Yes. Both filtered and unfiltered samples were collected for metals. Filtered metals samples were used in the risk assessment and are considered representative of dissolved concentrations in groundwater. Low-flow groundwater sampling techniques were used to collect the samples representative of groundwater quality.
Assess the effect of field QC results on data usability.	Field duplicate samples were collected at the rate of 1 per 10 groundwater samples. The average concentration of the groundwater sample and its duplicate sample were used in the risk assessments. Equipment rinsate blank samples were collected at the rate of 1 per 20 groundwater samples. Low-level detections at concentrations below the laboratory reporting limit were reported in one or more of the equipment blank samples for selected metals, VOCs, and SVOCs. No significant impact on data usability resulted from these detections. Matrix spike (MS)/matrix spike duplicate (MSD) samples were at the rate of 1 per 20 groundwater samples. No significant impact on data usability was identified based on the matrix spike results.
Summarize the effect of field sampling issues on the risk assessment, if applicable.	No significant sampling issues were noted. Section 5.0 of the SSP Report discusses the uncertainty analysis for the human health risk assessment for sampling and analysis.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	Yes. Low-level SW-846 and EPA analytical methods were used for groundwater analysis in accordance with the MWP and WPA 022. Groundwater samples were analyzed for VOCs by SW-846 by Method 8260B, SVOCs by SW-846 Method 8270C, explosives by SW-846 Methods 8330 and 8332, pesticides by SW-846 Method 8081A, PCBs by SW-846 Method 8082, metals by SW-846 Methods 6010B, 6020, and 7470A, and perchlorate by Method SW-846 Method 6850.

TABLE G.1-2
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Groundwater

Activity	Comment
Were detection limits adequate?	Yes. Low-level SW-846 Methods were used. The detection limits were adequate for screening against adjusted RBCs except as noted in Table E.1-2.5. As discussed in the uncertainties in Section 5.0, the lack of sensitivity could lead to an underestimation of risk at the site.
Summarize the effect of analytical technique issues on risk assessment, if applicable.	There were no analytical technical issues which significantly affected the risk assessments. Section 5.0 of the SSP Report discusses the uncertainty analysis for the human health for sampling and analysis.
Data Quality Objectives	
Precision – How were duplicates handled?	Field duplicate samples were collected at the rate of 1 per 10 groundwater samples. The average concentration of the groundwater sample and its duplicate sample were used in the risk assessment.
Accuracy – How were split samples handled?	Split samples were not collected.
Representativeness – Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, COC problems, etc.).	No significant issues regarding data representativeness were noted.
Completeness – Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	No significant issues regarding completeness of the data were noted. The overall completeness goal of 90±2% for field activities was exceeded for analytical analysis and field data collection.
Comparability – Indicate any problems associated with data comparability.	No significant issues regarding comparability of the data were noted.
Were the DQOs specified in the QAPP satisfied?	Yes, the DQOs specified in the QAPP were satisfied.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Not applicable.
Data Validation and Interpretation	
What are the data validation requirements for this region?	EPA Region III modifications to the National Functional Guidelines for Data Validation.
What method or guidance was used to validate the data?	EPA Region III National Functional Guidelines for Data Validation.
Was the data validation method consistent with regional guidance? Discuss any discrepancies.	Yes, there were no discrepancies.

TABLE G.1-2
DATA USABILITY WORKSHEET
SITE: SWMU 45
MEDIUM: Groundwater

Activity	Comment
Were all data qualifiers defined? Discuss those which were not.	Yes, they were defined in the guidance document, data validation reports included in Appendix G.2 of the SSP Report, and in the data tables included in Section 4.0 of the SSP Report.
Which qualifiers represent usable data?	B, J, L, U
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	Detected tentatively identified compounds are qualified NJ. These compounds are not used in the risk assessment.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Section 4.0 of the SSP Report discusses uncertainties associated with qualified data.
Additional notes:	None.

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Table G.1-2
Detected Analytes in Groundwater Field Blanks
SWMU 45 SSP Report
Radford Army Ammunition Plant, Radford, Virginia

Sample ID / Sample Date	Units	EQBK-3 5/22/2008		MDL	RL	Trip Blank 1 5/21/2008		MDL	RL	Trip Blank 2 5/22/2008		MDL	RL
		Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals	Units												
Chromium, Dissolved	ug/L	0.76	J,B,p	0.33	2	NT				NT			
Chromium, Total	ug/L	0.68	J	0.33	2	NT				NT			
Iron, Total	ug/L	84		9.6	20	NT				NT			
Vanadium, Total	ug/L	0.29	J,B,o	0.27	5	NT				NT			
Zinc, Dissolved	ug/L	2.5	J	1.8	10	NT				NT			
Zinc, Total	ug/L	3	J	1.8	10	NT				NT			
Cyanide													
Cyanide, Total	ug/L	2.04	J,B,p	1.9	10	NT				NT			
TCL VOCs													
Toluene	ug/L	0.15	J	0.072	1	0.13	J	0.072	1	0.16	J	0.072	1
TCL SVOCs													
Bis(2-ethylhexyl) Phthalate	ug/L	1.1	J,B,z	0.41	5	NT				NT			
Butyl Benzyl Phthalate	ug/L	0.38	J,B,z	0.029	5	NT				NT			
Diethyl Phthalate	ug/L	0.04	J,B,z	0.034	5	NT				NT			
Di-n-butyl Phthalate	ug/L	3.4	J	0.38	5	NT				NT			

Notes:

CAS = Chemical Abstracts Service
µg/L = Microgram Per Liter
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
MDL = Method Detection Limit
RL = Reporting Limit
LQ = Laboratory Qualifier
VQ = Validation Qualifier
r = Reason Code
NT = Not Tested

Data Qualifiers

B = Analyte found in associated blank as well as in the sample.
J = Estimated value.
o = Calibration blank contamination
p = Preparation blank contamination
z = Method blank and/or storage blank contamination

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APPENDIX G.2

LABORATORY ANALYTICAL DATA (FORM 1s)

SITE SCREENING PROCESS SAMPLING
2007-2008

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DATA VALIDATION REPORT - Level III Review

SDG No.:_____36440-54_____ Fraction:_VOCs, SVOCs, Pest, PCBs, Explosives, Metals, TOC & Cyanide__

Lab:_____TriMatrix_____ Project Name _____Radford SWMU 45_____

Reviewer:_____RA_____ Date:_____June 27, 2008_____

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied (as required), the completed data validation checklist, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the Region III Modifications to the USEPA National Functional Guidelines for Organic and Inorganic Data Review as pertains to the specifics of the analytical method employed and provisions of the approved project-specific QAPP.

Major Anomalies: For the VOCs analyses, the laboratory control sample analyzed for batch 805786 displayed a percent recovery (%R) less than the lower control limit of 80% for 1,1,2-trichloro-1,2,2-trifluoroethane at 76%. The associated field sample results were non-detects and were flagged "R,l".

For the SVOCs analyses, the laboratory control sample analyzed for batch 805286 displayed a %R less than the lower control limit of 25% for caprolactam at 21%. The associated field sample result for EQBK-2 was a non-detect and was flagged "R,l".

Minor Anomalies: For the VOCs analyses, the method blanks displayed positive detections for acetone, carbon disulfide, chloroform, and methyl acetate. Positive associated field sample results less than ten times the method blank concentration for acetone and less than five times the method blank concentration for the other compounds were flagged "B,z". The equipment blanks displayed positive detections for toluene. The associated field sample results were either non-detects or greater than five times the equipment blank concentrations and no data qualifying action was necessary.

The continuing calibration analyzed on 05/09/08 displayed a percent difference (%D) greater than the control limit (i.e., 20%) with a positive bias for trichlorofluoromethane at 25.7%. The continuing calibration analyzed on 05/15/08 displayed %Ds greater than the control limit with a positive bias for carbon tetrachloride at 21.1%, chloroethane at 21.3%, and dichlorodifluoromethane at 22.2%. The associated field sample results were non-detects, and no data qualifying action was required.

The matrix spike pair analyzed for sample 45TP4B displayed %Rs and/or relative percent differences (RPDs) outside the control limits for benzene, bromodichloromethane, carbon disulfide, chlorobenzene, dibromochloromethane, 1,2-

dichloropropane, trans-1,2-dichloroethene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, ethyl benzene, isopropylbenzene, methyl acetate, methylcyclohexane, styrene, tetrachloroethene, toluene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, trichloroethene, 1,1,2-trichloro-1,2,2-trifluoroethane, and total xylene. The matrix spike pair analyzed for sample 45SB1A also displayed %Rs and/or RPDs outside the control limits for acetone, benzene, bromochloromethane, bromodichloromethane, bromoform, carbon disulfide, chlorobenzene, dibromochloromethane, 1,2-dichloroethane, cis-1,2-dichloroethene, 1,1,2,2-tetrachloroethane, 1,2-dibromoethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethene, trans-1,2-dichloroethene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, ethyl benzene, isopropylbenzene, methyl acetate, styrene, tetrachloroethene, toluene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, trichloroethene, and total xylene. Positive associated parent sample results were flagged "J,m" and non-detect parent sample results were flagged "UJ,m".

Several compounds exceeded the calibration range of the instrument in several samples and were flagged "E" by the laboratory. These results were flagged "J,q" by the reviewer.

For the SVOCs analyses, the aqueous method blanks displayed positive detections for acetophenone, naphthalene, benzo(a)anthracene, butyl benzyl phthalate, chrysene, diethyl phthalate, isophorone, and phenol. The soil method blanks displayed positive detections for 1,1'-biphenyl, naphthalene, and butyl benzyl phthalate. Positive associated field sample results less than ten times the method blank concentrations for the phthalates and less than five times the method blank concentrations for the other compounds were flagged "B,z".

The equipment blanks displayed positive detections for acenaphthene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, bis(2-ethylhexyl)phthalate, fluoranthene, and phenanthrene. Positive associated field sample results less than ten times the equipment blank concentrations for the phthalates were flagged "B,x". The associated field sample results for the other compounds were well above the equipment blank concentrations and no further data qualifying action was required.

The matrix spike pair analyzed for sample 45TP4B displayed %Rs and/or RPDs outside the control limits for anthracene, benzaldehyde, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, 4,6-dinitro-2-methylphenol, 2,4-dinitrophenol, benzo(b)fluoranthene, benzo(k)fluoranthene, butyl benzyl phthalate, carbazole, dibenz(a,h)anthracene, di-n-butyl phthalate, di-n-octyl phthalate, bis(2-ethylhexyl)phthalate, fluoranthene, indeno(1,2,3-cd)pyrene, 3-nitroaniline, and pyrene. Positive associated parent sample results were flagged "J,m" and non-detects were flagged "UJ,m" for the compounds that displayed a failed %R. Positive associated

parent sample results were flagged "J,d" for the compounds that displayed a failed RPD.

The laboratory control sample analyzed for batch 805286 displayed a %R greater than the upper control limit of 115% for 2,3,4,6-tetrachlorophenol at 119%. The laboratory control sample analyzed for batches 805309 and 805368 displayed %Rs greater than the upper control limits for carbazole and 4-methylphenol. The associated field sample results were non-detects and no data qualifying action was necessary.

For the pesticides analyses, sample 45SB1B was re-extracted 2 days after the holding time had expired. The associated field sample results were non-detects and were flagged "UJ,h". The original sample results should be used for data interpretation.

The aqueous method bank displayed positive detections for gamma-chlordane, endosulfan sulfate, endrin aldehyde, and endrin ketone. The associated equipment blank results were non-detects and no data qualifying action was necessary.

The continuing calibration analyzed on 05/16/08 displayed %Ds greater than the control limit of 15% with a positive bias for alpha-BHC, delta-BHC, alpha-chlordane, 4,4'-DDE, aldrin, 4,4'-DDT, 4,4'-DDD, dieldrin, endrin aldehyde, endosulfan II, endosulfan sulfate, endrin, endrin ketone, methoxychlor, and toxaphene. The continuing calibration analyzed on 05/20/08 displayed %Ds greater than the control limit with a positive bias for all compounds except beta-BHC. The associated positive field sample results were flagged "J,c".

The laboratory control sample analyzed for batch 805288 displayed %Rs greater than the upper control limits for numerous compounds. The associated field sample results were non-detects and no data qualifying action was necessary.

Sample 45TP2A displayed a percent difference greater than the control limit of 40% between the two analytical columns for endosulfan II at 158.8%. This result was previously qualified for a calibration anomaly and no further data qualifying action was taken.

For the PCBs analyses, the matrix spike pair analyzed for sample 45TP4B displayed %Rs greater than the upper control limits for PCB-1260 on both columns. The associated parent sample result was a non-detect and no data qualifying action was necessary.

For the explosives analyses by method 8330, the continuing calibrations analyzed on 05/15/08 at 0813 and 1612 displayed %Ds greater than the control limit of 15% with a negative bias for 2-nitrotoluene and 4-nitrotoluene. The associated field sample results were non-detects and were flagged "UJ,c".

For the metals analyses, for method 6010, the method blanks displayed positive detections for calcium, iron, beryllium, magnesium, manganese, and zinc. The associated field sample results were greater than five times the blank concentrations and no data qualifying action was taken. The initial and continuing calibration blanks displayed negative detections for aluminum. The associated equipment blank results were non-detects and were flagged "UL,o". The initial and continuing calibration blanks also displayed positive detections for aluminum, beryllium, chromium, and magnesium. The equipment blanks displayed positive detections for calcium and manganese. The associated field sample results were greater than five times the blank concentrations and no data qualifying action was required.

For method 6020, the method blanks displayed positive detections for nickel, vanadium, and zinc. The associated positive field sample results less than five times the method blank concentrations were flagged "B,p" in the equipment blanks. The continuing calibration blanks displayed negative detections for arsenic, selenium, and vanadium. The associated field sample results were positive and greater than five times the absolute value of the blank concentrations and no data qualifying action was taken. The initial and continuing calibration blanks also displayed positive detections for antimony, arsenic, selenium, and vanadium. The associated field sample results less than five times the blank concentrations were flagged "B,o". The equipment blanks displayed positive detections for manganese and selenium. The associated field sample results were greater than five times the blank concentrations and no data qualifying action was required.

For method 6010, the matrix spike analyzed for sample 45TP4B displayed a %R less than the lower control limit of 75% for magnesium at 68%. The associated field sample result was positive and was flagged "L,m".

For method 6020, the matrix spike pair analyzed for sample 45SB1A displayed %Rs less than the lower control limit of 75% for arsenic (69%/66%) and selenium (61%/59%). Positive associated field sample results were flagged "L,m" and non-detects were flagged "UL,m". The matrix spike pair analyzed for sample 45TP4B displayed %Rs less than the lower control limit of 75% for antimony (-35%/-30%). The associated field sample result was positive and was flagged "L,m".

For the mercury analyses, the matrix spike duplicate analyzed for sample 45TP4B displayed a percent recovery greater than the upper control limit of 125% at 129%. Positive associated field sample results were flagged "K,m".

For the cyanide analyses, the aqueous method blank displayed a positive detection for cyanide at 3.31 ug/L. Positive associated equipment blank results were less than five times the blank concentration and were flagged "B,p". The continuing calibration blanks also displayed positive detections for cyanide. The associated equipment blank

results were previously flagged for method blank contamination and no further data qualifying action was taken.

Correctable Anomalies: None.

Comments: On the basis of this evaluation, the laboratory appears to have followed the specified method. All data, except for data flagged "R", are usable, as qualified, for their intended purpose based on the data reviewed. It should be noted that detection limits were raised in several samples due to dilutions. Please note that all quality control criteria were met for the TOC analyses.

Signed: Rayan

SAMPLE ID SUMMARY

USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

8232L

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 10001A.D

Sampled: 05/05/08 11:15 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 14:51

Solids: 72.50 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	920	28	5.8	E J/B
71-43-2	Benzene	1	0.21	6.9	0.18	J
74-97-5	Bromochloromethane	1	28	28	0.18	U
75-27-4	Bromodichloromethane	1	6.9	6.9	0.34	U
75-25-2	Bromoform	1	6.9	6.9	0.67	U
74-83-9	Bromomethane	1	6.9	6.9	1.7	U
75-15-0	Carbon Disulfide	1	3.5	6.9	0.36	J
56-23-5	Carbon Tetrachloride	1	6.9	6.9	0.40	U
108-90-7	Chlorobenzene	1	6.9	6.9	0.28	U
75-00-3	Chloroethane	1	28	28	0.48	U
67-66-3	Chloroform	1	6.9	6.9	0.20	U
74-87-3	Chloromethane	1	6.9	6.9	0.34	U
110-82-7	Cyclohexane	1	14	14	0.95	U
96-12-8	1,2-Dibromo-3-chloropropane	1	14	14	1.1	U
124-48-1	Dibromochloromethane	1	6.9	6.9	0.48	U
106-93-4	1,2-Dibromoethane	1	6.9	6.9	1.2	U
95-50-1	1,2-Dichlorobenzene	1	6.9	6.9	0.34	U
541-73-1	1,3-Dichlorobenzene	1	6.9	6.9	0.33	U
106-46-7	1,4-Dichlorobenzene	1	6.9	6.9	0.30	U
75-71-8	Dichlorodifluoromethane	1	6.9	6.9	0.46	U
75-34-3	1,1-Dichloroethane	1	6.9	6.9	0.27	U
107-06-2	1,2-Dichloroethane	1	6.9	6.9	0.41	U
75-35-4	1,1-Dichloroethene	1	6.9	6.9	0.51	U
156-59-2	cis-1,2-Dichloroethene	1	6.9	6.9	0.22	U
156-60-5	trans-1,2-Dichloroethene	1	6.9	6.9	0.31	U
78-87-5	1,2-Dichloropropane	1	6.9	6.9	1.3	U
10061-01-5	cis-1,3-Dichloropropene	1	6.9	6.9	0.35	U
10061-02-6	trans-1,3-Dichloropropene	1	6.9	6.9	1.2	U
100-41-4	Ethylbenzene	1	6.9	6.9	0.17	U
591-78-6	2-Hexanone	1	14	14	4.1	U
98-82-8	Isopropylbenzene	1	6.9	6.9	0.17	U
79-20-9	Methyl Acetate	1	11	28	1.1	J
1634-04-4	Methyl tert-Butyl Ether	1	6.9	6.9	0.32	U
108-87-2	Methylcyclohexane	1	14	14	1.1	U
75-09-2	Methylene Chloride	1	28	28	5.4	U
78-93-3	2-Butanone (MEK)	1	320	28	3.3	E J/B
108-10-1	4-Methyl-2-pentanone (MIBK)	1	14	14	2.6	U
100-42-5	Styrene	1	6.9	6.9	0.30	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.9	6.9	0.28	U
127-18-4	Tetrachloroethene	1	6.9	6.9	0.61	U

02412

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 10001A.D

Sampled: 05/05/08 11:15 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 14:51

Solids: 72.50 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
108-88-3	Toluene	1	6.9	6.9	0.55	U
87-61-6	1,2,3-Trichlorobenzene	1	28	28	0.28	U
120-82-1	1,2,4-Trichlorobenzene	1	6.9	6.9	0.33	U
71-55-6	1,1,1-Trichloroethane	1	6.9	6.9	0.28	U
79-00-5	1,1,2-Trichloroethane	1	6.9	6.9	0.95	U
79-01-6	Trichloroethene	1	6.9	6.9	0.77	U
75-69-4	Trichlorofluoromethane	1	6.9	6.9	0.30	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.9	6.9	0.46	U
75-01-4	Vinyl Chloride	1	6.9	6.9	0.63	U
1330-20-7	Xylene (Total)	1	6.9	6.9	0.81	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	43.1	108	78 - 121	
1,2-Dichloroethane-d4	40.0	46.3	116	66 - 124	
Toluene-d8	40.0	38.7	97	85 - 115	
4-Bromofluorobenzene	40.0	37.8	95	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	671977	7.36	726450	7.33	
Chlorobenzene-d5	294678	17.41	333795	17.39	
1,4-Dichlorobenzene-d4	275134	22.44	403063	22.43	

* Values outside of QC limits

02413

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 0805100-01.D

Sampled: 05/05/08 11:15 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 18:29

Solids: 72.50 Preparation: 5030B Aqueous Purge & Initial/Final: 4.5 g / 225 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	1000	1000	82	U
71-43-2	Benzene	1	69	69	8.1	U
74-97-5	Bromochloromethane	1	69	69	14	U
75-27-4	Bromodichloromethane	1	69	69	13	U
75-25-2	Bromoform	1	69	69	16	U
74-83-9	Bromomethane	1	69	69	13	U
75-15-0	Carbon Disulfide	1	340	340	20	U
56-23-5	Carbon Tetrachloride	1	69	69	10	U
108-90-7	Chlorobenzene	1	69	69	8.3	U
75-00-3	Chloroethane	1	69	69	14	U
67-66-3	Chloroform	1	69	69	4.3	U
74-87-3	Chloromethane	1	69	69	4.1	U
110-82-7	Cyclohexane	1	340	340	9.5	U
96-12-8	1,2-Dibromo-3-chloropropane	1	340	340	20	U
124-48-1	Dibromochloromethane	1	69	69	9.5	U
106-93-4	1,2-Dibromoethane	1	69	69	15	U
95-50-1	1,2-Dichlorobenzene	1	69	69	4.6	U
541-73-1	1,3-Dichlorobenzene	1	69	69	8.3	U
106-46-7	1,4-Dichlorobenzene	1	69	69	9.2	U
75-71-8	Dichlorodifluoromethane	1	69	69	12	U
75-34-3	1,1-Dichloroethane	1	69	69	5.2	U
107-06-2	1,2-Dichloroethane	1	69	69	11	U
75-35-4	1,1-Dichloroethene	1	69	69	9.5	U
156-59-2	cis-1,2-Dichloroethene	1	69	69	11	U
156-60-5	trans-1,2-Dichloroethene	1	69	69	11	U
78-87-5	1,2-Dichloropropane	1	69	69	7.2	U
10061-01-5	cis-1,3-Dichloropropene	1	69	69	9.8	U
10061-02-6	trans-1,3-Dichloropropene	1	69	69	11	U
100-41-4	Ethylbenzene	1	69	69	9.1	U
591-78-6	2-Hexanone	1	3400	3400	29	U
98-82-8	Isopropylbenzene	1	69	69	8.6	U
79-20-9	Methyl Acetate	1	340	340	11	U
1634-04-4	Methyl tert-Butyl Ether	1	69	69	6.6	U
108-87-2	Methylcyclohexane	1	340	340	10	U
75-09-2	Methylene Chloride	1	340	340	11	U
78-93-3	2-Butanone (MEK)	1	3400	3400	23	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	3400	3400	26	U
100-42-5	Styrene	1	69	69	7.4	U
79-34-5	1,1,2,2-Tetrachloroethane	1	69	69	6.9	U
127-18-4	Tetrachloroethene	1	69	69	10	U
108-88-3	Toluene	1	69	69	5.0	U

02421

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 0805100-01.D

Sampled: 05/05/08 11:15 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 18:29

Solids: 72.50 Preparation: 5030B Aqueous Purge & Initial/Final: 4.5 g / 225 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	140	140	9.2	U
120-82-1	1,2,4-Trichlorobenzene	1	140	140	11	U
71-55-6	1,1,1-Trichloroethane	1	69	69	7.6	U
79-00-5	1,1,2-Trichloroethane	1	69	69	14	U
79-01-6	Trichloroethene	1	69	69	12	U
75-69-4	Trichlorofluoromethane	1	69	69	12	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	340	340	9.9	U R1
75-01-4	Vinyl Chloride	1	69	69	12	U
1330-20-7	Xylene (Total)	1	210	210	25	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	38.6	97	78 - 121	
1,2-Dichloroethane-d4	40.0	40.2	100	66 - 124	
Toluene-d8	40.0	40.8	102	85 - 115	
4-Bromofluorobenzene	40.0	39.2	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	391863	3.86	344632	3.86	
Chlorobenzene-d5	313158	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	169697	9.15	157692	9.15	

* Values outside of QC limits

Do not purge RA 4/23/08

02422

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 10002.D

Sampled: 05/05/08 11:40 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 12:37

Solids: 86.13 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	630	23	4.9	E JB
71-43-2	Benzene	1	5.8	5.8	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.8	5.8	0.29	U
75-25-2	Bromoform	1	5.8	5.8	0.56	U
74-83-9	Bromomethane	1	5.8	5.8	1.4	U
75-15-0	Carbon Disulfide	1	5.8	5.8	0.31	U
56-23-5	Carbon Tetrachloride	1	5.8	5.8	0.33	U
108-90-7	Chlorobenzene	1	5.8	5.8	0.23	U
75-00-3	Chloroethane	1	23	23	0.41	U
67-66-3	Chloroform	1	5.8	5.8	0.17	U
74-87-3	Chloromethane	1	5.8	5.8	0.28	U
110-82-7	Cyclohexane	1	12	12	0.80	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.95	U
124-48-1	Dibromochloromethane	1	5.8	5.8	0.41	U
106-93-4	1,2-Dibromoethane	1	5.8	5.8	0.98	U
95-50-1	1,2-Dichlorobenzene	1	5.8	5.8	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.8	5.8	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.8	5.8	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.8	5.8	0.38	U
75-34-3	1,1-Dichloroethane	1	5.8	5.8	0.23	U
107-06-2	1,2-Dichloroethane	1	5.8	5.8	0.34	U
75-35-4	1,1-Dichloroethene	1	5.8	5.8	0.43	U
156-59-2	cis-1,2-Dichloroethene	1	5.8	5.8	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.8	5.8	0.26	U
78-87-5	1,2-Dichloropropane	1	5.8	5.8	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.8	5.8	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.8	5.8	0.97	U
100-41-4	Ethylbenzene	1	5.8	5.8	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.8	5.8	0.14	U
79-20-9	Methyl Acetate	1	5.5	23	0.97	J BJ
1634-04-4	Methyl tert-Butyl Ether	1	5.8	5.8	0.27	U
108-87-2	Methylcyclohexane	1	12	12	0.92	U
75-09-2	Methylene Chloride	1	23	23	4.6	U
78-93-3	2-Butanone (MEK)	1	260	23	2.8	E JB
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.8	5.8	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.8	5.8	0.23	U
127-18-4	Tetrachloroethene	1	5.8	5.8	0.51	U
108-88-3	Toluene	1	5.8	5.8	0.47	U

02426

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 10002.D

Sampled: 05/05/08 11:40 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 12:37

Solids: 86.13 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.8	5.8	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.8	5.8	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.8	5.8	0.80	U
79-01-6	Trichloroethene	1	5.8	5.8	0.65	U
75-69-4	Trichlorofluoromethane	1	5.8	5.8	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.8	5.8	0.38	U
75-01-4	Vinyl Chloride	1	5.8	5.8	0.53	U
1330-20-7	Xylene (Total)	1	5.8	5.8	0.68	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.6	106	78 - 121	
1,2-Dichloroethane-d4	40.0	47.6	119	66 - 124	
Toluene-d8	40.0	40.5	101	85 - 115	
4-Bromofluorobenzene	40.0	41.1	103	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	697194	7.36	726450	7.33	
Chlorobenzene-d5	330049	17.4	333795	17.39	
1,4-Dichlorobenzene-d4	369019	22.44	403063	22.43	

* Values outside of QC limits

82427

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 0805100-02.D

Sampled: 05/05/08 11:40 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 18:57

Solids: 86.13 Preparation: 5030B Aqueous Purge & Initial/Final: 6.1 g / 305 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	870	870	69	U
71-43-2	Benzene	1	58	58	6.9	U
74-97-5	Bromochloromethane	1	58	58	11	U
75-27-4	Bromodichloromethane	1	58	58	11	U
75-25-2	Bromoform	1	58	58	13	U
74-83-9	Bromomethane	1	58	58	11	U
75-15-0	Carbon Disulfide	1	290	290	16	U
56-23-5	Carbon Tetrachloride	1	58	58	8.8	U
108-90-7	Chlorobenzene	1	58	58	7.0	U
75-00-3	Chloroethane	1	58	58	12	U
67-66-3	Chloroform	1	58	58	3.6	U
74-87-3	Chloromethane	1	58	58	3.5	U
110-82-7	Cyclohexane	1	290	290	8.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1	290	290	17	U
124-48-1	Dibromochloromethane	1	58	58	8.0	U
106-93-4	1,2-Dibromoethane	1	58	58	13	U
95-50-1	1,2-Dichlorobenzene	1	58	58	3.8	U
541-73-1	1,3-Dichlorobenzene	1	58	58	7.0	U
106-46-7	1,4-Dichlorobenzene	1	58	58	7.8	U
75-71-8	Dichlorodifluoromethane	1	58	58	9.8	U
75-34-3	1,1-Dichloroethane	1	58	58	4.4	U
107-06-2	1,2-Dichloroethane	1	58	58	8.9	U
75-35-4	1,1-Dichloroethene	1	58	58	8.0	U
156-59-2	cis-1,2-Dichloroethene	1	58	58	9.6	U
156-60-5	trans-1,2-Dichloroethene	1	58	58	9.2	U
78-87-5	1,2-Dichloropropane	1	58	58	6.0	U
10061-01-5	cis-1,3-Dichloropropene	1	58	58	8.2	U
10061-02-6	trans-1,3-Dichloropropene	1	58	58	9.1	U
100-41-4	Ethylbenzene	1	58	58	7.7	U
591-78-6	2-Hexanone	1	2900	2900	25	U
98-82-8	Isopropylbenzene	1	58	58	7.2	U
79-20-9	Methyl Acetate	1	290	290	9.6	U
1634-04-4	Methyl tert-Butyl Ether	1	58	58	5.6	U
108-87-2	Methylcyclohexane	1	290	290	8.6	U
75-09-2	Methylene Chloride	1	290	290	9.3	U
78-93-3	2-Butanone (MEK)	1	2900	2900	19	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	2900	2900	22	U
100-42-5	Styrene	1	58	58	6.3	U
79-34-5	1,1,2,2-Tetrachloroethane	1	58	58	5.8	U
127-18-4	Tetrachloroethene	1	58	58	8.7	U
108-88-3	Toluene	1	58	58	4.2	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 0805100-02.D

Sampled: 05/05/08 11:40 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 18:57

Solids: 86.13 Preparation: 5030B Aqueous Purge & Initial/Final: 6.1 g / 305 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	120	120	7.8	U
120-82-1	1,2,4-Trichlorobenzene	1	120	120	9.4	U
71-55-6	1,1,1-Trichloroethane	1	58	58	6.4	U
79-00-5	1,1,2-Trichloroethane	1	58	58	12	U
79-01-6	Trichloroethene	1	58	58	9.9	U
75-69-4	Trichlorofluoromethane	1	58	58	10	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	290	290	8.4	U R1
75-01-4	Vinyl Chloride	1	58	58	10	U
1330-20-7	Xylene (Total)	1	170	170	21	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	38.0	95	78 - 121	
1,2-Dichloroethane-d4	40.0	40.3	101	66 - 124	
Toluene-d8	40.0	40.1	100	85 - 115	
4-Bromofluorobenzene	40.0	38.8	97	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	400789	3.86	344632	3.86	
Chlorobenzene-d5	314947	6.87	271481	6.86	
1,4-Dichlorobenzene-d4	170629	9.15	157692	9.15	

* Values outside of QC limits

Do Not use for Dioxins

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 10003.D

Sampled: 05/05/08 12:15 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 13:10

Solids: 73.18 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	760	27	5.8	E JA
71-43-2	Benzene	1	6.8	6.8	0.17	U
74-97-5	Bromochloromethane	1	27	27	0.17	U
75-27-4	Bromodichloromethane	1	6.8	6.8	0.34	U
75-25-2	Bromoform	1	6.8	6.8	0.66	U
74-83-9	Bromomethane	1	6.8	6.8	1.7	U
75-15-0	Carbon Disulfide	1	3.5	6.8	0.36	J
56-23-5	Carbon Tetrachloride	1	6.8	6.8	0.39	U
108-90-7	Chlorobenzene	1	6.8	6.8	0.28	U
75-00-3	Chloroethane	1	27	27	0.48	U
67-66-3	Chloroform	1	6.8	6.8	0.20	U
74-87-3	Chloromethane	1	6.8	6.8	0.33	U
110-82-7	Cyclohexane	1	14	14	0.94	U
96-12-8	1,2-Dibromo-3-chloropropane	1	14	14	1.1	U
124-48-1	Dibromochloromethane	1	6.8	6.8	0.48	U
106-93-4	1,2-Dibromoethane	1	6.8	6.8	1.2	U
95-50-1	1,2-Dichlorobenzene	1	6.8	6.8	0.33	U
541-73-1	1,3-Dichlorobenzene	1	6.8	6.8	0.33	U
106-46-7	1,4-Dichlorobenzene	1	6.8	6.8	0.30	U
75-71-8	Dichlorodifluoromethane	1	6.8	6.8	0.45	U
75-34-3	1,1-Dichloroethane	1	6.8	6.8	0.27	U
107-06-2	1,2-Dichloroethane	1	6.8	6.8	0.40	U
75-35-4	1,1-Dichloroethene	1	6.8	6.8	0.51	U
156-59-2	cis-1,2-Dichloroethene	1	6.8	6.8	0.22	U
156-60-5	trans-1,2-Dichloroethene	1	6.8	6.8	0.31	U
78-87-5	1,2-Dichloropropane	1	6.8	6.8	1.3	U
10061-01-5	cis-1,3-Dichloropropene	1	6.8	6.8	0.35	U
10061-02-6	trans-1,3-Dichloropropene	1	6.8	6.8	1.1	U
100-41-4	Ethylbenzene	1	6.8	6.8	0.17	U
591-78-6	2-Hexanone	1	14	14	4.1	U
98-82-8	Isopropylbenzene	1	6.8	6.8	0.17	U
79-20-9	Methyl Acetate	1	9.5	27	1.1	J
1634-04-4	Methyl tert-Butyl Ether	1	6.8	6.8	0.32	U
108-87-2	Methylcyclohexane	1	14	14	1.1	U
75-09-2	Methylene Chloride	1	27	27	5.4	U
78-93-3	2-Butanone (MEK)	1	250	27	3.3	
108-10-1	4-Methyl-2-pentanone (MIBK)	1	14	14	2.6	U
100-42-5	Styrene	1	6.8	6.8	0.30	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.8	6.8	0.28	U
127-18-4	Tetrachloroethene	1	6.8	6.8	0.60	U
108-88-3	Toluene	1	6.8	6.8	0.55	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 10003.D

Sampled: 05/05/08 12:15 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 13:10

Solids: 73.18 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	27	27	0.28	U
120-82-1	1,2,4-Trichlorobenzene	1	6.8	6.8	0.33	U
71-55-6	1,1,1-Trichloroethane	1	6.8	6.8	0.28	U
79-00-5	1,1,2-Trichloroethane	1	6.8	6.8	0.94	U
79-01-6	Trichloroethene	1	6.8	6.8	0.77	U
75-69-4	Trichlorofluoromethane	1	6.8	6.8	0.29	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.8	6.8	0.45	U
75-01-4	Vinyl Chloride	1	6.8	6.8	0.62	U
1330-20-7	Xylene (Total)	1	6.8	6.8	0.80	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.7	102	78 - 121	
1,2-Dichloroethane-d4	40.0	48.5	121	66 - 124	
Toluene-d8	40.0	41.0	102	85 - 115	
4-Bromofluorobenzene	40.0	41.3	103	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	659905	7.37	726450	7.33	
Chlorobenzene-d5	297379	17.41	333795	17.39	
1,4-Dichlorobenzene-d4	313602	22.44	403063	22.43	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 0805100-03.D

Sampled: 05/05/08 12:15 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 19:25

Solids: 73.18 Preparation: 5030B Aqueous Purge & Initial/Final: 5.5 g / 275 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	1000	1000	82	U
71-43-2	Benzene	1	68	68	8.1	U
74-97-5	Bromochloromethane	1	68	68	13	U
75-27-4	Bromodichloromethane	1	68	68	13	U
75-25-2	Bromoform	1	68	68	16	U
74-83-9	Bromomethane	1	68	68	13	U
75-15-0	Carbon Disulfide	1	340	340	19	U
56-23-5	Carbon Tetrachloride	1	68	68	10	U
108-90-7	Chlorobenzene	1	68	68	8.2	U
75-00-3	Chloroethane	1	68	68	14	U
67-66-3	Chloroform	1	68	68	4.2	U
74-87-3	Chloromethane	1	68	68	4.1	U
110-82-7	Cyclohexane	1	340	340	9.4	U
96-12-8	1,2-Dibromo-3-chloropropane	1	340	340	20	U
124-48-1	Dibromochloromethane	1	68	68	9.4	U
106-93-4	1,2-Dibromoethane	1	68	68	15	U
95-50-1	1,2-Dichlorobenzene	1	68	68	4.5	U
541-73-1	1,3-Dichlorobenzene	1	68	68	8.2	U
106-46-7	1,4-Dichlorobenzene	1	68	68	9.2	U
75-71-8	Dichlorodifluoromethane	1	68	68	11	U
75-34-3	1,1-Dichloroethane	1	68	68	5.2	U
107-06-2	1,2-Dichloroethane	1	68	68	11	U
75-35-4	1,1-Dichloroethene	1	68	68	9.4	U
156-59-2	cis-1,2-Dichloroethene	1	68	68	11	U
156-60-5	trans-1,2-Dichloroethene	1	68	68	11	U
78-87-5	1,2-Dichloropropane	1	68	68	7.1	U
10061-01-5	cis-1,3-Dichloropropene	1	68	68	9.7	U
10061-02-6	trans-1,3-Dichloropropene	1	68	68	11	U
100-41-4	Ethylbenzene	1	68	68	9.0	U
591-78-6	2-Hexanone	1	3400	3400	29	U
98-82-8	Isopropylbenzene	1	68	68	8.5	U
79-20-9	Methyl Acetate	1	340	340	11	U
1634-04-4	Methyl tert-Butyl Ether	1	68	68	6.6	U
108-87-2	Methylcyclohexane	1	340	340	10	U
75-09-2	Methylene Chloride	1	340	340	11	U
78-93-3	2-Butanone (MEK)	1	3400	3400	23	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	3400	3400	26	U
100-42-5	Styrene	1	68	68	7.4	U
79-34-5	1,1,2,2-Tetrachloroethane	1	68	68	6.8	U
127-18-4	Tetrachloroethene	1	68	68	10	U
108-88-3	Toluene	1	68	68	4.9	U

DO NOT USE

82447

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 0805100-03.D

Sampled: 05/05/08 12:15 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 19:25

Solids: 73.18 Preparation: 5030B Aqueous Purge & Initial/Final: 5.5 g / 275 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	140	140	9.2	U
120-82-1	1,2,4-Trichlorobenzene	1	140	140	11	U
71-55-6	1,1,1-Trichloroethane	1	68	68	7.5	U
79-00-5	1,1,2-Trichloroethane	1	68	68	14	U
79-01-6	Trichloroethene	1	68	68	12	U
75-69-4	Trichlorofluoromethane	1	68	68	12	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	340	340	9.8	U R1
75-01-4	Vinyl Chloride	1	68	68	12	U
1330-20-7	Xylene (Total)	1	200	200	24	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	37.6	94	78 - 121	
1,2-Dichloroethane-d4	40.0	41.0	103	66 - 124	
Toluene-d8	40.0	40.3	101	85 - 115	
4-Bromofluorobenzene	40.0	38.7	97	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	398517	3.86	344632	3.86	
Chlorobenzene-d5	312138	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	169832	9.15	157692	9.15	

* Values outside of QC limits

Do not use RA 6/23/08

82HHB

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 10004.D

Sampled: 05/05/08 12:40 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 13:44

Solids: 87.60 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	600	23	4.8	E J,B
71-43-2	Benzene	1	5.7	5.7	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.7	5.7	0.28	U
75-25-2	Bromoform	1	5.7	5.7	0.55	U
74-83-9	Bromomethane	1	5.7	5.7	1.4	U
75-15-0	Carbon Disulfide	1	3.0	5.7	0.30	J
56-23-5	Carbon Tetrachloride	1	5.7	5.7	0.33	U
108-90-7	Chlorobenzene	1	5.7	5.7	0.23	U
75-00-3	Chloroethane	1	23	23	0.40	U
67-66-3	Chloroform	1	5.7	5.7	0.17	U
74-87-3	Chloromethane	1	5.7	5.7	0.28	U
110-82-7	Cyclohexane	1	11	11	0.78	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.93	U
124-48-1	Dibromochloromethane	1	5.7	5.7	0.40	U
106-93-4	1,2-Dibromoethane	1	5.7	5.7	0.96	U
95-50-1	1,2-Dichlorobenzene	1	5.7	5.7	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.7	5.7	0.27	U
106-46-7	1,4-Dichlorobenzene	1	5.7	5.7	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.7	5.7	0.38	U
75-34-3	1,1-Dichloroethane	1	5.7	5.7	0.22	U
107-06-2	1,2-Dichloroethane	1	5.7	5.7	0.34	U
75-35-4	1,1-Dichloroethene	1	5.7	5.7	0.42	U
156-59-2	cis-1,2-Dichloroethene	1	5.7	5.7	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.7	5.7	0.26	U
78-87-5	1,2-Dichloropropane	1	5.7	5.7	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.7	5.7	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.7	5.7	0.95	U
100-41-4	Ethylbenzene	1	5.7	5.7	0.14	U
591-78-6	2-Hexanone	1	11	11	3.4	U
98-82-8	Isopropylbenzene	1	5.7	5.7	0.14	U
79-20-9	Methyl Acetate	1	1.6	23	0.95	J B,Z
1634-04-4	Methyl tert-Butyl Ether	1	5.7	5.7	0.27	U
108-87-2	Methylcyclohexane	1	11	11	0.91	U
75-09-2	Methylene Chloride	1	23	23	4.5	U
78-93-3	2-Butanone (MEK)	1	240	23	2.8	E J,A
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.1	U
100-42-5	Styrene	1	5.7	5.7	0.25	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.7	5.7	0.23	U
127-18-4	Tetrachloroethene	1	5.7	5.7	0.50	U
108-88-3	Toluene	1	5.7	5.7	0.46	U

02152

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 10004.D

Sampled: 05/05/08 12:40 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 13:44

Solids: 87.60 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.7	5.7	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.7	5.7	0.23	U
79-00-5	1,1,2-Trichloroethane	1	5.7	5.7	0.78	U
79-01-6	Trichloroethene	1	5.7	5.7	0.64	U
75-69-4	Trichlorofluoromethane	1	5.7	5.7	0.24	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.7	5.7	0.38	U
75-01-4	Vinyl Chloride	1	5.7	5.7	0.52	U
1330-20-7	Xylene (Total)	1	5.7	5.7	0.67	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.4	106	78 - 121	
1,2-Dichloroethane-d4	40.0	46.3	116	66 - 124	
Toluene-d8	40.0	41.3	103	85 - 115	
4-Bromofluorobenzene	40.0	42.1	105	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	732650	7.37	726450	7.33	
Chlorobenzene-d5	354219	17.41	333795	17.39	
1,4-Dichlorobenzene-d4	407706	22.44	403063	22.43	

* Values outside of QC limits

02153

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 0805100-04.D

Sampled: 05/05/08 12:40 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 19:54

Solids: 87.60 Preparation: 5030B Aqueous Purge & Initial/Final: 5.3 g / 265 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	860	860	68	U
71-43-2	Benzene	1	57	57	6.7	U
74-97-5	Bromochloromethane	1	57	57	11	U
75-27-4	Bromodichloromethane	1	57	57	11	U
75-25-2	Bromoform	1	57	57	13	U
74-83-9	Bromomethane	1	57	57	11	U
75-15-0	Carbon Disulfide	1	290	290	16	U
56-23-5	Carbon Tetrachloride	1	57	57	8.7	U
108-90-7	Chlorobenzene	1	57	57	6.8	U
75-00-3	Chloroethane	1	57	57	12	U
67-66-3	Chloroform	1	57	57	3.5	U
74-87-3	Chloromethane	1	57	57	3.4	U
110-82-7	Cyclohexane	1	290	290	7.9	U
96-12-8	1,2-Dibromo-3-chloropropane	1	290	290	17	U
124-48-1	Dibromochloromethane	1	57	57	7.9	U
106-93-4	1,2-Dibromoethane	1	57	57	13	U
95-50-1	1,2-Dichlorobenzene	1	57	57	3.8	U
541-73-1	1,3-Dichlorobenzene	1	57	57	6.8	U
106-46-7	1,4-Dichlorobenzene	1	57	57	7.6	U
75-71-8	Dichlorodifluoromethane	1	57	57	9.6	U
75-34-3	1,1-Dichloroethane	1	57	57	4.3	U
107-06-2	1,2-Dichloroethane	1	57	57	8.8	U
75-35-4	1,1-Dichloroethene	1	57	57	7.9	U
156-59-2	cis-1,2-Dichloroethene	1	57	57	9.5	U
156-60-5	trans-1,2-Dichloroethene	1	57	57	9.0	U
78-87-5	1,2-Dichloropropane	1	57	57	5.9	U
10061-01-5	cis-1,3-Dichloropropene	1	57	57	8.1	U
10061-02-6	trans-1,3-Dichloropropene	1	57	57	8.9	U
100-41-4	Ethylbenzene	1	57	57	7.5	U
591-78-6	2-Hexanone	1	2900	2900	24	U
98-82-8	Isopropylbenzene	1	57	57	7.1	U
79-20-9	Methyl Acetate	1	290	290	9.5	U
1634-04-4	Methyl tert-Butyl Ether	1	57	57	5.5	U
108-87-2	Methylcyclohexane	1	290	290	8.4	U
75-09-2	Methylene Chloride	1	290	290	9.1	U
78-93-3	2-Butanone (MEK)	1	2900	2900	19	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	2900	2900	22	U
100-42-5	Styrene	1	57	57	6.2	U
79-34-5	1,1,2,2-Tetrachloroethane	1	57	57	5.7	U
127-18-4	Tetrachloroethene	1	57	57	8.6	U
108-88-3	Toluene	1	57	57	4.1	U

DO NOT USE 10/23/08

02460

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 0805100-04.D

Sampled: 05/05/08 12:40 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 19:54

Solids: 87.60 Preparation: 5030B Aqueous Purge & Initial/Final: 5.3 g / 265 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	110	110	7.6	U
120-82-1	1,2,4-Trichlorobenzene	1	110	110	9.2	U
71-55-6	1,1,1-Trichloroethane	1	57	57	6.3	U
79-00-5	1,1,2-Trichloroethane	1	57	57	12	U
79-01-6	Trichloroethene	1	57	57	9.7	U
75-69-4	Trichlorofluoromethane	1	57	57	10	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	290	290	8.2	U R1
75-01-4	Vinyl Chloride	1	57	57	9.9	U
1330-20-7	Xylene (Total)	1	170	170	20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	37.4	93	78 - 121	
1,2-Dichloroethane-d4	40.0	40.9	102	66 - 124	
Toluene-d8	40.0	40.5	101	85 - 115	
4-Bromofluorobenzene	40.0	38.8	97	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	397540	3.86	344632	3.86	
Chlorobenzene-d5	313374	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	171038	9.15	157692	9.15	

* Values outside of QC limits

Do Not Use
RA
6/23/08

02461

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 10005.D

Sampled: 05/05/08 13:20 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 14:17

Solids: 78.25 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	840	26	5.4	E J/B
71-43-2	Benzene	1	0.28	6.4	0.16	J
74-97-5	Bromochloromethane	1	26	26	0.16	U
75-27-4	Bromodichloromethane	1	6.4	6.4	0.32	U
75-25-2	Bromoform	1	6.4	6.4	0.62	U
74-83-9	Bromomethane	1	6.4	6.4	1.6	U
75-15-0	Carbon Disulfide	1	3.4	6.4	0.34	J
56-23-5	Carbon Tetrachloride	1	6.4	6.4	0.37	U
108-90-7	Chlorobenzene	1	6.4	6.4	0.26	U
75-00-3	Chloroethane	1	26	26	0.45	U
67-66-3	Chloroform	1	6.4	6.4	0.19	U
74-87-3	Chloromethane	1	6.4	6.4	0.31	U
110-82-7	Cyclohexane	1	13	13	0.88	U
96-12-8	1,2-Dibromo-3-chloropropane	1	13	13	1.0	U
124-48-1	Dibromochloromethane	1	6.4	6.4	0.45	U
106-93-4	1,2-Dibromoethane	1	6.4	6.4	1.1	U
95-50-1	1,2-Dichlorobenzene	1	6.4	6.4	0.31	U
541-73-1	1,3-Dichlorobenzene	1	6.4	6.4	0.30	U
106-46-7	1,4-Dichlorobenzene	1	6.4	6.4	0.28	U
75-71-8	Dichlorodifluoromethane	1	6.4	6.4	0.42	U
75-34-3	1,1-Dichloroethane	1	6.4	6.4	0.25	U
107-06-2	1,2-Dichloroethane	1	6.4	6.4	0.38	U
75-35-4	1,1-Dichloroethene	1	6.4	6.4	0.47	U
156-59-2	cis-1,2-Dichloroethene	1	6.4	6.4	0.21	U
156-60-5	trans-1,2-Dichloroethene	1	6.4	6.4	0.29	U
78-87-5	1,2-Dichloropropane	1	6.4	6.4	1.2	U
10061-01-5	cis-1,3-Dichloropropene	1	6.4	6.4	0.32	U
10061-02-6	trans-1,3-Dichloropropene	1	6.4	6.4	1.1	U
100-41-4	Ethylbenzene	1	6.4	6.4	0.16	U
591-78-6	2-Hexanone	1	13	13	3.8	U
98-82-8	Isopropylbenzene	1	6.4	6.4	0.16	U
79-20-9	Methyl Acetate	1	6.1	26	1.1	J B,Z
1634-04-4	Methyl tert-Butyl Ether	1	6.4	6.4	0.30	U
108-87-2	Methylcyclohexane	1	13	13	1.0	U
75-09-2	Methylene Chloride	1	26	26	5.0	U
78-93-3	2-Butanone (MEK)	1	290	26	3.1	E J/B
108-10-1	4-Methyl-2-pentanone (MIBK)	1	13	13	2.4	U
100-42-5	Styrene	1	6.4	6.4	0.28	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.4	6.4	0.26	U
127-18-4	Tetrachloroethene	1	6.4	6.4	0.56	U
108-88-3	Toluene	1	6.4	6.4	0.51	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 10005.D

Sampled: 05/05/08 13:20 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 14:17

Solids: 78.25 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	26	26	0.26	U
120-82-1	1,2,4-Trichlorobenzene	1	6.4	6.4	0.31	U
71-55-6	1,1,1-Trichloroethane	1	6.4	6.4	0.26	U
79-00-5	1,1,2-Trichloroethane	1	6.4	6.4	0.88	U
79-01-6	Trichloroethene	1	6.4	6.4	0.72	U
75-69-4	Trichlorofluoromethane	1	6.4	6.4	0.27	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.4	6.4	0.42	U
75-01-4	Vinyl Chloride	1	6.4	6.4	0.58	U
1330-20-7	Xylene (Total)	1	6.4	6.4	0.75	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.4	106	78 - 121	
1,2-Dichloroethane-d4	40.0	45.7	114	66 - 124	
Toluene-d8	40.0	39.8	99	85 - 115	
4-Bromofluorobenzene	40.0	39.6	99	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	724410	7.37	726450	7.33	
Chlorobenzene-d5	337280	17.41	333795	17.39	
1,4-Dichlorobenzene-d4	343905	22.45	403063	22.43	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 0805100-05.D

Sampled: 05/05/08 13:20 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 20:22

Solids: 78.25 Preparation: 5030B Aqueous Purge & Initial/Final: 5.7 g / 285 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	960	960	76	U
71-43-2	Benzene	1	64	64	7.5	U
74-97-5	Bromochloromethane	1	64	64	13	U
75-27-4	Bromodichloromethane	1	64	64	12	U
75-25-2	Bromoform	1	64	64	15	U
74-83-9	Bromomethane	1	64	64	12	U
75-15-0	Carbon Disulfide	1	320	320	18	U
56-23-5	Carbon Tetrachloride	1	64	64	9.7	U
108-90-7	Chlorobenzene	1	64	64	7.7	U
75-00-3	Chloroethane	1	64	64	13	U
67-66-3	Chloroform	1	64	64	4.0	U
74-87-3	Chloromethane	1	64	64	3.8	U
110-82-7	Cyclohexane	1	320	320	8.8	U
96-12-8	1,2-Dibromo-3-chloropropane	1	320	320	19	U
124-48-1	Dibromochloromethane	1	64	64	8.8	U
106-93-4	1,2-Dibromoethane	1	64	64	14	U
95-50-1	1,2-Dichlorobenzene	1	64	64	4.2	U
541-73-1	1,3-Dichlorobenzene	1	64	64	7.7	U
106-46-7	1,4-Dichlorobenzene	1	64	64	8.6	U
75-71-8	Dichlorodifluoromethane	1	64	64	11	U
75-34-3	1,1-Dichloroethane	1	64	64	4.9	U
107-06-2	1,2-Dichloroethane	1	64	64	9.8	U
75-35-4	1,1-Dichloroethene	1	64	64	8.8	U
156-59-2	cis-1,2-Dichloroethene	1	64	64	11	U
156-60-5	trans-1,2-Dichloroethene	1	64	64	10	U
78-87-5	1,2-Dichloropropane	1	64	64	6.6	U
10061-01-5	cis-1,3-Dichloropropene	1	64	64	9.1	U
10061-02-6	trans-1,3-Dichloropropene	1	64	64	10	U
100-41-4	Ethylbenzene	1	64	64	8.4	U
591-78-6	2-Hexanone	1	3200	3200	27	U
98-82-8	Isopropylbenzene	1	64	64	7.9	U
79-20-9	Methyl Acetate	1	320	320	11	U
1634-04-4	Methyl tert-Butyl Ether	1	64	64	6.1	U
108-87-2	Methylcyclohexane	1	320	320	9.5	U
75-09-2	Methylene Chloride	1	320	320	10	U
78-93-3	2-Butanone (MEK)	1	3200	3200	21	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	3200	3200	24	U
100-42-5	Styrene	1	64	64	6.9	U
79-34-5	1,1,2,2-Tetrachloroethane	1	64	64	6.4	U
127-18-4	Tetrachloroethene	1	64	64	9.6	U
108-88-3	Toluene	1	64	64	4.6	U

02474

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 0805100-05.D

Sampled: 05/05/08 13:20 Prepared: 05/16/08 14:00 Analyzed: 05/16/08 20:22

Solids: 78.25 Preparation: 5030B Aqueous Purge & Initial/Final: 5.7 g / 285 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	130	130	8.6	U
120-82-1	1,2,4-Trichlorobenzene	1	130	130	10	U
71-55-6	1,1,1-Trichloroethane	1	64	64	7.0	U
79-00-5	1,1,2-Trichloroethane	1	64	64	13	U
79-01-6	Trichloroethene	1	64	64	11	U
75-69-4	Trichlorofluoromethane	1	64	64	12	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	320	320	9.2	U R1
75-01-4	Vinyl Chloride	1	64	64	11	U
1330-20-7	Xylene (Total)	1	190	190	23	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	37.4	94	78 - 121	
1,2-Dichloroethane-d4	40.0	40.2	101	66 - 124	
Toluene-d8	40.0	40.2	100	85 - 115	
4-Bromofluorobenzene	40.0	39.0	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	400978	3.86	344632	3.86	
Chlorobenzene-d5	314298	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	169684	9.15	157692	9.15	

* Values outside of QC limits

DO NOT USE
RA
6/23/08

02475

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: 13301.D

Sampled: 05/06/08 10:25 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 16:31

Solids: 86.32 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	150	23	4.9	
71-43-2	Benzene	1	5.8	5.8	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.8	5.8	0.29	U
75-25-2	Bromoform	1	5.8	5.8	0.56	U
74-83-9	Bromomethane	1	5.8	5.8	1.4	U
75-15-0	Carbon Disulfide	1	3.2	5.8	0.30	J
56-23-5	Carbon Tetrachloride	1	5.8	5.8	0.33	U
108-90-7	Chlorobenzene	1	5.8	5.8	0.23	U
75-00-3	Chloroethane	1	23	23	0.41	U
67-66-3	Chloroform	1	5.8	5.8	0.17	U
74-87-3	Chloromethane	1	5.8	5.8	0.28	U
110-82-7	Cyclohexane	1	12	12	0.80	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.94	U
124-48-1	Dibromochloromethane	1	5.8	5.8	0.41	U
106-93-4	1,2-Dibromoethane	1	5.8	5.8	0.98	U
95-50-1	1,2-Dichlorobenzene	1	5.8	5.8	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.8	5.8	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.8	5.8	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.8	5.8	0.38	U
75-34-3	1,1-Dichloroethane	1	5.8	5.8	0.22	U
107-06-2	1,2-Dichloroethane	1	5.8	5.8	0.34	U
75-35-4	1,1-Dichloroethene	1	5.8	5.8	0.43	U
156-59-2	cis-1,2-Dichloroethene	1	5.8	5.8	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.8	5.8	0.26	U
78-87-5	1,2-Dichloropropane	1	5.8	5.8	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.8	5.8	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.8	5.8	0.97	U
100-41-4	Ethylbenzene	1	5.8	5.8	0.14	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.8	5.8	0.14	U
79-20-9	Methyl Acetate	1	6.7	23	0.97	J B7Z
1634-04-4	Methyl tert-Butyl Ether	1	5.8	5.8	0.27	U
108-87-2	Methylcyclohexane	1	12	12	0.92	U
75-09-2	Methylene Chloride	1	23	23	4.6	U
78-93-3	2-Butanone (MEK)	1	11	23	2.8	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.8	5.8	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.8	5.8	0.23	U
127-18-4	Tetrachloroethene	1	5.8	5.8	0.51	U
108-88-3	Toluene	1	5.8	5.8	0.47	U

02479

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: 13301.D

Sampled: 05/06/08 10:25 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 16:31

Solids: 86.32 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.8	5.8	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.8	5.8	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.8	5.8	0.80	U
79-01-6	Trichloroethene	1	5.8	5.8	0.65	U
75-69-4	Trichlorofluoromethane	1	5.8	5.8	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.8	5.8	0.38	U
75-01-4	Vinyl Chloride	1	5.8	5.8	0.53	U
1330-20-7	Xylene (Total)	1	5.8	5.8	0.68	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.1	105	78 - 121	
1,2-Dichloroethane-d4	40.0	46.2	116	66 - 124	
Toluene-d8	40.0	40.3	101	85 - 115	
4-Bromofluorobenzene	40.0	40.4	101	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	670230	7.38	726450	7.33	
Chlorobenzene-d5	319612	17.42	333795	17.39	
1,4-Dichlorobenzene-d4	337136	22.45	403063	22.43	

* Values outside of QC limits

02480

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: 13302.D

Sampled: 05/06/08 11:10 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 17:04

Solids: 81.01 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	46	25	5.2	
71-43-2	Benzene	1	0.47	6.2	0.16	J
74-97-5	Bromochloromethane	1	25	25	0.16	U
75-27-4	Bromodichloromethane	1	6.2	6.2	0.31	U
75-25-2	Bromoform	1	6.2	6.2	0.60	U
74-83-9	Bromomethane	1	6.2	6.2	1.5	U
75-15-0	Carbon Disulfide	1	9.8	6.2	0.32	
56-23-5	Carbon Tetrachloride	1	6.2	6.2	0.35	U
108-90-7	Chlorobenzene	1	0.51	6.2	0.25	J
75-00-3	Chloroethane	1	25	25	0.43	U
67-66-3	Chloroform	1	6.2	6.2	0.18	U
74-87-3	Chloromethane	1	6.2	6.2	0.30	U
110-82-7	Cyclohexane	1	12	12	0.85	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	1.0	U
124-48-1	Dibromochloromethane	1	6.2	6.2	0.43	U
106-93-4	1,2-Dibromoethane	1	6.2	6.2	1.0	U
95-50-1	1,2-Dichlorobenzene	1	6.2	6.2	0.30	U
541-73-1	1,3-Dichlorobenzene	1	6.2	6.2	0.29	U
106-46-7	1,4-Dichlorobenzene	1	6.2	6.2	0.27	U
75-71-8	Dichlorodifluoromethane	1	6.2	6.2	0.41	U
75-34-3	1,1-Dichloroethane	1	6.2	6.2	0.24	U
107-06-2	1,2-Dichloroethane	1	6.2	6.2	0.36	U
75-35-4	1,1-Dichloroethene	1	6.2	6.2	0.46	U
156-59-2	cis-1,2-Dichloroethene	1	6.2	6.2	0.20	U
156-60-5	trans-1,2-Dichloroethene	1	6.2	6.2	0.28	U
78-87-5	1,2-Dichloropropane	1	6.2	6.2	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	6.2	6.2	0.31	U
10061-02-6	trans-1,3-Dichloropropene	1	6.2	6.2	1.0	U
100-41-4	Ethylbenzene	1	6.2	6.2	0.15	U
591-78-6	2-Hexanone	1	12	12	3.7	U
98-82-8	Isopropylbenzene	1	4.6	6.2	0.15	J
79-20-9	Methyl Acetate	1	25	25	1.0	U
1634-04-4	Methyl tert-Butyl Ether	1	6.2	6.2	0.29	U
108-87-2	Methylcyclohexane	1	12	12	0.98	U
75-09-2	Methylene Chloride	1	5.4	25	4.9	J
78-93-3	2-Butanone (MEK)	1	25	25	3.0	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.3	U
100-42-5	Styrene	1	6.2	6.2	0.27	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.2	6.2	0.25	U
127-18-4	Tetrachloroethene	1	6.2	6.2	0.55	U
108-88-3	Toluene	1	6.2	6.2	0.50	U

02487

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: 13302.D

Sampled: 05/06/08 11:10 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 17:04

Solids: 81.01 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	25	25	0.25	U
120-82-1	1,2,4-Trichlorobenzene	1	0.48	6.2	0.30	J
71-55-6	1,1,1-Trichloroethane	1	6.2	6.2	0.25	U
79-00-5	1,1,2-Trichloroethane	1	6.2	6.2	0.85	U
79-01-6	Trichloroethene	1	6.2	6.2	0.69	U
75-69-4	Trichlorofluoromethane	1	6.2	6.2	0.26	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.2	6.2	0.41	U
75-01-4	Vinyl Chloride	1	6.2	6.2	0.56	U
1330-20-7	Xylene (Total)	1	13	6.2	0.72	

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.9	107	78 - 121	
1,2-Dichloroethane-d4	40.0	46.6	116	66 - 124	
Toluene-d8	40.0	40.3	101	85 - 115	
4-Bromofluorobenzene	40.0	42.2	106	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	658661	7.38	726450	7.33	
Chlorobenzene-d5	308500	17.42	333795	17.39	
1,4-Dichlorobenzene-d4	325150	22.45	403063	22.43	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: 13303.D

Sampled: 05/06/08 13:05 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 17:38

Solids: 87.40 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	210	23	4.8	
71-43-2	Benzene	1	5.7	5.7	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.7	5.7	0.28	U
75-25-2	Bromoform	1	5.7	5.7	0.55	U
74-83-9	Bromomethane	1	5.7	5.7	1.4	U
75-15-0	Carbon Disulfide	1	2.9	5.7	0.30	J
56-23-5	Carbon Tetrachloride	1	5.7	5.7	0.33	U
108-90-7	Chlorobenzene	1	5.7	5.7	0.23	U
75-00-3	Chloroethane	1	23	23	0.40	U
67-66-3	Chloroform	1	5.7	5.7	0.17	U
74-87-3	Chloromethane	1	5.7	5.7	0.28	U
110-82-7	Cyclohexane	1	11	11	0.79	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.93	U
124-48-1	Dibromochloromethane	1	5.7	5.7	0.40	U
106-93-4	1,2-Dibromoethane	1	5.7	5.7	0.96	U
95-50-1	1,2-Dichlorobenzene	1	5.7	5.7	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.7	5.7	0.27	U
106-46-7	1,4-Dichlorobenzene	1	5.7	5.7	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.7	5.7	0.38	U
75-34-3	1,1-Dichloroethane	1	5.7	5.7	0.22	U
107-06-2	1,2-Dichloroethane	1	5.7	5.7	0.34	U
75-35-4	1,1-Dichloroethene	1	5.7	5.7	0.42	U
156-59-2	cis-1,2-Dichloroethene	1	5.7	5.7	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.7	5.7	0.26	U
78-87-5	1,2-Dichloropropane	1	5.7	5.7	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.7	5.7	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.7	5.7	0.95	U
100-41-4	Ethylbenzene	1	5.7	5.7	0.14	U
591-78-6	2-Hexanone	1	11	11	3.4	U
98-82-8	Isopropylbenzene	1	5.7	5.7	0.14	U
79-20-9	Methyl Acetate	1	13	23	0.95	J
1634-04-4	Methyl tert-Butyl Ether	1	5.7	5.7	0.27	U
108-87-2	Methylcyclohexane	1	11	11	0.91	U
75-09-2	Methylene Chloride	1	23	23	4.5	U
78-93-3	2-Butanone (MEK)	1	23	23	2.8	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.1	U
100-42-5	Styrene	1	5.7	5.7	0.25	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.7	5.7	0.23	U
127-18-4	Tetrachloroethene	1	5.7	5.7	0.51	U
108-88-3	Toluene	1	5.7	5.7	0.46	U

02499

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: 13303.D

Sampled: 05/06/08 13:05 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 17:38

Solids: 87.40 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.7	5.7	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.7	5.7	0.23	U
79-00-5	1,1,2-Trichloroethane	1	5.7	5.7	0.79	U
79-01-6	Trichloroethene	1	5.7	5.7	0.64	U
75-69-4	Trichlorofluoromethane	1	5.7	5.7	0.24	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.7	5.7	0.38	U
75-01-4	Vinyl Chloride	1	5.7	5.7	0.52	U
1330-20-7	Xylene (Total)	1	5.7	5.7	0.67	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.2	101	78 - 121	
1,2-Dichloroethane-d4	40.0	45.2	113	66 - 124	
Toluene-d8	40.0	39.1	98	85 - 115	
4-Bromofluorobenzene	40.0	39.0	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	690946	7.38	726450	7.33	
Chlorobenzene-d5	324177	17.43	333795	17.39	
1,4-Dichlorobenzene-d4	337629	22.45	403063	22.43	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: 13304.D

Sampled: 05/06/08 13:45 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 18:11

Solids: 91.38 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	160	22	4.6	
71-43-2	Benzene	1	5.5	5.5	0.14	U
74-97-5	Bromochloromethane	1	22	22	0.14	U
75-27-4	Bromodichloromethane	1	5.5	5.5	0.27	U
75-25-2	Bromoform	1	5.5	5.5	0.53	U
74-83-9	Bromomethane	1	5.5	5.5	1.3	U
75-15-0	Carbon Disulfide	1	2.7	5.5	0.29	J
56-23-5	Carbon Tetrachloride	1	5.5	5.5	0.31	U
108-90-7	Chlorobenzene	1	5.5	5.5	0.22	U
75-00-3	Chloroethane	1	22	22	0.38	U
67-66-3	Chloroform	1	5.5	5.5	0.16	U
74-87-3	Chloromethane	1	5.5	5.5	0.27	U
110-82-7	Cyclohexane	1	11	11	0.75	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.89	U
124-48-1	Dibromochloromethane	1	5.5	5.5	0.38	U
106-93-4	1,2-Dibromoethane	1	5.5	5.5	0.92	U
95-50-1	1,2-Dichlorobenzene	1	5.5	5.5	0.27	U
541-73-1	1,3-Dichlorobenzene	1	5.5	5.5	0.26	U
106-46-7	1,4-Dichlorobenzene	1	5.5	5.5	0.24	U
75-71-8	Dichlorodifluoromethane	1	5.5	5.5	0.36	U
75-34-3	1,1-Dichloroethane	1	5.5	5.5	0.21	U
107-06-2	1,2-Dichloroethane	1	5.5	5.5	0.32	U
75-35-4	1,1-Dichloroethene	1	5.5	5.5	0.41	U
156-59-2	cis-1,2-Dichloroethene	1	5.5	5.5	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.5	5.5	0.25	U
78-87-5	1,2-Dichloropropane	1	5.5	5.5	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.5	5.5	0.28	U
10061-02-6	trans-1,3-Dichloropropene	1	5.5	5.5	0.91	U
100-41-4	Ethylbenzene	1	5.5	5.5	0.14	U
591-78-6	2-Hexanone	1	11	11	3.3	U
98-82-8	Isopropylbenzene	1	5.5	5.5	0.13	U
79-20-9	Methyl Acetate	1	3.5	22	0.91	J B
1634-04-4	Methyl tert-Butyl Ether	1	5.5	5.5	0.26	U
108-87-2	Methylcyclohexane	1	11	11	0.87	U
75-09-2	Methylene Chloride	1	4.5	22	4.3	J
78-93-3	2-Butanone (MEK)	1	8.2	22	2.6	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.0	U
100-42-5	Styrene	1	5.5	5.5	0.24	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.5	5.5	0.22	U
127-18-4	Tetrachloroethene	1	5.5	5.5	0.48	U
108-88-3	Toluene	1	5.5	5.5	0.44	U

02507

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: 13304.D

Sampled: 05/06/08 13:45 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 18:11

Solids: 91.38 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	22	22	0.23	U
120-82-1	1,2,4-Trichlorobenzene	1	5.5	5.5	0.26	U
71-55-6	1,1,1-Trichloroethane	1	5.5	5.5	0.22	U
79-00-5	1,1,2-Trichloroethane	1	5.5	5.5	0.75	U
79-01-6	Trichloroethene	1	5.5	5.5	0.61	U
75-69-4	Trichlorofluoromethane	1	5.5	5.5	0.23	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.5	5.5	0.36	U
75-01-4	Vinyl Chloride	1	5.5	5.5	0.50	U
1330-20-7	Xylene (Total)	1	5.5	5.5	0.64	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.5	104	78 - 121	
1,2-Dichloroethane-d4	40.0	46.9	117	66 - 124	
Toluene-d8	40.0	40.8	102	85 - 115	
4-Bromofluorobenzene	40.0	40.6	101	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	686660	7.39	726450	7.33	
Chlorobenzene-d5	329379	17.43	333795	17.39	
1,4-Dichlorobenzene-d4	357367	22.45	403063	22.43	

* Values outside of QC limits

025088

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 13305.D

Sampled: 05/06/08 14:00 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 18:44

Solids: 80.57 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	250	25	5.3	E J4
71-43-2	Benzene	1	0.51	6.2	0.16	J
74-97-5	Bromochloromethane	1	25	25	0.16	U
75-27-4	Bromodichloromethane	1	6.2	6.2	0.31	U
75-25-2	Bromoform	1	6.2	6.2	0.60	U
74-83-9	Bromomethane	1	6.2	6.2	1.5	U
75-15-0	Carbon Disulfide	1	3.3	6.2	0.33	J
56-23-5	Carbon Tetrachloride	1	6.2	6.2	0.36	U
108-90-7	Chlorobenzene	1	6.2	6.2	0.25	U
75-00-3	Chloroethane	1	25	25	0.44	U
67-66-3	Chloroform	1	6.2	6.2	0.18	U
74-87-3	Chloromethane	1	6.2	6.2	0.30	U
110-82-7	Cyclohexane	1	12	12	0.85	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	1.0	U
124-48-1	Dibromochloromethane	1	6.2	6.2	0.43	U
106-93-4	1,2-Dibromoethane	1	6.2	6.2	1.0	U
95-50-1	1,2-Dichlorobenzene	1	6.2	6.2	0.30	U
541-73-1	1,3-Dichlorobenzene	1	6.2	6.2	0.30	U
106-46-7	1,4-Dichlorobenzene	1	6.2	6.2	0.27	U
75-71-8	Dichlorodifluoromethane	1	6.2	6.2	0.41	U
75-34-3	1,1-Dichloroethane	1	6.2	6.2	0.24	U
107-06-2	1,2-Dichloroethane	1	6.2	6.2	0.37	U
75-35-4	1,1-Dichloroethene	1	6.2	6.2	0.46	U
156-59-2	cis-1,2-Dichloroethene	1	6.2	6.2	0.20	U
156-60-5	trans-1,2-Dichloroethene	1	6.2	6.2	0.28	U
78-87-5	1,2-Dichloropropane	1	6.2	6.2	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	6.2	6.2	0.31	U
10061-02-6	trans-1,3-Dichloropropene	1	6.2	6.2	1.0	U
100-41-4	Ethylbenzene	1	6.2	6.2	0.16	U
591-78-6	2-Hexanone	1	12	12	3.7	U
98-82-8	Isopropylbenzene	1	6.2	6.2	0.15	U
79-20-9	Methyl Acetate	1	8.9	25	1.0	J
1634-04-4	Methyl tert-Butyl Ether	1	6.2	6.2	0.29	U
108-87-2	Methylcyclohexane	1	12	12	0.99	U
75-09-2	Methylene Chloride	1	25	25	4.9	U
78-93-3	2-Butanone (MEK)	1	20	25	3.0	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.3	U
100-42-5	Styrene	1	6.2	6.2	0.27	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.2	6.2	0.25	U
127-18-4	Tetrachloroethene	1	6.2	6.2	0.55	U
108-88-3	Toluene	1	6.2	6.2	0.50	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 13305.D

Sampled: 05/06/08 14:00 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 18:44

Solids: 80.57 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	25	25	0.26	U
120-82-1	1,2,4-Trichlorobenzene	1	6.2	6.2	0.30	U
71-55-6	1,1,1-Trichloroethane	1	6.2	6.2	0.25	U
79-00-5	1,1,2-Trichloroethane	1	6.2	6.2	0.85	U
79-01-6	Trichloroethene	1	6.2	6.2	0.70	U
75-69-4	Trichlorofluoromethane	1	6.2	6.2	0.27	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.2	6.2	0.41	U
75-01-4	Vinyl Chloride	1	6.2	6.2	0.57	U
1330-20-7	Xylene (Total)	1	6.2	6.2	0.73	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.1	105	78 - 121	
1,2-Dichloroethane-d4	40.0	48.1	120	66 - 124	
Toluene-d8	40.0	38.7	97	85 - 115	
4-Bromofluorobenzene	40.0	37.1	93	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	648455	7.38	726450	7.33	
Chlorobenzene-d5	290900	17.42	333795	17.39	
1,4-Dichlorobenzene-d4	274329	22.45	403063	22.43	

* Values outside of QC limits

82517

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 0805133-05.D

Sampled: 05/06/08 14:00 Prepared: 05/16/08 14:30 Analyzed: 05/16/08 20:50

Solids: 80.57 Preparation: 5030B Aqueous Purge & Initial/Final: 5.6 g / 280 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	930	930	74	U
71-43-2	Benzene	1	62	62	7.3	U
74-97-5	Bromochloromethane	1	62	62	12	U
75-27-4	Bromodichloromethane	1	62	62	12	U
75-25-2	Bromoform	1	62	62	14	U
74-83-9	Bromomethane	1	62	62	12	U
75-15-0	Carbon Disulfide	1	310	310	18	U
56-23-5	Carbon Tetrachloride	1	62	62	9.4	U
108-90-7	Chlorobenzene	1	62	62	7.4	U
75-00-3	Chloroethane	1	62	62	13	U
67-66-3	Chloroform	1	62	62	3.8	U
74-87-3	Chloromethane	1	62	62	3.7	U
110-82-7	Cyclohexane	1	310	310	8.6	U
96-12-8	1,2-Dibromo-3-chloropropane	1	310	310	18	U
124-48-1	Dibromochloromethane	1	62	62	8.6	U
106-93-4	1,2-Dibromoethane	1	62	62	14	U
95-50-1	1,2-Dichlorobenzene	1	62	62	4.1	U
541-73-1	1,3-Dichlorobenzene	1	62	62	7.4	U
106-46-7	1,4-Dichlorobenzene	1	62	62	8.3	U
75-71-8	Dichlorodifluoromethane	1	62	62	10	U
75-34-3	1,1-Dichloroethane	1	62	62	4.7	U
107-06-2	1,2-Dichloroethane	1	62	62	9.6	U
75-35-4	1,1-Dichloroethene	1	62	62	8.6	U
156-59-2	cis-1,2-Dichloroethene	1	62	62	10	U
156-60-5	trans-1,2-Dichloroethene	1	62	62	9.8	U
78-87-5	1,2-Dichloropropane	1	62	62	6.5	U
10061-01-5	cis-1,3-Dichloropropene	1	62	62	8.8	U
10061-02-6	trans-1,3-Dichloropropene	1	62	62	9.7	U
100-41-4	Ethylbenzene	1	62	62	8.2	U
591-78-6	2-Hexanone	1	3100	3100	26	U
98-82-8	Isopropylbenzene	1	62	62	7.7	U
79-20-9	Methyl Acetate	1	310	310	10	U
1634-04-4	Methyl tert-Butyl Ether	1	62	62	6.0	U
108-87-2	Methylcyclohexane	1	310	310	9.2	U
75-09-2	Methylene Chloride	1	310	310	9.9	U
78-93-3	2-Butanone (MEK)	1	3100	3100	20	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	3100	3100	24	U
100-42-5	Styrene	1	62	62	6.7	U
79-34-5	1,1,2,2-Tetrachloroethane	1	62	62	6.2	U
127-18-4	Tetrachloroethene	1	62	62	9.3	U
108-88-3	Toluene	1	62	62	4.5	U

02525

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 0805133-05.D

Sampled: 05/06/08 14:00 Prepared: 05/16/08 14:30 Analyzed: 05/16/08 20:50

Solids: 80.57 Preparation: 5030B Aqueous Purge & Initial/Final: 5.6 g / 280 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	120	120	8.3	U
120-82-1	1,2,4-Trichlorobenzene	1	120	120	10	U
71-55-6	1,1,1-Trichloroethane	1	62	62	6.8	U
79-00-5	1,1,2-Trichloroethane	1	62	62	13	U
79-01-6	Trichloroethene	1	62	62	11	U
75-69-4	Trichlorofluoromethane	1	62	62	11	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	310	310	8.9	U R1 Q
75-01-4	Vinyl Chloride	1	62	62	11	U
1330-20-7	Xylene (Total)	1	190	190	22	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	38.1	95	78 - 121	
1,2-Dichloroethane-d4	40.0	40.1	100	66 - 124	
Toluene-d8	40.0	40.4	101	85 - 115	
4-Bromofluorobenzene	40.0	39.1	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	398848	3.86	344632	3.86	
Chlorobenzene-d5	315044	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	171829	9.15	157692	9.15	

* Values outside of QC limits

DO NOT USE RA 6/25/08

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 13306.D

Sampled: 05/06/08 14:30 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 19:18

Solids: 77.95 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	290	26	5.4	E J,B
71-43-2	Benzene	1	0.18	6.4	0.16	J J, m
74-97-5	Bromochloromethane	1	26	26	0.16	U
75-27-4	Bromodichloromethane	1	6.4	6.4	0.32	U UJ, m
75-25-2	Bromoform	1	6.4	6.4	0.62	U
74-83-9	Bromomethane	1	1.8	6.4	1.6	J
75-15-0	Carbon Disulfide	1	3.3	6.4	0.34	J J,m
56-23-5	Carbon Tetrachloride	1	6.4	6.4	0.37	U
108-90-7	Chlorobenzene	1	6.4	6.4	0.26	U UJ, m
75-00-3	Chloroethane	1	26	26	0.45	U
67-66-3	Chloroform	1	6.4	6.4	0.19	U
74-87-3	Chloromethane	1	6.4	6.4	0.31	U
110-82-7	Cyclohexane	1	13	13	0.88	U
96-12-8	1,2-Dibromo-3-chloropropane	1	13	13	1.0	U
124-48-1	Dibromochloromethane	1	6.4	6.4	0.45	U UJ, m
106-93-4	1,2-Dibromoethane	1	6.4	6.4	1.1	U UJ, m
95-50-1	1,2-Dichlorobenzene	1	6.4	6.4	0.31	U UJ, m
541-73-1	1,3-Dichlorobenzene	1	6.4	6.4	0.31	U UJ, m
106-46-7	1,4-Dichlorobenzene	1	6.4	6.4	0.28	U UJ, m
75-71-8	Dichlorodifluoromethane	1	6.4	6.4	0.42	U
75-34-3	1,1-Dichloroethane	1	6.4	6.4	0.25	U
107-06-2	1,2-Dichloroethane	1	6.4	6.4	0.38	U
75-35-4	1,1-Dichloroethene	1	6.4	6.4	0.48	U
156-59-2	cis-1,2-Dichloroethene	1	6.4	6.4	0.21	U
156-60-5	trans-1,2-Dichloroethene	1	6.4	6.4	0.29	U UJ,m
78-87-5	1,2-Dichloropropane	1	6.4	6.4	1.2	U UJ, m
10061-01-5	cis-1,3-Dichloropropene	1	6.4	6.4	0.32	U UJ, m
10061-02-6	trans-1,3-Dichloropropene	1	6.4	6.4	1.1	U UJ, m
100-41-4	Ethylbenzene	1	6.4	6.4	0.16	U UJ, m
591-78-6	2-Hexanone	1	13	13	3.8	U
98-82-8	Isopropylbenzene	1	6.4	6.4	0.16	U UJ, m
79-20-9	Methyl Acetate	1	14	26	1.1	J J,m
1634-04-4	Methyl tert-Butyl Ether	1	6.4	6.4	0.30	U
108-87-2	Methylcyclohexane	1	13	13	1.0	U UJ, m
75-09-2	Methylene Chloride	1	26	26	5.1	U
78-93-3	2-Butanone (MEK)	1	21	26	3.1	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	13	13	2.4	U
100-42-5	Styrene	1	6.4	6.4	0.28	U UJ, m
79-34-5	1,1,2,2-Tetrachloroethane	1	6.4	6.4	0.26	U
127-18-4	Tetrachloroethene	1	6.4	6.4	0.57	U UJ, m
108-88-3	Toluene	1	6.4	6.4	0.52	U UJ, m

02530

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 13306.D

Sampled: 05/06/08 14:30 Prepared: 05/13/08 09:00 Analyzed: 05/13/08 19:18

Solids: 77.95 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051617 Calibration: 8E15003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	26	26	0.26	U UJ, M
120-82-1	1,2,4-Trichlorobenzene	1	6.4	6.4	0.31	U UJ, M
71-55-6	1,1,1-Trichloroethane	1	6.4	6.4	0.26	U
79-00-5	1,1,2-Trichloroethane	1	6.4	6.4	0.88	U
79-01-6	Trichloroethene	1	6.4	6.4	0.72	U UJ, M
75-69-4	Trichlorofluoromethane	1	6.4	6.4	0.27	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.4	6.4	0.42	U UJ, M
75-01-4	Vinyl Chloride	1	6.4	6.4	0.58	U
1330-20-7	Xylene (Total)	1	6.4	6.4	0.75	U UJ, M

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	44.3	111	78 - 121	
1,2-Dichloroethane-d4	40.0	48.0	120	66 - 124	
Toluene-d8	40.0	39.2	98	85 - 115	
4-Bromofluorobenzene	40.0	36.9	92	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	636506	7.38	726450	7.33	
Chlorobenzene-d5	282507	17.42	333795	17.39	
1,4-Dichlorobenzene-d4	240086	22.45	403063	22.43	

* Values outside of QC limits

02531

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 0805133-06.D

Sampled: 05/06/08 14:30 Prepared: 05/16/08 14:30 Analyzed: 05/16/08 21:19

Solids: 77.95 Preparation: 5030B Aqueous Purge & Initial/Final: 5.4 g / 270 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	960	960	77	U
71-43-2	Benzene	1	64	64	7.6	U
74-97-5	Bromochloromethane	1	64	64	13	U
75-27-4	Bromodichloromethane	1	64	64	12	U
75-25-2	Bromoform	1	64	64	15	U
74-83-9	Bromomethane	1	64	64	12	U
75-15-0	Carbon Disulfide	1	320	320	18	U
56-23-5	Carbon Tetrachloride	1	64	64	9.7	U
108-90-7	Chlorobenzene	1	64	64	7.7	U
75-00-3	Chloroethane	1	64	64	13	U
67-66-3	Chloroform	1	64	64	4.0	U
74-87-3	Chloromethane	1	64	64	3.8	U
110-82-7	Cyclohexane	1	320	320	8.9	U
96-12-8	1,2-Dibromo-3-chloropropane	1	320	320	19	U
124-48-1	Dibromochloromethane	1	64	64	8.9	U
106-93-4	1,2-Dibromoethane	1	64	64	14	U
95-50-1	1,2-Dichlorobenzene	1	64	64	4.2	U
541-73-1	1,3-Dichlorobenzene	1	64	64	7.7	U
106-46-7	1,4-Dichlorobenzene	1	64	64	8.6	U
75-71-8	Dichlorodifluoromethane	1	64	64	11	U
75-34-3	1,1-Dichloroethane	1	64	64	4.9	U
107-06-2	1,2-Dichloroethane	1	64	64	9.9	U
75-35-4	1,1-Dichloroethene	1	64	64	8.9	U
156-59-2	cis-1,2-Dichloroethene	1	64	64	11	U
156-60-5	trans-1,2-Dichloroethene	1	64	64	10	U
78-87-5	1,2-Dichloropropane	1	64	64	6.7	U
10061-01-5	cis-1,3-Dichloropropene	1	64	64	9.1	U
10061-02-6	trans-1,3-Dichloropropene	1	64	64	10	U
100-41-4	Ethylbenzene	1	64	64	8.5	U
591-78-6	2-Hexanone	1	3200	3200	27	U
98-82-8	Isopropylbenzene	1	64	64	8.0	U
79-20-9	Methyl Acetate	1	320	320	11	U
1634-04-4	Methyl tert-Butyl Ether	1	64	64	6.2	U
108-87-2	Methylcyclohexane	1	320	320	9.5	U
75-09-2	Methylene Chloride	1	320	320	10	U
78-93-3	2-Butanone (MEK)	1	3200	3200	21	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	3200	3200	25	U
100-42-5	Styrene	1	64	64	6.9	U
79-34-5	1,1,2,2-Tetrachloroethane	1	64	64	6.4	U
127-18-4	Tetrachloroethene	1	64	64	9.6	U
108-88-3	Toluene	1	64	64	4.6	U

02533

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 0805133-06.D

Sampled: 05/06/08 14:30 Prepared: 05/16/08 14:30 Analyzed: 05/16/08 21:19

Solids: 77.95 Preparation: 5030B Aqueous Purge & Initial/Final: 5.4 g / 270 mL

QC Batch: 0805786 Sequence: 8051934 Calibration: 8E19017 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	130	130	8.6	U
120-82-1	1,2,4-Trichlorobenzene	1	130	130	10	U
71-55-6	1,1,1-Trichloroethane	1	64	64	7.1	U
79-00-5	1,1,2-Trichloroethane	1	64	64	13	U
79-01-6	Trichloroethene	1	64	64	11	U
75-69-4	Trichlorofluoromethane	1	64	64	12	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	320	320	9.2	U R1
75-01-4	Vinyl Chloride	1	64	64	11	U
1330-20-7	Xylene (Total)	1	190	190	23	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	37.7	94	78 - 121	
1,2-Dichloroethane-d4	40.0	40.2	100	66 - 124	
Toluene-d8	40.0	40.2	100	85 - 115	
4-Bromofluorobenzene	40.0	38.8	97	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	398215	3.86	344632	3.86	
Chlorobenzene-d5	313332	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	169269	9.15	157692	9.15	

* Values outside of QC limits

Do Not Use RA 6/23/08

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: 13307.D

Sampled: 05/06/08 15:00 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 17:32

Solids: 77.47 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	220	26	5.5	
71-43-2	Benzene	1	6.5	6.5	0.17	U
74-97-5	Bromochloromethane	1	26	26	0.17	U
75-27-4	Bromodichloromethane	1	6.5	6.5	0.32	U
75-25-2	Bromoform	1	6.5	6.5	0.62	U
74-83-9	Bromomethane	1	6.5	6.5	1.6	U
75-15-0	Carbon Disulfide	1	4.2	6.5	0.34	J
56-23-5	Carbon Tetrachloride	1	6.5	6.5	0.37	U
108-90-7	Chlorobenzene	1	6.5	6.5	0.26	U
75-00-3	Chloroethane	1	26	26	0.45	U
67-66-3	Chloroform	1	6.5	6.5	0.19	U
74-87-3	Chloromethane	1	6.5	6.5	0.31	U
110-82-7	Cyclohexane	1	13	13	0.89	U
96-12-8	1,2-Dibromo-3-chloropropane	1	13	13	1.1	U
124-48-1	Dibromochloromethane	1	6.5	6.5	0.45	U
106-93-4	1,2-Dibromoethane	1	6.5	6.5	1.1	U
95-50-1	1,2-Dichlorobenzene	1	6.5	6.5	0.32	U
541-73-1	1,3-Dichlorobenzene	1	6.5	6.5	0.31	U
106-46-7	1,4-Dichlorobenzene	1	6.5	6.5	0.28	U
75-71-8	Dichlorodifluoromethane	1	6.5	6.5	0.43	U
75-34-3	1,1-Dichloroethane	1	6.5	6.5	0.25	U
107-06-2	1,2-Dichloroethane	1	6.5	6.5	0.38	U
75-35-4	1,1-Dichloroethene	1	6.5	6.5	0.48	U
156-59-2	cis-1,2-Dichloroethene	1	6.5	6.5	0.21	U
156-60-5	trans-1,2-Dichloroethene	1	6.5	6.5	0.29	U
78-87-5	1,2-Dichloropropane	1	6.5	6.5	1.2	U
10061-01-5	cis-1,3-Dichloropropene	1	6.5	6.5	0.33	U
10061-02-6	trans-1,3-Dichloropropene	1	6.5	6.5	1.1	U
100-41-4	Ethylbenzene	1	6.5	6.5	0.16	U
591-78-6	2-Hexanone	1	13	13	3.9	U
98-82-8	Isopropylbenzene	1	6.5	6.5	0.16	U
79-20-9	Methyl Acetate	1	12	26	1.1	J
1634-04-4	Methyl tert-Butyl Ether	1	6.5	6.5	0.30	U
108-87-2	Methylcyclohexane	1	13	13	1.0	U
75-09-2	Methylene Chloride	1	26	26	5.1	U
78-93-3	2-Butanone (MEK)	1	27	26	3.1	
108-10-1	4-Methyl-2-pentanone (MIBK)	1	13	13	2.4	U
100-42-5	Styrene	1	6.5	6.5	0.29	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.5	6.5	0.26	U
127-18-4	Tetrachloroethene	1	6.5	6.5	0.57	U
108-88-3	Toluene	1	6.5	6.5	0.52	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: 13307.D

Sampled: 05/06/08 15:00 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 17:32

Solids: 77.47 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	26	26	0.27	U
120-82-1	1,2,4-Trichlorobenzene	1	6.5	6.5	0.31	U
71-55-6	1,1,1-Trichloroethane	1	6.5	6.5	0.26	U
79-00-5	1,1,2-Trichloroethane	1	6.5	6.5	0.89	U
79-01-6	Trichloroethene	1	6.5	6.5	0.72	U
75-69-4	Trichlorofluoromethane	1	6.5	6.5	0.28	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.5	6.5	0.43	U
75-01-4	Vinyl Chloride	1	6.5	6.5	0.59	U
1330-20-7	Xylene (Total)	1	6.5	6.5	0.76	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.3	101	78 - 121	
1,2-Dichloroethane-d4	40.0	42.2	105	66 - 124	
Toluene-d8	40.0	39.7	99	85 - 115	
4-Bromofluorobenzene	40.0	38.2	96	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	650636	7.39	684697	7.39	
Chlorobenzene-d5	297148	17.42	336761	17.44	
1,4-Dichlorobenzene-d4	280883	22.45	374622	22.46	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: 13308.D

Sampled: 05/06/08 15:25 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 18:05

Solids: 84.60 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	72	24	5.0	
71-43-2	Benzene	1	5.9	5.9	0.15	U
74-97-5	Bromochloromethane	1	24	24	0.15	U
75-27-4	Bromodichloromethane	1	5.9	5.9	0.29	U
75-25-2	Bromoform	1	5.9	5.9	0.57	U
74-83-9	Bromomethane	1	5.9	5.9	1.4	U
75-15-0	Carbon Disulfide	1	3.8	5.9	0.31	J
56-23-5	Carbon Tetrachloride	1	5.9	5.9	0.34	U
108-90-7	Chlorobenzene	1	5.9	5.9	0.24	U
75-00-3	Chloroethane	1	24	24	0.41	U
67-66-3	Chloroform	1	5.9	5.9	0.17	U
74-87-3	Chloromethane	1	5.9	5.9	0.29	U
110-82-7	Cyclohexane	1	12	12	0.81	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.96	U
124-48-1	Dibromochloromethane	1	5.9	5.9	0.41	U
106-93-4	1,2-Dibromoethane	1	5.9	5.9	1.0	U
95-50-1	1,2-Dichlorobenzene	1	5.9	5.9	0.29	U
541-73-1	1,3-Dichlorobenzene	1	5.9	5.9	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.9	5.9	0.26	U
75-71-8	Dichlorodifluoromethane	1	5.9	5.9	0.39	U
75-34-3	1,1-Dichloroethane	1	5.9	5.9	0.23	U
107-06-2	1,2-Dichloroethane	1	5.9	5.9	0.35	U
75-35-4	1,1-Dichloroethene	1	5.9	5.9	0.44	U
156-59-2	cis-1,2-Dichloroethene	1	5.9	5.9	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.9	5.9	0.27	U
78-87-5	1,2-Dichloropropane	1	5.9	5.9	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.9	5.9	0.30	U
10061-02-6	trans-1,3-Dichloropropene	1	5.9	5.9	0.99	U
100-41-4	Ethylbenzene	1	5.9	5.9	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.9	5.9	0.15	U
79-20-9	Methyl Acetate	1	3.0	24	0.98	J B
1634-04-4	Methyl tert-Butyl Ether	1	5.9	5.9	0.28	U
108-87-2	Methylcyclohexane	1	12	12	0.94	U
75-09-2	Methylene Chloride	1	24	24	4.7	U
78-93-3	2-Butanone (MEK)	1	24	24	2.9	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.9	5.9	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.9	5.9	0.24	U
127-18-4	Tetrachloroethene	1	5.9	5.9	0.52	U
108-88-3	Toluene	1	5.9	5.9	0.48	U

02552

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: 13308.D

Sampled: 05/06/08 15:25 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 18:05

Solids: 84.60 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805608 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	24	24	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.9	5.9	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.9	5.9	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.9	5.9	0.81	U
79-01-6	Trichloroethene	1	5.9	5.9	0.66	U
75-69-4	Trichlorofluoromethane	1	5.9	5.9	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.9	5.9	0.39	U
75-01-4	Vinyl Chloride	1	5.9	5.9	0.54	U
1330-20-7	Xylene (Total)	1	5.9	5.9	0.69	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.6	101	78 - 121	
1,2-Dichloroethane-d4	40.0	42.1	105	66 - 124	
Toluene-d8	40.0	41.2	103	85 - 115	
4-Bromofluorobenzene	40.0	39.7	99	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	656491	7.38	684697	7.39	
Chlorobenzene-d5	330392	17.42	336761	17.44	
1,4-Dichlorobenzene-d4	360542	22.45	374622	22.46	

* Values outside of QC limits

025593

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: 0805133-09.D

Sampled: 05/06/08 16:00 Prepared: 05/19/08 12:00 Analyzed: 05/20/08 10:10

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0805888 Sequence: 8052073 Calibration: 8E20016 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.090	1.0	0.072	J

02560

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: 0805133-09.D

Sampled: 05/06/08 16:00 Prepared: 05/19/08 12:00 Analyzed: 05/20/08 10:10

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0805888 Sequence: 8052073 Calibration: 8E20016 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.8	102	85 - 115	
1,2-Dichloroethane-d4	40.0	40.9	102	70 - 120	
Toluene-d8	40.0	41.8	104	85 - 120	
4-Bromofluorobenzene	40.0	39.0	98	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	301061	3.86	325625	3.86	
Chlorobenzene-d5	257475	6.86	268558	6.86	
1,4-Dichlorobenzene-d4	139059	9.15	156977	9.15	

* Values outside of QC limits

82561

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: 16201.D

Sampled: 05/07/08 10:10 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 19:46

Solids: 82.59 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	45	24	5.1	B B2Z
71-43-2	Benzene	1	0.18	6.1	0.15	J
74-97-5	Bromochloromethane	1	24	24	0.15	U
75-27-4	Bromodichloromethane	1	6.1	6.1	0.30	U
75-25-2	Bromoform	1	6.1	6.1	0.59	U
74-83-9	Bromomethane	1	6.1	6.1	1.5	U
75-15-0	Carbon Disulfide	1	4.5	6.1	0.32	JB B2Z
56-23-5	Carbon Tetrachloride	1	6.1	6.1	0.35	U
108-90-7	Chlorobenzene	1	6.1	6.1	0.24	U
75-00-3	Chloroethane	1	24	24	0.42	U
67-66-3	Chloroform	1	6.1	6.1	0.18	U
74-87-3	Chloromethane	1	6.1	6.1	0.29	U
110-82-7	Cyclohexane	1	12	12	0.83	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.99	U
124-48-1	Dibromochloromethane	1	6.1	6.1	0.42	U
106-93-4	1,2-Dibromoethane	1	6.1	6.1	1.0	U
95-50-1	1,2-Dichlorobenzene	1	6.1	6.1	0.30	U
541-73-1	1,3-Dichlorobenzene	1	6.1	6.1	0.29	U
106-46-7	1,4-Dichlorobenzene	1	6.1	6.1	0.26	U
75-71-8	Dichlorodifluoromethane	1	6.1	6.1	0.40	U
75-34-3	1,1-Dichloroethane	1	6.1	6.1	0.23	U
107-06-2	1,2-Dichloroethane	1	6.1	6.1	0.36	U
75-35-4	1,1-Dichloroethene	1	6.1	6.1	0.45	U
156-59-2	cis-1,2-Dichloroethene	1	6.1	6.1	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	6.1	6.1	0.27	U
78-87-5	1,2-Dichloropropane	1	6.1	6.1	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	6.1	6.1	0.31	U
10061-02-6	trans-1,3-Dichloropropene	1	6.1	6.1	1.0	U
100-41-4	Ethylbenzene	1	6.1	6.1	0.15	U
591-78-6	2-Hexanone	1	12	12	3.6	U
98-82-8	Isopropylbenzene	1	6.1	6.1	0.15	U
79-20-9	Methyl Acetate	1	24	24	1.0	U
1634-04-4	Methyl tert-Butyl Ether	1	6.1	6.1	0.28	U
108-87-2	Methylcyclohexane	1	12	12	0.96	U
75-09-2	Methylene Chloride	1	24	24	4.8	U
78-93-3	2-Butanone (MEK)	1	12	24	2.9	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.3	U
100-42-5	Styrene	1	6.1	6.1	0.27	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.1	6.1	0.24	U
127-18-4	Tetrachloroethene	1	6.1	6.1	0.54	U
108-88-3	Toluene	1	6.1	6.1	0.49	U

025566

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: 16201.D

Sampled: 05/07/08 10:10 Prepared: 05/14/08 09:00 Analyzed: 05/14/08 19:46

Solids: 82.59 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051626 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	24	24	0.25	U
120-82-1	1,2,4-Trichlorobenzene	1	6.1	6.1	0.29	U
71-55-6	1,1,1-Trichloroethane	1	6.1	6.1	0.25	U
79-00-5	1,1,2-Trichloroethane	1	6.1	6.1	0.83	U
79-01-6	Trichloroethene	1	6.1	6.1	0.68	U
75-69-4	Trichlorofluoromethane	1	6.1	6.1	0.26	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.1	6.1	0.40	U
75-01-4	Vinyl Chloride	1	6.1	6.1	0.55	U
1330-20-7	Xylene (Total)	1	6.1	6.1	0.71	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.1	103	78 - 121	
1,2-Dichloroethane-d4	40.0	42.0	105	66 - 124	
Toluene-d8	40.0	39.1	98	85 - 115	
4-Bromofluorobenzene	40.0	39.1	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	645866	7.37	684697	7.39	
Chlorobenzene-d5	319662	17.42	336761	17.44	
1,4-Dichlorobenzene-d4	331835	22.45	374622	22.46	

* Values outside of QC limits

02567

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: 16202A.D

Sampled: 05/07/08 00:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 14:10

Solids: 80.87 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	31	25	5.2	B
71-43-2	Benzene	1	0.49	6.2	0.16	J
74-97-5	Bromochloromethane	1	25	25	0.16	U
75-27-4	Bromodichloromethane	1	6.2	6.2	0.31	U
75-25-2	Bromoform	1	6.2	6.2	0.60	U
74-83-9	Bromomethane	1	6.2	6.2	1.5	U
75-15-0	Carbon Disulfide	1	4.7	6.2	0.33	JB
56-23-5	Carbon Tetrachloride	1	6.2	6.2	0.35	U
108-90-7	Chlorobenzene	1	6.2	6.2	0.25	U
75-00-3	Chloroethane	1	25	25	0.43	U
67-66-3	Chloroform	1	6.2	6.2	0.18	U
74-87-3	Chloromethane	1	6.2	6.2	0.30	U
110-82-7	Cyclohexane	1	12	12	0.85	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	1.0	U
124-48-1	Dibromochloromethane	1	6.2	6.2	0.43	U
106-93-4	1,2-Dibromoethane	1	6.2	6.2	1.0	U
95-50-1	1,2-Dichlorobenzene	1	6.2	6.2	0.30	U
541-73-1	1,3-Dichlorobenzene	1	6.2	6.2	0.29	U
106-46-7	1,4-Dichlorobenzene	1	6.2	6.2	0.27	U
75-71-8	Dichlorodifluoromethane	1	6.2	6.2	0.41	U
75-34-3	1,1-Dichloroethane	1	6.2	6.2	0.24	U
107-06-2	1,2-Dichloroethane	1	6.2	6.2	0.36	U
75-35-4	1,1-Dichloroethene	1	6.2	6.2	0.46	U
156-59-2	cis-1,2-Dichloroethene	1	6.2	6.2	0.20	U
156-60-5	trans-1,2-Dichloroethene	1	6.2	6.2	0.28	U
78-87-5	1,2-Dichloropropane	1	6.2	6.2	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	6.2	6.2	0.31	U
10061-02-6	trans-1,3-Dichloropropene	1	6.2	6.2	1.0	U
100-41-4	Ethylbenzene	1	6.2	6.2	0.15	U
591-78-6	2-Hexanone	1	12	12	3.7	U
98-82-8	Isopropylbenzene	1	6.2	6.2	0.15	U
79-20-9	Methyl Acetate	1	25	25	1.0	U
1634-04-4	Methyl tert-Butyl Ether	1	6.2	6.2	0.29	U
108-87-2	Methylcyclohexane	1	12	12	0.98	U
75-09-2	Methylene Chloride	1	25	25	4.9	U
78-93-3	2-Butanone (MEK)	1	25	25	3.0	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.3	U
100-42-5	Styrene	1	6.2	6.2	0.27	U
79-34-5	1,1,2,2-Tetrachloroethane	1	6.2	6.2	0.25	U
127-18-4	Tetrachloroethene	1	6.2	6.2	0.55	U
108-88-3	Toluene	1	6.2	6.2	0.50	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: 16202A.D

Sampled: 05/07/08 00:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 14:10

Solids: 80.87 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	25	25	0.25	U
120-82-1	1,2,4-Trichlorobenzene	1	6.2	6.2	0.30	U
71-55-6	1,1,1-Trichloroethane	1	6.2	6.2	0.25	U
79-00-5	1,1,2-Trichloroethane	1	6.2	6.2	0.85	U
79-01-6	Trichloroethene	1	6.2	6.2	0.69	U
75-69-4	Trichlorofluoromethane	1	6.2	6.2	0.26	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.2	6.2	0.41	U
75-01-4	Vinyl Chloride	1	6.2	6.2	0.56	U
1330-20-7	Xylene (Total)	1	6.2	6.2	0.72	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.6	102	78 - 121	
1,2-Dichloroethane-d4	40.0	40.8	102	66 - 124	
Toluene-d8	40.0	40.5	101	85 - 115	
4-Bromofluorobenzene	40.0	40.6	101	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	688307	7.34	745772	7.31	
Chlorobenzene-d5	323361	17.39	345159	17.38	
1,4-Dichlorobenzene-d4	367226	22.43	404925	22.42	

* Values outside of QC limits

02575

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: 16203A.D

Sampled: 05/07/08 11:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 14:44

Solids: 81.89 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	210	24	5.2	B J,M
71-43-2	Benzene	1	6.1	6.1	0.16	U UJ,M
74-97-5	Bromochloromethane	1	24	24	0.16	U
75-27-4	Bromodichloromethane	1	6.1	6.1	0.30	U UJ,M
75-25-2	Bromoform	1	6.1	6.1	0.59	U UJ,M
74-83-9	Bromomethane	1	6.1	6.1	1.5	U
75-15-0	Carbon Disulfide	1	6.1	6.1	0.32	U
56-23-5	Carbon Tetrachloride	1	6.1	6.1	0.35	U
108-90-7	Chlorobenzene	1	6.1	6.1	0.25	U UJ,M
75-00-3	Chloroethane	1	24	24	0.43	U
67-66-3	Chloroform	1	0.28	6.1	0.18	J B,Z
74-87-3	Chloromethane	1	6.1	6.1	0.30	U
110-82-7	Cyclohexane	1	12	12	0.84	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	1.0	U
124-48-1	Dibromochloromethane	1	6.1	6.1	0.43	U UJ,M
106-93-4	1,2-Dibromoethane	1	6.1	6.1	1.0	U
95-50-1	1,2-Dichlorobenzene	1	6.1	6.1	0.30	U
541-73-1	1,3-Dichlorobenzene	1	6.1	6.1	0.29	U
106-46-7	1,4-Dichlorobenzene	1	6.1	6.1	0.27	U UJ,M
75-71-8	Dichlorodifluoromethane	1	6.1	6.1	0.40	U
75-34-3	1,1-Dichloroethane	1	6.1	6.1	0.24	U
107-06-2	1,2-Dichloroethane	1	6.1	6.1	0.36	U
75-35-4	1,1-Dichloroethene	1	6.1	6.1	0.45	U UJ, M
156-59-2	cis-1,2-Dichloroethene	1	6.1	6.1	0.20	U
156-60-5	trans-1,2-Dichloroethene	1	6.1	6.1	0.28	U UJ, M
78-87-5	1,2-Dichloropropane	1	6.1	6.1	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	6.1	6.1	0.31	U UJ, M
10061-02-6	trans-1,3-Dichloropropene	1	6.1	6.1	1.0	U
100-41-4	Ethylbenzene	1	6.1	6.1	0.15	U UJ, M
591-78-6	2-Hexanone	1	12	12	3.7	U
98-82-8	Isopropylbenzene	1	6.1	6.1	0.15	U UJ, M
79-20-9	Methyl Acetate	1	16	24	1.0	J J, M
1634-04-4	Methyl tert-Butyl Ether	1	6.1	6.1	0.29	U
108-87-2	Methylcyclohexane	1	12	12	0.97	U
75-09-2	Methylene Chloride	1	24	24	4.8	U
78-93-3	2-Butanone (MEK)	1	31	24	3.0	
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.3	U
100-42-5	Styrene	1	6.1	6.1	0.27	U UJ,M
79-34-5	1,1,2,2-Tetrachloroethane	1	6.1	6.1	0.25	U
127-18-4	Tetrachloroethene	1	6.1	6.1	0.54	U UJ, M
108-88-3	Toluene	1	6.1	6.1	0.49	U UJ, M

02583

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: 16203A.D

Sampled: 05/07/08 11:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 14:44

Solids: 81.89 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	24	24	0.25	U UJ, M
120-82-1	1,2,4-Trichlorobenzene	1	6.1	6.1	0.29	U UJ, M
71-55-6	1,1,1-Trichloroethane	1	6.1	6.1	0.25	U
79-00-5	1,1,2-Trichloroethane	1	6.1	6.1	0.84	U
79-01-6	Trichloroethene	1	6.1	6.1	0.69	U UJ, M
75-69-4	Trichlorofluoromethane	1	6.1	6.1	0.26	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	6.1	6.1	0.40	U
75-01-4	Vinyl Chloride	1	6.1	6.1	0.56	U
1330-20-7	Xylene (Total)	1	6.1	6.1	0.71	U UJ, M

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.5	104	78 - 121	
1,2-Dichloroethane-d4	40.0	43.4	108	66 - 124	
Toluene-d8	40.0	39.0	98	85 - 115	
4-Bromofluorobenzene	40.0	37.9	95	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	644065	7.34	745772	7.31	
Chlorobenzene-d5	294469	17.4	345159	17.38	
1,4-Dichlorobenzene-d4	279857	22.43	404925	22.42	

* Values outside of QC limits

02SB1

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: 16204.D

Sampled: 05/07/08 11:05 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 12:30

Solids: 84.58 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	62	24	5.0	B B2
71-43-2	Benzene	1	5.9	5.9	0.15	U
74-97-5	Bromochloromethane	1	24	24	0.15	U
75-27-4	Bromodichloromethane	1	5.9	5.9	0.29	U
75-25-2	Bromoform	1	5.9	5.9	0.57	U
74-83-9	Bromomethane	1	5.9	5.9	1.4	U
75-15-0	Carbon Disulfide	1	3.8	5.9	0.31	JB B2
56-23-5	Carbon Tetrachloride	1	5.9	5.9	0.34	U
108-90-7	Chlorobenzene	1	5.9	5.9	0.24	U
75-00-3	Chloroethane	1	24	24	0.41	U
67-66-3	Chloroform	1	5.9	5.9	0.17	U
74-87-3	Chloromethane	1	5.9	5.9	0.29	U
110-82-7	Cyclohexane	1	12	12	0.81	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.96	U
124-48-1	Dibromochloromethane	1	5.9	5.9	0.41	U
106-93-4	1,2-Dibromoethane	1	5.9	5.9	1.0	U
95-50-1	1,2-Dichlorobenzene	1	5.9	5.9	0.29	U
541-73-1	1,3-Dichlorobenzene	1	5.9	5.9	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.9	5.9	0.26	U
75-71-8	Dichlorodifluoromethane	1	5.9	5.9	0.39	U
75-34-3	1,1-Dichloroethane	1	5.9	5.9	0.23	U
107-06-2	1,2-Dichloroethane	1	5.9	5.9	0.35	U
75-35-4	1,1-Dichloroethene	1	5.9	5.9	0.44	U
156-59-2	cis-1,2-Dichloroethene	1	5.9	5.9	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.9	5.9	0.27	U
78-87-5	1,2-Dichloropropane	1	5.9	5.9	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.9	5.9	0.30	U
10061-02-6	trans-1,3-Dichloropropene	1	5.9	5.9	0.99	U
100-41-4	Ethylbenzene	1	5.9	5.9	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.9	5.9	0.15	U
79-20-9	Methyl Acetate	1	24	24	0.98	U
1634-04-4	Methyl tert-Butyl Ether	1	5.9	5.9	0.28	U
108-87-2	Methylcyclohexane	1	12	12	0.94	U
75-09-2	Methylene Chloride	1	24	24	4.7	U
78-93-3	2-Butanone (MEK)	1	24	24	2.9	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.9	5.9	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.9	5.9	0.24	U
127-18-4	Tetrachloroethene	1	5.9	5.9	0.52	U
108-88-3	Toluene	1	5.9	5.9	0.48	U

02591

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: 16204.D

Sampled: 05/07/08 11:05 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 12:30

Solids: 84.58 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	24	24	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.9	5.9	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.9	5.9	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.9	5.9	0.81	U
79-01-6	Trichloroethene	1	5.9	5.9	0.66	U
75-69-4	Trichlorofluoromethane	1	5.9	5.9	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.9	5.9	0.39	U
75-01-4	Vinyl Chloride	1	5.9	5.9	0.54	U
1330-20-7	Xylene (Total)	1	5.9	5.9	0.69	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.2	100	78 - 121	
1,2-Dichloroethane-d4	40.0	42.4	106	66 - 124	
Toluene-d8	40.0	40.2	100	85 - 115	
4-Bromofluorobenzene	40.0	42.9	107	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	705077	7.33	745772	7.31	
Chlorobenzene-d5	323658	17.39	345159	17.38	
1,4-Dichlorobenzene-d4	368483	22.43	404925	22.42	

* Values outside of QC limits

02592

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: 16205.D

Sampled: 05/07/08 11:55 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 13:03

Solids: 86.03 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	200	23	4.9	B
71-43-2	Benzene	1	5.8	5.8	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.8	5.8	0.29	U
75-25-2	Bromoform	1	5.8	5.8	0.56	U
74-83-9	Bromomethane	1	5.8	5.8	1.4	U
75-15-0	Carbon Disulfide	1	3.7	5.8	0.31	JB B22
56-23-5	Carbon Tetrachloride	1	5.8	5.8	0.33	U
108-90-7	Chlorobenzene	1	5.8	5.8	0.23	U
75-00-3	Chloroethane	1	23	23	0.41	U
67-66-3	Chloroform	1	5.8	5.8	0.17	U
74-87-3	Chloromethane	1	5.8	5.8	0.28	U
110-82-7	Cyclohexane	1	12	12	0.80	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.95	U
124-48-1	Dibromochloromethane	1	5.8	5.8	0.41	U
106-93-4	1,2-Dibromoethane	1	5.8	5.8	0.98	U
95-50-1	1,2-Dichlorobenzene	1	5.8	5.8	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.8	5.8	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.8	5.8	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.8	5.8	0.38	U
75-34-3	1,1-Dichloroethane	1	5.8	5.8	0.23	U
107-06-2	1,2-Dichloroethane	1	5.8	5.8	0.34	U
75-35-4	1,1-Dichloroethene	1	5.8	5.8	0.43	U
156-59-2	cis-1,2-Dichloroethene	1	5.8	5.8	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.8	5.8	0.26	U
78-87-5	1,2-Dichloropropane	1	5.8	5.8	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.8	5.8	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.8	5.8	0.97	U
100-41-4	Ethylbenzene	1	5.8	5.8	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.8	5.8	0.14	U
79-20-9	Methyl Acetate	1	5.5	23	0.97	J
1634-04-4	Methyl tert-Butyl Ether	1	5.8	5.8	0.27	U
108-87-2	Methylcyclohexane	1	12	12	0.93	U
75-09-2	Methylene Chloride	1	23	23	4.6	U
78-93-3	2-Butanone (MEK)	1	26	23	2.8	
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.8	5.8	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.8	5.8	0.23	U
127-18-4	Tetrachloroethene	1	5.8	5.8	0.51	U
108-88-3	Toluene	1	2.1	5.8	0.47	J

02599

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: 16205.D

Sampled: 05/07/08 11:55 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 13:03

Solids: 86.03 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.8	5.8	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.8	5.8	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.8	5.8	0.80	U
79-01-6	Trichloroethene	1	5.8	5.8	0.65	U
75-69-4	Trichlorofluoromethane	1	5.8	5.8	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.8	5.8	0.38	U
75-01-4	Vinyl Chloride	1	5.8	5.8	0.53	U
1330-20-7	Xylene (Total)	1	5.8	5.8	0.68	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.3	103	78 - 121	
1,2-Dichloroethane-d4	40.0	41.6	104	66 - 124	
Toluene-d8	40.0	40.6	101	85 - 115	
4-Bromofluorobenzene	40.0	40.9	102	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	656140	7.34	745772	7.31	
Chlorobenzene-d5	307927	17.39	345159	17.38	
1,4-Dichlorobenzene-d4	328290	22.43	404925	22.42	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: 16206.D

Sampled: 05/07/08 12:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 13:37

Solids: 91.96 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	65	22	4.6	B B2 Z
71-43-2	Benzene	1	5.4	5.4	0.14	U
74-97-5	Bromochloromethane	1	22	22	0.14	U
75-27-4	Bromodichloromethane	1	5.4	5.4	0.27	U
75-25-2	Bromoform	1	5.4	5.4	0.53	U
74-83-9	Bromomethane	1	5.4	5.4	1.3	U
75-15-0	Carbon Disulfide	1	3.5	5.4	0.29	JB B2 Z
56-23-5	Carbon Tetrachloride	1	5.4	5.4	0.31	U
108-90-7	Chlorobenzene	1	5.4	5.4	0.22	U
75-00-3	Chloroethane	1	22	22	0.38	U
67-66-3	Chloroform	1	0.29	5.4	0.16	J B2 Z
74-87-3	Chloromethane	1	5.4	5.4	0.26	U
110-82-7	Cyclohexane	1	11	11	0.75	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.89	U
124-48-1	Dibromochloromethane	1	5.4	5.4	0.38	U
106-93-4	1,2-Dibromoethane	1	5.4	5.4	0.92	U
95-50-1	1,2-Dichlorobenzene	1	5.4	5.4	0.27	U
541-73-1	1,3-Dichlorobenzene	1	5.4	5.4	0.26	U
106-46-7	1,4-Dichlorobenzene	1	5.4	5.4	0.24	U
75-71-8	Dichlorodifluoromethane	1	5.4	5.4	0.36	U
75-34-3	1,1-Dichloroethane	1	5.4	5.4	0.21	U
107-06-2	1,2-Dichloroethane	1	5.4	5.4	0.32	U
75-35-4	1,1-Dichloroethene	1	5.4	5.4	0.40	U
156-59-2	cis-1,2-Dichloroethene	1	5.4	5.4	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.4	5.4	0.25	U
78-87-5	1,2-Dichloropropane	1	5.4	5.4	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.4	5.4	0.28	U
10061-02-6	trans-1,3-Dichloropropene	1	5.4	5.4	0.91	U
100-41-4	Ethylbenzene	1	5.4	5.4	0.14	U
591-78-6	2-Hexanone	1	11	11	3.3	U
98-82-8	Isopropylbenzene	1	5.4	5.4	0.13	U
79-20-9	Methyl Acetate	1	22	22	0.91	U
1634-04-4	Methyl tert-Butyl Ether	1	5.4	5.4	0.25	U
108-87-2	Methylcyclohexane	1	11	11	0.87	U
75-09-2	Methylene Chloride	1	22	22	4.3	U
78-93-3	2-Butanone (MEK)	1	22	22	2.6	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.0	U
100-42-5	Styrene	1	5.4	5.4	0.24	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.4	5.4	0.22	U
127-18-4	Tetrachloroethene	1	5.4	5.4	0.48	U
108-88-3	Toluene	1	5.4	5.4	0.44	U

02608

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: 16206.D

Sampled: 05/07/08 12:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 13:37

Solids: 91.96 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	22	22	0.22	U
120-82-1	1,2,4-Trichlorobenzene	1	5.4	5.4	0.26	U
71-55-6	1,1,1-Trichloroethane	1	5.4	5.4	0.22	U
79-00-5	1,1,2-Trichloroethane	1	5.4	5.4	0.75	U
79-01-6	Trichloroethene	1	5.4	5.4	0.61	U
75-69-4	Trichlorofluoromethane	1	5.4	5.4	0.23	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.4	5.4	0.36	U
75-01-4	Vinyl Chloride	1	5.4	5.4	0.50	U
1330-20-7	Xylene (Total)	1	5.4	5.4	0.64	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.0	102	78 - 121	
1,2-Dichloroethane-d4	40.0	44.0	110	66 - 124	
Toluene-d8	40.0	39.4	98	85 - 115	
4-Bromofluorobenzene	40.0	41.2	103	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	684603	7.33	745772	7.31	
Chlorobenzene-d5	333757	17.38	345159	17.38	
1,4-Dichlorobenzene-d4	355487	22.43	404925	22.42	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: 16207.D

Sampled: 05/07/08 12:55 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 15:17

Solids: 85.70 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	210	23	4.9	B
71-43-2	Benzene	1	5.8	5.8	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.8	5.8	0.29	U
75-25-2	Bromoform	1	5.8	5.8	0.56	U
74-83-9	Bromomethane	1	5.8	5.8	1.4	U
75-15-0	Carbon Disulfide	1	3.7	5.8	0.31	JB B,2
56-23-5	Carbon Tetrachloride	1	5.8	5.8	0.33	U
108-90-7	Chlorobenzene	1	5.8	5.8	0.24	U
75-00-3	Chloroethane	1	23	23	0.41	U
67-66-3	Chloroform	1	0.29	5.8	0.17	J B,2
74-87-3	Chloromethane	1	5.8	5.8	0.28	U
110-82-7	Cyclohexane	1	12	12	0.80	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.95	U
124-48-1	Dibromochloromethane	1	5.8	5.8	0.41	U
106-93-4	1,2-Dibromoethane	1	5.8	5.8	0.98	U
95-50-1	1,2-Dichlorobenzene	1	5.8	5.8	0.29	U
541-73-1	1,3-Dichlorobenzene	1	5.8	5.8	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.8	5.8	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.8	5.8	0.39	U
75-34-3	1,1-Dichloroethane	1	5.8	5.8	0.23	U
107-06-2	1,2-Dichloroethane	1	5.8	5.8	0.34	U
75-35-4	1,1-Dichloroethene	1	5.8	5.8	0.43	U
156-59-2	cis-1,2-Dichloroethene	1	5.8	5.8	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.8	5.8	0.26	U
78-87-5	1,2-Dichloropropane	1	5.8	5.8	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.8	5.8	0.30	U
10061-02-6	trans-1,3-Dichloropropene	1	5.8	5.8	0.97	U
100-41-4	Ethylbenzene	1	5.8	5.8	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.8	5.8	0.14	U
79-20-9	Methyl Acetate	1	9.3	23	0.97	J
1634-04-4	Methyl tert-Butyl Ether	1	5.8	5.8	0.27	U
108-87-2	Methylcyclohexane	1	12	12	0.93	U
75-09-2	Methylene Chloride	1	23	23	4.6	U
78-93-3	2-Butanone (MEK)	1	25	23	2.8	
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.8	5.8	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.8	5.8	0.24	U
127-18-4	Tetrachloroethene	1	5.8	5.8	0.52	U
108-88-3	Toluene	1	5.8	5.8	0.47	U

02516

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: 16207.D

Sampled: 05/07/08 12:55 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 15:17

Solids: 85.70 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.8	5.8	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.8	5.8	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.8	5.8	0.80	U
79-01-6	Trichloroethene	1	5.8	5.8	0.65	U
75-69-4	Trichlorofluoromethane	1	5.8	5.8	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.8	5.8	0.39	U
75-01-4	Vinyl Chloride	1	5.8	5.8	0.53	U
1330-20-7	Xylene (Total)	1	5.8	5.8	0.68	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.7	104	78 - 121	
1,2-Dichloroethane-d4	40.0	43.0	108	66 - 124	
Toluene-d8	40.0	39.4	98	85 - 115	
4-Bromofluorobenzene	40.0	39.0	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	666424	7.34	745772	7.31	
Chlorobenzene-d5	308503	17.39	345159	17.38	
1,4-Dichlorobenzene-d4	312773	22.44	404925	22.42	

* Values outside of QC limits

02617

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-08 File ID: 16208.D

Sampled: 05/07/08 13:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 15:51

Solids: 89.42 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	65	22	4.7	B B,Z
71-43-2	Benzene	1	5.6	5.6	0.14	U
74-97-5	Bromochloromethane	1	22	22	0.14	U
75-27-4	Bromodichloromethane	1	5.6	5.6	0.28	U
75-25-2	Bromoform	1	5.6	5.6	0.54	U
74-83-9	Bromomethane	1	5.6	5.6	1.4	U
75-15-0	Carbon Disulfide	1	3.6	5.6	0.29	JB B,Z
56-23-5	Carbon Tetrachloride	1	5.6	5.6	0.32	U
108-90-7	Chlorobenzene	1	5.6	5.6	0.23	U
75-00-3	Chloroethane	1	22	22	0.39	U
67-66-3	Chloroform	1	0.42	5.6	0.16	J B,Z
74-87-3	Chloromethane	1	5.6	5.6	0.27	U
110-82-7	Cyclohexane	1	11	11	0.77	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.91	U
124-48-1	Dibromochloromethane	1	5.6	5.6	0.39	U
106-93-4	1,2-Dibromoethane	1	5.6	5.6	0.94	U
95-50-1	1,2-Dichlorobenzene	1	5.6	5.6	0.27	U
541-73-1	1,3-Dichlorobenzene	1	5.6	5.6	0.27	U
106-46-7	1,4-Dichlorobenzene	1	5.6	5.6	0.24	U
75-71-8	Dichlorodifluoromethane	1	5.6	5.6	0.37	U
75-34-3	1,1-Dichloroethane	1	5.6	5.6	0.22	U
107-06-2	1,2-Dichloroethane	1	5.6	5.6	0.33	U
75-35-4	1,1-Dichloroethene	1	5.6	5.6	0.41	U
156-59-2	cis-1,2-Dichloroethene	1	5.6	5.6	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.6	5.6	0.25	U
78-87-5	1,2-Dichloropropane	1	5.6	5.6	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.6	5.6	0.28	U
10061-02-6	trans-1,3-Dichloropropene	1	5.6	5.6	0.93	U
100-41-4	Ethylbenzene	1	5.6	5.6	0.14	U
591-78-6	2-Hexanone	1	11	11	3.3	U
98-82-8	Isopropylbenzene	1	5.6	5.6	0.14	U
79-20-9	Methyl Acetate	1	22	22	0.93	U
1634-04-4	Methyl tert-Butyl Ether	1	5.6	5.6	0.26	U
108-87-2	Methylcyclohexane	1	11	11	0.89	U
75-09-2	Methylene Chloride	1	22	22	4.4	U
78-93-3	2-Butanone (MEK)	1	9.8	22	2.7	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.1	U
100-42-5	Styrene	1	5.6	5.6	0.25	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.6	5.6	0.23	U
127-18-4	Tetrachloroethene	1	5.6	5.6	0.49	U
108-88-3	Toluene	1	5.6	5.6	0.45	U

02525

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-08
File ID: 16208.D
Sampled: 05/07/08 13:00
Prepared: 05/15/08 07:00
Analyzed: 05/15/08 15:51
Solids: 89.42
Preparation: 5035 Soil Purge & Trap -
Initial/Final: 5 g / 5 mL
QC Batch: 0805698
Sequence: 8051643
Calibration: 8E16003
Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	22	22	0.23	U
120-82-1	1,2,4-Trichlorobenzene	1	5.6	5.6	0.27	U
71-55-6	1,1,1-Trichloroethane	1	5.6	5.6	0.23	U
79-00-5	1,1,2-Trichloroethane	1	5.6	5.6	0.77	U
79-01-6	Trichloroethene	1	5.6	5.6	0.63	U
75-69-4	Trichlorofluoromethane	1	5.6	5.6	0.24	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.6	5.6	0.37	U
75-01-4	Vinyl Chloride	1	5.6	5.6	0.51	U
1330-20-7	Xylene (Total)	1	5.6	5.6	0.65	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	40.8	102	78 - 121	
1,2-Dichloroethane-d4	40.0	42.0	105	66 - 124	
Toluene-d8	40.0	39.9	100	85 - 115	
4-Bromofluorobenzene	40.0	41.7	104	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	683290	7.35	745772	7.31	
Chlorobenzene-d5	326823	17.4	345159	17.38	
1,4-Dichlorobenzene-d4	372002	22.44	404925	22.42	

* Values outside of QC limits

02626

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: 16209.D

Sampled: 05/07/08 00:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 16:24

Solids: 85.72 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	150	23	4.9	B B2
71-43-2	Benzene	1	5.8	5.8	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.8	5.8	0.29	U
75-25-2	Bromoform	1	5.8	5.8	0.56	U
74-83-9	Bromomethane	1	5.8	5.8	1.4	U
75-15-0	Carbon Disulfide	1	5.8	5.8	0.31	U
56-23-5	Carbon Tetrachloride	1	5.8	5.8	0.33	U
108-90-7	Chlorobenzene	1	5.8	5.8	0.24	U
75-00-3	Chloroethane	1	23	23	0.41	U
67-66-3	Chloroform	1	0.44	5.8	0.17	J B2
74-87-3	Chloromethane	1	5.8	5.8	0.28	U
110-82-7	Cyclohexane	1	12	12	0.80	U
96-12-8	1,2-Dibromo-3-chloropropane	1	12	12	0.95	U
124-48-1	Dibromochloromethane	1	5.8	5.8	0.41	U
106-93-4	1,2-Dibromoethane	1	5.8	5.8	0.98	U
95-50-1	1,2-Dichlorobenzene	1	5.8	5.8	0.29	U
541-73-1	1,3-Dichlorobenzene	1	5.8	5.8	0.28	U
106-46-7	1,4-Dichlorobenzene	1	5.8	5.8	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.8	5.8	0.38	U
75-34-3	1,1-Dichloroethane	1	5.8	5.8	0.23	U
107-06-2	1,2-Dichloroethane	1	5.8	5.8	0.34	U
75-35-4	1,1-Dichloroethene	1	5.8	5.8	0.43	U
156-59-2	cis-1,2-Dichloroethene	1	5.8	5.8	0.19	U
156-60-5	trans-1,2-Dichloroethene	1	5.8	5.8	0.26	U
78-87-5	1,2-Dichloropropane	1	5.8	5.8	1.1	U
10061-01-5	cis-1,3-Dichloropropene	1	5.8	5.8	0.30	U
10061-02-6	trans-1,3-Dichloropropene	1	5.8	5.8	0.97	U
100-41-4	Ethylbenzene	1	5.8	5.8	0.15	U
591-78-6	2-Hexanone	1	12	12	3.5	U
98-82-8	Isopropylbenzene	1	5.8	5.8	0.14	U
79-20-9	Methyl Acetate	1	8.4	23	0.97	J
1634-04-4	Methyl tert-Butyl Ether	1	5.8	5.8	0.27	U
108-87-2	Methylcyclohexane	1	12	12	0.93	U
75-09-2	Methylene Chloride	1	23	23	4.6	U
78-93-3	2-Butanone (MEK)	1	17	23	2.8	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	12	12	2.2	U
100-42-5	Styrene	1	5.8	5.8	0.26	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.8	5.8	0.24	U
127-18-4	Tetrachloroethene	1	5.8	5.8	0.52	U
108-88-3	Toluene	1	5.8	5.8	0.47	U

02634

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: 16209.D

Sampled: 05/07/08 00:00 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 16:24

Solids: 85.72 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.8	5.8	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.8	5.8	0.24	U
79-00-5	1,1,2-Trichloroethane	1	5.8	5.8	0.80	U
79-01-6	Trichloroethene	1	5.8	5.8	0.65	U
75-69-4	Trichlorofluoromethane	1	5.8	5.8	0.25	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.8	5.8	0.39	U
75-01-4	Vinyl Chloride	1	5.8	5.8	0.53	U
1330-20-7	Xylene (Total)	1	5.8	5.8	0.68	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.8	104	78 - 121	
1,2-Dichloroethane-d4	40.0	42.9	107	66 - 124	
Toluene-d8	40.0	40.1	100	85 - 115	
4-Bromofluorobenzene	40.0	36.6	92	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	659131	7.36	745772	7.31	
Chlorobenzene-d5	319329	17.4	345159	17.38	
1,4-Dichlorobenzene-d4	285894	22.44	404925	22.42	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: 16210.D

Sampled: 05/07/08 13:40 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 16:58

Solids: 87.43 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	160	23	4.8	B B7Z
71-43-2	Benzene	1	5.7	5.7	0.15	U
74-97-5	Bromochloromethane	1	23	23	0.15	U
75-27-4	Bromodichloromethane	1	5.7	5.7	0.28	U
75-25-2	Bromoform	1	5.7	5.7	0.55	U
74-83-9	Bromomethane	1	5.7	5.7	1.4	U
75-15-0	Carbon Disulfide	1	5.7	5.7	0.30	U
56-23-5	Carbon Tetrachloride	1	5.7	5.7	0.33	U
108-90-7	Chlorobenzene	1	5.7	5.7	0.23	U
75-00-3	Chloroethane	1	23	23	0.40	U
67-66-3	Chloroform	1	5.7	5.7	0.17	U
74-87-3	Chloromethane	1	5.7	5.7	0.28	U
110-82-7	Cyclohexane	1	11	11	0.79	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.93	U
124-48-1	Dibromochloromethane	1	5.7	5.7	0.40	U
106-93-4	1,2-Dibromoethane	1	5.7	5.7	0.96	U
95-50-1	1,2-Dichlorobenzene	1	5.7	5.7	0.28	U
541-73-1	1,3-Dichlorobenzene	1	5.7	5.7	0.27	U
106-46-7	1,4-Dichlorobenzene	1	5.7	5.7	0.25	U
75-71-8	Dichlorodifluoromethane	1	5.7	5.7	0.38	U
75-34-3	1,1-Dichloroethane	1	5.7	5.7	0.22	U
107-06-2	1,2-Dichloroethane	1	5.7	5.7	0.34	U
75-35-4	1,1-Dichloroethene	1	5.7	5.7	0.42	U
156-59-2	cis-1,2-Dichloroethene	1	5.7	5.7	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.7	5.7	0.26	U
78-87-5	1,2-Dichloropropane	1	5.7	5.7	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.7	5.7	0.29	U
10061-02-6	trans-1,3-Dichloropropene	1	5.7	5.7	0.95	U
100-41-4	Ethylbenzene	1	5.7	5.7	0.14	U
591-78-6	2-Hexanone	1	11	11	3.4	U
98-82-8	Isopropylbenzene	1	5.7	5.7	0.14	U
79-20-9	Methyl Acetate	1	11	23	0.95	J
1634-04-4	Methyl tert-Butyl Ether	1	5.7	5.7	0.27	U
108-87-2	Methylcyclohexane	1	11	11	0.91	U
75-09-2	Methylene Chloride	1	23	23	4.5	U
78-93-3	2-Butanone (MEK)	1	16	23	2.8	J
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.1	U
100-42-5	Styrene	1	5.7	5.7	0.25	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.7	5.7	0.23	U
127-18-4	Tetrachloroethene	1	5.7	5.7	0.51	U
108-88-3	Toluene	1	5.7	5.7	0.46	U

025412

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: 16210.D

Sampled: 05/07/08 13:40 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 16:58

Solids: 87.43 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	23	23	0.24	U
120-82-1	1,2,4-Trichlorobenzene	1	5.7	5.7	0.28	U
71-55-6	1,1,1-Trichloroethane	1	5.7	5.7	0.23	U
79-00-5	1,1,2-Trichloroethane	1	5.7	5.7	0.79	U
79-01-6	Trichloroethene	1	5.7	5.7	0.64	U
75-69-4	Trichlorofluoromethane	1	5.7	5.7	0.24	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.7	5.7	0.38	U
75-01-4	Vinyl Chloride	1	5.7	5.7	0.52	U
1330-20-7	Xylene (Total)	1	5.7	5.7	0.67	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.7	104	78 - 121	
1,2-Dichloroethane-d4	40.0	42.0	105	66 - 124	
Toluene-d8	40.0	39.7	99	85 - 115	
4-Bromofluorobenzene	40.0	37.1	93	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	670389	7.36	745772	7.31	
Chlorobenzene-d5	309383	17.4	345159	17.38	
1,4-Dichlorobenzene-d4	280607	22.44	404925	22.42	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: 16211.D

Sampled: 05/07/08 13:45 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 17:31

Solids: 91.63 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
67-64-1	Acetone	1	81	22	4.6	B B,Z
71-43-2	Benzene	1	5.5	5.5	0.14	U
74-97-5	Bromochloromethane	1	22	22	0.14	U
75-27-4	Bromodichloromethane	1	5.5	5.5	0.27	U
75-25-2	Bromoform	1	5.5	5.5	0.53	U
74-83-9	Bromomethane	1	5.5	5.5	1.3	U
75-15-0	Carbon Disulfide	1	3.5	5.5	0.29	JB B,J,Z
56-23-5	Carbon Tetrachloride	1	5.5	5.5	0.31	U
108-90-7	Chlorobenzene	1	5.5	5.5	0.22	U
75-00-3	Chloroethane	1	22	22	0.38	U
67-66-3	Chloroform	1	0.38	5.5	0.16	J B,J,Z
74-87-3	Chloromethane	1	5.5	5.5	0.27	U
110-82-7	Cyclohexane	1	11	11	0.75	U
96-12-8	1,2-Dibromo-3-chloropropane	1	11	11	0.89	U
124-48-1	Dibromochloromethane	1	5.5	5.5	0.38	U
106-93-4	1,2-Dibromoethane	1	5.5	5.5	0.92	U
95-50-1	1,2-Dichlorobenzene	1	5.5	5.5	0.27	U
541-73-1	1,3-Dichlorobenzene	1	5.5	5.5	0.26	U
106-46-7	1,4-Dichlorobenzene	1	5.5	5.5	0.24	U
75-71-8	Dichlorodifluoromethane	1	5.5	5.5	0.36	U
75-34-3	1,1-Dichloroethane	1	5.5	5.5	0.21	U
107-06-2	1,2-Dichloroethane	1	5.5	5.5	0.32	U
75-35-4	1,1-Dichloroethene	1	5.5	5.5	0.40	U
156-59-2	cis-1,2-Dichloroethene	1	5.5	5.5	0.18	U
156-60-5	trans-1,2-Dichloroethene	1	5.5	5.5	0.25	U
78-87-5	1,2-Dichloropropane	1	5.5	5.5	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1	5.5	5.5	0.28	U
10061-02-6	trans-1,3-Dichloropropene	1	5.5	5.5	0.91	U
100-41-4	Ethylbenzene	1	5.5	5.5	0.14	U
591-78-6	2-Hexanone	1	11	11	3.3	U
98-82-8	Isopropylbenzene	1	5.5	5.5	0.13	U
79-20-9	Methyl Acetate	1	5.4	22	0.91	J
1634-04-4	Methyl tert-Butyl Ether	1	5.5	5.5	0.26	U
108-87-2	Methylcyclohexane	1	11	11	0.87	U
75-09-2	Methylene Chloride	1	22	22	4.3	U
78-93-3	2-Butanone (MEK)	1	22	22	2.6	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	11	11	2.0	U
100-42-5	Styrene	1	5.5	5.5	0.24	U
79-34-5	1,1,2,2-Tetrachloroethane	1	5.5	5.5	0.22	U
127-18-4	Tetrachloroethene	1	5.5	5.5	0.48	U
108-88-3	Toluene	1	5.5	5.5	0.44	U

02650

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: 16211.D

Sampled: 05/07/08 13:45 Prepared: 05/15/08 07:00 Analyzed: 05/15/08 17:31

Solids: 91.63 Preparation: 5035 Soil Purge & Trap - Initial/Final: 5 g / 5 mL

QC Batch: 0805698 Sequence: 8051643 Calibration: 8E16003 Instrument: 139

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	22	22	0.22	U
120-82-1	1,2,4-Trichlorobenzene	1	5.5	5.5	0.26	U
71-55-6	1,1,1-Trichloroethane	1	5.5	5.5	0.22	U
79-00-5	1,1,2-Trichloroethane	1	5.5	5.5	0.75	U
79-01-6	Trichloroethene	1	5.5	5.5	0.61	U
75-69-4	Trichlorofluoromethane	1	5.5	5.5	0.23	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5.5	5.5	0.36	U
75-01-4	Vinyl Chloride	1	5.5	5.5	0.50	U
1330-20-7	Xylene (Total)	1	5.5	5.5	0.64	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.1	105	78 - 121	
1,2-Dichloroethane-d4	40.0	42.7	107	66 - 124	
Toluene-d8	40.0	39.5	99	85 - 115	
4-Bromofluorobenzene	40.0	39.0	98	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	648923	7.36	745772	7.31	
Chlorobenzene-d5	315088	17.4	345159	17.38	
1,4-Dichlorobenzene-d4	314567	22.44	404925	22.42	

* Values outside of QC limits

02651

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: 0805162-16.D

Sampled: 05/07/08 15:45 Prepared: 05/19/08 12:00 Analyzed: 05/20/08 10:38

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0805888 Sequence: 8052073 Calibration: 8E20016 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.080	1.0	0.072	J

02658

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: 0805162-16.D

Sampled: 05/07/08 15:45 Prepared: 05/19/08 12:00 Analyzed: 05/20/08 10:38

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0805888 Sequence: 8052073 Calibration: 8E20016 Instrument: 323

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.0	102	85 - 115	
1,2-Dichloroethane-d4	40.0	41.0	102	70 - 120	
Toluene-d8	40.0	41.6	104	85 - 120	
4-Bromofluorobenzene	40.0	39.4	99	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	305085	3.86	325625	3.86	
Chlorobenzene-d5	257036	6.86	268558	6.86	
1,4-Dichlorobenzene-d4	141497	9.15	156977	9.15	

* Values outside of QC limits

02659

SAMPLE ID SUMMARY

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 80510001.D

Sampled: 05/05/08 11:15 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 18:11

Solids: 72.50 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.92	23	0.55	J
208-96-8	Acenaphthylene	1	2.3	23	0.83	J
98-86-2	Acetophenone	1	230	230	9.3	U
120-12-7	Anthracene	1	1.4	23	0.59	J
1912-24-9	Atrazine	1	230	230	2.1	U
100-52-7	Benzaldehyde	1	230	230	36	U
56-55-3	Benzo(a)anthracene	1	13	23	0.74	J
50-32-8	Benzo(a)pyrene	1	20	23	1.4	J
205-99-2	Benzo(b)fluoranthene	1	31	23	1.2	
207-08-9	Benzo(k)fluoranthene	1	6.4	23	0.99	J
191-24-2	Benzo(g,h,i)perylene	1	19	92	3.2	J
92-52-4	1,1'-Biphenyl	1	1.4	230	0.63	J B2C
101-55-3	4-Bromophenyl Phenyl Ether	1	230	230	1.7	U
85-68-7	Butyl Benzyl Phthalate	1	18	230	2.9	J
105-60-2	Caprolactam	1	460	460	32	U
86-74-8	Carbazole	1	230	230	0.69	U
59-50-7	4-Chloro-3-methylphenol	1	230	230	2.5	U
106-47-8	4-Chloroaniline	1	230	230	27	U
111-91-1	Bis(2-chloroethoxy)methane	1	230	230	1.1	U
111-44-4	Bis(2-chloroethyl) Ether	1	230	230	1.2	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	230	230	0.43	U
91-58-7	2-Chloronaphthalene	1	230	230	0.60	U
95-57-8	2-Chlorophenol	1	230	230	0.53	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	230	230	0.62	U
218-01-9	Chrysene	1	13	23	0.66	J
53-70-3	Dibenz(a,h)anthracene	1	92	92	0.74	U
132-64-9	Dibenzofuran	1	2.3	230	0.36	J
84-74-2	Di-n-butyl Phthalate	1	230	230	1.7	
91-94-1	3,3'-Dichlorobenzidine	1	460	460	110	U
120-83-2	2,4-Dichlorophenol	1	230	230	9.1	U
84-66-2	Diethyl Phthalate	1	3.7	230	0.51	J
105-67-9	2,4-Dimethylphenol	1	230	230	7.9	U
131-11-3	Dimethyl Phthalate	1	230	230	0.47	U
534-52-1	4,6-Dinitro-2-methylphenol	1	230	230	50	U
51-28-5	2,4-Dinitrophenol	1	460	460	46	U
121-14-2	2,4-Dinitrotoluene	1	230	230	18	U
606-20-2	2,6-Dinitrotoluene	1	230	230	2.2	U
117-84-0	Di-n-octyl Phthalate	1	27	230	14	J
117-81-7	Bis(2-ethylhexyl) Phthalate	1	120	230	1.8	J
206-44-0	Fluoranthene	1	17	23	5.2	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: 80510001.D

Sampled: 05/05/08 11:15 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 18:11

Solids: 72.50 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
86-73-7	Fluorene	1	1.8	23	0.39	J
118-74-1	Hexachlorobenzene	1	230	230	1.1	U
87-68-3	Hexachlorobutadiene	1	230	230	0.95	U
77-47-4	Hexachlorocyclopentadiene	1	230	230	5.4	U
67-72-1	Hexachloroethane	1	230	230	1.1	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	27	92	0.97	J
78-59-1	Isophorone	1	0.92	230	0.55	J
91-57-6	2-Methylnaphthalene	1	4.1	230	0.66	J
95-48-7	2-Methylphenol	1	230	230	11	U
106-44-5	4-Methylphenol	1	230	230	13	U
91-20-3	Naphthalene	1	14	23	0.32	J B7Z
88-74-4	2-Nitroaniline	1	230	230	18	U
99-09-2	3-Nitroaniline	1	230	230	15	U
100-01-6	4-Nitroaniline	1	230	230	32	U
98-95-3	Nitrobenzene	1	230	230	2.1	U
100-02-7	4-Nitrophenol	1	460	460	15	U
88-75-5	2-Nitrophenol	1	230	230	17	U
86-30-6	N-Nitroso-diphenylamine	1	230	230	1.1	U
621-64-7	N-Nitroso-di-n-propylamine	1	230	230	0.98	U
87-86-5	Pentachlorophenol	1	460	460	5.1	U
85-01-8	Phenanthrene	1	13	23	5.0	J
108-95-2	Phenol	1	2.8	230	0.97	J
129-00-0	Pyrene	1	18	23	0.44	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	230	230	1.1	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	230	230	22	U
88-06-2	2,4,6-Trichlorophenol	1	230	230	6.3	U
95-95-4	2,4,5-Trichlorophenol	1	230	230	8.3	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	929	870	94	35 - 105	
Phenol-d6	920	749	82	40 - 100	
Nitrobenzene-d5	478	396	83	35 - 100	
2-Fluorobiphenyl	460	430	94	45 - 105	
2,4,6-Tribromophenol	924	736	80	35 - 125	
o-Terphenyl	460	422	92	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	174074	4.85	155158	4.84	
Naphthalene-d8	570798	6.33	520254	6.33	
Acenaphthene-d10	338194	8.33	305751	8.33	
Phenanthrene-d10	484730	9.99	499730	9.98	

03098

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805100-01
File ID: 80510001.D
Sampled: 05/05/08 11:15
Prepared: 05/09/08 10:49
Analyzed: 05/12/08 18:11
Solids: 72.50
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
QC Batch: 0805309
Sequence: 8051997
Calibration: 8E19033
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Chrysene-d12	381882	12.92	431600	12.91	
Perylene-d12	393067	14.39	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 805100D2.d

Sampled: 05/05/08 11:40 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 21:43

Solids: 86.13 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	2	39	39	0.93	U
208-96-8	Acenaphthylene	2	39	39	1.4	U
98-86-2	Acetophenone	2	390	390	16	U
120-12-7	Anthracene	2	39	39	0.99	U
1912-24-9	Atrazine	2	390	390	3.5	U
100-52-7	Benzaldehyde	2	390	390	61	U
56-55-3	Benzo(a)anthracene	2	39	39	1.2	U
50-32-8	Benzo(a)pyrene	2	39	39	2.4	U
205-99-2	Benzo(b)fluoranthene	2	39	39	2.0	U
207-08-9	Benzo(k)fluoranthene	2	39	39	1.7	U
191-24-2	Benzo(g,h,i)perylene	2	160	160	5.3	U
92-52-4	1,1'-Biphenyl	2	390	390	1.1	U
101-55-3	4-Bromophenyl Phenyl Ether	2	390	390	2.9	U
85-68-7	Butyl Benzyl Phthalate	2	7.0	390	4.9	J
105-60-2	Caprolactam	2	770	770	53	U
86-74-8	Carbazole	2	390	390	1.2	U
59-50-7	4-Chloro-3-methylphenol	2	390	390	4.2	U
106-47-8	4-Chloroaniline	2	390	390	46	U
111-91-1	Bis(2-chloroethoxy)methane	2	390	390	1.9	U
111-44-4	Bis(2-chloroethyl) Ether	2	390	390	2.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	2	390	390	0.73	U
91-58-7	2-Chloronaphthalene	2	390	390	1.0	U
95-57-8	2-Chlorophenol	2	390	390	0.89	U
7005-72-3	4-Chlorophenyl Phenyl Ether	2	390	390	1.0	U
218-01-9	Chrysene	2	39	39	1.1	U
53-70-3	Dibenz(a,h)anthracene	2	160	160	1.2	U
132-64-9	Dibenzofuran	2	390	390	0.61	U
84-74-2	Di-n-butyl Phthalate	2	1500	390	2.8	
91-94-1	3,3'-Dichlorobenzidine	2	770	770	180	U
120-83-2	2,4-Dichlorophenol	2	390	390	15	U
84-66-2	Diethyl Phthalate	2	390	390	0.86	U
105-67-9	2,4-Dimethylphenol	2	390	390	13	U
131-11-3	Dimethyl Phthalate	2	390	390	0.79	U
534-52-1	4,6-Dinitro-2-methylphenol	2	390	390	85	U
51-28-5	2,4-Dinitrophenol	2	770	770	77	U
121-14-2	2,4-Dinitrotoluene	2	430	390	31	
606-20-2	2,6-Dinitrotoluene	2	21	390	3.8	J
117-84-0	Di-n-octyl Phthalate	2	390	390	23	U
117-81-7	Bis(2-ethylhexyl) Phthalate	2	390	390	3.0	U
206-44-0	Fluoranthene	2	39	39	8.7	U
86-73-7	Fluorene	2	39	39	0.65	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: 805100D2.d

Sampled: 05/05/08 11:40 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 21:43

Solids: 86.13 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	2	390	390	1.8	U
87-68-3	Hexachlorobutadiene	2	390	390	1.6	U
77-47-4	Hexachlorocyclopentadiene	2	390	390	9.1	U
67-72-1	Hexachloroethane	2	390	390	1.9	U
193-39-5	Indeno(1,2,3-cd)pyrene	2	160	160	1.6	U
78-59-1	Isophorone	2	390	390	0.93	U
91-57-6	2-Methylnaphthalene	2	390	390	1.1	U
95-48-7	2-Methylphenol	2	390	390	19	U
106-44-5	4-Methylphenol	2	390	390	21	U
91-20-3	Naphthalene	2	6.2	39	0.54	J B17
88-74-4	2-Nitroaniline	2	390	390	31	U
99-09-2	3-Nitroaniline	2	390	390	26	U
100-01-6	4-Nitroaniline	2	390	390	53	U
98-95-3	Nitrobenzene	2	390	390	3.5	U
100-02-7	4-Nitrophenol	2	770	770	26	U
88-75-5	2-Nitrophenol	2	390	390	28	U
86-30-6	N-Nitroso-diphenylamine	2	100	390	1.9	J
621-64-7	N-Nitroso-di-n-propylamine	2	390	390	1.7	U
87-86-5	Pentachlorophenol	2	770	770	8.5	U
85-01-8	Phenanthrene	2	39	39	8.4	U
108-95-2	Phenol	2	390	390	1.6	U
129-00-0	Pyrene	2	39	39	0.74	U
95-94-3	1,2,4,5-Tetrachlorobenzene	2	390	390	1.9	U
58-90-2	2,3,4,6-Tetrachlorophenol	2	390	390	38	U
88-06-2	2,4,6-Trichlorophenol	2	390	390	11	U
95-95-4	2,4,5-Trichlorophenol	2	390	390	14	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	782	574	73	35 - 105	
Phenol-d6	774	492	64	40 - 100	
Nitrobenzene-d5	402	338	84	35 - 100	
2-Fluorobiphenyl	387	369	95	45 - 105	
2,4,6-Tribromophenol	778	643	83	35 - 125	
o-Terphenyl	387	176	45	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	198407	4.78	205931	4.76	
Naphthalene-d8	633977	6.28	670578	6.26	
Acenaphthene-d10	380277	8.27	407873	8.26	
Phenanthrene-d10	625946	9.93	610785	9.91	
Chrysene-d12	516391	12.86	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 80510003.D

Sampled: 05/05/08 12:15 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:07

Solids: 73.18 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	1.8	23	0.55	J
208-96-8	Acenaphthylene	1	23	23	0.82	U
98-86-2	Acetophenone	1	230	230	9.2	U
120-12-7	Anthracene	1	5.0	23	0.58	J
1912-24-9	Atrazine	1	230	230	2.0	U
100-52-7	Benzaldehyde	1	230	230	36	U
56-55-3	Benzo(a)anthracene	1	49	23	0.73	
50-32-8	Benzo(a)pyrene	1	43	23	1.4	
205-99-2	Benzo(b)fluoranthene	1	82	23	1.2	
207-08-9	Benzo(k)fluoranthene	1	20	23	0.98	J
191-24-2	Benzo(g,h,i)perylene	1	38	92	3.1	J
92-52-4	1,1'-Biphenyl	1	1.4	230	0.63	J B,Z
101-55-3	4-Bromophenyl Phenyl Ether	1	230	230	1.7	U
85-68-7	Butyl Benzyl Phthalate	1	230	230	2.9	U
105-60-2	Caprolactam	1	450	450	31	U
86-74-8	Carbazole	1	230	230	0.68	U
59-50-7	4-Chloro-3-methylphenol	1	230	230	2.4	U
106-47-8	4-Chloroaniline	1	230	230	27	U
111-91-1	Bis(2-chloroethoxy)methane	1	230	230	1.1	U
111-44-4	Bis(2-chloroethyl) Ether	1	230	230	1.2	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	230	230	0.43	U
91-58-7	2-Chloronaphthalene	1	230	230	0.59	U
95-57-8	2-Chlorophenol	1	230	230	0.52	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	230	230	0.61	U
218-01-9	Chrysene	1	30	23	0.65	
53-70-3	Dibenz(a,h)anthracene	1	28	92	0.73	J
132-64-9	Dibenzofuran	1	1.8	230	0.36	J
84-74-2	Di-n-butyl Phthalate	1	320	230	1.6	
91-94-1	3,3´-Dichlorobenzidine	1	450	450	110	U
120-83-2	2,4-Dichlorophenol	1	230	230	9.0	U
84-66-2	Diethyl Phthalate	1	3.2	230	0.51	J
105-67-9	2,4-Dimethylphenol	1	230	230	7.8	U
131-11-3	Dimethyl Phthalate	1	230	230	0.46	U
534-52-1	4,6-Dinitro-2-methylphenol	1	230	230	50	U
51-28-5	2,4-Dinitrophenol	1	450	450	45	U
121-14-2	2,4-Dinitrotoluene	1	26	230	18	J
606-20-2	2,6-Dinitrotoluene	1	230	230	2.2	U
117-84-0	Di-n-octyl Phthalate	1	230	230	13	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	13	230	1.8	J B,X
206-44-0	Fluoranthene	1	60	23	5.1	
86-73-7	Fluorene	1	1.8	23	0.38	J

03156

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 80510003.D

Sampled: 05/05/08 12:15 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:07

Solids: 73.18 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	230	230	1.1	U
87-68-3	Hexachlorobutadiene	1	230	230	0.94	U
77-47-4	Hexachlorocyclopentadiene	1	230	230	5.4	U
67-72-1	Hexachloroethane	1	230	230	1.1	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	42	92	0.96	J
78-59-1	Isophorone	1	1.4	230	0.55	J
91-57-6	2-Methylnaphthalene	1	3.6	230	0.65	J
95-48-7	2-Methylphenol	1	230	230	11	U
106-44-5	4-Methylphenol	1	230	230	12	U
91-20-3	Naphthalene	1	9.1	23	0.32	J BZ
88-74-4	2-Nitroaniline	1	230	230	18	U
99-09-2	3-Nitroaniline	1	230	230	15	U
100-01-6	4-Nitroaniline	1	230	230	31	U
98-95-3	Nitrobenzene	1	230	230	2.0	U
100-02-7	4-Nitrophenol	1	450	450	15	U
88-75-5	2-Nitrophenol	1	230	230	17	U
86-30-6	N-Nitroso-diphenylamine	1	18	230	1.1	J
621-64-7	N-Nitroso-di-n-propylamine	1	230	230	0.97	U
87-86-5	Pentachlorophenol	1	450	450	5.0	U
85-01-8	Phenanthrene	1	28	23	4.9	
108-95-2	Phenol	1	3.2	230	0.96	J
129-00-0	Pyrene	1	52	23	0.43	
95-94-3	1,2,4,5-Tetrachlorobenzene	1	230	230	1.1	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	230	230	22	U
88-06-2	2,4,6-Trichlorophenol	1	230	230	6.3	U
95-95-4	2,4,5-Trichlorophenol	1	230	230	8.2	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	920	830	90	35 - 105	
Phenol-d6	911	737	81	40 - 100	
Nitrobenzene-d5	474	387	82	35 - 100	
2-Fluorobiphenyl	456	411	90	45 - 105	
2,4,6-Tribromophenol	916	798	87	35 - 125	
o-Terphenyl	456	385	84	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	187692	4.85	155158	4.84	
Naphthalene-d8	620547	6.34	520254	6.33	
Acenaphthene-d10	372764	8.33	305751	8.33	
Phenanthrene-d10	591310	9.99	499730	9.98	
Chrysene-d12	455433	12.93	431600	12.91	

03151

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: 80510003.D

Sampled: 05/05/08 12:15 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:07

Solids: 73.18 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	430087	14.4	390586	14.38	

* Values outside of QC limits

03152

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 80510004.D

Sampled: 05/05/08 12:40 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:35

Solids: 87.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.76	19	0.46	J
208-96-8	Acenaphthylene	1	19	19	0.68	U
98-86-2	Acetophenone	1	190	190	7.7	U
120-12-7	Anthracene	1	19	19	0.49	U
1912-24-9	Atrazine	1	190	190	1.7	U
100-52-7	Benzaldehyde	1	190	190	30	U
56-55-3	Benzo(a)anthracene	1	1.1	19	0.61	J
50-32-8	Benzo(a)pyrene	1	11	19	1.2	J
205-99-2	Benzo(b)fluoranthene	1	11	19	0.97	J
207-08-9	Benzo(k)fluoranthene	1	19	19	0.82	U
191-24-2	Benzo(g,h,i)perylene	1	76	76	2.6	U
92-52-4	1,1'-Biphenyl	1	190	190	0.52	U
101-55-3	4-Bromophenyl Phenyl Ether	1	190	190	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	190	190	2.4	U
105-60-2	Caprolactam	1	380	380	26	U
86-74-8	Carbazole	1	190	190	0.57	U
59-50-7	4-Chloro-3-methylphenol	1	190	190	2.0	U
106-47-8	4-Chloroaniline	1	190	190	22	U
111-91-1	Bis(2-chloroethoxy)methane	1	190	190	0.91	U
111-44-4	Bis(2-chloroethyl) Ether	1	190	190	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	190	190	0.36	U
91-58-7	2-Chloronaphthalene	1	190	190	0.49	U
95-57-8	2-Chlorophenol	1	190	190	0.44	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	190	190	0.51	U
218-01-9	Chrysene	1	0.76	19	0.54	J
53-70-3	Dibenz(a,h)anthracene	1	76	76	0.61	U
132-64-9	Dibenzofuran	1	190	190	0.30	U
84-74-2	Di-n-butyl Phthalate	1	150	190	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	380	380	89	U
120-83-2	2,4-Dichlorophenol	1	190	190	7.5	U
84-66-2	Diethyl Phthalate	1	1.1	190	0.42	J
105-67-9	2,4-Dimethylphenol	1	190	190	6.5	U
131-11-3	Dimethyl Phthalate	1	190	190	0.39	U
534-52-1	4,6-Dinitro-2-methylphenol	1	190	190	42	U
51-28-5	2,4-Dinitrophenol	1	380	380	38	U
121-14-2	2,4-Dinitrotoluene	1	190	190	15	U
606-20-2	2,6-Dinitrotoluene	1	190	190	1.8	U
117-84-0	Di-n-octyl Phthalate	1	190	190	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	190	190	1.5	U
206-44-0	Fluoranthene	1	19	19	4.3	U
86-73-7	Fluorene	1	19	19	0.32	U

03186

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 80510004.D

Sampled: 05/05/08 12:40 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:35

Solids: 87.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	190	190	0.91	U
87-68-3	Hexachlorobutadiene	1	190	190	0.79	U
77-47-4	Hexachlorocyclopentadiene	1	190	190	4.5	U
67-72-1	Hexachloroethane	1	190	190	0.91	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	76	76	0.80	U
78-59-1	Isophorone	1	1.5	190	0.46	J
91-57-6	2-Methylnaphthalene	1	190	190	0.55	U
95-48-7	2-Methylphenol	1	190	190	9.3	U
106-44-5	4-Methylphenol	1	190	190	10	U
91-20-3	Naphthalene	1	6.1	19	0.27	J B2E
88-74-4	2-Nitroaniline	1	190	190	15	U
99-09-2	3-Nitroaniline	1	190	190	13	U
100-01-6	4-Nitroaniline	1	190	190	26	U
98-95-3	Nitrobenzene	1	190	190	1.7	U
100-02-7	4-Nitrophenol	1	380	380	13	U
88-75-5	2-Nitrophenol	1	190	190	14	U
86-30-6	N-Nitroso-diphenylamine	1	190	190	0.91	U
621-64-7	N-Nitroso-di-n-propylamine	1	190	190	0.81	U
87-86-5	Pentachlorophenol	1	380	380	4.2	U
85-01-8	Phenanthrene	1	19	19	4.1	U
108-95-2	Phenol	1	1.9	190	0.80	J
129-00-0	Pyrene	1	0.38	19	0.36	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	190	190	0.91	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	190	190	19	U
88-06-2	2,4,6-Trichlorophenol	1	190	190	5.3	U
95-95-4	2,4,5-Trichlorophenol	1	190	190	6.8	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	769	671	87	35 - 105	
Phenol-d6	761	603	79	40 - 100	
Nitrobenzene-d5	396	346	88	35 - 100	
2-Fluorobiphenyl	381	349	92	45 - 105	
2,4,6-Tribromophenol	765	568	74	35 - 125	
o-Terphenyl	381	326	86	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	179369	4.85	155158	4.84	
Naphthalene-d8	579426	6.33	520254	6.33	
Acenaphthene-d10	349378	8.34	305751	8.33	
Phenanthrene-d10	556354	9.99	499730	9.98	
Chrysene-d12	436175	12.92	431600	12.91	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: 80510004.D

Sampled: 05/05/08 12:40 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 19:35

Solids: 87.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	400745	14.4	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 80510005.D

Sampled: 05/05/08 13:20 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:04

Solids: 78.25 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	22	22	0.51	U
208-96-8	Acenaphthylene	1	22	22	0.77	U
98-86-2	Acetophenone	1	220	220	8.6	U
120-12-7	Anthracene	1	22	22	0.54	U
1912-24-9	Atrazine	1	220	220	1.9	U
100-52-7	Benzaldehyde	1	220	220	33	U
56-55-3	Benzo(a)anthracene	1	4.7	22	0.69	J
50-32-8	Benzo(a)pyrene	1	22	22	1.3	U
205-99-2	Benzo(b)fluoranthene	1	18	22	1.1	J
207-08-9	Benzo(k)fluoranthene	1	1.3	22	0.92	J
191-24-2	Benzo(g,h,i)perylene	1	86	86	2.9	U
92-52-4	1,1'-Biphenyl	1	1.3	220	0.59	J B,Z
101-55-3	4-Bromophenyl Phenyl Ether	1	220	220	1.6	U
85-68-7	Butyl Benzyl Phthalate	1	3.0	220	2.7	J
105-60-2	Caprolactam	1	420	420	29	U
86-74-8	Carbazole	1	220	220	0.64	U
59-50-7	4-Chloro-3-methylphenol	1	220	220	2.3	U
106-47-8	4-Chloroaniline	1	220	220	25	U
111-91-1	Bis(2-chloroethoxy)methane	1	220	220	1.0	U
111-44-4	Bis(2-chloroethyl) Ether	1	220	220	1.2	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	220	220	0.40	U
91-58-7	2-Chloronaphthalene	1	220	220	0.55	U
95-57-8	2-Chlorophenol	1	220	220	0.49	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	220	220	0.57	U
218-01-9	Chrysene	1	4.3	22	0.61	J
53-70-3	Dibenz(a,h)anthracene	1	86	86	0.69	U
132-64-9	Dibenzofuran	1	0.43	220	0.34	J
84-74-2	Di-n-butyl Phthalate	1	120	220	1.5	J
91-94-1	3,3'-Dichlorobenzidine	1	420	420	100	U
120-83-2	2,4-Dichlorophenol	1	220	220	8.4	U
84-66-2	Diethyl Phthalate	1	3.0	220	0.48	J
105-67-9	2,4-Dimethylphenol	1	220	220	7.3	U
131-11-3	Dimethyl Phthalate	1	220	220	0.43	U
534-52-1	4,6-Dinitro-2-methylphenol	1	220	220	47	U
51-28-5	2,4-Dinitrophenol	1	420	420	42	U
121-14-2	2,4-Dinitrotoluene	1	220	220	17	U
606-20-2	2,6-Dinitrotoluene	1	220	220	2.1	U
117-84-0	Di-n-octyl Phthalate	1	220	220	13	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	3.4	220	1.7	J B,X
206-44-0	Fluoranthene	1	22	22	4.8	U
86-73-7	Fluorene	1	22	22	0.36	U

03265

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 80510005.D

Sampled: 05/05/08 13:20 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:04

Solids: 78.25 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	220	220	1.0	U
87-68-3	Hexachlorobutadiene	1	220	220	0.88	U
77-47-4	Hexachlorocyclopentadiene	1	220	220	5.0	U
67-72-1	Hexachloroethane	1	220	220	1.0	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	86	86	0.89	U
78-59-1	Isophorone	1	2.6	220	0.51	J
91-57-6	2-Methylnaphthalene	1	2.1	220	0.61	J
95-48-7	2-Methylphenol	1	220	220	10	U
106-44-5	4-Methylphenol	1	220	220	12	U
91-20-3	Naphthalene	1	7.7	22	0.30	J B2 E
88-74-4	2-Nitroaniline	1	220	220	17	U
99-09-2	3-Nitroaniline	1	220	220	14	U
100-01-6	4-Nitroaniline	1	220	220	29	U
98-95-3	Nitrobenzene	1	220	220	1.9	U
100-02-7	4-Nitrophenol	1	420	420	14	U
88-75-5	2-Nitrophenol	1	220	220	16	U
86-30-6	N-Nitroso-diphenylamine	1	220	220	1.0	U
621-64-7	N-Nitroso-di-n-propylamine	1	220	220	0.91	U
87-86-5	Pentachlorophenol	1	420	420	4.7	U
85-01-8	Phenanthrene	1	22	22	4.6	U
108-95-2	Phenol	1	3.8	220	0.89	J
129-00-0	Pyrene	1	4.3	22	0.41	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	220	220	1.0	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	220	220	21	U
88-06-2	2,4,6-Trichlorophenol	1	220	220	5.9	U
95-95-4	2,4,5-Trichlorophenol	1	220	220	7.7	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	861	785	91	35 - 105	
Phenol-d6	852	680	80	40 - 100	
Nitrobenzene-d5	443	363	82	35 - 100	
2-Fluorobiphenyl	426	394	93	45 - 105	
2,4,6-Tribromophenol	856	773	90	35 - 125	
o-Terphenyl	426	364	86	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	179158	4.85	155158	4.84	
Naphthalene-d8	609129	6.34	520254	6.33	
Acenaphthene-d10	358028	8.33	305751	8.33	
Phenanthrene-d10	562513	9.99	499730	9.98	
Chrysene-d12	419980	12.93	431600	12.91	

03205

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: 80510005.D

Sampled: 05/05/08 13:20 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:04

Solids: 78.25 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	401060	14.4	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: 80513301.D

Sampled: 05/06/08 10:25 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:33

Solids: 86.32 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.46	U
208-96-8	Acenaphthylene	1	2.3	20	0.70	J
98-86-2	Acetophenone	1	200	200	7.8	U
120-12-7	Anthracene	1	1.5	20	0.49	J
1912-24-9	Atrazine	1	200	200	1.7	U
100-52-7	Benzaldehyde	1	200	200	30	U
56-55-3	Benzo(a)anthracene	1	4.6	20	0.62	J
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	0.98	
207-08-9	Benzo(k)fluoranthene	1	2.7	20	0.83	J
191-24-2	Benzo(g,h,i)perylene	1	78	78	2.7	U
92-52-4	1,1'-Biphenyl	1	200	200	0.53	U
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	200	200	2.4	U
105-60-2	Caprolactam	1	380	380	27	U
86-74-8	Carbazole	1	200	200	0.58	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.93	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.36	U
91-58-7	2-Chloronaphthalene	1	200	200	0.50	U
95-57-8	2-Chlorophenol	1	200	200	0.44	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.52	U
218-01-9	Chrysene	1	6.6	20	0.55	J
53-70-3	Dibenz(a,h)anthracene	1	78	78	0.62	U
132-64-9	Dibenzofuran	1	200	200	0.30	U
84-74-2	Di-n-butyl Phthalate	1	68	200	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	380	380	91	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.6	U
84-66-2	Diethyl Phthalate	1	3.5	200	0.43	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.6	U
131-11-3	Dimethyl Phthalate	1	200	200	0.39	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	42	U
51-28-5	2,4-Dinitrophenol	1	380	380	38	U
121-14-2	2,4-Dinitrotoluene	1	200	200	15	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	200	200	1.5	U
206-44-0	Fluoranthene	1	7.0	20	4.4	J
86-73-7	Fluorene	1	20	20	0.32	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: 80513301.D

Sampled: 05/06/08 10:25 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:33

Solids: 86.32 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.92	U
87-68-3	Hexachlorobutadiene	1	200	200	0.80	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.93	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	78	78	0.81	U
78-59-1	Isophorone	1	2.3	200	0.46	J
91-57-6	2-Methylnaphthalene	1	200	200	0.55	U
95-48-7	2-Methylphenol	1	200	200	9.4	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	7.0	20	0.27	J B7C
88-74-4	2-Nitroaniline	1	200	200	15	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.7	U
100-02-7	4-Nitrophenol	1	380	380	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.93	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.83	U
87-86-5	Pentachlorophenol	1	380	380	4.3	U
85-01-8	Phenanthrene	1	5.0	20	4.2	J
108-95-2	Phenol	1	1.2	200	0.81	J
129-00-0	Pyrene	1	10	20	0.37	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.93	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.3	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.0	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	780	646	83	35 - 105	
Phenol-d6	772	582	75	40 - 100	
Nitrobenzene-d5	402	321	80	35 - 100	
2-Fluorobiphenyl	386	342	89	45 - 105	
2,4,6-Tribromophenol	776	524	68	35 - 125	
o-Terphenyl	386	303	79	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	173101	4.85	155158	4.84	
Naphthalene-d8	573501	6.34	520254	6.33	
Acenaphthene-d10	345175	8.34	305751	8.33	
Phenanthrene-d10	532900	10	499730	9.98	
Chrysene-d12	371683	12.93	431600	12.91	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: 80513301.D

Sampled: 05/06/08 10:25 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 20:33

Solids: 86.32 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	326189	14.4	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: 80513302.D

Sampled: 05/06/08 11:10 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:01

Solids: 81.01 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	1.6	21	0.49	J
208-96-8	Acenaphthylene	1	21	21	0.74	U
98-86-2	Acetophenone	1	210	210	8.3	U
120-12-7	Anthracene	1	2.5	21	0.53	J
1912-24-9	Atrazine	1	210	210	1.8	U
100-52-7	Benzaldehyde	1	81	210	32	J
56-55-3	Benzo(a)anthracene	1	21	21	0.66	U
50-32-8	Benzo(a)pyrene	1	21	21	1.3	U
205-99-2	Benzo(b)fluoranthene	1	21	21	1.0	U
207-08-9	Benzo(k)fluoranthene	1	21	21	0.88	U
191-24-2	Benzo(g,h,i)perylene	1	83	83	2.8	U
92-52-4	1,1'-Biphenyl	1	3.3	210	0.57	J B,Z
101-55-3	4-Bromophenyl Phenyl Ether	1	210	210	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	16	210	2.6	J
105-60-2	Caprolactam	1	410	410	28	U
86-74-8	Carbazole	1	210	210	0.61	U
59-50-7	4-Chloro-3-methylphenol	1	210	210	2.2	U
106-47-8	4-Chloroaniline	1	210	210	24	U
111-91-1	Bis(2-chloroethoxy)methane	1	210	210	0.99	U
111-44-4	Bis(2-chloroethyl) Ether	1	210	210	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	210	210	0.39	U
91-58-7	2-Chloronaphthalene	1	210	210	0.53	U
95-57-8	2-Chlorophenol	1	210	210	0.47	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	210	210	0.55	U
218-01-9	Chrysene	1	21	21	0.59	U
53-70-3	Dibenz(a,h)anthracene	1	83	83	0.66	U
132-64-9	Dibenzofuran	1	210	210	0.32	U
84-74-2	Di-n-butyl Phthalate	1	60	210	1.5	J
91-94-1	3,3'-Dichlorobenzidine	1	410	410	97	U
120-83-2	2,4-Dichlorophenol	1	210	210	8.1	U
84-66-2	Diethyl Phthalate	1	7.8	210	0.46	J
105-67-9	2,4-Dimethylphenol	1	210	210	7.0	U
131-11-3	Dimethyl Phthalate	1	210	210	0.42	U
534-52-1	4,6-Dinitro-2-methylphenol	1	210	210	45	U
51-28-5	2,4-Dinitrophenol	1	410	410	41	U
121-14-2	2,4-Dinitrotoluene	1	210	210	16	U
606-20-2	2,6-Dinitrotoluene	1	210	210	2.0	U
117-84-0	Di-n-octyl Phthalate	1	33	210	12	J
117-81-7	Bis(2-ethylhexyl) Phthalate	1	56	210	1.6	J
206-44-0	Fluoranthene	1	7.8	21	4.6	J
86-73-7	Fluorene	1	3.7	21	0.35	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: 80513302.D

Sampled: 05/06/08 11:10 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:01

Solids: 81.01 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	210	210	0.98	U
87-68-3	Hexachlorobutadiene	1	210	210	0.85	U
77-47-4	Hexachlorocyclopentadiene	1	210	210	4.9	U
67-72-1	Hexachloroethane	1	210	210	0.99	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	83	83	0.86	U
78-59-1	Isophorone	1	7.4	210	0.50	J
91-57-6	2-Methylnaphthalene	1	28	210	0.59	J
95-48-7	2-Methylphenol	1	210	210	10	U
106-44-5	4-Methylphenol	1	210	210	11	U
91-20-3	Naphthalene	1	47	21	0.29	
88-74-4	2-Nitroaniline	1	210	210	16	U
99-09-2	3-Nitroaniline	1	210	210	14	U
100-01-6	4-Nitroaniline	1	210	210	28	U
98-95-3	Nitrobenzene	1	210	210	1.8	U
100-02-7	4-Nitrophenol	1	410	410	14	U
88-75-5	2-Nitrophenol	1	210	210	15	U
86-30-6	N-Nitroso-diphenylamine	1	23	210	0.99	J
621-64-7	N-Nitroso-di-n-propylamine	1	210	210	0.88	U
87-86-5	Pentachlorophenol	1	410	410	4.5	U
85-01-8	Phenanthrene	1	16	21	4.5	J
108-95-2	Phenol	1	210	210	0.86	U
129-00-0	Pyrene	1	4.5	21	0.39	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	210	210	0.99	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	210	210	20	U
88-06-2	2,4,6-Trichlorophenol	1	210	210	5.7	U
95-95-4	2,4,5-Trichlorophenol	1	210	210	7.4	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	831	742	89	35 - 105	
Phenol-d6	823	642	78	40 - 100	
Nitrobenzene-d5	428	361	84	35 - 100	
2-Fluorobiphenyl	411	384	93	45 - 105	
2,4,6-Tribromophenol	827	730	88	35 - 125	
o-Terphenyl	411	370	90	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	189432	4.85	155158	4.84	
Naphthalene-d8	592159	6.34	520254	6.33	
Acenaphthene-d10	352805	8.34	305751	8.33	
Phenanthrene-d10	550884	10	499730	9.98	
Chrysene-d12	425102	12.97	431600	12.91	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: 80513302.D

Sampled: 05/06/08 11:10 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:01

Solids: 81.01 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	343282	14.44	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: 80513303.D

Sampled: 05/06/08 13:05 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:29

Solids: 87.40 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	19	19	0.46	U
208-96-8	Acenaphthylene	1	3.1	19	0.69	J
98-86-2	Acetophenone	1	190	190	7.7	U
120-12-7	Anthracene	1	19	19	0.49	U
1912-24-9	Atrazine	1	190	190	1.7	U
100-52-7	Benzaldehyde	1	40	190	30	J
56-55-3	Benzo(a)anthracene	1	5.3	19	0.61	J
50-32-8	Benzo(a)pyrene	1	19	19	1.2	U
205-99-2	Benzo(b)fluoranthene	1	18	19	0.97	J
207-08-9	Benzo(k)fluoranthene	1	2.7	19	0.82	J
191-24-2	Benzo(g,h,i)perylene	1	77	77	2.6	U
92-52-4	1,1'-Biphenyl	1	1.5	190	0.53	J B,Z
101-55-3	4-Bromophenyl Phenyl Ether	1	190	190	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	12	190	2.4	J
105-60-2	Caprolactam	1	380	380	26	U
86-74-8	Carbazole	1	190	190	0.57	U
59-50-7	4-Chloro-3-methylphenol	1	190	190	2.0	U
106-47-8	4-Chloroaniline	1	190	190	22	U
111-91-1	Bis(2-chloroethoxy)methane	1	190	190	0.92	U
111-44-4	Bis(2-chloroethyl) Ether	1	190	190	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	190	190	0.36	U
91-58-7	2-Chloronaphthalene	1	190	190	0.49	U
95-57-8	2-Chlorophenol	1	190	190	0.44	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	190	190	0.51	U
218-01-9	Chrysene	1	4.6	19	0.54	J
53-70-3	Dibenz(a,h)anthracene	1	77	77	0.61	U
132-64-9	Dibenzofuran	1	0.76	190	0.30	J
84-74-2	Di-n-butyl Phthalate	1	27	190	1.4	J B,Z
91-94-1	3,3'-Dichlorobenzidine	1	380	380	90	U
120-83-2	2,4-Dichlorophenol	1	190	190	7.5	U
84-66-2	Diethyl Phthalate	1	4.2	190	0.43	J
105-67-9	2,4-Dimethylphenol	1	190	190	6.5	U
131-11-3	Dimethyl Phthalate	1	190	190	0.39	U
534-52-1	4,6-Dinitro-2-methylphenol	1	190	190	42	U
51-28-5	2,4-Dinitrophenol	1	380	380	38	U
121-14-2	2,4-Dinitrotoluene	1	190	190	15	U
606-20-2	2,6-Dinitrotoluene	1	190	190	1.9	U
117-84-0	Di-n-octyl Phthalate	1	190	190	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	9.5	190	1.5	J B,X
206-44-0	Fluoranthene	1	5.7	19	4.3	J
86-73-7	Fluorene	1	19	19	0.32	U

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ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: 80513303.D

Sampled: 05/06/08 13:05 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:29

Solids: 87.40 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	190	190	0.91	U
87-68-3	Hexachlorobutadiene	1	190	190	0.79	U
77-47-4	Hexachlorocyclopentadiene	1	190	190	4.5	U
67-72-1	Hexachloroethane	1	190	190	0.92	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	77	77	0.80	U
78-59-1	Isophorone	1	3.8	190	0.46	J
91-57-6	2-Methylnaphthalene	1	0.76	190	0.55	J
95-48-7	2-Methylphenol	1	190	190	9.3	U
106-44-5	4-Methylphenol	1	190	190	10	U
91-20-3	Naphthalene	1	6.9	19	0.27	J b7E
88-74-4	2-Nitroaniline	1	190	190	15	U
99-09-2	3-Nitroaniline	1	190	190	13	U
100-01-6	4-Nitroaniline	1	190	190	26	U
98-95-3	Nitrobenzene	1	190	190	1.7	U
100-02-7	4-Nitrophenol	1	380	380	13	U
88-75-5	2-Nitrophenol	1	190	190	14	U
86-30-6	N-Nitroso-diphenylamine	1	190	190	0.92	U
621-64-7	N-Nitroso-di-n-propylamine	1	190	190	0.82	U
87-86-5	Pentachlorophenol	1	380	380	4.2	U
85-01-8	Phenanthrene	1	19	19	4.1	U
108-95-2	Phenol	1	190	190	0.80	U
129-00-0	Pyrene	1	6.5	19	0.36	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	190	190	0.92	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	190	190	19	U
88-06-2	2,4,6-Trichlorophenol	1	190	190	5.3	U
95-95-4	2,4,5-Trichlorophenol	1	190	190	6.9	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	770	679	88	35 - 105	
Phenol-d6	763	587	77	40 - 100	
Nitrobenzene-d5	397	334	84	35 - 100	
2-Fluorobiphenyl	381	333	87	45 - 105	
2,4,6-Tribromophenol	767	703	92	35 - 125	
o-Terphenyl	381	314	82	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	169801	4.85	155158	4.84	
Naphthalene-d8	558883	6.34	520254	6.33	
Acenaphthene-d10	343972	8.34	305751	8.33	
Phenanthrene-d10	532626	10	499730	9.98	
Chrysene-d12	419151	12.94	431600	12.91	

03282

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: 80513303.D

Sampled: 05/06/08 13:05 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:29

Solids: 87.40 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	320849	14.42	390586	14.38	

* Values outside of QC limits

83283

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: 80513304.D

Sampled: 05/06/08 13:45 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:58

Solids: 91.38 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	19	19	0.44	U
208-96-8	Acenaphthylene	1	19	19	0.66	U
98-86-2	Acetophenone	1	190	190	7.4	U
120-12-7	Anthracene	1	19	19	0.47	U
1912-24-9	Atrazine	1	190	190	1.6	U
100-52-7	Benzaldehyde	1	190	190	29	U
56-55-3	Benzo(a)anthracene	1	19	19	0.59	U
50-32-8	Benzo(a)pyrene	1	19	19	1.1	U
205-99-2	Benzo(b)fluoranthene	1	19	19	0.93	U
207-08-9	Benzo(k)fluoranthene	1	19	19	0.78	U
191-24-2	Benzo(g,h,i)perylene	1	73	73	2.5	U
92-52-4	1,1'-Biphenyl	1	190	190	0.50	U
101-55-3	4-Bromophenyl Phenyl Ether	1	190	190	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	190	190	2.3	U
105-60-2	Caprolactam	1	360	360	25	U
86-74-8	Carbazole	1	190	190	0.54	U
59-50-7	4-Chloro-3-methylphenol	1	190	190	2.0	U
106-47-8	4-Chloroaniline	1	190	190	21	U
111-91-1	Bis(2-chloroethoxy)methane	1	190	190	0.88	U
111-44-4	Bis(2-chloroethyl) Ether	1	190	190	0.98	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	190	190	0.34	U
91-58-7	2-Chloronaphthalene	1	190	190	0.47	U
95-57-8	2-Chlorophenol	1	190	190	0.42	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	190	190	0.49	U
218-01-9	Chrysene	1	19	19	0.52	U
53-70-3	Dibenz(a,h)anthracene	1	73	73	0.59	U
132-64-9	Dibenzofuran	1	190	190	0.29	U
84-74-2	Di-n-butyl Phthalate	1	13	190	1.3	J B2X
91-94-1	3,3'-Dichlorobenzidine	1	360	360	86	U
120-83-2	2,4-Dichlorophenol	1	190	190	7.2	U
84-66-2	Diethyl Phthalate	1	0.73	190	0.41	J
105-67-9	2,4-Dimethylphenol	1	190	190	6.2	U
131-11-3	Dimethyl Phthalate	1	190	190	0.37	U
534-52-1	4,6-Dinitro-2-methylphenol	1	190	190	40	U
51-28-5	2,4-Dinitrophenol	1	360	360	36	U
121-14-2	2,4-Dinitrotoluene	1	190	190	14	U
606-20-2	2,6-Dinitrotoluene	1	190	190	1.8	U
117-84-0	Di-n-octyl Phthalate	1	190	190	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	2.2	190	1.4	J B2X
206-44-0	Fluoranthene	1	19	19	4.1	U
86-73-7	Fluorene	1	19	19	0.31	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: 80513304.D

Sampled: 05/06/08 13:45 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:58

Solids: 91.38 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	190	190	0.87	U
87-68-3	Hexachlorobutadiene	1	190	190	0.75	U
77-47-4	Hexachlorocyclopentadiene	1	190	190	4.3	U
67-72-1	Hexachloroethane	1	190	190	0.88	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	73	73	0.77	U
78-59-1	Isophorone	1	0.73	190	0.44	J
91-57-6	2-Methylnaphthalene	1	190	190	0.52	U
95-48-7	2-Methylphenol	1	190	190	8.9	U
106-44-5	4-Methylphenol	1	190	190	10	U
91-20-3	Naphthalene	1	5.5	19	0.25	J B77
88-74-4	2-Nitroaniline	1	190	190	14	U
99-09-2	3-Nitroaniline	1	190	190	12	U
100-01-6	4-Nitroaniline	1	190	190	25	U
98-95-3	Nitrobenzene	1	190	190	1.6	U
100-02-7	4-Nitrophenol	1	360	360	12	U
88-75-5	2-Nitrophenol	1	190	190	13	U
86-30-6	N-Nitroso-diphenylamine	1	190	190	0.88	U
621-64-7	N-Nitroso-di-n-propylamine	1	190	190	0.78	U
87-86-5	Pentachlorophenol	1	360	360	4.0	U
85-01-8	Phenanthrene	1	19	19	4.0	U
108-95-2	Phenol	1	190	190	0.77	U
129-00-0	Pyrene	1	19	19	0.35	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	190	190	0.88	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	190	190	18	U
88-06-2	2,4,6-Trichlorophenol	1	190	190	5.0	U
95-95-4	2,4,5-Trichlorophenol	1	190	190	6.6	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	737	584	79	35 - 105	
Phenol-d6	730	517	71	40 - 100	
Nitrobenzene-d5	379	285	75	35 - 100	
2-Fluorobiphenyl	365	311	85	45 - 105	
2,4,6-Tribromophenol	733	453	62	35 - 125	
o-Terphenyl	365	287	79	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	158919	4.86	155158	4.84	
Naphthalene-d8	542357	6.35	520254	6.33	
Acenaphthene-d10	319729	8.34	305751	8.33	
Phenanthrene-d10	519198	10	499730	9.98	
Chrysene-d12	415787	12.93	431600	12.91	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: 80513304.D

Sampled: 05/06/08 13:45 Prepared: 05/09/08 10:49 Analyzed: 05/12/08 21:58

Solids: 91.38 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8051997 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	326894	14.41	390586	14.38	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 80513305.D

Sampled: 05/06/08 14:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 15:34

Solids: 80.57 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	21	21	0.50	U
208-96-8	Acenaphthylene	1	1.2	21	0.74	J
98-86-2	Acetophenone	1	210	210	8.3	U
120-12-7	Anthracene	1	1.2	21	0.53	J
1912-24-9	Atrazine	1	210	210	1.8	U
100-52-7	Benzaldehyde	1	210	210	33	U
56-55-3	Benzo(a)anthracene	1	17	21	0.67	J
50-32-8	Benzo(a)pyrene	1	23	21	1.3	
205-99-2	Benzo(b)fluoranthene	1	38	21	1.1	
207-08-9	Benzo(k)fluoranthene	1	5.0	21	0.89	J
191-24-2	Benzo(g,h,i)perylene	1	17	83	2.8	J
92-52-4	1,1'-Biphenyl	1	0.83	210	0.57	J B,F
101-55-3	4-Bromophenyl Phenyl Ether	1	210	210	1.6	U
85-68-7	Butyl Benzyl Phthalate	1	210	210	2.6	U
105-60-2	Caprolactam	1	410	410	28	U
86-74-8	Carbazole	1	210	210	0.62	U
59-50-7	4-Chloro-3-methylphenol	1	210	210	2.2	U
106-47-8	4-Chloroaniline	1	210	210	24	U
111-91-1	Bis(2-chloroethoxy)methane	1	210	210	0.99	U
111-44-4	Bis(2-chloroethyl) Ether	1	210	210	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	210	210	0.39	U
91-58-7	2-Chloronaphthalene	1	210	210	0.54	U
95-57-8	2-Chlorophenol	1	210	210	0.48	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	210	210	0.56	U
218-01-9	Chrysene	1	12	21	0.59	J
53-70-3	Dibenz(a,h)anthracene	1	83	83	0.67	U
132-64-9	Dibenzofuran	1	0.83	210	0.33	J
84-74-2	Di-n-butyl Phthalate	1	22	210	1.5	J B,X
91-94-1	3,3'-Dichlorobenzidine	1	410	410	97	U
120-83-2	2,4-Dichlorophenol	1	210	210	8.2	U
84-66-2	Diethyl Phthalate	1	2.9	210	0.46	J
105-67-9	2,4-Dimethylphenol	1	210	210	7.1	U
131-11-3	Dimethyl Phthalate	1	0.83	210	0.42	J
534-52-1	4,6-Dinitro-2-methylphenol	1	210	210	45	U
51-28-5	2,4-Dinitrophenol	1	410	410	41	U
121-14-2	2,4-Dinitrotoluene	1	210	210	16	U
606-20-2	2,6-Dinitrotoluene	1	210	210	2.0	U
117-84-0	Di-n-octyl Phthalate	1	210	210	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	5.0	210	1.6	J B,X
206-44-0	Fluoranthene	1	19	21	4.7	J
86-73-7	Fluorene	1	0.41	21	0.35	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 80513305.D

Sampled: 05/06/08 14:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 15:34

Solids: 80.57 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	210	210	0.99	U
87-68-3	Hexachlorobutadiene	1	210	210	0.86	U
77-47-4	Hexachlorocyclopentadiene	1	210	210	4.9	U
67-72-1	Hexachloroethane	1	210	210	0.99	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	26	83	0.87	J
78-59-1	Isophorone	1	0.83	210	0.50	J
91-57-6	2-Methylnaphthalene	1	1.7	210	0.59	J
95-48-7	2-Methylphenol	1	210	210	10	U
106-44-5	4-Methylphenol	1	210	210	11	U
91-20-3	Naphthalene	1	6.6	21	0.29	J B,Z
88-74-4	2-Nitroaniline	1	210	210	16	U
99-09-2	3-Nitroaniline	1	210	210	14	U
100-01-6	4-Nitroaniline	1	210	210	29	U
98-95-3	Nitrobenzene	1	210	210	1.8	U
100-02-7	4-Nitrophenol	1	410	410	14	U
88-75-5	2-Nitrophenol	1	210	210	15	U
86-30-6	N-Nitroso-diphenylamine	1	210	210	0.99	U
621-64-7	N-Nitroso-di-n-propylamine	1	210	210	0.88	U
87-86-5	Pentachlorophenol	1	410	410	4.6	U
85-01-8	Phenanthrene	1	7.4	21	4.5	J
108-95-2	Phenol	1	2.9	210	0.87	J
129-00-0	Pyrene	1	19	21	0.39	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	210	210	0.99	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	210	210	20	U
88-06-2	2,4,6-Trichlorophenol	1	210	210	5.7	U
95-95-4	2,4,5-Trichlorophenol	1	210	210	7.4	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	836	738	88	35 - 105	
Phenol-d6	827	624	75	40 - 100	
Nitrobenzene-d5	430	337	78	35 - 100	
2-Fluorobiphenyl	414	352	85	45 - 105	
2,4,6-Tribromophenol	832	700	84	35 - 125	
o-Terphenyl	414	250	60	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	210761	4.77	205931	4.76	
Naphthalene-d8	683878	6.26	670578	6.26	
Acenaphthene-d10	411124	8.26	407873	8.26	
Phenanthrene-d10	648992	9.91	610785	9.91	
Chrysene-d12	520248	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: 80513305.D

Sampled: 05/06/08 14:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 15:34

Solids: 80.57 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	525589	14.32	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 80513306.D

Sampled: 05/06/08 14:30 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 16:02

Solids: 77.95 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	22	22	0.51	U
208-96-8	Acenaphthylene	1	0.86	22	0.77	J
98-86-2	Acetophenone	1	220	220	8.6	U
120-12-7	Anthracene	1	1.3	22	0.55	J J,m
1912-24-9	Atrazine	1	220	220	1.9	U
100-52-7	Benzaldehyde	1	47	220	34	J J,m
56-55-3	Benzo(a)anthracene	1	9.4	22	0.69	J
50-32-8	Benzo(a)pyrene	1	20	22	1.3	J J,m
205-99-2	Benzo(b)fluoranthene	1	30	22	1.1	J,d
207-08-9	Benzo(k)fluoranthene	1	6.0	22	0.92	J J,d
191-24-2	Benzo(g,h,i)perylene	1	20	86	2.9	J J,m
92-52-4	1,1'-Biphenyl	1	220	220	0.59	U
101-55-3	4-Bromophenyl Phenyl Ether	1	220	220	1.6	U
85-68-7	Butyl Benzyl Phthalate	1	220	220	2.7	U
105-60-2	Caprolactam	1	420	420	29	U
86-74-8	Carbazole	1	220	220	0.64	U
59-50-7	4-Chloro-3-methylphenol	1	220	220	2.3	U
106-47-8	4-Chloroaniline	1	220	220	25	U
111-91-1	Bis(2-chloroethoxy)methane	1	220	220	1.0	U
111-44-4	Bis(2-chloroethyl) Ether	1	220	220	1.2	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	220	220	0.40	U
91-58-7	2-Chloronaphthalene	1	220	220	0.55	U
95-57-8	2-Chlorophenol	1	220	220	0.49	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	220	220	0.57	U
218-01-9	Chrysene	1	6.4	22	0.61	J J,m
53-70-3	Dibenz(a,h)anthracene	1	86	86	0.69	U
132-64-9	Dibenzofuran	1	0.43	220	0.34	J
84-74-2	Di-n-butyl Phthalate	1	16	220	1.5	J B,X
91-94-1	3,3'-Dichlorobenzidine	1	420	420	100	U
120-83-2	2,4-Dichlorophenol	1	220	220	8.4	U
84-66-2	Diethyl Phthalate	1	1.7	220	0.48	J
105-67-9	2,4-Dimethylphenol	1	220	220	7.3	U
131-11-3	Dimethyl Phthalate	1	220	220	0.43	U
534-52-1	4,6-Dinitro-2-methylphenol	1	220	220	47	U UJ,m
51-28-5	2,4-Dinitrophenol	1	420	420	42	U UJ,m
121-14-2	2,4-Dinitrotoluene	1	220	220	17	U
606-20-2	2,6-Dinitrotoluene	1	220	220	2.1	U
117-84-0	Di-n-octyl Phthalate	1	27	220	13	J J,d
117-81-7	Bis(2-ethylhexyl) Phthalate	1	9.8	220	1.7	J B,X
206-44-0	Fluoranthene	1	22	22	4.8	U
86-73-7	Fluorene	1	22	22	0.36	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 80513306.D

Sampled: 05/06/08 14:30 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 16:02

Solids: 77.95 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	220	220	1.0	U
87-68-3	Hexachlorobutadiene	1	220	220	0.88	U
77-47-4	Hexachlorocyclopentadiene	1	220	220	5.0	U
67-72-1	Hexachloroethane	1	220	220	1.0	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	28	86	0.90	J J,d
78-59-1	Isophorone	1	3.4	220	0.51	J
91-57-6	2-Methylnaphthalene	1	1.3	220	0.61	J
95-48-7	2-Methylphenol	1	220	220	10	U
106-44-5	4-Methylphenol	1	220	220	12	U
91-20-3	Naphthalene	1	7.7	22	0.30	J B,E
88-74-4	2-Nitroaniline	1	220	220	17	U
99-09-2	3-Nitroaniline	1	220	220	14	U
100-01-6	4-Nitroaniline	1	220	220	30	U
98-95-3	Nitrobenzene	1	220	220	1.9	U
100-02-7	4-Nitrophenol	1	420	420	14	U
88-75-5	2-Nitrophenol	1	220	220	16	U
86-30-6	N-Nitroso-diphenylamine	1	220	220	1.0	U
621-64-7	N-Nitroso-di-n-propylamine	1	220	220	0.91	U
87-86-5	Pentachlorophenol	1	420	420	4.7	U
85-01-8	Phenanthrene	1	22	22	4.6	U
108-95-2	Phenol	1	2.6	220	0.90	J
129-00-0	Pyrene	1	7.3	22	0.41	J J,d
95-94-3	1,2,4,5-Tetrachlorobenzene	1	220	220	1.0	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	220	220	21	U
88-06-2	2,4,6-Trichlorophenol	1	220	220	5.9	U
95-95-4	2,4,5-Trichlorophenol	1	220	220	7.7	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	864	724	84	35 - 105	
Phenol-d6	855	651	76	40 - 100	
Nitrobenzene-d5	445	346	78	35 - 100	
2-Fluorobiphenyl	428	351	82	45 - 105	
2,4,6-Tribromophenol	859	635	74	35 - 125	
o-Terphenyl	428	260	61	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	215243	4.78	205931	4.76	
Naphthalene-d8	714186	6.26	670578	6.26	
Acenaphthene-d10	426809	8.26	407873	8.26	
Phenanthrene-d10	657385	9.91	610785	9.91	
Chrysene-d12	413799	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: 80513306.D

Sampled: 05/06/08 14:30 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 16:02

Solids: 77.95 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	388834	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: 80513307.D

Sampled: 05/06/08 15:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:27

Solids: 77.47 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	1.3	22	0.52	J
208-96-8	Acenaphthylene	1	0.86	22	0.77	J
98-86-2	Acetophenone	1	220	220	8.7	U
120-12-7	Anthracene	1	0.86	22	0.55	J
1912-24-9	Atrazine	1	220	220	1.9	U
100-52-7	Benzaldehyde	1	220	220	34	U
56-55-3	Benzo(a)anthracene	1	6.9	22	0.69	J
50-32-8	Benzo(a)pyrene	1	17	22	1.3	J
205-99-2	Benzo(b)fluoranthene	1	23	22	1.1	
207-08-9	Benzo(k)fluoranthene	1	4.3	22	0.92	J
191-24-2	Benzo(g,h,i)perylene	1	86	86	3.0	U
92-52-4	1,1'-Biphenyl	1	0.86	220	0.59	J B,Z
101-55-3	4-Bromophenyl Phenyl Ether	1	220	220	1.6	U
85-68-7	Butyl Benzyl Phthalate	1	3.0	220	2.7	J
105-60-2	Caprolactam	1	430	430	30	U
86-74-8	Carbazole	1	220	220	0.64	U
59-50-7	4-Chloro-3-methylphenol	1	220	220	2.3	U
106-47-8	4-Chloroaniline	1	220	220	25	U
111-91-1	Bis(2-chloroethoxy)methane	1	220	220	1.0	U
111-44-4	Bis(2-chloroethyl) Ether	1	220	220	1.2	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	220	220	0.40	U
91-58-7	2-Chloronaphthalene	1	220	220	0.56	U
95-57-8	2-Chlorophenol	1	220	220	0.49	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	220	220	0.58	U
218-01-9	Chrysene	1	7.7	22	0.61	J
53-70-3	Dibenz(a,h)anthracene	1	86	86	0.69	U
132-64-9	Dibenzofuran	1	0.86	220	0.34	J
84-74-2	Di-n-butyl Phthalate	1	46	220	1.5	J B,X
91-94-1	3,3'-Dichlorobenzidine	1	430	430	100	U
120-83-2	2,4-Dichlorophenol	1	220	220	8.5	U
84-66-2	Diethyl Phthalate	1	2.2	220	0.48	J
105-67-9	2,4-Dimethylphenol	1	220	220	7.4	U
131-11-3	Dimethyl Phthalate	1	220	220	0.44	U
534-52-1	4,6-Dinitro-2-methylphenol	1	220	220	47	U
51-28-5	2,4-Dinitrophenol	1	430	430	43	U
121-14-2	2,4-Dinitrotoluene	1	220	220	17	U
606-20-2	2,6-Dinitrotoluene	1	220	220	2.1	U
117-84-0	Di-n-octyl Phthalate	1	220	220	13	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	9.5	220	1.7	J B,X
206-44-0	Fluoranthene	1	5.2	22	4.9	J
86-73-7	Fluorene	1	0.43	22	0.36	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: 80513307.D

Sampled: 05/06/08 15:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:27

Solids: 77.47 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	220	220	1.0	U
87-68-3	Hexachlorobutadiene	1	220	220	0.89	U
77-47-4	Hexachlorocyclopentadiene	1	220	220	5.1	U
67-72-1	Hexachloroethane	1	220	220	1.0	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	86	86	0.90	U
78-59-1	Isophorone	1	2.6	220	0.52	J
91-57-6	2-Methylnaphthalene	1	1.3	220	0.62	J
95-48-7	2-Methylphenol	1	220	220	10	U
106-44-5	4-Methylphenol	1	220	220	12	U
91-20-3	Naphthalene	1	6.9	22	0.30	J B
88-74-4	2-Nitroaniline	1	220	220	17	U
99-09-2	3-Nitroaniline	1	220	220	14	U
100-01-6	4-Nitroaniline	1	220	220	30	U
98-95-3	Nitrobenzene	1	220	220	1.9	U
100-02-7	4-Nitrophenol	1	430	430	14	U
88-75-5	2-Nitrophenol	1	220	220	16	U
86-30-6	N-Nitroso-diphenylamine	1	220	220	1.0	U
621-64-7	N-Nitroso-di-n-propylamine	1	220	220	0.92	U
87-86-5	Pentachlorophenol	1	430	430	4.8	U
85-01-8	Phenanthrene	1	22	22	4.7	U
108-95-2	Phenol	1	2.6	220	0.90	J
129-00-0	Pyrene	1	8.2	22	0.41	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	220	220	1.0	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	220	220	21	U
88-06-2	2,4,6-Trichlorophenol	1	220	220	5.9	U
95-95-4	2,4,5-Trichlorophenol	1	220	220	7.7	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	869	723	83	35 - 105	
Phenol-d6	861	609	71	40 - 100	
Nitrobenzene-d5	447	362	81	35 - 100	
2-Fluorobiphenyl	430	370	86	45 - 105	
2,4,6-Tribromophenol	865	710	82	35 - 125	
o-Terphenyl	430	302	70	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	220814	4.78	205931	4.76	
Naphthalene-d8	714595	6.26	670578	6.26	
Acenaphthene-d10	426792	8.27	407873	8.26	
Phenanthrene-d10	675791	9.92	610785	9.91	
Chrysene-d12	436923	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: 80513307.D

Sampled: 05/06/08 15:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:27

Solids: 77.47 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	415889	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: 80513308.D

Sampled: 05/06/08 15:25 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:56

Solids: 84.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.47	U
208-96-8	Acenaphthylene	1	20	20	0.71	U
98-86-2	Acetophenone	1	200	200	7.9	U
120-12-7	Anthracene	1	20	20	0.50	U
1912-24-9	Atrazine	1	200	200	1.8	U
100-52-7	Benzaldehyde	1	200	200	31	U
56-55-3	Benzo(a)anthracene	1	1.2	20	0.63	J
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	1.0	U
207-08-9	Benzo(k)fluoranthene	1	20	20	0.85	U
191-24-2	Benzo(g,h,i)perylene	1	79	79	2.7	U
92-52-4	1,1'-Biphenyl	1	200	200	0.54	U
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	200	200	2.5	U
105-60-2	Caprolactam	1	390	390	27	U
86-74-8	Carbazole	1	200	200	0.59	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.95	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.37	U
91-58-7	2-Chloronaphthalene	1	200	200	0.51	U
95-57-8	2-Chlorophenol	1	200	200	0.45	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.53	U
218-01-9	Chrysene	1	0.79	20	0.56	J
53-70-3	Dibenz(a,h)anthracene	1	79	79	0.63	U
132-64-9	Dibenzofuran	1	200	200	0.31	U
84-74-2	Di-n-butyl Phthalate	1	17	200	1.4	J B2X
91-94-1	3,3'-Dichlorobenzidine	1	390	390	93	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.8	U
84-66-2	Diethyl Phthalate	1	1.2	200	0.44	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.7	U
131-11-3	Dimethyl Phthalate	1	200	200	0.40	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	43	U
51-28-5	2,4-Dinitrophenol	1	390	390	39	U
121-14-2	2,4-Dinitrotoluene	1	200	200	16	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	28	200	1.5	J B2X
206-44-0	Fluoranthene	1	20	20	4.4	U
86-73-7	Fluorene	1	20	20	0.33	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: 80513308.D

Sampled: 05/06/08 15:25 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:56

Solids: 84.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.94	U
87-68-3	Hexachlorobutadiene	1	200	200	0.81	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.95	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	79	79	0.83	U
78-59-1	Isophorone	1	0.79	200	0.47	J
91-57-6	2-Methylnaphthalene	1	200	200	0.57	U
95-48-7	2-Methylphenol	1	200	200	9.6	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	5.9	20	0.28	J B17
88-74-4	2-Nitroaniline	1	200	200	16	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.8	U
100-02-7	4-Nitrophenol	1	390	390	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.95	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.84	U
87-86-5	Pentachlorophenol	1	390	390	4.3	U
85-01-8	Phenanthrene	1	20	20	4.3	U
108-95-2	Phenol	1	1.2	200	0.83	J
129-00-0	Pyrene	1	0.39	20	0.37	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.95	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.4	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.1	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	796	618	78	35 - 105	
Phenol-d6	788	548	70	40 - 100	
Nitrobenzene-d5	410	314	77	35 - 100	
2-Fluorobiphenyl	394	321	82	45 - 105	
2,4,6-Tribromophenol	792	441	56	35 - 125	
o-Terphenyl	394	319	81	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	220302	4.78	205931	4.76	
Naphthalene-d8	723067	6.27	670578	6.26	
Acenaphthene-d10	428891	8.27	407873	8.26	
Phenanthrene-d10	676071	9.92	610785	9.91	
Chrysene-d12	532873	12.85	486648	12.84	

03425

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: 80513308.D

Sampled: 05/06/08 15:25 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 17:56

Solids: 84.60 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	487531	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: 80513309.D

Sampled: 05/06/08 16:00 Prepared: 05/08/08 07:48 Analyzed: 05/13/08 15:05

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0805202 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.020	0.50	0.013	J
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.080	0.50	0.037	J B,E
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.33	0.50	0.040	J
207-08-9	Benzo(k)fluoranthene	1	0.070	0.50	0.036	J
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.29	5.0	0.029	J B,E
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.070	0.50	0.020	J B,E
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	5.6	5.0	0.38	
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.070	5.0	0.034	J B,E
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	3.7	5.0	0.41	J
206-44-0	Fluoranthene	1	0.030	0.50	0.016	J
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: 80513309.D

Sampled: 05/06/08 16:00 Prepared: 05/08/08 07:48 Analyzed: 05/13/08 15:05

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0805202 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.020	0.50	0.015	J
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	9.95	49	20 - 110	
Phenol-d6	20.0	6.30	32	10 - 115	
Nitrobenzene-d5	10.4	9.51	91	40 - 110	
2-Fluorobiphenyl	10.0	8.89	89	50 - 110	
2,4,6-Tribromophenol	20.1	18.1	90	40 - 125	
o-Terphenyl	10.0	9.21	92	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	187072	4.77	205931	4.76	
Naphthalene-d8	607871	6.26	670578	6.26	
Acenaphthene-d10	359699	8.26	407873	8.26	
Phenanthrene-d10	588527	9.91	610785	9.91	
Chrysene-d12	470871	12.84	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: 80513309.D

Sampled: 05/06/08 16:00 Prepared: 05/08/08 07:48 Analyzed: 05/13/08 15:05

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0805202 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	478827	14.31	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: 80516201.D

Sampled: 05/07/08 10:10 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:25

Solids: 82.59 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	21	21	0.48	U
208-96-8	Acenaphthylene	1	21	21	0.73	U
98-86-2	Acetophenone	1	210	210	8.1	U
120-12-7	Anthracene	1	21	21	0.52	U
1912-24-9	Atrazine	1	210	210	1.8	U
100-52-7	Benzaldehyde	1	210	210	32	U
56-55-3	Benzo(a)anthracene	1	1.2	21	0.65	J
50-32-8	Benzo(a)pyrene	1	21	21	1.2	U
205-99-2	Benzo(b)fluoranthene	1	21	21	1.0	U
207-08-9	Benzo(k)fluoranthene	1	21	21	0.87	U
191-24-2	Benzo(g,h,i)perylene	1	81	81	2.8	U
92-52-4	1,1'-Biphenyl	1	210	210	0.56	U
101-55-3	4-Bromophenyl Phenyl Ether	1	210	210	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	210	210	2.5	U
105-60-2	Caprolactam	1	400	400	28	U
86-74-8	Carbazole	1	210	210	0.60	U
59-50-7	4-Chloro-3-methylphenol	1	210	210	2.2	U
106-47-8	4-Chloroaniline	1	210	210	24	U
111-91-1	Bis(2-chloroethoxy)methane	1	210	210	0.97	U
111-44-4	Bis(2-chloroethyl) Ether	1	210	210	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	210	210	0.38	U
91-58-7	2-Chloronaphthalene	1	210	210	0.52	U
95-57-8	2-Chlorophenol	1	210	210	0.46	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	210	210	0.54	U
218-01-9	Chrysene	1	0.81	21	0.58	J
53-70-3	Dibenz(a,h)anthracene	1	81	81	0.65	U
132-64-9	Dibenzofuran	1	210	210	0.32	U
84-74-2	Di-n-butyl Phthalate	1	6.1	210	1.5	J
91-94-1	3,3'-Dichlorobenzidine	1	400	400	95	U
120-83-2	2,4-Dichlorophenol	1	210	210	8.0	U
84-66-2	Diethyl Phthalate	1	1.2	210	0.45	J
105-67-9	2,4-Dimethylphenol	1	210	210	6.9	U
131-11-3	Dimethyl Phthalate	1	210	210	0.41	U
534-52-1	4,6-Dinitro-2-methylphenol	1	210	210	44	U
51-28-5	2,4-Dinitrophenol	1	400	400	40	U
121-14-2	2,4-Dinitrotoluene	1	210	210	16	U
606-20-2	2,6-Dinitrotoluene	1	210	210	2.0	U
117-84-0	Di-n-octyl Phthalate	1	210	210	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	210	210	1.6	U
206-44-0	Fluoranthene	1	21	21	4.6	U
86-73-7	Fluorene	1	21	21	0.34	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: 80516201.D

Sampled: 05/07/08 10:10 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:25

Solids: 82.59 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	210	210	0.96	U
87-68-3	Hexachlorobutadiene	1	210	210	0.83	U
77-47-4	Hexachlorocyclopentadiene	1	210	210	4.8	U
67-72-1	Hexachloroethane	1	210	210	0.97	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	81	81	0.85	U
78-59-1	Isophorone	1	3.2	210	0.49	J
91-57-6	2-Methylnaphthalene	1	0.81	210	0.58	J
95-48-7	2-Methylphenol	1	210	210	9.8	U
106-44-5	4-Methylphenol	1	210	210	11	U
91-20-3	Naphthalene	1	8.1	21	0.28	J B
88-74-4	2-Nitroaniline	1	210	210	16	U
99-09-2	3-Nitroaniline	1	210	210	13	U
100-01-6	4-Nitroaniline	1	210	210	28	U
98-95-3	Nitrobenzene	1	210	210	1.8	U
100-02-7	4-Nitrophenol	1	400	400	14	U
88-75-5	2-Nitrophenol	1	210	210	15	U
86-30-6	N-Nitroso-diphenylamine	1	210	210	0.97	U
621-64-7	N-Nitroso-di-n-propylamine	1	210	210	0.86	U
87-86-5	Pentachlorophenol	1	400	400	4.5	U
85-01-8	Phenanthrene	1	21	21	4.4	U
108-95-2	Phenol	1	1.2	210	0.85	J
129-00-0	Pyrene	1	1.2	21	0.38	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	210	210	0.97	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	210	210	20	U
88-06-2	2,4,6-Trichlorophenol	1	210	210	5.6	U
95-95-4	2,4,5-Trichlorophenol	1	210	210	7.3	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	815	690	85	35 - 105	
Phenol-d6	807	608	75	40 - 100	
Nitrobenzene-d5	420	341	81	35 - 100	
2-Fluorobiphenyl	404	360	89	45 - 105	
2,4,6-Tribromophenol	811	476	59	35 - 125	
o-Terphenyl	404	340	84	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	205836	4.78	205931	4.76	
Naphthalene-d8	676552	6.27	670578	6.26	
Acenaphthene-d10	412136	8.27	407873	8.26	
Phenanthrene-d10	658342	9.92	610785	9.91	
Chrysene-d12	518062	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: 80516201.D

Sampled: 05/07/08 10:10 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:25

Solids: 82.59 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	473238	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: 80516202.D

Sampled: 05/07/08 00:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:53

Solids: 80.87 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.82	21	0.49	J
208-96-8	Acenaphthylene	1	21	21	0.74	U
98-86-2	Acetophenone	1	210	210	8.3	U
120-12-7	Anthracene	1	0.82	21	0.53	J
1912-24-9	Atrazine	1	210	210	1.8	U
100-52-7	Benzaldehyde	1	210	210	32	U
56-55-3	Benzo(a)anthracene	1	1.6	21	0.66	J
50-32-8	Benzo(a)pyrene	1	21	21	1.3	U
205-99-2	Benzo(b)fluoranthene	1	21	21	1.0	U
207-08-9	Benzo(k)fluoranthene	1	21	21	0.89	U
191-24-2	Benzo(g,h,i)perylene	1	83	83	2.8	U
92-52-4	1,1'-Biphenyl	1	0.82	210	0.57	J B,E
101-55-3	4-Bromophenyl Phenyl Ether	1	210	210	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	210	210	2.6	U
105-60-2	Caprolactam	1	410	410	28	U
86-74-8	Carbazole	1	210	210	0.62	U
59-50-7	4-Chloro-3-methylphenol	1	210	210	2.2	U
106-47-8	4-Chloroaniline	1	210	210	24	U
111-91-1	Bis(2-chloroethoxy)methane	1	210	210	0.99	U
111-44-4	Bis(2-chloroethyl) Ether	1	210	210	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	210	210	0.39	U
91-58-7	2-Chloronaphthalene	1	210	210	0.53	U
95-57-8	2-Chlorophenol	1	210	210	0.47	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	210	210	0.55	U
218-01-9	Chrysene	1	1.2	21	0.59	J
53-70-3	Dibenz(a,h)anthracene	1	83	83	0.66	U
132-64-9	Dibenzofuran	1	210	210	0.33	U
84-74-2	Di-n-butyl Phthalate	1	9.5	210	1.5	J
91-94-1	3,3'-Dichlorobenzidine	1	410	410	97	U
120-83-2	2,4-Dichlorophenol	1	210	210	8.1	U
84-66-2	Diethyl Phthalate	1	1.6	210	0.46	J
105-67-9	2,4-Dimethylphenol	1	210	210	7.0	U
131-11-3	Dimethyl Phthalate	1	210	210	0.42	U
534-52-1	4,6-Dinitro-2-methylphenol	1	210	210	45	U
51-28-5	2,4-Dinitrophenol	1	410	410	41	U
121-14-2	2,4-Dinitrotoluene	1	210	210	16	U
606-20-2	2,6-Dinitrotoluene	1	210	210	2.0	U
117-84-0	Di-n-octyl Phthalate	1	210	210	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	210	210	1.6	U
206-44-0	Fluoranthene	1	21	21	4.6	U
86-73-7	Fluorene	1	0.41	21	0.35	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: 80516202.D

Sampled: 05/07/08 00:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:53

Solids: 80.87 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	210	210	0.98	U
87-68-3	Hexachlorobutadiene	1	210	210	0.85	U
77-47-4	Hexachlorocyclopentadiene	1	210	210	4.9	U
67-72-1	Hexachloroethane	1	210	210	0.99	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	83	83	0.87	U
78-59-1	Isophorone	1	2.5	210	0.50	J
91-57-6	2-Methylnaphthalene	1	1.2	210	0.59	J
95-48-7	2-Methylphenol	1	210	210	10	U
106-44-5	4-Methylphenol	1	210	210	11	U
91-20-3	Naphthalene	1	7.8	21	0.29	J B1E
88-74-4	2-Nitroaniline	1	210	210	16	U
99-09-2	3-Nitroaniline	1	210	210	14	U
100-01-6	4-Nitroaniline	1	210	210	28	U
98-95-3	Nitrobenzene	1	210	210	1.8	U
100-02-7	4-Nitrophenol	1	410	410	14	U
88-75-5	2-Nitrophenol	1	210	210	15	U
86-30-6	N-Nitroso-diphenylamine	1	15	210	0.99	J
621-64-7	N-Nitroso-di-n-propylamine	1	210	210	0.88	U
87-86-5	Pentachlorophenol	1	410	410	4.6	U
85-01-8	Phenanthrene	1	21	21	4.5	U
108-95-2	Phenol	1	1.2	210	0.87	J
129-00-0	Pyrene	1	2.5	21	0.39	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	210	210	0.99	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	210	210	20	U
88-06-2	2,4,6-Trichlorophenol	1	210	210	5.7	U
95-95-4	2,4,5-Trichlorophenol	1	210	210	7.4	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	833	664	80	35 - 105	
Phenol-d6	824	571	69	40 - 100	
Nitrobenzene-d5	429	324	75	35 - 100	
2-Fluorobiphenyl	412	331	80	45 - 105	
2,4,6-Tribromophenol	828	542	65	35 - 125	
o-Terphenyl	412	323	78	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	218387	4.78	205931	4.76	
Naphthalene-d8	740819	6.27	670578	6.26	
Acenaphthene-d10	446367	8.27	407873	8.26	
Phenanthrene-d10	735148	9.92	610785	9.91	
Chrysene-d12	598045	12.86	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: 80516202.D

Sampled: 05/07/08 00:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 18:53

Solids: 80.87 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	534463	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: 80516203.D

Sampled: 05/07/08 11:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 16:53

Solids: 81.89 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	21	21	0.49	U
208-96-8	Acenaphthylene	1	21	21	0.73	U
98-86-2	Acetophenone	1	210	210	8.2	U
120-12-7	Anthracene	1	21	21	0.52	U
1912-24-9	Atrazine	1	210	210	1.8	U
100-52-7	Benzaldehyde	1	210	210	32	U
56-55-3	Benzo(a)anthracene	1	3.3	21	0.66	J
50-32-8	Benzo(a)pyrene	1	21	21	1.3	U
205-99-2	Benzo(b)fluoranthene	1	16	21	1.0	J
207-08-9	Benzo(k)fluoranthene	1	2.8	21	0.87	J
191-24-2	Benzo(g,h,i)perylene	1	82	82	2.8	U
92-52-4	1,1'-Biphenyl	1	210	210	0.56	U
101-55-3	4-Bromophenyl Phenyl Ether	1	210	210	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	3.3	210	2.6	J B17
105-60-2	Caprolactam	1	400	400	28	U
86-74-8	Carbazole	1	210	210	0.61	U
59-50-7	4-Chloro-3-methylphenol	1	210	210	2.2	U
106-47-8	4-Chloroaniline	1	210	210	24	U
111-91-1	Bis(2-chloroethoxy)methane	1	210	210	0.98	U
111-44-4	Bis(2-chloroethyl) Ether	1	210	210	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	210	210	0.38	U
91-58-7	2-Chloronaphthalene	1	210	210	0.53	U
95-57-8	2-Chlorophenol	1	210	210	0.47	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	210	210	0.55	U
218-01-9	Chrysene	1	4.1	21	0.58	J
53-70-3	Dibenz(a,h)anthracene	1	82	82	0.66	U
132-64-9	Dibenzofuran	1	210	210	0.32	U
84-74-2	Di-n-butyl Phthalate	1	12	210	1.5	J
91-94-1	3,3'-Dichlorobenzidine	1	400	400	96	U
120-83-2	2,4-Dichlorophenol	1	210	210	8.0	U
84-66-2	Diethyl Phthalate	1	0.81	210	0.45	J
105-67-9	2,4-Dimethylphenol	1	210	210	7.0	U
131-11-3	Dimethyl Phthalate	1	210	210	0.41	U
534-52-1	4,6-Dinitro-2-methylphenol	1	210	210	44	U
51-28-5	2,4-Dinitrophenol	1	400	400	40	U
121-14-2	2,4-Dinitrotoluene	1	210	210	16	U
606-20-2	2,6-Dinitrotoluene	1	210	210	2.0	U
117-84-0	Di-n-octyl Phthalate	1	210	210	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	210	210	1.6	U
206-44-0	Fluoranthene	1	21	21	4.6	U
86-73-7	Fluorene	1	21	21	0.34	U

035000

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: 80516203.D

Sampled: 05/07/08 11:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 16:53

Solids: 81.89 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	210	210	0.97	U
87-68-3	Hexachlorobutadiene	1	210	210	0.84	U
77-47-4	Hexachlorocyclopentadiene	1	210	210	4.8	U
67-72-1	Hexachloroethane	1	210	210	0.98	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	82	82	0.85	U
78-59-1	Isophorone	1	2.8	210	0.49	J BIF
91-57-6	2-Methylnaphthalene	1	0.81	210	0.58	J
95-48-7	2-Methylphenol	1	210	210	9.9	U
106-44-5	4-Methylphenol	1	210	210	11	U
91-20-3	Naphthalene	1	6.1	21	0.28	J BIF
88-74-4	2-Nitroaniline	1	210	210	16	U
99-09-2	3-Nitroaniline	1	210	210	13	U
100-01-6	4-Nitroaniline	1	210	210	28	U
98-95-3	Nitrobenzene	1	210	210	1.8	U
100-02-7	4-Nitrophenol	1	400	400	14	U
88-75-5	2-Nitrophenol	1	210	210	15	U
86-30-6	N-Nitroso-diphenylamine	1	210	210	0.98	U
621-64-7	N-Nitroso-di-n-propylamine	1	210	210	0.87	U
87-86-5	Pentachlorophenol	1	400	400	4.5	U
85-01-8	Phenanthrene	1	21	21	4.4	U
108-95-2	Phenol	1	2.0	210	0.85	J
129-00-0	Pyrene	1	3.3	21	0.39	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	210	210	0.98	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	210	210	20	U
88-06-2	2,4,6-Trichlorophenol	1	210	210	5.6	U
95-95-4	2,4,5-Trichlorophenol	1	210	210	7.3	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	822	769	94	35 - 105	
Phenol-d6	814	663	81	40 - 100	
Nitrobenzene-d5	423	385	91	35 - 100	
2-Fluorobiphenyl	407	367	90	45 - 105	
2,4,6-Tribromophenol	818	699	85	35 - 125	
o-Terphenyl	407	375	92	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	197221	4.71	191478	4.7	
Naphthalene-d8	618068	6.2	605584	6.2	
Acenaphthene-d10	380114	8.2	365893	8.2	
Phenanthrene-d10	574697	9.85	560133	9.85	
Chrysene-d12	438198	12.78	450022	12.78	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: 80516203.D

Sampled: 05/07/08 11:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 16:53

Solids: 81.89 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	440104	14.25	424122	14.25	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: 80516204.d

Sampled: 05/07/08 11:05 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 19:21

Solids: 84.58 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.47	U
208-96-8	Acenaphthylene	1	20	20	0.71	U
98-86-2	Acetophenone	1	200	200	7.9	U
120-12-7	Anthracene	1	20	20	0.50	U
1912-24-9	Atrazine	1	200	200	1.8	U
100-52-7	Benzaldehyde	1	200	200	31	U
56-55-3	Benzo(a)anthracene	1	20	20	0.63	U
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	1.0	U
207-08-9	Benzo(k)fluoranthene	1	20	20	0.85	U
191-24-2	Benzo(g,h,i)perylene	1	79	79	2.7	U
92-52-4	1,1'-Biphenyl	1	200	200	0.54	U
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	200	200	2.5	U
105-60-2	Caprolactam	1	390	390	27	U
86-74-8	Carbazole	1	200	200	0.59	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.95	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.37	U
91-58-7	2-Chloronaphthalene	1	200	200	0.51	U
95-57-8	2-Chlorophenol	1	200	200	0.45	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.53	U
218-01-9	Chrysene	1	20	20	0.56	U
53-70-3	Dibenz(a,h)anthracene	1	79	79	0.63	U
132-64-9	Dibenzofuran	1	200	200	0.31	U
84-74-2	Di-n-butyl Phthalate	1	6.7	200	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	390	390	93	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.8	U
84-66-2	Diethyl Phthalate	1	0.79	200	0.44	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.7	U
131-11-3	Dimethyl Phthalate	1	200	200	0.40	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	43	U
51-28-5	2,4-Dinitrophenol	1	390	390	39	U
121-14-2	2,4-Dinitrotoluene	1	200	200	16	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	12	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	200	200	1.5	U
206-44-0	Fluoranthene	1	20	20	4.4	U
86-73-7	Fluorene	1	20	20	0.33	U

03521

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: 80516204.d

Sampled: 05/07/08 11:05 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 19:21

Solids: 84.58 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.94	U
87-68-3	Hexachlorobutadiene	1	200	200	0.81	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.95	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	79	79	0.83	U
78-59-1	Isophorone	1	2.0	200	0.47	J
91-57-6	2-Methylnaphthalene	1	200	200	0.57	U
95-48-7	2-Methylphenol	1	200	200	9.6	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	5.1	20	0.28	J B1E
88-74-4	2-Nitroaniline	1	200	200	16	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.8	U
100-02-7	4-Nitrophenol	1	390	390	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.95	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.84	U
87-86-5	Pentachlorophenol	1	390	390	4.4	U
85-01-8	Phenanthrene	1	20	20	4.3	U
108-95-2	Phenol	1	1.2	200	0.83	J
129-00-0	Pyrene	1	20	20	0.37	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.95	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.4	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.1	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	796	584	73	35 - 105	
Phenol-d6	788	512	65	40 - 100	
Nitrobenzene-d5	410	279	68	35 - 100	
2-Fluorobiphenyl	394	296	75	45 - 105	
2,4,6-Tribromophenol	792	374	47	35 - 125	
o-Terphenyl	394	294	75	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	208861	4.78	205931	4.76	
Naphthalene-d8	687145	6.27	670578	6.26	
Acenaphthene-d10	413040	8.27	407873	8.26	
Phenanthrene-d10	675598	9.93	610785	9.91	
Chrysene-d12	542563	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: 80516204.d

Sampled: 05/07/08 11:05 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 19:21

Solids: 84.58 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	488471	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: 80516205.d

Sampled: 05/07/08 11:55 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 19:49

Solids: 86.03 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.46	U
208-96-8	Acenaphthylene	1	20	20	0.70	U
98-86-2	Acetophenone	1	200	200	7.8	U
120-12-7	Anthracene	1	20	20	0.50	U
1912-24-9	Atrazine	1	200	200	1.7	U
100-52-7	Benzaldehyde	1	200	200	30	U
56-55-3	Benzo(a)anthracene	1	1.2	20	0.62	J
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	0.99	U
207-08-9	Benzo(k)fluoranthene	1	20	20	0.83	U
191-24-2	Benzo(g,h,i)perylene	1	78	78	2.7	U
92-52-4	1,1'-Biphenyl	1	0.77	200	0.53	J B/E
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	200	200	2.4	U
105-60-2	Caprolactam	1	380	380	27	U
86-74-8	Carbazole	1	200	200	0.58	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.93	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.36	U
91-58-7	2-Chloronaphthalene	1	200	200	0.50	U
95-57-8	2-Chlorophenol	1	200	200	0.45	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.52	U
218-01-9	Chrysene	1	0.77	20	0.55	J
53-70-3	Dibenz(a,h)anthracene	1	78	78	0.62	U
132-64-9	Dibenzofuran	1	200	200	0.31	U
84-74-2	Di-n-butyl Phthalate	1	16	200	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	380	380	91	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.6	U
84-66-2	Diethyl Phthalate	1	1.2	200	0.43	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.6	U
131-11-3	Dimethyl Phthalate	1	200	200	0.39	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	42	U
51-28-5	2,4-Dinitrophenol	1	380	380	38	U
121-14-2	2,4-Dinitrotoluene	1	200	200	15	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	1.5	200	1.5	J
206-44-0	Fluoranthene	1	20	20	4.4	U
86-73-7	Fluorene	1	0.39	20	0.33	J

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: 80516205.d

Sampled: 05/07/08 11:55 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 19:49

Solids: 86.03 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.93	U
87-68-3	Hexachlorobutadiene	1	200	200	0.80	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.93	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	78	78	0.81	U
78-59-1	Isophorone	1	4.6	200	0.47	J
91-57-6	2-Methylnaphthalene	1	0.77	200	0.56	J
95-48-7	2-Methylphenol	1	200	200	9.4	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	5.4	20	0.27	J B17
88-74-4	2-Nitroaniline	1	200	200	15	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.7	U
100-02-7	4-Nitrophenol	1	380	380	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.93	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.83	U
87-86-5	Pentachlorophenol	1	380	380	4.3	U
85-01-8	Phenanthrene	1	20	20	4.2	U
108-95-2	Phenol	1	1.2	200	0.81	J
129-00-0	Pyrene	1	0.77	20	0.37	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.93	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.3	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.0	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	783	623	80	35 - 105	
Phenol-d6	775	531	68	40 - 100	
Nitrobenzene-d5	403	304	75	35 - 100	
2-Fluorobiphenyl	387	319	82	45 - 105	
2,4,6-Tribromophenol	779	518	67	35 - 125	
o-Terphenyl	387	283	73	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	233674	4.78	205931	4.76	
Naphthalene-d8	753720	6.27	670578	6.26	
Acenaphthene-d10	459007	8.27	407873	8.26	
Phenanthrene-d10	711710	9.93	610785	9.91	
Chrysene-d12	569577	12.85	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-05
File ID: 80516205.d
Sampled: 05/07/08 11:55
Prepared: 05/09/08 10:49
Analyzed: 05/13/08 19:49
Solids: 86.03
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
QC Batch: 0805309
Sequence: 8052017
Calibration: 8E19033
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	466561	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: 80516206.d

Sampled: 05/07/08 12:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:18

Solids: 91.96 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	18	18	0.43	U
208-96-8	Acenaphthylene	1	18	18	0.65	U
98-86-2	Acetophenone	1	180	180	7.3	U
120-12-7	Anthracene	1	18	18	0.46	U
1912-24-9	Atrazine	1	180	180	1.6	U
100-52-7	Benzaldehyde	1	180	180	28	U
56-55-3	Benzo(a)anthracene	1	18	18	0.58	U
50-32-8	Benzo(a)pyrene	1	18	18	1.1	U
205-99-2	Benzo(b)fluoranthene	1	18	18	0.92	U
207-08-9	Benzo(k)fluoranthene	1	18	18	0.78	U
191-24-2	Benzo(g,h,i)perylene	1	73	73	2.5	U
92-52-4	1,1'-Biphenyl	1	180	180	0.50	U
101-55-3	4-Bromophenyl Phenyl Ether	1	180	180	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	180	180	2.3	U
105-60-2	Caprolactam	1	360	360	25	U
86-74-8	Carbazole	1	180	180	0.54	U
59-50-7	4-Chloro-3-methylphenol	1	180	180	1.9	U
106-47-8	4-Chloroaniline	1	180	180	21	U
111-91-1	Bis(2-chloroethoxy)methane	1	180	180	0.87	U
111-44-4	Bis(2-chloroethyl) Ether	1	180	180	0.98	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	180	180	0.34	U
91-58-7	2-Chloronaphthalene	1	180	180	0.47	U
95-57-8	2-Chlorophenol	1	180	180	0.42	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	180	180	0.49	U
218-01-9	Chrysene	1	18	18	0.52	U
53-70-3	Dibenz(a,h)anthracene	1	73	73	0.58	U
132-64-9	Dibenzofuran	1	180	180	0.29	U
84-74-2	Di-n-butyl Phthalate	1	13	180	1.3	J
91-94-1	3,3'-Dichlorobenzidine	1	360	360	85	U
120-83-2	2,4-Dichlorophenol	1	180	180	7.2	U
84-66-2	Diethyl Phthalate	1	0.72	180	0.40	J
105-67-9	2,4-Dimethylphenol	1	180	180	6.2	U
131-11-3	Dimethyl Phthalate	1	180	180	0.37	U
534-52-1	4,6-Dinitro-2-methylphenol	1	180	180	40	U
51-28-5	2,4-Dinitrophenol	1	360	360	36	U
121-14-2	2,4-Dinitrotoluene	1	180	180	14	U
606-20-2	2,6-Dinitrotoluene	1	180	180	1.8	U
117-84-0	Di-n-octyl Phthalate	1	180	180	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	180	180	1.4	U
206-44-0	Fluoranthene	1	18	18	4.1	U
86-73-7	Fluorene	1	18	18	0.30	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: 80516206.d

Sampled: 05/07/08 12:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:18

Solids: 91.96 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	180	180	0.87	U
87-68-3	Hexachlorobutadiene	1	180	180	0.75	U
77-47-4	Hexachlorocyclopentadiene	1	180	180	4.3	U
67-72-1	Hexachloroethane	1	180	180	0.87	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	73	73	0.76	U
78-59-1	Isophorone	1	1.8	180	0.44	J
91-57-6	2-Methylnaphthalene	1	180	180	0.52	U
95-48-7	2-Methylphenol	1	180	180	8.8	U
106-44-5	4-Methylphenol	1	180	180	9.9	U
91-20-3	Naphthalene	1	5.4	18	0.25	J B1F
88-74-4	2-Nitroaniline	1	180	180	14	U
99-09-2	3-Nitroaniline	1	180	180	12	U
100-01-6	4-Nitroaniline	1	180	180	25	U
98-95-3	Nitrobenzene	1	180	180	1.6	U
100-02-7	4-Nitrophenol	1	360	360	12	U
88-75-5	2-Nitrophenol	1	180	180	13	U
86-30-6	N-Nitroso-diphenylamine	1	180	180	0.87	U
621-64-7	N-Nitroso-di-n-propylamine	1	180	180	0.78	U
87-86-5	Pentachlorophenol	1	360	360	4.0	U
85-01-8	Phenanthrene	1	18	18	3.9	U
108-95-2	Phenol	1	180	180	0.76	U
129-00-0	Pyrene	1	18	18	0.34	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	180	180	0.87	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	180	180	18	U
88-06-2	2,4,6-Trichlorophenol	1	180	180	5.0	U
95-95-4	2,4,5-Trichlorophenol	1	180	180	6.5	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	732	534	73	35 - 105	
Phenol-d6	725	456	63	40 - 100	
Nitrobenzene-d5	377	279	74	35 - 100	
2-Fluorobiphenyl	362	291	80	45 - 105	
2,4,6-Tribromophenol	729	377	52	35 - 125	
o-Terphenyl	362	283	78	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	215715	4.78	205931	4.76	
Naphthalene-d8	699505	6.28	670578	6.26	
Acenaphthene-d10	421203	8.27	407873	8.26	
Phenanthrene-d10	673257	9.92	610785	9.91	
Chrysene-d12	546166	12.86	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: 80516206.d

Sampled: 05/07/08 12:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:18

Solids: 91.96 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	480773	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: 80516207.d

Sampled: 05/07/08 12:55 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:47

Solids: 85.70 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.47	U
208-96-8	Acenaphthylene	1	20	20	0.70	U
98-86-2	Acetophenone	1	200	200	7.8	U
120-12-7	Anthracene	1	20	20	0.50	U
1912-24-9	Atrazine	1	200	200	1.7	U
100-52-7	Benzaldehyde	1	200	200	31	U
56-55-3	Benzo(a)anthracene	1	1.6	20	0.63	J
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	0.99	U
207-08-9	Benzo(k)fluoranthene	1	20	20	0.84	U
191-24-2	Benzo(g,h,i)perylene	1	78	78	2.7	U
92-52-4	1,1'-Biphenyl	1	0.78	200	0.54	J B1Z
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	16	200	2.5	J
105-60-2	Caprolactam	1	390	390	27	U
86-74-8	Carbazole	1	200	200	0.58	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.93	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.37	U
91-58-7	2-Chloronaphthalene	1	200	200	0.50	U
95-57-8	2-Chlorophenol	1	200	200	0.45	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.52	U
218-01-9	Chrysene	1	1.9	20	0.56	J
53-70-3	Dibenz(a,h)anthracene	1	78	78	0.63	U
132-64-9	Dibenzofuran	1	200	200	0.31	U
84-74-2	Di-n-butyl Phthalate	1	16	200	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	390	390	91	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.7	U
84-66-2	Diethyl Phthalate	1	0.78	200	0.43	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.7	U
131-11-3	Dimethyl Phthalate	1	200	200	0.40	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	42	U
51-28-5	2,4-Dinitrophenol	1	390	390	39	U
121-14-2	2,4-Dinitrotoluene	1	200	200	15	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	1.9	200	1.5	J
206-44-0	Fluoranthene	1	20	20	4.4	U
86-73-7	Fluorene	1	20	20	0.33	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: 80516207.d

Sampled: 05/07/08 12:55 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:47

Solids: 85.70 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.93	U
87-68-3	Hexachlorobutadiene	1	200	200	0.80	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.93	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	78	78	0.82	U
78-59-1	Isophorone	1	5.1	200	0.47	J
91-57-6	2-Methylnaphthalene	1	0.78	200	0.56	J
95-48-7	2-Methylphenol	1	200	200	9.5	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	5.1	20	0.27	J B1Z
88-74-4	2-Nitroaniline	1	200	200	15	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.7	U
100-02-7	4-Nitrophenol	1	390	390	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.93	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.83	U
87-86-5	Pentachlorophenol	1	390	390	4.3	U
85-01-8	Phenanthrene	1	20	20	4.2	U
108-95-2	Phenol	1	2.3	200	0.82	J
129-00-0	Pyrene	1	1.9	20	0.37	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.93	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.4	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.0	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	786	605	77	35 - 105	
Phenol-d6	778	522	67	40 - 100	
Nitrobenzene-d5	405	320	79	35 - 100	
2-Fluorobiphenyl	389	330	85	45 - 105	
2,4,6-Tribromophenol	782	553	71	35 - 125	
o-Terphenyl	389	270	69	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	217432	4.78	205931	4.76	
Naphthalene-d8	694486	6.27	670578	6.26	
Acenaphthene-d10	417467	8.26	407873	8.26	
Phenanthrene-d10	654043	9.92	610785	9.91	
Chrysene-d12	442260	12.86	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: 80516207.d

Sampled: 05/07/08 12:55 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 20:47

Solids: 85.70 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	406646	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-08 File ID: 80516208.d

Sampled: 05/07/08 13:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 21:15

Solids: 89.42 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	19	19	0.45	U
208-96-8	Acenaphthylene	1	19	19	0.67	U
98-86-2	Acetophenone	1	190	190	7.5	U
120-12-7	Anthracene	1	19	19	0.48	U
1912-24-9	Atrazine	1	190	190	1.7	U
100-52-7	Benzaldehyde	1	190	190	29	U
56-55-3	Benzo(a)anthracene	1	19	19	0.60	U
50-32-8	Benzo(a)pyrene	1	19	19	1.2	U
205-99-2	Benzo(b)fluoranthene	1	19	19	0.95	U
207-08-9	Benzo(k)fluoranthene	1	19	19	0.80	U
191-24-2	Benzo(g,h,i)perylene	1	75	75	2.6	U
92-52-4	1,1'-Biphenyl	1	190	190	0.51	U
101-55-3	4-Bromophenyl Phenyl Ether	1	190	190	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	11	190	2.3	J
105-60-2	Caprolactam	1	370	370	26	U
86-74-8	Carbazole	1	190	190	0.56	U
59-50-7	4-Chloro-3-methylphenol	1	190	190	2.0	U
106-47-8	4-Chloroaniline	1	190	190	22	U
111-91-1	Bis(2-chloroethoxy)methane	1	190	190	0.89	U
111-44-4	Bis(2-chloroethyl) Ether	1	190	190	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	190	190	0.35	U
91-58-7	2-Chloronaphthalene	1	190	190	0.48	U
95-57-8	2-Chlorophenol	1	190	190	0.43	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	190	190	0.50	U
218-01-9	Chrysene	1	19	19	0.53	U
53-70-3	Dibenz(a,h)anthracene	1	75	75	0.60	U
132-64-9	Dibenzofuran	1	190	190	0.29	U
84-74-2	Di-n-butyl Phthalate	1	7.8	190	1.3	J
91-94-1	3,3'-Dichlorobenzidine	1	370	370	88	U
120-83-2	2,4-Dichlorophenol	1	190	190	7.4	U
84-66-2	Diethyl Phthalate	1	0.75	190	0.42	J
105-67-9	2,4-Dimethylphenol	1	190	190	6.4	U
131-11-3	Dimethyl Phthalate	1	190	190	0.38	U
534-52-1	4,6-Dinitro-2-methylphenol	1	190	190	41	U
51-28-5	2,4-Dinitrophenol	1	370	370	37	U
121-14-2	2,4-Dinitrotoluene	1	190	190	15	U
606-20-2	2,6-Dinitrotoluene	1	190	190	1.8	U
117-84-0	Di-n-octyl Phthalate	1	190	190	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	190	190	1.5	U
206-44-0	Fluoranthene	1	19	19	4.2	U
86-73-7	Fluorene	1	19	19	0.31	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-08 File ID: 80516208.d

Sampled: 05/07/08 13:00 Prepared: 05/09/08 10:49 Analyzed: 05/13/08 21:15

Solids: 89.42 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805309 Sequence: 8052017 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	190	190	0.89	U
87-68-3	Hexachlorobutadiene	1	190	190	0.77	U
77-47-4	Hexachlorocyclopentadiene	1	190	190	4.4	U
67-72-1	Hexachloroethane	1	190	190	0.89	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	75	75	0.78	U
78-59-1	Isophorone	1	190	190	0.45	U
91-57-6	2-Methylnaphthalene	1	190	190	0.53	U
95-48-7	2-Methylphenol	1	190	190	9.1	U
106-44-5	4-Methylphenol	1	190	190	10	U
91-20-3	Naphthalene	1	5.2	19	0.26	J B1F
88-74-4	2-Nitroaniline	1	190	190	15	U
99-09-2	3-Nitroaniline	1	190	190	12	U
100-01-6	4-Nitroaniline	1	190	190	26	U
98-95-3	Nitrobenzene	1	190	190	1.7	U
100-02-7	4-Nitrophenol	1	370	370	13	U
88-75-5	2-Nitrophenol	1	190	190	14	U
86-30-6	N-Nitroso-diphenylamine	1	190	190	0.89	U
621-64-7	N-Nitroso-di-n-propylamine	1	190	190	0.80	U
87-86-5	Pentachlorophenol	1	370	370	4.1	U
85-01-8	Phenanthrene	1	19	19	4.0	U
108-95-2	Phenol	1	1.1	190	0.78	J
129-00-0	Pyrene	1	19	19	0.35	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	190	190	0.89	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	190	190	18	U
88-06-2	2,4,6-Trichlorophenol	1	190	190	5.1	U
95-95-4	2,4,5-Trichlorophenol	1	190	190	6.7	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	753	586	78	35 - 105	
Phenol-d6	746	497	67	40 - 100	
Nitrobenzene-d5	388	286	74	35 - 100	
2-Fluorobiphenyl	373	316	85	45 - 105	
2,4,6-Tribromophenol	749	488	65	35 - 125	
o-Terphenyl	373	288	77	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	214646	4.78	205931	4.76	
Naphthalene-d8	718729	6.27	670578	6.26	
Acenaphthene-d10	432878	8.27	407873	8.26	
Phenanthrene-d10	695075	9.93	610785	9.91	
Chrysene-d12	561654	12.86	486648	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-08
File ID: 80516208.d
Sampled: 05/07/08 13:00
Prepared: 05/09/08 10:49
Analyzed: 05/13/08 21:15
Solids: 89.42
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
QC Batch: 0805309
Sequence: 8052017
Calibration: 8E19033
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	497460	14.33	466997	14.31	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: 80516209.D

Sampled: 05/07/08 00:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 18:18

Solids: 85.72 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	20	20	0.47	U
208-96-8	Acenaphthylene	1	20	20	0.70	U
98-86-2	Acetophenone	1	200	200	7.8	U
120-12-7	Anthracene	1	20	20	0.50	U
1912-24-9	Atrazine	1	200	200	1.7	U
100-52-7	Benzaldehyde	1	200	200	31	U
56-55-3	Benzo(a)anthracene	1	2.7	20	0.63	J
50-32-8	Benzo(a)pyrene	1	20	20	1.2	U
205-99-2	Benzo(b)fluoranthene	1	20	20	0.99	U
207-08-9	Benzo(k)fluoranthene	1	2.3	20	0.84	J
191-24-2	Benzo(g,h,i)perylene	1	78	78	2.7	U
92-52-4	1,1'-Biphenyl	1	0.78	200	0.54	J
101-55-3	4-Bromophenyl Phenyl Ether	1	200	200	1.5	U
85-68-7	Butyl Benzyl Phthalate	1	3.1	200	2.4	J B/Z
105-60-2	Caprolactam	1	380	380	27	U
86-74-8	Carbazole	1	200	200	0.58	U
59-50-7	4-Chloro-3-methylphenol	1	200	200	2.1	U
106-47-8	4-Chloroaniline	1	200	200	23	U
111-91-1	Bis(2-chloroethoxy)methane	1	200	200	0.93	U
111-44-4	Bis(2-chloroethyl) Ether	1	200	200	1.0	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	200	200	0.37	U
91-58-7	2-Chloronaphthalene	1	200	200	0.50	U
95-57-8	2-Chlorophenol	1	200	200	0.45	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	200	200	0.52	U
218-01-9	Chrysene	1	2.7	20	0.56	J
53-70-3	Dibenz(a,h)anthracene	1	78	78	0.63	U
132-64-9	Dibenzofuran	1	200	200	0.31	U
84-74-2	Di-n-butyl Phthalate	1	6.6	200	1.4	J
91-94-1	3,3'-Dichlorobenzidine	1	380	380	91	U
120-83-2	2,4-Dichlorophenol	1	200	200	7.7	U
84-66-2	Diethyl Phthalate	1	1.2	200	0.43	J
105-67-9	2,4-Dimethylphenol	1	200	200	6.6	U
131-11-3	Dimethyl Phthalate	1	200	200	0.40	U
534-52-1	4,6-Dinitro-2-methylphenol	1	200	200	42	U
51-28-5	2,4-Dinitrophenol	1	380	380	39	U
121-14-2	2,4-Dinitrotoluene	1	200	200	15	U
606-20-2	2,6-Dinitrotoluene	1	200	200	1.9	U
117-84-0	Di-n-octyl Phthalate	1	200	200	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	200	200	1.5	U
206-44-0	Fluoranthene	1	20	20	4.4	U
86-73-7	Fluorene	1	20	20	0.33	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: 80516209.D

Sampled: 05/07/08 00:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 18:18

Solids: 85.72 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	200	200	0.93	U
87-68-3	Hexachlorobutadiene	1	200	200	0.80	U
77-47-4	Hexachlorocyclopentadiene	1	200	200	4.6	U
67-72-1	Hexachloroethane	1	200	200	0.93	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	78	78	0.82	U
78-59-1	Isophorone	1	0.78	200	0.47	J B1Z
91-57-6	2-Methylnaphthalene	1	0.78	200	0.56	J
95-48-7	2-Methylphenol	1	200	200	9.5	U
106-44-5	4-Methylphenol	1	200	200	11	U
91-20-3	Naphthalene	1	6.2	20	0.27	J B1Z
88-74-4	2-Nitroaniline	1	200	200	15	U
99-09-2	3-Nitroaniline	1	200	200	13	U
100-01-6	4-Nitroaniline	1	200	200	27	U
98-95-3	Nitrobenzene	1	200	200	1.7	U
100-02-7	4-Nitrophenol	1	380	380	13	U
88-75-5	2-Nitrophenol	1	200	200	14	U
86-30-6	N-Nitroso-diphenylamine	1	200	200	0.93	U
621-64-7	N-Nitroso-di-n-propylamine	1	200	200	0.83	U
87-86-5	Pentachlorophenol	1	380	380	4.3	U
85-01-8	Phenanthrene	1	20	20	4.2	U
108-95-2	Phenol	1	4.3	200	0.82	J
129-00-0	Pyrene	1	1.6	20	0.37	J
95-94-3	1,2,4,5-Tetrachlorobenzene	1	200	200	0.93	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	200	200	19	U
88-06-2	2,4,6-Trichlorophenol	1	200	200	5.4	U
95-95-4	2,4,5-Trichlorophenol	1	200	200	7.0	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	786	714	91	35 - 105	
Phenol-d6	778	620	80	40 - 100	
Nitrobenzene-d5	404	365	90	35 - 100	
2-Fluorobiphenyl	389	364	94	45 - 105	
2,4,6-Tribromophenol	782	607	78	35 - 125	
o-Terphenyl	389	322	83	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	200811	4.71	191478	4.7	
Naphthalene-d8	646537	6.2	605584	6.2	
Acenaphthene-d10	396032	8.2	365893	8.2	
Phenanthrene-d10	635619	9.86	560133	9.85	
Chrysene-d12	445940	12.78	450022	12.78	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: 80516209.D

Sampled: 05/07/08 00:00 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 18:18

Solids: 85.72 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	448380	14.26	424122	14.25	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: 80516210.D

Sampled: 05/07/08 13:40 Prepared: 05/12/08 09:39 Analyzed: 05/17/08 14:37

Solids: 87.43 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052019 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	5	97	97	2.3	U
208-96-8	Acenaphthylene	5	97	97	3.4	U
98-86-2	Acetophenone	5	970	970	38	U
120-12-7	Anthracene	5	97	97	2.4	U
1912-24-9	Atrazine	5	970	970	8.5	U
100-52-7	Benzaldehyde	5	970	970	150	U
56-55-3	Benzo(a)anthracene	5	15	97	3.1	J
50-32-8	Benzo(a)pyrene	5	97	97	5.9	U
205-99-2	Benzo(b)fluoranthene	5	97	97	4.9	U
207-08-9	Benzo(k)fluoranthene	5	17	97	4.1	J
191-24-2	Benzo(g,h,i)perylene	5	380	380	13	U
92-52-4	1,1'-Biphenyl	5	970	970	2.6	U
101-55-3	4-Bromophenyl Phenyl Ether	5	970	970	7.1	U
85-68-7	Butyl Benzyl Phthalate	5	970	970	12	U
105-60-2	Caprolactam	5	1900	1900	130	U
86-74-8	Carbazole	5	970	970	2.8	U
59-50-7	4-Chloro-3-methylphenol	5	970	970	10	U
106-47-8	4-Chloroaniline	5	970	970	110	U
111-91-1	Bis(2-chloroethoxy)methane	5	970	970	4.6	U
111-44-4	Bis(2-chloroethyl) Ether	5	970	970	5.1	U
108-60-1	Bis(2-chloroisopropyl) Ether	5	970	970	1.8	U
91-58-7	2-Chloronaphthalene	5	970	970	2.5	U
95-57-8	2-Chlorophenol	5	970	970	2.2	U
7005-72-3	4-Chlorophenyl Phenyl Ether	5	970	970	2.6	U
218-01-9	Chrysene	5	15	97	2.7	J
53-70-3	Dibenz(a,h)anthracene	5	380	380	3.1	U
132-64-9	Dibenzofuran	5	970	970	1.5	U
84-74-2	Di-n-butyl Phthalate	5	3400	970	6.9	
91-94-1	3,3'-Dichlorobenzidine	5	1900	1900	450	U
120-83-2	2,4-Dichlorophenol	5	970	970	38	U
84-66-2	Diethyl Phthalate	5	970	970	2.1	U
105-67-9	2,4-Dimethylphenol	5	970	970	33	U
131-11-3	Dimethyl Phthalate	5	970	970	1.9	U
534-52-1	4,6-Dinitro-2-methylphenol	5	970	970	210	U
51-28-5	2,4-Dinitrophenol	5	1900	1900	190	U
121-14-2	2,4-Dinitrotoluene	5	3100	970	75	
606-20-2	2,6-Dinitrotoluene	5	170	970	9.3	J
117-84-0	Di-n-octyl Phthalate	5	970	970	56	U
117-81-7	Bis(2-ethylhexyl) Phthalate	5	970	970	7.4	U
206-44-0	Fluoranthene	5	97	97	22	U
86-73-7	Fluorene	5	97	97	1.6	U

03622

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: 80516210.D

Sampled: 05/07/08 13:40 Prepared: 05/12/08 09:39 Analyzed: 05/17/08 14:37

Solids: 87.43 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052019 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	5	970	970	4.6	U
87-68-3	Hexachlorobutadiene	5	970	970	3.9	U
77-47-4	Hexachlorocyclopentadiene	5	970	970	22	U
67-72-1	Hexachloroethane	5	970	970	4.6	U
193-39-5	Indeno(1,2,3-cd)pyrene	5	380	380	4.0	U
78-59-1	Isophorone	5	3.8	970	2.3	J B
91-57-6	2-Methylnaphthalene	5	970	970	2.7	U
95-48-7	2-Methylphenol	5	970	970	46	U
106-44-5	4-Methylphenol	5	970	970	52	U
91-20-3	Naphthalene	5	7.6	97	1.3	J B
88-74-4	2-Nitroaniline	5	970	970	75	U
99-09-2	3-Nitroaniline	5	970	970	63	U
100-01-6	4-Nitroaniline	5	970	970	130	U
98-95-3	Nitrobenzene	5	970	970	8.5	U
100-02-7	4-Nitrophenol	5	1900	1900	64	U
88-75-5	2-Nitrophenol	5	970	970	70	U
86-30-6	N-Nitroso-diphenylamine	5	370	970	4.6	J
621-64-7	N-Nitroso-di-n-propylamine	5	970	970	4.1	U
87-86-5	Pentachlorophenol	5	1900	1900	21	U
85-01-8	Phenanthrene	5	97	97	21	U
108-95-2	Phenol	5	970	970	4.0	U
129-00-0	Pyrene	5	7.6	97	1.8	J
95-94-3	1,2,4,5-Tetrachlorobenzene	5	970	970	4.6	U
58-90-2	2,3,4,6-Tetrachlorophenol	5	970	970	93	U
88-06-2	2,4,6-Trichlorophenol	5	970	970	26	U
95-95-4	2,4,5-Trichlorophenol	5	970	970	34	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	770	511	66	35 - 105	D
Phenol-d6	763	524	69	40 - 100	D
Nitrobenzene-d5	397	275	69	35 - 100	D
2-Fluorobiphenyl	381	337	88	45 - 105	D
2,4,6-Tribromophenol	766	492	64	35 - 125	D
o-Terphenyl	381	362	95	30 - 125	D

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	156493	4.76	184689	4.77	
Naphthalene-d8	527824	6.26	596574	6.26	
Acenaphthene-d10	312977	8.26	358993	8.26	
Phenanthrene-d10	452937	9.91	529247	9.91	
Chrysene-d12	354715	12.84	403375	12.84	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: 80516210.D

Sampled: 05/07/08 13:40 Prepared: 05/12/08 09:39 Analyzed: 05/17/08 14:37

Solids: 87.43 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052019 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	319923	14.3	342548	14.3	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: 80516211.D

Sampled: 05/07/08 13:45 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 19:14

Solids: 91.63 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
83-32-9	Acenaphthene	1	19	19	0.44	U
208-96-8	Acenaphthylene	1	19	19	0.65	U
98-86-2	Acetophenone	1	190	190	7.3	U
120-12-7	Anthracene	1	19	19	0.46	U
1912-24-9	Atrazine	1	190	190	1.6	U
100-52-7	Benzaldehyde	1	190	190	29	U
56-55-3	Benzo(a)anthracene	1	1.1	19	0.59	J
50-32-8	Benzo(a)pyrene	1	19	19	1.1	U
205-99-2	Benzo(b)fluoranthene	1	19	19	0.93	U
207-08-9	Benzo(k)fluoranthene	1	19	19	0.78	U
191-24-2	Benzo(g,h,i)perylene	1	73	73	2.5	U
92-52-4	1,1'-Biphenyl	1	0.73	190	0.50	J
101-55-3	4-Bromophenyl Phenyl Ether	1	190	190	1.4	U
85-68-7	Butyl Benzyl Phthalate	1	2.9	190	2.3	J B/E
105-60-2	Caprolactam	1	360	360	25	U
86-74-8	Carbazole	1	190	190	0.54	U
59-50-7	4-Chloro-3-methylphenol	1	190	190	2.0	U
106-47-8	4-Chloroaniline	1	190	190	21	U
111-91-1	Bis(2-chloroethoxy)methane	1	190	190	0.87	U
111-44-4	Bis(2-chloroethyl) Ether	1	190	190	0.98	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	190	190	0.34	U
91-58-7	2-Chloronaphthalene	1	190	190	0.47	U
95-57-8	2-Chlorophenol	1	190	190	0.42	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	190	190	0.49	U
218-01-9	Chrysene	1	19	19	0.52	U
53-70-3	Dibenz(a,h)anthracene	1	73	73	0.59	U
132-64-9	Dibenzofuran	1	190	190	0.29	U
84-74-2	Di-n-butyl Phthalate	1	8.4	190	1.3	J
91-94-1	3,3'-Dichlorobenzidine	1	360	360	86	U
120-83-2	2,4-Dichlorophenol	1	190	190	7.2	U
84-66-2	Diethyl Phthalate	1	0.73	190	0.41	J
105-67-9	2,4-Dimethylphenol	1	190	190	6.2	U
131-11-3	Dimethyl Phthalate	1	190	190	0.37	U
534-52-1	4,6-Dinitro-2-methylphenol	1	190	190	40	U
51-28-5	2,4-Dinitrophenol	1	360	360	36	U
121-14-2	2,4-Dinitrotoluene	1	190	190	14	U
606-20-2	2,6-Dinitrotoluene	1	190	190	1.8	U
117-84-0	Di-n-octyl Phthalate	1	190	190	11	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	190	190	1.4	U
206-44-0	Fluoranthene	1	19	19	4.1	U
86-73-7	Fluorene	1	19	19	0.31	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: 80516211.D

Sampled: 05/07/08 13:45 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 19:14

Solids: 91.63 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	190	190	0.87	U
87-68-3	Hexachlorobutadiene	1	190	190	0.75	U
77-47-4	Hexachlorocyclopentadiene	1	190	190	4.3	U
67-72-1	Hexachloroethane	1	190	190	0.87	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	73	73	0.76	U
78-59-1	Isophorone	1	1.1	190	0.44	J B1Z
91-57-6	2-Methylnaphthalene	1	190	190	0.52	U
95-48-7	2-Methylphenol	1	190	190	8.9	U
106-44-5	4-Methylphenol	1	190	190	9.9	U
91-20-3	Naphthalene	1	6.2	19	0.25	J B1Z
88-74-4	2-Nitroaniline	1	190	190	14	U
99-09-2	3-Nitroaniline	1	190	190	12	U
100-01-6	4-Nitroaniline	1	190	190	25	U
98-95-3	Nitrobenzene	1	190	190	1.6	U
100-02-7	4-Nitrophenol	1	360	360	12	U
88-75-5	2-Nitrophenol	1	190	190	13	U
86-30-6	N-Nitroso-diphenylamine	1	190	190	0.87	U
621-64-7	N-Nitroso-di-n-propylamine	1	190	190	0.78	U
87-86-5	Pentachlorophenol	1	360	360	4.0	U
85-01-8	Phenanthrene	1	19	19	4.0	U
108-95-2	Phenol	1	1.1	190	0.76	J
129-00-0	Pyrene	1	19	19	0.35	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	190	190	0.87	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	190	190	18	U
88-06-2	2,4,6-Trichlorophenol	1	190	190	5.0	U
95-95-4	2,4,5-Trichlorophenol	1	190	190	6.5	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% REC.	QC Limits	Q
2-Fluorophenol	735	645	88	35 - 105	
Phenol-d6	728	550	76	40 - 100	
Nitrobenzene-d5	378	330	87	35 - 100	
2-Fluorobiphenyl	364	347	95	45 - 105	
2,4,6-Tribromophenol	731	574	79	35 - 125	
o-Terphenyl	364	310	85	30 - 125	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	206926	4.71	191478	4.7	
Naphthalene-d8	651093	6.21	605584	6.2	
Acenaphthene-d10	389576	8.21	365893	8.2	
Phenanthrene-d10	617814	9.86	560133	9.85	
Chrysene-d12	501537	12.79	450022	12.78	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: 80516211.D

Sampled: 05/07/08 13:45 Prepared: 05/12/08 09:39 Analyzed: 05/14/08 19:14

Solids: 91.63 Preparation: 3550B Sonication Extract Initial/Final: 30 g / 1 mL

QC Batch: 0805368 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	473383	14.26	424122	14.25	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-2

REVISED fb 6/23/08

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: 80516216.D

Sampled: 05/07/08 15:45 Prepared: 05/09/08 08:13 Analyzed: 05/14/08 16:24

Solids: Preparation: 3510C Liquid-Liquid Extr Initial/Final: 1000 mL / 1 mL

QC Batch: 0805286 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.060	0.50	0.037	J
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.070	5.0	0.029	J
105-60-2	Caprolactam	1	5.0	5.0	0.14	U RL
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.060	0.50	0.020	J
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	5.0	5.0	0.38	U
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	5.0	5.0	0.034	U
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	5.0	5.0	0.41	U
206-44-0	Fluoranthene	1	0.020	0.50	0.016	J
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: 80516216.D

Sampled: 05/07/08 15:45 Prepared: 05/09/08 08:13 Analyzed: 05/14/08 16:24

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0805286 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.030	0.50	0.023	J B2 Z
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	9.70	48	20 - 110	
Phenol-d6	20.0	5.79	29	10 - 115	
Nitrobenzene-d5	10.4	8.98	86	40 - 110	
2-Fluorobiphenyl	10.0	8.79	88	50 - 110	
2,4,6-Tribromophenol	20.1	16.0	80	40 - 125	
o-Terphenyl	10.0	9.76	98	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	198638	4.7	191478	4.7	
Naphthalene-d8	642178	6.2	605584	6.2	
Acenaphthene-d10	390597	8.2	365893	8.2	
Phenanthrene-d10	579214	9.85	560133	9.85	
Chrysene-d12	488804	12.78	450022	12.78	

A3661

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: 80516216.D

Sampled: 05/07/08 15:45 Prepared: 05/09/08 08:13 Analyzed: 05/14/08 16:24

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0805286 Sequence: 8052018 Calibration: 8E19033 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	463336	14.25	424122	14.25	

* Values outside of QC limits

SAMPLE ID SUMMARY

USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB1B	0805162-04RE1
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

01199

ANALYSIS DATA SHEET

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-01 File ID: B70_381-0

Sampled: 05/05/08 11:15 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 15:40

Solids: 72.50 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.3	2.3	0.48	U
319-85-7	beta-BHC	1	4.6	4.6	0.93	U
58-89-9	gamma-BHC (Lindane)	1	4.6	4.6	0.89	U
319-86-8	delta-BHC	1	4.6	4.6	1.3	U
5103-71-9	alpha-Chlordane	1	4.6	4.6	0.94	U
5103-74-2	gamma-Chlordane	1	4.6	4.6	0.65	U
72-54-8	4,4'-DDD	1	4.6	4.6	1.5	U
72-55-9	4,4'-DDE	1	4.6	4.6	1.2	U
50-29-3	4,4'-DDT	1	21	4.6	1.4	J,C
309-00-2	Aldrin	1	2.3	2.3	0.75	U
60-57-1	Dieldrin	1	4.6	4.6	0.64	U
959-98-8	Endosulfan I	1	4.6	4.6	1.2	U
33213-65-9	Endosulfan II	1	4.6	4.6	1.2	U
1031-07-8	Endosulfan Sulfate	1	4.6	4.6	1.4	U
72-20-8	Endrin	1	4.6	4.6	0.74	U
7421-93-4	Endrin Aldehyde	1	4.6	4.6	1.4	U
53494-70-5	Endrin Ketone	1	4.6	4.6	1.4	U
76-44-8	Heptachlor	1	9.2	9.2	1.7	U
1024-57-3	Heptachlor Epoxide	1	2.3	2.3	0.57	U
72-43-5	Methoxychlor	1	23	23	1.8	U
8001-35-2	Toxaphene	1	230	230	31	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	46.0	44.0	96	70 - 125	
Decachlorobiphenyl	46.0	55.5	121	55 - 130	

* Values outside of QC limits

012257

ANALYSIS DATA SHEET

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-02 File ID: B70_380-0

Sampled: 05/05/08 11:40 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 15:04

Solids: 86.13 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.8	3.8	0.78	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.75	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.79	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.55	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.63	U
60-57-1	Dieldrin	1	3.8	3.8	0.54	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.99	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.2	U
72-20-8	Endrin	1	3.8	3.8	0.62	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.8	7.8	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.48	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.7	38.3	99	70 - 125	
Decachlorobiphenyl	38.7	43.7	113	55 - 130	

* Values outside of QC limits

001256

ANALYSIS DATA SHEET

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-03 File ID: B70_379-0

Sampled: 05/05/08 12:15 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 14:28

Solids: 73.18 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.3	2.3	0.48	U
319-85-7	beta-BHC	1	4.5	4.5	0.92	U
58-89-9	gamma-BHC (Lindane)	1	4.5	4.5	0.88	U
319-86-8	delta-BHC	1	4.5	4.5	1.3	U
5103-71-9	alpha-Chlordane	1	4.5	4.5	0.93	U
5103-74-2	gamma-Chlordane	1	4.5	4.5	0.64	U
72-54-8	4,4'-DDD	1	4.5	4.5	1.5	U
72-55-9	4,4'-DDE	1	4.5	4.5	1.2	U
50-29-3	4,4'-DDT	1	4.5	4.5	1.4	U
309-00-2	Aldrin	1	2.3	2.3	0.74	U
60-57-1	Dieldrin	1	4.5	4.5	0.63	U
959-98-8	Endosulfan I	1	4.5	4.5	1.2	U
33213-65-9	Endosulfan II	1	36	4.5	1.2	J,C
1031-07-8	Endosulfan Sulfate	1	4.5	4.5	1.4	U
72-20-8	Endrin	1	4.5	4.5	0.73	U
7421-93-4	Endrin Aldehyde	1	4.5	4.5	1.4	U
53494-70-5	Endrin Ketone	1	4.5	4.5	1.4	U
76-44-8	Heptachlor	1	9.2	9.2	1.7	U
1024-57-3	Heptachlor Epoxide	1	2.3	2.3	0.57	U
72-43-5	Methoxychlor	1	23	23	1.8	U
8001-35-2	Toxaphene	1	230	230	31	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	45.6	43.0	94	70 - 125	
Decachlorobiphenyl	45.6	52.8	116	55 - 130	

* Values outside of QC limits

01275

ANALYSIS DATA SHEET

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-04 File ID: B70_378-0

Sampled: 05/05/08 12:40 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 13:52

Solids: 87.60 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.40	U
319-85-7	beta-BHC	1	3.8	3.8	0.77	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.73	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.77	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.54	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	1.9	1.9	0.62	U
60-57-1	Dieldrin	1	3.8	3.8	0.53	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.97	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.1	U
72-20-8	Endrin	1	3.8	3.8	0.61	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.6	7.6	1.4	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.47	U
72-43-5	Methoxychlor	1	19	19	1.5	U
8001-35-2	Toxaphene	1	190	190	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.1	42.1	111	70 - 125	
Decachlorobiphenyl	38.1	46.3	122	55 - 130	

* Values outside of QC limits

: 01281

ANALYSIS DATA SHEET

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-05 File ID: B70_377-0

Sampled: 05/05/08 13:20 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 13:16

Solids: 78.25 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.2	2.2	0.45	U
319-85-7	beta-BHC	1	4.2	4.2	0.86	U
58-89-9	gamma-BHC (Lindane)	1	4.2	4.2	0.82	U
319-86-8	delta-BHC	1	4.2	4.2	1.2	U
5103-71-9	alpha-Chlordane	1	4.2	4.2	0.87	U
5103-74-2	gamma-Chlordane	1	4.2	4.2	0.60	U
72-54-8	4,4'-DDD	1	4.2	4.2	1.4	U
72-55-9	4,4'-DDE	1	4.2	4.2	1.1	U
50-29-3	4,4'-DDT	1	4.2	4.2	1.3	U
309-00-2	Aldrin	1	2.2	2.2	0.69	U
60-57-1	Dieldrin	1	4.2	4.2	0.59	U
959-98-8	Endosulfan I	1	4.2	4.2	1.1	U
33213-65-9	Endosulfan II	1	4.2	4.2	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.2	4.2	1.3	U
72-20-8	Endrin	1	4.2	4.2	0.69	U
7421-93-4	Endrin Aldehyde	1	4.2	4.2	1.3	U
53494-70-5	Endrin Ketone	1	4.2	4.2	1.3	U
76-44-8	Heptachlor	1	8.6	8.6	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.2	2.2	0.53	U
72-43-5	Methoxychlor	1	22	22	1.6	U
8001-35-2	Toxaphene	1	220	220	29	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	42.6	42.7	100	70 - 125	
Decachlorobiphenyl	42.6	49.6	116	55 - 130	

* Values outside of QC limits

01293

ANALYSIS DATA SHEET

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-01 File ID: B70_376-0

Sampled: 05/06/08 10:25 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 12:40

Solids: 86.32 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.8	3.8	0.78	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.74	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.79	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.54	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.63	U
60-57-1	Dieldrin	1	3.8	3.8	0.53	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.99	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.2	U
72-20-8	Endrin	1	3.8	3.8	0.62	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.8	7.8	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.48	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.6	33.4	86	70 - 125	
Decachlorobiphenyl	38.6	39.2	101	55 - 130	

* Values outside of QC limits

01382

ANALYSIS DATA SHEET

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-02 File ID: B70_375-0

Sampled: 05/06/08 11:10 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 12:04

Solids: 81.01 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.1	2.1	0.43	U
319-85-7	beta-BHC	1	4.1	4.1	0.83	U
58-89-9	gamma-BHC (Lindane)	1	4.1	4.1	0.79	U
319-86-8	delta-BHC	1	4.1	4.1	1.2	U
5103-71-9	alpha-Chlordane	1	4.1	4.1	0.84	U
5103-74-2	gamma-Chlordane	1	4.1	4.1	0.58	U
72-54-8	4,4'-DDD	1	4.1	4.1	1.4	U
72-55-9	4,4'-DDE	1	4.1	4.1	1.1	U
50-29-3	4,4'-DDT	1	4.2	4.1	1.3	JC
309-00-2	Aldrin	1	2.1	2.1	0.67	U
60-57-1	Dieldrin	1	4.1	4.1	0.57	U
959-98-8	Endosulfan I	1	4.1	4.1	1.1	U
33213-65-9	Endosulfan II	1	4.1	4.1	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.1	4.1	1.2	U
72-20-8	Endrin	1	4.1	4.1	0.66	U
7421-93-4	Endrin Aldehyde	1	4.1	4.1	1.3	U
53494-70-5	Endrin Ketone	1	4.1	4.1	1.3	U
76-44-8	Heptachlor	1	8.3	8.3	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.1	2.1	0.51	U
72-43-5	Methoxychlor	1	21	21	1.6	U
8001-35-2	Toxaphene	1	210	210	28	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	41.1	35.4	86	70 - 125	
Decachlorobiphenyl	41.1	40.2	98	55 - 130	

* Values outside of QC limits

01311

ANALYSIS DATA SHEET

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-03 File ID: B70_387-0

Sampled: 05/06/08 13:05 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 19:15

Solids: 87.40 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.40	U
319-85-7	beta-BHC	1	3.8	3.8	0.77	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.73	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.78	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.54	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	1.9	1.9	0.62	U
60-57-1	Dieldrin	1	3.8	3.8	0.53	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.98	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.1	U
72-20-8	Endrin	1	3.8	3.8	0.61	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.7	7.7	1.4	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.47	U
72-43-5	Methoxychlor	1	19	19	1.5	U
8001-35-2	Toxaphene	1	190	190	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.1	35.3	93	70 - 125	
Decachlorobiphenyl	38.1	41.5	109	55 - 130	

* Values outside of QC limits

01320

ANALYSIS DATA SHEET

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-04 File ID: B70_388-0

Sampled: 05/06/08 13:45 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 19:51

Solids: 91.38 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.38	U
319-85-7	beta-BHC	1	3.6	3.6	0.74	U
58-89-9	gamma-BHC (Lindane)	1	3.6	3.6	0.70	U
319-86-8	delta-BHC	1	3.6	3.6	1.0	U
5103-71-9	alpha-Chlordane	1	3.6	3.6	0.74	U
5103-74-2	gamma-Chlordane	1	3.6	3.6	0.51	U
72-54-8	4,4'-DDD	1	3.6	3.6	1.2	U
72-55-9	4,4'-DDE	1	3.6	3.6	0.98	U
50-29-3	4,4'-DDT	1	3.6	3.6	1.1	U
309-00-2	Aldrin	1	1.9	1.9	0.59	U
60-57-1	Dieldrin	1	3.6	3.6	0.50	U
959-98-8	Endosulfan I	1	3.6	3.6	0.98	U
33213-65-9	Endosulfan II	1	3.6	3.6	0.93	U
1031-07-8	Endosulfan Sulfate	1	3.6	3.6	1.1	U
72-20-8	Endrin	1	3.6	3.6	0.59	U
7421-93-4	Endrin Aldehyde	1	3.6	3.6	1.1	U
53494-70-5	Endrin Ketone	1	3.6	3.6	1.1	U
76-44-8	Heptachlor	1	7.3	7.3	1.3	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.45	U
72-43-5	Methoxychlor	1	19	19	1.4	U
8001-35-2	Toxaphene	1	190	190	25	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	36.5	34.5	95	70 - 125	
Decachlorobiphenyl	36.5	39.9	109	55 - 130	

* Values outside of QC limits

01329

ANALYSIS DATA SHEET

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-05 File ID: B70_389-0

Sampled: 05/06/08 14:00 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 20:27

Solids: 80.57 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.1	2.1	0.44	U
319-85-7	beta-BHC	1	4.1	4.1	0.84	U
58-89-9	gamma-BHC (Lindane)	1	4.1	4.1	0.80	U
319-86-8	delta-BHC	1	4.1	4.1	1.2	U
5103-71-9	alpha-Chlordane	1	4.1	4.1	0.84	U
5103-74-2	gamma-Chlordane	1	4.1	4.1	0.58	U
72-54-8	4,4'-DDD	1	4.1	4.1	1.4	U
72-55-9	4,4'-DDE	1	4.1	4.1	1.1	U
50-29-3	4,4'-DDT	1	4.1	4.1	1.3	U
309-00-2	Aldrin	1	2.1	2.1	0.67	U
60-57-1	Dieldrin	1	4.1	4.1	0.57	U
959-98-8	Endosulfan I	1	4.1	4.1	1.1	U
33213-65-9	Endosulfan II	1	4.1	4.1	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.1	4.1	1.2	U
72-20-8	Endrin	1	4.1	4.1	0.67	U
7421-93-4	Endrin Aldehyde	1	4.1	4.1	1.3	U
53494-70-5	Endrin Ketone	1	4.1	4.1	1.3	U
76-44-8	Heptachlor	1	8.3	8.3	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.1	2.1	0.51	U
72-43-5	Methoxychlor	1	21	21	1.6	U
8001-35-2	Toxaphene	1	210	210	28	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	41.4	39.0	94	70 - 125	
Decachlorobiphenyl	41.4	50.5	122	55 - 130	

* Values outside of QC limits

01338

ANALYSIS DATA SHEET

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-06 File ID: B70_390-0

Sampled: 05/06/08 14:30 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 21:03

Solids: 77.95 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.2	2.2	0.45	U
319-85-7	beta-BHC	1	4.2	4.2	0.86	U
58-89-9	gamma-BHC (Lindane)	1	4.2	4.2	0.82	U
319-86-8	delta-BHC	1	4.2	4.2	1.2	U
5103-71-9	alpha-Chlordane	1	4.2	4.2	0.87	U
5103-74-2	gamma-Chlordane	1	4.2	4.2	0.60	U
72-54-8	4,4'-DDD	1	4.2	4.2	1.4	U
72-55-9	4,4'-DDE	1	4.2	4.2	1.2	U
50-29-3	4,4'-DDT	1	4.2	4.2	1.3	U
309-00-2	Aldrin	1	2.2	2.2	0.70	U
60-57-1	Dieldrin	1	4.2	4.2	0.59	U
959-98-8	Endosulfan I	1	4.2	4.2	1.1	U
33213-65-9	Endosulfan II	1	4.2	4.2	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.2	4.2	1.3	U
72-20-8	Endrin	1	4.2	4.2	0.69	U
7421-93-4	Endrin Aldehyde	1	4.2	4.2	1.3	U
53494-70-5	Endrin Ketone	1	4.2	4.2	1.3	U
76-44-8	Heptachlor	1	8.6	8.6	1.6	U
1024-57-3	Heptachlor Epoxide	1	2.2	2.2	0.53	U
72-43-5	Methoxychlor	1	22	22	1.7	U
8001-35-2	Toxaphene	1	220	220	29	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	42.8	38.5	90	70 - 125	
Decachlorobiphenyl	42.8	45.8	107	55 - 130	

* Values outside of QC limits

01347

ANALYSIS DATA SHEET

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-07 File ID: B70_391-0

Sampled: 05/06/08 15:00 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 21:39

Solids: 77.47 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.2	2.2	0.45	U
319-85-7	beta-BHC	1	4.3	4.3	0.87	U
58-89-9	gamma-BHC (Lindane)	1	4.3	4.3	0.83	U
319-86-8	delta-BHC	1	4.3	4.3	1.2	U
5103-71-9	alpha-Chlordane	1	4.3	4.3	0.88	U
5103-74-2	gamma-Chlordane	1	4.3	4.3	0.61	U
72-54-8	4,4'-DDD	1	4.3	4.3	1.4	U
72-55-9	4,4'-DDE	1	4.3	4.3	1.2	U
50-29-3	4,4'-DDT	1	4.3	4.3	1.3	U
309-00-2	Aldrin	1	2.2	2.2	0.70	U
60-57-1	Dieldrin	1	4.3	4.3	0.60	U
959-98-8	Endosulfan I	1	4.3	4.3	1.2	U
33213-65-9	Endosulfan II	1	4.3	4.3	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.3	4.3	1.3	U
72-20-8	Endrin	1	4.3	4.3	0.69	U
7421-93-4	Endrin Aldehyde	1	4.3	4.3	1.3	U
53494-70-5	Endrin Ketone	1	4.3	4.3	1.3	U
76-44-8	Heptachlor	1	8.6	8.6	1.6	U
1024-57-3	Heptachlor Epoxide	1	2.2	2.2	0.53	U
72-43-5	Methoxychlor	1	22	22	1.7	U
8001-35-2	Toxaphene	1	220	220	29	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	43.0	40.8	95	70 - 125	
Decachlorobiphenyl	43.0	48.1	112	55 - 130	

* Values outside of QC limits

01357

ANALYSIS DATA SHEET

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-08 File ID: B70_392-0

Sampled: 05/06/08 15:25 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 22:15

Solids: 84.60 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.9	3.9	0.80	U
58-89-9	gamma-BHC (Lindane)	1	3.9	3.9	0.76	U
319-86-8	delta-BHC	1	3.9	3.9	1.1	U
5103-71-9	alpha-Chlordane	1	3.9	3.9	0.80	U
5103-74-2	gamma-Chlordane	1	3.9	3.9	0.56	U
72-54-8	4,4'-DDD	1	3.9	3.9	1.3	U
72-55-9	4,4'-DDE	1	3.9	3.9	1.1	U
50-29-3	4,4'-DDT	1	3.9	3.9	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.64	U
60-57-1	Dieldrin	1	3.9	3.9	0.54	U
959-98-8	Endosulfan I	1	3.9	3.9	1.1	U
33213-65-9	Endosulfan II	1	3.9	3.9	1.0	U
1031-07-8	Endosulfan Sulfate	1	3.9	3.9	1.2	U
72-20-8	Endrin	1	3.9	3.9	0.63	U
7421-93-4	Endrin Aldehyde	1	3.9	3.9	1.2	U
53494-70-5	Endrin Ketone	1	3.9	3.9	1.2	U
76-44-8	Heptachlor	1	7.9	7.9	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.49	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	39.4	41.4	105	70 - 125	
Decachlorobiphenyl	39.4	46.7	118	55 - 130	

* Values outside of QC limits

01366

ANALYSIS DATA SHEET

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Water Laboratory ID: 0805133-09 File ID: A70_208-0

Sampled: 05/06/08 16:00 Prepared: 05/08/08 07:51 Analyzed: 05/15/08 20:58

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0805203 Sequence: 8051653 Calibration: 8E16009 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.204	102	25 - 140	
Decachlorobiphenyl	0.200	0.240	120	30 - 135	

* Values outside of QC limits

01375

ANALYSIS DATA SHEET

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-01 File ID: B70_393-0

Sampled: 05/07/08 10:10 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 22:51

Solids: 82.59 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.1	2.1	0.42	U
319-85-7	beta-BHC	1	4.0	4.0	0.81	U
58-89-9	gamma-BHC (Lindane)	1	4.0	4.0	0.78	U
319-86-8	delta-BHC	1	4.0	4.0	1.1	U
5103-71-9	alpha-Chlordane	1	4.0	4.0	0.82	U
5103-74-2	gamma-Chlordane	1	4.0	4.0	0.57	U
72-54-8	4,4'-DDD	1	4.0	4.0	1.4	U
72-55-9	4,4'-DDE	1	4.0	4.0	1.1	U
50-29-3	4,4'-DDT	1	4.0	4.0	1.2	U
309-00-2	Aldrin	1	2.1	2.1	0.66	U
60-57-1	Dieldrin	1	4.0	4.0	0.56	U
959-98-8	Endosulfan I	1	4.0	4.0	1.1	U
33213-65-9	Endosulfan II	1	4.0	4.0	1.0	U
1031-07-8	Endosulfan Sulfate	1	4.0	4.0	1.2	U
72-20-8	Endrin	1	4.0	4.0	0.65	U
7421-93-4	Endrin Aldehyde	1	4.0	4.0	1.3	U
53494-70-5	Endrin Ketone	1	4.0	4.0	1.2	U
76-44-8	Heptachlor	1	8.1	8.1	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.1	2.1	0.50	U
72-43-5	Methoxychlor	1	21	21	1.6	U
8001-35-2	Toxaphene	1	210	210	27	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	40.4	37.3	92	70 - 125	
Decachlorobiphenyl	40.4	43.9	109	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-02 File ID: B70_394-0

Sampled: 05/07/08 00:00 Prepared: 05/09/08 08:20 Analyzed: 05/20/08 23:27

Solids: 80.87 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.1	2.1	0.43	U
319-85-7	beta-BHC	1	4.1	4.1	0.83	U
58-89-9	gamma-BHC (Lindane)	1	4.1	4.1	0.79	U
319-86-8	delta-BHC	1	4.1	4.1	1.2	U
5103-71-9	alpha-Chlordane	1	4.1	4.1	0.84	U
5103-74-2	gamma-Chlordane	1	4.1	4.1	0.58	U
72-54-8	4,4'-DDD	1	4.1	4.1	1.4	U
72-55-9	4,4'-DDE	1	4.1	4.1	1.1	U
50-29-3	4,4'-DDT	1	4.1	4.1	1.3	U
309-00-2	Aldrin	1	2.1	2.1	0.67	U
60-57-1	Dieldrin	1	4.1	4.1	0.57	U
959-98-8	Endosulfan I	1	4.1	4.1	1.1	U
33213-65-9	Endosulfan II	1	4.1	4.1	1.1	U
1031-07-8	Endosulfan Sulfate	1	4.1	4.1	1.2	U
72-20-8	Endrin	1	4.1	4.1	0.66	U
7421-93-4	Endrin Aldehyde	1	4.1	4.1	1.3	U
53494-70-5	Endrin Ketone	1	4.1	4.1	1.3	U
76-44-8	Heptachlor	1	8.3	8.3	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.1	2.1	0.51	U
72-43-5	Methoxychlor	1	21	21	1.6	U
8001-35-2	Toxaphene	1	210	210	28	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	41.2	42.8	104	70 - 125	
Decachlorobiphenyl	41.2	50.5	122	55 - 130	

* Values outside of QC limits

01393

ANALYSIS DATA SHEET

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-03 File ID: A71_153-0

Sampled: 05/07/08 11:00 Prepared: 05/12/08 09:40 Analyzed: 05/29/08 22:07

Solids: 81.89 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805370 Sequence: 8053024 Calibration: 8E30010 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.1	2.1	0.43	U
319-85-7	beta-BHC	1	4.0	4.0	0.82	U
58-89-9	gamma-BHC (Lindane)	1	4.0	4.0	0.78	U
319-86-8	delta-BHC	1	4.0	4.0	1.1	U
5103-71-9	alpha-Chlordane	1	4.0	4.0	0.83	U
5103-74-2	gamma-Chlordane	1	4.0	4.0	0.57	U
72-54-8	4,4'-DDD	1	4.0	4.0	1.4	U
72-55-9	4,4'-DDE	1	4.0	4.0	1.1	U
50-29-3	4,4'-DDT	1	4.0	4.0	1.3	U
309-00-2	Aldrin	1	2.1	2.1	0.66	U
60-57-1	Dieldrin	1	4.0	4.0	0.56	U
959-98-8	Endosulfan I	1	4.0	4.0	1.1	U
33213-65-9	Endosulfan II	1	4.0	4.0	1.0	U
1031-07-8	Endosulfan Sulfate	1	4.0	4.0	1.2	U
72-20-8	Endrin	1	4.0	4.0	0.65	U
7421-93-4	Endrin Aldehyde	1	4.0	4.0	1.3	U
53494-70-5	Endrin Ketone	1	4.0	4.0	1.2	U
76-44-8	Heptachlor	1	8.2	8.2	1.5	U
1024-57-3	Heptachlor Epoxide	1	2.1	2.1	0.51	U
72-43-5	Methoxychlor	1	21	21	1.6	U
8001-35-2	Toxaphene	1	210	210	27	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	40.7	37.5	92	70 - 125	
Decachlorobiphenyl	40.7	39.9	98	55 - 130	

* Values outside of QC limits

01402

ANALYSIS DATA SHEET

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-04 File ID: B70_395-0

Sampled: 05/07/08 11:05 Prepared: 05/09/08 08:20 Analyzed: 05/21/08 00:03

Solids: 84.58 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.9	3.9	0.80	U
58-89-9	gamma-BHC (Lindane)	1	3.9	3.9	0.76	U
319-86-8	delta-BHC	1	3.9	3.9	1.1	U
5103-71-9	alpha-Chlordane	1	3.9	3.9	0.80	U
5103-74-2	gamma-Chlordane	1	3.9	3.9	0.56	U
72-54-8	4,4'-DDD	1	3.9	3.9	1.3	U
72-55-9	4,4'-DDE	1	3.9	3.9	1.1	U
50-29-3	4,4'-DDT	1	3.9	3.9	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.64	U
60-57-1	Dieldrin	1	3.9	3.9	0.55	U
959-98-8	Endosulfan I	1	3.9	3.9	1.1	U
33213-65-9	Endosulfan II	1	3.9	3.9	1.0	U
1031-07-8	Endosulfan Sulfate	1	3.9	3.9	1.2	U
72-20-8	Endrin	1	3.9	3.9	0.63	U
7421-93-4	Endrin Aldehyde	1	3.9	3.9	1.2	U
53494-70-5	Endrin Ketone	1	3.9	3.9	1.2	U
76-44-8	Heptachlor	1	7.9	7.9	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.49	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	39.4	38.5	98	70 - 125	
Decachlorobiphenyl	39.4	45.2	115	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-04RE1 File ID: A71_048-0

Sampled: 05/07/08 11:05 Prepared: 05/23/08 08:20 Analyzed: 05/23/08 21:59

Solids: 84.58 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052743 Calibration: 8E27007 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.9	3.9	0.80	U
58-89-9	gamma-BHC (Lindane)	1	3.9	3.9	0.76	U
319-86-8	delta-BHC	1	3.9	3.9	1.1	U
5103-71-9	alpha-Chlordane	1	3.9	3.9	0.80	U
5103-74-2	gamma-Chlordane	1	3.9	3.9	0.56	U
72-54-8	4,4'-DDD	1	3.9	3.9	1.3	U
72-55-9	4,4'-DDE	1	3.9	3.9	1.1	U
50-29-3	4,4'-DDT	1	3.9	3.9	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.64	U
60-57-1	Dieldrin	1	3.9	3.9	0.55	U
959-98-8	Endosulfan I	1	3.9	3.9	1.1	U
33213-65-9	Endosulfan II	1	3.9	3.9	1.0	U
1031-07-8	Endosulfan Sulfate	1	3.9	3.9	1.2	U
72-20-8	Endrin	1	3.9	3.9	0.63	U
7421-93-4	Endrin Aldehyde	1	3.9	3.9	1.2	U
53494-70-5	Endrin Ketone	1	3.9	3.9	1.2	U
76-44-8	Heptachlor	1	7.9	7.9	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.49	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	39.4	43.9	112	70 - 125	
Decachlorobiphenyl	39.4	40.0	102	55 - 130	

* Values outside of QC limits

Do Not Use RA 6/20/08

01420

ANALYSIS DATA SHEET

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-05 File ID: B70_396-0

Sampled: 05/07/08 11:55 Prepared: 05/09/08 08:20 Analyzed: 05/21/08 00:39

Solids: 86.03 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052238 Calibration: 8E22013 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.8	3.8	0.78	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.75	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.79	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.55	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.63	U
60-57-1	Dieldrin	1	3.8	3.8	0.54	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.99	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.2	U
72-20-8	Endrin	1	3.8	3.8	0.62	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.8	7.8	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.48	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.7	38.3	99	70 - 125	
Decachlorobiphenyl	38.7	44.3	114	55 - 130	

* Values outside of QC limits

01429

ANALYSIS DATA SHEET

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-06 File ID: A70_429-0

Sampled: 05/07/08 12:00 Prepared: 05/09/08 08:20 Analyzed: 05/22/08 01:11

Solids: 91.96 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052749 Calibration: 8E27008 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.8	1.8	0.38	U
319-85-7	beta-BHC	1	3.6	3.6	0.73	U
58-89-9	gamma-BHC (Lindane)	1	3.6	3.6	0.70	U
319-86-8	delta-BHC	1	3.6	3.6	1.0	U
5103-71-9	alpha-Chlordane	1	3.6	3.6	0.74	U
5103-74-2	gamma-Chlordane	1	3.6	3.6	0.51	U
72-54-8	4,4'-DDD	1	3.6	3.6	1.2	U
72-55-9	4,4'-DDE	1	3.6	3.6	0.98	U
50-29-3	4,4'-DDT	1	3.6	3.6	1.1	U
309-00-2	Aldrin	1	1.8	1.8	0.59	U
60-57-1	Dieldrin	1	3.6	3.6	0.50	U
959-98-8	Endosulfan I	1	3.6	3.6	0.97	U
33213-65-9	Endosulfan II	1	3.6	3.6	0.93	U
1031-07-8	Endosulfan Sulfate	1	3.6	3.6	1.1	U
72-20-8	Endrin	1	3.6	3.6	0.58	U
7421-93-4	Endrin Aldehyde	1	3.6	3.6	1.1	U
53494-70-5	Endrin Ketone	1	3.6	3.6	1.1	U
76-44-8	Heptachlor	1	7.3	7.3	1.3	U
1024-57-3	Heptachlor Epoxide	1	1.8	1.8	0.45	U
72-43-5	Methoxychlor	1	18	18	1.4	U
8001-35-2	Toxaphene	1	180	180	24	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	36.2	35.5	98	70 - 125	
Decachlorobiphenyl	36.2	35.5	98	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-07 File ID: A70_430-0

Sampled: 05/07/08 12:55 Prepared: 05/09/08 08:20 Analyzed: 05/22/08 01:47

Solids: 85.70 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052749 Calibration: 8E27008 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.9	3.9	0.79	U
58-89-9	gamma-BHC (Lindane)	1	3.9	3.9	0.75	U
319-86-8	delta-BHC	1	3.9	3.9	1.1	U
5103-71-9	alpha-Chlordane	1	3.9	3.9	0.79	U
5103-74-2	gamma-Chlordane	1	3.9	3.9	0.55	U
72-54-8	4,4'-DDD	1	3.9	3.9	1.3	U
72-55-9	4,4'-DDE	1	3.9	3.9	1.0	U
50-29-3	4,4'-DDT	1	3.9	3.9	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.63	U
60-57-1	Dieldrin	1	3.9	3.9	0.54	U
959-98-8	Endosulfan I	1	3.9	3.9	1.0	U
33213-65-9	Endosulfan II	1	3.9	3.9	1.0	U
1031-07-8	Endosulfan Sulfate	1	3.9	3.9	1.2	U
72-20-8	Endrin	1	3.9	3.9	0.63	U
7421-93-4	Endrin Aldehyde	1	3.9	3.9	1.2	U
53494-70-5	Endrin Ketone	1	3.9	3.9	1.2	U
76-44-8	Heptachlor	1	7.8	7.8	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.48	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.9	39.2	101	70 - 125	
Decachlorobiphenyl	38.9	39.1	101	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-08 File ID: A70_431-0

Sampled: 05/07/08 13:00 Prepared: 05/09/08 08:20 Analyzed: 05/22/08 02:23

Solids: 89.42 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805288 Sequence: 8052749 Calibration: 8E27008 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.39	U
319-85-7	beta-BHC	1	3.7	3.7	0.75	U
58-89-9	gamma-BHC (Lindane)	1	3.7	3.7	0.72	U
319-86-8	delta-BHC	1	3.7	3.7	1.0	U
5103-71-9	alpha-Chlordane	1	3.7	3.7	0.76	U
5103-74-2	gamma-Chlordane	1	3.7	3.7	0.53	U
72-54-8	4,4'-DDD	1	3.7	3.7	1.3	U
72-55-9	4,4'-DDE	1	3.7	3.7	1.0	U
50-29-3	4,4'-DDT	1	3.7	3.7	1.2	U
309-00-2	Aldrin	1	1.9	1.9	0.61	U
60-57-1	Dieldrin	1	3.7	3.7	0.52	U
959-98-8	Endosulfan I	1	3.7	3.7	1.0	U
33213-65-9	Endosulfan II	1	3.7	3.7	0.95	U
1031-07-8	Endosulfan Sulfate	1	3.7	3.7	1.1	U
72-20-8	Endrin	1	3.7	3.7	0.60	U
7421-93-4	Endrin Aldehyde	1	3.7	3.7	1.2	U
53494-70-5	Endrin Ketone	1	3.7	3.7	1.1	U
76-44-8	Heptachlor	1	7.5	7.5	1.4	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.46	U
72-43-5	Methoxychlor	1	19	19	1.4	U
8001-35-2	Toxaphene	1	190	190	25	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	37.3	35.5	95	70 - 125	
Decachlorobiphenyl	37.3	35.1	94	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-09 File ID: A71_152-0

Sampled: 05/07/08 00:00 Prepared: 05/12/08 09:40 Analyzed: 05/29/08 21:31

Solids: 85.72 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805370 Sequence: 8053024 Calibration: 8E30010 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	2.0	2.0	0.41	U
319-85-7	beta-BHC	1	3.8	3.8	0.79	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.75	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.79	U
5103-74-2	gamma-Chlordane	1	3.8	3.8	0.55	U
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	2.0	2.0	0.63	U
60-57-1	Dieldrin	1	3.8	3.8	0.54	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	1.0	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.2	U
72-20-8	Endrin	1	3.8	3.8	0.63	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.8	7.8	1.4	U
1024-57-3	Heptachlor Epoxide	1	2.0	2.0	0.48	U
72-43-5	Methoxychlor	1	20	20	1.5	U
8001-35-2	Toxaphene	1	200	200	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.9	34.5	89	70 - 125	
Decachlorobiphenyl	38.9	35.3	91	55 - 130	

* Values outside of QC limits

01455

ANALYSIS DATA SHEET

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-10 File ID: A71_151-0

Sampled: 05/07/08 13:40 Prepared: 05/12/08 09:40 Analyzed: 05/29/08 20:55

Solids: 87.43 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805370 Sequence: 8053024 Calibration: 8E30010 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.40	U
319-85-7	beta-BHC	1	3.8	3.8	0.77	U
58-89-9	gamma-BHC (Lindane)	1	3.8	3.8	0.73	U
319-86-8	delta-BHC	1	3.8	3.8	1.1	U
5103-71-9	alpha-Chlordane	1	3.8	3.8	0.78	U
5103-74-2	gamma-Chlordane	1	1.4	3.8	0.54	J
72-54-8	4,4'-DDD	1	3.8	3.8	1.3	U
72-55-9	4,4'-DDE	1	3.8	3.8	1.0	U
50-29-3	4,4'-DDT	1	3.8	3.8	1.2	U
309-00-2	Aldrin	1	1.9	1.9	0.62	U
60-57-1	Dieldrin	1	3.8	3.8	0.53	U
959-98-8	Endosulfan I	1	3.8	3.8	1.0	U
33213-65-9	Endosulfan II	1	3.8	3.8	0.98	U
1031-07-8	Endosulfan Sulfate	1	3.8	3.8	1.1	U
72-20-8	Endrin	1	3.8	3.8	0.61	U
7421-93-4	Endrin Aldehyde	1	3.8	3.8	1.2	U
53494-70-5	Endrin Ketone	1	3.8	3.8	1.2	U
76-44-8	Heptachlor	1	7.7	7.7	1.4	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.47	U
72-43-5	Methoxychlor	1	19	19	1.5	U
8001-35-2	Toxaphene	1	190	190	26	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	38.1	32.0	84	70 - 125	
Decachlorobiphenyl	38.1	33.2	87	55 - 130	

* Values outside of QC limits

01174

ANALYSIS DATA SHEET

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-11 File ID: A71_150-0

Sampled: 05/07/08 13:45 Prepared: 05/12/08 09:40 Analyzed: 05/29/08 20:19

Solids: 91.63 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805370 Sequence: 8053024 Calibration: 8E30010 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
319-84-6	alpha-BHC	1	1.9	1.9	0.38	U
319-85-7	beta-BHC	1	3.6	3.6	0.73	U
58-89-9	gamma-BHC (Lindane)	1	3.6	3.6	0.70	U
319-86-8	delta-BHC	1	3.6	3.6	1.0	U
5103-71-9	alpha-Chlordane	1	3.6	3.6	0.74	U
5103-74-2	gamma-Chlordane	1	3.6	3.6	0.51	U
72-54-8	4,4'-DDD	1	3.6	3.6	1.2	U
72-55-9	4,4'-DDE	1	3.6	3.6	0.98	U
50-29-3	4,4'-DDT	1	3.6	3.6	1.1	U
309-00-2	Aldrin	1	1.9	1.9	0.59	U
60-57-1	Dieldrin	1	3.6	3.6	0.50	U
959-98-8	Endosulfan I	1	3.6	3.6	0.98	U
33213-65-9	Endosulfan II	1	3.6	3.6	0.93	U
1031-07-8	Endosulfan Sulfate	1	3.6	3.6	1.1	U
72-20-8	Endrin	1	3.6	3.6	0.58	U
7421-93-4	Endrin Aldehyde	1	3.6	3.6	1.1	U
53494-70-5	Endrin Ketone	1	3.6	3.6	1.1	U
76-44-8	Heptachlor	1	7.3	7.3	1.3	U
1024-57-3	Heptachlor Epoxide	1	1.9	1.9	0.45	U
72-43-5	Methoxychlor	1	19	19	1.4	U
8001-35-2	Toxaphene	1	190	190	24	U

System Monitoring Compound	ADDED (ug/kg dry)	CONC (ug/kg dry)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	36.4	32.4	89	70 - 125	
Decachlorobiphenyl	36.4	33.8	93	55 - 130	

* Values outside of QC limits

ANALYSIS DATA SHEET

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Water Laboratory ID: 0805162-16 File ID: A70_224-0

Sampled: 05/07/08 15:45 Prepared: 05/13/08 07:51 Analyzed: 05/16/08 07:39

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0805203 Sequence: 8051653 Calibration: 8E16009 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.135	68	25 - 140	
Decachlorobiphenyl	0.200	0.213	106	30 - 135	

* Values outside of QC limits

04492

SAMPLE ID SUMMARY

USEPA-8082

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
EQBK-1	0805133-09RE1
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

00135

ANALYSIS DATA SHEET

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-01 File ID: A008070-0

Sampled: 05/05/08 11:15 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 00:07

Solids: 72.50 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	46	46	5.8	U
11104-28-2	PCB-1221	1	46	46	10	U
11141-16-5	PCB-1232	1	46	46	12	U
53469-21-9	PCB-1242	1	92	92	22	U
12672-29-6	PCB-1248	1	46	46	7.3	U
11097-69-1	PCB-1254	1	37	46	6.1	J
11096-82-5	PCB-1260	1	92	92	22	U
37324-23-5	PCB-1262	1	46	46	7.2	U
11100-14-4	PCB-1268	1	46	46	6.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		46.0	45.3	99	60 - 125	
Tetrachloro-m-xylene		46.0	46.3	101	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-02 File ID: A008071-0

Sampled: 05/05/08 11:40 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 00:32

Solids: 86.13 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.9	U
11104-28-2	PCB-1221	1	38	38	8.6	U
11141-16-5	PCB-1232	1	38	38	9.8	U
53469-21-9	PCB-1242	1	78	78	19	U
12672-29-6	PCB-1248	1	38	38	6.2	U
11097-69-1	PCB-1254	1	38	38	5.1	U
11096-82-5	PCB-1260	1	78	78	18	U
37324-23-5	PCB-1262	1	38	38	6.0	U
11100-14-4	PCB-1268	1	38	38	5.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.7	40.3	104	60 - 125	
Tetrachloro-m-xylene		38.7	39.7	103	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-03 File ID: A008072-0

Sampled: 05/05/08 12:15 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 00:57

Solids: 73.18 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	45	45	5.7	U
11104-28-2	PCB-1221	1	45	45	10	U
11141-16-5	PCB-1232	1	45	45	11	U
53469-21-9	PCB-1242	1	92	92	22	U
12672-29-6	PCB-1248	1	45	45	7.2	U
11097-69-1	PCB-1254	1	730	45	6.0	
11096-82-5	PCB-1260	1	630	92	22	
37324-23-5	PCB-1262	1	45	45	7.1	U
11100-14-4	PCB-1268	1	45	45	6.0	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		45.6	45.6	100	60 - 125	
Tetrachloro-m-xylene		45.6	46.6	102	32 - 129	

* Values outside of QC limits

00203

ANALYSIS DATA SHEET

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-04 File ID: A008073-0

Sampled: 05/05/08 12:40 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 01:22

Solids: 87.60 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.8	U
11104-28-2	PCB-1221	1	38	38	8.4	U
11141-16-5	PCB-1232	1	38	38	9.6	U
53469-21-9	PCB-1242	1	76	76	19	U
12672-29-6	PCB-1248	1	38	38	6.1	U
11097-69-1	PCB-1254	1	16	38	5.0	J
11096-82-5	PCB-1260	1	76	76	18	U
37324-23-5	PCB-1262	1	38	38	5.9	U
11100-14-4	PCB-1268	1	38	38	5.0	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.1	38.8	102	60 - 125	
Tetrachloro-m-xylene		38.1	39.9	105	32 - 129	

* Values outside of QC limits

00212

ANALYSIS DATA SHEET

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805100-05 File ID: A008074-0

Sampled: 05/05/08 13:20 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 01:47

Solids: 78.25 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	42	42	5.4	U
11104-28-2	PCB-1221	1	42	42	9.5	U
11141-16-5	PCB-1232	1	42	42	11	U
53469-21-9	PCB-1242	1	86	86	21	U
12672-29-6	PCB-1248	1	42	42	6.8	U
11097-69-1	PCB-1254	1	9.7	42	5.6	J
11096-82-5	PCB-1260	1	86	86	20	U
37324-23-5	PCB-1262	1	42	42	6.6	U
11100-14-4	PCB-1268	1	42	42	5.6	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		42.6	44.0	103	60 - 125	
Tetrachloro-m-xylene		42.6	43.6	102	32 - 129	

* Values outside of QC limits

002221

ANALYSIS DATA SHEET

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-01 File ID: A008075-0

Sampled: 05/06/08 10:25 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 02:12

Solids: 86.32 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.9	U
11104-28-2	PCB-1221	1	38	38	8.6	U
11141-16-5	PCB-1232	1	38	38	9.7	U
53469-21-9	PCB-1242	1	78	78	19	U
12672-29-6	PCB-1248	1	38	38	6.1	U
11097-69-1	PCB-1254	1	39	38	5.1	
11096-82-5	PCB-1260	1	78	78	18	U
37324-23-5	PCB-1262	1	38	38	6.0	U
11100-14-4	PCB-1268	1	38	38	5.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.6	38.5	100	60 - 125	
Tetrachloro-m-xylene		38.6	37.9	98	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-02 File ID: A008076-0

Sampled: 05/06/08 11:10 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 02:37

Solids: 81.01 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	41	41	5.2	U
11104-28-2	PCB-1221	1	41	41	9.1	U
11141-16-5	PCB-1232	1	41	41	10	U
53469-21-9	PCB-1242	1	83	83	20	U
12672-29-6	PCB-1248	1	41	41	6.5	U
11097-69-1	PCB-1254	1	110	41	5.4	
11096-82-5	PCB-1260	1	83	83	20	U
37324-23-5	PCB-1262	1	41	41	6.4	U
11100-14-4	PCB-1268	1	41	41	5.4	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		41.1	40.7	99	60 - 125	
Tetrachloro-m-xylene		41.1	41.0	100	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-03 File ID: A008077-0

Sampled: 05/06/08 13:05 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 03:02

Solids: 87.40 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.8	U
11104-28-2	PCB-1221	1	38	38	8.5	U
11141-16-5	PCB-1232	1	38	38	9.6	U
53469-21-9	PCB-1242	1	77	77	19	U
12672-29-6	PCB-1248	1	38	38	6.1	U
11097-69-1	PCB-1254	1	12	38	5.0	J
11096-82-5	PCB-1260	1	77	77	18	U
37324-23-5	PCB-1262	1	38	38	5.9	U
11100-14-4	PCB-1268	1	38	38	5.0	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.1	36.8	96	60 - 125	
Tetrachloro-m-xylene		38.1	37.1	97	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-04 File ID: A008081-0

Sampled: 05/06/08 13:45 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 04:42

Solids: 91.38 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	36	36	4.6	U
11104-28-2	PCB-1221	1	36	36	8.1	U
11141-16-5	PCB-1232	1	36	36	9.2	U
53469-21-9	PCB-1242	1	73	73	18	U
12672-29-6	PCB-1248	1	36	36	5.8	U
11097-69-1	PCB-1254	1	36	36	4.8	U
11096-82-5	PCB-1260	1	73	73	17	U
37324-23-5	PCB-1262	1	36	36	5.7	U
11100-14-4	PCB-1268	1	36	36	4.8	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		36.5	37.0	101	60 - 125	
Tetrachloro-m-xylene		36.5	35.6	98	32 - 129	

* Values outside of QC limits

00257

ANALYSIS DATA SHEET

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-05 File ID: A008082-0

Sampled: 05/06/08 14:00 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 05:07

Solids: 80.57 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	41	41	5.2	U
11104-28-2	PCB-1221	1	41	41	9.2	U
11141-16-5	PCB-1232	1	41	41	10	U
53469-21-9	PCB-1242	1	83	83	20	U
12672-29-6	PCB-1248	1	41	41	6.6	U
11097-69-1	PCB-1254	1	520	41	5.5	
11096-82-5	PCB-1260	1	83	83	20	U
37324-23-5	PCB-1262	1	41	41	6.5	U
11100-14-4	PCB-1268	1	41	41	5.5	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		41.4	38.6	93	60 - 125	
Tetrachloro-m-xylene		41.4	41.1	99	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-06 File ID: A008109-0

Sampled: 05/06/08 14:30 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 17:20

Solids: 77.95 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	2	85	85	11	U
11104-28-2	PCB-1221	2	85	85	19	U
11141-16-5	PCB-1232	2	85	85	22	U
53469-21-9	PCB-1242	2	170	170	42	U
12672-29-6	PCB-1248	2	85	85	14	U
11097-69-1	PCB-1254	2	1200	85	11	
11096-82-5	PCB-1260	2	170	170	41	U
37324-23-5	PCB-1262	2	85	85	13	U
11100-14-4	PCB-1268	2	85	85	11	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		42.8	34.2	80	60 - 125	
Tetrachloro-m-xylene		42.8	38.0	89	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-07 File ID: A008084-0

Sampled: 05/06/08 15:00 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 05:57

Solids: 77.47 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	43	43	5.4	U
11104-28-2	PCB-1221	1	43	43	9.6	U
11141-16-5	PCB-1232	1	43	43	11	U
53469-21-9	PCB-1242	1	86	86	21	U
12672-29-6	PCB-1248	1	43	43	6.8	U
11097-69-1	PCB-1254	1	19	43	5.7	J
11096-82-5	PCB-1260	1	86	86	21	U
37324-23-5	PCB-1262	1	43	43	6.7	U
11100-14-4	PCB-1268	1	43	43	5.7	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		43.0	42.5	99	60 - 125	
Tetrachloro-m-xylene		43.0	41.5	96	32 - 129	

* Values outside of QC limits

00284

ANALYSIS DATA SHEET

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805133-08 File ID: A008085-0

Sampled: 05/06/08 15:25 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 06:22

Solids: 84.60 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	39	39	5.0	U
11104-28-2	PCB-1221	1	39	39	8.7	U
11141-16-5	PCB-1232	1	39	39	9.9	U
53469-21-9	PCB-1242	1	79	79	19	U
12672-29-6	PCB-1248	1	39	39	6.3	U
11097-69-1	PCB-1254	1	39	39	5.2	U
11096-82-5	PCB-1260	1	79	79	19	U
37324-23-5	PCB-1262	1	39	39	6.1	U
11100-14-4	PCB-1268	1	39	39	5.2	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		39.4	39.6	101	60 - 125	
Tetrachloro-m-xylene		39.4	38.7	98	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Water Laboratory ID: 0805133-09 File ID: A007072-0

Sampled: 05/06/08 16:00 Prepared: 05/08/08 07:52 Analyzed: 05/09/08 21:57

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0805204 Sequence: 8052063 Calibration: 8E20019 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U
System Monitoring Compound		**ADDED (ug/L)**	**CONC (ug/L)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		0.200	0.183	92	40 - 135	
Tetrachloro-m-xylene		0.200	0.155	78	36 - 114	

* Values outside of QC limits

ANALYSIS DATA SHEET

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-01 File ID: A008088-0

Sampled: 05/07/08 10:10 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 07:36

Solids: 82.59 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	40	40	5.1	U
11104-28-2	PCB-1221	1	40	40	9.0	U
11141-16-5	PCB-1232	1	40	40	10	U
53469-21-9	PCB-1242	1	81	81	20	U
12672-29-6	PCB-1248	1	40	40	6.4	U
11097-69-1	PCB-1254	1	24	40	5.3	J
11096-82-5	PCB-1260	1	81	81	19	U
37324-23-5	PCB-1262	1	40	40	6.3	U
11100-14-4	PCB-1268	1	40	40	5.3	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		40.4	41.7	103	60 - 125	
Tetrachloro-m-xylene		40.4	39.2	97	32 - 129	

* Values outside of QC limits

00311

ANALYSIS DATA SHEET

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-02 File ID: A008089-0

Sampled: 05/07/08 00:00 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 08:01

Solids: 80.87 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	41	41	5.2	U
11104-28-2	PCB-1221	1	41	41	9.2	U
11141-16-5	PCB-1232	1	41	41	10	U
53469-21-9	PCB-1242	1	83	83	20	U
12672-29-6	PCB-1248	1	41	41	6.6	U
11097-69-1	PCB-1254	1	8.4	41	5.4	J
11096-82-5	PCB-1260	1	83	83	20	U
37324-23-5	PCB-1262	1	41	41	6.4	U
11100-14-4	PCB-1268	1	41	41	5.4	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		41.2	43.4	105	60 - 125	
Tetrachloro-m-xylene		41.2	40.9	99	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-03 File ID: A008116-0

Sampled: 05/07/08 11:00 Prepared: 05/12/08 09:40 Analyzed: 05/22/08 20:14

Solids: 81.89 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805369 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	40	40	5.1	U
11104-28-2	PCB-1221	1	40	40	9.0	U
11141-16-5	PCB-1232	1	40	40	10	U
53469-21-9	PCB-1242	1	82	82	20	U
12672-29-6	PCB-1248	1	40	40	6.5	U
11097-69-1	PCB-1254	1	40	40	5.4	U
11096-82-5	PCB-1260	1	82	82	19	U
37324-23-5	PCB-1262	1	40	40	6.4	U
11100-14-4	PCB-1268	1	40	40	5.4	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		40.7	30.9	76	60 - 125	
Tetrachloro-m-xylene		40.7	32.4	80	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-04 File ID: A008090-0

Sampled: 05/07/08 11:05 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 08:26

Solids: 84.58 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052234 Calibration: 8E23018 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	39	39	5.0	U
11104-28-2	PCB-1221	1	39	39	8.7	U
11141-16-5	PCB-1232	1	39	39	9.9	U
53469-21-9	PCB-1242	1	79	79	19	U
12672-29-6	PCB-1248	1	39	39	6.3	U
11097-69-1	PCB-1254	1	39	39	5.2	U
11096-82-5	PCB-1260	1	79	79	19	U
37324-23-5	PCB-1262	1	39	39	6.1	U
11100-14-4	PCB-1268	1	39	39	5.2	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		39.4	40.4	102	60 - 125	
Tetrachloro-m-xylene		39.4	37.6	95	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-05 File ID: A008112-0

Sampled: 05/07/08 11:55 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 18:34

Solids: 86.03 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.9	U
11104-28-2	PCB-1221	1	38	38	8.6	U
11141-16-5	PCB-1232	1	38	38	9.8	U
53469-21-9	PCB-1242	1	78	78	19	U
12672-29-6	PCB-1248	1	38	38	6.2	U
11097-69-1	PCB-1254	1	12	38	5.1	J
11096-82-5	PCB-1260	1	78	78	18	U
37324-23-5	PCB-1262	1	38	38	6.0	U
11100-14-4	PCB-1268	1	38	38	5.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.7	30.1	78	60 - 125	
Tetrachloro-m-xylene		38.7	33.0	85	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-06 File ID: A008113-0

Sampled: 05/07/08 12:00 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 18:59

Solids: 91.96 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	36	36	4.6	U
11104-28-2	PCB-1221	1	36	36	8.0	U
11141-16-5	PCB-1232	1	36	36	9.1	U
53469-21-9	PCB-1242	1	73	73	18	U
12672-29-6	PCB-1248	1	36	36	5.8	U
11097-69-1	PCB-1254	1	36	36	4.8	U
11096-82-5	PCB-1260	1	73	73	17	U
37324-23-5	PCB-1262	1	36	36	5.7	U
11100-14-4	PCB-1268	1	36	36	4.8	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		36.2	29.1	80	60 - 125	
Tetrachloro-m-xylene		36.2	30.2	83	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-07 File ID: A008114-0

Sampled: 05/07/08 12:55 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 19:24

Solids: 85.70 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	39	39	4.9	U
11104-28-2	PCB-1221	1	39	39	8.6	U
11141-16-5	PCB-1232	1	39	39	9.8	U
53469-21-9	PCB-1242	1	78	78	19	U
12672-29-6	PCB-1248	1	39	39	6.2	U
11097-69-1	PCB-1254	1	39	39	5.1	U
11096-82-5	PCB-1260	1	78	78	19	U
37324-23-5	PCB-1262	1	39	39	6.1	U
11100-14-4	PCB-1268	1	39	39	5.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.9	31.2	80	60 - 125	
Tetrachloro-m-xylene		38.9	34.0	88	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-08 File ID: A008115-0

Sampled: 05/07/08 13:00 Prepared: 05/09/08 08:18 Analyzed: 05/22/08 19:49

Solids: 89.42 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805287 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	37	37	4.7	U
11104-28-2	PCB-1221	1	37	37	8.3	U
11141-16-5	PCB-1232	1	37	37	9.4	U
53469-21-9	PCB-1242	1	75	75	18	U
12672-29-6	PCB-1248	1	37	37	5.9	U
11097-69-1	PCB-1254	1	37	37	4.9	U
11096-82-5	PCB-1260	1	75	75	18	U
37324-23-5	PCB-1262	1	37	37	5.8	U
11100-14-4	PCB-1268	1	37	37	4.9	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		37.3	28.2	76	60 - 125	
Tetrachloro-m-xylene		37.3	30.5	82	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-09 File ID: A008118-0

Sampled: 05/07/08 00:00 Prepared: 05/12/08 09:40 Analyzed: 05/22/08 21:04

Solids: 85.72 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805369 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.9	U
11104-28-2	PCB-1221	1	38	38	8.6	U
11141-16-5	PCB-1232	1	38	38	9.8	U
53469-21-9	PCB-1242	1	78	78	19	U
12672-29-6	PCB-1248	1	38	38	6.2	U
11097-69-1	PCB-1254	1	38	38	5.1	U
11096-82-5	PCB-1260	1	78	78	19	U
37324-23-5	PCB-1262	1	38	38	6.1	U
11100-14-4	PCB-1268	1	38	38	5.1	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.9	27.9	72	60 - 125	
Tetrachloro-m-xylene		38.9	30.4	78	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-10 File ID: A008119-0

Sampled: 05/07/08 13:40 Prepared: 05/12/08 09:40 Analyzed: 05/22/08 21:29

Solids: 87.43 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805369 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	38	38	4.8	U
11104-28-2	PCB-1221	1	38	38	8.5	U
11141-16-5	PCB-1232	1	38	38	9.6	U
53469-21-9	PCB-1242	1	77	77	19	U
12672-29-6	PCB-1248	1	38	38	6.1	U
11097-69-1	PCB-1254	1	38	38	5.0	U
11096-82-5	PCB-1260	1	77	77	18	U
37324-23-5	PCB-1262	1	38	38	5.9	U
11100-14-4	PCB-1268	1	38	38	5.0	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		38.1	27.0	71	60 - 125	
Tetrachloro-m-xylene		38.1	29.0	76	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Soil Laboratory ID: 0805162-11 File ID: A008120-0

Sampled: 05/07/08 13:45 Prepared: 05/12/08 09:40 Analyzed: 05/22/08 21:54

Solids: 91.63 Preparation: 3550B Sonication Extrac Initial/Final: 30 g / 10 mL

QC Batch: 0805369 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/kg dry)	MRL	MDL	Q
12674-11-2	PCB-1016	1	36	36	4.6	U
11104-28-2	PCB-1221	1	36	36	8.1	U
11141-16-5	PCB-1232	1	36	36	9.2	U
53469-21-9	PCB-1242	1	73	73	18	U
12672-29-6	PCB-1248	1	36	36	5.8	U
11097-69-1	PCB-1254	1	36	36	4.8	U
11096-82-5	PCB-1260	1	73	73	17	U
37324-23-5	PCB-1262	1	36	36	5.7	U
11100-14-4	PCB-1268	1	36	36	4.8	U
System Monitoring Compound		**ADDED (ug/kg dry)**	**CONC (ug/kg dry)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		36.4	26.8	74	60 - 125	
Tetrachloro-m-xylene		36.4	29.0	80	32 - 129	

* Values outside of QC limits

ANALYSIS DATA SHEET

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Water Laboratory ID: 0805162-16 File ID: A008123-0

Sampled: 05/07/08 15:45 Prepared: 05/13/08 07:52 Analyzed: 05/22/08 23:09

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0805204 Sequence: 8052342 Calibration: 8E23016 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.200	0.165	83	40 - 135	
Tetrachloro-m-xylene	0.200	0.0980	49	36 - 114	

* Values outside of QC limits

SAMPLE ID SUMMARY

USEPA-8330

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-01 File ID: EXPa007-0

Sampled: 05/05/08 11:15 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 20:16

Solids: 72.50 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.38	95	57 - 139	

* Values outside of QC limits

0422G

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: EXPa008-0

Sampled: 05/05/08 11:40 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 20:59

Solids: 86.13 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.36	94	57 - 139	

* Values outside of QC limits

04223

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03 File ID: EXPa009-0

Sampled: 05/05/08 12:15 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 21:41

Solids: 73.18 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.02	81	57 - 139	

* Values outside of QC limits

84226

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: EXPa010-0

Sampled: 05/05/08 12:40 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 22:23

Solids: 87.60 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.39	96	57 - 139	

* Values outside of QC limits

84229

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: EXPa011-0

Sampled: 05/05/08 13:20 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 23:05

Solids: 78.25 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.27	91	57 - 139	

* Values outside of QC limits

64232

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: EXPa012-0

Sampled: 05/06/08 10:25 Prepared: 05/13/08 07:32 Analyzed: 05/14/08 23:47

Solids: 86.32 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.30	92	57 - 139	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: EXPa014-0

Sampled: 05/06/08 11:10 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 01:11

Solids: 81.01 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.30	92	57 - 139	

* Values outside of QC limits

QU238

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: EXPa015-0

Sampled: 05/06/08 13:05 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 01:54

Solids: 87.40 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.16	87	57 - 139	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: EXPa016-0

Sampled: 05/06/08 13:45 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 02:36

Solids: 91.38 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.46	99	57 - 139	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP4A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-05 File ID: EXPa017-0

Sampled: 05/06/08 14:00 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 03:18

Solids: 80.57 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.43	97	57 - 139	

* Values outside of QC limits

84247

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: EXPa018-0

Sampled: 05/06/08 14:30 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 04:00

Solids: 77.95 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.47	99	57 - 139	

* Values outside of QC limits

84256

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-07 File ID: EXPa019-0

Sampled: 05/06/08 15:00 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 04:42

Solids: 77.47 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.36	94	57 - 139	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: EXPa020-0

Sampled: 05/06/08 15:25 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 05:24

Solids: 84.60 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.46	98	57 - 139	

* Values outside of QC limits

84256

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: EXPa013-0

Sampled: 05/06/08 16:00 Prepared: 05/12/08 07:31 Analyzed: 05/13/08 18:38

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0805351 Sequence: 8051453 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.32	71	29 - 138	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: EXPa021-0

Sampled: 05/07/08 10:10 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 06:07

Solids: 82.59 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.24	89	57 - 139	

* Values outside of QC limits

04262

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: EXPa022-0

Sampled: 05/07/08 00:00 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 06:49

Solids: 80.87 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.30	92	57 - 139	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB1A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-03 File ID: EXPa029-0

Sampled: 05/07/08 11:00 Prepared: 05/13/08 07:34 Analyzed: 05/15/08 11:44

Solids: 81.89 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805355 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.24	90	57 - 139	

* Values outside of QC limits

GW268

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: EXPa023-0

Sampled: 05/07/08 11:05 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 07:31

Solids: 84.58 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.38	95	57 - 139	

* Values outside of QC limits

AU271

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: EXPa025-0

Sampled: 05/07/08 11:55 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 08:55

Solids: 86.03 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.23	89	57 - 139	

* Values outside of QC limits

04274

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: EXPa026-0

Sampled: 05/07/08 12:00 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 09:37

Solids: 91.96 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ,C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ,C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.27	91	57 - 139	

* Values outside of QC limits

AW277

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB14A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-07 File ID: EXPa027-0

Sampled: 05/07/08 12:55 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 10:19

Solids: 85.70 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.15	86	57 - 139	

* Values outside of QC limits

04289

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-08 File ID: EXPa028-0

Sampled: 05/07/08 13:00 Prepared: 05/13/08 07:32 Analyzed: 05/15/08 11:02

Solids: 89.42 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805353 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.24	89	57 - 139	

* Values outside of QC limits

04283

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

Dup-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-09 File ID: EXPa030-0

Sampled: 05/07/08 00:00 Prepared: 05/13/08 07:34 Analyzed: 05/15/08 12:26

Solids: 85.72 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805355 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.22	89	57 - 139	

* Values outside of QC limits

84286

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB8A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-10 File ID: EXPa031-0

Sampled: 05/07/08 13:40 Prepared: 05/13/08 07:34 Analyzed: 05/15/08 13:08

Solids: 87.43 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805355 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.22	89	57 - 139	

* Values outside of QC limits

AU289

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45SB8B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-11 File ID: EXPa035-0

Sampled: 05/07/08 13:45 Prepared: 05/13/08 07:34 Analyzed: 05/15/08 16:54

Solids: 91.63 Preparation: 8330 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805355 Sequence: 8052091 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	2.5	2.5	0.074	U
99-65-0	1,3-Dinitrobenzene	1	2.5	2.5	0.076	U
118-96-7	2,4,6-Trinitrotoluene	1	2.5	2.5	0.15	U
121-14-2	2,4-Dinitrotoluene	1	2.5	2.5	0.10	U
606-20-2	2,6-Dinitrotoluene	1	2.5	2.5	0.20	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	2.5	2.5	0.22	U
88-72-2	2-Nitrotoluene	1	2.5	2.5	0.17	U UJ, C
99-08-1	3-Nitrotoluene	1	2.5	2.5	0.21	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	2.5	2.5	0.30	U
99-99-0	4-Nitrotoluene	1	2.5	2.5	0.20	U UJ, C
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	2.5	2.5	0.048	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	2.5	2.5	0.065	U
98-95-3	Nitrobenzene	1	2.5	2.5	0.030	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	2.5	2.5	0.066	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
4-Nitroaniline	2.50	2.13	85	57 - 139	

* Values outside of QC limits

64292

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: EXPa014-0

Sampled: 05/07/08 15:45 Prepared: 05/12/08 07:31 Analyzed: 05/13/08 19:20

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0805351 Sequence: 8051453 Calibration: 8E14009 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.60	80	29 - 138	

* Values outside of QC limits

SAMPLE ID SUMMARY

USEPA-8332

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2A	0805100-03RE1
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805100-01
File ID: NGPa010-0
Sampled: 05/05/08 11:15
Prepared: 05/14/08 07:33
Analyzed: 05/16/08 17:33
Solids: 72.50
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805354
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	548	110	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-02 File ID: NGPa011-0

Sampled: 05/05/08 11:40 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 17:56

Solids: 86.13 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	553	111	50 - 150	

* Values outside of QC limits

84502

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805100-03
File ID: NGPa012-0
Sampled: 05/05/08 12:15
Prepared: 05/14/08 07:33
Analyzed: 05/16/08 18:18
Solids: 73.18
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805354
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	3.8	5.0	0.39	J
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	525	105	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP2A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-03RE1 File ID: data014-0

Sampled: 05/05/08 12:15 Prepared: 05/14/08 07:33 Analyzed: 05/20/08 15:40

Solids: 73.18 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8052128 Calibration: 8E21011 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	4.2	5.0	0.39	J
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	496	99	50 - 150	

* Values outside of QC limits

Do NOT use for confirmation. RA 6/24/08

01658

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP2B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-04 File ID: NGPa014-0

Sampled: 05/05/08 12:40 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 19:02

Solids: 87.60 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	487	97	50 - 150	

* Values outside of QC limits

0L5Q8

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP3A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805100-05 File ID: NGPa015-0

Sampled: 05/05/08 13:20 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 19:25

Solids: 78.25 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	713	143	50 - 150	

* Values outside of QC limits

04511

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP6A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-01 File ID: NGPa016-0

Sampled: 05/06/08 10:25 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 19:47

Solids: 86.32 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	617	123	50 - 150	

* Values outside of QC limits

0451

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP6B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-02 File ID: NGPa017-0

Sampled: 05/06/08 11:10 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 20:09

Solids: 81.01 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	704	141	50 - 150	

* Values outside of QC limits

DU517

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP7A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-03 File ID: NGPa018-0

Sampled: 05/06/08 13:05 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 20:32

Solids: 87.40 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	519	104	50 - 150	

* Values outside of QC limits

04520

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP7B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-04 File ID: NGPa019-0

Sampled: 05/06/08 13:45 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 20:54

Solids: 91.38 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	475	95	50 - 150	

* Values outside of QC limits

84523

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805133-05
File ID: NGPa020-0
Sampled: 05/06/08 14:00
Prepared: 05/14/08 07:33
Analyzed: 05/16/08 21:16
Solids: 80.57
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805354
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	548	110	50 - 150	

* Values outside of QC limits

84526

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP4B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-06 File ID: NGPa021-0

Sampled: 05/06/08 14:30 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 21:38

Solids: 77.95 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	556	111	50 - 150	

* Values outside of QC limits

0U529

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805133-07
File ID: NGPa022-0
Sampled: 05/06/08 15:00
Prepared: 05/14/08 07:33
Analyzed: 05/16/08 22:01
Solids: 77.47
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805354
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	551	110	50 - 150	

* Values outside of QC limits

QU532

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805133-08 File ID: NGPa023-0

Sampled: 05/06/08 15:25 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 22:23

Solids: 84.60 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	557	111	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

EQBK-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805133-09 File ID: NGPa006-0

Sampled: 05/06/08 16:00 Prepared: 05/12/08 07:32 Analyzed: 05/16/08 16:04

Solids: Preparation: 8332 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0805352 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	649	638	98	50 - 150	

* Values outside of QC limits

04536

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45TP3B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-01 File ID: NGPa025-0

Sampled: 05/07/08 10:10 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 23:07

Solids: 82.59 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	552	110	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

Dup-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-02 File ID: NGPa026-0

Sampled: 05/07/08 00:00 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 23:30

Solids: 80.87 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	550	110	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-03
File ID: NGPa037-0
Sampled: 05/07/08 11:00
Prepared: 05/14/08 07:34
Analyzed: 05/17/08 03:35
Solids: 81.89
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805356
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	556	111	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB1B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-04 File ID: NGPa027-0

Sampled: 05/07/08 11:05 Prepared: 05/14/08 07:33 Analyzed: 05/16/08 23:52

Solids: 84.58 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	481	96	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB5A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-05 File ID: NGPa028-0

Sampled: 05/07/08 11:55 Prepared: 05/14/08 07:33 Analyzed: 05/17/08 00:14

Solids: 86.03 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	563	113	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB5B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-06 File ID: NGPa029-0

Sampled: 05/07/08 12:00 Prepared: 05/14/08 07:33 Analyzed: 05/17/08 00:37

Solids: 91.96 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	484	97	50 - 150	

* Values outside of QC limits

04556

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-07
File ID: NGPa030-0
Sampled: 05/07/08 12:55
Prepared: 05/14/08 07:33
Analyzed: 05/17/08 00:59
Solids: 85.70
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805354
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	558	112	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB14B

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Soil Laboratory ID: 0805162-08 File ID: NGPa031-0

Sampled: 05/07/08 13:00 Prepared: 05/14/08 07:33 Analyzed: 05/17/08 01:21

Solids: 89.42 Preparation: 8332 Extraction Initial/Final: 2 g / 20 mL

QC Batch: 0805354 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	736	147	50 - 150	

* Values outside of QC limits

04562

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-09
File ID: NGPa038-0
Sampled: 05/07/08 00:00
Prepared: 05/14/08 07:34
Analyzed: 05/17/08 03:57
Solids: 85.72
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805356
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	559	112	50 - 150	

* Values outside of QC limits

04565

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-10
File ID: NGPa039-0
Sampled: 05/07/08 13:40
Prepared: 05/14/08 07:34
Analyzed: 05/17/08 04:19
Solids: 87.43
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805356
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	564	113	50 - 150	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805162-11
File ID: NGPa040-0
Sampled: 05/07/08 13:45
Prepared: 05/14/08 07:34
Analyzed: 05/17/08 04:41
Solids: 91.63
Preparation: 8332 Extraction
Initial/Final: 2 g / 20 mL
QC Batch: 0805356
Sequence: 8051931
Calibration: 8E16010
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (mg/kg dry	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.39	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.23	U

System Monitoring Compound	ADDED (mg/kg dry	CONC (mg/kg dry	% REC.	QC Limits	Q
1-Nitronaphthalene	500	592	118	50 - 150	

* Values outside of QC limits

04571

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

EQBK-2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805162-16 File ID: NGPa007-0

Sampled: 05/07/08 15:45 Prepared: 05/12/08 07:32 Analyzed: 05/16/08 16:26

Solids: Preparation: 8332 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0805352 Sequence: 8051931 Calibration: 8E16010 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	649	625	96	50 - 150	

* Values outside of QC limits

04574

SAMPLE ID SUMMARY

USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
~~45TP4B~~	~~0805133-06RE1~~
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
~~45SB1A~~	~~0805162-03RE1~~
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

No RE results were required.
RA
4/27/08

No RE results were required.
RA

04715

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	9800	mg/kg dry wt.	1	10	2.0		05/14/08 09:46
7440-39-3	Barium, Total	130	mg/kg dry wt.	1	1.0	0.33		05/14/08 09:46
7440-41-7	Beryllium, Total	1.0	mg/kg dry wt.	1	1.0	0.061		05/14/08 09:46
7440-43-9	Cadmium, Total	1.3	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 09:46
7440-70-2	Calcium, Total	1800	mg/kg dry wt.	1	50	9.8		05/14/08 09:46
7440-47-3	Chromium, Total	21	mg/kg dry wt.	1	5.0	0.80		05/14/08 09:46
7440-48-4	Cobalt, Total	7.9	mg/kg dry wt.	1	2.0	0.53		05/14/08 09:46
7439-89-6	Iron, Total	27000	mg/kg dry wt.	1	10	0.98		05/14/08 09:46
7439-95-4	Magnesium, Total	2200	mg/kg dry wt.	1	50	2.8		05/14/08 09:46
7439-96-5	Manganese, Total	640	mg/kg dry wt.	1	1.0	0.18		05/14/08 09:46
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 09:46
7440-23-5	Sodium, Total	67	mg/kg dry wt.	1	100	18	J	05/14/08 09:46
7440-66-6	Zinc, Total	760	mg/kg dry wt.	1	5.0	0.49		05/14/08 09:46

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5002 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	10000	mg/kg dry wt.	1	10	2.0		05/14/08 09:50
7440-39-3	Barium, Total	92	mg/kg dry wt.	1	1.0	0.33		05/14/08 09:50
7440-41-7	Beryllium, Total	0.80	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 09:50
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 09:50
7440-70-2	Calcium, Total	1000	mg/kg dry wt.	1	50	9.8		05/14/08 09:50
7440-47-3	Chromium, Total	16	mg/kg dry wt.	1	5.0	0.80		05/14/08 09:50
7440-48-4	Cobalt, Total	7.6	mg/kg dry wt.	1	2.0	0.53		05/14/08 09:50
7439-89-6	Iron, Total	15000	mg/kg dry wt.	1	10	0.98		05/14/08 09:50
7439-95-4	Magnesium, Total	2500	mg/kg dry wt.	1	50	2.8		05/14/08 09:50
7439-96-5	Manganese, Total	420	mg/kg dry wt.	1	1.0	0.18		05/14/08 09:50
7440-09-7	Potassium, Total	1300	mg/kg dry wt.	1	50	14		05/14/08 09:50
7440-23-5	Sodium, Total	34	mg/kg dry wt.	1	100	18	J	05/14/08 09:50
7440-66-6	Zinc, Total	57	mg/kg dry wt.	1	5.0	0.49		05/14/08 09:50

0171?

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	1	10	2.0		05/14/08 09:53
7440-39-3	Barium, Total	220	mg/kg dry wt.	1	1.0	0.33		05/14/08 09:53
7440-41-7	Beryllium, Total	1.1	mg/kg dry wt.	1	1.0	0.061		05/14/08 09:53
7440-43-9	Cadmium, Total	6.2	mg/kg dry wt.	1	2.0	0.45		05/14/08 09:53
7440-70-2	Calcium, Total	2100	mg/kg dry wt.	1	50	9.8		05/14/08 09:53
7440-47-3	Chromium, Total	35	mg/kg dry wt.	1	5.0	0.80		05/14/08 09:53
7440-48-4	Cobalt, Total	9.0	mg/kg dry wt.	1	2.0	0.53		05/14/08 09:53
7439-89-6	Iron, Total	44000	mg/kg dry wt.	1	10	0.98		05/14/08 09:53
7439-95-4	Magnesium, Total	2800	mg/kg dry wt.	1	50	2.8		05/14/08 09:53
7439-96-5	Manganese, Total	980	mg/kg dry wt.	1	1.0	0.18		05/14/08 09:53
7440-09-7	Potassium, Total	1300	mg/kg dry wt.	1	50	14		05/14/08 09:53
7440-23-5	Sodium, Total	50	mg/kg dry wt.	1	100	18	J	05/14/08 09:53
7440-66-6	Zinc, Total	2500	mg/kg dry wt.	1	5.0	0.49		05/14/08 09:53

04718

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	1	10	2.0		05/14/08 09:57
7440-39-3	Barium, Total	110	mg/kg dry wt.	1	1.0	0.33		05/14/08 09:57
7440-41-7	Beryllium, Total	1.1	mg/kg dry wt.	1	1.0	0.061		05/14/08 09:57
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 09:57
7440-70-2	Calcium, Total	1400	mg/kg dry wt.	1	50	9.8		05/14/08 09:57
7440-47-3	Chromium, Total	19	mg/kg dry wt.	1	5.0	0.80		05/14/08 09:57
7440-48-4	Cobalt, Total	7.0	mg/kg dry wt.	1	2.0	0.53		05/14/08 09:57
7439-89-6	Iron, Total	17000	mg/kg dry wt.	1	10	0.98		05/14/08 09:57
7439-95-4	Magnesium, Total	3000	mg/kg dry wt.	1	50	2.8		05/14/08 09:57
7439-96-5	Manganese, Total	420	mg/kg dry wt.	1	1.0	0.18		05/14/08 09:57
7440-09-7	Potassium, Total	1000	mg/kg dry wt.	1	50	14		05/14/08 09:57
7440-23-5	Sodium, Total	40	mg/kg dry wt.	1	100	18	J	05/14/08 09:57
7440-66-6	Zinc, Total	70	mg/kg dry wt.	1	5.0	0.49		05/14/08 09:57

GW719

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5005 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	18000	mg/kg dry wt.	1	10	2.0		05/14/08 10:01
7440-39-3	Barium, Total	62	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:01
7440-41-7	Beryllium, Total	0.55	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 10:01
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 10:01
7440-70-2	Calcium, Total	650	mg/kg dry wt.	1	50	9.8		05/14/08 10:01
7440-47-3	Chromium, Total	28	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:01
7440-48-4	Cobalt, Total	3.8	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:01
7439-89-6	Iron, Total	26000	mg/kg dry wt.	1	10	0.98		05/14/08 10:01
7439-95-4	Magnesium, Total	1200	mg/kg dry wt.	1	50	2.8		05/14/08 10:01
7439-96-5	Manganese, Total	250	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:01
7440-09-7	Potassium, Total	970	mg/kg dry wt.	1	50	14		05/14/08 10:01
7440-23-5	Sodium, Total	100	mg/kg dry wt.	1	100	18	U	05/14/08 10:01
7440-66-6	Zinc, Total	60	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:01

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5005 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	17000	mg/kg dry wt.	1	10	2.0		05/14/08 10:04
7440-39-3	Barium, Total	95	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:04
7440-41-7	Beryllium, Total	0.76	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 10:04
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 10:04
7440-70-2	Calcium, Total	1300	mg/kg dry wt.	1	50	9.8		05/14/08 10:04
7440-47-3	Chromium, Total	22	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:04
7440-48-4	Cobalt, Total	8.6	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:04
7439-89-6	Iron, Total	23000	mg/kg dry wt.	1	10	0.98		05/14/08 10:04
7439-95-4	Magnesium, Total	2000	mg/kg dry wt.	1	50	2.8		05/14/08 10:04
7439-96-5	Manganese, Total	510	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:04
7440-09-7	Potassium, Total	1000	mg/kg dry wt.	1	50	14		05/14/08 10:04
7440-23-5	Sodium, Total	33	mg/kg dry wt.	1	100	18	J	05/14/08 10:04
7440-66-6	Zinc, Total	110	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:04

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.4995 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	15000	mg/kg dry wt.	1	10	2.0		05/14/08 10:08
7440-39-3	Barium, Total	150	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:08
7440-41-7	Beryllium, Total	1.2	mg/kg dry wt.	1	1.0	0.061		05/14/08 10:08
7440-43-9	Cadmium, Total	0.50	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 10:08
7440-70-2	Calcium, Total	2000	mg/kg dry wt.	1	50	9.8		05/14/08 10:08
7440-47-3	Chromium, Total	24	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:08
7440-48-4	Cobalt, Total	9.4	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:08
7439-89-6	Iron, Total	22000	mg/kg dry wt.	1	10	0.98		05/14/08 10:08
7439-95-4	Magnesium, Total	3900	mg/kg dry wt.	1	50	2.8		05/14/08 10:08
7439-96-5	Manganese, Total	560	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:08
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 10:08
7440-23-5	Sodium, Total	67	mg/kg dry wt.	1	100	18	J	05/14/08 10:08
7440-66-6	Zinc, Total	130	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:08

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.4999 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	14000	mg/kg dry wt.	1	10	2.0		05/14/08 10:18
7440-39-3	Barium, Total	84	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:18
7440-41-7	Beryllium, Total	0.69	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 10:18
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 10:18
7440-70-2	Calcium, Total	210	mg/kg dry wt.	1	50	9.8		05/14/08 10:18
7440-47-3	Chromium, Total	39	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:18
7440-48-4	Cobalt, Total	5.0	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:18
7439-89-6	Iron, Total	24000	mg/kg dry wt.	1	10	0.98		05/14/08 10:18
7439-95-4	Magnesium, Total	940	mg/kg dry wt.	1	50	2.8		05/14/08 10:18
7439-96-5	Manganese, Total	490	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:18
7440-09-7	Potassium, Total	730	mg/kg dry wt.	1	50	14		05/14/08 10:18
7440-23-5	Sodium, Total	100	mg/kg dry wt.	1	100	18	U	05/14/08 10:18
7440-66-6	Zinc, Total	36	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:18

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5005 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	13000	mg/kg dry wt.	1	10	2.0		05/14/08 10:21
7440-39-3	Barium, Total	91	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:21
7440-41-7	Beryllium, Total	0.82	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 10:21
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 10:21
7440-70-2	Calcium, Total	1200	mg/kg dry wt.	1	50	9.8		05/14/08 10:21
7440-47-3	Chromium, Total	20	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:21
7440-48-4	Cobalt, Total	7.7	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:21
7439-89-6	Iron, Total	19000	mg/kg dry wt.	1	10	0.98		05/14/08 10:21
7439-95-4	Magnesium, Total	3200	mg/kg dry wt.	1	50	2.8		05/14/08 10:21
7439-96-5	Manganese, Total	370	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:21
7440-09-7	Potassium, Total	1800	mg/kg dry wt.	1	50	14		05/14/08 10:21
7440-23-5	Sodium, Total	35	mg/kg dry wt.	1	100	18	J	05/14/08 10:21
7440-66-6	Zinc, Total	57	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:21

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5001 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	1	10	2.0		05/14/08 10:25
7440-39-3	Barium, Total	240	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:25
7440-41-7	Beryllium, Total	1.2	mg/kg dry wt.	1	1.0	0.061		05/14/08 10:25
7440-43-9	Cadmium, Total	2.1	mg/kg dry wt.	1	2.0	0.45		05/14/08 10:25
7440-70-2	Calcium, Total	2000	mg/kg dry wt.	1	50	9.8		05/14/08 10:25
7440-47-3	Chromium, Total	79	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:25
7440-48-4	Cobalt, Total	8.4	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:25
7439-89-6	Iron, Total	47000	mg/kg dry wt.	10	100	9.8		05/14/08 12:20
7439-95-4	Magnesium, Total	2700	mg/kg dry wt.	1	50	2.8		05/14/08 10:25
7439-96-5	Manganese, Total	1100	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:25
7440-09-7	Potassium, Total	1500	mg/kg dry wt.	1	50	14		05/14/08 10:25
7440-23-5	Sodium, Total	58	mg/kg dry wt.	1	100	18	J	05/14/08 10:25
7440-66-6	Zinc, Total	1500	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:25

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5002 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-39-3	Barium, Total	300	mg/kg dry wt.	5	5.0	1.7		05/14/08 12:24
7440-41-7	Beryllium, Total	1.6	mg/kg dry wt.	1	1.0	0.061		05/14/08 10:29
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 10:29
7440-70-2	Calcium, Total	2700	mg/kg dry wt.	1	50	9.8		05/14/08 10:29
7440-48-4	Cobalt, Total	11	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:29
7440-09-7	Potassium, Total	1600	mg/kg dry wt.	1	50	14		05/14/08 10:29
7440-23-5	Sodium, Total	59	mg/kg dry wt.	1	100	18	J	05/14/08 10:29

04726

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/15/08 07:00
Initial/Final: 0.4998 g / 50 mL
QC Batch: 0805663

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	13000	mg/kg dry wt.	100	1000	200		05/16/08 10:55
7440-47-3	Chromium, Total	170	mg/kg dry wt.	1	5.0	0.80		05/16/08 11:21
7439-89-6	Iron, Total	39000	mg/kg dry wt.	1000	10000	980		05/16/08 10:45
7439-95-4	Magnesium, Total	3600	mg/kg dry wt.	1	50	2.8	L,m	05/16/08 11:21 L,m
7439-96-5	Manganese, Total	990	mg/kg dry wt.	20	20	3.5		05/16/08 11:05
7440-66-6	Zinc, Total	1000	mg/kg dry wt.	20	100	9.7	B	05/16/08 11:05

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.4997 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	14000	mg/kg dry wt.	1	10	2.0		05/14/08 10:47
7440-39-3	Barium, Total	160	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:47
7440-41-7	Beryllium, Total	1.3	mg/kg dry wt.	1	1.0	0.061		05/14/08 10:47
7440-43-9	Cadmium, Total	0.63	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 10:47
7440-70-2	Calcium, Total	1200	mg/kg dry wt.	1	50	9.8		05/14/08 10:47
7440-47-3	Chromium, Total	23	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:47
7440-48-4	Cobalt, Total	9.1	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:47
7439-89-6	Iron, Total	24000	mg/kg dry wt.	1	10	0.98		05/14/08 10:47
7439-95-4	Magnesium, Total	3000	mg/kg dry wt.	1	50	2.8		05/14/08 10:47
7439-96-5	Manganese, Total	900	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:47
7440-09-7	Potassium, Total	1700	mg/kg dry wt.	1	50	14		05/14/08 10:47
7440-23-5	Sodium, Total	38	mg/kg dry wt.	1	100	18	J	05/14/08 10:47
7440-66-6	Zinc, Total	300	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:47

04728

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 10:00
Initial/Final: 0.5005 g / 50 mL
QC Batch: 0805479

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	18000	mg/kg dry wt.	1	10	2.0		05/14/08 10:51
7440-39-3	Barium, Total	130	mg/kg dry wt.	1	1.0	0.33		05/14/08 10:51
7440-41-7	Beryllium, Total	1.0	mg/kg dry wt.	1	1.0	0.061		05/14/08 10:51
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 10:51
7440-70-2	Calcium, Total	1300	mg/kg dry wt.	1	50	9.8		05/14/08 10:51
7440-47-3	Chromium, Total	29	mg/kg dry wt.	1	5.0	0.80		05/14/08 10:51
7440-48-4	Cobalt, Total	10	mg/kg dry wt.	1	2.0	0.53		05/14/08 10:51
7439-89-6	Iron, Total	26000	mg/kg dry wt.	1	10	0.98		05/14/08 10:51
7439-95-4	Magnesium, Total	4600	mg/kg dry wt.	1	50	2.8		05/14/08 10:51
7439-96-5	Manganese, Total	510	mg/kg dry wt.	1	1.0	0.18		05/14/08 10:51
7440-09-7	Potassium, Total	1900	mg/kg dry wt.	1	50	14		05/14/08 10:51
7440-23-5	Sodium, Total	38	mg/kg dry wt.	1	100	18	J	05/14/08 10:51
7440-66-6	Zinc, Total	78	mg/kg dry wt.	1	5.0	0.49		05/14/08 10:51

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

EQBK-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/06/08 16:00
Solids: 0.00
Laboratory ID: 0805133-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/14/08 07:00
Initial/Final: 25 mL / 25 mL
QC Batch: 0805566

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	50	ug/L	1	50	20	U	05/15/08 15:15
7440-70-2	Calcium, Total	350	ug/L	1	500	69	J	05/15/08 15:16
7439-89-6	Iron, Total	20	ug/L	1	20	9.6	U	05/15/08 15:16
7439-95-4	Magnesium, Total	500	ug/L	1	500	63	U	05/15/08 15:16
7440-09-7	Potassium, Total	200	ug/L	1	200	62	U	05/15/08 15:15
7440-23-5	Sodium, Total	500	ug/L	1	500	210	U	05/15/08 15:15

U L10

QL730

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5001 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	17000	mg/kg dry wt.	1	10	2.0		05/14/08 11:08
7440-39-3	Barium, Total	150	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:08
7440-41-7	Beryllium, Total	1.1	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:08
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:08
7440-70-2	Calcium, Total	2100	mg/kg dry wt.	1	50	9.8		05/14/08 11:08
7440-47-3	Chromium, Total	26	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:08
7440-48-4	Cobalt, Total	11	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:08
7439-89-6	Iron, Total	25000	mg/kg dry wt.	1	10	0.98		05/14/08 11:08
7439-95-4	Magnesium, Total	4600	mg/kg dry wt.	1	50	2.8		05/14/08 11:08
7439-96-5	Manganese, Total	760	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:08
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 11:08
7440-23-5	Sodium, Total	220	mg/kg dry wt.	1	100	18		05/14/08 11:08
7440-66-6	Zinc, Total	77	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:08

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	16000	mg/kg dry wt.	1	10	2.0		05/14/08 11:12
7440-39-3	Barium, Total	150	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:12
7440-41-7	Beryllium, Total	1.2	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:12
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:12
7440-70-2	Calcium, Total	1900	mg/kg dry wt.	1	50	9.8		05/14/08 11:12
7440-47-3	Chromium, Total	25	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:12
7440-48-4	Cobalt, Total	11	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:12
7439-89-6	Iron, Total	25000	mg/kg dry wt.	1	10	0.98		05/14/08 11:12
7439-95-4	Magnesium, Total	4500	mg/kg dry wt.	1	50	2.8		05/14/08 11:12
7439-96-5	Manganese, Total	610	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:12
7440-09-7	Potassium, Total	1300	mg/kg dry wt.	1	50	14		05/14/08 11:12
7440-23-5	Sodium, Total	220	mg/kg dry wt.	1	100	18		05/14/08 11:12
7440-66-6	Zinc, Total	75	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:12

04732

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5003 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	100	1000	200		05/14/08 12:43
7440-39-3	Barium, Total	190	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:15
7440-41-7	Beryllium, Total	0.98	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 11:15
7440-43-9	Cadmium, Total	0.49	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 11:15
7440-70-2	Calcium, Total	1600	mg/kg dry wt.	1	50	9.8		05/14/08 11:15
7440-47-3	Chromium, Total	18	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:15
7440-48-4	Cobalt, Total	8.5	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:15
7439-89-6	Iron, Total	24000	mg/kg dry wt.	500	5000	490		05/14/08 12:34
7439-95-4	Magnesium, Total	2500	mg/kg dry wt.	1	50	2.8		05/14/08 11:15
7439-96-5	Manganese, Total	930	mg/kg dry wt.	20	20	3.5		05/14/08 13:00
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 11:15
7440-23-5	Sodium, Total	34	mg/kg dry wt.	1	100	18	J	05/14/08 11:15
7440-66-6	Zinc, Total	330	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:15

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5004 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	14000	mg/kg dry wt.	1	10	2.0		05/14/08 11:33
7440-39-3	Barium, Total	130	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:33
7440-41-7	Beryllium, Total	1.4	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:33
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:33
7440-70-2	Calcium, Total	1800	mg/kg dry wt.	1	50	9.8		05/14/08 11:33
7440-47-3	Chromium, Total	20	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:33
7440-48-4	Cobalt, Total	8.9	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:33
7439-89-6	Iron, Total	21000	mg/kg dry wt.	1	10	0.98		05/14/08 11:33
7439-95-4	Magnesium, Total	3400	mg/kg dry wt.	1	50	2.8		05/14/08 11:33
7439-96-5	Manganese, Total	620	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:33
7440-09-7	Potassium, Total	2000	mg/kg dry wt.	1	50	14		05/14/08 11:33
7440-23-5	Sodium, Total	34	mg/kg dry wt.	1	100	18	J	05/14/08 11:33
7440-66-6	Zinc, Total	71	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:33

04734

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5002 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	9100	mg/kg dry wt.	1	10	2.0		05/14/08 11:43
7440-39-3	Barium, Total	110	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:43
7440-41-7	Beryllium, Total	0.93	mg/kg dry wt.	1	1.0	0.061	J	05/14/08 11:43
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:43
7440-70-2	Calcium, Total	1400	mg/kg dry wt.	1	50	9.8		05/14/08 11:43
7440-47-3	Chromium, Total	16	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:43
7440-48-4	Cobalt, Total	7.4	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:43
7439-89-6	Iron, Total	14000	mg/kg dry wt.	1	10	0.98		05/14/08 11:43
7439-95-4	Magnesium, Total	2700	mg/kg dry wt.	1	50	2.8		05/14/08 11:43
7439-96-5	Manganese, Total	390	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:43
7440-09-7	Potassium, Total	950	mg/kg dry wt.	1	50	14		05/14/08 11:43
7440-23-5	Sodium, Total	40	mg/kg dry wt.	1	100	18	J	05/14/08 11:43
7440-66-6	Zinc, Total	57	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:43

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.4997 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	12000	mg/kg dry wt.	1	10	2.0		05/14/08 11:47
7440-39-3	Barium, Total	120	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:47
7440-41-7	Beryllium, Total	1.2	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:47
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:47
7440-70-2	Calcium, Total	1600	mg/kg dry wt.	1	50	9.8		05/14/08 11:47
7440-47-3	Chromium, Total	19	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:47
7440-48-4	Cobalt, Total	8.4	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:47
7439-89-6	Iron, Total	19000	mg/kg dry wt.	1	10	0.98		05/14/08 11:47
7439-95-4	Magnesium, Total	3400	mg/kg dry wt.	1	50	2.8		05/14/08 11:47
7439-96-5	Manganese, Total	470	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:47
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 11:47
7440-23-5	Sodium, Total	42	mg/kg dry wt.	1	100	18	J	05/14/08 11:47
7440-66-6	Zinc, Total	58	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:47

0U735

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.4997 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	1	10	2.0		05/14/08 11:50
7440-39-3	Barium, Total	170	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:50
7440-41-7	Beryllium, Total	1.0	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:50
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:50
7440-70-2	Calcium, Total	1500	mg/kg dry wt.	1	50	9.8		05/14/08 11:50
7440-47-3	Chromium, Total	22	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:50
7440-48-4	Cobalt, Total	7.7	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:50
7439-89-6	Iron, Total	18000	mg/kg dry wt.	1	10	0.98		05/14/08 11:50
7439-95-4	Magnesium, Total	2500	mg/kg dry wt.	1	50	2.8		05/14/08 11:50
7439-96-5	Manganese, Total	640	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:50
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 11:50
7440-23-5	Sodium, Total	41	mg/kg dry wt.	1	100	18	J	05/14/08 11:50
7440-66-6	Zinc, Total	130	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:50

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.4995 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	19000	mg/kg dry wt.	1	10	2.0		05/14/08 11:54
7440-39-3	Barium, Total	140	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:54
7440-41-7	Beryllium, Total	1.2	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:54
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:54
7440-70-2	Calcium, Total	1400	mg/kg dry wt.	1	50	9.8		05/14/08 11:54
7440-47-3	Chromium, Total	27	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:54
7440-48-4	Cobalt, Total	11	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:54
7439-89-6	Iron, Total	27000	mg/kg dry wt.	1	10	0.98		05/14/08 11:54
7439-95-4	Magnesium, Total	4700	mg/kg dry wt.	1	50	2.8		05/14/08 11:54
7439-96-5	Manganese, Total	510	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:54
7440-09-7	Potassium, Total	2400	mg/kg dry wt.	1	50	14		05/14/08 11:54
7440-23-5	Sodium, Total	45	mg/kg dry wt.	1	100	18	J	05/14/08 11:54
7440-66-6	Zinc, Total	73	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:54

au738

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.5005 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	11000	mg/kg dry wt.	1	10	2.0		05/14/08 11:57
7440-39-3	Barium, Total	160	mg/kg dry wt.	1	1.0	0.33		05/14/08 11:57
7440-41-7	Beryllium, Total	1.0	mg/kg dry wt.	1	1.0	0.061		05/14/08 11:57
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 11:57
7440-70-2	Calcium, Total	1500	mg/kg dry wt.	1	50	9.8		05/14/08 11:57
7440-47-3	Chromium, Total	19	mg/kg dry wt.	1	5.0	0.80		05/14/08 11:57
7440-48-4	Cobalt, Total	7.6	mg/kg dry wt.	1	2.0	0.53		05/14/08 11:57
7439-89-6	Iron, Total	16000	mg/kg dry wt.	1	10	0.98		05/14/08 11:57
7439-95-4	Magnesium, Total	2500	mg/kg dry wt.	1	50	2.8		05/14/08 11:57
7439-96-5	Manganese, Total	630	mg/kg dry wt.	1	1.0	0.18		05/14/08 11:57
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 11:57
7440-23-5	Sodium, Total	38	mg/kg dry wt.	1	100	18	J	05/14/08 11:57
7440-66-6	Zinc, Total	120	mg/kg dry wt.	1	5.0	0.49		05/14/08 11:57

04739

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.4996 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	10000	mg/kg dry wt.	1	10	2.0		05/14/08 12:01
7440-39-3	Barium, Total	160	mg/kg dry wt.	1	1.0	0.33		05/14/08 12:01
7440-41-7	Beryllium, Total	1.1	mg/kg dry wt.	1	1.0	0.061		05/14/08 12:01
7440-43-9	Cadmium, Total	2.0	mg/kg dry wt.	1	2.0	0.45	U	05/14/08 12:01
7440-70-2	Calcium, Total	1000	mg/kg dry wt.	1	50	9.8		05/14/08 12:01
7440-47-3	Chromium, Total	19	mg/kg dry wt.	1	5.0	0.80		05/14/08 12:01
7440-48-4	Cobalt, Total	8.8	mg/kg dry wt.	1	2.0	0.53		05/14/08 12:01
7439-89-6	Iron, Total	17000	mg/kg dry wt.	1	10	0.98		05/14/08 12:01
7439-95-4	Magnesium, Total	2600	mg/kg dry wt.	1	50	2.8		05/14/08 12:01
7439-96-5	Manganese, Total	700	mg/kg dry wt.	1	1.0	0.18		05/14/08 12:01
7440-09-7	Potassium, Total	1400	mg/kg dry wt.	1	50	14		05/14/08 12:01
7440-23-5	Sodium, Total	40	mg/kg dry wt.	1	100	18	J	05/14/08 12:01
7440-66-6	Zinc, Total	160	mg/kg dry wt.	1	5.0	0.49		05/14/08 12:01

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 07:30
Initial/Final: 0.4995 g / 50 mL
QC Batch: 0805482

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	12000	mg/kg dry wt.	1	10	2.0		05/14/08 12:05
7440-39-3	Barium, Total	150	mg/kg dry wt.	1	1.0	0.33		05/14/08 12:05
7440-41-7	Beryllium, Total	1.3	mg/kg dry wt.	1	1.0	0.061		05/14/08 12:05
7440-43-9	Cadmium, Total	0.53	mg/kg dry wt.	1	2.0	0.45	J	05/14/08 12:05
7440-70-2	Calcium, Total	1100	mg/kg dry wt.	1	50	9.8		05/14/08 12:05
7440-47-3	Chromium, Total	21	mg/kg dry wt.	1	5.0	0.80		05/14/08 12:05
7440-48-4	Cobalt, Total	8.5	mg/kg dry wt.	1	2.0	0.53		05/14/08 12:05
7439-89-6	Iron, Total	17000	mg/kg dry wt.	1	10	0.98		05/14/08 12:05
7439-95-4	Magnesium, Total	3200	mg/kg dry wt.	1	50	2.8		05/14/08 12:05
7439-96-5	Manganese, Total	590	mg/kg dry wt.	1	1.0	0.18		05/14/08 12:05
7440-09-7	Potassium, Total	1200	mg/kg dry wt.	1	50	14		05/14/08 12:05
7440-23-5	Sodium, Total	42	mg/kg dry wt.	1	100	18	J	05/14/08 12:05
7440-66-6	Zinc, Total	100	mg/kg dry wt.	1	5.0	0.49		05/14/08 12:05

0L7Q1

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

EQBK-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/07/08 15:45
Solids: 0.00
Laboratory ID: 0805162-16

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/14/08 07:00
Initial/Final: 25 mL / 25 mL
QC Batch: 0805566

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	50	ug/L	1	50	20	U	05/15/08 15:20
7440-70-2	Calcium, Total	500	ug/L	1	500	69	U	05/15/08 15:20
7439-89-6	Iron, Total	20	ug/L	1	20	9.6	U	05/15/08 15:20
7439-95-4	Magnesium, Total	500	ug/L	1	500	63	U	05/15/08 15:20
7440-09-7	Potassium, Total	200	ug/L	1	200	62	U	05/15/08 15:20
7440-23-5	Sodium, Total	500	ug/L	1	500	210	U	05/15/08 15:20

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04742

SAMPLE ID SUMMARY

USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
~~45TP4B~~	~~0805133-06RE1~~
~~45TP4B~~	~~0805133-06RE2~~
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

No RE results were required. RA 6/27/08

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	2.5	mg/kg dry wt.	1	0.20	0.026		05/14/08 17:20

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	2.8	mg/kg dry wt.	1	0.20	0.026		05/15/08 08:55
7440-50-8	Copper, Total	71	mg/kg dry wt.	5	1.0	0.13		05/14/08 18:59
7439-92-1	Lead, Total	200	mg/kg dry wt.	10	2.0	0.24		05/14/08 18:57
7440-02-0	Nickel, Total	13	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:30
7782-49-2	Selenium, Total	0.26	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 20:58
7440-22-4	Silver, Total	0.10	mg/kg dry wt.	1	0.10	0.0093		05/14/08 17:30
7440-28-0	Thallium, Total	0.24	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:30
7440-62-2	Vanadium, Total	20	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:30

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/14/08 17:22

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.60	mg/kg dry wt.	1	0.20	0.026		05/15/08 08:58
7440-50-8	Copper, Total	6.5	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:33
7439-92-1	Lead, Total	8.1	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:33
7440-02-0	Nickel, Total	8.9	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:33
7782-49-2	Selenium, Total	0.068	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 21:00
7440-22-4	Silver, Total	0.031	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:33
7440-28-0	Thallium, Total	0.11	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:33
7440-62-2	Vanadium, Total	15	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:33

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	2.0	mg/kg dry wt.	1	0.20	0.026		05/14/08 17:25

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	4.5	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:00
7440-50-8	Copper, Total	1100	mg/kg dry wt.	40	8.0	1.1		05/14/08 19:01
7439-92-1	Lead, Total	450	mg/kg dry wt.	20	4.0	0.47		05/14/08 19:04
7440-02-0	Nickel, Total	24	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:36
7782-49-2	Selenium, Total	0.32	mg/kg dry wt.	1	0.30	0.028		05/14/08 21:02
7440-22-4	Silver, Total	0.73	mg/kg dry wt.	1	0.10	0.0093		05/14/08 17:36
7440-28-0	Thallium, Total	0.42	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:36
7440-62-2	Vanadium, Total	27	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:36

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.054	mg/kg dry wt.	1	0.20	0.026	J	05/14/08 17:37

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.71	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:02
7440-50-8	Copper, Total	9.3	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:39
7439-92-1	Lead, Total	11	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:39
7440-02-0	Nickel, Total	12	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:39
7782-49-2	Selenium, Total	0.30	mg/kg dry wt.	1	0.30	0.028	U	05/14/08 21:05
7440-22-4	Silver, Total	0.042	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:39
7440-28-0	Thallium, Total	0.11	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:39
7440-62-2	Vanadium, Total	18	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:39

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.21	mg/kg dry wt.	1	0.20	0.026		05/14/08 17:39

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	12	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:04
7440-50-8	Copper, Total	12	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:42
7439-92-1	Lead, Total	20	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:42
7440-02-0	Nickel, Total	7.8	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:42
7782-49-2	Selenium, Total	0.41	mg/kg dry wt.	1	0.30	0.028		05/14/08 21:07
7440-22-4	Silver, Total	0.046	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:42
7440-28-0	Thallium, Total	0.54	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:42
7440-62-2	Vanadium, Total	28	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:42

05108

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.26	mg/kg dry wt.	1	0.20	0.026		05/14/08 17:41

05109

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	6.5	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:06
7440-50-8	Copper, Total	19	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:45
7439-92-1	Lead, Total	33	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:45
7440-02-0	Nickel, Total	9.7	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:45
7782-49-2	Selenium, Total	0.87	mg/kg dry wt.	1	0.30	0.028		05/14/08 21:09
7440-22-4	Silver, Total	0.052	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:45
7440-28-0	Thallium, Total	0.46	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:45
7440-62-2	Vanadium, Total	43	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:45

0510

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.093	mg/kg dry wt.	1	0.20	0.026	J	05/14/08 17:43

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.89	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:08
7440-50-8	Copper, Total	20	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:48
7439-92-1	Lead, Total	27	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:48
7440-02-0	Nickel, Total	14	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:48
7782-49-2	Selenium, Total	0.30	mg/kg dry wt.	1	0.30	0.028	U	05/14/08 21:12
7440-22-4	Silver, Total	0.077	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:48
7440-28-0	Thallium, Total	0.17	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:48
7440-62-2	Vanadium, Total	24	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:48

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.4995 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.18	mg/kg dry wt.	1	0.20	0.026	J	05/14/08 17:45

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	11	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:10
7440-50-8	Copper, Total	9.4	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:51
7439-92-1	Lead, Total	22	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:51
7440-02-0	Nickel, Total	6.6	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:51
7782-49-2	Selenium, Total	0.58	mg/kg dry wt.	1	0.30	0.028		05/14/08 21:14
7440-22-4	Silver, Total	0.046	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:51
7440-28-0	Thallium, Total	0.45	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:51
7440-62-2	Vanadium, Total	25	mg/kg dry wt.	1	0.10	0.032		05/14/08 17:51

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/14/08 17:47

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.79	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:20
7440-50-8	Copper, Total	8.3	mg/kg dry wt.	1	0.20	0.027		05/14/08 17:59
7439-92-1	Lead, Total	8.4	mg/kg dry wt.	1	0.20	0.024		05/14/08 17:59
7440-02-0	Nickel, Total	11	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 17:59
7782-49-2	Selenium, Total	0.30	mg/kg dry wt.	1	0.30	0.028	U	05/14/08 21:21
7440-22-4	Silver, Total	0.024	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 17:59
7440-28-0	Thallium, Total	0.15	mg/kg dry wt.	1	0.10	0.0068		05/14/08 17:59
7440-62-2	Vanadium, Total	21	mg/kg dry wt.	1	0.10	0.032		05/14/08 21:21

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5002 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	4.6	mg/kg dry wt.	1	0.20	0.026		05/14/08 17:49

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	3.2	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:22
7440-50-8	Copper, Total	460	mg/kg dry wt.	20	4.0	0.53		05/14/08 19:06
7439-92-1	Lead, Total	760	mg/kg dry wt.	20	4.0	0.47		05/14/08 19:06
7440-02-0	Nickel, Total	23	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 18:02
7782-49-2	Selenium, Total	0.27	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 21:23
7440-22-4	Silver, Total	0.56	mg/kg dry wt.	1	0.10	0.0093		05/14/08 18:02
7440-28-0	Thallium, Total	0.30	mg/kg dry wt.	1	0.10	0.0068		05/14/08 18:02
7440-62-2	Vanadium, Total	46	mg/kg dry wt.	1	0.10	0.032		05/14/08 21:23

0518

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.4998 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.8	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:24
7439-92-1	Lead, Total	300	mg/kg dry wt.	10	2.0	0.24		05/14/08 19:47
7440-02-0	Nickel, Total	34	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 18:05
7782-49-2	Selenium, Total	0.15	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 21:26
7440-22-4	Silver, Total	0.34	mg/kg dry wt.	1	0.10	0.0093		05/14/08 18:05
7440-28-0	Thallium, Total	0.19	mg/kg dry wt.	1	0.10	0.0068		05/14/08 18:05
7440-62-2	Vanadium, Total	40	mg/kg dry wt.	2	0.20	0.063		05/15/08 12:25

0519

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:32
Initial/Final: 0.4995 g / 250 mL
QC Batch: 0805678

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	33	mg/kg dry wt.	1	0.20	0.026	LIM	05/19/08 17:36

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/15/08 07:00
Initial/Final: 0.5002 g / 250 mL
QC Batch: 0805728

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-50-8	Copper, Total	560	mg/kg dry wt.	20	4.0	0.53		05/19/08 09:56

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.76	mg/kg dry wt.	1	0.20	0.026		05/14/08 18:15

05122

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.8	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:34
7440-50-8	Copper, Total	6.3	mg/kg dry wt.	1	0.20	0.027		05/14/08 19:58
7439-92-1	Lead, Total	100	mg/kg dry wt.	5	1.0	0.12		05/14/08 19:58
7440-02-0	Nickel, Total	13	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 18:20
7782-49-2	Selenium, Total	0.18	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 21:37
7440-22-4	Silver, Total	0.073	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 18:20
7440-28-0	Thallium, Total	0.35	mg/kg dry wt.	1	0.10	0.0068		05/14/08 18:20
7440-62-2	Vanadium, Total	23	mg/kg dry wt.	1	0.10	0.032		05/14/08 21:37

05123

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 13:59
Initial/Final: 0.5002 g / 250 mL
QC Batch: 0805471

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.062	mg/kg dry wt.	1	0.20	0.026	J	05/14/08 18:17

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/13/08 15:15
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805480

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.0	mg/kg dry wt.	1	0.20	0.026		05/15/08 09:36
7440-50-8	Copper, Total	11	mg/kg dry wt.	1	0.20	0.027		05/14/08 18:23
7439-92-1	Lead, Total	12	mg/kg dry wt.	1	0.20	0.024		05/14/08 18:23
7440-02-0	Nickel, Total	15	mg/kg dry wt.	1	0.10	0.035	B	05/14/08 18:23
7782-49-2	Selenium, Total	0.13	mg/kg dry wt.	1	0.30	0.028	J	05/14/08 21:40
7440-22-4	Silver, Total	0.029	mg/kg dry wt.	1	0.10	0.0093	J	05/14/08 18:23
7440-28-0	Thallium, Total	0.21	mg/kg dry wt.	1	0.10	0.0068		05/14/08 18:23
7440-62-2	Vanadium, Total	29	mg/kg dry wt.	1	0.10	0.032		05/14/08 21:40

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

EQBK-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/06/08 16:00
Solids: 0.00
Laboratory ID: 0805133-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/14/08 07:00
Initial/Final: 25 mL / 125 mL
QC Batch: 0805567

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7440-36-0	Antimony, Total	0.50	ug/L	1	3.0	0.32	J	05/19/08 18:20	B,O
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	05/16/08 10:46	
7440-39-3	Barium, Total	2.0	ug/L	1	2.0	0.23	U	05/16/08 10:46	
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	05/16/08 10:46	
7440-43-9	Cadmium, Total	0.20	ug/L	1	0.20	0.056	U	05/16/08 10:46	
7440-47-3	Chromium, Total	2.0	ug/L	1	2.0	0.33	U	05/16/08 13:00	
7440-48-4	Cobalt, Total	1.0	ug/L	1	1.0	0.050	U	05/16/08 10:46	
7440-50-8	Copper, Total	1.0	ug/L	1	1.0	0.29	U	05/16/08 13:00	
7439-92-1	Lead, Total	1.0	ug/L	1	1.0	0.29	U	05/16/08 10:46	
7439-96-5	Manganese, Total	3.0	ug/L	1	3.0	0.30	U	05/16/08 10:46	
7440-02-0	Nickel, Total	2.0	ug/L	1	2.0	0.35	U	05/16/08 13:00	
7782-49-2	Selenium, Total	3.0	ug/L	1	3.0	0.30	U	05/16/08 10:46	
7440-22-4	Silver, Total	0.50	ug/L	1	0.50	0.061	U	05/16/08 10:46	
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	05/16/08 16:56	
7440-62-2	Vanadium, Total	5.0	ug/L	1	5.0	0.27	U	05/16/08 10:46	
7440-66-6	Zinc, Total	5.7	ug/L	1	10	1.8	J	05/16/08 16:56	B,P

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5002 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.95	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:01
7440-50-8	Copper, Total	12	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:01
7439-92-1	Lead, Total	11	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:01
7440-02-0	Nickel, Total	16	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:01
7782-49-2	Selenium, Total	0.097	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 13:20
7440-22-4	Silver, Total	0.051	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 13:20
7440-28-0	Thallium, Total	0.18	mg/kg dry wt.	1	0.10	0.0068		05/20/08 13:20
7440-62-2	Vanadium, Total	25	mg/kg dry wt.	1	0.10	0.032		05/20/08 12:01

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.4999 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.081	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 18:05

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.90	mg/kg dry wt.	1	0.20	0.026	Lim	05/20/08 12:04
7440-50-8	Copper, Total	12	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:04
7439-92-1	Lead, Total	11	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:04
7440-02-0	Nickel, Total	16	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:04
7782-49-2	Selenium, Total	0.30	mg/kg dry wt.	1	0.30	0.028	U Lim	05/20/08 13:23
7440-22-4	Silver, Total	0.044	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 13:23
7440-28-0	Thallium, Total	0.17	mg/kg dry wt.	1	0.10	0.0068		05/20/08 13:23
7440-62-2	Vanadium, Total	25	mg/kg dry wt.	1	0.10	0.032		05/20/08 12:04

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.092	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 18:17

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5003 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.1	mg/kg dry wt.	1	0.20	0.026	LIM	05/20/08 12:08
7440-50-8	Copper, Total	9.9	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:08
7439-92-1	Lead, Total	79	mg/kg dry wt.	5	1.0	0.12		05/20/08 14:12
7440-02-0	Nickel, Total	10	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:08
7782-49-2	Selenium, Total	0.15	mg/kg dry wt.	1	0.30	0.028	J LIM	05/20/08 13:25
7440-22-4	Silver, Total	0.048	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 13:25
7440-28-0	Thallium, Total	0.36	mg/kg dry wt.	1	0.10	0.0068		05/20/08 13:25
7440-62-2	Vanadium, Total	16	mg/kg dry wt.	1	0.10	0.032		05/20/08 12:08

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.074	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 18:19

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.4999 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.84	mg/kg dry wt.	1	0.20	0.026	L, M	05/20/08 12:25
7440-50-8	Copper, Total	9.6	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:25
7439-92-1	Lead, Total	9.2	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:25
7440-02-0	Nickel, Total	14	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:25
7782-49-2	Selenium, Total	0.12	mg/kg dry wt.	1	0.30	0.028	J, L, M	05/20/08 13:39
7440-22-4	Silver, Total	0.041	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 13:39
7440-28-0	Thallium, Total	0.14	mg/kg dry wt.	1	0.10	0.0068		05/20/08 13:39
7440-62-2	Vanadium, Total	20	mg/kg dry wt.	1	0.10	0.032		05/20/08 12:25

05133

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5001 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/19/08 18:37

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.4996 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.57	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:39
7440-50-8	Copper, Total	6.5	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:39
7439-92-1	Lead, Total	7.9	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:39
7440-02-0	Nickel, Total	9.9	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:39
7782-49-2	Selenium, Total	0.12	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 13:48
7440-22-4	Silver, Total	0.037	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:39
7440-28-0	Thallium, Total	0.10	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:39
7440-62-2	Vanadium, Total	16	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:12

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.4997 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/19/08 18:39

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.73	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:42
7440-50-8	Copper, Total	8.5	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:42
7439-92-1	Lead, Total	7.7	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:42
7440-02-0	Nickel, Total	11	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:42
7782-49-2	Selenium, Total	0.036	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 13:51
7440-22-4	Silver, Total	0.032	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:42
7440-28-0	Thallium, Total	0.14	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:42
7440-62-2	Vanadium, Total	17	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:14

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.4995 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/19/08 18:41

05138

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.4996 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.84	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:46
7440-50-8	Copper, Total	9.3	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:46
7439-92-1	Lead, Total	81	mg/kg dry wt.	2	0.40	0.047		05/20/08 14:24
7440-02-0	Nickel, Total	11	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:46
7782-49-2	Selenium, Total	0.12	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 13:53
7440-22-4	Silver, Total	0.045	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:46
7440-28-0	Thallium, Total	0.15	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:46
7440-62-2	Vanadium, Total	18	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:16

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.22	mg/kg dry wt.	1	0.20	0.026		05/19/08 18:43

05146

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.2	mg/kg dry wt.	1	0.20	0.026	L, M	05/20/08 12:49
7440-50-8	Copper, Total	13	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:49
7439-92-1	Lead, Total	11	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:49
7440-02-0	Nickel, Total	14	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:49
7782-49-2	Selenium, Total	0.30	mg/kg dry wt.	1	0.30	0.028	U, L, M	05/20/08 13:56
7440-22-4	Silver, Total	0.024	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:49
7440-28-0	Thallium, Total	0.21	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:49
7440-62-2	Vanadium, Total	27	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:18

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.046	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 18:56

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.82	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:52
7440-50-8	Copper, Total	8.6	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:52
7439-92-1	Lead, Total	51	mg/kg dry wt.	2	0.40	0.047		05/20/08 14:26
7440-02-0	Nickel, Total	11	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:52
7782-49-2	Selenium, Total	0.13	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 13:58
7440-22-4	Silver, Total	0.047	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:52
7440-28-0	Thallium, Total	0.16	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:52
7440-62-2	Vanadium, Total	18	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:21

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.12	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 18:58

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.4998 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	1.1	mg/kg dry wt.	1	0.20	0.026	L1M	05/20/08 12:56
7440-50-8	Copper, Total	33	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:56
7439-92-1	Lead, Total	56	mg/kg dry wt.	2	0.40	0.047		05/20/08 14:29
7440-02-0	Nickel, Total	10	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:56
7782-49-2	Selenium, Total	0.18	mg/kg dry wt.	1	0.30	0.028	J L1M	05/20/08 14:01
7440-22-4	Silver, Total	0.049	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:56
7440-28-0	Thallium, Total	0.21	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:56
7440-62-2	Vanadium, Total	17	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:23

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5005 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.077	mg/kg dry wt.	1	0.20	0.026	J	05/19/08 19:00

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/14/08 07:15
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805538

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-38-2	Arsenic, Total	0.66	mg/kg dry wt.	1	0.20	0.026	L, M	05/20/08 12:59
7440-50-8	Copper, Total	14	mg/kg dry wt.	1	0.20	0.027		05/20/08 12:59
7439-92-1	Lead, Total	8.7	mg/kg dry wt.	1	0.20	0.024		05/20/08 12:59
7440-02-0	Nickel, Total	14	mg/kg dry wt.	1	0.10	0.035		05/20/08 12:59
7782-49-2	Selenium, Total	0.11	mg/kg dry wt.	1	0.30	0.028	J, L, M	05/20/08 14:03
7440-22-4	Silver, Total	0.040	mg/kg dry wt.	1	0.10	0.0093	J	05/20/08 12:59
7440-28-0	Thallium, Total	0.14	mg/kg dry wt.	1	0.10	0.0068		05/20/08 12:59
7440-62-2	Vanadium, Total	21	mg/kg dry wt.	1	0.10	0.032		05/20/08 15:25

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3050B Digestion
Prepared: 05/16/08 10:33
Initial/Final: 0.5004 g / 250 mL
QC Batch: 0805709

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.20	mg/kg dry wt.	1	0.20	0.026	U	05/19/08 19:02

05148

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

EQBK-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/07/08 15:45
Solids: 0.00
Laboratory ID: 0805162-16

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/14/08 07:00
Initial/Final: 25 mL / 125 mL
QC Batch: 0805567

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	05/19/08 18:23
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	05/16/08 10:50
7440-39-3	Barium, Total	2.0	ug/L	1	2.0	0.23	U	05/16/08 10:50
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	05/16/08 10:50
7440-43-9	Cadmium, Total	0.20	ug/L	1	0.20	0.056	U	05/16/08 10:50
7440-47-3	Chromium, Total	2.0	ug/L	1	2.0	0.33	U	05/16/08 13:05
7440-48-4	Cobalt, Total	1.0	ug/L	1	1.0	0.050	U	05/16/08 10:50
7440-50-8	Copper, Total	1.0	ug/L	1	1.0	0.29	U	05/16/08 13:05
7439-92-1	Lead, Total	1.0	ug/L	1	1.0	0.29	U	05/16/08 10:50
7439-96-5	Manganese, Total	0.36	ug/L	1	3.0	0.30	J	05/16/08 10:50
7440-02-0	Nickel, Total	2.0	ug/L	1	2.0	0.35	U	05/16/08 13:05
7782-49-2	Selenium, Total	0.75	ug/L	1	3.0	0.30	J	05/16/08 10:50
7440-22-4	Silver, Total	0.50	ug/L	1	0.50	0.061	U	05/16/08 10:50
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	05/16/08 16:58
7440-62-2	Vanadium, Total	5.0	ug/L	1	5.0	0.27	U	05/16/08 10:50
7440-66-6	Zinc, Total	7.5	ug/L	1	10	1.8	J	05/16/08 16:58

B,P

SAMPLE ID SUMMARY

USEPA-7470A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
EQBK-1	0805133-09
EQBK-2	0805162-16

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

EQBK-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/06/08 16:00
Solids: 0.00
Laboratory ID: 0805133-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 05/15/08 16:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0805666

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	05/16/08 11:51

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

EQBK-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/07/08 15:45
Solids: 0.00
Laboratory ID: 0805162-16

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 05/15/08 16:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0805666

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	05/16/08 11:56

SAMPLE ID SUMMARY

USEPA-7471A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/07/08 14:41
Initial/Final: 0.2996 g / 50 mL
QC Batch: 0805182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.12	mg/kg dry wt.	1	0.050	0.0075		05/08/08 12:41

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/07/08 14:41
Initial/Final: 0.3004 g / 50 mL
QC Batch: 0805182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.0087	mg/kg dry wt.	1	0.050	0.0075	J	05/08/08 13:06

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/07/08 14:41
Initial/Final: 0.3005 g / 50 mL
QC Batch: 0805182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.22	mg/kg dry wt.	1	0.050	0.0075		05/08/08 13:11

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/07/08 14:41
Initial/Final: 0.3 g / 50 mL
QC Batch: 0805182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.011	mg/kg dry wt.	1	0.050	0.0075	J	05/08/08 13:16

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/07/08 14:41
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.16	mg/kg dry wt.	1	0.050	0.0075		05/08/08 13:21

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.12	mg/kg dry wt.	1	0.050	0.0075	K/M	05/15/08 10:33

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2995 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.089	mg/kg dry wt.	1	0.050	0.0075	KIM	05/15/08 10:38

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2996 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.088	mg/kg dry wt.	1	0.050	0.0075	KIM	05/15/08 10:43

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.015	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 10:48

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2995 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.13	mg/kg dry wt.	1	0.050	0.0075	KIM	05/15/08 10:53

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.15	mg/kg dry wt.	1	0.050	0.0075	KIM	05/15/08 11:08

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.037	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 11:22

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805569

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.017	mg/kg dry wt.	1	0.050	0.0075	KJM	05/15/08 11:27

06085

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2998 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.024	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 11:42

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2999 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.020	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 11:47

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2997 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.019	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 11:52

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3005 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.012	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:17

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3001 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.020	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:22

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3002 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.050	mg/kg dry wt.	1	0.050	0.0075	U	05/15/08 12:27

06091

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.2998 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.018	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:32

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.023	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:37

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.0089	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:42

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3003 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.027	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:47

INORGANIC ANALYSIS DATA SHEET
USEPA-7471A

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Prepared: 05/14/08 17:00
Initial/Final: 0.3005 g / 50 mL
QC Batch: 0805570

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.016	mg/kg dry wt.	1	0.050	0.0075	J	05/15/08 12:52

SAMPLE ID SUMMARY

MSA 29-3.5.2

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45SB8A-PS	0805162-12
45SB8B-PS	0805162-13
45SB14A-PS	0805162-14
45SB14B-PS	0805162-15

06148

INORGANIC ANALYSIS DATA SHEET
MSA 29-3.5.2

45SB8A-PS

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:30
Solids: 0.00
Laboratory ID: 0805162-12

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: Method-Specific Preparation
Prepared: 05/21/08 14:16
Initial/Final: 0.78 g / 0.78 mL
QC Batch: 0805997

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-44-0	Carbon, Total Organic	1.4	%	1	0.20	0.0080		05/21/08 14:16

INORGANIC ANALYSIS DATA SHEET
MSA 29-3.5.2

45SB8B-PS

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:35
Solids: 0.00
Laboratory ID: 0805162-13

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: Method-Specific Preparation
Prepared: 05/21/08 14:16
Initial/Final: 0.89 g / 0.89 mL
QC Batch: 0805997

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-44-0	Carbon, Total Organic	1.7	%	1	0.20	0.0080		05/21/08 14:16

INORGANIC ANALYSIS DATA SHEET
MSA 29-3.5.2

45SB14A-PS

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 14:40
Solids: 0.00
Laboratory ID: 0805162-14

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: Method-Specific Preparation
Prepared: 05/21/08 14:16
Initial/Final: 1.19 g / 1.19 mL
QC Batch: 0805997

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-44-0	Carbon, Total Organic	0.49	%	1	0.20	0.0080		05/21/08 14:16

06151

INORGANIC ANALYSIS DATA SHEET
MSA 29-3.5.2

45SB14B-PS

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 14:45
Solids: 0.00
Laboratory ID: 0805162-15

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: Method-Specific Preparation
Prepared: 05/21/08 14:16
Initial/Final: 1.45 g / 1.45 mL
QC Batch: 0805997

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-44-0	Carbon, Total Organic	0.22	%	1	0.20	0.0080		05/21/08 14:16

SAMPLE ID SUMMARY

USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
EQBK-1	0805133-09
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11
EQBK-2	0805162-16

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/08/08 08:00
Initial/Final: 24.02 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.16	mg/kg dry	1	0.14	0.11		05/12/08 11:01

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/08/08 08:00
Initial/Final: 25.3 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.093	U	05/12/08 11:01

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/08/08 08:00
Initial/Final: 24.67 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.13	mg/kg dry	1	0.14	0.11	J	05/12/08 11:01

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/08/08 08:00
Initial/Final: 25.26 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.092	U	05/12/08 11:01

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.23 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.18	mg/kg dry	1	0.13	0.10		05/12/08 11:06

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.47 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.24	mg/kg dry	1	0.12	0.093		05/12/08 11:06

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.81 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.19	mg/kg dry	1	0.12	0.099		05/12/08 11:06

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 25.35 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.092	U	05/12/08 11:37

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.82 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.088	U	05/12/08 11:37

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.96 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.23	mg/kg dry	1	0.12	0.10		05/12/08 11:37

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.95 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.17	mg/kg dry	1	0.13	0.10		05/12/08 11:37

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.49 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.17	mg/kg dry	1	0.13	0.10		05/12/08 11:40

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/09/08 07:00
Initial/Final: 24.85 g / 250 mL
QC Batch: 0805273

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.095	U	05/12/08 11:40

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

EQBK-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/06/08 16:00
Solids: 0.00
Laboratory ID: 0805133-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0805399

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	4.51	ug/L	1	10.0	1.90	BJ	05/13/08 13:02

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 08:00
Initial/Final: 24.86 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.097	U	05/13/08 13:33

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 08:00
Initial/Final: 25.72 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.10	U	05/13/08 13:33

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 08:00
Initial/Final: 24.5 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.12	0.098	J	05/13/08 13:33

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 08:00
Initial/Final: 25.36 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.095	U	05/13/08 13:33

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 08:00
Initial/Final: 25.52 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.094	U	05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 24.61 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.088	U	05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 24.4 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.094	U	05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 25.22 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.090	U	05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 24.4 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.12	0.094	U	05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 25.45 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.12	mg/kg dry	1	0.11	0.092		05/13/08 13:39

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/13/08 07:30
Initial/Final: 25.64 g / 250 mL
QC Batch: 0805400

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	0.11	mg/kg dry	1	0.11	0.088	U	05/13/08 13:43

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

EQBK-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water
Sampled: 05/07/08 15:45
Solids: 0.00
Laboratory ID: 0805162-16

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/12/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0805399

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	3.64	ug/L	1	10.0	1.90	B J P	05/13/08 13:02

SAMPLE ID SUMMARY

USEPA-3550B

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-54

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45TP1A	0805100-01
45TP1B	0805100-02
45TP2A	0805100-03
45TP2B	0805100-04
45TP3A	0805100-05
45TP6A	0805133-01
45TP6B	0805133-02
45TP7A	0805133-03
45TP7B	0805133-04
45TP4A	0805133-05
45TP4B	0805133-06
45TP5A	0805133-07
45TP5B	0805133-08
45TP3B	0805162-01
Dup-1	0805162-02
45SB1A	0805162-03
45SB1B	0805162-04
45SB5A	0805162-05
45SB5B	0805162-06
45SB14A	0805162-07
45SB14B	0805162-08
Dup-2	0805162-09
45SB8A	0805162-10
45SB8B	0805162-11

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:15
Solids: 72.50
Laboratory ID: 0805100-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	73	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 11:40
Solids: 86.13
Laboratory ID: 0805100-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	86	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
Laboratory ID: 0805100-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	73	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP2B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:40
Solids: 87.60
Laboratory ID: 0805100-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	88	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP3A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 13:20
Solids: 78.25
Laboratory ID: 0805100-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	78	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP6A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 10:25
Solids: 86.32
Laboratory ID: 0805133-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	86	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP6B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 11:10
Solids: 81.01
Laboratory ID: 0805133-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	81	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP7A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:05
Solids: 87.40
Laboratory ID: 0805133-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	87	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP7B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 13:45
Solids: 91.38
Laboratory ID: 0805133-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	91	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP4A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:00
Solids: 80.57
Laboratory ID: 0805133-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	81	%	1	0.1	0.1		05/08/08 11:07

36175

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 14:30
Solids: 77.95
Laboratory ID: 0805133-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	78	%	1	0.1	0.1		05/08/08 11:07

06176

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:00
Solids: 77.47
Laboratory ID: 0805133-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	77	%	1	0.1	0.1		05/08/08 11:07

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/06/08 15:25
Solids: 84.60
Laboratory ID: 0805133-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/08/08 11:07
Initial/Final: 10 g / 10 mL
QC Batch: 0805221

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	85	%	1	0.1	0.1		05/08/08 11:07

06178

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45TP3B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 10:10
Solids: 82.59
Laboratory ID: 0805162-01

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	83	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

Dup-1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 80.87
Laboratory ID: 0805162-02

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	81	%	1	0.1	0.1		05/19/08 11:58

06186

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:00
Solids: 81.89
Laboratory ID: 0805162-03

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	82	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB1B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:05
Solids: 84.58
Laboratory ID: 0805162-04

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	85	%	1	0.1	0.1		05/19/08 11:58

06182

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB5A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 11:55
Solids: 86.03
Laboratory ID: 0805162-05

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	86	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB5B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:00
Solids: 91.96
Laboratory ID: 0805162-06

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	92	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB14A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 12:55
Solids: 85.70
Laboratory ID: 0805162-07

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	86	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB14B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:00
Solids: 89.42
Laboratory ID: 0805162-08

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	89	%	1	0.1	0.1		05/19/08 11:58

06185

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

Dup-2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 00:00
Solids: 85.72
Laboratory ID: 0805162-09

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	86	%	1	0.1	0.1		05/19/08 11:58

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB8A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:40
Solids: 87.43
Laboratory ID: 0805162-10

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	87	%	1	0.1	0.1		05/19/08 11:58

05188

INORGANIC ANALYSIS DATA SHEET
USEPA-3550B

45SB8B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/07/08 13:45
Solids: 91.63
Laboratory ID: 0805162-11

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Inorganic Prep
Prepared: 05/19/08 11:58
Initial/Final: 10 g / 10 mL
QC Batch: 0805802

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
	Percent Solids	92	%	1	0.1	0.1		05/19/08 11:58

06185

DATA VALIDATION WORKSHEET

Volatile Organic Analysis by GC/MS

Reviewer: RA
Date: 6/20/08
DV Level: II III IV
Review Document:
X NFG - Region III Modifications
X Project QAPP/SAP

Project Name: Radford
Project Number: 11656351
Laboratory: TriMatrix
SDG No.: 30440-54
Test Name: VOC
Method No.: 8260B

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If the temperature of the cooler was elevated (> 10 ^{O}C) or bubble size in aqueous sample was too big (tiny bubble is OK.), then flag all positive results with a "L" and all non-detects "UL".			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.		✓	

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Were samples preserved on ice for soils and on ice with HCL for aqueous samples?	✓		
2.2	Have any technical holding times (14 days), determined from date of sampling to date of analysis, been exceeded? If yes, L(+)/UL(-).		✓	
2.3	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, L(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks prepared at the appropriate frequency (every 12 hour period per GCMS, matrix, and level)?	✓		
3.2	Do any method blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample]≤ 5X[associated blank]. (or 10 times for the common volatile lab contaminants - methylene chloride, acetone, and 2-butanone)	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If Yes, use same rules above.	✓		
3.4	Are there field equipment blank/trip blanks associated with every sample? If No, noted in the DV report.	✓		

Notes: MB → acetone, Carbon disulfide, Chloroform, methyl acetate,
≤10X → B, Z ≤5X → B, Z
EQBK-1 toluene 0.09 ug/L ; all NDs or >5X, No action
EQBK-2 " 0.08 "

URS

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are at least five standards included in the calibration curve?Are at least five standards included in the calibration curve?	✓		
4.2	Was an initial calibration analyzed at the beginning of each analysis?	✓		
4.3	Was a second source calibration verification analyzed for each calibration curve?	✓		
4.4	Has a continuing calibration standard been analyzed for every 12 hours of sample analysis per instrument?	✓		
4.5	Are all calibration standard %RSDs, correlation coefficient, or % drift within the control limits (%RSD <15%, r>0.995 or r^2>0.99; for 2° source: %D<+20%; and for CCC, %D < 20%)?		✓	
For initial calibration: %RSD > 15%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>20% J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 20%, J(+), only. Negative Bias - %D>-20% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				
4.6	Are any CCCs (chloroform, 1,1-DCE, 1,2-DCPA, ethylbenzene, toluene, and vinyl chloride) displaying an RSD greater than 30%? If yes, L(+)/R(-) all associated results.		✓	
4.7	Do any SPCC have an RRF low? (<0.10 for chloromethane, 1,1-dichloroethane, and bromoform or <0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane) If yes, L(+)/R(-) all associated results.		✓	

Notes: CC 5/9/08 Trichlorofluoromethane 25.7%. Pos bias

CC 5/15/08 CCl4 21.1%
chloroethane 21.3%
dichlorodifluoromethane 22.2%
} pos

all and results NDs → No action

5.0 GC/MS Instrument Performance Check		Yes	No	NA
5.1	Are GC/MS Tuning and Mass Calibration forms present for bromofluorobenzene (BFB)?	✓		
5.2	Have all samples been analyzed within twelve hours of the BFB tune? If twelve hours have elapsed according to the system clock, and the laboratory had analyzed standards, blanks, field samples or QC samples after twelve (12) hours, the data for the affected standards, blanks, field samples or QC samples are rejected "R".	✓		
5.3	Have ion abundance criteria for BFB been met for each instrument used? If no, flag "R".	✓		

Notes:

6.0 Surrogate Recovery		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.2, are these sample(s) or method blank(s) reanalyzed?			✓
	If any system monitoring compound(s) in the volatile fraction is out of specification, there should be a reanalysis to confirm			
6.3	If No in Section 6.3, is any sample dilution factor greater than 10? DV report should indicate that extraction efficiency/			✓
	1 or more <10% / 1 high/low / 2 or 3 high/low / 2 or 3 all low / 2 or 3 all high Positives: L / J / J / L / K Non-detects: R / UJ / UJ / UJ / NONE			
	Note: The B qualifier remains over surrogate flagging.			

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?	✓		
7.4	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?	✓		
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data.			

Notes: The MS/MSD for 45TP4B and 455B1A
several %Rs and RPDs outside QC limits.
J, UJ, M in the parent samples

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are %R for LCS/LCSD recoveries outside the QC limits? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).	✓		
8.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes: LCS for batch 805756 <50% for
1,1,2-trichloro-1,2,2-trifluoroethane at 76%.
Major → all NDs → RL

9.0 Internal Standard		Yes	No	NA
9.1	Are internal standard area of every sample and blank within +100% or -50% of the mid point calibration standard? If not, J(+)/UJ(-).	✓		
	If extremely low area counts are reported, or performance exhibits a major abrupt drop-off, then a severe loss of sensitivity is indicated. Non-detect target compounds should then be qualified as unusable (R).			
9.2	Are retention times of internal standards within 30 seconds of the associated calibration standard?	✓		
	The chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction. Positive results should not needed to be qualified as "R", if the mass spectral criteria are met.			

Notes:

10.0 Field Duplicate		Yes	No	NA
10.1	Was a field duplicate prepared and analyzed at the correct frequency (one per 20 samples, matrix, and level)?	✓		
	For sample results > 5 x RL, use 50% RPD. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 x RL for soil will be used.			
10.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV	✓		

Notes: see attached

11.0 Detection Limit Verification		Yes	No	NA
11.1	Do detection limits meet those required by the project QAPP and were they properly adjusted to reflect all sample dilutions and dry weight factors?	✓		
11.2	Were sample concentrations above the highest standard run at a dilution? If not, for ion saturation flag "L", unsaturated	✓		

Notes: several compds exceeded calib range → "E" → J8 J8

12.0 Data Completeness		Yes	No	NA
12.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
12.1.1	Number of samples:			
12.1.2	Number of target compounds in each analysis:			
12.1.3	Number of results rejected and not reported:			
	% Completeness = (12.1.1 x 12.1.2 - 12.1.3) x 100/(12.1.1 x 12.1.2)			
	% Completeness = 100%			

Notes:

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by _____ Date _____

_____ Checked by _____ Date _____

Reference

VOCs Field DUPs

	45TP3B	&	DUP-1	RL
benzene	0.18J		0.49J	4.1 OKV
2-butanone	12J		ND	24 OKV

	45SB14A	&	DUP-2	RL
acetone	210		150 B	23 OKV
methyl acetate	9.3J		8.4J	23 OKV
2-butanone	25		17	23 OKV

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Volatile Organic Compounds by EPA Method 8260B

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8260B

Sample/Analyte:		
0805133-06	45TP4B	1,1,2-Trichloro-1,2,2-trifluoroethane
0805133-06	45TP4B	1,2,3-Trichlorobenzene
0805133-06	45TP4B	1,2,4-Trichlorobenzene
0805133-06	45TP4B	1,2-Dibromoethane
0805133-06	45TP4B	1,2-Dichlorobenzene
0805133-06	45TP4B	1,2-Dichloropropane
0805133-06	45TP4B	1,3-Dichlorobenzene
0805133-06	45TP4B	1,4-Dichlorobenzene
0805133-06	45TP4B	Benzene
0805133-06	45TP4B	Bromodichloromethane
0805133-06	45TP4B	Carbon Disulfide
0805133-06	45TP4B	Chlorobenzene
0805133-06	45TP4B	cis-1,3-Dichloropropene
0805133-06	45TP4B	Dibromochloromethane
0805133-06	45TP4B	Ethylbenzene
0805133-06	45TP4B	Isopropylbenzene
0805133-06	45TP4B	Methyl Acetate
0805133-06	45TP4B	Methylcyclohexane
0805133-06	45TP4B	Styrene
0805133-06	45TP4B	Tetrachloroethene
0805133-06	45TP4B	Toluene
0805133-06	45TP4B	trans-1,2-Dichloroethene
0805133-06	45TP4B	trans-1,3-Dichloropropene
0805133-06	45TP4B	Trichloroethene
0805133-06	45TP4B	Xylene (Total)
0805162-03	45SB1A	1,1-Dichloroethene
0805162-03	45SB1A	1,2,3-Trichlorobenzene
0805162-03	45SB1A	1,2,4-Trichlorobenzene
0805162-03	45SB1A	1,2-Dibromoethane
0805162-03	45SB1A	1,2-Dichlorobenzene
0805162-03	45SB1A	1,3-Dichlorobenzene
0805162-03	45SB1A	1,4-Dichlorobenzene
0805162-03	45SB1A	Acetone
0805162-03	45SB1A	Benzene
0805162-03	45SB1A	Bromodichloromethane
0805162-03	45SB1A	Bromoform

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Volatile Organic Compounds by EPA Method 8260B

Sample/Analyte:	0805162-03	45SB1A	Chlorobenzene
	0805162-03	45SB1A	cis-1,3-Dichloropropene
	0805162-03	45SB1A	Dibromochloromethane
	0805162-03	45SB1A	Ethylbenzene
	0805162-03	45SB1A	Isopropylbenzene
	0805162-03	45SB1A	Methyl Acetate
	0805162-03	45SB1A	Styrene
	0805162-03	45SB1A	Tetrachloroethene
	0805162-03	45SB1A	Toluene
	0805162-03	45SB1A	trans-1,2-Dichloroethene
	0805162-03	45SB1A	trans-1,3-Dichloropropene
	0805162-03	45SB1A	Trichloroethene

Qualification: The RPD between the MS and MSD results exceeded the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8260B

Sample/Analyte:	0805133-06	45TP4B	Ethylbenzene
	0805133-06	45TP4B	Isopropylbenzene
	0805133-06	45TP4B	Xylene (Total)
	0805162-03	45SB1A	1,1,2,2-Tetrachloroethane
	0805162-03	45SB1A	1,1,2-Trichloroethane
	0805162-03	45SB1A	1,1-Dichloroethene
	0805162-03	45SB1A	1,2,3-Trichlorobenzene
	0805162-03	45SB1A	1,2,4-Trichlorobenzene
	0805162-03	45SB1A	1,2-Dibromo-3-chloropropane
	0805162-03	45SB1A	1,2-Dibromoethane
	0805162-03	45SB1A	1,2-Dichlorobenzene
	0805162-03	45SB1A	1,2-Dichloroethane
	0805162-03	45SB1A	1,2-Dichloropropane
	0805162-03	45SB1A	1,3-Dichlorobenzene
	0805162-03	45SB1A	1,4-Dichlorobenzene
	0805162-03	45SB1A	Bromochloromethane
	0805162-03	45SB1A	Bromodichloromethane
	0805162-03	45SB1A	Bromoform
	0805162-03	45SB1A	Carbon Disulfide
	0805162-03	45SB1A	Chlorobenzene
	0805162-03	45SB1A	cis-1,2-Dichloroethene
	0805162-03	45SB1A	cis-1,3-Dichloropropene
	0805162-03	45SB1A	Dibromochloromethane
	0805162-03	45SB1A	Ethylbenzene

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Volatile Organic Compounds by EPA Method 8260B

Sample/Analyte:	0805162-03	45SB1A	Isopropylbenzene
	0805162-03	45SB1A	Methyl Acetate
	0805162-03	45SB1A	Styrene
	0805162-03	45SB1A	Tetrachloroethene
	0805162-03	45SB1A	Toluene
	0805162-03	45SB1A	trans-1,2-Dichloroethene
	0805162-03	45SB1A	trans-1,3-Dichloropropene
	0805162-03	45SB1A	Trichloroethene
	0805162-03	45SB1A	Vinyl Chloride
	0805162-03	45SB1A	Xylene (Total)
Qualification:	Concentration exceeds calibration range		
Analysis:	USEPA-8260B		
Sample/Analyte:	0805100-01	45TP1A	2-Butanone (MEK)
	0805100-01	45TP1A	Acetone
	0805100-02	45TP1B	2-Butanone (MEK)
	0805100-02	45TP1B	Acetone
	0805100-03	45TP2A	Acetone
	0805100-04	45TP2B	2-Butanone (MEK)
	0805100-04	45TP2B	Acetone
	0805100-05	45TP3A	2-Butanone (MEK)
	0805100-05	45TP3A	Acetone
	0805133-05	45TP4A	Acetone
	0805133-06	45TP4B	Acetone
	0805608-MS1		Acetone
	0805608-MSD1		Acetone
	0805698-MS1		Acetone

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METHOD BLANK DATA SHEET
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805698-BLK2
File ID: MPB.D
Prepared: 05/15/08 07:00
Preparation: 5035 Soil Purge & Trap -
Initial/Final: 5 g / 5 mL
Analyzed: 05/15/08 09:46
Instrument: 139
QC Batch: 0805698
Sequence: 8051643
Calibration: 8E16003

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
67-64-1	Acetone	4.2	20	19.0	ug/kg wet	J
71-43-2	Benzene	0.13	5.0	5.0	ug/kg wet	U
74-97-5	Bromochloromethane	0.13	20	20	ug/kg wet	U
75-27-4	Bromodichloromethane	0.25	5.0	5.0	ug/kg wet	U
75-25-2	Bromoform	0.48	5.0	5.0	ug/kg wet	U
74-83-9	Bromomethane	1.2	5.0	5.0	ug/kg wet	U
75-15-0	Carbon Disulfide	0.26	5.0	3.23	ug/kg wet	J
56-23-5	Carbon Tetrachloride	0.29	5.0	5.0	ug/kg wet	U
108-90-7	Chlorobenzene	0.20	5.0	5.0	ug/kg wet	U
75-00-3	Chloroethane	0.35	20	20	ug/kg wet	U
67-66-3	Chloroform	0.15	5.0	0.450	ug/kg wet	J
74-87-3	Chloromethane	0.24	5.0	5.0	ug/kg wet	U
110-82-7	Cyclohexane	0.69	10	10	ug/kg wet	U
96-12-8	1,2-Dibromo-3-chloropropane	0.82	10	10	ug/kg wet	U
124-48-1	Dibromochloromethane	0.35	5.0	5.0	ug/kg wet	U
106-93-4	1,2-Dibromoethane	0.84	5.0	5.0	ug/kg wet	U
95-50-1	1,2-Dichlorobenzene	0.24	5.0	5.0	ug/kg wet	U
541-73-1	1,3-Dichlorobenzene	0.24	5.0	5.0	ug/kg wet	U
106-46-7	1,4-Dichlorobenzene	0.22	5.0	5.0	ug/kg wet	U
75-71-8	Dichlorodifluoromethane	0.33	5.0	5.0	ug/kg wet	U
75-34-3	1,1-Dichloroethane	0.19	5.0	5.0	ug/kg wet	U
107-06-2	1,2-Dichloroethane	0.30	5.0	5.0	ug/kg wet	U
75-35-4	1,1-Dichloroethene	0.37	5.0	5.0	ug/kg wet	U
156-59-2	cis-1,2-Dichloroethene	0.16	5.0	5.0	ug/kg wet	U
156-60-5	trans-1,2-Dichloroethene	0.23	5.0	5.0	ug/kg wet	U
78-87-5	1,2-Dichloropropane	0.92	5.0	5.0	ug/kg wet	U
10061-01-5	cis-1,3-Dichloropropene	0.25	5.0	5.0	ug/kg wet	U
10061-02-6	trans-1,3-Dichloropropene	0.83	5.0	5.0	ug/kg wet	U
100-41-4	Ethylbenzene	0.12	5.0	5.0	ug/kg wet	U
591-78-6	2-Hexanone	3.0	10	10	ug/kg wet	U

02370

METHOD BLANK DATA SHEET
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805786-BLK2
File ID: MPB0507.D
Prepared: 05/16/08 14:30
Preparation: 5030B Aqueous Purge &
Initial/Final: 5 g / 250 mL
Analyzed: 05/16/08 17:03
Instrument: 323
QC Batch: 0805786
Sequence: 8051934
Calibration: 8E19017

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
98-82-8	Isopropylbenzene	6.2	50	50	ug/kg wet	U
79-20-9	Methyl Acetate	8.3	250	42.5	ug/kg wet	J
1634-04-4	Methyl tert-Butyl Ether	4.8	50	50	ug/kg wet	U
108-87-2	Methylcyclohexane	7.4	250	250	ug/kg wet	U
75-09-2	Methylene Chloride	8.0	250	250	ug/kg wet	U
78-93-3	2-Butanone (MEK)	16	2500	2500	ug/kg wet	U
108-10-1	4-Methyl-2-pentanone (MIBK)	19	2500	2500	ug/kg wet	U
100-42-5	Styrene	5.4	50	50	ug/kg wet	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	50	50	ug/kg wet	U
127-18-4	Tetrachloroethene	7.5	50	50	ug/kg wet	U
108-88-3	Toluene	3.6	50	50	ug/kg wet	U
87-61-6	1,2,3-Trichlorobenzene	6.7	100	100	ug/kg wet	U
120-82-1	1,2,4-Trichlorobenzene	8.1	100	100	ug/kg wet	U
71-55-6	1,1,1-Trichloroethane	5.5	50	50	ug/kg wet	U
79-00-5	1,1,2-Trichloroethane	10	50	50	ug/kg wet	U
79-01-6	Trichloroethene	8.5	50	50	ug/kg wet	U
75-69-4	Trichlorofluoromethane	9.0	50	50	ug/kg wet	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	7.2	250	250	ug/kg wet	U
75-01-4	Vinyl Chloride	8.7	50	50	ug/kg wet	U
1330-20-7	Xylene (Total)	18	150	150	ug/kg wet	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
Dibromofluoromethane	40.0	37.9	95	78 - 121	
1,2-Dichloroethane-d4	40.0	40.2	100	66 - 124	
Toluene-d8	40.0	40.2	101	85 - 115	
4-Bromofluorobenzene	40.0	38.6	96	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	377508	3.86	344632	3.86	
Chlorobenzene-d5	296371	6.86	271481	6.86	
1,4-Dichlorobenzene-d4	162458	9.15	157692	9.15	

02376

METHOD BLANK DATA SHEET
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805608-BLK1
File ID: BLK0513.D
Prepared: 05/13/08 09:00
Preparation: 5035 Soil Purge & Trap -
Initial/Final: 5 g / 5 mL
Analyzed: 05/13/08 11:30
Instrument: 139
QC Batch: 0805608
Sequence: 8051617
Calibration: 8E15003

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
98-82-8	Isopropylbenzene	0.12	5.0	5.0	ug/kg wet	U
79-20-9	Methyl Acetate	0.83	20	1.40	ug/kg wet	J
1634-04-4	Methyl tert-Butyl Ether	0.23	5.0	5.0	ug/kg wet	U
108-87-2	Methylcyclohexane	0.80	10	10	ug/kg wet	U
75-09-2	Methylene Chloride	4.0	20	20	ug/kg wet	U
78-93-3	2-Butanone (MEK)	2.4	20	20	ug/kg wet	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1.9	10	10	ug/kg wet	U
100-42-5	Styrene	0.22	5.0	5.0	ug/kg wet	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	5.0	5.0	ug/kg wet	U
127-18-4	Tetrachloroethene	0.44	5.0	5.0	ug/kg wet	U
108-88-3	Toluene	0.40	5.0	5.0	ug/kg wet	U
87-61-6	1,2,3-Trichlorobenzene	0.21	20	20	ug/kg wet	U
120-82-1	1,2,4-Trichlorobenzene	0.24	5.0	5.0	ug/kg wet	U
71-55-6	1,1,1-Trichloroethane	0.20	5.0	5.0	ug/kg wet	U
79-00-5	1,1,2-Trichloroethane	0.69	5.0	5.0	ug/kg wet	U
79-01-6	Trichloroethene	0.56	5.0	5.0	ug/kg wet	U
75-69-4	Trichlorofluoromethane	0.21	5.0	5.0	ug/kg wet	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.33	5.0	5.0	ug/kg wet	U
75-01-4	Vinyl Chloride	0.46	5.0	5.0	ug/kg wet	U
1330-20-7	Xylene (Total)	0.58	5.0	5.0	ug/kg wet	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
Dibromofluoromethane	40.0	41.0	103	78 - 121	
1,2-Dichloroethane-d4	40.0	45.3	113	66 - 124	
Toluene-d8	40.0	39.9	100	85 - 115	
4-Bromofluorobenzene	40.0	43.5	109	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	708520	7.34	726450	7.33	
Chlorobenzene-d5	325910	17.39	333795	17.39	
1,4-Dichlorobenzene-d4	377435	22.43	403063	22.43	

02364

METHOD BLANK DATA SHEET
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805608-BLK2
File ID: BLK0514.D
Prepared: 05/14/08 09:00
Preparation: 5035 Soil Purge & Trap -
Initial/Final: 5 g / 5 mL
Analyzed: 05/14/08 16:58
Instrument: 139
QC Batch: 0805608
Sequence: 8051626
Calibration: 8E16003

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
98-82-8	Isopropylbenzene	0.12	5.0	5.0	ug/kg wet	U
79-20-9	Methyl Acetate	0.83	20	1.46	ug/kg wet	J
1634-04-4	Methyl tert-Butyl Ether	0.23	5.0	5.0	ug/kg wet	U
108-87-2	Methylcyclohexane	0.80	10	10	ug/kg wet	U
75-09-2	Methylene Chloride	4.0	20	20	ug/kg wet	U
78-93-3	2-Butanone (MEK)	2.4	20	20	ug/kg wet	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1.9	10	10	ug/kg wet	U
100-42-5	Styrene	0.22	5.0	5.0	ug/kg wet	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	5.0	5.0	ug/kg wet	U
127-18-4	Tetrachloroethene	0.44	5.0	5.0	ug/kg wet	U
108-88-3	Toluene	0.40	5.0	5.0	ug/kg wet	U
87-61-6	1,2,3-Trichlorobenzene	0.21	20	20	ug/kg wet	U
120-82-1	1,2,4-Trichlorobenzene	0.24	5.0	5.0	ug/kg wet	U
71-55-6	1,1,1-Trichloroethane	0.20	5.0	5.0	ug/kg wet	U
79-00-5	1,1,2-Trichloroethane	0.69	5.0	5.0	ug/kg wet	U
79-01-6	Trichloroethene	0.56	5.0	5.0	ug/kg wet	U
75-69-4	Trichlorofluoromethane	0.21	5.0	5.0	ug/kg wet	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.33	5.0	5.0	ug/kg wet	U
75-01-4	Vinyl Chloride	0.46	5.0	5.0	ug/kg wet	U
1330-20-7	Xylene (Total)	0.58	5.0	5.0	ug/kg wet	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
Dibromofluoromethane	40.0	43.5	109	78 - 121	
1,2-Dichloroethane-d4	40.0	44.4	111	66 - 124	
Toluene-d8	40.0	39.6	99	85 - 115	
4-Bromofluorobenzene	40.0	41.8	104	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	533521	7.39	684697	7.39	
Chlorobenzene-d5	269808	17.42	336761	17.44	
1,4-Dichlorobenzene-d4	312189	22.46	374622	22.46	

82366

METHOD BLANK DATA SHEET
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805698-BLK1
File ID: BLK0514.D
Prepared: 05/14/08 09:00
Preparation: 5035 Soil Purge & Trap -
Initial/Final: 5 g / 5 mL
Analyzed: 05/14/08 16:58
Instrument: 139
QC Batch: 0805698
Sequence: 8051626
Calibration: 8E16003

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
98-82-8	Isopropylbenzene	0.12	5.0	5.0	ug/kg wet	U
79-20-9	Methyl Acetate	0.83	20	1.46	ug/kg wet	J
1634-04-4	Methyl tert-Butyl Ether	0.23	5.0	5.0	ug/kg wet	U
108-87-2	Methylcyclohexane	0.80	10	10	ug/kg wet	U
75-09-2	Methylene Chloride	4.0	20	20	ug/kg wet	U
78-93-3	2-Butanone (MEK)	2.4	20	20	ug/kg wet	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1.9	10	10	ug/kg wet	U
100-42-5	Styrene	0.22	5.0	5.0	ug/kg wet	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	5.0	5.0	ug/kg wet	U
127-18-4	Tetrachloroethene	0.44	5.0	5.0	ug/kg wet	U
108-88-3	Toluene	0.40	5.0	5.0	ug/kg wet	U
87-61-6	1,2,3-Trichlorobenzene	0.21	20	20	ug/kg wet	U
120-82-1	1,2,4-Trichlorobenzene	0.24	5.0	5.0	ug/kg wet	U
71-55-6	1,1,1-Trichloroethane	0.20	5.0	5.0	ug/kg wet	U
79-00-5	1,1,2-Trichloroethane	0.69	5.0	5.0	ug/kg wet	U
79-01-6	Trichloroethene	0.56	5.0	5.0	ug/kg wet	U
75-69-4	Trichlorofluoromethane	0.21	5.0	5.0	ug/kg wet	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.33	5.0	5.0	ug/kg wet	U
75-01-4	Vinyl Chloride	0.46	5.0	5.0	ug/kg wet	U
1330-20-7	Xylene (Total)	0.58	5.0	5.0	ug/kg wet	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
Dibromofluoromethane	40.0	43.5	109	78 - 121	
1,2-Dichloroethane-d4	40.0	44.4	111	66 - 124	
Toluene-d8	40.0	39.6	99	85 - 115	
4-Bromofluorobenzene	40.0	41.8	104	85 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	533521	7.39	684697	7.39	
Chlorobenzene-d5	269808	17.42	336761	17.44	
1,4-Dichlorobenzene-d4	312189	22.46	374622	22.46	

62369

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805608-MS1

QC Batch: 0805608

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #		QC Limits Rec.	Units
Acetone	51.3	293	366	141		20 - 160	ug/kg dry
Benzene	51.3	0.180	31.2	60	*	75 - 125	ug/kg dry
Bromochloromethane	51.3	ND	38.4	75		70 - 125	ug/kg dry
Bromodichloromethane	51.3	ND	29.5	57	*	70 - 130	ug/kg dry
Bromoform	51.3	ND	30.0	58		55 - 135	ug/kg dry
Bromomethane	51.3	1.85	48.8	91		30 - 160	ug/kg dry
Carbon Disulfide	51.3	3.31	30.2	52		45 - 160	ug/kg dry
Carbon Tetrachloride	51.3	ND	39.3	77		65 - 135	ug/kg dry
Chlorobenzene	51.3	ND	22.4	44	*	75 - 125	ug/kg dry
Chloroethane	51.3	ND	55.1	107		40 - 155	ug/kg dry
Chloroform	51.3	ND	38.3	75		70 - 125	ug/kg dry
Chloromethane	51.3	ND	56.0	109		50 - 130	ug/kg dry
Cyclohexane	51.3	ND	42.1	82		70 - 130	ug/kg dry
1,2-Dibromo-3-chloropropane	51.3	ND	38.2	74		40 - 135	ug/kg dry
Dibromochloromethane	51.3	ND	29.8	58	*	65 - 130	ug/kg dry
1,2-Dibromoethane	51.3	ND	32.5	63	*	70 - 125	ug/kg dry
1,2-Dichlorobenzene	51.3	ND	20.7	40	*	75 - 120	ug/kg dry
1,3-Dichlorobenzene	51.3	ND	20.6	40	*	70 - 125	ug/kg dry
1,4-Dichlorobenzene	51.3	ND	20.9	41	*	70 - 125	ug/kg dry
Dichlorodifluoromethane	51.3	ND	66.5	130		35 - 135	ug/kg dry
1,1-Dichloroethane	51.3	ND	42.9	84		75 - 125	ug/kg dry
1,2-Dichloroethane	51.3	ND	37.4	73		70 - 135	ug/kg dry
1,1-Dichloroethene	51.3	ND	43.6	85		65 - 135	ug/kg dry
cis-1,2-Dichloroethene	51.3	ND	33.6	66		65 - 125	ug/kg dry
trans-1,2-Dichloroethene	51.3	ND	35.0	68		65 - 135	ug/kg dry
1,2-Dichloropropane	51.3	ND	31.9	62	*	70 - 120	ug/kg dry
cis-1,3-Dichloropropene	51.3	ND	23.6	46	*	70 - 125	ug/kg dry
trans-1,3-Dichloropropene	51.3	ND	24.6	48	*	65 - 125	ug/kg dry
Ethylbenzene	51.3	ND	13.6	27	*	75 - 125	ug/kg dry
2-Hexanone	51.3	ND	39.9	78		45 - 145	ug/kg dry
Isopropylbenzene	51.3	ND	14.2	28	*	75 - 130	ug/kg dry
Methyl Acetate	51.3	13.8	35.0	41	*	70 - 130	ug/kg dry
Methyl tert-Butyl Ether	51.3	ND	52.7	103		63 - 127	ug/kg dry

02337

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805608-MS1

QC Batch: 0805608

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Methylcyclohexane	51.3	ND	32.0	62 *	70 - 130	ug/kg dry
Methylene Chloride	51.3	ND	47.4	92	55 - 140	ug/kg dry
2-Butanone (MEK)	51.3	21.3	85.7	126	30 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	51.3	ND	46.4	90	45 - 145	ug/kg dry
Styrene	51.3	ND	0.410	0.8 *	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	51.3	ND	40.1	78	55 - 130	ug/kg dry
Tetrachloroethene	51.3	ND	21.1	41 *	65 - 140	ug/kg dry
Toluene	51.3	ND	21.1	41 *	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	51.3	ND	10.5	20 *	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	51.3	ND	11.6	23 *	65 - 130	ug/kg dry
1,1,1-Trichloroethane	51.3	ND	41.8	81	70 - 135	ug/kg dry
1,1,2-Trichloroethane	51.3	ND	33.9	66	60 - 125	ug/kg dry
Trichloroethene	51.3	ND	23.7	46 *	75 - 125	ug/kg dry
Trichlorofluoromethane	51.3	ND	66.7	130	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	51.3	ND	67.7	132 *	80 - 120	ug/kg dry
Vinyl Chloride	51.3	ND	56.3	110	60 - 125	ug/kg dry
Xylene (Total)	154	ND	46.2	30 *	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

02336

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45TP4B

USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805608-MSD1

QC Batch: 0805608

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acetone	51.3	372	153	2	30	20 - 160	ug/kg dry
Benzene	51.3	34.3	67 *	9	30	75 - 125	ug/kg dry
Bromochloromethane	51.3	41.9	82	9	30	70 - 125	ug/kg dry
Bromodichloromethane	51.3	34.7	68 *	16	30	70 - 130	ug/kg dry
Bromoform	51.3	35.7	70	17	30	55 - 135	ug/kg dry
Bromomethane	51.3	51.7	97	6	30	30 - 160	ug/kg dry
Carbon Disulfide	51.3	25.6	43 *	16	30	45 - 160	ug/kg dry
Carbon Tetrachloride	51.3	40.6	79	3	30	65 - 135	ug/kg dry
Chlorobenzene	51.3	25.4	49 *	13	30	75 - 125	ug/kg dry
Chloroethane	51.3	54.6	106	0.8	30	40 - 155	ug/kg dry
Chloroform	51.3	39.5	77	3	30	70 - 125	ug/kg dry
Chloromethane	51.3	54.1	106	3	30	50 - 130	ug/kg dry
Cyclohexane	51.3	42.5	83	1	30	70 - 130	ug/kg dry
1,2-Dibromo-3-chloropropane	51.3	38.0	74	0.5	30	40 - 135	ug/kg dry
Dibromochloromethane	51.3	34.4	67	14	30	65 - 130	ug/kg dry
1,2-Dibromoethane	51.3	36.6	71	12	30	70 - 125	ug/kg dry
1,2-Dichlorobenzene	51.3	22.5	44 *	9	30	75 - 120	ug/kg dry
1,3-Dichlorobenzene	51.3	20.7	40 *	0.2	30	70 - 125	ug/kg dry
1,4-Dichlorobenzene	51.3	21.0	41 *	0.2	30	70 - 125	ug/kg dry
Dichlorodifluoromethane	51.3	65.5	128	1	30	35 - 135	ug/kg dry
1,1-Dichloroethane	51.3	44.6	87	4	30	75 - 125	ug/kg dry
1,2-Dichloroethane	51.3	43.1	84	14	30	70 - 135	ug/kg dry
1,1-Dichloroethene	51.3	44.5	87	2	30	65 - 135	ug/kg dry
cis-1,2-Dichloroethene	51.3	35.1	68	4	30	65 - 125	ug/kg dry
trans-1,2-Dichloroethene	51.3	31.2	61 *	12	30	65 - 135	ug/kg dry
1,2-Dichloropropane	51.3	36.0	70	12	30	70 - 120	ug/kg dry
cis-1,3-Dichloropropene	51.3	26.7	52 *	12	30	70 - 125	ug/kg dry
trans-1,3-Dichloropropene	51.3	24.2	47 *	2	30	65 - 125	ug/kg dry
Ethylbenzene	51.3	21.3	42 *	44 *	30	75 - 125	ug/kg dry
2-Hexanone	51.3	49.0	96	21	30	45 - 145	ug/kg dry
Isopropylbenzene	51.3	25.4	50 *	57 *	30	75 - 130	ug/kg dry
Methyl Acetate	51.3	33.1	38 *	5	30	70 - 130	ug/kg dry
Methyl tert-Butyl Ether	51.3	55.1	107	4	30	63 - 127	ug/kg dry
Methylcyclohexane	51.3	33.3	65 *	4	30	70 - 130	ug/kg dry

02333

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805608-MSD1

QC Batch: 0805608

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Methylene Chloride	51.3	49.6	97	4	30	55 - 140	ug/kg dry
2-Butanone (MEK)	51.3	97.0	148	12	30	30 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	51.3	44.7	87	4	30	45 - 145	ug/kg dry
Styrene	51.3	0.321	0.6 *	25	30	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	51.3	49.8	97	22	30	55 - 130	ug/kg dry
Tetrachloroethene	51.3	27.0	53 *	25	30	65 - 140	ug/kg dry
Toluene	51.3	23.7	46 *	11	30	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	51.3	10.2	20 *	2	30	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	51.3	10.3	20 *	12	30	65 - 130	ug/kg dry
1,1,1-Trichloroethane	51.3	44.2	86	6	30	70 - 135	ug/kg dry
1,1,2-Trichloroethane	51.3	36.9	72	8	30	60 - 125	ug/kg dry
Trichloroethene	51.3	26.6	52 *	11	30	75 - 125	ug/kg dry
Trichlorofluoromethane	51.3	64.4	126	3	30	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	51.3	64.1	125 *	5	30	80 - 120	ug/kg dry
Vinyl Chloride	51.3	53.1	104	6	30	60 - 125	ug/kg dry
Xylene (Total)	154	64.6	42 *	33 *	30	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

023446

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5030B Aqueous Purge & Trap

Initial/Final: 5.2 g / 260 mL

Laboratory ID: 0805786-MS1

QC Batch: 0805786

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Methylcyclohexane	2470	ND	2310	94	70 - 130	ug/kg dry
Methylene Chloride	2470	ND	2280	92	55 - 140	ug/kg dry
2-Butanone (MEK)	2470	ND	1970	80	60 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	2470	ND	2010	82	45 - 145	ug/kg dry
Styrene	2470	ND	2270	92	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	2470	ND	2080	84	55 - 130	ug/kg dry
Tetrachloroethene	2470	ND	2280	92	65 - 140	ug/kg dry
Toluene	2470	ND	2290	93	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	2470	ND	2120	86	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	2470	ND	2150	87	65 - 130	ug/kg dry
1,1,1-Trichloroethane	2470	ND	2320	94	70 - 135	ug/kg dry
1,1,2-Trichloroethane	2470	ND	2110	85	60 - 125	ug/kg dry
Trichloroethene	2470	ND	2270	92	75 - 125	ug/kg dry
Trichlorofluoromethane	2470	ND	1700	69	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	2470	ND	1790	73 *	80 - 120	ug/kg dry
Vinyl Chloride	2470	ND	1890	76	60 - 125	ug/kg dry
Xylene (Total)	7400	ND	6910	93	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

82346

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5030B Aqueous Purge & Trap

Initial/Final: 5.2 g / 260 mL

Laboratory ID: 0805786-MSD1

QC Batch: 0805786

Analyte	Spike Added	MSD Conc.	MSD % Rec. #		% RPD #	QC Limits RPD	QC Limits Rec.	Units
Methylene Chloride	2470	2310	94		1	30	55 - 140	ug/kg dry
2-Butanone (MEK)	2470	2060	83		5	30	60 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	2470	2030	82		1	30	45 - 145	ug/kg dry
Styrene	2470	2300	93		1	30	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	2470	2090	85		0.5	30	55 - 130	ug/kg dry
Tetrachloroethene	2470	2320	94		2	30	65 - 140	ug/kg dry
Toluene	2470	2330	95		2	30	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	2470	2280	92		7	30	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	2470	2270	92		6	30	65 - 130	ug/kg dry
1,1,1-Trichloroethane	2470	2380	96		2	30	70 - 135	ug/kg dry
1,1,2-Trichloroethane	2470	2160	88		2	30	60 - 125	ug/kg dry
Trichloroethene	2470	2340	95		3	30	75 - 125	ug/kg dry
Trichlorofluoromethane	2470	1730	70		2	30	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	2470	1750	71	*	3	30	80 - 120	ug/kg dry
Vinyl Chloride	2470	1930	78		2	30	60 - 125	ug/kg dry
Xylene (Total)	7400	7040	95		2	30	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

62348

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805698-MS1

QC Batch: 0805698

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Acetone	48.8	207	272	134	20 - 160	ug/kg dry
Benzene	48.8	ND	36.0	74 *	75 - 125	ug/kg dry
Bromochloromethane	48.8	ND	36.3	74	70 - 125	ug/kg dry
Bromodichloromethane	48.8	ND	29.6	61 *	70 - 130	ug/kg dry
Bromoform	48.8	ND	23.0	47 *	55 - 135	ug/kg dry
Bromomethane	48.8	ND	40.0	82	30 - 160	ug/kg dry
Carbon Disulfide	48.8	ND	23.5	48	45 - 160	ug/kg dry
Carbon Tetrachloride	48.8	ND	40.1	82	65 - 135	ug/kg dry
Chlorobenzene	48.8	ND	25.6	52 *	75 - 125	ug/kg dry
Chloroethane	48.8	ND	43.7	89	40 - 155	ug/kg dry
Chloroform	48.8	0.281	38.5	78	70 - 125	ug/kg dry
Chloromethane	48.8	ND	41.4	85	50 - 130	ug/kg dry
Cyclohexane	48.8	ND	42.4	87	70 - 130	ug/kg dry
1,2-Dibromo-3-chloropropane	48.8	ND	26.2	54	40 - 135	ug/kg dry
Dibromochloromethane	48.8	ND	27.0	55 *	65 - 130	ug/kg dry
1,2-Dibromoethane	48.8	ND	31.5	65 *	70 - 125	ug/kg dry
1,2-Dichlorobenzene	48.8	ND	17.8	36 *	75 - 120	ug/kg dry
1,3-Dichlorobenzene	48.8	ND	18.6	38 *	70 - 125	ug/kg dry
1,4-Dichlorobenzene	48.8	ND	18.2	37 *	70 - 125	ug/kg dry
Dichlorodifluoromethane	48.8	ND	40.2	82	35 - 135	ug/kg dry
1,1-Dichloroethane	48.8	ND	41.8	86	75 - 125	ug/kg dry
1,2-Dichloroethane	48.8	ND	34.8	71	70 - 135	ug/kg dry
1,1-Dichloroethene	48.8	ND	29.0	59 *	65 - 135	ug/kg dry
cis-1,2-Dichloroethene	48.8	ND	31.7	65	65 - 125	ug/kg dry
trans-1,2-Dichloroethene	48.8	ND	28.2	58 *	65 - 135	ug/kg dry
1,2-Dichloropropane	48.8	ND	37.0	76	70 - 120	ug/kg dry
cis-1,3-Dichloropropene	48.8	ND	24.2	49 *	70 - 125	ug/kg dry
trans-1,3-Dichloropropene	48.8	ND	19.7	40 *	65 - 125	ug/kg dry
Ethylbenzene	48.8	ND	21.8	45 *	75 - 125	ug/kg dry
2-Hexanone	48.8	ND	38.6	79	45 - 145	ug/kg dry
Isopropylbenzene	48.8	ND	24.9	51 *	75 - 130	ug/kg dry
Methyl Acetate	48.8	16.3	44.8	58 *	70 - 130	ug/kg dry
Methyl tert-Butyl Ether	48.8	ND	40.8	83	63 - 127	ug/kg dry

823U1

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY
USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 5035 Soil Purge & Trap - MS
Initial/Final: 5 g / 5 mL

Laboratory ID: 0805698-MS1
QC Batch: 0805698

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Methylcyclohexane	48.8	ND	35.7	73	70 - 130	ug/kg dry
Methylene Chloride	48.8	ND	51.1	105	55 - 140	ug/kg dry
2-Butanone (MEK)	48.8	31.5	89.8	119	30 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	48.8	ND	45.9	94	45 - 145	ug/kg dry
Styrene	48.8	ND	0.623	1 *	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	48.8	ND	34.3	70	55 - 130	ug/kg dry
Tetrachloroethene	48.8	ND	29.5	60 *	65 - 140	ug/kg dry
Toluene	48.8	ND	29.5	60 *	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	48.8	ND	9.34	19 *	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	48.8	ND	9.57	20 *	65 - 130	ug/kg dry
1,1,1-Trichloroethane	48.8	ND	41.5	85	70 - 135	ug/kg dry
1,1,2-Trichloroethane	48.8	ND	35.0	72	60 - 125	ug/kg dry
Trichloroethene	48.8	ND	29.6	61 *	75 - 125	ug/kg dry
Trichlorofluoromethane	48.8	ND	44.9	92	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	48.8	ND	45.9	94	80 - 120	ug/kg dry
Vinyl Chloride	48.8	ND	31.6	65	60 - 125	ug/kg dry
Xylene (Total)	147	ND	64.7	44 *	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

02342

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY
USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 5035 Soil Purge & Trap - MS
Initial/Final: 5 g / 5 mL

Laboratory ID: 0805698-MSD1
QC Batch: 0805698

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acetone	48.8	206	-0.8 *	28	30	20 - 160	ug/kg dry
Benzene	48.8	48.6	100	30	30	75 - 125	ug/kg dry
Bromochloromethane	48.8	50.8	104	33 *	30	70 - 125	ug/kg dry
Bromodichloromethane	48.8	44.5	91	40 *	30	70 - 130	ug/kg dry
Bromoform	48.8	38.6	79	51 *	30	55 - 135	ug/kg dry
Bromomethane	48.8	48.9	100	20	30	30 - 160	ug/kg dry
Carbon Disulfide	48.8	35.2	72	40 *	30	45 - 160	ug/kg dry
Carbon Tetrachloride	48.8	52.1	107	26	30	65 - 135	ug/kg dry
Chlorobenzene	48.8	39.2	80	42 *	30	75 - 125	ug/kg dry
Chloroethane	48.8	52.7	108	19	30	40 - 155	ug/kg dry
Chloroform	48.8	48.8	99	23	30	70 - 125	ug/kg dry
Chloromethane	48.8	48.2	99	15	30	50 - 130	ug/kg dry
Cyclohexane	48.8	54.6	112	25	30	70 - 130	ug/kg dry
1,2-Dibromo-3-chloropropane	48.8	46.6	95	56 *	30	40 - 135	ug/kg dry
Dibromochloromethane	48.8	41.9	86	43 *	30	65 - 130	ug/kg dry
1,2-Dibromoethane	48.8	49.4	101	44 *	30	70 - 125	ug/kg dry
1,2-Dichlorobenzene	48.8	28.5	58 *	46 *	30	75 - 120	ug/kg dry
1,3-Dichlorobenzene	48.8	27.3	56 *	38 *	30	70 - 125	ug/kg dry
1,4-Dichlorobenzene	48.8	27.3	56 *	40 *	30	70 - 125	ug/kg dry
Dichlorodifluoromethane	48.8	52.6	108	27	30	35 - 135	ug/kg dry
1,1-Dichloroethane	48.8	53.0	108	23	30	75 - 125	ug/kg dry
1,2-Dichloroethane	48.8	49.9	102	36 *	30	70 - 135	ug/kg dry
1,1-Dichloroethene	48.8	44.8	92	43 *	30	65 - 135	ug/kg dry
cis-1,2-Dichloroethene	48.8	44.9	92	35 *	30	65 - 125	ug/kg dry
trans-1,2-Dichloroethene	48.8	42.4	87	40 *	30	65 - 135	ug/kg dry
1,2-Dichloropropane	48.8	50.2	103	30	30	70 - 120	ug/kg dry
cis-1,3-Dichloropropene	48.8	38.4	79	45 *	30	70 - 125	ug/kg dry
trans-1,3-Dichloropropene	48.8	32.5	66	49 *	30	65 - 125	ug/kg dry
Ethylbenzene	48.8	35.9	74 *	49 *	30	75 - 125	ug/kg dry
2-Hexanone	48.8	51.3	105	28	30	45 - 145	ug/kg dry
Isopropylbenzene	48.8	36.9	75	39 *	30	75 - 130	ug/kg dry
Methyl Acetate	48.8	28.3	25 *	45 *	30	70 - 130	ug/kg dry
Methyl tert-Butyl Ether	48.8	49.1	101	19	30	63 - 127	ug/kg dry
Methylcyclohexane	48.8	47.9	98	29	30	70 - 130	ug/kg dry

02343

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5035 Soil Purge & Trap - MS

Initial/Final: 5 g / 5 mL

Laboratory ID: 0805698-MSD1

QC Batch: 0805698

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Methylene Chloride	48.8	65.2	134	24	30	55 - 140	ug/kg dry
2-Butanone (MEK)	48.8	86.8	113	3	30	30 - 160	ug/kg dry
4-Methyl-2-pentanone (MIBK)	48.8	54.4	111	17	30	45 - 145	ug/kg dry
Styrene	48.8	1.06	2 *	52 *	30	75 - 125	ug/kg dry
1,1,2,2-Tetrachloroethane	48.8	49.4	101	36 *	30	55 - 130	ug/kg dry
Tetrachloroethene	48.8	42.5	87	36 *	30	65 - 140	ug/kg dry
Toluene	48.8	43.4	89	38 *	30	70 - 125	ug/kg dry
1,2,3-Trichlorobenzene	48.8	17.9	37 *	63 *	30	60 - 135	ug/kg dry
1,2,4-Trichlorobenzene	48.8	18.7	38 *	64 *	30	65 - 130	ug/kg dry
1,1,1-Trichloroethane	48.8	52.1	107	23	30	70 - 135	ug/kg dry
1,1,2-Trichloroethane	48.8	48.6	100	33 *	30	60 - 125	ug/kg dry
Trichloroethene	48.8	42.7	87	36 *	30	75 - 125	ug/kg dry
Trichlorofluoromethane	48.8	51.9	106	14	30	25 - 185	ug/kg dry
1,1,2-Trichloro-1,2,2-trifluoroetha	48.8	58.8	120	25	30	80 - 120	ug/kg dry
Vinyl Chloride	48.8	47.0	96	39 *	30	60 - 125	ug/kg dry
Xylene (Total)	147	107	73 *	49 *	30	75 - 125	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

823414

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Volatile Organic Compounds by EPA Method 8260B (High Level)

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8260B

Sample/Analyte:			
	0805133-06	45TP4B	1,1,2-Trichloro-1,2,2-trifluoroethane

Qualification: The LCS recovery was less than the lower control limit but greater than or equal to 10%. A positive result for this analyte in the associated QC batch is considered estimated; a non-detect result for the same analyte is considered as approximate.

Analysis: USEPA-8260B

Sample/Analyte:			
	0805100-01	45TP1A	1,1,2-Trichloro-1,2,2-trifluoroethane
	0805100-02	45TP1B	1,1,2-Trichloro-1,2,2-trifluoroethane
	0805100-03	45TP2A	1,1,2-Trichloro-1,2,2-trifluoroethane
	0805100-04	45TP2B	1,1,2-Trichloro-1,2,2-trifluoroethane
	0805100-05	45TP3A	1,1,2-Trichloro-1,2,2-trifluoroethane

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Individual sample results relate only to the sample tested.
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LCS / LCS DUPLICATE RECOVERY
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805786-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 5030B Aqueous Purge & Trap
Initial/Final: 5 g / 250 mL
QC Batch: 0805786
Sequence: 8051934

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
2-Hexanone	2000	2040	102	45 - 145	ug/kg wet
Isopropylbenzene	2000	2170	109	75 - 130	ug/kg wet
Methyl Acetate	2000	1990	100	70 - 130	ug/kg wet
Methyl tert-Butyl Ether	2000	2000	100	63 - 127	ug/kg wet
Methylcyclohexane	2000	2140	107	70 - 130	ug/kg wet
Methylene Chloride	2000	1890	94	55 - 140	ug/kg wet
2-Butanone (MEK)	2000	1890	94	60 - 160	ug/kg wet
4-Methyl-2-pentanone (MIBK)	2000	1870	94	45 - 145	ug/kg wet
Styrene	2000	2060	103	75 - 125	ug/kg wet
1,1,2,2-Tetrachloroethane	2000	1950	97	55 - 130	ug/kg wet
Tetrachloroethene	2000	2010	101	65 - 140	ug/kg wet
Toluene	2000	2040	102	70 - 125	ug/kg wet
1,2,3-Trichlorobenzene	2000	2080	104	60 - 135	ug/kg wet
1,2,4-Trichlorobenzene	2000	2110	106	65 - 130	ug/kg wet
1,1,1-Trichloroethane	2000	2090	104	70 - 135	ug/kg wet
1,1,2-Trichloroethane	2000	1910	96	60 - 125	ug/kg wet
Trichloroethene	2000	1990	100	75 - 125	ug/kg wet
Trichlorofluoromethane	2000	1710	86	25 - 185	ug/kg wet
1,1,2-Trichloro-1,2,2-trifluoroethane	2000	1530	76 *	80 - 120	ug/kg wet
Vinyl Chloride	2000	1890	94	60 - 125	ug/kg wet
Xylene (Total)	6000	6260	104	75 - 125	ug/kg wet

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

02358

CONTINUING CALIBRATION CHECK
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Instrument ID: 139
Lab File ID: CCV0513.D
Sequence: 8051617
Lab Sample ID: 8051617-CCV1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Calibration: 8E15003
Calibration Date: 05/09/08 00:00
Injection Date: 05/13/08
Injection Time: 10:23

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Trichlorofluoromethane	A	40.0	50.3	0.2780283	0.349431	109	25.7	25 *
1,2,3-Trichloropropane	A	40.0	33.9	0.2503739	0.211992		-15.3	25
1,2,4-Trimethylbenzene	A	40.0	36.9	2.458951	2.26927		-7.7	25
1,3,5-Trimethylbenzene	A	40.0	39.8	2.27131	2.26256		-0.4	25
Vinyl Chloride	A	40.0	44.5	0.2183623	0.242759		11.2	20
Xylene, Meta + Para	A	80.0	89.4	1.19181	1.33124		11.7	25
Xylene, Ortho	A	40.0	40.1	1.205589	1.20787		0.2	25
Xylene (Total)	A	120	129	1.196403	1.29012		7.8	25

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

02797

CONTINUING CALIBRATION CHECK
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Instrument ID: 323
Lab File ID: CCV0519A2.D
Sequence: 8052073
Lab Sample ID: 8052073-CCV1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Calibration: 8E20016
Calibration Date: 05/15/08 00:00
Injection Date: 05/19/08
Injection Time: 23:18

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Acetone	A	40.0	48.5	4.866249E-02	0.0582695		19.7	40
Benzene	A	40.0	43.2	1.669032	1.80039		7.9	25
Bromobenzene	A	40.0	41.0	1.525665	1.56419		2.5	25
Bromochloromethane	A	40.0	36.0	0.294552	0.264995		-10.0	25
Bromodichloromethane	A	40.0	46.2	0.4618491	0.532846		15.4	25
Bromoform	L	40.0	39.1	0.2946841	0.344898	0.1	-2.4	25
Bromomethane	A	40.0	43.6	0.2288282	0.2496		9.1	25
n-Butylbenzene	A	40.0	42.5	2.717676	2.88565		6.2	25
sec-Butylbenzene	A	40.0	43.1	4.001564	4.3088		7.7	25
tert-Butylbenzene	A	40.0	43.1	2.829314	3.04798		7.7	25
Carbon Disulfide	L	40.0	46.6	0.615422	0.818494		16.6	25
Carbon Tetrachloride	A	40.0	48.4	0.4497695	0.544587	POS	21.1	25
Chlorobenzene	A	40.0	41.8	1.559753	1.62792	0.3	4.4	25
Chloroethane	A	40.0	48.5	0.2100943	0.254876	POS	21.3	25
Chloroform	A	40.0	41.4	0.6507781	0.673692		3.5	20
Chloromethane	A	40.0	44.1	0.3974563	0.437952	0.1	10.2	25
2-Chlorotoluene	A	40.0	42.3	1.102778	1.16499		5.6	25
4-Chlorotoluene	A	40.0	41.7	3.15949	3.29453		4.3	25
1,2-Dibromo-3-chloropropane	A	40.0	41.9	0.1688163	0.176918		4.8	25
Dibromochloromethane	L	40.0	39.4	0.4625623	0.520945		-1.4	25
1,2-Dibromoethane	A	40.0	42.0	0.4228054	0.444314		5.1	25
Dibromomethane	A	40.0	43.6	0.2233861	0.243452		9.0	25
1,2-Dichlorobenzene	A	40.0	41.5	1.949866	2.02413		3.8	25
1,3-Dichlorobenzene	A	40.0	41.4	2.081618	2.15322		3.4	25
1,4-Dichlorobenzene	A	40.0	40.9	2.191751	2.24286		2.3	25
Dichlorodifluoromethane	A	40.0	48.9	0.3355662	0.410098	POS	22.2	25
1,1-Dichloroethane	A	40.0	44.0	0.5871809	0.646038	0.1	10.0	25
1,2-Dichloroethane	A	40.0	44.0	0.4376038	0.48187		10.1	25
1,1-Dichloroethene	A	40.0	43.5	0.3703616	0.402653		8.7	20

02833

DATA VALIDATION WORKSHEET

Semivolatile Organic Analysis

Reviewer: RA
Date: 9/20/08
DV Level: II III IV
Review Document:
_X_ SW-846
_X_ NFG - Region III Modifications
_X_ Project QAPP/SAP

Project Name: Radford
Project Number: 11656351
Laboratory: Trimatrix
SDG No.: 30440-54
Test Name: SVOC
Method No.: 8270C

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were not on ice or the ice was melted upon arrival at the laboratory and the temperature of the cooler was elevated (> 20 °C), then flag all positive results with a "L" and all non-detects "UL".			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.		✓	

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). For aqueous matrix - 7 days (extraction) and 40 days (analysis) For soil matrix - 14 days		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per batch)?	✓		
3.2	Do any blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample≤5X[blank] (or 10 times for the common phthalate contaminants).	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.	✓		

Notes: aques MB → acetophenone 0.08, naphthalene 0.1 ug/L → See attached
soil MB → 1,1'-biphenyl 0.667, naphthalene 4.33, butyl benzyl phthalate 2.67
isophorone 1 ug/kg 3.33 <5X, <10X phthalates

<10X for phthalates, B2X, others 5X

EQBKs also pos hits for acenaphthene, benzo(b)fluoranthene, benzo(k)fluoranthene, di-n-butyl phthalate, bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, anthracene, benzo(a)anthracene, butyl benzyl phthalate, chrysene,

B, B

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are at least five standards included in the calibration curve?	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve?	✓		
4.3	Has a continuing calibration standard been analyzed for every 12 hours of sample analysis?	✓		
4.4	Are all calibration standard %RSD $\leq$15%, r>0.995, or r^2<0.99), second source $\pm$30% or %D($\leq$20%) within the control limits?	✓		
For initial calibration: %RSD > 15% but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>30% J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 20%, J(+), only. Negative Bias - %D>-20% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				
4.5	Are any SPCCs RF < 0.05 and/or CCC >30%? If yes reject all associated data.		✓	

Notes:

5.0 GC/MS Instrument Performance Check		Yes	No	NA
5.1	Are GC/MS Tuning and Mass Calibration forms present for decafluorotriphenylphosphine (DFTPP)?	✓		
5.2	Are DFTPP monitored ions within specification? If no, flag R.	✓		
5.3	Have all samples been analyzed within twelve hours of the DFTPP tune? If no, flag R.	✓		
5.4	Have ion abundance criteria for DFTPP been met for each instrument used? If no, flag R.	✓		

Notes:

6.0 Surrogate Recovery		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.2, are these sample(s) or method blank(s) reanalyzed?			✓
6.3	If any two base/neutral or acid fraction are out of specification, or if any one base/neutral or acid extractable surrogate has a recovery of less than 10%, then there should be a reanalysis to confirm that the non-compliance is because of sample matrix effects rather than laboratory deficiencies.			
6.4	If No in Section 6.3, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓
	If No, for 2 or 3 %Rs > UCL, K(+) only; for 2 or 3 %Rs < LCL, but > 10%, L(+)/UL (-); for 2 or 3 %Rs mixed high/low, J(+)/UJ(-); for %R < 10%, L(+)/R(-).			

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate outside the QC limits?	✓		
7.4	Are there any RPD for matrix spike and matrix spike duplicate outside the QC limits?	✓		
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of the data.			

Notes: MS/MSD for 45TP4B soil exp %Rs/RPDs outside QC limits. See attached.
J/UJ/m for MS/MSD %R failures

pos J/d for RPD failures

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are there any %R for LCS outside the QC limits? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).	✓		
8.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes: Major → batch 505256 caprolactam 21%-225% ND/RL in EQBK-2
batch 505256 2,3,4,6-tetrachlorophenol 119%-7115%, ND in ass sample ✓
batch 505309 Carbazole 122%) 4-methylphenol 104% 7 qc
batch 505368 (was 505 ~~to 15~~) 4 117%) 4 107% 7 qc } All NDs No action
368

9.0 Internal Standard		Yes	No	NA
9.1	Are internal standard areas within +100% and -50% of the mid point initail calibration? If No, J(+)/UJ(-).	✓		
	If extremely low area counts are reported, or performance exhibits a major abrupt drop-off, then a severe loss of sensitivity is indicated. Non-detect target compounds should then be qualified as unusable (R).			
9.2	Are retention times of internal standards within 30 seconds of the associated calibration?			
	The chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction. Positive results should not needed to be qualified as "R", if the mass spectral criteria are met.	✓		

Notes:

10.0 Field Duplicate		Yes	No	NA
10.1	Are all analyte duplicate results within control limits (use RPD limits of matrix spikes)? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes:

See attached

11.0 Detection Limit Verification		Yes	No	NA
11.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture?	✓		

Notes:

DLs raised in 455B8A due to DF=5

12.0 Data Completeness		Yes	No	NA
12.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
12.1.1	Number of samples: 26			
12.1.2	Number of target compounds in each analysis: 67			
12.1.3	Number of results rejected and not reported: 1			
	% Completeness = (12.1.1 x 12.1.2 - 12.1.3) x 100/(12.1.1 x 12.1.2)			
	% Completeness = 99.9%			

Notes:

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by _____ Date _____

_____ Checked by _____ Date _____

Reference

Field Dups for SVOCs ✓

	45TP3B	&	DUP-1	RL	
benzo(a) anthracene	1.2J		1.6J	21	OKV
Chrysene	0.81J		1.2J	21	OKV
di-n-butyl phthalate	6.1J		9.5J	210	OKV
diethyl phthalate	1.2J		1.6J	210	OKV
Isophorone	3.2J		2.5J	210	OKV
2-methylnaphthalene	0.81J		1.2J	210	OKV
Phenol	1.2J		1.2J	210	OKV
Pyrene	1.2J		2.5J	21	OKV
acenaphthene	ND		0.82J	21	OKV
anthracene	ND		0.82J	21	OKV
fluorene	ND		0.41J	21	OKV
n-nitroso-diphenylamine	ND		15J	210	OKV

URS

Page ____ of ____

Job ____ Project No. ____ Sheet ____ of ____

Description ____ Computed by ____ Date ____

____ Checked by ____ Date ____

Reference

Field DUPs for SVOCs (cont.)

	455B14A	&	DUP-2	RL	
benzo(a)anthracene	1.6 J		2.7 J	20	0 ICV
Butyl benzyl phthalate	16 J		3.1 J	200	0 ICV
Chrysene	1.9 J		2.7 J	20	0 ICV
Di-n-butyl phthalate	16 J		6.6 J	200	0 ICV
Diethyl phthalate	0.78 J		1.2 J	200	0 ICV
bis(2-ethylhexyl)phthalate	1.9 J		ND	200	0 ICV
Isophorone	5.1 J		0.78 J	200	0 ICV
2-methylnaphthalene	0.78 J		0.78 J	200	0 ICV
Phenol	2.3 J		4.3 J	200	0 ICV
Pyrene	1.9 J		1.6 J	20	0 ICV
Benzo(k)fluoranthene	ND		2.3 J	20	0 ICV
1,1'-biphenyl	ND		0.78 J	200	0 ICV

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Semivolatile Organic Compounds by EPA Method 8270C

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8270C

Sample/Analyte:			
	0805133-06	45TP4B	2,4-Dinitrophenol
	0805133-06	45TP4B	4,6-Dinitro-2-methylphenol
	0805133-06	45TP4B	Anthracene
	0805133-06	45TP4B	Benzaldehyde
	0805133-06	45TP4B	Benzo(a)pyrene
	0805133-06	45TP4B	Benzo(g,h,i)perylene
	0805133-06	45TP4B	Benzo(k)fluoranthene
	0805133-06	45TP4B	Chrysene

Qualification: The RPD between the MS and MSD results exceeded the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8270C

Sample/Analyte:			
	0805133-06	45TP4B	3-Nitroaniline
	0805133-06	45TP4B	4,6-Dinitro-2-methylphenol
	0805133-06	45TP4B	Anthracene
	0805133-06	45TP4B	Benzo(a)pyrene
	0805133-06	45TP4B	Benzo(b)fluoranthene
	0805133-06	45TP4B	Benzo(g,h,i)perylene
	0805133-06	45TP4B	Benzo(k)fluoranthene
	0805133-06	45TP4B	Bis(2-ethylhexyl) Phthalate
	0805133-06	45TP4B	Butyl Benzyl Phthalate
	0805133-06	45TP4B	Carbazole
	0805133-06	45TP4B	Chrysene
	0805133-06	45TP4B	Dibenz(a,h)anthracene
	0805133-06	45TP4B	Di-n-butyl Phthalate
	0805133-06	45TP4B	Di-n-octyl Phthalate
	0805133-06	45TP4B	Fluoranthene
	0805133-06	45TP4B	Indeno(1,2,3-cd)pyrene
	0805133-06	45TP4B	Pyrene

Qualification: The LCS recovery exceeded the control limit but it was within the marginal exceedance for a compound that is not a project-specific analyte of concern. The result for this analyte in any sample from the associated QC batch is not considered qualified.

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Semivolatile Organic Compounds by EPA Method 8270C

Analysis: USEPA-8270C

Sample/Analyte:		
0805100-01	45TP1A	4-Methylphenol
0805100-01	45TP1A	Carbazole
0805100-02	45TP1B	4-Methylphenol
0805100-02	45TP1B	Carbazole
0805100-03	45TP2A	4-Methylphenol
0805100-03	45TP2A	Carbazole
0805100-04	45TP2B	4-Methylphenol
0805100-04	45TP2B	Carbazole
0805100-05	45TP3A	4-Methylphenol
0805100-05	45TP3A	Carbazole
0805133-01	45TP6A	4-Methylphenol
0805133-01	45TP6A	Carbazole
0805133-02	45TP6B	4-Methylphenol
0805133-02	45TP6B	Carbazole
0805133-03	45TP7A	4-Methylphenol
0805133-03	45TP7A	Carbazole
0805133-04	45TP7B	4-Methylphenol
0805133-04	45TP7B	Carbazole
0805133-05	45TP4A	4-Methylphenol
0805133-05	45TP4A	Carbazole
0805133-06	45TP4B	4-Methylphenol
0805133-06	45TP4B	Carbazole
0805133-07	45TP5A	4-Methylphenol
0805133-07	45TP5A	Carbazole
0805133-08	45TP5B	4-Methylphenol
0805133-08	45TP5B	Carbazole
0805162-01	45TP3B	4-Methylphenol
0805162-01	45TP3B	Carbazole
0805162-02	Dup-1	4-Methylphenol
0805162-02	Dup-1	Carbazole
0805162-03	45SB1A	4-Methylphenol
0805162-03	45SB1A	Carbazole
0805162-04	45SB1B	4-Methylphenol
0805162-04	45SB1B	Carbazole
0805162-05	45SB5A	4-Methylphenol
0805162-05	45SB5A	Carbazole
0805162-06	45SB5B	4-Methylphenol
0805162-06	45SB5B	Carbazole
0805162-07	45SB14A	4-Methylphenol
0805162-07	45SB14A	Carbazole
0805162-08	45SB14B	4-Methylphenol

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Semivolatile Organic Compounds by EPA Method 8270C

Sample/Analyte:	0805162-08	45SB14B	Carbazole
	0805162-09	Dup-2	4-Methylphenol
	0805162-09	Dup-2	Carbazole
	0805162-10	45SB8A	4-Methylphenol
	0805162-10	45SB8A	Carbazole
	0805162-11	45SB8B	4-Methylphenol
	0805162-11	45SB8B	Carbazole
	0805162-16	EQBK-2	2,3,4,6-Tetrachlorophenol
	0805162-16	EQBK-2	Caprolactam
	0805162-16	EQBK-2	Carbazole

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QC BATCH SUMMARY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54

Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002

QC Batch: 0805368
QC Batch Matrix: Soil
Preparation: 3550B Sonication Extraction

Sample Name	Lab Sample ID	Date Prepared	Observations
45SB1A ✓	0805162-03	05/12/08 09:39	
Dup-2 ✓	0805162-09	05/12/08 09:39	
45SB8A ✓	0805162-10	05/12/08 09:39	
45SB8B	0805162-11	05/12/08 09:39	
Blank	0805368-BLK1	05/12/08 09:39	
LCS	0805368-BS1	05/12/08 09:39	
45SB1A	0805368-MS1	05/12/08 09:39	
45SB1A	0805368-MSD1	05/12/08 09:39	

butyl benzyl phthalate 26.7

Isophorone 5

naphthalene 10.65

QC BATCH SUMMARY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54

Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002

QC Batch: 0805309
QC Batch Matrix: Soil
Preparation: 3550B Sonication Extraction

Sample Name	Lab Sample ID	Date Prepared	Observations
45TP1A	0805100-01	05/09/08 10:49	
45TP1B	0805100-02	05/09/08 10:49	
45TP2A	0805100-03	05/09/08 10:49	
45TP2B	0805100-04	05/09/08 10:49	
45TP3A	0805100-05	05/09/08 10:49	
45TP6A	0805133-01	05/09/08 10:49	
45TP6B	0805133-02	05/09/08 10:49	
45TP7A	0805133-03	05/09/08 10:49	
45TP7B	0805133-04	05/09/08 10:49	
45TP4A	0805133-05	05/09/08 10:49	
45TP4B	0805133-06	05/09/08 10:49	
45TP5A	0805133-07	05/09/08 10:49	
45TP5B	0805133-08	05/09/08 10:49	
45TP3B	0805162-01	05/09/08 10:49	
Dup-1	0805162-02	05/09/08 10:49	
45SB1B	0805162-04	05/09/08 10:49	
45SB5A	0805162-05	05/09/08 10:49	
45SB5B	0805162-06	05/09/08 10:49	
45SB14A	0805162-07	05/09/08 10:49	
45SB14B	0805162-08	05/09/08 10:49	
Blank	0805309-BLK1	05/09/08 10:49	
LCS	0805309-BS1	05/09/08 10:49	
45TP4B	0805309-MS1	05/09/08 10:49	
45TP4B	0805309-MSD1	05/09/08 10:49	

1,1-biphenyl 3.335
naphthalene 21.65

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805286-BLK1
File ID: 805286BK.D
Prepared: 05/09/08 08:13
Preparation: 3510C Liquid-Liquid Extr
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/14/08 14:03
Instrument: 195
0.4
QC Batch: 0805286
Sequence: 8052018
Calibration: 8E19033

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.013	0.50	0.50	ug/L	U
208-96-8	Acenaphthylene	0.012	0.50	0.50	ug/L	U
98-86-2	Acetophenone	0.043	5.0	0.0800	ug/L	J
120-12-7	Anthracene	0.014	0.50	0.50	ug/L	U
1912-24-9	Atrazine	0.026	5.0	5.0	ug/L	U
100-52-7	Benzaldehyde	0.051	5.0	5.0	ug/L	U
56-55-3	Benzo(a)anthracene	0.037	0.50	0.50	ug/L	U
50-32-8	Benzo(a)pyrene	0.023	0.50	0.50	ug/L	U
205-99-2	Benzo(b)fluoranthene	0.040	0.50	0.50	ug/L	U
207-08-9	Benzo(k)fluoranthene	0.036	0.50	0.50	ug/L	U
191-24-2	Benzo(g,h,i)perylene	0.022	0.50	0.50	ug/L	U
92-52-4	1,1'-Biphenyl	0.015	5.0	5.0	ug/L	U
101-55-3	4-Bromophenyl Phenyl Ether	0.026	5.0	5.0	ug/L	U
85-68-7	Butyl Benzyl Phthalate	0.029	5.0	5.0	ug/L	U
105-60-2	Caprolactam	0.14	5.0	5.0	ug/L	U
86-74-8	Carbazole	0.018	5.0	5.0	ug/L	U
59-50-7	4-Chloro-3-methylphenol	0.021	5.0	5.0	ug/L	U
106-47-8	4-Chloroaniline	0.021	5.0	5.0	ug/L	U
111-91-1	Bis(2-chloroethoxy)methane	0.016	5.0	5.0	ug/L	U
111-44-4	Bis(2-chloroethyl) Ether	0.016	5.0	5.0	ug/L	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.047	5.0	5.0	ug/L	U
91-58-7	2-Chloronaphthalene	0.012	5.0	5.0	ug/L	U
95-57-8	2-Chlorophenol	0.016	5.0	5.0	ug/L	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.016	5.0	5.0	ug/L	U
218-01-9	Chrysene	0.020	0.50	0.50	ug/L	U
53-70-3	Dibenz(a,h)anthracene	0.026	0.50	0.50	ug/L	U
132-64-9	Dibenzofuran	0.016	5.0	5.0	ug/L	U
84-74-2	Di-n-butyl Phthalate	0.38	5.0	5.0	ug/L	U
91-94-1	3,3´-Dichlorobenzidine	0.21	5.0	5.0	ug/L	U
120-83-2	2,4-Dichlorophenol	0.015	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805286-BLK1
File ID: 805286BK.D
Prepared: 05/09/08 08:13
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/14/08 14:03
Instrument: 195
QC Batch: 0805286
Sequence: 8052018
Calibration: 8E19033

0.5

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate	0.034	5.0	5.0	ug/L	U
105-67-9	2,4-Dimethylphenol	0.33	5.0	5.0	ug/L	U
131-11-3	Dimethyl Phthalate	0.016	5.0	5.0	ug/L	U
534-52-1	4,6-Dinitro-2-methylphenol	0.12	5.0	5.0	ug/L	U
51-28-5	2,4-Dinitrophenol	1.5	5.0	5.0	ug/L	U
121-14-2	2,4-Dinitrotoluene	0.21	5.0	5.0	ug/L	U
606-20-2	2,6-Dinitrotoluene	0.050	5.0	5.0	ug/L	U
117-84-0	Di-n-octyl Phthalate	0.34	5.0	5.0	ug/L	U
117-81-7	Bis(2-ethylhexyl) Phthalate	0.41	5.0	5.0	ug/L	U
206-44-0	Fluoranthene	0.016	0.50	0.50	ug/L	U
86-73-7	Fluorene	0.011	0.50	0.50	ug/L	U
118-74-1	Hexachlorobenzene	0.019	5.0	5.0	ug/L	U
87-68-3	Hexachlorobutadiene	0.018	5.0	5.0	ug/L	U
77-47-4	Hexachlorocyclopentadiene	0.13	5.0	5.0	ug/L	U
67-72-1	Hexachloroethane	0.038	5.0	5.0	ug/L	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.014	0.50	0.50	ug/L	U
78-59-1	Isophorone	0.031	5.0	5.0	ug/L	U
91-57-6	2-Methylnaphthalene	0.015	5.0	5.0	ug/L	U
95-48-7	2-Methylphenol	0.14	5.0	5.0	ug/L	U
106-44-5	4-Methylphenol	0.16	5.0	5.0	ug/L	U
91-20-3	Naphthalene	0.023	0.50	0.100	ug/L	J
88-74-4	2-Nitroaniline	0.12	5.0	5.0	ug/L	U
99-09-2	3-Nitroaniline	0.13	5.0	5.0	ug/L	U
100-01-6	4-Nitroaniline	0.14	5.0	5.0	ug/L	U
98-95-3	Nitrobenzene	0.026	5.0	5.0	ug/L	U
100-02-7	4-Nitrophenol	1.3	5.0	5.0	ug/L	U
88-75-5	2-Nitrophenol	0.026	5.0	5.0	ug/L	U
86-30-6	N-Nitroso-diphenylamine	0.019	5.0	5.0	ug/L	U
621-64-7	N-Nitroso-di-n-propylamine	0.030	5.0	5.0	ug/L	U
87-86-5	Pentachlorophenol	0.19	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805202-BLK1
File ID: 805202B1.D
Prepared: 05/08/08 07:48
Preparation: 3510C Liquid-Liquid Extı
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/13/08 13:41
Instrument: 195
QC Batch: 0805202
Sequence: 8052017
Calibration: 8E19033

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.013	0.50	0.50	ug/L	U
208-96-8	Acenaphthylene	0.012	0.50	0.50	ug/L	U
98-86-2	Acetophenone	0.043	5.0	5.0	ug/L	U
120-12-7	Anthracene	0.014	0.50	0.50	ug/L	U
1912-24-9	Atrazine	0.026	5.0	5.0	ug/L	U
100-52-7	Benzaldehyde	0.051	5.0	5.0	ug/L	U
56-55-3	Benzo(a)anthracene 0.25	0.037	0.50	0.0500	ug/L	J
50-32-8	Benzo(a)pyrene	0.023	0.50	0.50	ug/L	U
205-99-2	Benzo(b)fluoranthene	0.040	0.50	0.50	ug/L	U
207-08-9	Benzo(k)fluoranthene	0.036	0.50	0.50	ug/L	U
191-24-2	Benzo(g,h,i)perylene	0.022	0.50	0.50	ug/L	U
92-52-4	1,1'-Biphenyl	0.015	5.0	5.0	ug/L	U
101-55-3	4-Bromophenyl Phenyl Ether	0.026	5.0	5.0	ug/L	U
85-68-7	Butyl Benzyl Phthalate 0.5	0.029	5.0	0.0500	ug/L	J
105-60-2	Caprolactam	0.14	5.0	5.0	ug/L	U
86-74-8	Carbazole	0.018	5.0	5.0	ug/L	U
59-50-7	4-Chloro-3-methylphenol	0.021	5.0	5.0	ug/L	U
106-47-8	4-Chloroaniline	0.021	5.0	5.0	ug/L	U
111-91-1	Bis(2-chloroethoxy)methane	0.016	5.0	5.0	ug/L	U
111-44-4	Bis(2-chloroethyl) Ether	0.016	5.0	5.0	ug/L	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.047	5.0	5.0	ug/L	U
91-58-7	2-Chloronaphthalene	0.012	5.0	5.0	ug/L	U
95-57-8	2-Chlorophenol	0.016	5.0	5.0	ug/L	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.016	5.0	5.0	ug/L	U
218-01-9	Chrysene 0.2	0.020	0.50	0.0400	ug/L	J
53-70-3	Dibenz(a,h)anthracene	0.026	0.50	0.50	ug/L	U
132-64-9	Dibenzofuran	0.016	5.0	5.0	ug/L	U
84-74-2	Di-n-butyl Phthalate	0.38	5.0	5.0	ug/L	U
91-94-1	3,3´-Dichlorobenzidine	0.21	5.0	5.0	ug/L	U
120-83-2	2,4-Dichlorophenol	0.015	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805202-BLK1
File ID: 805202B1.D
Prepared: 05/08/08 07:48
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/13/08 13:41
Instrument: 195
QC Batch: 0805202
Sequence: 8052017
Calibration: 8E19033

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate 0.6	0.034	5.0	0.0600	ug/L	J
105-67-9	2,4-Dimethylphenol	0.33	5.0	5.0	ug/L	U
131-11-3	Dimethyl Phthalate	0.016	5.0	5.0	ug/L	U
534-52-1	4,6-Dinitro-2-methylphenol	0.12	5.0	5.0	ug/L	U
51-28-5	2,4-Dinitrophenol	1.5	5.0	5.0	ug/L	U
121-14-2	2,4-Dinitrotoluene	0.21	5.0	5.0	ug/L	U
606-20-2	2,6-Dinitrotoluene	0.050	5.0	5.0	ug/L	U
117-84-0	Di-n-octyl Phthalate	0.34	5.0	5.0	ug/L	U
117-81-7	Bis(2-ethylhexyl) Phthalate	0.41	5.0	5.0	ug/L	U
206-44-0	Fluoranthene	0.016	0.50	0.50	ug/L	U
86-73-7	Fluorene	0.011	0.50	0.50	ug/L	U
118-74-1	Hexachlorobenzene	0.019	5.0	5.0	ug/L	U
87-68-3	Hexachlorobutadiene	0.018	5.0	5.0	ug/L	U
77-47-4	Hexachlorocyclopentadiene	0.13	5.0	5.0	ug/L	U
67-72-1	Hexachloroethane	0.038	5.0	5.0	ug/L	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.014	5.0	5.0	ug/L	U
78-59-1	Isophorone 0.25	0.031	0.50	0.0500	ug/L	J
91-57-6	2-Methylnaphthalene	0.015	5.0	5.0	ug/L	U
95-48-7	2-Methylphenol	0.14	5.0	5.0	ug/L	U
106-44-5	4-Methylphenol	0.16	5.0	5.0	ug/L	U
91-20-3	Naphthalene	0.023	0.50	0.50	ug/L	U
88-74-4	2-Nitroaniline	0.12	5.0	5.0	ug/L	U
99-09-2	3-Nitroaniline	0.13	5.0	5.0	ug/L	U
100-01-6	4-Nitroaniline	0.14	5.0	5.0	ug/L	U
98-95-3	Nitrobenzene	0.026	5.0	5.0	ug/L	U
100-02-7	4-Nitrophenol	1.3	5.0	5.0	ug/L	U
88-75-5	2-Nitrophenol	0.026	5.0	5.0	ug/L	U
86-30-6	N-Nitroso-diphenylamine	0.019	5.0	5.0	ug/L	U
621-64-7	N-Nitroso-di-n-propylamine	0.030	5.0	5.0	ug/L	U
87-86-5	Pentachlorophenol	0.19	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805202-BLK1
File ID: 805202B1.D
Prepared: 05/08/08 07:48
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/13/08 13:41
Instrument: 195
QC Batch: 0805202
Sequence: 8052017
Calibration: 8E19033

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
85-01-8	Phenanthrene	0.015	0.50	0.50	ug/L	U
108-95-2	Phenol 0.25	0.028	5.0	0.0500	ug/L	J
129-00-0	Pyrene	0.047	0.50	0.50	ug/L	U
95-94-3	1,2,4,5-Tetrachlorobenzene	0.024	5.0	5.0	ug/L	U
58-90-2	2,3,4,6-Tetrachlorophenol	0.16	5.0	5.0	ug/L	U
88-06-2	2,4,6-Trichlorophenol	0.027	0.50	0.50	ug/L	U
95-95-4	2,4,5-Trichlorophenol	0.11	0.50	0.50	ug/L	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
2-Fluorophenol	20.2	7.55	37	20 - 110	
Phenol-d6	20.0	5.77	29	10 - 115	
Nitrobenzene-d5	10.4	8.98	86	40 - 110	
2-Fluorobiphenyl	10.0	9.48	95	50 - 110	
2,4,6-Tribromophenol	20.1	14.1	70	40 - 125	
o-Terphenyl	10.0	10.1	101	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	218027	4.76	205931	4.76	
Naphthalene-d8	712601	6.26	670578	6.26	
Acenaphthene-d10	420645	8.26	407873	8.26	
Phenanthrene-d10	626097	9.91	610785	9.91	
Chrysene-d12	541978	12.84	486648	12.84	
Perylene-d12	530119	14.31	466997	14.31	

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805309-BLK1
File ID: 805309BK.D
Prepared: 05/09/08 10:49
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
Analyzed: 05/12/08 17:14
Instrument: 195
QC Batch: 0805309
Sequence: 8051997
Calibration: 8E19033

3.335

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.40	17	17	ug/kg wet	U
208-96-8	Acenaphthylene	0.60	17	17	ug/kg wet	U
98-86-2	Acetophenone	6.7	170	170	ug/kg wet	U
120-12-7	Anthracene	0.43	17	17	ug/kg wet	U
1912-24-9	Atrazine	1.5	170	170	ug/kg wet	U
100-52-7	Benzaldehyde	26	170	170	ug/kg wet	U
56-55-3	Benzo(a)anthracene	0.54	17	17	ug/kg wet	U
50-32-8	Benzo(a)pyrene	1.0	17	17	ug/kg wet	U
205-99-2	Benzo(b)fluoranthene	0.85	17	17	ug/kg wet	U
207-08-9	Benzo(k)fluoranthene	0.72	17	17	ug/kg wet	U
191-24-2	Benzo(g,h,i)perylene	2.3	67	67	ug/kg wet	U
92-52-4	1,1'-Biphenyl	0.46	170	0.667	ug/kg wet	J
101-55-3	4-Bromophenyl Phenyl Ether	1.2	170	170	ug/kg wet	U
85-68-7	Butyl Benzyl Phthalate	2.1	170	170	ug/kg wet	U
105-60-2	Caprolactam	23	170	170	ug/kg wet	U
86-74-8	Carbazole	0.50	330	330	ug/kg wet	U
59-50-7	4-Chloro-3-methylphenol	1.8	170	170	ug/kg wet	U
106-47-8	4-Chloroaniline	20	170	170	ug/kg wet	U
111-91-1	Bis(2-chloroethoxy)methane	0.80	170	170	ug/kg wet	U
111-44-4	Bis(2-chloroethyl) Ether	0.90	170	170	ug/kg wet	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.31	170	170	ug/kg wet	U
91-58-7	2-Chloronaphthalene	0.43	170	170	ug/kg wet	U
95-57-8	2-Chlorophenol	0.38	170	170	ug/kg wet	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.45	170	170	ug/kg wet	U
218-01-9	Chrysene	0.48	17	17	ug/kg wet	U
53-70-3	Dibenz(a,h)anthracene	0.54	67	67	ug/kg wet	U
132-64-9	Dibenzofuran	0.26	170	170	ug/kg wet	U
84-74-2	Di-n-butyl Phthalate	1.2	170	170	ug/kg wet	U
91-94-1	3,3'-Dichlorobenzidine	78	330	330	ug/kg wet	U
120-83-2	2,4-Dichlorophenol	6.6	170	170	ug/kg wet	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805309-BLK1
File ID: 805309BK.D
Prepared: 05/09/08 10:49
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
Analyzed: 05/12/08 17:14
Instrument: 195
QC Batch: 0805309
Sequence: 8051997
Calibration: 8E19033 21.65

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate	0.37	170	170	ug/kg wet	U
105-67-9	2,4-Dimethylphenol	5.7	170	170	ug/kg wet	U
131-11-3	Dimethyl Phthalate	0.34	170	170	ug/kg wet	U
534-52-1	4,6-Dinitro-2-methylphenol	36	170	170	ug/kg wet	U
51-28-5	2,4-Dinitrophenol	33	330	330	ug/kg wet	U
121-14-2	2,4-Dinitrotoluene	13	170	170	ug/kg wet	U
606-20-2	2,6-Dinitrotoluene	1.6	170	170	ug/kg wet	U
117-84-0	Di-n-octyl Phthalate	9.8	170	170	ug/kg wet	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1.3	170	170	ug/kg wet	U
206-44-0	Fluoranthene	3.8	17	17	ug/kg wet	U
86-73-7	Fluorene	0.28	17	17	ug/kg wet	U
118-74-1	Hexachlorobenzene	0.80	170	170	ug/kg wet	U
87-68-3	Hexachlorobutadiene	0.69	170	170	ug/kg wet	U
77-47-4	Hexachlorocyclopentadiene	3.9	170	170	ug/kg wet	U
67-72-1	Hexachloroethane	0.80	170	170	ug/kg wet	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.70	67	67	ug/kg wet	U
78-59-1	Isophorone	0.40	170	170	ug/kg wet	U
91-57-6	2-Methylnaphthalene	0.48	170	170	ug/kg wet	U
95-48-7	2-Methylphenol	8.1	170	170	ug/kg wet	U
106-44-5	4-Methylphenol	9.1	170	170	ug/kg wet	U
91-20-3	Naphthalene	0.23	17	4.33	ug/kg wet	J
88-74-4	2-Nitroaniline	13	170	170	ug/kg wet	U
99-09-2	3-Nitroaniline	11	170	170	ug/kg wet	U
100-01-6	4-Nitroaniline	23	170	170	ug/kg wet	U
98-95-3	Nitrobenzene	1.5	170	170	ug/kg wet	U
100-02-7	4-Nitrophenol	11	330	330	ug/kg wet	U
88-75-5	2-Nitrophenol	12	170	170	ug/kg wet	U
86-30-6	N-Nitroso-diphenylamine	0.80	170	170	ug/kg wet	U
621-64-7	N-Nitroso-di-n-propylamine	0.71	170	170	ug/kg wet	U
87-86-5	Pentachlorophenol	3.7	330	330	ug/kg wet	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805368-BLK1
File ID: 805368BK.D
Prepared: 05/12/08 09:39
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
Analyzed: 05/14/08 14:31
Instrument: 195
QC Batch: 0805368
Sequence: 8052018
Calibration: 8E19033

26.7

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.40	17	17	ug/kg wet	U
208-96-8	Acenaphthylene	0.60	17	17	ug/kg wet	U
98-86-2	Acetophenone	6.7	170	170	ug/kg wet	U
120-12-7	Anthracene	0.43	17	17	ug/kg wet	U
1912-24-9	Atrazine	1.5	170	170	ug/kg wet	U
100-52-7	Benzaldehyde	26	170	170	ug/kg wet	U
56-55-3	Benzo(a)anthracene	0.54	17	17	ug/kg wet	U
50-32-8	Benzo(a)pyrene	1.0	17	17	ug/kg wet	U
205-99-2	Benzo(b)fluoranthene	0.85	17	17	ug/kg wet	U
207-08-9	Benzo(k)fluoranthene	0.72	17	17	ug/kg wet	U
191-24-2	Benzo(g,h,i)perylene	2.3	67	67	ug/kg wet	U
92-52-4	1,1'-Biphenyl	0.46	170	170	ug/kg wet	U
101-55-3	4-Bromophenyl Phenyl Ether	1.2	170	170	ug/kg wet	U
85-68-7	Butyl Benzyl Phthalate	2.1	170	2.67	ug/kg wet	J
105-60-2	Caprolactam	23	330	330	ug/kg wet	U
86-74-8	Carbazole	0.50	170	170	ug/kg wet	U
59-50-7	4-Chloro-3-methylphenol	1.8	170	170	ug/kg wet	U
106-47-8	4-Chloroaniline	20	170	170	ug/kg wet	U
111-91-1	Bis(2-chloroethoxy)methane	0.80	170	170	ug/kg wet	U
111-44-4	Bis(2-chloroethyl) Ether	0.90	170	170	ug/kg wet	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.31	170	170	ug/kg wet	U
91-58-7	2-Chloronaphthalene	0.43	170	170	ug/kg wet	U
95-57-8	2-Chlorophenol	0.38	170	170	ug/kg wet	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.45	170	170	ug/kg wet	U
218-01-9	Chrysene	0.48	17	17	ug/kg wet	U
53-70-3	Dibenz(a,h)anthracene	0.54	67	67	ug/kg wet	U
132-64-9	Dibenzofuran	0.26	170	170	ug/kg wet	U
84-74-2	Di-n-butyl Phthalate	1.2	170	170	ug/kg wet	U
91-94-1	3,3´-Dichlorobenzidine	78	330	330	ug/kg wet	U
120-83-2	2,4-Dichlorophenol	6.6	170	170	ug/kg wet	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805368-BLK1
File ID: 805368BK.D
Prepared: 05/12/08 09:39
Preparation: 3550B Sonication Extract
Initial/Final: 30 g / 1 mL
Analyzed: 05/14/08 14:31
Instrument: 195
QC Batch: 0805368
Sequence: 8052018
Calibration: 8E19033

16.65

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate	0.37	170	170	ug/kg wet	U
105-67-9	2,4-Dimethylphenol	5.7	170	170	ug/kg wet	U
131-11-3	Dimethyl Phthalate	0.34	170	170	ug/kg wet	U
534-52-1	4,6-Dinitro-2-methylphenol	36	170	170	ug/kg wet	U
51-28-5	2,4-Dinitrophenol	33	330	330	ug/kg wet	U
121-14-2	2,4-Dinitrotoluene	13	170	170	ug/kg wet	U
606-20-2	2,6-Dinitrotoluene	1.6	170	170	ug/kg wet	U
117-84-0	Di-n-octyl Phthalate	9.8	170	170	ug/kg wet	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1.3	170	170	ug/kg wet	U
206-44-0	Fluoranthene	3.8	17	17	ug/kg wet	U
86-73-7	Fluorene	0.28	17	17	ug/kg wet	U
118-74-1	Hexachlorobenzene	0.80	170	170	ug/kg wet	U
87-68-3	Hexachlorobutadiene	0.69	170	170	ug/kg wet	U
77-47-4	Hexachlorocyclopentadiene	3.9	170	170	ug/kg wet	U
67-72-1	Hexachloroethane	0.80	170	170	ug/kg wet	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.70	67	67	ug/kg wet	U
78-59-1	Isophorone	0.40	170	1.00	ug/kg wet	J
91-57-6	2-Methylnaphthalene	0.48	170	170	ug/kg wet	U
95-48-7	2-Methylphenol	8.1	170	170	ug/kg wet	U
106-44-5	4-Methylphenol	9.1	170	170	ug/kg wet	U
91-20-3	Naphthalene	0.23	17	3.33	ug/kg wet	J
88-74-4	2-Nitroaniline	13	170	170	ug/kg wet	U
99-09-2	3-Nitroaniline	11	170	170	ug/kg wet	U
100-01-6	4-Nitroaniline	23	170	170	ug/kg wet	U
98-95-3	Nitrobenzene	1.5	170	170	ug/kg wet	U
100-02-7	4-Nitrophenol	11	330	330	ug/kg wet	U
88-75-5	2-Nitrophenol	12	170	170	ug/kg wet	U
86-30-6	N-Nitroso-diphenylamine	0.80	170	170	ug/kg wet	U
621-64-7	N-Nitroso-di-n-propylamine	0.71	170	170	ug/kg wet	U
87-86-5	Pentachlorophenol	3.7	330	330	ug/kg wet	U

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Page ____ of ____

Job ____ Project No. ____ Sheet ____ of ____

Description ____ Computed by ____ Date ____

____ Checked by ____ Date ____

Reference

EQ BK 5/7/08

~~acenaphthene 0.2~~

benzo(a)anthracene 0.3
butyl benzyl Phthalate 0.7
Chrysene 0.3
fluoranthene 0.1

EQ BK 5/6/08

acenaphthene 0.1
benzo(b)fluoranthene 1.65
benzo(K) " " 0.35
di-n-butyl phthalate 56
bis(2-ethylhexyl) phthalate 37
fluoranthene 0.15
phenanthrene 0.1

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8270C

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 1 mL

Laboratory ID: 0805309-MS1

QC Batch: 0805309

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Acenaphthene	402	ND	314	78	45 - 110	ug/kg dry
Acenaphthylene	402	0.855	322	80	45 - 105	ug/kg dry
Acetophenone	428	ND	331	78	50 - 150	ug/kg dry
Anthracene	402	1.28	219	54 *	55 - 105	ug/kg dry
Atrazine	428	ND	354	83	61 - 146	ug/kg dry
Benzaldehyde	428	47.0	128	19 *	50 - 150	ug/kg dry
Benzo(a)anthracene	402	9.41	310	75	50 - 110	ug/kg dry
Benzo(a)pyrene	402	19.7	202	45 *	50 - 110	ug/kg dry
Benzo(b)fluoranthene	402	29.5	302	68	45 - 115	ug/kg dry
Benzo(k)fluoranthene	402	5.99	186	45	45 - 125	ug/kg dry
Benzo(g,h,i)perylene	402	19.7	167	37 *	40 - 125	ug/kg dry
1,1'-Biphenyl	428	ND	364	85	60 - 131	ug/kg dry
4-Bromophenyl Phenyl Ether	402	ND	323	80	45 - 115	ug/kg dry
Butyl Benzyl Phthalate	402	ND	236	59	50 - 125	ug/kg dry
Caprolactam	428	ND	332	78	62 - 112	ug/kg dry
Carbazole	830	ND	622	75	45 - 115	ug/kg dry
4-Chloro-3-methylphenol	419	ND	347	83	45 - 115	ug/kg dry
4-Chloroaniline	428	ND	49.6	12	10 - 95	ug/kg dry
Bis(2-chloroethoxy)methane	402	ND	325	81	45 - 110	ug/kg dry
Bis(2-chloroethyl) Ether	402	ND	278	69	40 - 105	ug/kg dry
Bis(2-chloroisopropyl) Ether	402	ND	298	74	20 - 115	ug/kg dry
2-Chloronaphthalene	402	ND	302	75	45 - 105	ug/kg dry
2-Chlorophenol	419	ND	339	81	45 - 105	ug/kg dry
4-Chlorophenyl Phenyl Ether	402	ND	331	82	45 - 110	ug/kg dry
Chrysene	402	6.41	192	46 *	55 - 110	ug/kg dry
Dibenz(a,h)anthracene	402	ND	195	49	40 - 125	ug/kg dry
Dibenzofuran	428	0.428	352	82	50 - 105	ug/kg dry
Di-n-butyl Phthalate	402	16.2	254	59	55 - 110	ug/kg dry
3,3´-Dichlorobenzidine	855	ND	356	42	10 - 130	ug/kg dry
2,4-Dichlorophenol	419	ND	317	76	45 - 110	ug/kg dry
Diethyl Phthalate	402	1.71	213	53	50 - 115	ug/kg dry
2,4-Dimethylphenol	419	ND	209	50	30 - 105	ug/kg dry
Dimethyl Phthalate	402	ND	324	81	50 - 110	ug/kg dry

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45TP4B

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 1 mL

Laboratory ID: 0805309-MS1

QC Batch: 0805309

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
4,6-Dinitro-2-methylphenol	419	ND	97.1	23 *	30 - 135	ug/kg dry
2,4-Dinitrophenol	419	ND	53.9	13 *	15 - 130	ug/kg dry
2,4-Dinitrotoluene	402	ND	322	80	50 - 115	ug/kg dry
2,6-Dinitrotoluene	402	ND	334	83	50 - 110	ug/kg dry
Di-n-octyl Phthalate	402	27.4	271	61	40 - 130	ug/kg dry
Bis(2-ethylhexyl) Phthalate	402	9.83	233	55	45 - 125	ug/kg dry
Fluoranthene	402	ND	228	57	55 - 115	ug/kg dry
Fluorene	402	ND	332	83	50 - 110	ug/kg dry
Hexachlorobenzene	402	ND	304	76	45 - 120	ug/kg dry
Hexachlorobutadiene	402	ND	313	78	40 - 115	ug/kg dry
Hexachlorocyclopentadiene	402	ND	125	31	10 - 113	ug/kg dry
Hexachloroethane	402	ND	291	72	35 - 110	ug/kg dry
Indeno(1,2,3-cd)pyrene	402	28.2	189	40	40 - 120	ug/kg dry
Isophorone	402	3.42	319	78	45 - 110	ug/kg dry
2-Methylnaphthalene	428	1.28	373	87	45 - 105	ug/kg dry
2-Methylphenol	410	ND	301	73	40 - 105	ug/kg dry
4-Methylphenol	410	ND	369	90	40 - 105	ug/kg dry
Naphthalene	402	7.70	319	77	40 - 105	ug/kg dry
2-Nitroaniline	428	ND	364	85	45 - 120	ug/kg dry
3-Nitroaniline	428	ND	360	84	25 - 110	ug/kg dry
4-Nitroaniline	428	ND	196	46	35 - 115	ug/kg dry
Nitrobenzene	402	ND	293	73	40 - 115	ug/kg dry
4-Nitrophenol	419	ND	365	87	15 - 140	ug/kg dry
2-Nitrophenol	419	ND	304	73	40 - 110	ug/kg dry
N-Nitroso-diphenylamine	402	ND	263	65	50 - 115	ug/kg dry
N-Nitroso-di-n-propylamine	402	ND	312	78	40 - 115	ug/kg dry
Pentachlorophenol	419	ND	229	55	25 - 120	ug/kg dry
Phenanthrene	402	ND	302	75	50 - 110	ug/kg dry
Phenol	419	2.57	329	78	40 - 100	ug/kg dry
Pyrene	402	7.27	214	51	45 - 125	ug/kg dry
1,2,4,5-Tetrachlorobenzene	214	ND	172	81	30 - 150	ug/kg dry
2,3,4,6-Tetrachlorophenol	419	ND	332	79	30 - 150	ug/kg dry
2,4,6-Trichlorophenol	419	ND	390	93	45 - 110	ug/kg dry

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45TP4B

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 1 mL

Laboratory ID: 0805309-MSD1

QC Batch: 0805309

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acenaphthene	402	314	78	0	30	45 - 110	ug/kg dry
Acenaphthylene	402	327	81	2	30	45 - 105	ug/kg dry
Acetophenone	428	332	78	0.1	30	50 - 150	ug/kg dry
Anthracene	402	333	83	41 *	30	55 - 105	ug/kg dry
Atrazine	428	375	88	6	30	61 - 146	ug/kg dry
Benzaldehyde	428	130	19 *	2	30	50 - 150	ug/kg dry
Benzo(a)anthracene	402	396	96	24	30	50 - 110	ug/kg dry
Benzo(a)pyrene	402	315	73	44 *	30	50 - 110	ug/kg dry
Benzo(b)fluoranthene	402	470	110	44 *	30	45 - 115	ug/kg dry
Benzo(k)fluoranthene	402	319	78	53 *	30	45 - 125	ug/kg dry
Benzo(g,h,i)perylene	402	254	58	42 *	30	40 - 125	ug/kg dry
1,1'-Biphenyl	428	337	79	8	30	60 - 131	ug/kg dry
4-Bromophenyl Phenyl Ether	402	402	100	22	30	45 - 115	ug/kg dry
Butyl Benzyl Phthalate	402	364	91	42 *	30	50 - 125	ug/kg dry
Caprolactam	428	410	96	21	30	62 - 112	ug/kg dry
Carbazole	830	874	105	34 *	30	45 - 115	ug/kg dry
4-Chloro-3-methylphenol	419	337	80	3	30	45 - 115	ug/kg dry
4-Chloroaniline	428	62.0	14	22	30	10 - 95	ug/kg dry
Bis(2-chloroethoxy)methane	402	328	82	1	30	45 - 110	ug/kg dry
Bis(2-chloroethyl) Ether	402	290	72	4	30	40 - 105	ug/kg dry
Bis(2-chloroisopropyl) Ether	402	295	74	0.9	30	20 - 115	ug/kg dry
2-Chloronaphthalene	402	295	74	2	30	45 - 105	ug/kg dry
2-Chlorophenol	419	335	80	1	30	45 - 105	ug/kg dry
4-Chlorophenyl Phenyl Ether	402	324	81	2	30	45 - 110	ug/kg dry
Chrysene	402	305	74	45 *	30	55 - 110	ug/kg dry
Dibenz(a,h)anthracene	402	290	72	39 *	30	40 - 125	ug/kg dry
Dibenzofuran	428	349	82	0.9	30	50 - 105	ug/kg dry
Di-n-butyl Phthalate	402	388	92	42 *	30	55 - 110	ug/kg dry
3,3´-Dichlorobenzidine	855	397	46	11	30	10 - 130	ug/kg dry
2,4-Dichlorophenol	419	312	74	2	30	45 - 110	ug/kg dry
Diethyl Phthalate	402	239	59	12	30	50 - 115	ug/kg dry
2,4-Dimethylphenol	419	255	61	20	30	30 - 105	ug/kg dry
Dimethyl Phthalate	402	322	80	0.8	30	50 - 110	ug/kg dry
4,6-Dinitro-2-methylphenol	419	52.6	13 *	59 *	30	30 - 135	ug/kg dry

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45TP4B

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 1 mL

Laboratory ID: 0805309-MSD1

QC Batch: 0805309

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
2,4-Dinitrophenol	419	44.5	11 *	19	30	15 - 130	ug/kg dry
2,4-Dinitrotoluene	402	311	77	3	30	50 - 115	ug/kg dry
2,6-Dinitrotoluene	402	334	83	0	30	50 - 110	ug/kg dry
Di-n-octyl Phthalate	402	382	88	34 *	30	40 - 130	ug/kg dry
Bis(2-ethylhexyl) Phthalate	402	360	87	43 *	30	45 - 125	ug/kg dry
Fluoranthene	402	334	83	38 *	30	55 - 115	ug/kg dry
Fluorene	402	334	83	0.5	30	50 - 110	ug/kg dry
Hexachlorobenzene	402	380	94	22	30	45 - 120	ug/kg dry
Hexachlorobutadiene	402	305	76	3	30	40 - 115	ug/kg dry
Hexachlorocyclopentadiene	402	114	28	10	30	10 - 113	ug/kg dry
Hexachloroethane	402	279	69	4	30	35 - 110	ug/kg dry
Indeno(1,2,3-cd)pyrene	402	275	61	37 *	30	40 - 120	ug/kg dry
Isophorone	402	323	80	1	30	45 - 110	ug/kg dry
2-Methylnaphthalene	428	349	81	7	30	45 - 105	ug/kg dry
2-Methylphenol	410	301	73	0	30	40 - 105	ug/kg dry
4-Methylphenol	410	390	95	6	30	40 - 105	ug/kg dry
Naphthalene	402	316	77	1	30	40 - 105	ug/kg dry
2-Nitroaniline	428	366	86	0.6	30	45 - 120	ug/kg dry
3-Nitroaniline	428	198	46	58 *	30	25 - 110	ug/kg dry
4-Nitroaniline	428	236	55	18	30	35 - 115	ug/kg dry
Nitrobenzene	402	300	75	2	30	40 - 115	ug/kg dry
4-Nitrophenol	419	371	89	2	30	15 - 140	ug/kg dry
2-Nitrophenol	419	298	71	2	30	40 - 110	ug/kg dry
N-Nitroso-diphenylamine	402	323	80	21	30	50 - 115	ug/kg dry
N-Nitroso-di-n-propylamine	402	316	79	1	30	40 - 115	ug/kg dry
Pentachlorophenol	419	289	69	23	30	25 - 120	ug/kg dry
Phenanthrene	402	378	94	22	30	50 - 110	ug/kg dry
Phenol	419	333	79	1	30	40 - 100	ug/kg dry
Pyrene	402	323	79	41 *	30	45 - 125	ug/kg dry
1,2,4,5-Tetrachlorobenzene	214	174	82	1	30	30 - 150	ug/kg dry
2,3,4,6-Tetrachlorophenol	419	448	107	30	30	30 - 150	ug/kg dry
2,4,6-Trichlorophenol	419	344	82	12	30	45 - 110	ug/kg dry
2,4,5-Trichlorophenol	410	321	78	15	30	50 - 110	ug/kg dry

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL

Laboratory ID: 0805286-BSD1

QC Batch: 0805286
Sequence: 8052018

Analyte	Spike Added ug/L	LCSD Conc.	LCSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acenaphthene	9.40	8.01	85	1	30	45 - 110	ug/L
Acenaphthylene	9.40	8.50	90	1	30	50 - 105	ug/L
Acetophenone	10.0	9.28	93	1	30	54 - 113	ug/L
Anthracene	9.40	8.60	91	0.3	30	55 - 110	ug/L
Atrazine	10.0	8.75	88	1	30	61 - 139	ug/L
Benzaldehyde	10.0	8.32	83	2	30	25 - 141	ug/L
Benzo(a)anthracene	9.40	8.70	93	0.6	30	55 - 110	ug/L
Benzo(a)pyrene	9.40	8.13	86	2	30	55 - 110	ug/L
Benzo(b)fluoranthene	9.40	8.76	93	4	30	45 - 120	ug/L
Benzo(k)fluoranthene	9.40	7.42	79	2	30	45 - 125	ug/L
Benzo(g,h,i)perylene	9.40	8.07	86	2	30	40 - 125	ug/L
1,1'-Biphenyl	10.0	8.74	87	2	30	59 - 114	ug/L
4-Bromophenyl Phenyl Ether	9.40	8.21	87	3	30	50 - 115	ug/L
Butyl Benzyl Phthalate	9.40	8.87	94	0.7	30	45 - 115	ug/L
Caprolactam	10.0	2.11	21 *	17	30	25 - 135	ug/L
Carbazole	19.4	22.3	115	0.9	30	50 - 115	ug/L
4-Chloro-3-methylphenol	9.80	8.78	90	1	30	45 - 110	ug/L
4-Chloroaniline	10.0	7.65	76	0.8	30	15 - 110	ug/L
Bis(2-chloroethoxy)methane	9.40	8.38	89	3	30	45 - 105	ug/L
Bis(2-chloroethyl) Ether	9.40	8.01	85	3	30	35 - 110	ug/L
Bis(2-chloroisopropyl) Ether	9.40	7.98	85	0.4	30	25 - 130	ug/L
2-Chloronaphthalene	9.40	8.12	86	2	30	50 - 105	ug/L
2-Chlorophenol	9.80	8.27	84	4	30	35 - 105	ug/L
4-Chlorophenyl Phenyl Ether	9.40	8.60	91	0.7	30	50 - 110	ug/L
Chrysene	9.40	8.31	88	0.4	30	55 - 110	ug/L
Dibenz(a,h)anthracene	9.40	8.37	89	2	30	40 - 125	ug/L
Dibenzofuran	10.0	9.03	90	0.7	30	55 - 105	ug/L
Di-n-butyl Phthalate	9.40	9.51	101	9	30	55 - 115	ug/L
3,3'-Dichlorobenzidine	20.0	17.8	89	2	30	20 - 110	ug/L

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

Laboratory ID: 0805286-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL
QC Batch: 0805286
Sequence: 8052018

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
N-Nitroso-di-n-propylamine	9.40	8.15	87	35 - 130	ug/L
Pentachlorophenol	9.80	6.38	65	40 - 115	ug/L
Phenanthrene	9.40	8.05	86	50 - 115	ug/L
Phenol	9.80	4.60	47	0 - 115	ug/L
Pyrene	9.40	8.26	88	50 - 130	ug/L
1,2,4,5-Tetrachlorobenzene	5.00	4.35	87	40 - 140	ug/L
2,3,4,6-Tetrachlorophenol	9.80	11.6	119 *	40 - 115	ug/L
2,4,6-Trichlorophenol	9.80	7.89	81	50 - 115	ug/L
2,4,5-Trichlorophenol	9.60	9.26	96	50 - 110	ug/L

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805368-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 1 mL
QC Batch: 0805368
Sequence: 8052018

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Acenaphthene	313	283	90	45 - 110	ug/kg wet
Acenaphthylene	313	300	96	45 - 105	ug/kg wet
Acetophenone	333	322	97	50 - 150	ug/kg wet
Anthracene	313	302	96	55 - 105	ug/kg wet
Atrazine	333	309	93	61 - 146	ug/kg wet
Benzaldehyde	333	198	59	50 - 150	ug/kg wet
Benzo(a)anthracene	313	298	95	50 - 110	ug/kg wet
Benzo(a)pyrene	313	284	91	50 - 110	ug/kg wet
Benzo(b)fluoranthene	313	300	96	45 - 115	ug/kg wet
Benzo(k)fluoranthene	313	268	85	45 - 125	ug/kg wet
Benzo(g,h,i)perylene	313	279	89	40 - 125	ug/kg wet
1,1'-Biphenyl	333	313	94	60 - 131	ug/kg wet
4-Bromophenyl Phenyl Ether	313	296	95	45 - 115	ug/kg wet
Butyl Benzyl Phthalate	313	298	95	50 - 125	ug/kg wet
Caprolactam	333	372	112	62 - 112	ug/kg wet
Carbazole	647	758	117 *	45 - 115	ug/kg wet
4-Chloro-3-methylphenol	327	324	99	45 - 115	ug/kg wet
4-Chloroaniline	333	72.0	22	10 - 95	ug/kg wet
Bis(2-chloroethoxy)methane	313	310	99	45 - 110	ug/kg wet
Bis(2-chloroethyl) Ether	313	277	88	40 - 105	ug/kg wet
Bis(2-chloroisopropyl) Ether	313	291	93	20 - 115	ug/kg wet
2-Chloronaphthalene	313	288	92	45 - 105	ug/kg wet
2-Chlorophenol	327	326	100	45 - 105	ug/kg wet
4-Chlorophenyl Phenyl Ether	313	310	99	45 - 110	ug/kg wet
Chrysene	313	288	92	55 - 110	ug/kg wet
Dibenz(a,h)anthracene	313	291	93	40 - 125	ug/kg wet
Dibenzofuran	333	322	97	50 - 105	ug/kg wet
Di-n-butyl Phthalate	313	310	99	55 - 110	ug/kg wet
3,3´-Dichlorobenzidine	667	346	52	10 - 130	ug/kg wet

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805368-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 1 mL
QC Batch: 0805368
Sequence: 8052018

Analyte	Spike Added	LCS Conc.	LCS % Rec. #		QC Limits Rec.	Units
2,4-Dichlorophenol	327	306	94		45 - 110	ug/kg wet
Diethyl Phthalate	313	295	94		50 - 115	ug/kg wet
2,4-Dimethylphenol	327	277	85		30 - 105	ug/kg wet
Dimethyl Phthalate	313	296	94		50 - 110	ug/kg wet
4,6-Dinitro-2-methylphenol	327	246	75		30 - 135	ug/kg wet
2,4-Dinitrophenol	327	234	72		15 - 130	ug/kg wet
2,4-Dinitrotoluene	313	304	97		50 - 115	ug/kg wet
2,6-Dinitrotoluene	313	315	101		50 - 110	ug/kg wet
Di-n-octyl Phthalate	313	302	96		40 - 130	ug/kg wet
Bis(2-ethylhexyl) Phthalate	313	274	88		45 - 125	ug/kg wet
Fluoranthene	313	306	98		55 - 115	ug/kg wet
Fluorene	313	311	99		50 - 110	ug/kg wet
Hexachlorobenzene	313	288	92		45 - 120	ug/kg wet
Hexachlorobutadiene	313	292	93		40 - 115	ug/kg wet
Hexachlorocyclopentadiene	313	238	76		10 - 113	ug/kg wet
Hexachloroethane	313	296	95		35 - 110	ug/kg wet
Indeno(1,2,3-cd)pyrene	313	305	97		40 - 120	ug/kg wet
Isophorone	313	296	94		45 - 110	ug/kg wet
2-Methylnaphthalene	333	322	97		45 - 105	ug/kg wet
2-Methylphenol	320	300	94		40 - 105	ug/kg wet
4-Methylphenol	320	343	107	*	40 - 105	ug/kg wet
Naphthalene	313	295	94		40 - 105	ug/kg wet
2-Nitroaniline	333	338	101		45 - 120	ug/kg wet
3-Nitroaniline	333	174	52		25 - 110	ug/kg wet
4-Nitroaniline	333	296	89		35 - 115	ug/kg wet
Nitrobenzene	313	295	94		40 - 115	ug/kg wet
4-Nitrophenol	327	295	90		15 - 140	ug/kg wet
2-Nitrophenol	327	290	89		40 - 110	ug/kg wet
N-Nitroso-diphenylamine	313	238	76		50 - 115	ug/kg wet

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805309-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 1 mL
QC Batch: 0805309
Sequence: 8051997

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Acenaphthene	313	276	88	45 - 110	ug/kg wet
Acenaphthylene	313	290	93	45 - 105	ug/kg wet
Acetophenone	333	316	95	50 - 150	ug/kg wet
Anthracene	313	311	99	55 - 105	ug/kg wet
Atrazine	333	319	96	61 - 146	ug/kg wet
Benzaldehyde	333	208	62	50 - 150	ug/kg wet
Benzo(a)anthracene	313	283	90	50 - 110	ug/kg wet
Benzo(a)pyrene	313	285	91	50 - 110	ug/kg wet
Benzo(b)fluoranthene	313	275	88	45 - 115	ug/kg wet
Benzo(k)fluoranthene	313	297	95	45 - 125	ug/kg wet
Benzo(g,h,i)perylene	313	277	89	40 - 125	ug/kg wet
1,1'-Biphenyl	333	304	91	60 - 131	ug/kg wet
4-Bromophenyl Phenyl Ether	313	286	91	45 - 115	ug/kg wet
Butyl Benzyl Phthalate	313	288	92	50 - 125	ug/kg wet
Caprolactam	333	338	101	62 - 112	ug/kg wet
Carbazole	647	791	122 *	45 - 115	ug/kg wet
4-Chloro-3-methylphenol	327	323	99	45 - 115	ug/kg wet
4-Chloroaniline	333	81.0	24	10 - 95	ug/kg wet
Bis(2-chloroethoxy)methane	313	300	96	45 - 110	ug/kg wet
Bis(2-chloroethyl) Ether	313	268	85	40 - 105	ug/kg wet
Bis(2-chloroisopropyl) Ether	313	299	95	20 - 115	ug/kg wet
2-Chloronaphthalene	313	283	90	45 - 105	ug/kg wet
2-Chlorophenol	327	314	96	45 - 105	ug/kg wet
4-Chlorophenyl Phenyl Ether	313	292	93	45 - 110	ug/kg wet
Chrysene	313	290	92	55 - 110	ug/kg wet
Dibenz(a,h)anthracene	313	281	90	40 - 125	ug/kg wet
Dibenzofuran	333	314	94	50 - 105	ug/kg wet
Di-n-butyl Phthalate	313	311	99	55 - 110	ug/kg wet
3,3'-Dichlorobenzidine	667	301	45	10 - 130	ug/kg wet

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805309-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 1 mL
QC Batch: 0805309
Sequence: 8051997

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
2,4-Dichlorophenol	327	293	90	45 - 110	ug/kg wet
Diethyl Phthalate	313	296	94	50 - 115	ug/kg wet
2,4-Dimethylphenol	327	246	75	30 - 105	ug/kg wet
Dimethyl Phthalate	313	297	95	50 - 110	ug/kg wet
4,6-Dinitro-2-methylphenol	327	253	78	30 - 135	ug/kg wet
2,4-Dinitrophenol	327	216	66	15 - 130	ug/kg wet
2,4-Dinitrotoluene	313	295	94	50 - 115	ug/kg wet
2,6-Dinitrotoluene	313	297	95	50 - 110	ug/kg wet
Di-n-octyl Phthalate	313	283	90	40 - 130	ug/kg wet
Bis(2-ethylhexyl) Phthalate	313	258	82	45 - 125	ug/kg wet
Fluoranthene	313	319	102	55 - 115	ug/kg wet
Fluorene	313	297	95	50 - 110	ug/kg wet
Hexachlorobenzene	313	284	91	45 - 120	ug/kg wet
Hexachlorobutadiene	313	276	88	40 - 115	ug/kg wet
Hexachlorocyclopentadiene	313	231	74	10 - 113	ug/kg wet
Hexachloroethane	313	288	92	35 - 110	ug/kg wet
Indeno(1,2,3-cd)pyrene	313	292	93	40 - 120	ug/kg wet
Isophorone	313	289	92	45 - 110	ug/kg wet
2-Methylnaphthalene	333	309	93	45 - 105	ug/kg wet
2-Methylphenol	320	291	91	40 - 105	ug/kg wet
4-Methylphenol	320	338	106 *	40 - 105	ug/kg wet
Naphthalene	313	288	92	40 - 105	ug/kg wet
2-Nitroaniline	333	333	100	45 - 120	ug/kg wet
3-Nitroaniline	333	164	49	25 - 110	ug/kg wet
4-Nitroaniline	333	310	93	35 - 115	ug/kg wet
Nitrobenzene	313	292	93	40 - 115	ug/kg wet
4-Nitrophenol	327	294	90	15 - 140	ug/kg wet
2-Nitrophenol	327	280	86	40 - 110	ug/kg wet
N-Nitroso-diphenylamine	313	236	75	50 - 115	ug/kg wet

DATA VALIDATION WORKSHEET

Pesticides/PCBs

Reviewer: RA
Date: 6/20/08
DV Level: II **III** IV
Review Document:
X SW-846 - 8081/8082
X NFG - Region III Modifications
X project QAPP

Project Name: Radford
Project Number: 11656351
Laboratory: TriMatrix
SDG No.: 36440-54
Test Name: Pest / PCBs
Method No.: 8081/8082

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, or special circumstances affecting the quality of the data?		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were received with the cooler temperature exceeding 20 ^{O}C, then flag L(+)/UL(-).			✓
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.		✓	

Notes:

2.0 Holding Times

		Yes	No	NA
2.2	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). Extraction: (aqueous) 7 days and (soil) 14 days; and Analysis: 40 days.	✓		
2.3	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes: Pest → 455B1B was re-extracted 2days pass ht → all NDs, UJ/h

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks prepared at the appropriate frequency (one per 20 samples or batch and matrix)?	✓		
3.2	Do any blanks have positive results? If yes, positive sample results should be reported and qualified "B", if the [sample≤5X[blank].	✓		
3.3	Do any field equipment blanks have positive results? If yes, use same rules above.		✓	

Notes: Aqueous MB analyzed 5/16/08 several pos hits and EB → NDs, No action

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are at least five standards included in the calibration curve for 1016, 1260, toxaphene, and technical chlordane; and at least one point for the other arochlors reported? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 12 hours or twenty samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±15%) or %D(≤15%) within the control limits?		✓	
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>15%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 15%, J(+), only. Negative Bias - %D>-15% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes: See attached - several %D > 20% Pos Bias. and field sample result → J, C Pos

5.0 GC/ECD Instrument Performance Check

		Yes	No	NA
5.1	Has a Performance Evaluation Mixture (PEM) been analyzed at the beginning, every 12 hours, and at the end of every sequence.	✓		
5.2	Is the 4,4'-DDT breakdown </= to 20%? If No, for positive DDT results, DDT-L(+), DDD/DDE - NJ(+). For non detect DDT results, DDD/DDE - R(+).	✓		
5.3	Is the endrin breakdown </= to 20%? If No, for positive endrin results, endrin-L(+), endrin aldehyde/ketone - NJ(+). For non-detect DDT results, endrin aldehyde/ketone - R(+).	✓		
5.4	Is the combined breakdowns less than or equal to 30%? If No, for positive DDT/endrin results, DDT/endrin-L(+), DDD/DD/endrin aldehyde/endrin ketone - NJ(+). For non-detect DDT/endrin results, DDD/DDE/endrin aldehyde/endrin ketone - R(+).	✓		

Notes:

6.0 Surrogate Recovery

		Yes	No	NA
6.1	Do all surrogate retention times fall within the RT windows established during the initial calibration sequence? If No, the associated sample result should be carefully evaluated.	✓		
6.2	Are surrogate recoveries within acceptance criteria for all samples and method blanks? Advisory limit: 60-150%.	✓		
6.3	If No in Section 6.3, are these sample(s) or method blank(s) reanalyzed?			✓
6.4	If No in Section 6.4, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓

# of outliers	Recovery	Sample result from column with non-conformance	Sample result from column without non-conformance
1 out	high/low	No action	No action
2 out	2 high same column	K	No action
	2 low same column	L, UL	No action
	mixed same column	J, UJ	No action
	2 high diff columns	J	Not applicable
	2 low diff columns	J, UJ	Not applicable
	mixed diff columns	Professional judgement	Not applicable
3 out	All high	K	Not applicable
	All low	L, UL	Not applicable
	2 high, 1 low	K (2 high)	J (1 low 2nd column)
	2 low, 1 high	L, UJ (2 low)	J (1 high 2nd column)
	other mixed	J, UJ	Not applicable
4 out	All high	K	Not applicable
	All low	L, UL	Not applicable
	Mixed	J, UJ	Not applicable

If any recovery is >0% and <10% then L(+)/R(-).
If any recovery is 0% then R(+/-).

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?	✓	✓	
7.4	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data.			

Notes: MS/MSD for 45TP4B7130% for PCB-1260 437%/363% } ans. Parent result
PCB-7 and column = = 967%/749% } ND → No action

URS

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are there any %R for LCS/LCSD recoveries outside the QC limits?	✓		
	If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			

Notes: LCS for batch 805288 several %Rs >UQC and field sample results ND → No action

9.0 Field Duplicate

		Yes	No	NA
9.2	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: 45TP3B, DUP-1 RL
PCB-1254 24J 8.4J 40 OKV

10.0 Compound Identification and Detection Limit Verification

		Yes	No	NA
10.1	Is the percent difference calculated for the positive sample results on both columns <40%? If No, J(+).		✓	
10.2	Do detection limits meet those required by the project QAPP and were properly adjusted for dilution factors and moisture?	✓		

Notes: Pest → sample 45TP2A Endosulfan II 155.8%. Prev. flagged for Calib. anomaly; No more action.

11.0 Data Completeness

		Yes	No	NA
11.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
11.1.1	Number of samples: Pest_____ PCB_____			
11.1.2	Number of target compounds in each analysis: PEST_____ PCB_____			
11.1.3	Number of results rejected and not reported: Pest_____ PCB_____			
11.1.4	% Completeness = (11.1.1 x 11.1.2 - 11.1.3) x 100/(11.1.1 x 11.1.2)			
	% Completeness = Pest 100%. PCB 100%.			

Notes:

LCS / LCS DUPLICATE RECOVERY
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805288-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 10 mL
QC Batch: 0805288
Sequence: 8052238

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
alpha-BHC	13.3	18.2	137 *	60 - 125	ug/kg wet
alpha-BHC [2C]	13.3	16.9	127 *	60 - 125	ug/kg wet
beta-BHC	13.3	17.4	130 *	60 - 125	ug/kg wet
beta-BHC [2C]	13.3	15.9	120	60 - 125	ug/kg wet
gamma-BHC (Lindane)	13.3	17.9	134 *	60 - 125	ug/kg wet
gamma-BHC (Lindane) [2C]	13.3	16.5	124	60 - 125	ug/kg wet
delta-BHC	13.3	18.4	138 *	55 - 130	ug/kg wet
delta-BHC [2C]	13.3	17.0	127	55 - 130	ug/kg wet
alpha-Chlordane	13.3	17.7	133 *	65 - 120	ug/kg wet
alpha-Chlordane [2C]	13.3	15.9	120	65 - 120	ug/kg wet
gamma-Chlordane	13.3	17.8	133 *	65 - 125	ug/kg wet
gamma-Chlordane [2C]	13.3	15.5	116	65 - 125	ug/kg wet
4,4'-DDD	13.3	18.8	141 *	30 - 135	ug/kg wet
4,4'-DDD [2C]	13.3	17.1	128	30 - 135	ug/kg wet
4,4'-DDE	13.3	18.5	139 *	70 - 125	ug/kg wet
4,4'-DDE [2C]	13.3	16.7	126 *	70 - 125	ug/kg wet
4,4'-DDT	13.3	17.8	133	45 - 140	ug/kg wet
4,4'-DDT [2C]	13.3	16.9	127	45 - 140	ug/kg wet
Aldrin	13.3	18.0	135	45 - 140	ug/kg wet
Aldrin [2C]	13.3	16.8	126	45 - 140	ug/kg wet
Dieldrin	13.3	18.5	139 *	65 - 125	ug/kg wet
Dieldrin [2C]	13.3	16.6	124	65 - 125	ug/kg wet
Endosulfan I	13.3	16.0	120	15 - 135	ug/kg wet
Endosulfan I [2C]	13.3	14.5	109	15 - 135	ug/kg wet
Endosulfan II	13.3	17.2	129	35 - 140	ug/kg wet
Endosulfan II [2C]	13.3	16.0	120	35 - 140	ug/kg wet
Endosulfan Sulfate	13.3	18.8	141 *	60 - 135	ug/kg wet
Endosulfan Sulfate [2C]	13.3	17.3	130	60 - 135	ug/kg wet
Endrin	13.3	19.0	142 *	60 - 135	ug/kg wet

LCS / LCS DUPLICATE RECOVERY
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

Laboratory ID: 0805288-BS1

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3550B Sonication Extraction
Initial/Final: 30 g / 10 mL
QC Batch: 0805288
Sequence: 8052238

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Endrin [2C]	13.3	17.1	128	60 - 135	ug/kg wet
Endrin Aldehyde	13.3	16.7	125	35 - 145	ug/kg wet
Endrin Aldehyde [2C]	13.3	15.6	117	35 - 145	ug/kg wet
Endrin Ketone	13.3	18.2	136 *	65 - 135	ug/kg wet
Endrin Ketone [2C]	13.3	17.6	132	65 - 135	ug/kg wet
Heptachlor	13.3	17.9	134	50 - 140	ug/kg wet
Heptachlor [2C]	13.3	16.3	122	50 - 140	ug/kg wet
Heptachlor Epoxide	13.3	17.7	133 *	65 - 130	ug/kg wet
Heptachlor Epoxide [2C]	13.3	16.0	120	65 - 130	ug/kg wet
Methoxychlor	13.3	17.8	134	55 - 145	ug/kg wet
Methoxychlor [2C]	13.3	18.2	137	55 - 145	ug/kg wet

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

DUAL COLUMN CONFIRMATION CHECK

45TP2A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil
Sampled: 05/05/08 12:15
Solids: 73.18
QC Batch: 0805288
GC Column(1):

Laboratory ID: 0805100-03
Prepared: 05/09/08 08:20
Preparation: 3550B Sonication Extracti
Sequence: 8052238
GC Column(2): RTX CLP Pest2

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, W(
File ID: A70_379-0
Analyzed: 05/20/08 14:28
Instrument: 199

Analyte	Col.	RT	EXP RT	Diff.	Area	Amount	Conc.	RPD
Endosulfan II	1	16.9	16.925	0.025	19571.46		4.19	
	* 2	19.64	19.66167	0.0217	156611		36.5	158.8

* Column used for quantitation

022235

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Qualification: The RPD between the detected values from the primary and confirmation analyses exceeded 40%. The higher concentration result has been reported.

Analysis: USEPA-8081A

Sample/Analyte:		
0805100-03	45TP2A	Endosulfan II [2C]

Qualification: The EPA hold time for sample pretreatment was exceeded and the sample result(s) are considered estimated.

Analysis: USEPA-8081A

Sample/Analyte: 0805162-04RE1 45SB1B

Qualification: Matrix QC results are not available due to high concentrations on PCBs in the sample.

Analysis: USEPA-8081A

Sample/Analyte: 0805133-06 45TP4B

Qualification: The LCS recovery exceeded the upper control limit. The samples were outside of twice the holding time and were not re-extracted. All results in the associated QC batch are considered as estimated.

Analysis: USEPA-8081A

Sample/Analyte:		
0805100-01	45TP1A	4,4'-DDD
0805100-01	45TP1A	4,4'-DDE
0805100-01	45TP1A	4,4'-DDE [2C]
0805100-01	45TP1A	alpha-BHC
0805100-01	45TP1A	alpha-BHC [2C]
0805100-01	45TP1A	alpha-Chlordane
0805100-01	45TP1A	beta-BHC
0805100-01	45TP1A	delta-BHC
0805100-01	45TP1A	Dieldrin
0805100-01	45TP1A	Endosulfan Sulfate
0805100-01	45TP1A	Endrin
0805100-01	45TP1A	Endrin Ketone
0805100-01	45TP1A	gamma-BHC (Lindane)
0805100-01	45TP1A	gamma-Chlordane
0805100-01	45TP1A	Heptachlor Epoxide
0805100-02	45TP1B	4,4'-DDD
0805100-02	45TP1B	4,4'-DDE
0805100-02	45TP1B	4,4'-DDE [2C]
0805100-02	45TP1B	alpha-BHC
0805100-02	45TP1B	alpha-BHC [2C]
0805100-02	45TP1B	alpha-Chlordane
0805100-02	45TP1B	beta-BHC

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805100-02	45TP1B	delta-BHC
	0805100-02	45TP1B	Dieldrin
	0805100-02	45TP1B	Endosulfan Sulfate
	0805100-02	45TP1B	Endrin
	0805100-02	45TP1B	Endrin Ketone
	0805100-02	45TP1B	gamma-BHC (Lindane)
	0805100-02	45TP1B	gamma-Chlordane
	0805100-02	45TP1B	Heptachlor Epoxide
	0805100-03	45TP2A	4,4'-DDD
	0805100-03	45TP2A	4,4'-DDE
	0805100-03	45TP2A	4,4'-DDE [2C]
	0805100-03	45TP2A	alpha-BHC
	0805100-03	45TP2A	alpha-BHC [2C]
	0805100-03	45TP2A	alpha-Chlordane
	0805100-03	45TP2A	beta-BHC
	0805100-03	45TP2A	delta-BHC
	0805100-03	45TP2A	Dieldrin
	0805100-03	45TP2A	Endosulfan Sulfate
	0805100-03	45TP2A	Endrin
	0805100-03	45TP2A	Endrin Ketone
	0805100-03	45TP2A	gamma-BHC (Lindane)
	0805100-03	45TP2A	gamma-Chlordane
	0805100-03	45TP2A	Heptachlor Epoxide
	0805100-04	45TP2B	4,4'-DDD
	0805100-04	45TP2B	4,4'-DDE
	0805100-04	45TP2B	4,4'-DDE [2C]
	0805100-04	45TP2B	alpha-BHC
	0805100-04	45TP2B	alpha-BHC [2C]
	0805100-04	45TP2B	alpha-Chlordane
	0805100-04	45TP2B	beta-BHC
	0805100-04	45TP2B	delta-BHC
	0805100-04	45TP2B	Dieldrin
	0805100-04	45TP2B	Endosulfan Sulfate
	0805100-04	45TP2B	Endrin
	0805100-04	45TP2B	Endrin Ketone
	0805100-04	45TP2B	gamma-BHC (Lindane)
	0805100-04	45TP2B	gamma-Chlordane
	0805100-04	45TP2B	Heptachlor Epoxide
	0805100-05	45TP3A	4,4'-DDD
	0805100-05	45TP3A	4,4'-DDE
	0805100-05	45TP3A	4,4'-DDE [2C]
	0805100-05	45TP3A	alpha-BHC

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805100-05	45TP3A	alpha-BHC [2C]
	0805100-05	45TP3A	alpha-Chlordane
	0805100-05	45TP3A	beta-BHC
	0805100-05	45TP3A	delta-BHC
	0805100-05	45TP3A	Dieldrin
	0805100-05	45TP3A	Endosulfan Sulfate
	0805100-05	45TP3A	Endrin
	0805100-05	45TP3A	Endrin Ketone
	0805100-05	45TP3A	gamma-BHC (Lindane)
	0805100-05	45TP3A	gamma-Chlordane
	0805100-05	45TP3A	Heptachlor Epoxide
	0805133-01	45TP6A	4,4'-DDD
	0805133-01	45TP6A	4,4'-DDE
	0805133-01	45TP6A	4,4'-DDE [2C]
	0805133-01	45TP6A	alpha-BHC
	0805133-01	45TP6A	alpha-BHC [2C]
	0805133-01	45TP6A	alpha-Chlordane
	0805133-01	45TP6A	beta-BHC
	0805133-01	45TP6A	delta-BHC
	0805133-01	45TP6A	Dieldrin
	0805133-01	45TP6A	Endosulfan Sulfate
	0805133-01	45TP6A	Endrin
	0805133-01	45TP6A	Endrin Ketone
	0805133-01	45TP6A	gamma-BHC (Lindane)
	0805133-01	45TP6A	gamma-Chlordane
	0805133-01	45TP6A	Heptachlor Epoxide
	0805133-02	45TP6B	4,4'-DDD
	0805133-02	45TP6B	4,4'-DDE
	0805133-02	45TP6B	4,4'-DDE [2C]
	0805133-02	45TP6B	alpha-BHC
	0805133-02	45TP6B	alpha-BHC [2C]
	0805133-02	45TP6B	alpha-Chlordane
	0805133-02	45TP6B	beta-BHC
	0805133-02	45TP6B	delta-BHC
	0805133-02	45TP6B	Dieldrin
	0805133-02	45TP6B	Endosulfan Sulfate
	0805133-02	45TP6B	Endrin
	0805133-02	45TP6B	Endrin Ketone
	0805133-02	45TP6B	gamma-BHC (Lindane)
	0805133-02	45TP6B	gamma-Chlordane
	0805133-02	45TP6B	Heptachlor Epoxide
	0805133-03	45TP7A	4,4'-DDD

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805133-03	45TP7A	4,4'-DDE
	0805133-03	45TP7A	4,4'-DDE [2C]
	0805133-03	45TP7A	alpha-BHC
	0805133-03	45TP7A	alpha-BHC [2C]
	0805133-03	45TP7A	alpha-Chlordane
	0805133-03	45TP7A	beta-BHC
	0805133-03	45TP7A	delta-BHC
	0805133-03	45TP7A	Dieldrin
	0805133-03	45TP7A	Endosulfan Sulfate
	0805133-03	45TP7A	Endrin
	0805133-03	45TP7A	Endrin Ketone
	0805133-03	45TP7A	gamma-BHC (Lindane)
	0805133-03	45TP7A	gamma-Chlordane
	0805133-03	45TP7A	Heptachlor Epoxide
	0805133-04	45TP7B	4,4'-DDD
	0805133-04	45TP7B	4,4'-DDE
	0805133-04	45TP7B	4,4'-DDE [2C]
	0805133-04	45TP7B	alpha-BHC
	0805133-04	45TP7B	alpha-BHC [2C]
	0805133-04	45TP7B	alpha-Chlordane
	0805133-04	45TP7B	beta-BHC
	0805133-04	45TP7B	delta-BHC
	0805133-04	45TP7B	Dieldrin
	0805133-04	45TP7B	Endosulfan Sulfate
	0805133-04	45TP7B	Endrin
	0805133-04	45TP7B	Endrin Ketone
	0805133-04	45TP7B	gamma-BHC (Lindane)
	0805133-04	45TP7B	gamma-Chlordane
	0805133-04	45TP7B	Heptachlor Epoxide
	0805133-05	45TP4A	4,4'-DDD
	0805133-05	45TP4A	4,4'-DDE
	0805133-05	45TP4A	4,4'-DDE [2C]
	0805133-05	45TP4A	alpha-BHC
	0805133-05	45TP4A	alpha-BHC [2C]
	0805133-05	45TP4A	alpha-Chlordane
	0805133-05	45TP4A	beta-BHC
	0805133-05	45TP4A	delta-BHC
	0805133-05	45TP4A	Dieldrin
	0805133-05	45TP4A	Endosulfan Sulfate
	0805133-05	45TP4A	Endrin
	0805133-05	45TP4A	Endrin Ketone
	0805133-05	45TP4A	gamma-BHC (Lindane)

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805133-05	45TP4A	gamma-Chlordane
	0805133-05	45TP4A	Heptachlor Epoxide
	0805133-06	45TP4B	4,4'-DDD
	0805133-06	45TP4B	4,4'-DDE
	0805133-06	45TP4B	4,4'-DDE [2C]
	0805133-06	45TP4B	alpha-BHC
	0805133-06	45TP4B	alpha-BHC [2C]
	0805133-06	45TP4B	alpha-Chlordane
	0805133-06	45TP4B	beta-BHC
	0805133-06	45TP4B	delta-BHC
	0805133-06	45TP4B	Dieldrin
	0805133-06	45TP4B	Endosulfan Sulfate
	0805133-06	45TP4B	Endrin
	0805133-06	45TP4B	Endrin Ketone
	0805133-06	45TP4B	gamma-BHC (Lindane)
	0805133-06	45TP4B	gamma-Chlordane
	0805133-06	45TP4B	Heptachlor Epoxide
	0805133-07	45TP5A	4,4'-DDD
	0805133-07	45TP5A	4,4'-DDE
	0805133-07	45TP5A	4,4'-DDE [2C]
	0805133-07	45TP5A	alpha-BHC
	0805133-07	45TP5A	alpha-BHC [2C]
	0805133-07	45TP5A	alpha-Chlordane
	0805133-07	45TP5A	beta-BHC
	0805133-07	45TP5A	delta-BHC
	0805133-07	45TP5A	Dieldrin
	0805133-07	45TP5A	Endosulfan Sulfate
	0805133-07	45TP5A	Endrin
	0805133-07	45TP5A	Endrin Ketone
	0805133-07	45TP5A	gamma-BHC (Lindane)
	0805133-07	45TP5A	gamma-Chlordane
	0805133-07	45TP5A	Heptachlor Epoxide
	0805133-08	45TP5B	4,4'-DDD
	0805133-08	45TP5B	4,4'-DDE
	0805133-08	45TP5B	4,4'-DDE [2C]
	0805133-08	45TP5B	alpha-BHC
	0805133-08	45TP5B	alpha-BHC [2C]
	0805133-08	45TP5B	alpha-Chlordane
	0805133-08	45TP5B	beta-BHC
	0805133-08	45TP5B	delta-BHC
	0805133-08	45TP5B	Dieldrin
	0805133-08	45TP5B	Endosulfan Sulfate

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805133-08	45TP5B	Endrin
	0805133-08	45TP5B	Endrin Ketone
	0805133-08	45TP5B	gamma-BHC (Lindane)
	0805133-08	45TP5B	gamma-Chlordane
	0805133-08	45TP5B	Heptachlor Epoxide
	0805162-01	45TP3B	4,4'-DDD
	0805162-01	45TP3B	4,4'-DDE
	0805162-01	45TP3B	4,4'-DDE [2C]
	0805162-01	45TP3B	alpha-BHC
	0805162-01	45TP3B	alpha-BHC [2C]
	0805162-01	45TP3B	alpha-Chlordane
	0805162-01	45TP3B	beta-BHC
	0805162-01	45TP3B	delta-BHC
	0805162-01	45TP3B	Dieldrin
	0805162-01	45TP3B	Endosulfan Sulfate
	0805162-01	45TP3B	Endrin
	0805162-01	45TP3B	Endrin Ketone
	0805162-01	45TP3B	gamma-BHC (Lindane)
	0805162-01	45TP3B	gamma-Chlordane
	0805162-01	45TP3B	Heptachlor Epoxide
	0805162-02	Dup-1	4,4'-DDD
	0805162-02	Dup-1	4,4'-DDE
	0805162-02	Dup-1	4,4'-DDE [2C]
	0805162-02	Dup-1	alpha-BHC
	0805162-02	Dup-1	alpha-BHC [2C]
	0805162-02	Dup-1	alpha-Chlordane
	0805162-02	Dup-1	beta-BHC
	0805162-02	Dup-1	delta-BHC
	0805162-02	Dup-1	Dieldrin
	0805162-02	Dup-1	Endosulfan Sulfate
	0805162-02	Dup-1	Endrin
	0805162-02	Dup-1	Endrin Ketone
	0805162-02	Dup-1	gamma-BHC (Lindane)
	0805162-02	Dup-1	gamma-Chlordane
	0805162-02	Dup-1	Heptachlor Epoxide
	0805162-04	45SB1B	4,4'-DDD
	0805162-04	45SB1B	4,4'-DDE
	0805162-04	45SB1B	4,4'-DDE [2C]
	0805162-04	45SB1B	alpha-BHC
	0805162-04	45SB1B	alpha-BHC [2C]
	0805162-04	45SB1B	alpha-Chlordane
	0805162-04	45SB1B	beta-BHC

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Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805162-04	45SB1B	delta-BHC
	0805162-04	45SB1B	Dieldrin
	0805162-04	45SB1B	Endosulfan Sulfate
	0805162-04	45SB1B	Endrin
	0805162-04	45SB1B	Endrin Ketone
	0805162-04	45SB1B	gamma-BHC (Lindane)
	0805162-04	45SB1B	gamma-Chlordane
	0805162-04	45SB1B	Heptachlor Epoxide
	0805162-05	45SB5A	4,4'-DDD
	0805162-05	45SB5A	4,4'-DDE
	0805162-05	45SB5A	4,4'-DDE [2C]
	0805162-05	45SB5A	alpha-BHC
	0805162-05	45SB5A	alpha-BHC [2C]
	0805162-05	45SB5A	alpha-Chlordane
	0805162-05	45SB5A	beta-BHC
	0805162-05	45SB5A	delta-BHC
	0805162-05	45SB5A	Dieldrin
	0805162-05	45SB5A	Endosulfan Sulfate
	0805162-05	45SB5A	Endrin
	0805162-05	45SB5A	Endrin Ketone
	0805162-05	45SB5A	gamma-BHC (Lindane)
	0805162-05	45SB5A	gamma-Chlordane
	0805162-05	45SB5A	Heptachlor Epoxide
	0805162-06	45SB5B	4,4'-DDD
	0805162-06	45SB5B	4,4'-DDE
	0805162-06	45SB5B	4,4'-DDE [2C]
	0805162-06	45SB5B	alpha-BHC
	0805162-06	45SB5B	alpha-BHC [2C]
	0805162-06	45SB5B	alpha-Chlordane
	0805162-06	45SB5B	beta-BHC
	0805162-06	45SB5B	delta-BHC
	0805162-06	45SB5B	Dieldrin
	0805162-06	45SB5B	Endosulfan Sulfate
	0805162-06	45SB5B	Endrin
	0805162-06	45SB5B	Endrin Ketone
	0805162-06	45SB5B	gamma-BHC (Lindane)
	0805162-06	45SB5B	gamma-Chlordane
	0805162-06	45SB5B	Heptachlor Epoxide
	0805162-07	45SB14A	4,4'-DDD
	0805162-07	45SB14A	4,4'-DDE
	0805162-07	45SB14A	4,4'-DDE [2C]
	0805162-07	45SB14A	alpha-BHC

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Organochlorine Pesticides by EPA Method 8081A

Sample/Analyte:	0805162-07	45SB14A	alpha-BHC [2C]
	0805162-07	45SB14A	alpha-Chlordane
	0805162-07	45SB14A	beta-BHC
	0805162-07	45SB14A	delta-BHC
	0805162-07	45SB14A	Dieldrin
	0805162-07	45SB14A	Endosulfan Sulfate
	0805162-07	45SB14A	Endrin
	0805162-07	45SB14A	Endrin Ketone
	0805162-07	45SB14A	gamma-BHC (Lindane)
	0805162-07	45SB14A	gamma-Chlordane
	0805162-07	45SB14A	Heptachlor Epoxide
	0805162-08	45SB14B	4,4'-DDD
	0805162-08	45SB14B	4,4'-DDE
	0805162-08	45SB14B	4,4'-DDE [2C]
	0805162-08	45SB14B	alpha-BHC
	0805162-08	45SB14B	alpha-BHC [2C]
	0805162-08	45SB14B	alpha-Chlordane
	0805162-08	45SB14B	beta-BHC
	0805162-08	45SB14B	delta-BHC
	0805162-08	45SB14B	Dieldrin
	0805162-08	45SB14B	Endosulfan Sulfate
	0805162-08	45SB14B	Endrin
	0805162-08	45SB14B	Endrin Ketone
	0805162-08	45SB14B	gamma-BHC (Lindane)
	0805162-08	45SB14B	gamma-Chlordane
	0805162-08	45SB14B	Heptachlor Epoxide

Qualification: The EPA hold time for sample pretreatment was exceeded and the sample results are considered as estimated. It was extracted out of hold at the client's request in order to get accurracy and precsion data for the batch.

Analysis: USEPA-8081A

Sample/Analyte: 0805162-04RE1 45SB1B
0805288-MS3
0805288-MS4

Qualification: One or more surrogate recoveries for the sample exceeded the upper control limit. Positive results are considered estimated. Non-detect results are not qualified.

Analysis: USEPA-8081A

Sample/Analyte: 0805288-BLK1
0805288-BS1

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HOLDING TIME SUMMARY
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-54

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Method: Organochlorine Pesticides by EPA Method 8081A

Sample Name	Date Collected	Date Received	Date Leached	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
45TP1A	05/05/08	05/06/08		05/09/08	4	14	05/20/08	11	40	
45TP1B	05/05/08	05/06/08		05/09/08	4	14	05/20/08	11	40	
45TP2A	05/05/08	05/06/08		05/09/08	4	14	05/20/08	11	40	
45TP2B	05/05/08	05/06/08		05/09/08	4	14	05/20/08	11	40	
45TP3A	05/05/08	05/06/08		05/09/08	4	14	05/20/08	11	40	
45TP6A	05/06/08	05/07/08		05/09/08	3	14	05/20/08	11	40	
45TP6B	05/06/08	05/07/08		05/09/08	3	14	05/20/08	11	40	
45TP7A	05/06/08	05/07/08		05/09/08	3	14	05/20/08	11	40	
45TP7B	05/06/08	05/07/08		05/09/08	3	14	05/20/08	11	40	
45TP4A	05/06/08	05/07/08		05/09/08	3	14	05/20/08	12	40	
45TP4B	05/06/08	05/07/08		05/09/08	3	14	05/20/08	12	40	
45TP5A	05/06/08	05/07/08		05/09/08	3	14	05/20/08	12	40	
45TP5B	05/06/08	05/07/08		05/09/08	3	14	05/20/08	12	40	
EQBK-1	05/06/08	05/07/08		05/08/08	2	7	05/15/08	8	40	
45TP3B	05/07/08	05/08/08		05/09/08	2	14	05/20/08	12	40	
Dup-1	05/07/08	05/08/08		05/09/08	2	14	05/20/08	12	40	
45SB1A	05/07/08	05/08/08		05/12/08	5	14	05/29/08	18	40	
45SB1B	05/07/08	05/08/08		05/09/08	2	14	05/21/08	12	40	
45SB1B	05/07/08	05/08/08		05/23/08	16	14	05/23/08	1	40	*
45SB5A	05/07/08	05/08/08		05/09/08	2	14	05/21/08	12	40	
45SB5B	05/07/08	05/08/08		05/09/08	2	14	05/22/08	13	40	

: 01255

METHOD BLANK DATA SHEET
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805203-BLK2
File ID: A70_227-0
Prepared: 05/13/08 07:51
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 2 mL
Analyzed: 05/16/08 09:38
Instrument: 199
QC Batch: 0805203
Sequence: 8051653
Calibration: 8E16009

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
319-84-6	alpha-BHC	0.0019	0.010	0.010	ug/L	U
319-84-6	alpha-BHC [2C]	0.0019	0.010	0.010	ug/L	U
319-85-7	beta-BHC	0.0032	0.010	0.010	ug/L	U
319-85-7	beta-BHC [2C]	0.0032	0.010	0.010	ug/L	U
58-89-9	gamma-BHC (Lindane)	0.0018	0.010	0.010	ug/L	U
58-89-9	gamma-BHC (Lindane) [2C]	0.0018	0.010	0.010	ug/L	U
319-86-8	delta-BHC	0.0023	0.010	0.010	ug/L	U
319-86-8	delta-BHC [2C]	0.0023	0.010	0.010	ug/L	U
5103-71-9	alpha-Chlordane	0.0021	0.010	0.010	ug/L	U
5103-71-9	alpha-Chlordane [2C]	0.0021	0.010	0.010	ug/L	U
5103-74-2	gamma-Chlordane	0.0021	0.010	0.00260	ug/L	J
5103-74-2	gamma-Chlordane [2C]	0.0021	0.010	0.00280	ug/L	J
72-54-8	4,4'-DDD	0.0019	0.010	0.010	ug/L	U
72-54-8	4,4'-DDD [2C]	0.0019	0.010	0.010	ug/L	U
72-55-9	4,4'-DDE	0.0027	0.010	0.010	ug/L	U
72-55-9	4,4'-DDE [2C]	0.0027	0.010	0.010	ug/L	U
50-29-3	4,4'-DDT	0.0020	0.010	0.010	ug/L	U
50-29-3	4,4'-DDT [2C]	0.0020	0.010	0.010	ug/L	U
309-00-2	Aldrin	0.0079	0.020	0.020	ug/L	U
309-00-2	Aldrin [2C]	0.0079	0.020	0.020	ug/L	U
60-57-1	Dieldrin	0.0020	0.010	0.010	ug/L	U
60-57-1	Dieldrin [2C]	0.0020	0.010	0.010	ug/L	U
959-98-8	Endosulfan I	0.0023	0.010	0.010	ug/L	U
959-98-8	Endosulfan I [2C]	0.0023	0.010	0.010	ug/L	U
33213-65-9	Endosulfan II	0.0018	0.010	0.010	ug/L	U
33213-65-9	Endosulfan II [2C]	0.0018	0.010	0.010	ug/L	U
1031-07-8	Endosulfan Sulfate	0.0033	0.010	0.00400	ug/L	J
1031-07-8	Endosulfan Sulfate [2C]	0.0033	0.010	0.010	ug/L	U
72-20-8	Endrin	0.0020	0.010	0.010	ug/L	U
72-20-8	Endrin [2C]	0.0020	0.010	0.010	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805203-BLK2
File ID: A70_227-0
Prepared: 05/13/08 07:51
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 2 mL
Analyzed: 05/16/08 09:38
Instrument: 199
QC Batch: 0805203
Sequence: 8051653
Calibration: 8E16009

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7421-93-4	Endrin Aldehyde	0.0029	0.010	0.00400	ug/L	J
7421-93-4	Endrin Aldehyde [2C]	0.0029	0.010	0.00440	ug/L	J
53494-70-5	Endrin Ketone	0.0033	0.010	0.00440	ug/L	J
53494-70-5	Endrin Ketone [2C]	0.0033	0.010	0.010	ug/L	U
76-44-8	Heptachlor	0.0030	0.010	0.010	ug/L	U
76-44-8	Heptachlor [2C]	0.0030	0.010	0.010	ug/L	U
1024-57-3	Heptachlor Epoxide	0.0021	0.010	0.010	ug/L	U
1024-57-3	Heptachlor Epoxide [2C]	0.0021	0.010	0.010	ug/L	U
72-43-5	Methoxychlor	0.0052	0.020	0.020	ug/L	U
72-43-5	Methoxychlor [2C]	0.0052	0.020	0.020	ug/L	U
8001-35-2	Toxaphene	0.10	0.30	0.30	ug/L	U
8001-35-2	Toxaphene [2C]	0.10	0.30	0.30	ug/L	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.183	91	25 - 140	
Tetrachloro-m-xylene [2C]	0.200	0.179	90	25 - 140	
Decachlorobiphenyl	0.200	0.205	103	30 - 135	
Decachlorobiphenyl [2C]	0.200	0.205	102	30 - 135	

CONTINUING CALIBRATION CHECK
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 199
Calibration: 8E16009
Lab File ID: A70_230-0
Calibration Date: 05/15/08 15:29
Sequence: 8051653
Injection Date: 05/16/08
Lab Sample ID: 8051653-CCV3
Injection Time: 11:49

Analyte	Type	CONC. (ug/mL)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
alpha-BHC	A	0.0400	0.0467	4394988	5128710		16.7	20
beta-BHC	A	0.0400	0.0446	1622742	1808890		11.5	20
gamma-BHC (Lindane)	A	0.0400	0.0459	3739265	4290480		14.7	20
delta-BHC	A	0.0400	0.0474	3497502	4146200		18.5	20
alpha-Chlordane	A	0.0400	0.0461	2736696	3156750		15.3	20
gamma-Chlordane	A	0.0400	0.0460	2882838	3315410		15.0	20
4,4'-DDD	A	0.0400	0.0488	2046615	2495990	POS	22.0	20 *
4,4'-DDE	A	0.0400	0.0469	2629164	3083450		17.3	20
4,4'-DDT	A	0.0400	0.0477	2020168	2410790		19.3	20
Aldrin	A	0.0400	0.0464	3224100	3736710		15.9	20
Dieldrin	A	0.0400	0.0474	2607177	3088260		18.5	20
Endosulfan I	A	0.0400	0.0460	2534392	2912010		14.9	20
Endosulfan II	A	0.0400	0.0482	2081016	2507190	POS	20.5	20 *
Endosulfan Sulfate	A	0.0400	0.0481	1867683	2245200	POS	20.2	20 *
Endrin	A	0.0400	0.0485	2101342	2546810	POS	21.2	20 *
Endrin Aldehyde	A	0.0400	0.0476	1653800	1968420		19.0	20
Endrin Ketone	A	0.0400	0.0488	2159341	2633960	POS	22.0	20 *
Heptachlor	A	0.0400	0.0457	3777004	4313670		14.2	20
Heptachlor Epoxide	A	0.0400	0.0455	2898913	3294040		13.6	20
Methoxychlor	A	0.0400	0.0481	1093903	1314710	POS	20.2	20 *

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

01994

CONTINUING CALIBRATION CHECK
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 199
Calibration: 8E16009
Lab File ID: B70_217-0
Calibration Date: 05/15/08 15:29
Sequence: 8051653
Injection Date: 05/16/08
Lab Sample ID: 8051653-CCV2
Injection Time: 02:58

Analyte	Type	CONC. (ug/mL)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Toxaphene [2C]	Q	0.500	0.623	218263.6	261551	0.09	24.7	20 *

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

01991

CONTINUING CALIBRATION CHECK
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 199
Calibration: 8E16009
Lab File ID: A70_217-0
Calibration Date: 05/15/08 15:29
Sequence: 8051653
Injection Date: 05/16/08
Lab Sample ID: 8051653-CCV2
Injection Time: 02:58

Analyte	Type	CONC. (ug/mL)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Toxaphene	Q	0.500	0.646	219844	282327		29.2	20 *

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

P05

01988

CONTINUING CALIBRATION CHECK
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 199
Calibration: 8E16009
Lab File ID: A70_231-0
Calibration Date: 05/15/08 15:29
Sequence: 8051653
Injection Date: 05/16/08
Lab Sample ID: 8051653-CCV4
Injection Time: 12:29

Analyte	Type	CONC. (ug/mL)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Toxaphene	Q	0.500	0.690	219844	301410	Poly	37.9	20 *

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

CONTINUING CALIBRATION CHECK
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 199
Calibration: 8E22013
Lab File ID: A70_385-0
Calibration Date: 05/19/08 13:00
Sequence: 8052238
Injection Date: 05/20/08
Lab Sample ID: 8052238-CCV1
Injection Time: 18:03

Analyte	Type	CONC. (ug/mL)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
alpha-BHC	A	0.0400	0.0473	4482675	5297610		18.2	20
beta-BHC	A	0.0400	0.0457	1676608	1915840		14.3	20
gamma-BHC (Lindane)	A	0.0400	0.0473	3879123	4586110		18.2	20
delta-BHC	A	0.0400	0.0487	3620091	4406050	Pos	21.7	20 *
alpha-Chlordane	A	0.0400	0.0467	2790016	3254440		16.6	20
gamma-Chlordane	A	0.0400	0.0469	2948630	3457650		17.3	20
4,4'-DDD	A	0.0400	0.0498	2125847	2648650	Pos	24.6	20 *
4,4'-DDE	A	0.0400	0.0480	2716011	3259970		20.0	20
4,4'-DDT	A	0.0400	0.0465	2231970	2595590		16.3	20
Aldrin	A	0.0400	0.0471	3283951	3866580		17.7	20
Dieldrin	A	0.0400	0.0481	2680796	3223010	Pos	20.2	20 *
Endosulfan I	A	0.0400	0.0466	2577713	3005160		16.6	20
Endosulfan II	A	0.0400	0.0480	2137574	2566560	Pos	20.1	20 *
Endosulfan Sulfate	A	0.0400	0.0480	1922602	2308540		20.1	20 *
Endrin	A	0.0400	0.0487	2261253	2752560		21.7	20 *
Endrin Aldehyde	A	0.0400	0.0479	1656849	1984030		19.7	20
Endrin Ketone	A	0.0400	0.0477	2191293	2612950		19.2	20
Heptachlor	A	0.0400	0.0462	3894495	4497670		15.5	20
Heptachlor Epoxide	A	0.0400	0.0467	2954642	3446540		16.6	20
Methoxychlor	A	0.0400	0.0465	1232622	1432580		16.2	20

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

02012

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Polychlorinated Biphenyls (PCBs) by EPA Method 8082

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis: USEPA-8082

Sample/Analyte:			
	0805133-06	45TP4B	PCB-1260
	0805133-06	45TP4B	PCB-1260 [2C]

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Individual sample results relate only to the sample tested.
5560 Corporate Exchange Court SE • Grand Rapids, MI 49512 • (616) 975-4500 • Fax (616) 942-7465

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8082

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 10 mL

Laboratory ID: 0805287-MS1

QC Batch: 0805287

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
PCB-1016	214	ND	181	85	40 - 140	ug/kg dry
PCB-1016 [2C]	214	ND	192	90	40 - 140	ug/kg dry
PCB-1260	214	ND	933	437 *	60 - 130	ug/kg dry
PCB-1260 [2C]	214	ND	2070	967 *	60 - 130	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

00158

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45TP4B

USEPA-8082

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3550B Sonication Extraction

Initial/Final: 30 g / 10 mL

Laboratory ID: 0805287-MSD1

QC Batch: 0805287

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
PCB-1016	214	188	88	4	30	40 - 140	ug/kg dry
PCB-1016 [2C]	214	189	88	2	30	40 - 140	ug/kg dry
PCB-1260	214	777	363 *	18	30	60 - 130	ug/kg dry
PCB-1260 [2C]	214	1600	749 *	25	30	60 - 130	ug/kg dry

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

0159

DATA VALIDATION WORKSHEET

Explosives

Reviewer: RA
Date: 01/23/08
DV Level: II III IV

Project Name: Radford Storm 45
Project Number: 111056351
Laboratory: Tri Matrix
SDG No.: 36440-54
Test Name: Explosives
Method No.: 8330

Review Document:

_X__ Region III Modified for National Functional Guidelines
_X__ SW-846
_X__ Project QAPP/SAP

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were received with the cooler temperature exceeding 20 ^{O}C, then flag L(+)/UL(-).			
1.4	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). Extraction: (aqueous) 7 days and (soil) 14 days; and Analysis: 40 days.		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".		✓	
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.		✓	

Notes:

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are at least five standards included in the calibration curve? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 12 hours or twenty samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±15%) or %D(≤15%) within		✓	
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>15%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 15%, J(+), only. Negative Bias - %D>-15% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes: several %Ds 7 QC w/a neg. bias see attached.

all NDs → UJ, C

5.0 Laboratory Control Sample (LCS)		Yes	No	NA
5.1	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.2	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
5.3	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes:

6.0 Surrogate Recovery		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.3, are these sample(s) or method blank(s) reanalyzed?			✓
6.3	If No in Section 6.4, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓

	<10%	low	high
Positives	L	L	K
Non-detects	R	UL	No action

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
7.1	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.2	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
7.3	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Action: No action is required based on MS/MSd failure alone. Note in the report and use professional judgement.			

Notes:

8.0 Field Duplicate		Yes	No	NA
8.1	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: 45TP3B & DUP-1 Both NDs ✓ 45SB14A & DUP-2 Both NDs ✓

9.0 Compound Identification and Detection Limit Verification		Yes	No	NA
9.1	Are any target compounds detected in the field samples? If Yes, is all positive identifications were confirmed in second column? Apply J flag if RPD >40% between first and second columns.		✓	
9.2	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

10.0 Data Completeness		Yes	No	NA
10.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
10.1.1	Number of samples:_____			
10.1.2	Number of target compounds in each analysis: 14			
10.1.3	Number of results rejected or not reported:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			

Notes:

CONTINUING CALIBRATION CHECK
USEPA-8330

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 221
Calibration: 8E14009
Lab File ID: EXPa024-0
Calibration Date: 05/13/08 13:48
Sequence: 8052091
Injection Date: 05/15/08
Lab Sample ID: 8052091-CCV2
Injection Time: 08:13

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
1,3,5-Trinitrobenzene	A	400	371	16.59185	15.375		-7.3	20
1,3-Dinitrobenzene	A	400	367	17.93275	16.475		-8.1	20
2,4,6-Trinitrotoluene	A	400	355	10.15676	9.005		-11.3	20
2,4-Dinitrotoluene	A	400	354	10.37849	9.195		-11.4	20
2,6-Dinitrotoluene	A	400	354	6.193854	5.4775		-11.6	20
2-Amino-4,6-dinitrotoluene	A	400	363	7.753875	7.045		-9.1	20
2-Nitrotoluene	A	400	329	4.350209	3.575		-17.8	20
3-Nitrotoluene	A	400	365	3.849974	3.515		-8.7	20
4-Amino-2,6-dinitrotoluene	A	400	359	6.034201	5.42		-10.2	20
4-Nitrotoluene	A	400	337	3.411954	2.8725		-15.8	20
Hexahydro-1,3,5-trinitro-1,3,5-tri	A	400	363	9.482728	8.605		-9.3	20
Methyl-2,4,6-trinitrophenylnitrami	A	400	353	9.145921	8.0775		-11.7	20
Nitrobenzene	A	400	363	10.43826	9.465		-9.3	20
Octahydro-1,3,5,7-tetranitro-1,3,5	A	400	357	11.18886	9.9825		-10.8	20

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

neg

neg

neg

dup samples
455B5A ✓
455B5B ✓
455B14A ✓
455B14B ✓
455B1A ✓
Dup-2 ✓
455B8A ✓

84342

CONTINUING CALIBRATION CHECK
USEPA-8330

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 221
Calibration: 8E14009
Lab File ID: expa034-20080515-161241-0
Calibration Date: 05/13/08 13:48
Sequence: 8052091
Injection Date: 05/15/08
Lab Sample ID: 8052091-CCV3
Injection Time: 16:12

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
1,3,5-Trinitrobenzene	A	400	357	16.59185	14.8175		-10.7	20
1,3-Dinitrobenzene	A	400	356	17.93275	15.9425		-11.1	20
2,4,6-Trinitrotoluene	A	400	346	10.15676	8.795		-13.4	20
2,4-Dinitrotoluene	A	400	340	10.37849	8.8225		-15.0	20
2,6-Dinitrotoluene	A	400	346	6.193854	5.3525		-13.6	20
2-Amino-4,6-dinitrotoluene	A	400	355	7.753875	6.885		-11.2	20
2-Nitrotoluene	A	400	327	4.350209	3.5575	neg.	-18.2	20
3-Nitrotoluene	A	400	360	3.849974	3.4675		-9.9	20
4-Amino-2,6-dinitrotoluene	A	400	355	6.034201	5.3525		-11.3	20
4-Nitrotoluene	A	400	321	3.411954	2.7425		-19.6	20
Hexahydro-1,3,5-trinitro-1,3,5-tria	A	400	353	9.482728	8.365		-11.8	20
Methyl-2,4,6-trinitrophenylnitrami	A	400	343	9.145921	7.84		-14.3	20
Nitrobenzene	A	400	356	10.43826	9.2975		-10.9	20
Octahydro-1,3,5,7-tetranitro-1,3,5	A	400	342	11.18886	9.57		-14.5	20

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

455B8B ✓

04345

DATA VALIDATION WORKSHEET

Nitroglycerin

Reviewer: RA
Date: 9/24/08
DV Level: II (III) IV

Review Document:

_X__ Region III Modified for National Functional Guidelines
____ NFG for organic Data review (February 1994)
____ Project QAPP/SAP

All QC OK ✓

Project Name: Radford
Project Number: 116563511
Laboratory: TriMatrix
SDG No.: 36440-54
Test Name: Nitroglycerin
Method No.: 8332-HPLC

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	
1.4	Are the sample preparation benchsheets present and complete with sample volume/weights, dilutions, final volumes. %	✓		
1.5	Are the measurement read out records legible and complete (properly labeled, and include all samples and QC)?	✓		

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Do sample preservation, collection and storage condition meet method requirement?	✓		
	Action: If the temperature of the cooler was elevated (> 10 °C), then flag all positive results with a "J" and all non-detects "UJ".			✓
2.2	Have any technical holding times, determined from date of sampling to date of analysis (including dilution and reanalyese, been exceeded? Action: If yes, apply J (+) and UJ (-) to all analytes in the sample. For aqueous matrix - 7 days (extraction) and 40 days (analysis) For soil matrix - 14 days (extraction) and 40 days (analysis).		✓	
2.3	Have any technical holding times been grossly (twice the holding time) exceeded? If yes, note in the DV report.		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".		✓	
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.		✓	
3.4	Are there field equipment blank/trip blanks associated with every sample? If No, note in the DV report.	✓		

Notes:

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are sufficient standards (5 for first order, 6 for second order, or 7 for third order) included in the calibration curve? If no, apply professional judgement towards usability.	✓		
4.2	Was an initial calibration analyzed at the beginning of each analysis? If No, apply R to all results for specific analyte(s) for all samples associated with the calibration.	✓		
4.3	Are all calibration standard (ICV and CCV) %RSD (or correlation coefficient) or % drift within the control limits? Control Limits: r≥0.99, %RSD < ± 20% and %D < ± 15%	✓		
	For initial Calibration: for %RSD > ± 20%, but < ± 50%, J(+) only. for %RSD > ± 50%, but < ± 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).			✓
	For Continuing Calibration: displaying a negative bias: %D > + 15% and < + 50%, J(+)/UJ(-), >50%J(+)/R(-); displaying a positive bias >15%, J(+).			✓
4.4	Has a continuing calibration verification been analyzed prior to and after every 10 samples and at the end of the analysis sequence? If no, apply R to associated samples.	✓		

Notes:

5.0 Surrogate Recovery		Yes	No	NA
5.1	Are all samples listed on the appropriate Surrogate Recovery Summary Form ?	✓		
5.2	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
5.3	If No in Section 5.2, are these sample(s) or method blank(s) reanalyzed?			✓
5.4	If No in Section 5.3, is any sample DF greater than 10? No action is taken if surrogate is expected to be diluted out.			✓
	Action: If No, for any %R > UCL, apply K to all positive results of analytes; for any %R < LCL, but > 10%, L(+)/UL (-); for any %R < 10%, apply L (+) and R (-) to all results of analytes asociated with the surrogate.			

Notes:

6.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
6.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
6.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
6.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data. If determined to affect only the sample spiked, then qualify the parent sample alone. If determined that problem is systematic, flag all associated samples.			

Notes:

7.0 Laboratory Control Sample (LCS)

		Yes	No	NA
7.1	Is the LCS/LCSD recovery form present?	✓		
7.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
7.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, J(+) only.			

Notes:

8.0 Field Duplicate

		Yes	No	NA
8.1	Were field duplicate prepared and analyzed at the corrected frequency (one per 20 samples, per matrix and per level)?	✓		
	For sample results > 5 x RL, a control limit of 25% RPD for water and 35% RPD for soil will be used. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 X RL for soil will be used.			
8.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: 45TP3B & DUP-1 both NDs ✓ 45SB14A, DUP-2 both NDs ✓

9.0 Compound Identification and Detection Limit Verification		Yes	No	NA
9.1	Are any target compounds detected in the field samples? If Yes, is all positive identifications were confirmed in second column? Apply J flag if RPD >40% between first and second columns.	✓		
9.2	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

10.0 Data Completeness		Yes	No	NA
10.1	Is % completeness within the control limits? (Control limit 90%)	✓		
10.1.1	Number of samples:_____			
10.1.3	Number of results rejected and not reported:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			
	% Completeness = _____			

Notes:

DATA VALIDATION WORKSHEET
INORGANIC - ICP, CVAA, AND CYANIDE
REGION III - NATIONAL FUNCTIONAL GUIDELINES

SDG No.: 36440-54
Project No.: 11650351

Project Name: Radford
Reviewer: RA
Date: 6/12/08

1.0 Chain of Custody/Sample Condition/Raw Data		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples which were analyzed?	✓			✓			✓					
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓			✓			✓					
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓			✓			✓				
1.4	Does sample preservation, collection and storage meet method requirement? (For metal: water samples: with Nitric Acid to pH < 2, and soil/sediment samples: 4 ^{o}C $\pm$ 2 ^{o}C)	✓			✓			✓					
1.5	Are the digestion logs present and complete with pH values, sample weights, dilutions, final volumes. % solids (for soil samples), and preparation dates? For any missing or incomplete documentation, contact the laboratory for explanation/resubmittal.	✓			✓			✓					

Note: _____

2.0 Holding Time		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
2.1	Have any technical holding times, determined from date of collection to date of analysis, been exceeded? (Hg: 28days, CN: 14 days, other metals: 6 months) Action:L(+)/UL(-). If the holding time is grossly exceeded (twice the holding time criteria), L(+)/R(-).		✓			✓			✓				

Note: _____

3.0 Instrument Calibration

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
3.1	Are sufficient standards included in the calibration curve? (ICP& ICPMS: blank + one standard & a RL standard OR 3 standards and a blank with one standard at the RL; CVAA: blank + five standards with one standard at the RL). If not, qualify with "R".	✓			✓			✓					
3.2	Are the correlation coefficients > 0.99? Action: J(+)/UJ(-).	✓			✓			✓					
3.3	Once per calibration, did a high and low distilled standard recovery within 85-115%? If no, follow 3.6.												
3.4	Was an initial calibration check standard (ICV) analyzed immediately after instrument system had been calibrated? Action: If no, all associated data are rejected "R".	✓			✓			✓					
3.5	Was continuing calibration standard (CCS) analyzed at a minimum frequency of 10% (every 10 samples) during an analytical run and at the end of the analytical run? If not, document and flag based on professional judgement.	✓			✓			✓					
3.6	Are all calibration standard percent recoveries (ICV and CCV) within the control limits? FOR ICP 90%-110%, FOR Hg 80-120%, FOR CN 85-115%.	✓			✓			✓					
	ICV and CCV: Action: L(+)/R(-) L(+)/UL(-) K(+) Mercury < 65% 65% - 79% > 120% Cyanide < 65% 65% - 84% > 115% Other Metals < 75% 75% - 89% > 110%												
3.7	For ICP & ICPMS, did the CRDL standard recover between 80-120%?	✓			✓								
	<50% 50%-79% >120% 2xCRDL>[sample]>IDL L(+)/R(-) L(+)/UL(-) K												

Note: _____

4.0 Blanks

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
4.1	Were method blank (MB) prepared at the appropriate frequency (one per 20 samples, per batch, per matrix and per level)?	✓			✓			✓					
4.2	Were calibration blanks (ICB and CCBs) analyzed immediately after each and every ICV and CCVs? Action: If no ICB was run, all associated data are rejected. If the frequency of the CCBs does not follow requirement, all associated data are qualified "J".	✓			✓			✓					
4.3	Are there reported MB or ICB/CCBs values > MDL?	✓			✓				✓				
	Sample Results > MDL												
	< 5X Blank Contamination B												
4.4	Are there negative blank results with the absolute value > MDL?	✓			✓				✓				
	Sample Results Non-detects > MDL												
	< 5X absolute Blank Contamination UL L												
4.5	Are there reported field blank > ± MDL?	✓			✓				✓				
	Sample Results > MDL												
	< 5X Blank Contamination B												

Note: 6020 → MB → Fe, Zn, Ca, Ba, Mg, Mn, all 75%, No action if neg. for Al, NDs, UL to in EQBKs. ICB/CCB, pos Mg, Cr, [redacted] Al, Be, All >5X → No action, EQBKs pos Ca, Mn, [redacted] all 75%, No action.

6020 → MB, Ni, V, Zinc → <5X, B, P in EQBKs, CCBs neg for V, Se, As d.t. pos 75% No action ICB/CCB pos V, As, Se, antimony, <5X → B, O

5.0 ICP Interference Check Sample (ICS)

EB → [redacted] Se, all 75%, No action

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
5.1	Was ICS analyzed at beginning of each ICP run?	✓			✓								
5.2	Are the ICS AB recoveries within 80% - 120%?	✓			✓								
5.3	Are the results for unspiked analytes (in ICS A) < ± RL?	✓			✓								
5.4	If not, are the associated sample Al, Ca, Fe, and Mg concentrations less than the level in the ICS?	✓					✓						
	If not...												
	Action: Not Spiked Analytes: < -MDL L(+)/UL(-); > MDL K(+). Spiked analytes (ICS AB analytes): < 50% L(+)/R(-); 50% - 79% L(+)/UL(-); >120% K(+)												

Note:

URS

6.0 Laboratory Control Sample (LCS)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
6.1	Was an LCS prepared and analyzed at the correct frequency (one per 20 samples, per batch, per matrix and per level)? Action: If no, J(+) any sample not associated with LCS results.	✓			✓			✓					
6.2	Is any LCS recovery outside the control limits? (Aqueous limits: 80% - 120% - except Ag and Sb; Solid limits: as per EPA-EMSL/LV)		✓			✓			✓				
	Action: Solid: < LCL L(+)/UL(-); > UCL K(+). Aqueous: < 50% L(+)/R(-); 50% - 79% L(+)/UL(-); > 120% K(+)												

Note:

7.0 Laboratory Duplicates (MSD)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
7.1	Were Laboratory duplicates prepared and analyzed at the correct frequency (one per 20 samples, per batch, per matrix and per level)? Action: If no, J(+), using professional judgement, analytes not associated with duplicate results.	✓			✓			✓					
	For aqueous 6010B and Hg - RPD< 25%, aqueous CN - RPD < 20%, aqueous 6020 - RPD < 20%, and for soil - use laboratory generated limits for MS/MSD.												
7.2	Are all analyte duplicate results within control limits? If no, qualify all associated field samples J(+)/UJ(-) for the analyte with results that fall outside criteria.	✓			✓			✓					

Note:

8.0 Spike Sample Analysis -Pre-Digestion/Post-Digestion

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
8.1	Was a spiked sample prepared and analyzed at the correct frequency (one per 20 samples, batch, matrix and level)? If not, J(+) with professional judgement.	✓			✓			✓					
8.2	For all analytes with sample concentration > 4 x spike concentration, are spike recoveries within the control limit of 75-125% for aqueous matrices or lab limits for soil matrices?		✓			✓			✓				
	%R > 125% / 30%< %R < 74% / < 30%												
	Positive: K / L / L												
	Non-detect: None / UL / R												
8.3	Where pre-digestion matrix spike analytes were outside the acceptable recovery limits(except Ag), was a post-digestion spike performed? Note any failures in DV report, but no data qualifying action is required.	✓			✓			✓					

Note: 6010 → MS for 45TP4B <QC for total Mg at 65% & MD result POS → L/M
6020 → MS/MSD for 45SB1A <QC As 69%/66%; Se 61%/59% L/UL/M
MS/MSD for 45TP4B <QC Sb -35%/-30% POS → L/M in our sample.
Hg → MSD for 45TP4B >QC at 129% & POS → L/M

9.0 Instrument Detection Limits (IDL)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
9.1	Are all IDLs/RLs equal to or less than the reporting limits specified?	✓			✓			✓					

Note:

10.0 ICP/AA Serial Dilutions (Not for Mercury Analysis)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
10.1	Were serial dilutions performed?	✓			✓								
10.2	Was a five-fold dilution performed?				✓								
10.3	Did the serial dilution results agree within 10% for ICP analyte concentration > 5 X the RL for 6010 or > 20 X the RL for 6020 in the original sample? If no, J(+).	✓			✓								

Note:

11.0 Field Duplicate Samples

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
11.1	Were any field duplicates submitted for metal analysis?	✓			✓			✓					
	For sample results > 5 x RL, a control limit of 25% RPD for water and 35% RPD for soil will be used. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 X RL for soil will be used.												
11.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report	✓			✓			✓					

Note: See attached Hg → 45TP3B, DUP-1

Hg → 45SB14A & DUP-2 RL Hg 0.024J 0.02J OK✓

0.018J 0.0089 0.05 OK✓

12.0 Result Verification/ Internal Standards/ Tune

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
12.1	Were all results and detection limits for solid-matrix samples reported on a dry-weight basis?	✓			✓			✓					
12.2	Were all dilution reflected in the positive results and detection limits?	✓			✓			✓					
12.3	Were the Internal Standard recoveries within 30-120%	✓			✓			✓					
12.4	Were the tunes run at a minimum of four times with RSD < 5% for analytes in solution?	✓											
12.5	Were the tune mass calibrations < 0.1 amu from the true value?	✓											
12.6	Was the resolution check peak width < 0.9 amu at 10% peak height?	✓											

Note:

13.0 Completeness Calculation

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
13.1	Is % completeness within the control limits? (Control limit 90%)	✓			✓			✓					
13.1.1	Number of samples:												
13.1.2	Number of target compounds in each analysis:												
13.1.3	Number of results rejected and not reported:												
	% Completeness = (13.1.1 x 13.1.2 - 13.1.3) x 100/(13.1.1 x 13.1.2)												
	% Completeness = 100%												

Note:

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY
USEPA-7471A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Soil

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7471A Mercury Digestion
Initial/Final: 0.3005 g / 50 mL

Laboratory ID: 0805569-MSD1
QC Batch: 0805569

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Mercury, Total	0.333	0.581	129 *	12	20	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

0616

URS

Page ____ of ____

Job ____ Project No. ____ Sheet ____ of ____

Description ____ Computed by ____ Date ____

____ Checked by ____ Date ____

Reference

Field Dups for 6010

	45TP3B	&	DUP-1	RL	RPD
Al	17,000		16,000	10	6% ✓
Ba	150		150	1	0% ✓
Be	1.1		1.2	1	OK ✓
Cd	2.0		2.0	~~2~~	0% ✓
Ca	21,00		1900	50	10% ✓
Cr	26		25	5	4% ✓
Co	11		11	2	0% ✓
Fe	25,000		25000	10	0% ✓
Mg	4,600		4500	50	2% ✓
Mn	760		610	1	22% ✓
K	1,400		1300	50	7% ✓
Na	220		220	100	0% ✓
Zn	77		75	5	3% ✓

	455B14A	DUP-2	RL	RPD
Al	11,000	11,000	10	0% ✓
Ba	170	160	1	6% ✓
Be	1	1	1	0% ✓
Ca	1,500	1500	50	0% ✓
Cr	22	19	5	15% ✓
Co	7.7	7.6	2	OK ✓
Fe	18,000	16,000	10	12% ✓
Mg	2,500	2,500	50	0% ✓
Mn	640	630	1	2% ✓
K	1,400	1400	50	0% ✓
Na	41 J	38 J	100	OK ✓
Zn	130	120	5	9% ✓

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by _____ Date _____

_____ Checked by _____ Date _____

Reference

Field DUPS for 6020

	45TP3B	&	DUP-1	RL	RPD
As	0.95		0.90	0.2	OKV
Cu	12		12	0.2	0% V
lead	11		11	0.2	0% V
Ni	16		16	0.1	0% V
Se	0.097		ND ~~3~~	0.3	OKV
Ag	0.051		0.049	0.1	OKV
Tl	0.18		0.17	0.1	OKV
V	25		25	0.1	0% V
Sb	0.051		0.092	0.2	OKV

	455B14A	&	DUP-2	RL	RPD
As	0.84		0.82	0.2	OKV
Cu	9.3		8.6	0.2	8% V
Pb	81		51	0.4	45% OKV
Ni	11		11	0.1	0% V
Se	0.12		0.13	0.3	OKV
Ag	0.045		0.047	0.1	OKV
Tl	0.15		0.16	0.1	OKV
V	18		18	0.1	0% OKV
Sb	0.22		0.12	0.2	OKV

METHOD BLANK DATA SHEET
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805479-BLK1
File ID: 8051401-022
Prepared: 05/13/08 10:00
Preparation: 3050B Digestion
Initial/Final: 0.5 g / 50 mL
Analyzed: 05/14/08 09:39
Instrument: 101
QC Batch: 0805479
Sequence: 8051401
Calibration: 8E27013

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7429-90-5	Aluminum, Total	2.0	10	10	mg/kg dry wt.	U
7440-39-3	Barium, Total	0.33	1.0	1.0	mg/kg dry wt.	U
7440-41-7	Beryllium, Total	0.061	1.0	1.0	mg/kg dry wt.	U
7440-43-9	Cadmium, Total	0.45	2.0	2.0	mg/kg dry wt.	U
7440-47-3	Chromium, Total	0.80	5.0	5.0	mg/kg dry wt.	U
7440-48-4	Cobalt, Total	0.53	2.0	2.0	mg/kg dry wt.	U
7439-89-6	Iron, Total	0.98	10	1.06	mg/kg dry wt.	J
7439-95-4	Magnesium, Total	2.8	50	50	mg/kg dry wt.	U
7439-96-5	Manganese, Total	0.18	1.0	1.0	mg/kg dry wt.	U
7440-09-7	Potassium, Total	14	50	50	mg/kg dry wt.	U
7440-23-5	Sodium, Total	18	100	100	mg/kg dry wt.	U
7440-66-6	Zinc, Total	0.49	5.0	1.70	mg/kg dry wt.	J

Fe 5.3

Zn 8.5

04781

METHOD BLANK DATA SHEET
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805479-BLK1
File ID: 8051401-066
Prepared: 05/13/08 10:00
Preparation: 3050B Digestion
Initial/Final: 0.5 g / 50 mL
Analyzed: 05/14/08 12:17
Instrument: 101
QC Batch: 0805479
Sequence: 8051401
Calibration: 8E27013

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7440-70-2	Calcium, Total	9.8	50	23.9	mg/kg dry wt.	J

Ca 119.5

04782

METHOD BLANK DATA SHEET
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805482-BLK1
File ID: 8051401-045
Prepared: 05/13/08 07:30
Preparation: 3050B Digestion
Initial/Final: 0.5 g / 50 mL
Analyzed: 05/14/08 11:01
Instrument: 101
QC Batch: 0805482
Sequence: 8051401
Calibration: 8E27013

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7429-90-5	Aluminum, Total	2.0	10	10	mg/kg dry wt.	U
7440-39-3	Barium, Total	0.33	1.0	1.0	mg/kg dry wt.	U
7440-41-7	Beryllium, Total	0.061	1.0	0.0668	mg/kg dry wt.	J
7440-43-9	Cadmium, Total	0.45	2.0	2.0	mg/kg dry wt.	U
7440-70-2	Calcium, Total	9.8	50	50	mg/kg dry wt.	U
7440-47-3	Chromium, Total	0.80	5.0	5.0	mg/kg dry wt.	U
7440-48-4	Cobalt, Total	0.53	2.0	2.0	mg/kg dry wt.	U
7439-89-6	Iron, Total	0.98	10	2.05	mg/kg dry wt.	J
7439-95-4	Magnesium, Total	2.8	50	2.92	mg/kg dry wt.	J
7439-96-5	Manganese, Total	0.18	1.0	0.199	mg/kg dry wt.	J
7440-09-7	Potassium, Total	14	50	50	mg/kg dry wt.	U
7440-23-5	Sodium, Total	18	100	100	mg/kg dry wt.	U
7440-66-6	Zinc, Total	0.49	5.0	5.0	mg/kg dry wt.	U

Be 0.334

Fe 10.25

Mg 14.6

Mn 0.995

84783

METHOD BLANK DATA SHEET
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805663-BLK1
File ID: 8051606-015
Prepared: 05/15/08 07:00
Preparation: 3050B Digestion
Initial/Final: 0.5 g / 50 mL
Analyzed: 05/16/08 10:39
Instrument: 101
QC Batch: 0805663
Sequence: 8051606
Calibration: 8E16007

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7429-90-5	Aluminum, Total	2.0	10	10	mg/kg dry wt.	U
7440-47-3	Chromium, Total	0.80	5.0	5.0	mg/kg dry wt.	U
7439-89-6	Iron, Total	0.98	10	10	mg/kg dry wt.	U
7439-95-4	Magnesium, Total	2.8	50	50	mg/kg dry wt.	U
7439-96-5	Manganese, Total	0.18	1.0	1.0	mg/kg dry wt.	U
7440-66-6	Zinc, Total	0.49	5.0	3.48	mg/kg dry wt.	J

Zn 17.4

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051401

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 101
Calibration: 8E27013

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051401-ICB1	Aluminum	-0.00368	0.10	0.020	mg/L	U	05/14/08 09:15
	Barium	0.00130	0.010	0.0033	mg/L	U	05/14/08 09:15
	Beryllium	0.000129	0.010	0.00061	mg/L	U	05/14/08 09:15
	Cadmium	0.00215	0.020	0.0045	mg/L	U	05/14/08 09:15
	Calcium	0.00803	0.50	0.098	mg/L	U	05/14/08 09:15
	Chromium	0.00241	0.050	0.0080	mg/L	U	05/14/08 09:15
	Cobalt	0.00236	0.020	0.0053	mg/L	U	05/14/08 09:15
	Iron	0.00205	0.10	0.0098	mg/L	U	05/14/08 09:15
0.1545	Magnesium	0.0309	0.50	0.028	mg/L	J	05/14/08 09:15
	Manganese	0.00142	0.010	0.0018	mg/L	U	05/14/08 09:15
	Potassium	0.00331	0.50	0.14	mg/L	U	05/14/08 09:15
	Sodium	0.00109	1.0	0.18	mg/L	U	05/14/08 09:15
	Zinc	0.000360	0.050	0.0049	mg/L	U	05/14/08 09:15
8051401-CCB1	Aluminum	-0.00554	0.10	0.020	mg/L	U	05/14/08 09:36
	Barium	0.00142	0.010	0.0033	mg/L	U	05/14/08 09:36
	Beryllium	0.000137	0.010	0.00061	mg/L	U	05/14/08 09:36
	Cadmium	0.00186	0.020	0.0045	mg/L	U	05/14/08 09:36
	Calcium	0.00375	0.50	0.098	mg/L	U	05/14/08 09:36
0.054	Chromium	0.0108	0.050	0.0080	mg/L	J	05/14/08 09:36
	Cobalt	-0.00224	0.020	0.0053	mg/L	U	05/14/08 09:36
	Iron	0.00270	0.10	0.0098	mg/L	U	05/14/08 09:36
	Magnesium	0.0240	0.50	0.028	mg/L	U	05/14/08 09:36
	Manganese	0.00137	0.010	0.0018	mg/L	U	05/14/08 09:36
	Potassium	-0.0412	0.50	0.14	mg/L	U	05/14/08 09:36
	Sodium	-0.00402	1.0	0.18	mg/L	U	05/14/08 09:36
	Zinc	-0.000664	0.050	0.0049	mg/L	U	05/14/08 09:36
0805479-BLK1	Aluminum, Total	10	10	2.0	mg/kg dry wt.	U	05/14/08 09:39
	Barium, Total	1.0	1.0	0.33	mg/kg dry wt.	U	05/14/08 09:39
	Beryllium, Total	1.0	1.0	0.061	mg/kg dry wt.	U	05/14/08 09:39
	Cadmium, Total	2.0	2.0	0.45	mg/kg dry wt.	U	05/14/08 09:39
	Chromium, Total	5.0	5.0	0.80	mg/kg dry wt.	U	05/14/08 09:39
	Cobalt, Total	2.0	2.0	0.53	mg/kg dry wt.	U	05/14/08 09:39
	Iron, Total	1.06	10	0.98	mg/kg dry wt.	J	05/14/08 09:39

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8051401
Instrument ID: 101
Calibration: 8E27013

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
0805479-BLK1	Magnesium, Total	50	50	2.8	mg/kg dry wt.	U	05/14/08 09:39
	Manganese, Total	1.0	1.0	0.18	mg/kg dry wt.	U	05/14/08 09:39
	Potassium, Total	50	50	14	mg/kg dry wt.	U	05/14/08 09:39
	Sodium, Total	100	100	18	mg/kg dry wt.	U	05/14/08 09:39
	Zinc, Total	1.70	5.0	0.49	mg/kg dry wt.	J	05/14/08 09:39
8051401-CCB2	Aluminum	-0.0198	0.10	0.020	mg/L	U	05/14/08 10:14
	Barium	0.00107	0.010	0.0033	mg/L	U	05/14/08 10:14
	Beryllium	0.000346	0.010	0.00061	mg/L	U	05/14/08 10:14
	Cadmium	0.00131	0.020	0.0045	mg/L	U	05/14/08 10:14
	Calcium	0.00663	0.50	0.098	mg/L	U	05/14/08 10:14
	Chromium	0.00180	0.050	0.0080	mg/L	U	05/14/08 10:14
	Cobalt	0.00137	0.020	0.0053	mg/L	U	05/14/08 10:14
	Iron	0.00641	0.10	0.0098	mg/L	U	05/14/08 10:14
	Magnesium	0.0250	0.50	0.028	mg/L	U	05/14/08 10:14
	Manganese	0.00145	0.010	0.0018	mg/L	U	05/14/08 10:14
	Potassium	-0.0330	0.50	0.14	mg/L	U	05/14/08 10:14
	Sodium	0.0104	1.0	0.18	mg/L	U	05/14/08 10:14
	Zinc	-0.000185	0.050	0.0049	mg/L	U	05/14/08 10:14
8051401-CCB3	Aluminum	0.00410	0.10	0.020	mg/L	U	05/14/08 10:58
	Barium	0.000762	0.010	0.0033	mg/L	U	05/14/08 10:58
	Beryllium	0.000278	0.010	0.00061	mg/L	U	05/14/08 10:58
	Cadmium	0.00212	0.020	0.0045	mg/L	U	05/14/08 10:58
	Calcium	0.0163	0.50	0.098	mg/L	U	05/14/08 10:58
0.073	Chromium	0.0146	0.050	0.0080	mg/L	J	05/14/08 10:58
	Cobalt	0.00172	0.020	0.0053	mg/L	U	05/14/08 10:58
	Iron	0.00609	0.10	0.0098	mg/L	U	05/14/08 10:58
	Magnesium	-0.0246	0.50	0.028	mg/L	U	05/14/08 10:58
	Manganese	0.00145	0.010	0.0018	mg/L	U	05/14/08 10:58
	Potassium	0.0557	0.50	0.14	mg/L	U	05/14/08 10:58
	Sodium	-0.0198	1.0	0.18	mg/L	U	05/14/08 10:58
	Zinc	0.00588	0.050	0.0049	mg/L	J	05/14/08 10:58
0805482-BLK1	Aluminum, Total	10	10	2.0	mg/kg dry wt.	J	05/14/08 11:01
	Barium, Total	1.0	1.0	0.33	mg/kg dry wt.	U	05/14/08 11:01

64768

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051401

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 101
Calibration: 8E27013

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
0805482-BLK1	Beryllium, Total	0.0668	1.0	0.061	mg/kg dry wt.	J	05/14/08 11:01
	Cadmium, Total	2.0	2.0	0.45	mg/kg dry wt.	U	05/14/08 11:01
	Calcium, Total	50	50	9.8	mg/kg dry wt.	U	05/14/08 11:01
	Chromium, Total	5.0	5.0	0.80	mg/kg dry wt.	U	05/14/08 11:01
	Cobalt, Total	2.0	2.0	0.53	mg/kg dry wt.	U	05/14/08 11:01
	Iron, Total	2.05	10	0.98	mg/kg dry wt.	J	05/14/08 11:01
	Magnesium, Total	2.92	50	2.8	mg/kg dry wt.	J	05/14/08 11:01
	Manganese, Total	0.199	1.0	0.18	mg/kg dry wt.	J	05/14/08 11:01
	Potassium, Total	50	50	14	mg/kg dry wt.	U	05/14/08 11:01
	Sodium, Total	100	100	18	mg/kg dry wt.	U	05/14/08 11:01
	Zinc, Total	5.0	5.0	0.49	mg/kg dry wt.	U	05/14/08 11:01
8051401-CCB4	Aluminum	-0.0266	0.10	0.020	mg/L	J	05/14/08 11:39
-0.133	Barium	-0.00000650	0.010	0.0033	mg/L	U	05/14/08 11:39
	Beryllium	0.000339	0.010	0.00061	mg/L	U	05/14/08 11:39
	Cadmium	0.000393	0.020	0.0045	mg/L	U	05/14/08 11:39
	Calcium	0.0115	0.50	0.098	mg/L	U	05/14/08 11:39
	Chromium	0.00217	0.050	0.0080	mg/L	U	05/14/08 11:39
	Cobalt	0.00306	0.020	0.0053	mg/L	U	05/14/08 11:39
	Iron	0.00609	0.10	0.0098	mg/L	U	05/14/08 11:39
	Magnesium	0.0246	0.50	0.028	mg/L	U	05/14/08 11:39
	Manganese	0.00157	0.010	0.0018	mg/L	U	05/14/08 11:39
	Potassium	0.0464	0.50	0.14	mg/L	U	05/14/08 11:39
	Sodium	-0.0203	1.0	0.18	mg/L	U	05/14/08 11:39
	Zinc	-0.0000351	0.050	0.0049	mg/L	U	05/14/08 11:39
8051401-CCB5	Aluminum	-0.00964	0.10	0.020	mg/L	U	05/14/08 12:11
	Barium	0.000773	0.010	0.0033	mg/L	U	05/14/08 12:11
0.00344	Beryllium	0.000688	0.010	0.00061	mg/L	J	05/14/08 12:11
	Cadmium	0.000495	0.020	0.0045	mg/L	U	05/14/08 12:11
	Calcium	0.0189	0.50	0.098	mg/L	U	05/14/08 12:11
0.04995	Chromium	0.00999	0.050	0.0080	mg/L	J	05/14/08 12:11
	Cobalt	0.00344	0.020	0.0053	mg/L	U	05/14/08 12:11
	Iron	0.00599	0.10	0.0098	mg/L	U	05/14/08 12:11
0.166	Magnesium	0.0332	0.50	0.028	mg/L	J	05/14/08 12:11

04769

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051401

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 101
Calibration: 8E27013

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051401-CCB5	Manganese	0.00166	0.010	0.0018	mg/L	U	05/14/08 12:11
	Potassium	-0.117	0.50	0.14	mg/L	U	05/14/08 12:11
	Sodium	-0.0160	1.0	0.18	mg/L	U	05/14/08 12:11
	Zinc	-0.00197	0.050	0.0049	mg/L	U	05/14/08 12:11
0805479-BLK1	Calcium, Total	23.9	50	9.8	mg/kg dry wt.	J	05/14/08 12:17
8051401-CCB6	Aluminum	-0.0240	0.10	0.020	mg/L	J	05/14/08 12:53
-0.12	Barium	-0.000923	0.010	0.0033	mg/L	U	05/14/08 12:53
	Beryllium	0.000582	0.010	0.00061	mg/L	U	05/14/08 12:53
	Cadmium	0.000759	0.020	0.0045	mg/L	U	05/14/08 12:53
	Calcium	0.0206	0.50	0.098	mg/L	U	05/14/08 12:53
	Chromium	0.00798	0.050	0.0080	mg/L	U	05/14/08 12:53
	Cobalt	-0.00144	0.020	0.0053	mg/L	U	05/14/08 12:53
	Iron	0.00210	0.10	0.0098	mg/L	U	05/14/08 12:53
0.195	Magnesium	0.0391	0.50	0.028	mg/L	J	05/14/08 12:53
	Manganese	0.00135	0.010	0.0018	mg/L	U	05/14/08 12:53
	Potassium	-0.135	0.50	0.14	mg/L	U	05/14/08 12:53
	Sodium	-0.00334	1.0	0.18	mg/L	U	05/14/08 12:53
	Zinc	-0.00461	0.050	0.0049	mg/L	U	05/14/08 12:53
8051401-CCB7	Manganese	0.00171	0.010	0.0018	mg/L	U	05/14/08 13:13

* Values outside of QC limits

04770

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8051557
Instrument ID: 311
Calibration: 8E16001

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051557-ICB1	Aluminum	-19.4	50	20	ug/L	U	05/15/08 14:37
	Potassium	-0.00308	0.20	0.062	mg/L	U	05/15/08 14:37
	Sodium	-0.0819	0.50	0.21	mg/L	U	05/15/08 14:37
	Calcium	-0.0322	0.50	0.069	mg/L	U	05/15/08 14:38
	Iron	-2.90	20	9.6	ug/L	U	05/15/08 14:38
	Magnesium	-0.0392	0.50	0.063	mg/L	U	05/15/08 14:38
8051557-CCB1	Aluminum	-17.7	50	20	ug/L	U	05/15/08 15:03
	Potassium	-0.0377	0.20	0.062	mg/L	U	05/15/08 15:03
	Sodium	-0.130	0.50	0.21	mg/L	U	05/15/08 15:03
	Calcium	-0.0310	0.50	0.069	mg/L	U	05/15/08 15:03
	Iron	-2.44	20	9.6	ug/L	U	05/15/08 15:03
	Magnesium	-0.0402	0.50	0.063	mg/L	U	05/15/08 15:03
0805566-BLK1	Aluminum, Total	50	50	20	ug/L	U	05/15/08 15:07
	Potassium, Total	200	200	62	ug/L	U	05/15/08 15:07
	Sodium, Total	500	500	210	ug/L	U	05/15/08 15:07
	Calcium, Total	500	500	69	ug/L	U	05/15/08 15:08
	Iron, Total	20	20	9.6	ug/L	U	05/15/08 15:08
	Magnesium, Total	500	500	63	ug/L	U	05/15/08 15:08
8051557-CCB2	Aluminum	-20.5	50	20	ug/L	J	05/15/08 15:28
-102.5	Potassium	-0.0271	0.20	0.062	mg/L	U	05/15/08 15:28
	Sodium	-0.147	0.50	0.21	mg/L	U	05/15/08 15:28
	Calcium	-0.0344	0.50	0.069	mg/L	U	05/15/08 15:29
	Iron	-3.32	20	9.6	ug/L	U	05/15/08 15:29
	Magnesium	-0.0380	0.50	0.063	mg/L	U	05/15/08 15:29

* Values outside of QC limits

04771

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8051606
Instrument ID: 101
Calibration: 8E16007

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051606-ICB1	Aluminum — 0.103	-0.0206	0.10	0.020	mg/L	J	05/16/08 10:15
	Chromium	0.00235	0.050	0.0080	mg/L	U	05/16/08 10:15
	Iron	-0.000810	0.10	0.0098	mg/L	U	05/16/08 10:15
	Magnesium	0.000180	0.50	0.028	mg/L	U	05/16/08 10:15
	Manganese	0.000211	0.010	0.0018	mg/L	U	05/16/08 10:15
	Zinc	0.00237	0.050	0.0049	mg/L	U	05/16/08 10:15
8051606-CCB1	Aluminum — 0.11	-0.0220	0.10	0.020	mg/L	J	05/16/08 10:35
	Chromium	0.00450	0.050	0.0080	mg/L	U	05/16/08 10:35
	Iron	0.00152	0.10	0.0098	mg/L	U	05/16/08 10:35
	Magnesium	0.0121	0.50	0.028	mg/L	U	05/16/08 10:35
	Manganese	0.000883	0.010	0.0018	mg/L	U	05/16/08 10:35
	Zinc	0.00197	0.050	0.0049	mg/L	U	05/16/08 10:35
0805663-BLK1	Aluminum, Total	10	10	2.0	mg/kg dry wt.	U	05/16/08 10:39
	Chromium, Total	5.0	5.0	0.80	mg/kg dry wt.	U	05/16/08 10:39
	Iron, Total	10	10	0.98	mg/kg dry wt.	U	05/16/08 10:39
	Magnesium, Total	50	50	2.8	mg/kg dry wt.	U	05/16/08 10:39
	Manganese, Total	1.0	1.0	0.18	mg/kg dry wt.	U	05/16/08 10:39
	Zinc, Total	3.48	5.0	0.49	mg/kg dry wt.	J	05/16/08 10:39
8051606-CCB2	Aluminum — 0.1425	-0.0285	0.10	0.020	mg/L	J	05/16/08 11:15
	Chromium 0.0426	0.00852	0.050	0.0080	mg/L	J	05/16/08 11:15
	Iron	-0.000422	0.10	0.0098	mg/L	U	05/16/08 11:15
	Magnesium — 0.2735	-0.0547	0.50	0.028	mg/L	J	05/16/08 11:15
	Manganese	0.000216	0.010	0.0018	mg/L	U	05/16/08 11:15
	Zinc	0.000236	0.050	0.0049	mg/L	U	05/16/08 11:15
8051606-CCB3	Aluminum —0.126	-0.0252	0.10	0.020	mg/L	J	05/16/08 11:43
	Chromium	-0.00611	0.050	0.0080	mg/L	U	05/16/08 11:43
	Iron	0.00667	0.10	0.0098	mg/L	U	05/16/08 11:43
	Magnesium	0.0263	0.50	0.028	mg/L	U	05/16/08 11:43
	Manganese	0.000475	0.010	0.0018	mg/L	U	05/16/08 11:43
	Zinc	0.00197	0.050	0.0049	mg/L	U	05/16/08 11:43

* Values outside of QC limits

84772

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6010B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.4997 g / 50 mL

Laboratory ID: 0805663-MS1

QC Batch: 0805663

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Aluminum, Total	125	13000	14500	1240 *	80 - 120	mg/kg dry wt.
Chromium, Total	25.0	171	80.3	-364 *	80 - 120	mg/kg dry wt.
Iron, Total	25.0	39500	37300	-8890 *	80 - 120	mg/kg dry wt.
Magnesium, Total	1250	3610	4460	68 *	80 - 120	mg/kg dry wt.
Manganese, Total	25.0	990	925	-259 *	80 - 120	mg/kg dry wt.
Zinc, Total	25.0	997	939	-233 *	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

OC sample 74 x spike

04791

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6010B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.4998 g / 50 mL

QC Batch: 0805479

Laboratory ID: 0805479-MS1

0K sample 74x spike

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Barium, Total	25.0	304	314	41 *	80 - 120	mg/kg dry wt.
Beryllium, Total	2.50	1.58	3.82	89	80 - 120	mg/kg dry wt.
Cadmium, Total	25.0	1.98	25.8	95	80 - 120	mg/kg dry wt.
Calcium, Total	1250	2750	4210	117	80 - 120	mg/kg dry wt.
Cobalt, Total	25.0	11.0	34.3	93	80 - 120	mg/kg dry wt.
Potassium, Total	1250	1570	3080	121 *	80 - 120	mg/kg dry wt.
Sodium, Total	1250	58.9	1290	99	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

OK within 75-125 ✓

04787

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6010B

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5005 g / 50 mL

Laboratory ID: 0805479-MSD1

QC Batch: 0805479

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Barium, Total	25.0	285	-76 *	10	20	80 - 120	mg/kg dry wt.
Beryllium, Total	2.50	4.08	100	7	20	80 - 120	mg/kg dry wt.
Cadmium, Total	25.0	25.6	95	0.7	20	80 - 120	mg/kg dry wt.
Calcium, Total	1250	4030	103	4	20	80 - 120	mg/kg dry wt.
Cobalt, Total	25.0	40.9	120	17	20	80 - 120	mg/kg dry wt.
Potassium, Total	1250	2760	96	11	20	80 - 120	mg/kg dry wt.
Sodium, Total	1250	1280	98	1	20	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

OK sample conc. 7
4X spike amt.

04788

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6010B

45SB1A

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5003 g / 50 mL

Laboratory ID: 0805482-MS1

QC Batch: 0805482

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Aluminum, Total	125	10800	12300	1180 *	80 - 120	mg/kg dry wt.
Barium, Total	25.0	188	210	89	80 - 120	mg/kg dry wt.
Beryllium, Total	2.50	0.985	3.52	101	80 - 120	mg/kg dry wt.
Cadmium, Total	25.0	0.493	24.6	97	80 - 120	mg/kg dry wt.
Calcium, Total	1250	1560	2860	104	80 - 120	mg/kg dry wt.
Chromium, Total	25.0	17.7	42.8	100	80 - 120	mg/kg dry wt.
Cobalt, Total	25.0	8.54	32.4	96	80 - 120	mg/kg dry wt.
Iron, Total	25.0	23600	21300	-8950 *	80 - 120	mg/kg dry wt.
Magnesium, Total	1250	2540	3880	107	80 - 120	mg/kg dry wt.
Manganese, Total	25.0	929	889	-161 *	80 - 120	mg/kg dry wt.
Potassium, Total	1250	1440	2730	103	80 - 120	mg/kg dry wt.
Sodium, Total	1250	33.8	1270	99	80 - 120	mg/kg dry wt.
Zinc, Total	25.0	333	341	32 *	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

ok all sample conc. 7
4x spike amt

04789

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Total Metals by EPA 6000/7000 Series Methods

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis:	USEPA-6020A		
Sample/Analyte:	0805133-06	45TP4B	Antimony
	0805133-06	45TP4B	Selenium
	0805162-03	45SB1A	Arsenic
	0805162-03	45SB1A	Selenium

Qualification: The RPD between the MS and MSD results exceeded the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.

Analysis:	USEPA-6010B		
Sample/Analyte:	0805133-06	45TP4B	Iron
Analysis:	USEPA-6020A		
Sample/Analyte:	0805133-06	45TP4B	Copper

Qualification: The MS or MSD recovery, but not both, was outside the control limit. The RPD is within the control limit. The unspiked sample result is considered estimated.

Analysis:	USEPA-6010B		
Sample/Analyte:	0805133-06	45TP4B	Magnesium
	0805133-06	45TP4B	Potassium
Analysis:	USEPA-6020A		
Sample/Analyte:	0805133-06	45TP4B	Arsenic
	0805133-06	45TP4B	Nickel
Analysis:	USEPA-7471A		
Sample/Analyte:	0805133-06	45TP4B	Mercury

Qualification: The analyte concentration in the associated MB was greater than or equal to 1/2 the RL. The positive sample result, which was greater than 5 times the MB value, is not considered estimated.

Analysis:	USEPA-6010B		
Sample/Analyte:	0805133-06	45TP4B	Zinc
Analysis:	USEPA-6020A		
Sample/Analyte:	0805100-01	45TP1A	Nickel
	0805100-02	45TP1B	Nickel

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Individual sample results relate only to the sample tested.
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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Total Metals by EPA 6000/7000 Series Methods

Sample/Analyte:	0805100-03	45TP2A	Nickel
	0805100-04	45TP2B	Nickel
	0805100-05	45TP3A	Nickel
	0805133-01	45TP6A	Nickel
	0805133-02	45TP6B	Nickel
	0805133-03	45TP7A	Nickel
	0805133-04	45TP7B	Nickel
	0805133-05	45TP4A	Nickel
	0805133-06	45TP4B	Nickel
	0805133-07	45TP5A	Nickel
	0805133-08	45TP5B	Nickel

Qualification: This analyte was not present in this sample at a concentration greater than 50 times the MDL, therefore serial dilution is not required.

Analysis: USEPA-6010B

Sample/Analyte:	0805133-06	45TP4B	Beryllium
	0805133-06	45TP4B	Cobalt
	0805162-03	45SB1A	Beryllium
	0805162-03	45SB1A	Chromium

Qualification: This analyte was not present in this sample at a concentration greater than 100 times the MDL, therefore serial dilution is not required.

Analysis: USEPA-6020A

Sample/Analyte:	0805133-06	45TP4B	Arsenic
	0805133-06	45TP4B	Selenium
	0805133-06	45TP4B	Silver
	0805162-03	45SB1A	Arsenic
	0805162-03	45SB1A	Silver

Qualification: The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was greater than or equal to 4 times the spiked amount; the non-spiked sample result is not qualified.

Analysis: USEPA-6010B

Sample/Analyte:	0805133-06	45TP4B	Aluminum
	0805133-06	45TP4B	Barium
	0805133-06	45TP4B	Chromium
	0805133-06	45TP4B	Iron
	0805133-06	45TP4B	Manganese
	0805133-06	45TP4B	Zinc
	0805162-03	45SB1A	Aluminum
	0805162-03	45SB1A	Iron

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SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Total Metals by EPA 6000/7000 Series Methods

Sample/Analyte:	0805162-03	45SB1A	Manganese
	0805162-03	45SB1A	Zinc
Analysis:	USEPA-6020A		
Sample/Analyte:	0805133-06	45TP4B	Copper
	0805133-06	45TP4B	Lead

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6020A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5001 g / 250 mL

Laboratory ID: 0805678-MS1

QC Batch: 0805678

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #		QC Limits Rec.	Units
Antimony, Total	20.0	32.6	25.6	-35	*	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6020A

45TP4B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5002 g / 250 mL

Laboratory ID: 0805678-MSD1

QC Batch: 0805678

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Antimony, Total	20.0	26.6	-30 *	4	20	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6020A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5001 g / 250 mL

Laboratory ID: 0805538-MS1

QC Batch: 0805538

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Arsenic, Total	20.0	1.11	14.8	69 *	80 - 120	mg/kg dry wt.
Copper, Total	20.0	9.89	27.3	87	80 - 120	mg/kg dry wt.
Lead, Total	20.0	78.6	99.7	106	80 - 120	mg/kg dry wt.
Nickel, Total	20.0	10.1	28.3	91	80 - 120	mg/kg dry wt.
Selenium, Total	20.0	0.146	12.3	61 *	80 - 120	mg/kg dry wt.
Silver, Total	20.0	0.0480	17.7	88	75 - 120	mg/kg dry wt.
Thallium, Total	20.0	0.355	18.0	88	80 - 120	mg/kg dry wt.
Vanadium, Total	20.0	16.0	34.9	95	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6020A

45SB1A

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Soil

SDG: 36440-54

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3050B Digestion

Initial/Final: 0.5005 g / 250 mL

Laboratory ID: 0805538-MSD1

QC Batch: 0805538

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Arsenic, Total	20.0	14.4	66 *	3	20	80 - 120	mg/kg dry wt.
Copper, Total	20.0	25.9	80	5	20	80 - 120	mg/kg dry wt.
Lead, Total	20.0	100	110	0.7	20	80 - 120	mg/kg dry wt.
Nickel, Total	20.0	26.6	83	6	20	80 - 120	mg/kg dry wt.
Selenium, Total	20.0	11.9	59 *	3	20	80 - 120	mg/kg dry wt.
Silver, Total	20.0	16.7	83	6	20	75 - 120	mg/kg dry wt.
Thallium, Total	20.0	16.6	81	8	20	80 - 120	mg/kg dry wt.
Vanadium, Total	20.0	32.8	85	6	20	80 - 120	mg/kg dry wt.

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

METHOD BLANK DATA SHEET
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Soil
Laboratory ID: 0805480-BLK1
File ID: 8051479-016
Prepared: 05/13/08 15:15
Preparation: 3050B Digestion
Initial/Final: 0.5 g / 250 mL
Analyzed: 05/14/08 17:24
Instrument: 114
QC Batch: 0805480
Sequence: 8051479
Calibration: 8E14012

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7440-50-8	Copper, Total	0.027	0.20	0.20	mg/kg dry wt.	U
7439-92-1	Lead, Total	0.024	0.20	0.20	mg/kg dry wt.	U
7440-02-0	Nickel, Total	0.035	0.10	0.113	mg/kg dry wt.	
7440-22-4	Silver, Total	0.0093	0.10	0.10	mg/kg dry wt.	U
7440-28-0	Thallium, Total	0.0068	0.10	0.10	mg/kg dry wt.	U
7440-62-2	Vanadium, Total	0.032	0.10	0.0345	mg/kg dry wt.	J

Ni 0.565
V 0.1725

METHOD BLANK DATA SHEET
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805567-BLK3
File ID: 8051661-019
Prepared: 05/14/08 07:00
Preparation: 3020A Digestion
Initial/Final: 25 mL / 125 mL
Analyzed: 05/16/08 16:51
Instrument: 201
QC Batch: 0805567
Sequence: 8051661
Calibration: 8E16012

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7440-28-0	Thallium, Total	0.050	0.20	0.20	ug/L	U
7440-66-6	Zinc, Total	1.8	10	2.81	ug/L	J

Zn 14.05

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8051479
Instrument ID: 114
Calibration: 8E14012

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051479-ICB1	Copper	0.00000200	0.00040	0.000053	mg/L	U	05/14/08 17:06
	Lead	0.00000400	0.00040	0.000047	mg/L	U	05/14/08 17:06
	Nickel	-0.00000100	0.00020	0.000069	mg/L	U	05/14/08 17:06
	Silver	0.0000170	0.00020	0.000019	mg/L	U	05/14/08 17:06
	Thallium	0.00000400	0.00020	0.000014	mg/L	U	05/14/08 17:06
	Vanadium	-0.00000800	0.00020	0.000063	mg/L	U	05/14/08 17:06
8051479-CCB1	Copper	0.00000100	0.00040	0.000053	mg/L	U	05/14/08 17:21
1A,1B,2A,	Lead	0.00000100	0.00040	0.000047	mg/L	U	05/14/08 17:21
2B, 3A,6A	Nickel	-0.00000400	0.00020	0.000069	mg/L	U	05/14/08 17:21
6B,7A,	Silver	0.00000300	0.00020	0.000019	mg/L	U	05/14/08 17:21
	Thallium	0.00000300	0.00020	0.000014	mg/L	U	05/14/08 17:21
	Vanadium	-0.0000740	0.00020	0.000063	mg/L	J	05/14/08 17:21
0805480-BLK1	Copper, Total	0.20	0.20	0.027	mg/kg dry wt.	U	05/14/08 17:24
	Lead, Total	0.20	0.20	0.024	mg/kg dry wt.	U	05/14/08 17:24
	Nickel, Total	0.113	0.10	0.035	mg/kg dry wt.	*	05/14/08 17:24
	Silver, Total	0.10	0.10	0.0093	mg/kg dry wt.	U	05/14/08 17:24
	Thallium, Total	0.10	0.10	0.0068	mg/kg dry wt.	U	05/14/08 17:24
	Vanadium, Total	0.0345	0.10	0.032	mg/kg dry wt.	J	05/14/08 17:24
8051479-CCB2	Copper	0.0000170	0.00040	0.000053	mg/L	U	05/14/08 17:56
7B, 4A,4B,	Lead	0.00000700	0.00040	0.000047	mg/L	U	05/14/08 17:56
5A,5B	Nickel	-0.00000400	0.00020	0.000069	mg/L	U	05/14/08 17:56
	Silver	0.0000120	0.00020	0.000019	mg/L	U	05/14/08 17:56
	Thallium	0.00000300	0.00020	0.000014	mg/L	U	05/14/08 17:56
	Vanadium	-0.000117	0.00020	0.000063	mg/L	J	05/14/08 17:56
8051479-CCB3	Copper	0.0000580	0.00040	0.000053	mg/L	J	05/14/08 18:35
1A,2A,4A	Lead	0.00000400	0.00040	0.000047	mg/L	U	05/14/08 18:35
	Nickel	-0.00000200	0.00020	0.000069	mg/L	U	05/14/08 18:35
	Silver	0.00000100	0.00020	0.000019	mg/L	U	05/14/08 18:35
	Thallium	0.00	0.00020	0.000014	mg/L	U	05/14/08 18:35
8051479-CCB4	Copper	0.0000360	0.00040	0.000053	mg/L	U	05/14/08 19:26
	Lead	0.00000300	0.00040	0.000047	mg/L	U	05/14/08 19:26
8051479-CCB5	Copper	0.0000370	0.00040	0.000053	mg/L	U	05/14/08 19:45
4B	Lead	0.00000600	0.00040	0.000047	mg/L	U	05/14/08 19:45

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051486

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 114
Calibration: 8E14013

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051486-ICB1	Selenium	-0.0000170	0.00060	0.000056	mg/L	U	05/14/08 20:41
1A, 1B, 2A, 2B, 3A, 4A, 4B, 5A	Vanadium	0.0000190	0.00020	0.000063	mg/L	U	05/14/08 20:41
8051486-CCB1	Selenium 0.00043	-0.0000860	0.00060	0.000056	mg/L	J	05/14/08 20:51
	Vanadium	0.0000210	0.00020	0.000063	mg/L	U	05/14/08 20:51
0805480-BLK2	Selenium, Total	0.30	0.30	0.028	mg/kg dry wt.	U	05/14/08 20:53
8051486-CCB2	Selenium	-0.0000980	0.00060	0.000056	mg/L	J	05/14/08 21:19
7B, 4A, 4B, 5A, 5B,	Vanadium	0.0000110	0.00020	0.000063	mg/L	U	05/14/08 21:19
8051486-CCB3	Selenium	-0.0000520	0.00060	0.000056	mg/L	U	05/14/08 22:02
	Vanadium	0.0000820	0.00020	0.000063	mg/L	J	05/14/08 22:02

* Values outside of QC limits

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051505

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 114
Calibration: 8E15005

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051505-ICB1	Arsenic	0.0000870	0.00040	0.000053	mg/L	J	05/15/08 08:41
8051505-CCB1	Arsenic	-0.0000690	0.00040	0.000053	mg/L	J	05/15/08 08:49
0805480-BLK3	Arsenic, Total	0.20	0.20	0.026	mg/kg dry wt.	U	05/15/08 08:51
8051505-CCB2	Arsenic	0.00	0.00040	0.000053	mg/L	U	05/15/08 09:18
8051505-CCB3	Arsenic	0.0000420	0.00040	0.000053	mg/L	U	05/15/08 09:41

* Values outside of QC limits

1A, 1B, 2A, 2B, 3A, 6A, 6B, 7A

05205

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051612

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 201
Calibration: 8E16005

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051612-ICB1	Arsenic	0.0573	0.60	0.048	ug/L	J	05/16/08 09:42
	Barium	0.000526	0.40	0.047	ug/L	U	05/16/08 09:42
	Beryllium	0.0168	0.40	0.046	ug/L	U	05/16/08 09:42
	Cadmium	0.00187	0.040	0.011	ug/L	U	05/16/08 09:42
	Cobalt	0.00205	0.20	0.010	ug/L	U	05/16/08 09:42
	Lead	-0.00480	0.20	0.058	ug/L	U	05/16/08 09:42
	Manganese	-0.00517	0.60	0.059	ug/L	U	05/16/08 09:42
	Selenium	0.0162	0.60	0.061	ug/L	U	05/16/08 09:42
	Silver	0.00624	0.10	0.012	ug/L	U	05/16/08 09:42
	Vanadium	-0.0137	1.0	0.054	ug/L	U	05/16/08 09:42
8051612-CCB1	Arsenic	0.0242	0.60	0.048	ug/L	U	05/16/08 10:14
	Barium	-0.00158	0.40	0.047	ug/L	U	05/16/08 10:14
	Beryllium	0.00764	0.40	0.046	ug/L	U	05/16/08 10:14
	Cadmium	-0.00207	0.040	0.011	ug/L	U	05/16/08 10:14
	Cobalt	-0.0000250	0.20	0.010	ug/L	U	05/16/08 10:14
	Lead	-0.00741	0.20	0.058	ug/L	U	05/16/08 10:14
	Manganese	-0.00911	0.60	0.059	ug/L	U	05/16/08 10:14
	Selenium	-0.0471	0.60	0.061	ug/L	U	05/16/08 10:14
	Silver	0.00186	0.10	0.012	ug/L	U	05/16/08 10:14
	Vanadium	-0.0473	1.0	0.054	ug/L	U	05/16/08 10:14
0805567-BLK1	Arsenic, Total	3.0	3.0	0.24	ug/L	U	05/16/08 10:37
	Barium, Total	2.0	2.0	0.23	ug/L	U	05/16/08 10:37
	Beryllium, Total	2.0	2.0	0.23	ug/L	U	05/16/08 10:37
	Cadmium, Total	0.20	0.20	0.056	ug/L	U	05/16/08 10:37
	Cobalt, Total	1.0	1.0	0.050	ug/L	U	05/16/08 10:37
	Lead, Total	1.0	1.0	0.29	ug/L	U	05/16/08 10:37
	Manganese, Total	3.0	3.0	0.30	ug/L	U	05/16/08 10:37
	Selenium, Total	3.0	3.0	0.30	ug/L	U	05/16/08 10:37
	Silver, Total	0.50	0.50	0.061	ug/L	U	05/16/08 10:37
	Vanadium, Total	5.0	5.0	0.27	ug/L	U	05/16/08 10:37
8051612-CCB2	Arsenic	0.0167	0.60	0.048	ug/L	U	05/16/08 10:59
	Barium	-0.000798	0.40	0.047	ug/L	U	05/16/08 10:59
	Beryllium	0.000310	0.40	0.046	ug/L	U	05/16/08 10:59

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051612

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 201
Calibration: 8E16005

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051612-CCB2	Cadmium	0.000564	0.040	0.011	ug/L	U	05/16/08 10:59
	Cobalt	0.00103	0.20	0.010	ug/L	U	05/16/08 10:59
	Lead	-0.00455	0.20	0.058	ug/L	U	05/16/08 10:59
	Manganese	-0.00713	0.60	0.059	ug/L	U	05/16/08 10:59
	Selenium	0.104	0.60	0.061	ug/L	J	05/16/08 10:59
	Silver	0.00857	0.10	0.012	ug/L	U	05/16/08 10:59
	Vanadium	-0.0515	1.0	0.054	ug/L	U	05/16/08 10:59

* Values outside of QC limits

05208

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8051645

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 201
Calibration: 8E19030

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8051645-ICB1	Antimony	0.121	0.60	0.065	ug/L	J	05/16/08 11:53
	Chromium	0.0293	0.40	0.065	ug/L	U	05/16/08 11:53
	Copper	-0.000630	0.20	0.058	ug/L	U	05/16/08 11:53
	Nickel	0.00759	0.40	0.070	ug/L	U	05/16/08 11:53
8051645-CCB1	Antimony	0.0621	0.60	0.065	ug/L	U	05/16/08 12:16
	Chromium	-0.0346	0.40	0.065	ug/L	U	05/16/08 12:16
	Copper	-0.00117	0.20	0.058	ug/L	U	05/16/08 12:16
	Nickel	0.00551	0.40	0.070	ug/L	U	05/16/08 12:16
0805567-BLK2	Chromium, Total	2.0	2.0	0.33	ug/L	U	05/16/08 12:48
	Copper, Total	1.0	1.0	0.29	ug/L	U	05/16/08 12:48
	Nickel, Total	2.0	2.0	0.35	ug/L	U	05/16/08 12:48
8051645-CCB2	Antimony	0.0432	0.60	0.065	ug/L	U	05/16/08 13:20
	Chromium	-0.00528	0.40	0.065	ug/L	U	05/16/08 13:20
	Copper	-0.00368	0.20	0.058	ug/L	U	05/16/08 13:20
	Nickel	0.00601	0.40	0.070	ug/L	U	05/16/08 13:20

* Values outside of QC limits

LQBKS

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8052011

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 114
Calibration: 8E20005

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8052011-ICB1	Antimony	0.129	0.60	0.065	ug/L	J	05/19/08 17:37
8052011-CCB1	Antimony	0.0986	0.60	0.065	ug/L	J	05/19/08 18:04
0805567-BLK4	Antimony, Total	2.0	2.0	0.32	ug/L	U	05/19/08 18:06
8052011-CCB2	Antimony	0.0859	0.60	0.065	ug/L	J	05/19/08 18:33

* Values outside of QC limits

CQBKS

DATA VALIDATION WORKSHEET

Total Organic Carbon

Reviewer: RA
Date: 8/27/08
DV Level: II (III) IV
Review Document:
_X__ Region III Modified for National Functional Guidelines
_X__ Methods of Soil Analyses for soil by Walkley Black
_X__ Project QAPP/SAP

Project Name: Radford
Project Number: 46596351
Laboratory: TriMatrix
SDG No.: 36440-54
Test Name: TOC
Method No.: Walkley Black

All QC OK ✓

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do sample preservation, collection and storage condition meet method requirement? (4C and <2)	✓		
	If samples were received with the cooler temperature exceeding 20 ^{O}C, then flag L(+)/UL(-).			
1.4	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Have any technical holding times (28 days), determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-).		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".		✓	
3.3	Do any field / equipment blanks have positive results? If yes, use same rules above.			✓

Notes:

4.0 Calibration		Yes	No	NA
4.1	Was a titration blank analyzed before processing the samples?	✓		
4.2	Is titrant normality within 0.5 +/- 0.05N? If no, J/UJ	✓		
				✓

Notes:

5.0 Laboratory Control Sample (LCS)		Yes	No	NA
5.1	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.2	Are there any %R for LCS/LCSD recoveries outside the laboratory's QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
5.3	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes:

6.0 Laboratory Duplicate		Yes	No	NA
6.1	Was a laboratory duplicate analyzed at required frequency (one per 20 samples per batch) ?	✓		
6.2	Is the RPD within the laboratory's QC limits?	✓		
	If no, J flag positive results only.			

Notes:

7.0 Field Duplicate		Yes	No	NA
7.1	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended should be noted during data validation and discussed in the DV report.			

Notes:

8.0 Compound Identification and Detection Limit Verification		Yes	No	NA
8.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

9.0 Data Completeness		Yes	No	NA
9.1	Is % completeness for certainty? (Control limit 90%)	✓		
9.1.1	Number of samples:_____			
9.1.2	Number of target compounds in each analysis:_____1_____			
9.1.3	Number of results that are uncertain at comparison criteria standard:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			

Notes:

DATA VALIDATION WORKSHEET

Wet Chemistry

Reviewer: RA
Date: 9/24/08
DV Level: II III IV
Review Document:
_X__ Region III Modified for National Functional Guidelines
_

Project Name: Radford
Project Number: 11456351
Laboratory: Trimatrix
SDG No.: 36440-54
Test Name: CN
Method No.: 9012

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do sample preservation, collection and storage condition meet method requirement? (4C and <2)	✓		
	If samples were received with the cooler temperature exceeding 20 °C, then flag L(+)/UL(-).			
1.4	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Have any technical holding times determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-).		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.	✓		

Notes: Aqueous MB CN at 3.31 ug/L < 5 x → B, P in EQBKS
CCBs and w/ EQBKS also pos. hits. prev flagged for MB.

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are two standards included in the calibration curve run with four injections each? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 10 samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±10%) or %D(≤10%) within	✓		
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>10%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 10%, J(+), only. Negative Bias - %D>-10% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes:

5.0 Laboratory Control Sample (LCS)		Yes	No	NA
5.1	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.2	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
5.3	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes:

6.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
6.1	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
6.2	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
6.3	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Action: No action is required based on MS/MSd failure alone. Note in the report and use professional judgement.			

Notes:

7.0 Laboratory Duplicate		Yes	No	NA
7.1	Were laboratory duplicate prepared and analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.2	Was a field blank used for duplicate analysis? If yes, comment in the report.		✓	
7.3	Are all RPDs within the QC limits? If no, J (+)Are all RPDs within the QC limits? If no, J (+)	✓		
7.4	Were there any transaction, calculation errors?			

8.0 Field Duplicate		Yes	No	NA
8.1	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended should be noted during data validation and discussed in the DV report.	✓		

Notes:

45TP3B & DUP-1 Both NDs ✓

45SB14A & DUP-2 both NDs ✓

9.0 Compound Identification and Detection Limit Verification		Yes	No	NA
9.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

10.0 Data Completeness		Yes	No	NA
10.1	Is % completeness for certainty? (Control limit 90%)	✓		
10.2	Number of samples:_____			
10.3	Number of target compounds in each analysis:_____			
10.4	Number of results that are uncertain at comparison criteria standard:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			

Notes:

METHOD BLANK DATA SHEET
USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-54
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0805399-BLK1
File ID: 051308CNm-014
Prepared: 05/12/08 07:00
Preparation: 9010B Cyanide Distillatic
Initial/Final: 50 mL / 50 mL
Analyzed: 05/13/08 12:56
Instrument: 298
QC Batch: 0805399
Sequence: 8052055
Calibration: 8E14006

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
57-12-5	Cyanide, Total	1.90	10.0	3.31	ug/L	J

BLANKS
USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8052055

SDG: 36440-54
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 298
Calibration: 8E14006

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8052055-CCB1	Cyanide, Total	0.00301	0.0100	0.00190	mg/L	J	05/13/08 12:56
0805399-BLK1	Cyanide, Total	3.31	10.0	1.90	ug/L	J	05/13/08 12:56
8052055-CCB2	Cyanide, Total	0.00316	0.0100	0.00190	mg/L	J	05/13/08 13:02
8052055-CCB3	Cyanide, Total	0.00342	0.0100	0.00190	mg/L	J	05/13/08 13:08

* Values outside of QC limits

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Physical/Chemical Parameters by EPA/APHA/ASTM Methods

Qualification: The MS or MSD recovery, but not both, was outside the control limit. The RPD is within the control limit. The unspiked sample result is considered estimated.

Analysis: USEPA-9012A

Sample/Analyte: 0805133-06 45TP4B

Qualification: The CRL recovery for this analyte was outside of the laboratory control limits. However, the only requirement is that the analyte be detected. No qualifications are necessary.

Analysis: USEPA-9012A

Sample/Analyte: 8052055-CRL1 Cyanide, Total
8052179-CRL1 Cyanide, Total

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Individual sample results relate only to the sample tested.

SDG CASE NARRATIVE

URS Corporation
RFAAP SWMU 45 RFI/CMS, WO 002

SDG Executive Summary

This case narrative applies to samples received on May 06, 2008 through May 08, 2008. All samples were scheduled for analysis in accordance with parameters outlined on the field chain of custody record, the TriMatrix bid form, and/or oral and written correspondence between URS Corporation and TriMatrix Laboratories, Inc..

Each sample receipt event was assigned a unique TriMatrix work order number. Sample receipt documentation is included in section A of this data package.

Project Technical Issues/Problems

Project-related data qualification designations and reporting conventions are included in Attachment 1 - *Project Technical Narrative.*

QA/QC Data Qualifications/Narrations

Quality assurance issues and/or quality control data qualifications and narrations related to the analysis and reporting of this SDG are presented in Attachment 2 - *Statement of Data Qualifications.* The absence of a statement page for a particular analyte group (*e.g.* Percent Solids) implies that no qualifying statements were generated for that analyte.

Data Review and Approval

All data was peer-reviewed by a second analyst, and then by appropriate data management staff against laboratory quality control requirements and project specifications. It was then reviewed and approved by the group supervisor/manager prior to further review by the project chemist.

Data Deliverables

The data deliverables, both hardcopy and/or electronic (EDD), that comprise this data package are intended to comply with the documents referenced in the introductory section of this narrative. The EDD, if requested, will be issued separately from this hardcopy report. Hold time reports for each test procedure are presented following the CLP-like forms section of this report.

This report relates only to the sample(s) as received. Test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC). Estimates of analytical uncertainties for the test results contained within the report are available upon request.

Lisa M. Harvey, Project Chemist

06-12-2008
Date

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SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0805100

TriMatrix Laboratories received the cooler(s) for this work order on May 06, 2008, at 10:00am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and FedEx shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45TP1A	0805100-01	Soil	5/5/2008
45TP1B	0805100-02	Soil	5/5/2008
45TP2A	0805100-03	Soil	5/5/2008
45TP2B	0805100-04	Soil	5/5/2008
45TP3A	0805100-05	Soil	5/5/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0805133

TriMatrix Laboratories received the cooler(s) for this work order on May 07, 2008, at 10:15am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and FedEx shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45TP6A	0805133-01	Soil	5/6/2008
45TP6B	0805133-02	Soil	5/6/2008
45TP7A	0805133-03	Soil	5/6/2008
45TP7B	0805133-04	Soil	5/6/2008
45TP4A	0805133-05	Soil	5/6/2008
45TP4B	0805133-06	Soil	5/6/2008
45TP5A	0805133-07	Soil	5/6/2008
45TP5B	0805133-08	Soil	5/6/2008
EQBK-1	0805133-09	Water	5/6/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0805162

TriMatrix Laboratories received the cooler(s) for this work order on May 08, 2008, at 10:00am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and FedEx shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45TP3B	0805162-01	Soil	5/7/2008
Dup-1	0805162-02	Soil	5/7/2008
45SB1A	0805162-03	Soil	5/7/2008
45SB1B	0805162-04	Soil	5/7/2008
45SB5A	0805162-05	Soil	5/7/2008
45SB5B	0805162-06	Soil	5/7/2008
45SB14A	0805162-07	Soil	5/7/2008
45SB14B	0805162-08	Soil	5/7/2008
Dup-2	0805162-09	Soil	5/7/2008
45SB8A	0805162-10	Soil	5/7/2008
45SB8B	0805162-11	Soil	5/7/2008
45SB8A-PS	0805162-12	Soil	5/7/2008
45SB8B-PS	0805162-13	Soil	5/7/2008
45SB14A-PS	0805162-14	Soil	5/7/2008
45SB14B-PS	0805162-15	Soil	5/7/2008
EQBK-2	0805162-16	Water	5/7/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Attachment 1
Project Technical Narrative

Sample Result Reporting Convention

Sample results are reported as RL 'U' (e.g., 0.001 U) if the target analyte was not detected above the MDL. If a sample for an organic parameter is reanalyzed and also reported, the second analysis includes the suffix 'REn' where n = the first, second, etc. reanalysis. If a sample is reanalyzed for confirmation purposes, is confirmed and also reported, the second analysis includes the suffix 'RE1'. If the confirmation was not performed simultaneously, the second set of sample results is reported on a second Form 1 since that confirmation analysis did not occur at the same time and/or date.

Method Detection Limits, Target Analytes, and Reporting Limits

All method detection limits (MDL) for analytes in this report are compliant with the DoD QSM specification that each reporting limit (RL) employed is to be at least three times the MDL. In addition, no RL is less than the equivalent concentration of the lowest instrument calibration standard.

Quality Control Limits

Quality control limits specified in the DoD QSM were employed. For cases in which the analyte is not listed in the QSM, internal laboratory control limits were used.

Data Qualifier Designation

If applicable, a sample result is qualified with:

- a "U" flag if the analyte was not detected at a concentration greater than the MDL,
- a "B", "J", and/or an "E" flag as defined in the Variance section,
- a LIMS-generated statement of qualification. Qualifying statements, if any, will be found in Attachment 2 to this narrative.

QC Batch and Analytical Batch Designation

A Quality Control (QC) Batch is a seven digit number that associates all samples that have been prepared together (or analyzed together if there is no preparation). Quality Control batches are limited to no more than twenty samples, excluding batch QC (method blanks, control spikes, etc.). Some batches may contain multiple sets of method blanks (BLK) and laboratory control samples (BS), where a set of method quality control analyses were prepared in concert with each set of samples on a given day.

An Analytical Batch (or Sequence) is a seven digit number that associates all samples analyzed as a set under one analytical sequence.

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Variances

Data Qualifier Flags

Data qualifier flags other than those listed in the DoD QSM were employed or the definition of an existing flag was modified.

J – Estimated: the analyte was detected at a concentration greater than the limit of detection (i.e., MDL) but less than the reporting limit (i.e., MRL).

B – Blank contamination: The analyte was detected above one-half the reporting limit in an associated method blank. The same analyte in the sample was detected at less than five times the method blank concentration. (If a common laboratory contaminant is present in the method blank at a concentration greater than one-half the reporting limit but less than or equal to that reporting limit, any associated sample results are flagged but corrective action is not necessarily taken. A text qualifier is also associated with such a result.)

E – Exceeds calibration range: The analyte response exceeded the calibrated range of the instrument. (With the exception of metals for which only the final non-qualified result is reported, both the initial E-qualified result and final non-qualified result from reanalysis-at-dilution are reported.)

Text Qualifier

A LIMS-generated text qualifier is substituted for many instances in which the DoD QSM "Q" flag would otherwise apply. The text qualifiers are listed in a summary format by parameter with applicable samples identified.

Methods 6010B and 6020A

The acceptance criterion of < 2 x RL is substituted for < 2 x MDL for interference check solution ICS-A.

Project Correspondence

Any additional correspondence with the Client, and potentially any third parties also involved in the project, regarding sample receipt and/or analysis follows.

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TriMatrix Laboratories, Inc.

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Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124310

36440-54
CFAAP450508

Page 1 of 1

For Lab Use Only

Cart: 1
VOA Rack/Tray: —
Receipt Log No.: 49-3
Project Chemist: MH
Laboratory Project No.: 0805100

Client Name	URS Group, Inc.
Address	5540 Falmouth Street, Suite 201
	Richmond, Virginia 23230
Phone	804-474-5444
Fax	804-965-9764
Project Name	Radford AAP, SWMU 45
Client Project No./P.O. No.	NCA-07-1107, WO-002
Invoice No.	☒ Client ☐ Other (comments)
Contact/Report To	Lee Anne Mareck

Analyses Requested

Container Type (corresponds to Container Packing List)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	VOC - 8260 w/ TCL and HL	SVOC 8270	PCB-8082	Pesticides-6081	Explosives - 8330	Nitroglycerine PETN - 8332	Total TAL Metals 6010/7470/7471	Cyanide 9012	% Solids - 3550	Total	Sample Comments
				Container Type							21	17	17	17	17	17	17	17	20		
				Number of Containers Submitted																	
1	SO	-01	1	45TP1A		5-5-08	1115		X	S	3	1	1	1	1	1	1	1	1	5	
		-02	2	45TP1B		5-5-08	1140		X	S	3	1	1	1	1	1	1	1	1	5	
		-03	3	45TP2A		5-5-08	1215		X	S	3	1	1	1	1	1	1	1	1	5	
		-04	4	45TP2B		5-5-08	1240		X	S	3	1	1	1	1	1	1	1	1	5	
		-05	5	45TP3A		5-5-08	1320		X	S	3	1	1	1	1	1	1	1	1	5	
			6																		
			7																		
			8																		
			9																		
			10																		

PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter
Sampler's Signature:
Company: URS Corporation

How Shipped? Hand Carrier FedEx
Tracking No.

Comments

1. Relinquished By	Date	Time
	05-05-08	1635

2. Relinquished By	Date	Time

3. Relinquished By	Date	Time

1. Received By	Date	Time

2. Received By	Date	Time

3. Received For Lab By	Date	Time
	5.6.08	1000

TriMatrixCOC -- COC

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Chain of Custody Record

COC No. 124518

Page 1 of 1

36440-54

For Lab Use Only

Cart: 9
VOA Rack/Tray:
Receipt Log No.: 1-1
Project Chemist: MH
Laboratory Project No.: 0805133

Client Name: URS Group, Inc.	Project Name: Radford AAP, SWMU45
Address: 5540 Falmouth St., Suite 201	Client Project No./P.O. No.: NCA-07-1107, WO-002
Richmond, VA 23230	Invoice No. ☑ Client ☐ Other (comments)
Phone 804-474-5444	Contact/Report To: Lee Anne Mareck
Fax 804-965-9764	

Analyses Requested

Container Type (corresponds to Container Packing List)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	VOC (CL + HC) 8260	SVOC 8270	PCB 8082	Pesticides 8081	Explosives 8330	n-nitroglycerine PETN - 8332	Total TAL Metals	Cyanide - 9012	% Solids 3550	Total	Sample Comments
				Number of Containers Submitted							21	17	17	17	17	17	17	17	20		
01	SO	01	1	45TP6A	TM1746	5-6-08	1025		X	S	3		✓	✓	✓		1	✓	4	5	
		02	2	45TP6B	TM1746	5-6-08	1110		X	S	3		✓	✓	✓		1	✓	4	5	
		03	3	45TP7A	TM1746	5-6-08	1305		X	S	3		✓	✓	✓		1	✓	4	5	
		04	4	45TP7B	TM1746	5-6-08	1345		X	S	3		✓	✓	✓		1	✓	4	5	
		05	5	45TP4A	TM1746	5-6-08	1400		X	S	3		✓	✓	✓		1	✓	4	5	
03	SO	06	6	45TP4B MS/MSD	TM1746	5-6-08	1430 ~~1430~~		X	S	8		✓	✓	✓		2	✓	4	11	
01	SO	07	7	45TP5A	TM1746	5-6-08	1500		X	S	3		✓	✓	✓		1	✓	4	5	
01		08	8	45TP5B	TM1746	5-6-08	1525		X	S	3		✓	✓	✓		1	✓	4	5	
			9																		
			10																		

Preservatives
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter	How Shipped? Hand Carrier FedEx	Comments
Sampler's Signature: Jim Carter	Tracking No.	
Company: URS Corp.	1. Relinquished By: Jim Carter Date: 05-06-08 Time: 1633	2. Relinquished By Date Time
	1. Received By Date Time	2. Received By Date Time

3. Relinquished By Date Time
3. Received for Lab By: [signature] Date: 5-7-08 Time: 1015

TriMatrixCOC -- COC

WHITE COPY - REPORT YELLOW COPY - LABORATORY PINK COPY - FIELD

TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124520

For Lab Use Only
Cart: 9
VOA Rack/Tray: 732W
Receipt Log No.: 1-1
Project Chemist: LMH
Laboratory Project No.: 0805133

3644D-54

Client Name: URS Group, Inc.
Address: 5540 Falmouth St., Suite 201
Richmond, VA 23230
Phone: 804-474-5444
Fax: 804-965-9764

Project Name: Radford AAP, Sump 45
Client Project No./P.O. No.: NCA-07-1107; WO-002
Invoice No.: ☑ Client ☐ Other (comments)
Contact/Report To: Lee Anne Mareck

Page 1 of 1

Analyses Requested

Test Group	Matrix Code	Laboratory Sample Number	Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	P	B	E	A	A	A	A	A	Total	Sample Comments
										1	6	5	2	2	2	2	2		
										Container Type (corresponds to Container Packing List)									
										VOCs 8260	Total TAL Metals	Cyanide	SVOC 8270	Explosives 8330	Nitroaromatics/Isophorone PETN 8332	Pesticides 8081	PCBs 8082	Number of Containers Submitted	
04	WQ	09	1 EQBK-1	TM 1932	5-6-08	1600		X	W	3	1	4	2	2	2	1	1	13	
			2																
			3																
			4																
			5																
			6																
			7																
			8																
			9																
			10																

Preservatives
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter
Sampler's Signature: Jim Carter
Company: URS Corp

How Shipped? Hand Carrier Fed Ex
Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	05-06-08	1630						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							5708	1015

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Chain of Custody Record

COC No. 124521

36440-54

Page 1 of 2

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Cart: 8

VOA Rack/Tray:

Receipt Log No.: 3.4

Project Chemist: MH

Laboratory Project No.: 0805162

Client Name: URS Group, Inc.	Project Name: Radford AAP, SWMU 45
Address: 5540 Falmouth St., Suite 201	Client Project No./P.O. No.: NCA-07-1107 ; WO-002
Richmond, VA 23230	Invoice No. ☒ Client ☐ Other (comments)
Phone 804-474-5444	Contact/Report To: Lee Anne Marek
Fax 804-965-9764	

Analyses Requested

Container Type (corresponds to Container Packing List)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	VOC (CLP HL) 8260	SVOC 8270	RCB 8082	Pesticides 8081	Explosives 8330 nitroglycerin PETN 8332	Total TAL metals & Cyanide report Solids	6012 Trivalent Cr	% Solids	Total	Sample Comments
											21	17	17	17	17	17	17	20		
											Number of Containers Submitted									
01	SO	01	1	45TP3B	TM1878	05-07-08	1010		X	S	3	1	1	1	1	1	1	4	5	
02	FD SO	02	2	DUP-1	TM1878	05-07-08	—		X	S	3	1	1	1	1	1	1	4	5	
03	SO	03	3	45SB1A MS/MSD	TM1878	05-07-08	1100		X	S	6	2	2	2	2	2	2	4	11	
01	SO	04	4	45SB1B	TM1878	05-07-08	1105		X	S	3	1	1	1	1	1	1	4	5	
		05	5	45SB5A	TM1878	05-07-08	1155		X	S	3	1	1	1	1	1	1	4	5	
		06	6	45SB5B	TM1878	05-07-08	1200		X	S	3	1	1	1	1	1	1	4	5	
		07	7	45SB14A	TM1878	05-07-08	1255		X	S	3	1	1	1	1	1	1	4	5	
		08	8	45SB14B	TM1878	05-07-08	1300		X	S	3	1	1	1	1	1	1	4	5	
02	FD SO	09	9	DUP-2	TM1878	05-07-08	—		X	S	3	1	1	1	1	1	1	4	5	
01	SO	10	10	45SB9A	TM1878	05-07-08	1340		X	S	3	1	1	1	1	1	1	4	5	

PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter

Sampler's Signature: Jim Carter

Company: URS Corp.

How Shipped? Hand Carrier FedEx

Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	05-07-08	1610						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							5-8-08	1000

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Chain of Custody Record

COC No. 124522

Page 2 of 2

36440-54

For Lab Use Only

Cart: 8
VOA Rack/Tray:
Receipt Log No.: 3.4
Project Chemist: MH
Laboratory Project No.: 08051162

Client Name	Project Name
URS Group, Inc.	Radford AAP, SWMU 45
Address	Client Project No./P.O. No.
5540 Falmouth St., Suite 201	NCA-07-1107; WO-002
Richmond, VA 23230	Invoice No. ☒ Client ☐ Other (comments)
Phone 804-474-5444	Contact/Report To
Fax 804-965-9000	Lee Anne Marek

Analyses Requested

Container Type (corresponds to Container Packing List)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	VOC (CL+HL)-8260	SVOC 8270	PCB 8082	Pesticides 8081	Explosives 8330 nitroglycerine PETN 8332	Total TAL Metals	Cyanide 9014/9012	% Solids	TOC Walkley-Black	Total	Sample Comments
				Number of Containers Submitted							21	17	17	17	17	17	17	17	20	17	
01	SO	11	1	45SB8B	TM1578	05-07-08	1315		X	S	3	4	4	4	4	4	4	—	—	5	
06	SO	12	2	45SB8A-PS	TM1578	05-07-08	1330		X	S	—	—	—	—	—	—	—	—	4	1	
		13	3	45SB8B-PS	TM1578	05-07-08	1335		X	S	—	—	—	—	—	—	—	—	4	1	
		14	4	45SBH A-PS	TM1578	05-07-08	1440		X	S	—	—	—	—	—	—	—	—	4	1	
		15	5	45SBH B-PS	TM1578	05-07-08	1445		X	S	—	—	—	—	—	—	—	—	4	1	
			6	(MH) 05-09-08																	
			7																		
			8																		
			9																		
			10																		

PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter
Sampler's Signature: Jim Carter
Company: URS Corp

How Shipped? Hand Carrier Fed Ex
Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	05-07-08	1610						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							5/8/08	1000

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Chain of Custody Record

COC No. 124519

Page 1 of 1

36440-54

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Cart: 8
VOA Rack/Tray: 240B
Receipt Log No.: 3.4
Project Chemist: MH
Laboratory Project No.: 08051162

Client Name	Project Name
URS Group, Inc	Radford AAP - SWMU 45
Address: 5540 Falmouth St., Suite 201	Client Project No./P.O. No.: NCA07-01107, WO-002
Richmond, VA 23230	Invoice No. ☑ Client ☐ Other (comments)
Phone: 804-474-5444	Contact/Report To: Lee Anne Marek
Fax: 804-965-9764	

Analyses Requested

Container Type (corresponds to Container Packing List)

Test Group	Matrix Code	Laboratory Sample Number	Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	1	2	6	5	2	2	2	2	Total	Sample Comments
										D	A	B	E	A	A	A	A		
										VOCs 8260B	SVOC 8270C	Total TAL Metals	Cyanide	Explosives 8330	Nitroaromatics PETN 8332	Pesticides 8081	PCBs 8082		
1	EB WQ	16	EQBK-2	TM1421	05-07-08	1545		X	W	3	2	1	1	2	2	1	1	13	
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Preservatives
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): J. m Carter
Sampler's Signature: Jim Carter
Company: URS Corp.

How Shipped? Hand Carrier FedEx
Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	05-07-08	1615						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							5.8.08	1000

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Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision-making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA Region III Modifications to the National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	Unreliable result. Analyte may or may not be present in the sample. Supporting data is necessary to confirm result.
U	Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
N	Tentative Identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
J	Analyte present. Reported value may not be accurate or precise.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UJ	Not detected, quantitation limit may be inaccurate or imprecise.
UL	Not detected, quantitation limit is probably higher.
NT	Not tested, no analytical result provided.

The other type of code used by URS is a "Reason Code". The reason code indicates the type of quality control failure that led to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
b	Bubble found in vial >6mm	b	Instrument performance failure	c	Calibration failure
c	Calibration failure; poor or unstable response	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
d	MS/MSD imprecision	d	MS/MSD imprecision	e	LCS/LCSD imprecision
e	LCSD imprecision	e	LCSD imprecision	f	Field duplicate imprecision
f	Field duplicate imprecision	f	Field duplicate imprecision	g	Laboratory duplicate imprecision
g	Tuning failure or poor mass spectrometer performance	g	Dual column confirmation imprecision	h	Holding time violation
h	Holding time violation	h	Holding time violation	k	Cooler receipt temperature exceeds limits
i	Internal standard failure	i	Internal standard failure	l	LCS recovery failure
k	Cooler receipt temperature exceeds limits	k	Cooler receipt temperature exceeds limits	m	MS/MSD recovery failure
l	LCS recovery failure	l	LCS recovery failure	n	ICS failure
m	MS/MSD recovery failure	m	MS/MSD recovery failure	o	Calibration blank contamination
p	Poor chromatography	p	Poor chromatography	p	Preparation blank contamination
q	Concentration exceeded the linear range of the instrument	q	Concentration exceeded the linear range	q	Concentration exceeded the linear range
r	Linearity failure in initial calibration	r	Linearity failure in initial calibration	r	Linearity failure in calibration or MSA
s	Surrogate failure	s	Surrogate failure	s	Serial dilution failure
t	TIC	u	No confirmation column	v	Post-digestion spike failure
w	Identification criteria failure	w	Retention time failure	w	CRDL Standard Failure
x	Field blank contamination	x	Field blank contamination	x	Field blank contamination
y	Trip blank contamination	z	Method blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	n	Failed Signal to noise ratio		

DATA VALIDATION REPORT - Level III Review

SDG No.: 36440-56 **Fraction:** VOCs, SVOCs, Pest, PCBs, Explosives, Metals, & Cyanide

Lab: TriMatrix **Project Name** Radford SWMU 45

Reviewer: RA **Date:** June 27, 2008

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied (as required), the completed data validation checklist, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the Region III Modifications to the USEPA National Functional Guidelines for Organic and Inorganic Data Review as pertains to the specifics of the analytical method employed and provisions of the approved project-specific QAPP.

Major Anomalies: None.

Minor Anomalies: For the VOCs analyses, the trip and equipment blanks displayed positive detections for toluene. Positive associated field sample results less than five times the trip blank concentration were flagged "B,y".

The continuing calibration analyzed on 05/30/08 displayed percent differences greater than the control limit (i.e., 20%) with a positive bias for bromodichloromethane at 21.4% and trichloroethene at 22.1%. The associated field sample results were non-detects, and no data qualifying action was required.

The matrix spike duplicate analyzed for sample 45MW4 displayed a percent recovery (%R) greater than the upper control limit of 120% for bromodichloromethane at 121%. The associated parent sample result was a non-detect, and no data qualifying action was necessary.

The laboratory control sample analyzed for batch 806442 displayed a %R greater than the upper control limit of 120% for bromodichloromethane at 121%. The associated field sample results were non-detect, and no data qualifying action was required.

For the SVOCs analyses, the method blanks displayed positive detections for butyl benzyl phthalate, diethyl phthalate, bis(2-ethylhexyl)phthalate, and phenol. Positive associated field sample results less than ten times the method blank concentrations for the phthalates and less than five times the method blank concentration for phenol were flagged "B,z".

The equipment blank displayed a positive detection for di-n-butyl phthalate at 3.4 ug/L. Positive associated field sample results less than ten times the equipment blank concentration were flagged "B,x".

The matrix spike pair analyzed for sample 45TP4B displayed %Rs and/or relative percent differences greater than the upper control limits for carbazole, di-n-butyl phthalate, 2,3,4,6-tetrachlorophenol, 3,3'-dichlorobenzidine, and hexachloroethane. The positive hexachloroethane result was flagged "J,m" in the parent sample. The associated parent sample results for the other compounds were non-detects, and no further data qualifying action was required.

The laboratory control sample analyzed for batch 806214 displayed %Rs greater than the upper control limits for carbazole and 2,3,4,6-tetrachlorophenol. The associated field sample results were non-detects and no data qualifying action was necessary.

For the pesticides analyses, the method blank displayed %Rs greater than the upper control limit for surrogate decachlorobiphenyl on both columns. No data qualifying action was taken since all field samples displayed acceptable surrogate recoveries and also because the method blank is a quality control sample.

For the explosives analyses by method 8330, the laboratory control sample analyzed for sequence 8060244 displayed a %R greater than the upper control limit of 160% for RDX at 230%. The associated field sample result was a non-detect and no data qualifying action was required.

The percent difference between the two analytical columns was greater than the control limit of 40% for HMX in sample 45MW3 at 45.7%. This result was flagged "J,g". The higher result should be used for data interpretation.

For the metals analyses, for method 6010, the method blanks displayed positive detections for dissolved aluminum and dissolved potassium. Positive associated field sample results less than five times the method blank concentrations were flagged "B,p". The continuing calibration blanks displayed negative detections for potassium. The associated field sample results were positive and greater than five times the absolute value of the blank concentrations, therefore, no data qualifying action was required. The equipment blank displayed a positive detection for total iron at 84 ug/L. The associated field sample results were greater than five times the blank concentration and no data qualifying action was necessary.

For method 6020, the method blank displayed a positive detection for dissolved chromium. The associated positive field sample results less than five times the method blank concentration were flagged "B,p". The initial and continuing calibration blanks displayed positive detections for antimony, chromium, selenium, and vanadium. The

associated positive field sample results less than five times the calibration blank concentrations were flagged "B,o". The equipment blank displayed positive detections for total chromium, total zinc, and dissolved zinc. The associated field sample results less than five times the equipment blank concentrations were flagged "B,x".

For the mercury analyses, the continuing calibrations analyzed on 06/05/08 displayed negative detections for mercury. The associated field sample results were non-detects and were flagged "UL,o".

For method 6010, the matrix spike pair analyzed for sample 45MW4 displayed %Rs greater than the upper control limit of 125% for total aluminum at 159% and 154%, respectively. Positive associated field sample results were flagged "K,m".

For method 6020, the field duplicate pair (45MW2/DUP-3) displayed results outside the control limits for total chromium, total cobalt, and total nickel. These results were flagged "J,f" in these two samples.

For the cyanide analyses, the method blanks displayed positive detections for cyanide at 2.19 ug/L and 2.20 ug/L. Positive associated field sample results were less than five times the blank concentrations and were flagged "B,p". The equipment blank also displayed a positive detection for cyanide. This result was previously flagged for a method blank contamination and was not used to assess the field samples.

Correctable Anomalies: None.

Comments: On the basis of this evaluation, the laboratory appears to have followed the specified method. All data are usable, as qualified, for their intended purpose based on the data reviewed. Please note that if a fraction is not discussed in this report, all quality control criteria were met for that fraction.

Signed: Rayan

SAMPLE ID SUMMARY

USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
Trip Blank	0805500-03
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04
Trip Blank	0805546-05

00552

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: 50001.D

Sampled: 05/21/08 15:10 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 20:16

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U

00572

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: 50001.D

Sampled: 05/21/08 15:10 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 20:16

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
108-88-3	Toluene	1	0.26	1.0	0.072	J
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.6	104	85 - 115	
1,2-Dichloroethane-d4	40.0	39.1	98	70 - 120	
Toluene-d8	40.0	42.5	106	85 - 120	
4-Bromofluorobenzene	40.0	36.1	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	593261	5.14	656376	5.14	
Chlorobenzene-d5	622503	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	370602	10.38	426044	10.38	

* Values outside of QC limits

: 00573

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: 50002.D

Sampled: 05/21/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 20:45

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	1.0	1.0	0.072	U

00678

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: 50002.D

Sampled: 05/21/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 20:45

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.4	106	85 - 115	
1,2-Dichloroethane-d4	40.0	39.8	100	70 - 120	
Toluene-d8	40.0	42.3	106	85 - 120	
4-Bromofluorobenzene	40.0	36.1	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	601470	5.14	656376	5.14	
Chlorobenzene-d5	631442	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	373132	10.38	426044	10.38	

* Values outside of QC limits

00679

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Trip Blank

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805500-03 File ID: 50003.D

Sampled: 05/21/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 18:48

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.13	1.0	0.072	J

00583

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Trip Blank

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805500-03 File ID: 50003.D

Sampled: 05/21/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 18:48

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.3	106	85 - 115	
1,2-Dichloroethane-d4	40.0	39.3	98	70 - 120	
Toluene-d8	40.0	42.3	106	85 - 120	
4-Bromofluorobenzene	40.0	36.2	91	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	607622	5.14	656376	5.14	
Chlorobenzene-d5	631852	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	372166	10.38	426044	10.38	

* Values outside of QC limits

00684

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: 54601.D

Sampled: 05/22/08 11:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 21:14

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	1.0	1.0	0.072	U

00659

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: 54601.D

Sampled: 05/22/08 11:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 21:14

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.5	106	85 - 115	
1,2-Dichloroethane-d4	40.0	39.8	100	70 - 120	
Toluene-d8	40.0	42.1	105	85 - 120	
4-Bromofluorobenzene	40.0	36.1	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	589980	5.14	656376	5.14	
Chlorobenzene-d5	614980	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	361800	10.38	426044	10.38	

* Values outside of QC limits

00590

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: 54602.D

Sampled: 05/22/08 13:40 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 21:43

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.10	1.0	0.072	J B7

00694

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: 54602.D

Sampled: 05/22/08 13:40 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 21:43

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.7	104	85 - 115	
1,2-Dichloroethane-d4	40.0	40.1	100	70 - 120	
Toluene-d8	40.0	42.5	106	85 - 120	
4-Bromofluorobenzene	40.0	36.3	91	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	590428	5.14	656376	5.14	
Chlorobenzene-d5	611058	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	363088	10.38	426044	10.38	

* Values outside of QC limits

00595

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: 54603.D

Sampled: 05/22/08 10:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 22:12

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	0.70	1.0	0.061	J
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	1.0	1.0	0.072	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: 54603.D

Sampled: 05/22/08 10:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 22:12

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.6	106	85 - 115	
1,2-Dichloroethane-d4	40.0	40.0	100	70 - 120	
Toluene-d8	40.0	42.4	106	85 - 120	
4-Bromofluorobenzene	40.0	36.2	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	589792	5.14	656376	5.14	
Chlorobenzene-d5	622495	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	364876	10.38	426044	10.38	

* Values outside of QC limits

: 00701

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: 54604.D

Sampled: 05/22/08 14:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 19:17

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.15	1.0	0.072	J

: 00706

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: 54604.D

Sampled: 05/22/08 14:30 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 19:17

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	41.1	103	85 - 115	
1,2-Dichloroethane-d4	40.0	39.2	98	70 - 120	
Toluene-d8	40.0	42.1	105	85 - 120	
4-Bromofluorobenzene	40.0	36.2	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	601366	5.14	656376	5.14	
Chlorobenzene-d5	625139	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	367670	10.38	426044	10.38	

* Values outside of QC limits

00707

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Trip Blank

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805546-05 File ID: 54605.D

Sampled: 05/22/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 19:46

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
67-64-1	Acetone	1	20	20	1.2	U
71-43-2	Benzene	1	1.0	1.0	0.12	U
74-97-5	Bromochloromethane	1	1.0	1.0	0.20	U
75-27-4	Bromodichloromethane	1	1.0	1.0	0.19	U
75-25-2	Bromoform	1	1.0	1.0	0.23	U
74-83-9	Bromomethane	1	1.0	1.0	0.19	U
75-15-0	Carbon Disulfide	1	5.0	5.0	0.28	U
56-23-5	Carbon Tetrachloride	1	1.0	1.0	0.15	U
108-90-7	Chlorobenzene	1	1.0	1.0	0.12	U
75-00-3	Chloroethane	1	1.0	1.0	0.20	U
67-66-3	Chloroform	1	1.0	1.0	0.061	U
74-87-3	Chloromethane	1	1.0	1.0	0.060	U
110-82-7	Cyclohexane	1	5.0	5.0	0.14	U
96-12-8	1,2-Dibromo-3-chloropropane	1	5.0	5.0	0.29	U
124-48-1	Dibromochloromethane	1	1.0	1.0	0.14	U
106-93-4	1,2-Dibromoethane	1	1.0	1.0	0.22	U
95-50-1	1,2-Dichlorobenzene	1	1.0	1.0	0.065	U
541-73-1	1,3-Dichlorobenzene	1	1.0	1.0	0.12	U
106-46-7	1,4-Dichlorobenzene	1	1.0	1.0	0.13	U
75-71-8	Dichlorodifluoromethane	1	1.0	1.0	0.17	U
75-34-3	1,1-Dichloroethane	1	1.0	1.0	0.076	U
107-06-2	1,2-Dichloroethane	1	1.0	1.0	0.15	U
75-35-4	1,1-Dichloroethene	1	1.0	1.0	0.14	U
156-59-2	cis-1,2-Dichloroethene	1	1.0	1.0	0.17	U
156-60-5	trans-1,2-Dichloroethene	1	1.0	1.0	0.16	U
78-87-5	1,2-Dichloropropane	1	1.0	1.0	0.10	U
10061-01-5	cis-1,3-Dichloropropene	1	1.0	1.0	0.14	U
10061-02-6	trans-1,3-Dichloropropene	1	1.0	1.0	0.16	U
100-41-4	Ethylbenzene	1	1.0	1.0	0.13	U
591-78-6	2-Hexanone	1	10	10	0.42	U
98-82-8	Isopropylbenzene	1	1.0	1.0	0.12	U
79-20-9	Methyl Acetate	1	5.0	5.0	0.16	U
1634-04-4	Methyl tert-Butyl Ether	1	1.0	1.0	0.096	U
108-87-2	Methylcyclohexane	1	5.0	5.0	0.15	U
75-09-2	Methylene Chloride	1	5.0	5.0	0.051	U
78-93-3	2-Butanone (MEK)	1	10	10	0.33	U
108-10-1	4-Methyl-2-pentanone (MIBK)	1	10	10	0.38	U
100-42-5	Styrene	1	1.0	1.0	0.11	U
79-34-5	1,1,2,2-Tetrachloroethane	1	1.0	1.0	0.10	U
127-18-4	Tetrachloroethene	1	1.0	1.0	0.15	U
108-88-3	Toluene	1	0.16	1.0	0.072	J

00712

ORGANIC ANALYSIS DATA SHEET
USEPA-8260B

Trip Blank

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0805546-05 File ID: 54605.D

Sampled: 05/22/08 00:00 Prepared: 05/30/08 16:00 Analyzed: 05/30/08 19:46

Solids: Preparation: 5030B Aqueous Purge & Initial/Final: 5 mL / 5 mL

QC Batch: 0806442 Sequence: 8060212 Calibration: 8E01009 Instrument: 224

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
87-61-6	1,2,3-Trichlorobenzene	1	2.0	2.0	0.13	U
120-82-1	1,2,4-Trichlorobenzene	1	2.0	2.0	0.16	U
71-55-6	1,1,1-Trichloroethane	1	1.0	1.0	0.11	U
79-00-5	1,1,2-Trichloroethane	1	1.0	1.0	0.21	U
79-01-6	Trichloroethene	1	1.0	1.0	0.17	U
75-69-4	Trichlorofluoromethane	1	1.0	1.0	0.18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	1	1.0	1.0	0.14	U
75-01-4	Vinyl Chloride	1	1.0	1.0	0.17	U
1330-20-7	Xylene (Total)	1	3.0	3.0	0.36	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
Dibromofluoromethane	40.0	42.6	107	85 - 115	
1,2-Dichloroethane-d4	40.0	40.2	100	70 - 120	
Toluene-d8	40.0	42.5	106	85 - 120	
4-Bromofluorobenzene	40.0	36.1	90	75 - 120	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Fluorobenzene	595756	5.14	656376	5.14	
Chlorobenzene-d5	623332	8.08	677721	8.08	
1,4-Dichlorobenzene-d4	367663	10.38	426044	10.38	

* Values outside of QC limits

00713

SAMPLE ID SUMMARY

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

00795

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: 80550001.d

Sampled: 05/21/08 15:10 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 17:26

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.060	0.50	0.037	J
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.40	5.0	0.029	J B,Z
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.050	0.50	0.020	J
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	1.3	5.0	0.38	J B,X
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.090	5.0	0.034	J B,Z
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	0.58	5.0	0.34	J
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.47	5.0	0.41	J B,Z
206-44-0	Fluoranthene	1	0.030	0.50	0.016	J

00826

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: 80550001.d

Sampled: 05/21/08 15:10 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 17:26

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
86-73-7	Fluorene	1	0.50	0.50	0.011	U
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.020	0.50	0.015	J
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	11.1	55	20 - 110	
Phenol-d6	20.0	7.29	36	10 - 115	
Nitrobenzene-d5	10.4	9.52	92	40 - 110	
2-Fluorobiphenyl	10.0	9.07	91	50 - 110	
2,4,6-Tribromophenol	20.1	18.6	93	40 - 125	
o-Terphenyl	10.0	10.2	102	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	171221	4.86	189490	4.86	
Naphthalene-d8	555696	6.36	609978	6.36	
Acenaphthene-d10	324892	8.35	357547	8.35	
Phenanthrene-d10	487416	10	537983	10	

00827

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805500-01
File ID: 80550001.d
Sampled: 05/21/08 15:10
Prepared: 05/28/08 16:26
Analyzed: 05/30/08 17:26
Solids:
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
QC Batch: 0806214
Sequence: 8060612
Calibration: 8F06011
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Chrysene-d12	381828	12.93	450845	12.93	
Perylene-d12	351544	14.39	358240	14.39	

* Values outside of QC limits

00823

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: 80550002.d

Sampled: 05/21/08 00:00 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 17:53

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.39	5.0	0.029	J B,Z
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	0.43	5.0	0.38	J B,X
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.070	5.0	0.034	J B,Z
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.48	5.0	0.41	J B,Z
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: 80550002.d

Sampled: 05/21/08 00:00 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 17:53

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	10.4	52	20 - 110	
Phenol-d6	20.0	7.59	38	10 - 115	
Nitrobenzene-d5	10.4	9.97	96	40 - 110	
2-Fluorobiphenyl	10.0	9.03	90	50 - 110	
2,4,6-Tribromophenol	20.1	19.3	96	40 - 125	
o-Terphenyl	10.0	10.6	106	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	172724	4.87	189490	4.86	
Naphthalene-d8	562563	6.36	609978	6.36	
Acenaphthene-d10	332087	8.35	357547	8.35	
Phenanthrene-d10	500448	10	537983	10	
Chrysene-d12	397374	12.93	450845	12.93	

00854

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: 80550002.d

Sampled: 05/21/08 00:00 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 17:53

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	370470	14.4	358240	14.39	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: 80554601.d

Sampled: 05/22/08 11:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 18:21

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.020	0.50	0.013	J
208-96-8	Acenaphthylene	1	0.020	0.50	0.012	J
98-86-2	Acetophenone	1	0.060	5.0	0.043	J
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	0.030	5.0	0.015	J
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.41	5.0	0.029	J B
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	0.030	5.0	0.016	J
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	0.060	5.0	0.016	J
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	0.020	5.0	0.016	J
84-74-2	Di-n-butyl Phthalate	1	5.0	5.0	0.38	U
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.090	5.0	0.034	J B
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.66	5.0	0.41	J B
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: 80554601.d

Sampled: 05/22/08 11:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 18:21

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	0.070	5.0	0.038	J JM
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	0.030	5.0	0.015	J
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.040	0.50	0.023	J
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	0.040	5.0	0.028	J BJZ
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	10.5	52	20 - 110	
Phenol-d6	20.0	7.10	36	10 - 115	
Nitrobenzene-d5	10.4	9.65	93	40 - 110	
2-Fluorobiphenyl	10.0	8.00	80	50 - 110	
2,4,6-Tribromophenol	20.1	18.7	93	40 - 125	
o-Terphenyl	10.0	9.76	98	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	169870	4.87	189490	4.86	
Naphthalene-d8	542666	6.36	609978	6.36	
Acenaphthene-d10	322977	8.36	357547	8.35	
Phenanthrene-d10	489161	10	537983	10	
Chrysene-d12	397894	12.93	450845	12.93	

00877

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-01
File ID: 80554601.d
Sampled: 05/22/08 11:30
Prepared: 05/28/08 16:26
Analyzed: 05/30/08 18:21
Solids:
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
QC Batch: 0806214
Sequence: 8060612
Calibration: 8F06011
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	367011	14.4	358240	14.39	

* Values outside of QC limits

000879

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: 80554602.d

Sampled: 05/22/08 13:40 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 18:48

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.40	5.0	0.029	J B2E
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	5.0	5.0	0.38	U
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.050	5.0	0.034	J B2E
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.47	5.0	0.41	J B2E
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: 80554602.d

Sampled: 05/22/08 13:40 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 18:48

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	11.0	55	20 - 110	
Phenol-d6	20.0	7.56	38	10 - 115	
Nitrobenzene-d5	10.4	9.71	93	40 - 110	
2-Fluorobiphenyl	10.0	8.58	86	50 - 110	
2,4,6-Tribromophenol	20.1	19.4	97	40 - 125	
o-Terphenyl	10.0	10.4	104	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	171388	4.87	189490	4.86	
Naphthalene-d8	565524	6.36	609978	6.36	
Acenaphthene-d10	326008	8.35	357547	8.35	
Phenanthrene-d10	483750	10	537983	10	
Chrysene-d12	391959	12.93	450845	12.93	

00913

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: 80554602.d

Sampled: 05/22/08 13:40 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 18:48

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	367248	14.4	358240	14.39	

* Values outside of QC limits

00914

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: 80554603.d

Sampled: 05/22/08 10:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 19:16

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	5.0	5.0	0.029	U
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	5.0	5.0	0.38	U
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.060	5.0	0.034	J B7Z
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.87	5.0	0.41	J B7Z
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: 80554603.d

Sampled: 05/22/08 10:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 19:16

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	0.030	5.0	0.028	J B2E
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	9.96	49	20 - 110	
Phenol-d6	20.0	6.73	34	10 - 115	
Nitrobenzene-d5	10.4	9.40	90	40 - 110	
2-Fluorobiphenyl	10.0	8.32	83	50 - 110	
2,4,6-Tribromophenol	20.1	17.9	89	40 - 125	
o-Terphenyl	10.0	10.2	102	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	176649	4.87	189490	4.86	
Naphthalene-d8	571143	6.36	609978	6.36	
Acenaphthene-d10	329762	8.35	357547	8.35	
Phenanthrene-d10	473948	10	537983	10	
Chrysene-d12	344796	12.93	450845	12.93	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW1

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-03
File ID: 80554603.d
Sampled: 05/22/08 10:30
Prepared: 05/28/08 16:26
Analyzed: 05/30/08 19:16
Solids:
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
QC Batch: 0806214
Sequence: 8060612
Calibration: 8F06011
Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	324918	14.4	358240	14.39	

* Values outside of QC limits

: 009934

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: 80554604.d

Sampled: 05/22/08 14:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 19:44

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.38	5.0	0.029	J B, E
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	3.4	5.0	0.38	J
91-94-1	3,3´-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.040	5.0	0.034	J B, E
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	1.1	5.0	0.41	J B, E
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

000954

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: 80554604.d

Sampled: 05/22/08 14:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 19:44

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.2	11.1	55	20 - 110	
Phenol-d6	20.0	7.74	39	10 - 115	
Nitrobenzene-d5	10.4	9.94	96	40 - 110	
2-Fluorobiphenyl	10.0	9.02	90	50 - 110	
2,4,6-Tribromophenol	20.1	19.5	97	40 - 125	
o-Terphenyl	10.0	10.5	105	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	166526	4.87	189490	4.86	
Naphthalene-d8	547895	6.36	609978	6.36	
Acenaphthene-d10	325396	8.36	357547	8.35	
Phenanthrene-d10	490666	10	537983	10	
Chrysene-d12	405728	12.93	450845	12.93	

00955

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: 80554604.d

Sampled: 05/22/08 14:30 Prepared: 05/28/08 16:26 Analyzed: 05/30/08 19:44

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	367155	14.4	358240	14.39	

* Values outside of QC limits

: 000956

SAMPLE ID SUMMARY

USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

ANALYSIS DATA SHEET

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: A72_032-0

Sampled: 05/21/08 15:10 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 12:02

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.181	90	25 - 140	
Decachlorobiphenyl	0.200	0.188	94	30 - 135	

* Values outside of QC limits

00367

ANALYSIS DATA SHEET

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: A72_023-0

Sampled: 05/21/08 00:00 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 06:04

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 990 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.202	0.133	66	25 - 140	
Decachlorobiphenyl	0.202	0.185	91	30 - 135	

* Values outside of QC limits

00356

ANALYSIS DATA SHEET

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: A72_022-0

Sampled: 05/22/08 11:30 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 05:25

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.148	74	25 - 140	
Decachlorobiphenyl	0.200	0.180	90	30 - 135	

* Values outside of QC limits

00405

ANALYSIS DATA SHEET

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: A72_031-0

Sampled: 05/22/08 13:40 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 11:23

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.170	85	25 - 140	
Decachlorobiphenyl	0.200	0.177	88	30 - 135	

* Values outside of QC limits

ANALYSIS DATA SHEET

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: A72_030-0

Sampled: 05/22/08 10:30 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 10:43

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.165	82	25 - 140	
Decachlorobiphenyl	0.200	0.161	80	30 - 135	

* Values outside of QC limits

: 00425

ANALYSIS DATA SHEET

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: A72_029-0

Sampled: 05/22/08 14:30 Prepared: 05/27/08 10:23 Analyzed: 06/10/08 10:03

Solids: Preparation: 3510C Liquid-Liquid Ex(Initial/Final: 1000 mL / 2 mL

QC Batch: 0806158 Sequence: 8061120 Calibration: 8F11003 Instrument: 199

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
319-84-6	alpha-BHC	1	0.050	0.050	0.0019	U
319-85-7	beta-BHC	1	0.050	0.050	0.0032	U
58-89-9	gamma-BHC (Lindane)	1	0.050	0.050	0.0018	U
319-86-8	delta-BHC	1	0.10	0.10	0.0023	U
5103-71-9	alpha-Chlordane	1	0.050	0.050	0.0021	U
5103-74-2	gamma-Chlordane	1	0.050	0.050	0.0021	U
72-54-8	4,4'-DDD	1	0.10	0.10	0.0019	U
72-55-9	4,4'-DDE	1	0.10	0.10	0.0027	U
50-29-3	4,4'-DDT	1	0.10	0.10	0.0020	U
309-00-2	Aldrin	1	0.050	0.050	0.0079	U
60-57-1	Dieldrin	1	0.050	0.050	0.0020	U
959-98-8	Endosulfan I	1	0.10	0.10	0.0023	U
33213-65-9	Endosulfan II	1	0.10	0.10	0.0018	U
1031-07-8	Endosulfan Sulfate	1	0.10	0.10	0.0033	U
72-20-8	Endrin	1	0.10	0.10	0.0020	U
7421-93-4	Endrin Aldehyde	1	0.10	0.10	0.0029	U
53494-70-5	Endrin Ketone	1	0.050	0.050	0.0033	U
76-44-8	Heptachlor	1	0.050	0.050	0.0030	U
1024-57-3	Heptachlor Epoxide	1	0.050	0.050	0.0021	U
72-43-5	Methoxychlor	1	0.50	0.50	0.0052	U
8001-35-2	Toxaphene	1	5.0	5.0	0.10	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Tetrachloro-m-xylene	0.200	0.177	89	25 - 140	
Decachlorobiphenyl	0.200	0.181	90	30 - 135	

* Values outside of QC limits

: 00432

SAMPLE ID SUMMARY

USEPA-8082

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

00083

ANALYSIS DATA SHEET

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: A009015-0

Sampled: 05/21/08 15:10 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 14:52

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.200	0.165	83	40 - 135	
Tetrachloro-m-xylene	0.200	0.154	77	36 - 114	

* Values outside of QC limits

ANALYSIS DATA SHEET

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: A009016-0

Sampled: 05/21/08 00:00 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 15:17

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 990 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.202	0.166	82	40 - 135	
Tetrachloro-m-xylene	0.202	0.110	54	36 - 114	

* Values outside of QC limits

001105

ANALYSIS DATA SHEET

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: A009018-0

Sampled: 05/22/08 11:30 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 16:06

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.200	0.161	81	40 - 135	
Tetrachloro-m-xylene	0.200	0.125	63	36 - 114	

* Values outside of QC limits

: 00114

ANALYSIS DATA SHEET

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: A009019-0

Sampled: 05/22/08 13:40 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 16:31

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.200	0.168	84	40 - 135	
Tetrachloro-m-xylene	0.200	0.147	73	36 - 114	

* Values outside of QC limits

00123

ANALYSIS DATA SHEET

45MW1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-03 File ID: A009020-0

Sampled: 05/22/08 10:30 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 16:56

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% Rec.	QC Limits	Q
Decachlorobiphenyl	0.200	0.159	80	40 - 135	
Tetrachloro-m-xylene	0.200	0.143	72	36 - 114	

* Values outside of QC limits

00132

ANALYSIS DATA SHEET

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, W(

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: A009021-0

Sampled: 05/22/08 14:30 Prepared: 05/27/08 07:24 Analyzed: 05/29/08 17:21

Solids: Preparation: 3510C Liquid-Liquid Ex Initial/Final: 1000 mL / 2 mL

QC Batch: 0806159 Sequence: 8053011 Calibration: 8E30004 Instrument: 144

CAS No.	Analyst	Dilution	CONC. (ug/L)	MRL	MDL	Q
12674-11-2	PCB-1016	1	0.20	0.20	0.050	U
11104-28-2	PCB-1221	1	0.20	0.20	0.068	U
11141-16-5	PCB-1232	1	0.20	0.20	0.031	U
53469-21-9	PCB-1242	1	0.20	0.20	0.035	U
12672-29-6	PCB-1248	1	0.20	0.20	0.040	U
11097-69-1	PCB-1254	1	0.20	0.20	0.034	U
11096-82-5	PCB-1260	1	0.20	0.20	0.034	U
37324-23-5	PCB-1262	1	0.20	0.20	0.022	U
11100-14-4	PCB-1268	1	0.20	0.20	0.049	U
System Monitoring Compound		**ADDED (ug/L)**	**CONC (ug/L)**	**% Rec.**	**QC Limits**	**Q**
Decachlorobiphenyl		0.200	0.159	80	40 - 135	
Tetrachloro-m-xylene		0.200	0.152	76	36 - 114	

* Values outside of QC limits

: 00141

SAMPLE ID SUMMARY

USEPA-8330

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW3	0805546-02RE1
45MW1	0805546-03
EQBK-3	0805546-04

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-01 File ID: EXPa013-0

Sampled: 05/21/08 15:10 Prepared: 05/28/08 16:21 Analyzed: 05/30/08 21:23

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806212 Sequence: 8052962 Calibration: 8F02007 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.35	72	29 - 138	

* Values outside of QC limits

01222

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: EXPa014-0

Sampled: 05/21/08 00:00 Prepared: 05/28/08 16:21 Analyzed: 05/30/08 22:05

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806212 Sequence: 8052962 Calibration: 8F02007 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.09	64	29 - 138	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45MW4

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-01 File ID: EXPa015-0

Sampled: 05/22/08 11:30 Prepared: 05/28/08 16:21 Analyzed: 05/30/08 22:48

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806212 Sequence: 8052962 Calibration: 8F02007 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.11	65	29 - 138	

* Values outside of QC limits

01228

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45MW3

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS; WO 002
Matrix: Ground Water
Laboratory ID: 0805546-02
File ID: EXPa016-0
Sampled: 05/22/08 13:40
Prepared: 05/28/08 16:21
Analyzed: 05/30/08 23:30
Solids:
Preparation: 8330 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806212
Sequence: 8052962
Calibration: 8F02007
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	0.48	5.0	0.20	J

J, Q

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.52	78	29 - 138	

* Values outside of QC limits

Do Not use for WZU06

01231

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02RE1 File ID: data005-0

Sampled: 05/22/08 13:40 Prepared: 05/28/08 16:21 Analyzed: 05/31/08 13:23

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806212 Sequence: 8060244 Calibration: 8F02008 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	0.77	5.0	0.20	J

J/g

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.63	81	29 - 138	

* Values outside of QC limits

: 61301

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

45MW1

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-03
File ID: EXPa017-0
Sampled: 05/22/08 10:30
Prepared: 05/28/08 16:21
Analyzed: 05/31/08 00:12
Solids:
Preparation: 8330 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806212
Sequence: 8052962
Calibration: 8F02007
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.14	66	29 - 138	

* Values outside of QC limits

01234

ORGANIC ANALYSIS DATA SHEET
USEPA-8330

EQBK-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-04 File ID: EXPa018-0

Sampled: 05/22/08 14:30 Prepared: 05/28/08 16:21 Analyzed: 05/31/08 00:55

Solids: Preparation: 8330 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806212 Sequence: 8052962 Calibration: 8F02007 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
99-35-4	1,3,5-Trinitrobenzene	1	5.0	5.0	0.045	U
99-65-0	1,3-Dinitrobenzene	1	5.0	5.0	0.071	U
118-96-7	2,4,6-Trinitrotoluene	1	5.0	5.0	0.10	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.092	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.16	U
35572-78-2	2-Amino-4,6-dinitrotoluene	1	5.0	5.0	0.24	U
88-72-2	2-Nitrotoluene	1	5.0	5.0	0.28	U
99-08-1	3-Nitrotoluene	1	5.0	5.0	0.17	U
1946-51-0	4-Amino-2,6-dinitrotoluene	1	5.0	5.0	0.22	U
99-99-0	4-Nitrotoluene	1	5.0	5.0	0.49	U
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1	5.0	5.0	0.092	U
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	1	5.0	5.0	0.15	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.15	U
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1	5.0	5.0	0.20	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
4-Nitroaniline	3.25	2.38	73	29 - 138	

* Values outside of QC limits

: 01237

SAMPLE ID SUMMARY

USEPA-8332

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

: 01361

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45MW2

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805500-01
File ID: NGPT005-0
Sampled: 05/21/08 15:10
Prepared: 05/28/08 12:23
Analyzed: 05/28/08 16:04
Solids:
Preparation: 8332 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806213
Sequence: 8052965
Calibration: 8E23023
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	2.99	93	50 - 150	

* Values outside of QC limits

01370

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

DUP-3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805500-02 File ID: NGPT006-0

Sampled: 05/21/08 00:00 Prepared: 05/28/08 12:23 Analyzed: 05/28/08 16:26

Solids: Preparation: 8332 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806213 Sequence: 8052965 Calibration: 8E23023 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	3.08	96	50 - 150	

* Values outside of QC limits

01373

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45MW4

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-01
File ID: NGPT007-0
Sampled: 05/22/08 11:30
Prepared: 05/28/08 12:23
Analyzed: 05/28/08 16:49
Solids:
Preparation: 8332 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806213
Sequence: 8052965
Calibration: 8E23023
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	3.12	97	50 - 150	

* Values outside of QC limits

01376

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45MW3

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0805546-02 File ID: NGPT008-0

Sampled: 05/22/08 13:40 Prepared: 05/28/08 12:23 Analyzed: 05/28/08 17:11

Solids: Preparation: 8332 Extraction Initial/Final: 770 mL / 10 mL

QC Batch: 0806213 Sequence: 8052965 Calibration: 8E23023 Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	3.24	101	50 - 150	

* Values outside of QC limits

01379

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

45MW1

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-03
File ID: NGPT009-0
Sampled: 05/22/08 10:30
Prepared: 05/28/08 12:23
Analyzed: 05/28/08 17:34
Solids:
Preparation: 8332 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806213
Sequence: 8052965
Calibration: 8E23023
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	2.94	91	50 - 150	

* Values outside of QC limits

01382

ORGANIC ANALYSIS DATA SHEET
USEPA-8332

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Ground Water
Laboratory ID: 0805546-04
File ID: NGPT010-0
Sampled: 05/22/08 14:30
Prepared: 05/28/08 12:23
Analyzed: 05/28/08 17:56
Solids:
Preparation: 8332 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806213
Sequence: 8052965
Calibration: 8E23023
Instrument: 221

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
55-63-0	Nitroglycerin	1	5.0	5.0	0.58	U
78-11-5	Pentaerythritol Tetranitrate	1	5.0	5.0	0.61	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
1-Nitronaphthalene	3.22	2.99	93	50 - 150	

* Values outside of QC limits

01385

SAMPLE ID SUMMARY

USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

014445

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	550	ug/L	1	50	20		05/30/08 09:50 KIM
7440-70-2	Calcium, Total	75000	ug/L	1	500	69		05/30/08 09:50
7439-89-6	Iron, Total	1100	ug/L	1	20	9.6		05/30/08 09:50
7439-95-4	Magnesium, Total	23000	ug/L	1	500	63		05/30/08 09:50
7440-09-7	Potassium, Total	450	ug/L	1	500	62	J	05/30/08 09:50
7440-23-5	Sodium, Total	4200	ug/L	1	500	210		05/30/08 09:50

01456

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 09:23
7440-70-2	Calcium, Dissolved	62000	ug/L	1	500	69		06/03/08 09:23
7439-89-6	Iron, Dissolved	10	ug/L	1	20	9.6	J	06/03/08 09:23
7439-95-4	Magnesium, Dissolved	20000	ug/L	1	500	63		06/03/08 09:23
7440-09-7	Potassium, Dissolved	270	ug/L	1	200	62		06/03/08 09:23 B, P
7440-23-5	Sodium, Dissolved	3900	ug/L	1	500	210		06/03/08 11:36

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	890	ug/L	1	50	20		05/30/08 09:54 KM
7440-70-2	Calcium, Total	60000	ug/L	1	500	69		05/30/08 09:54
7439-89-6	Iron, Total	1800	ug/L	1	20	9.6		05/30/08 09:54
7439-95-4	Magnesium, Total	20000	ug/L	1	500	63		05/30/08 09:54
7440-09-7	Potassium, Total	560	ug/L	1	200	62		05/30/08 09:54
7440-23-5	Sodium, Total	4100	ug/L	1	500	210		05/30/08 09:54

01452

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 09:27
7440-70-2	Calcium, Dissolved	60000	ug/L	1	500	69		06/03/08 09:27
7439-89-6	Iron, Dissolved	20	ug/L	1	20	9.6	U	06/03/08 09:27
7439-95-4	Magnesium, Dissolved	19000	ug/L	1	500	63		06/03/08 09:27
7440-09-7	Potassium, Dissolved	250	ug/L	1	200	62		06/03/08 09:27
7440-23-5	Sodium, Dissolved	3900	ug/L	1	500	210		06/03/08 11:40

B,P

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	2400	ug/L	1	50	20		05/30/08 09:58 KIM
7440-70-2	Calcium, Total	74000	ug/L	1	500	69		05/30/08 09:58
7439-89-6	Iron, Total	4100	ug/L	1	20	9.6		05/30/08 09:58
7439-95-4	Magnesium, Total	33000	ug/L	1	500	63		05/30/08 09:58
7440-09-7	Potassium, Total	980	ug/L	1	200	62		05/30/08 09:58
7440-23-5	Sodium, Total	7000	ug/L	1	500	210		05/30/08 09:58

014954

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 09:32
7440-70-2	Calcium, Dissolved	70000	ug/L	1	500	69		06/03/08 09:32
7439-89-6	Iron, Dissolved	26	ug/L	1	20	9.6		06/03/08 09:32
7439-95-4	Magnesium, Dissolved	31000	ug/L	1	500	63		06/03/08 09:32
7440-09-7	Potassium, Dissolved	450	ug/L	1	200	62		06/03/08 09:32 B,P
7440-23-5	Sodium, Dissolved	6700	ug/L	1	500	210		06/03/08 11:45

01455

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	210	ug/L	1	50	20		05/30/08 10:18 KIM
7440-70-2	Calcium, Total	69000	ug/L	1	500	69		05/30/08 10:18
7439-89-6	Iron, Total	480	ug/L	1	20	9.6		05/30/08 10:18
7439-95-4	Magnesium, Total	21000	ug/L	1	500	63		05/30/08 10:18
7440-09-7	Potassium, Total	680	ug/L	1	200	62		05/30/08 10:18
7440-23-5	Sodium, Total	4900	ug/L	1	500	210		05/30/08 10:18

: 01456

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 09:53
7440-70-2	Calcium, Dissolved	68000	ug/L	1	500	69		06/03/08 09:53
7439-89-6	Iron, Dissolved	20	ug/L	1	20	9.6	U	06/03/08 09:53
7439-95-4	Magnesium, Dissolved	20000	ug/L	1	500	63		06/03/08 09:53
7440-09-7	Potassium, Dissolved	550	ug/L	1	200	62		06/03/08 09:53 B,P
7440-23-5	Sodium, Dissolved	4700	ug/L	1	500	210		06/03/08 12:06

01457

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	760	ug/L	1	50	20		05/30/08 10:30 KIM
7440-70-2	Calcium, Total	99000	ug/L	1	500	69		05/30/08 10:30
7439-89-6	Iron, Total	1400	ug/L	1	20	9.6		05/30/08 10:30
7439-95-4	Magnesium, Total	35000	ug/L	1	500	63		05/30/08 10:30
7440-09-7	Potassium, Total	1100	ug/L	1	200	62		05/30/08 10:30
7440-23-5	Sodium, Total	19000	ug/L	1	500	210		05/30/08 10:30

01468

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 10:09
7440-70-2	Calcium, Dissolved	96000	ug/L	1	500	69		06/03/08 10:09
7439-89-6	Iron, Dissolved	20	ug/L	1	20	9.6	U	06/03/08 10:10
7439-95-4	Magnesium, Dissolved	33000	ug/L	1	500	63		06/03/08 10:09
7440-09-7	Potassium, Dissolved	790	ug/L	1	200	62		06/03/08 10:09
7440-23-5	Sodium, Dissolved	19000	ug/L	1	500	210		06/03/08 12:19

BR

014456

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3010A Digestion
Prepared: 05/28/08 07:58
Initial/Final: 25 mL / 25 mL
QC Batch: 0806244

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Total	50	ug/L	1	50	20	U	05/30/08 10:34
7440-70-2	Calcium, Total	500	ug/L	1	500	69	U	05/30/08 10:34
7439-89-6	Iron, Total	84	ug/L	1	20	9.6		05/30/08 10:34
7439-95-4	Magnesium, Total	500	ug/L	1	500	63	U	05/30/08 10:34
7440-09-7	Potassium, Total	200	ug/L	1	200	62	U	05/30/08 10:34
7440-23-5	Sodium, Total	500	ug/L	1	500	210	U	05/30/08 10:34

01450

INORGANIC ANALYSIS DATA SHEET
USEPA-6010B

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:32
Initial/Final: 25 mL / 25 mL
QC Batch: 0806374

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7429-90-5	Aluminum, Dissolved	50	ug/L	1	50	20	U	06/03/08 10:14
7440-70-2	Calcium, Dissolved	500	ug/L	1	500	69	U	06/03/08 10:14
7439-89-6	Iron, Dissolved	20	ug/L	1	20	9.6	U	06/03/08 10:14
7439-95-4	Magnesium, Dissolved	500	ug/L	1	500	63	U	06/03/08 10:14
7440-09-7	Potassium, Dissolved	200	ug/L	1	200	62	U	06/03/08 10:14
7440-23-5	Sodium, Dissolved	500	ug/L	1	500	210	U	06/03/08 12:23

: 01461

SAMPLE ID SUMMARY

USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

01599

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	06/02/08 18:24	
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	06/02/08 18:24	
7440-39-3	Barium, Total	56	ug/L	1	2.0	0.23		06/02/08 18:24	
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 18:24	
7440-43-9	Cadmium, Total	0.20	ug/L	1	0.20	0.056	U	06/02/08 18:24	
7440-47-3	Chromium, Total	4.9	ug/L	1	2.0	0.33		06/03/08 09:01	J,F
7440-48-4	Cobalt, Total	3.6	ug/L	1	1.0	0.050		06/02/08 18:24	J,F
7440-50-8	Copper, Total	1.2	ug/L	1	1.0	0.29		06/02/08 18:24	
7439-92-1	Lead, Total	0.77	ug/L	1	1.0	0.29	J	06/02/08 18:24	
7439-96-5	Manganese, Total	44	ug/L	1	3.0	0.30		06/02/08 18:24	
7440-02-0	Nickel, Total	2.7	ug/L	1	2.0	0.35		06/02/08 18:24	J,F
7782-49-2	Selenium, Total	0.88	ug/L	1	3.0	0.30	J	06/03/08 09:01	
7440-22-4	Silver, Total	0.16	ug/L	1	0.50	0.061	J	06/02/08 18:24	
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 18:24	
7440-62-2	Vanadium, Total	1.9	ug/L	1	5.0	0.27	J	06/02/08 18:24	
7440-66-6	Zinc, Total	9.5	ug/L	1	10	1.8	J	06/02/08 18:24	B,X

01788

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Dissolved	3.0	ug/L	1	3.0	0.32	U	06/02/08 19:49
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 19:49
7440-39-3	Barium, Dissolved	47	ug/L	1	2.0	0.23		06/02/08 19:49
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:49
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 19:49
7440-47-3	Chromium, Dissolved	2.0	ug/L	1	2.0	0.33		06/03/08 11:50 B,P
7440-48-4	Cobalt, Dissolved	2.2	ug/L	1	1.0	0.050		06/02/08 19:49
7440-50-8	Copper, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:49
7439-92-1	Lead, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:49
7439-96-5	Manganese, Dissolved	4.2	ug/L	1	3.0	0.30		06/02/08 19:49
7440-02-0	Nickel, Dissolved	2.6	ug/L	1	2.0	0.35		06/02/08 19:49
7782-49-2	Selenium, Dissolved	0.54	ug/L	1	3.0	0.30	J	06/03/08 09:41
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 19:49
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 19:49
7440-62-2	Vanadium, Dissolved	0.44	ug/L	1	5.0	0.27	J	06/02/08 19:49
7440-66-6	Zinc, Dissolved	11	ug/L	1	10	1.8		06/02/08 19:49 B,X

01781

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	06/02/08 18:29	
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	06/02/08 18:29	
7440-39-3	Barium, Total	52	ug/L	1	2.0	0.23		06/02/08 18:29	
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 18:29	
7440-43-9	Cadmium, Total	0.064	ug/L	1	0.20	0.056	J	06/02/08 18:29	
7440-47-3	Chromium, Total	12	ug/L	1	2.0	0.33		06/03/08 09:04	J,f
7440-48-4	Cobalt, Total	11	ug/L	1	1.0	0.050		06/02/08 18:29	J,f
7440-50-8	Copper, Total	1.9	ug/L	1	1.0	0.29		06/02/08 18:29	
7439-92-1	Lead, Total	1.2	ug/L	1	1.0	0.29		06/02/08 18:29	
7439-96-5	Manganese, Total	57	ug/L	1	3.0	0.30		06/02/08 18:29	
7440-02-0	Nickel, Total	9.8	ug/L	1	2.0	0.35		06/02/08 18:29	J,f
7782-49-2	Selenium, Total	0.67	ug/L	1	3.0	0.30	J	06/03/08 09:04	
7440-22-4	Silver, Total	0.64	ug/L	1	0.50	0.061		06/02/08 18:29	
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 18:29	
7440-62-2	Vanadium, Total	2.8	ug/L	1	5.0	0.27	J	06/02/08 18:29	
7440-66-6	Zinc, Total	6.3	ug/L	1	10	1.8	J	06/02/08 18:29	B,X

017702

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7440-36-0	Antimony, Dissolved	3.0	ug/L	1	3.0	0.32	U	06/02/08 20:59	
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 20:59	
7440-39-3	Barium, Dissolved	45	ug/L	1	2.0	0.23		06/02/08 20:59	
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 20:59	
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 20:59	
7440-47-3	Chromium, Dissolved	1.9	ug/L	1	2.0	0.33	J	06/03/08 11:53	B, P
7440-48-4	Cobalt, Dissolved	1.4	ug/L	1	1.0	0.050		06/02/08 20:59	
7440-50-8	Copper, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 20:59	
7439-92-1	Lead, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 20:59	
7439-96-5	Manganese, Dissolved	2.8	ug/L	1	3.0	0.30	J	06/02/08 20:59	
7440-02-0	Nickel, Dissolved	1.9	ug/L	1	2.0	0.35	J	06/02/08 20:59	
7782-49-2	Selenium, Dissolved	0.62	ug/L	1	3.0	0.30	J	06/03/08 09:44	
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 20:59	
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 20:59	
7440-62-2	Vanadium, Dissolved	0.36	ug/L	1	5.0	0.27	J	06/02/08 20:59	
7440-66-6	Zinc, Dissolved	4.1	ug/L	1	10	1.8	J	06/02/08 20:59	B, X

01783

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	06/02/08 18:33
7440-38-2	Arsenic, Total	0.56	ug/L	1	3.0	0.24	J	06/02/08 18:33
7440-39-3	Barium, Total	80	ug/L	1	2.0	0.23		06/02/08 18:33
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 18:33
7440-43-9	Cadmium, Total	0.11	ug/L	1	0.20	0.056	J	06/02/08 18:33
7440-47-3	Chromium, Total	11	ug/L	1	2.0	0.33		06/03/08 09:07
7440-48-4	Cobalt, Total	3.0	ug/L	1	1.0	0.050		06/02/08 18:33
7440-50-8	Copper, Total	4.1	ug/L	1	1.0	0.29		06/02/08 18:33
7439-92-1	Lead, Total	1.6	ug/L	1	1.0	0.29		06/02/08 18:33
7439-96-5	Manganese, Total	190	ug/L	1	3.0	0.30		06/02/08 18:33
7440-02-0	Nickel, Total	9.5	ug/L	1	2.0	0.35		06/02/08 18:33
7782-49-2	Selenium, Total	0.38	ug/L	1	3.0	0.30	J	06/03/08 09:07
7440-22-4	Silver, Total	0.50	ug/L	1	0.50	0.061	U	06/02/08 18:33
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 18:33
7440-62-2	Vanadium, Total	6.6	ug/L	1	5.0	0.27		06/02/08 18:33
7440-66-6	Zinc, Total	10	ug/L	1	10	1.8		06/02/08 18:33

B, X

017084

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Dissolved	3.0	ug/L	1	3.0	0.32	U	06/02/08 19:58
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 19:58
7440-39-3	Barium, Dissolved	57	ug/L	1	2.0	0.23		06/02/08 19:58
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:58
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 19:58
7440-47-3	Chromium, Dissolved	3.4	ug/L	1	2.0	0.33		06/03/08 09:47
7440-48-4	Cobalt, Dissolved	1.3	ug/L	1	1.0	0.050		06/02/08 19:58
7440-50-8	Copper, Dissolved	0.31	ug/L	1	1.0	0.29	J	06/02/08 19:58
7439-92-1	Lead, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:58
7439-96-5	Manganese, Dissolved	9.5	ug/L	1	3.0	0.30		06/02/08 19:58
7440-02-0	Nickel, Dissolved	8.1	ug/L	1	2.0	0.35		06/02/08 19:58
7782-49-2	Selenium, Dissolved	3.0	ug/L	1	3.0	0.30	U	06/03/08 09:47
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 19:58
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 19:58
7440-62-2	Vanadium, Dissolved	0.50	ug/L	1	5.0	0.27	J	06/02/08 19:58
7440-66-6	Zinc, Dissolved	3.8	ug/L	1	10	1.8	J	06/02/08 19:58

B, X

01765

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	06/02/08 19:04
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	06/02/08 19:04
7440-39-3	Barium, Total	46	ug/L	1	2.0	0.23		06/02/08 19:04
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:04
7440-43-9	Cadmium, Total	0.20	ug/L	1	0.20	0.056	U	06/02/08 19:04
7440-47-3	Chromium, Total	4.2	ug/L	1	2.0	0.33		06/03/08 09:21
7440-48-4	Cobalt, Total	2.9	ug/L	1	1.0	0.050		06/02/08 19:04
7440-50-8	Copper, Total	0.86	ug/L	1	1.0	0.29	J	06/02/08 19:04
7439-92-1	Lead, Total	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:04
7439-96-5	Manganese, Total	32	ug/L	1	3.0	0.30		06/02/08 19:04
7440-02-0	Nickel, Total	2.6	ug/L	1	2.0	0.35		06/02/08 19:04
7782-49-2	Selenium, Total	0.48	ug/L	1	3.0	0.30	J	06/03/08 09:21
7440-22-4	Silver, Total	0.50	ug/L	1	0.50	0.061	U	06/02/08 19:04
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 19:04
7440-62-2	Vanadium, Total	0.83	ug/L	1	5.0	0.27	J	06/02/08 19:04
7440-66-6	Zinc, Total	3.9	ug/L	1	10	1.8	J	06/02/08 19:04 B,X

01765

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7440-36-0	Antimony, Dissolved	1.1	ug/L	1	3.0	0.32	J	06/02/08 20:46	
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 20:46	
7440-39-3	Barium, Dissolved	42	ug/L	1	2.0	0.23		06/02/08 20:46	
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 20:46	
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 20:46	
7440-47-3	Chromium, Dissolved	1.6	ug/L	1	2.0	0.33	J	06/02/08 20:46	B,P
7440-48-4	Cobalt, Dissolved	1.9	ug/L	1	1.0	0.050		06/02/08 20:46	
7440-50-8	Copper, Dissolved	0.41	ug/L	1	1.0	0.29	J	06/02/08 20:46	
7439-92-1	Lead, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 20:46	
7439-96-5	Manganese, Dissolved	1.3	ug/L	1	3.0	0.30	J	06/02/08 20:46	
7440-02-0	Nickel, Dissolved	1.3	ug/L	1	2.0	0.35	J	06/02/08 20:46	
7782-49-2	Selenium, Dissolved	0.54	ug/L	1	3.0	0.30	J	06/03/08 10:16	
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 20:46	
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 20:46	
7440-62-2	Vanadium, Dissolved	0.31	ug/L	1	5.0	0.27	J	06/02/08 20:46	B,O
7440-66-6	Zinc, Dissolved	2.7	ug/L	1	10	1.8	J	06/02/08 20:46	B,X

01707

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	0.60	ug/L	1	3.0	0.32	J	06/02/08 19:24
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	06/02/08 19:24
7440-39-3	Barium, Total	75	ug/L	1	2.0	0.23		06/02/08 19:24
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:24
7440-43-9	Cadmium, Total	0.10	ug/L	1	0.20	0.056	J	06/02/08 19:24
7440-47-3	Chromium, Total	8.9	ug/L	1	2.0	0.33		06/03/08 09:30
7440-48-4	Cobalt, Total	3.2	ug/L	1	1.0	0.050		06/02/08 19:24
7440-50-8	Copper, Total	4.8	ug/L	1	1.0	0.29		06/02/08 19:24
7439-92-1	Lead, Total	7.9	ug/L	1	1.0	0.29		06/02/08 19:24
7439-96-5	Manganese, Total	81	ug/L	1	3.0	0.30		06/02/08 19:24
7440-02-0	Nickel, Total	5.9	ug/L	1	2.0	0.35		06/02/08 19:24
7782-49-2	Selenium, Total	0.63	ug/L	1	3.0	0.30	J	06/03/08 09:30
7440-22-4	Silver, Total	0.19	ug/L	1	0.50	0.061	J	06/02/08 19:24
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 19:24
7440-62-2	Vanadium, Total	2.6	ug/L	1	5.0	0.27	J	06/02/08 19:24
7440-66-6	Zinc, Total	9.3	ug/L	1	10	1.8	J	06/02/08 19:24 BJX

01783

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Dissolved	0.43	ug/L	1	3.0	0.32	J	06/02/08 20:50
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 20:50
7440-39-3	Barium, Dissolved	66	ug/L	1	2.0	0.23		06/02/08 20:50
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 20:50
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 20:50
7440-47-3	Chromium, Dissolved	3.8	ug/L	1	2.0	0.33		06/03/08 10:19
7440-48-4	Cobalt, Dissolved	0.43	ug/L	1	1.0	0.050	J	06/02/08 20:50
7440-50-8	Copper, Dissolved	0.79	ug/L	1	1.0	0.29	J	06/02/08 20:50
7439-92-1	Lead, Dissolved	0.36	ug/L	1	1.0	0.29	J	06/02/08 20:50
7439-96-5	Manganese, Dissolved	3.3	ug/L	1	3.0	0.30		06/02/08 20:50
7440-02-0	Nickel, Dissolved	0.75	ug/L	1	2.0	0.35	J	06/02/08 20:50
7782-49-2	Selenium, Dissolved	0.38	ug/L	1	3.0	0.30	J	06/03/08 10:19
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 20:50
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 20:50
7440-62-2	Vanadium, Dissolved	0.39	ug/L	1	5.0	0.27	J	06/02/08 20:50
7440-66-6	Zinc, Dissolved	5.4	ug/L	1	10	1.8	J	06/02/08 20:50

01769

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3020A Digestion
Prepared: 05/28/08 08:08
Initial/Final: 25 mL / 125 mL
QC Batch: 0806248

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Total	3.0	ug/L	1	3.0	0.32	U	06/02/08 19:29
7440-38-2	Arsenic, Total	3.0	ug/L	1	3.0	0.24	U	06/02/08 19:29
7440-39-3	Barium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:29
7440-41-7	Beryllium, Total	2.0	ug/L	1	2.0	0.23	U	06/02/08 19:29
7440-43-9	Cadmium, Total	0.20	ug/L	1	0.20	0.056	U	06/02/08 19:29
7440-47-3	Chromium, Total	0.68	ug/L	1	2.0	0.33	J	06/02/08 19:29
7440-48-4	Cobalt, Total	1.0	ug/L	1	1.0	0.050	U	06/02/08 19:29
7440-50-8	Copper, Total	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:29
7439-92-1	Lead, Total	1.0	ug/L	1	1.0	0.29	U	06/02/08 19:29
7439-96-5	Manganese, Total	3.0	ug/L	1	3.0	0.30	U	06/02/08 19:29
7440-02-0	Nickel, Total	2.0	ug/L	1	2.0	0.35	U	06/02/08 19:29
7782-49-2	Selenium, Total	3.0	ug/L	1	3.0	0.30	U	06/03/08 09:33
7440-22-4	Silver, Total	0.50	ug/L	1	0.50	0.061	U	06/02/08 19:29
7440-28-0	Thallium, Total	0.20	ug/L	1	0.20	0.050	U	06/02/08 19:29
7440-62-2	Vanadium, Total	0.29	ug/L	1	5.0	0.27	J	06/02/08 19:29
7440-66-6	Zinc, Total	3.0	ug/L	1	10	1.8	J	06/02/08 19:29

B,O

01710

INORGANIC ANALYSIS DATA SHEET
USEPA-6020A

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: General Metals Prep
Prepared: 05/30/08 08:27
Initial/Final: 25 mL / 125 mL
QC Batch: 0806373

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7440-36-0	Antimony, Dissolved	3.0	ug/L	1	3.0	0.32	U	06/02/08 20:55
7440-38-2	Arsenic, Dissolved	3.0	ug/L	1	3.0	0.24	U	06/02/08 20:55
7440-39-3	Barium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 20:55
7440-41-7	Beryllium, Dissolved	2.0	ug/L	1	2.0	0.23	U	06/02/08 20:55
7440-43-9	Cadmium, Dissolved	0.20	ug/L	1	0.20	0.056	U	06/02/08 20:55
7440-47-3	Chromium, Dissolved	0.76	ug/L	1	2.0	0.33	J	06/02/08 20:55 B1P
7440-48-4	Cobalt, Dissolved	1.0	ug/L	1	1.0	0.050	U	06/02/08 20:55
7440-50-8	Copper, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 20:55
7439-92-1	Lead, Dissolved	1.0	ug/L	1	1.0	0.29	U	06/02/08 20:55
7439-96-5	Manganese, Dissolved	3.0	ug/L	1	3.0	0.30	U	06/02/08 20:55
7440-02-0	Nickel, Dissolved	2.0	ug/L	1	2.0	0.35	U	06/02/08 20:55
7782-49-2	Selenium, Dissolved	3.0	ug/L	1	3.0	0.30	U	06/03/08 10:22
7440-22-4	Silver, Dissolved	0.50	ug/L	1	0.50	0.061	U	06/02/08 20:55
7440-28-0	Thallium, Dissolved	0.20	ug/L	1	0.20	0.050	U	06/02/08 20:55
7440-62-2	Vanadium, Dissolved	5.0	ug/L	1	5.0	0.27	U	06/02/08 20:55
7440-66-6	Zinc, Dissolved	2.5	ug/L	1	10	1.8	J	06/02/08 20:55

01711

SAMPLE ID SUMMARY

USEPA-7470A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

02000

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 05/27/08 10:20
Initial/Final: 30 mL / 30 mL
QC Batch: 0806182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	05/28/08 14:20

02005

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 05/27/08 10:57
Initial/Final: 30 mL / 30 mL
QC Batch: 0806184

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	05/28/08 15:12

02016

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 05/27/08 10:20
Initial/Final: 30 mL / 30 mL
QC Batch: 0806182

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	05/28/08 14:35

: 02011

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 05/27/08 10:57
Initial/Final: 30 mL / 30 mL
QC Batch: 0806184

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	05/28/08 15:28

02012

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806474

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	06/05/08 11:17

UL0

02013

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806475

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	06/05/08 12:11

UL10

02014

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806474

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed	
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	06/05/08 11:32	U40

02815

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806475

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	06/05/08 12:26

UL,D

02015

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806474

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	06/05/08 11:37

ULO

02017

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806475

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	06/05/08 12:31

UU
0

02018

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Total
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806474

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Total	0.20	ug/L	1	0.20	0.046	U	06/05/08 11:42

U40

02019

INORGANIC ANALYSIS DATA SHEET
USEPA-7470A

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 7470A Digestion - Dissolved
Prepared: 06/04/08 04:00
Initial/Final: 30 mL / 30 mL
QC Batch: 0806475

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
7439-97-6	Mercury, Dissolved	0.20	ug/L	1	0.20	0.046	U	06/05/08 12:36

U,0

022020

SAMPLE ID SUMMARY

USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.

SDG: 36440-56

Client: URS Corporation

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Client Sample Id:	Lab Sample Id:
45MW2	0805500-01
DUP-3	0805500-02
45MW4	0805546-01
45MW3	0805546-02
45MW1	0805546-03
EQBK-3	0805546-04

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45MW2

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 15:10
Solids: 0.00
Laboratory ID: 0805500-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/27/08 07:20
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	2.25	ug/L	1	10.0	1.90	J	05/29/08 14:00

B,P

02078

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

DUP-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/21/08 00:00
Solids: 0.00
Laboratory ID: 0805500-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/27/08 07:20
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	3.46	ug/L	1	10.0	1.90	J	05/29/08 14:06

B, P

02079

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 11:30
Solids: 0.00
Laboratory ID: 0805546-01

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/28/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	2.48	ug/L	1	10.0	1.90	J	05/29/08 14:13

B, P

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45MW3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 13:40
Solids: 0.00
Laboratory ID: 0805546-02

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/28/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	2.60	ug/L	1	10.0	1.90	J	05/29/08 14:13

BP

02091

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

45MW1

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 10:30
Solids: 0.00
Laboratory ID: 0805546-03

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/28/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	2.21	ug/L	1	10.0	1.90	J	05/29/08 14:13

B, P

INORGANIC ANALYSIS DATA SHEET
USEPA-9012A

EQBK-3

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Ground Water
Sampled: 05/22/08 14:30
Solids: 0.00
Laboratory ID: 0805546-04

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 9010B Cyanide Distillation
Prepared: 05/28/08 07:00
Initial/Final: 50 mL / 50 mL
QC Batch: 0806168

CAS No.	Analyte	Conc.	Units	Dil. Factor	MRL	MDL	Q	Analyzed
57-12-5	Cyanide, Total	2.04	ug/L	1	10.0	1.90	J	05/29/08 14:19

B, P

02083

DATA VALIDATION WORKSHEET

Volatile Organic Analysis by GC/MS

Reviewer: RA
Date: 6/26/08
DV Level: II (III) IV
Review Document:
X NFG - Region III Modifications
X Project QAPP/SAP

Project Name: Radford
Project Number: 11656351
Laboratory: TriMatrix
SDG No.: 36440-56
Test Name: VOC
Method No.: 8260B

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If the temperature of the cooler was elevated (> 10 °C) or bubble size in aqueous sample was too big (tiny bubble is OK.), then flag all positive results with a "L" and all non-detects "UL".			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.			✓

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Were samples preserved on ice for soils and on ice with HCL for aqueous samples?	✓		
2.2	Have any technical holding times (14 days), determined from date of sampling to date of analysis, been exceeded? If yes, L(+)/UL(-).		✓	
2.3	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, L(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks prepared at the appropriate frequency (every 12 hour period per GCMS, matrix, and level)?	✓		
3.2	Do any method blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample]≤ 5X[associated blank]. (or 10 times for the common volatile lab contaminants - methylene chloride, acetone, and 2-butanone)		✓	
3.3	Do any field equipment blanks/trip blanks have positive results? If Yes, use same rules above.	✓		
3.4	Are there field equipment blank/trip blanks associated with every sample? If No, noted in the DV report.	✓		

Notes: Trip Blank 5/21/08 toluene 0.13 ug/L
Trip Blank 5/22/08 " 0.16 " 5X → Blk and Samples
EQBK-3 " 0.15 ug/L

URS

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are at least five standards included in the calibration curve?Are at least five standards included in the calibration curve?	✓		
4.2	Was an initial calibration analyzed at the beginning of each analysis?	✓		
4.3	Was a second source calibration verification analyzed for each calibration curve?	✓		
4.4	Has a continuing calibration standard been analyzed for every 12 hours of sample analysis per instrument?	✓		
4.5	Are all calibration standard %RSDs, correlation coefficient, or % drift within the control limits (%RSD <15%, r>0.995 or r^2>0.99; for 2° source: %D<+20%; and for CCC, %D < 20%)?		✓	
For initial calibration: %RSD > 15%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>20% J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 20%, J(+), only. Negative Bias - %D>-20% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				
4.6	Are any CCCs (chloroform, 1,1-DCE, 1,2-DCPA, ethylbenzene, toluene, and vinyl chloride) displaying an RSD greater than 30%? If yes, L(+)/R(-) all associated results.		✓	
4.7	Do any SPCC have an RRF low? (<0.10 for chloromethane, 1,1-dichloroethane, and bromoform or <0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane) If yes, L(+)/R(-) all associated results.		✓	

Notes: CC 5/30/08 720% pos bias for bromodichloromethane 21.4%. Trichloroethene 22.1%. all NDs, No action

5.0 GC/MS Instrument Performance Check

		Yes	No	NA
5.1	Are GC/MS Tuning and Mass Calibration forms present for bromofluorobenzene (BFB)?	✓		
5.2	Have all samples been analyzed within twelve hours of the BFB tune? If twelve hours have elapsed according to the system clock, and the laboratory had analyzed standards, blanks, field samples or QC samples after twelve (12) hours, the data for the affected standards, blanks, field samples or QC samples are rejected "R".	✓		
5.3	Have ion abundance criteria for BFB been met for each instrument used? If no, flag "R".	✓		

Notes:

URS

6.0 Surrogate Recovery

		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.2, are these sample(s) or method blank(s) reanalyzed?			✓
	If any system monitoring compound(s) in the volatile fraction is out of specification, there should be a reanalysis to confirm that			
6.3	If No in Section 6.3, is any sample dilution factor greater than 10? DV report should indicate that extraction efficiency/ method			✓
	Note: The B qualifier remains over surrogate flagging.			

	1 or more <10%	1 high/low	2 or 3 high/low	2 or 3 all low	2 or 3 all high
Positives	L	J	J	L	K
Non-detects	R	UJ	UJ	UJ	NONE

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?	✓		
7.4	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data.			

Notes:

MSD for 45MW4 >120% for bromodichloromethane 121%. as parent ND, No action.

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are %R for LCS/LCSD recoveries outside the QC limits? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).	✓		
8.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes: LCS for batch 806442 >120% for bromodichloromethane 121%. all NDs, No action

9.0 Internal Standard

		Yes	No	NA
9.1	Are internal standard area of every sample and blank within +100% or -50% of the mid point calibration standard? If not, J(+)/UJ(-).	✓		
	If extremely low area counts are reported, or performance exhibits a major abrupt drop-off, then a severe loss of sensitivity is indicated. Non-detect target compounds should then be qualified as unusable (R).			
9.2	Are retention times of internal standards within 30 seconds of the associated calibration standard?	✓		
	The chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction. Positive results should not needed to be qualified as "R", if the mass spectral criteria are met.			

Notes:

10.0 Field Duplicate

		Yes	No	NA
10.1	Was a field duplicate prepared and analyzed at the correct frequency (one per 20 samples, matrix, and level)?	✓		
	For sample results > 5 x RL, use 50% RPD. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 x RL for soil will be used.			
10.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV	✓		

Notes: 45MW2 & DUP-3

all NDs ✓

11.0 Detection Limit Verification

		Yes	No	NA
11.1	Do detection limits meet those required by the project QAPP and were they properly adjusted to reflect all sample dilutions and dry weight factors?	✓		
11.2	Were sample concentrations above the highest standard run at a dilution? If not, for ion saturation flag "L", unsaturated results			✓

Notes:

12.0 Data Completeness

		Yes	No	NA
12.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
12.1.1	Number of samples:_____			
12.1.2	Number of target compounds in each analysis:_____			
12.1.3	Number of results rejected and not reported:_____			
	% Completeness = (12.1.1 x 12.1.2 - 12.1.3) x 100/(12.1.1 x 12.1.2)			
	% Completeness = 100%			

Notes:

STATEMENT OF DATA QUALIFICATIONS

Volatile Organic Compounds by EPA Method 8260B

Qualification: The MS or MSD recovery, but not both, was outside the control limit. The RPD is within the control limit. The unspiked sample result is considered estimated.

Analysis: USEPA-8260B

Sample/Analyte:		
0805546-01	45MW4	Bromodichloromethane

Qualification: The LCS recovery exceeded the control limit but it was within the marginal exceedance for a compound that is not a project-specific analyte of concern. The result for this analyte in any sample from the associated QC batch is not considered qualified.

Analysis: USEPA-8260B

Sample/Analyte:		
0805500-01	45MW2	Bromodichloromethane
0805500-02	DUP-3	Bromodichloromethane
0805500-03	Trip Blank	Bromodichloromethane
0805546-01	45MW4	Bromodichloromethane
0805546-02	45MW3	Bromodichloromethane
0805546-03	45MW1	Bromodichloromethane
0805546-04	EQBK-3	Bromodichloromethane
0805546-05	Trip Blank	Bromodichloromethane

CONTINUING CALIBRATION CHECK
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 224
Calibration: 8E01009
Lab File ID: CCV0530B2.D
Calibration Date: 04/28/08 00:00
Sequence: 8060212
Injection Date: 05/30/08
Lab Sample ID: 8060212-CCV1
Injection Time: 16:52

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
Acetone	L	40.0	32.1	0.1652183	0.105467		-19.8	40
Benzene	A	40.0	45.0	1.416847	1.5955		12.6	25
Bromobenzene	A	40.0	34.1	1.191398	1.01577		-14.7	25
Bromochloromethane	A	40.0	43.4	0.2641918	0.286865		8.6	25
Bromodichloromethane	A	40.0	48.6	0.3722292	0.452031	POS	21.4	25
Bromoform	L	40.0	40.4	0.2082325	0.255376	0.1	1.0	25
Bromomethane	L	40.0	44.8	0.281315	0.285414		12.0	25
Carbon Disulfide	L	40.0	42.7	0.5686481	0.721065		6.8	25
Carbon Tetrachloride	A	40.0	48.0	0.4018934	0.482752		20.1	25
Chlorobenzene	A	40.0	41.0	1.135322	1.16485	0.3	2.6	25
Chloroethane	A	40.0	41.8	0.2602908	0.272345		4.6	25
Chloroform	A	40.0	43.9	0.5788189	0.634709		9.7	20
Chloromethane	A	40.0	37.8	0.4552036	0.430211	0.1	-5.5	25
2-Chlorotoluene	A	40.0	40.2	0.7686733	0.771831		0.4	25
Cyclohexane	A	40.0	38.9	0.5677869	0.552752		-2.6	25
1,2-Dibromo-3-chloropropane	L	40.0	36.2	0.1463466	0.151095		-9.5	25
Dibromochloromethane	L	40.0	39.2	0.3183966	0.361957		-2.1	25
1,2-Dibromoethane	A	40.0	41.4	0.3080834	0.318802		3.5	25
1,2-Dichlorobenzene	A	40.0	39.5	1.410751	1.39275		-1.3	25
1,3-Dichlorobenzene	A	40.0	39.3	1.445691	1.42064		-1.7	25
1,4-Dichlorobenzene	A	40.0	38.6	1.521987	1.46782		-3.6	25
Dichlorodifluoromethane	A	40.0	42.0	0.4872097	0.511212		4.9	25
1,1-Dichloroethane	A	40.0	43.4	0.5969719	0.647758	0.1	8.5	25
1,2-Dichloroethane	A	40.0	43.6	0.4481197	0.488753		9.1	25
1,1-Dichloroethene	A	40.0	45.4	0.3275326	0.371647		13.5	20
cis-1,2-Dichloroethene	A	40.0	47.8	0.3528148	0.42195		19.6	25
trans-1,2-Dichloroethene	A	40.0	47.7	0.3278295	0.390666		19.2	25
1,2-Dichloropropane	A	40.0	44.2	0.3372774	0.372657		10.5	20
cis-1,3-Dichloropropene	L	40.0	41.3	0.4321232	0.508117		3.2	25

00757

CONTINUING CALIBRATION CHECK
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 224
Calibration: 8E01009
Lab File ID: CCV0530B2.D
Calibration Date: 04/28/08 00:00
Sequence: 8060212
Injection Date: 05/30/08
Lab Sample ID: 8060212-CCV1
Injection Time: 16:52

Analyte	Type	CONC. (ug/L)		Response Factor			% Diff. / Drift	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
trans-1,3-Dichloropropene	L	40.0	40.4	0.3692274	0.437586		1.0	25
Ethylbenzene	A	40.0	39.6	1.937751	1.91877		-1.0	20
2-Hexanone	A	40.0	35.1	0.2547768	0.223397		-12.3	40
Isopropylbenzene	A	40.0	36.2	3.259855	2.95186		-9.4	25
Methyl Acetate	A	40.0	36.4	0.2679105	0.243552		-9.1	25
Methyl tert-Butyl Ether	A	40.0	39.3	0.867082	0.851614		-1.8	25
Methylcyclohexane	A	40.0	42.8	0.560585	0.599742		7.0	25
Methylene Chloride	L	40.0	43.2	0.4357803	0.415835		8.1	25
2-Butanone (MEK)	A	40.0	38.3	0.1835342	0.175611		-4.3	40
4-Methyl-2-pentanone (MIBK)	A	40.0	41.1	0.3252289	0.334039		2.7	40
Styrene	A	40.0	42.8	1.164685	1.24595		7.0	25
1,1,2,2-Tetrachloroethane	A	40.0	37.0	0.7758381	0.717954	0.3	-7.5	25
Tetrachloroethene	A	40.0	45.6	0.5074409	0.577989		13.9	25
Toluene	A	40.0	46.0	1.561665	1.79647		15.0	20
1,2,3-Trichlorobenzene	A	40.0	40.4	0.7756614	0.782546		0.9	25
1,2,4-Trichlorobenzene	A	40.0	39.5	0.800934	0.790867		-1.3	25
1,1,1-Trichloroethane	A	40.0	45.3	0.4893862	0.55398		13.2	25
1,1,2-Trichloroethane	A	40.0	45.9	0.2415211	0.276934		14.7	25
Trichloroethene	A	40.0	48.8	0.3918899	0.478636	POS	22.1	25
Trichlorofluoromethane	A	40.0	40.6	0.6253112	0.634069		1.4	25
1,1,2-Trichloro-1,2,2-trifluoroetha	A	40.0	38.4	0.3336737	0.320015		-4.1	25
Vinyl Chloride	A	40.0	40.9	0.434514	0.443936		2.2	20
Xylene (Total)	A	120	126	0.7399088	0.775304		4.8	25

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

: 00758

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8260B

45MW4

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Water

SDG: 36440-56

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 5030B Aqueous Purge & Trap

Initial/Final: 5 mL / 5 mL

Laboratory ID: 0806442-MSD1

QC Batch: 0806442

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acetone	40.0	39.3	98	7	30	40 - 140	ug/L
Benzene	40.0	45.7	114	2	30	80 - 120	ug/L
Bromochloromethane	40.0	43.5	109	1	30	65 - 130	ug/L
Bromodichloromethane	40.0	48.4	121 *	0.6	30	75 - 120	ug/L
Bromoform	40.0	39.8	100	4	30	70 - 130	ug/L
Bromomethane	40.0	45.7	114	10	30	30 - 145	ug/L
Carbon Disulfide	40.0	41.8	104	2	30	35 - 160	ug/L
Carbon Tetrachloride	40.0	48.3	121	3	30	65 - 140	ug/L
Chlorobenzene	40.0	41.0	103	2	30	80 - 120	ug/L
Chloroethane	40.0	41.7	104	2	30	60 - 135	ug/L
Chloroform	40.0	44.8	112	0.9	30	65 - 135	ug/L
Chloromethane	40.0	39.1	98	3	30	40 - 125	ug/L
Cyclohexane	40.0	38.6	96	2	30	77 - 125	ug/L
1,2-Dibromo-3-chloropropane	40.0	38.9	97	4	30	50 - 130	ug/L
Dibromochloromethane	40.0	39.1	98	2	30	60 - 135	ug/L
1,2-Dibromoethane	40.0	42.7	107	3	30	80 - 120	ug/L
1,2-Dichlorobenzene	40.0	39.6	99	0.9	30	70 - 120	ug/L
1,3-Dichlorobenzene	40.0	38.5	96	2	30	75 - 125	ug/L
1,4-Dichlorobenzene	40.0	37.8	94	0.5	30	75 - 125	ug/L
Dichlorodifluoromethane	40.0	39.9	100	2	30	30 - 155	ug/L
1,1-Dichloroethane	40.0	44.2	110	2	30	70 - 135	ug/L
1,2-Dichloroethane	40.0	44.3	111	0.8	30	70 - 130	ug/L
1,1-Dichloroethene	40.0	45.1	113	2	30	70 - 130	ug/L
cis-1,2-Dichloroethene	40.0	48.5	121	1	30	70 - 125	ug/L
trans-1,2-Dichloroethene	40.0	47.3	118	0.5	30	60 - 140	ug/L
1,2-Dichloropropane	40.0	44.7	112	2	30	75 - 125	ug/L
cis-1,3-Dichloropropene	40.0	39.7	99	4	30	70 - 130	ug/L
trans-1,3-Dichloropropene	40.0	39.6	99	2	30	55 - 140	ug/L
Ethylbenzene	40.0	39.0	98	0.6	30	75 - 125	ug/L
2-Hexanone	40.0	38.7	97	3	30	55 - 130	ug/L
Isopropylbenzene	40.0	36.0	90	2	30	75 - 125	ug/L
Methyl Acetate	40.0	28.8	72	1	30	70 - 130	ug/L
Methyl tert-Butyl Ether	40.0	41.3	103	3	30	65 - 125	ug/L
Methylcyclohexane	40.0	41.1	103	2	30	70 - 130	ug/L

006558

LCS / LCS DUPLICATE RECOVERY
USEPA-8260B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

Laboratory ID: 0806442-BS1

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 5030B Aqueous Purge & Trap
Initial/Final: 5 mL / 5 mL
QC Batch: 0806442
Sequence: 8060212

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Acetone	40.0	32.1	80	40 - 140	ug/L
Benzene	40.0	45.0	113	80 - 120	ug/L
Bromochloromethane	40.0	43.4	109	65 - 130	ug/L
Bromodichloromethane	40.0	48.6	121 *	75 - 120	ug/L
Bromoform	40.0	40.4	101	70 - 130	ug/L
Bromomethane	40.0	44.8	112	30 - 145	ug/L
Carbon Disulfide	40.0	42.7	107	35 - 160	ug/L
Carbon Tetrachloride	40.0	48.0	120	65 - 140	ug/L
Chlorobenzene	40.0	41.0	103	80 - 120	ug/L
Chloroethane	40.0	41.8	105	60 - 135	ug/L
Chloroform	40.0	43.9	110	65 - 135	ug/L
Chloromethane	40.0	37.8	94	40 - 125	ug/L
Cyclohexane	40.0	38.9	97	77 - 125	ug/L
1,2-Dibromo-3-chloropropane	40.0	36.2	90	50 - 130	ug/L
Dibromochloromethane	40.0	39.2	98	60 - 135	ug/L
1,2-Dibromoethane	40.0	41.4	103	80 - 120	ug/L
1,2-Dichlorobenzene	40.0	39.5	99	70 - 120	ug/L
1,3-Dichlorobenzene	40.0	39.3	98	75 - 125	ug/L
1,4-Dichlorobenzene	40.0	38.6	96	75 - 125	ug/L
Dichlorodifluoromethane	40.0	42.0	105	30 - 155	ug/L
1,1-Dichloroethane	40.0	43.4	108	70 - 135	ug/L
1,2-Dichloroethane	40.0	43.6	109	70 - 130	ug/L
1,1-Dichloroethene	40.0	45.4	113	70 - 130	ug/L
cis-1,2-Dichloroethene	40.0	47.8	120	70 - 125	ug/L
trans-1,2-Dichloroethene	40.0	47.7	119	60 - 140	ug/L
1,2-Dichloropropane	40.0	44.2	110	75 - 125	ug/L
cis-1,3-Dichloropropene	40.0	41.3	103	70 - 130	ug/L
trans-1,3-Dichloropropene	40.0	40.4	101	55 - 140	ug/L
Ethylbenzene	40.0	39.6	99	75 - 125	ug/L

DATA VALIDATION WORKSHEET

Semivolatile Organic Analysis

Reviewer: RA
Date: 6/26/08
DV Level: II (III) IV
Review Document:
_X_ SW-846
_X_ NFG - Region III Modifications
_X_ Project QAPP/SAP

Project Name: Rafford
Project Number: 11605635.1
Laboratory: TriMatrix
SDG No.: 11605635.1
Test Name: SVOC
Method No.: 8270C

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were not on ice or the ice was melted upon arrival at the laboratory and the temperature of the cooler was elevated (> 20 °C), then flag all positive results with a "L" and all non-detects "UL".			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.			✓

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). For aqueous matrix - 7 days (extraction) and 40 days (analysis) For soil matrix - 14 days		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per batch)?	✓		
3.2	Do any blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample≤5X[blank] (or 10 times for the common phthalate contaminants).	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.	✓		

Notes: MB → butyl benzyl phthalate .39, diethyl phthalate 0.04, bis(2-ethylhexyl)phthalate 0.46
phenol 0.06 <10 x for phthalates, <5 x phenol → B, Z
EQBK-3 di-n-butyl phthalate 3.4 ug/L <10 x → B, X

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are at least five standards included in the calibration curve?	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve?	✓		
4.3	Has a continuing calibration standard been analyzed for every 12 hours of sample analysis?	✓		
4.4	Are all calibration standard %RSD ≤15%, r>0.995, or r^2<0.99), second source ±30% or %D(≤20%) within the control limits?	✓		
For initial calibration: %RSD > 15% but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>30% J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 20%, J(+), only. Negative Bias - %D>-20% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				
4.5	Are any SPCCs RF < 0.05 and/or CCC >30%? If yes reject all associated data.		✓	

Notes:

5.0 GC/MS Instrument Performance Check		Yes	No	NA
5.1	Are GC/MS Tuning and Mass Calibration forms present for decafluorotriphenylphosphine (DFTPP)?	✓		
5.2	Are DFTPP monitored ions within specification? If no, flag R.	✓		
5.3	Have all samples been analyzed within twelve hours of the DFTPP tune? If no, flag R.	✓		
5.4	Have ion abundance criteria for DFTPP been met for each instrument used? If no, flag R.	✓		

Notes:

6.0 Surrogate Recovery

		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.2, are these sample(s) or method blank(s) reanalyzed?			✓
6.3	If any two base/neutral or acid fraction are out of specification, or if any one base/neutral or acid extractable surrogate has a recovery of less than 10%, then there should be a reanalysis to confirm that the non-compliance is because of sample matrix effects rather than laboratory deficiencies.			
6.4	If No in Section 6.3, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓
	If No, for 2 or 3 %Rs > UCL, K(+) only; for 2 or 3 %Rs < LCL, but > 10%, L(+)/UL (-); for 2 or 3 %Rs mixed high/low, J(+)/UJ(-); for %R < 10%, L(+)/R(-).			

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate outside the QC limits?	✓		
7.4	Are there any RPD for matrix spike and matrix spike duplicate outside the QC limits?	✓		
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of the data.			

Notes: see attached, several MS/MSD %RPD)QC for 45MW4. pos hexachloroethane J/m in Parent. all others, NDs ✓

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are there any %R for LCS outside the QC limits? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).	✓		
8.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes: LCS %R > QC Carbazole 131%
2,3,4,6-tetrachlorophenol 130%
all NDs, No action

9.0 Internal Standard

		Yes	No	NA
9.1	Are internal standard areas within +100% and -50% of the mid point initail calibration? If No, J(+)/UJ(-).	✓		
	If extremely low area counts are reported, or performance exhibits a major abrupt drop-off, then a severe loss of sensitivity is indicated. Non-detect target compounds should then be qualified as unusable (R).			
9.2	Are retention times of internal standards within 30 seconds of the associated calibration?			
	The chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction. Positive results should not needed to be qualified as "R", if the mass spectral criteria are met.	✓		

Notes:

10.0 Field Duplicate

		Yes	No	NA
10.1	Are all analyte duplicate results within control limits (use RPD limits of matrix spikes)? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓	✓	

Notes: 45MW2 & DUP-3

See attached

11.0 Detection Limit Verification

		Yes	No	NA
11.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture?	✓		

Notes:

12.0 Data Completeness

		Yes	No	NA
12.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
12.1.1	Number of samples:_____			
12.1.2	Number of target compounds in each analysis:_____			
12.1.3	Number of results rejected and not reported:_____			
	% Completeness = (12.1.1 x 12.1.2 - 12.1.3) x 100/(12.1.1 x 12.1.2)			
	% Completeness = 100%			

URS

Page ____ of ____

Job ____ Project No. ____ Sheet ____ of ____

Description ____ Computed by ____ Date ____

____ Checked by ____ Date ____

Reference

Field Dups for 8270

	45MW2	DUP-3	RL	RPD
benzo(a)anthracene	0.06 J	ND	0.5	OK ✓
Chrysene	0.05J	ND	0.5	OK ✓
di-n-octyl phthalate	0.58J	ND	5	OK ✓
fluoranthene	0.03J	ND	0.5	OK ✓
phenanthrene	0.02J	ND	0.5	OK ✓

STATEMENT OF DATA QUALIFICATIONS

Semivolatile Organic Compounds by EPA Method 8270C

Qualification:	The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.	
Analysis:	USEPA-8270C	
Sample/Analyte:	0805546-01 45MW4	2,3,4,6-Tetrachlorophenol
	0805546-01 45MW4	Carbazole
	0805546-01 45MW4	Di-n-butyl Phthalate
Qualification:	The RPD between the MS and MSD results exceeded the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.	
Analysis:	USEPA-8270C	
Sample/Analyte:	0805546-01 45MW4	3,3´-Dichlorobenzidine
Qualification:	The MS or MSD recovery, but not both, was outside the control limit. The RPD is within the control limit. The unspiked sample result is considered estimated.	
Analysis:	USEPA-8270C	
Sample/Analyte:	0805546-01 45MW4	Hexachloroethane
Qualification:	The LCS recovery exceeded both the control limit and the marginal exceedance for a compound that is not a project-specific analyte of concern. The result for this analyte in any sample from the associated QC batch is considered qualified.	
Analysis:	USEPA-8270C	
Sample/Analyte:	0805500-01 45MW2	2,3,4,6-Tetrachlorophenol
	0805500-01 45MW2	Carbazole
	0805500-02 DUP-3	2,3,4,6-Tetrachlorophenol
	0805500-02 DUP-3	Carbazole
	0805546-01 45MW4	2,3,4,6-Tetrachlorophenol
	0805546-01 45MW4	Carbazole
	0805546-02 45MW3	2,3,4,6-Tetrachlorophenol
	0805546-02 45MW3	Carbazole
	0805546-03 45MW1	2,3,4,6-Tetrachlorophenol
	0805546-03 45MW1	Carbazole
	0805546-04 EQBK-3	2,3,4,6-Tetrachlorophenol
	0805546-04 EQBK-3	Carbazole
Qualification:	Concentration exceeds calibration range	
Analysis:	USEPA-8270C	
	0806214-BS1	Carbazole
	0806214-MSD1	Carbazole

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0806214-BLK1
File ID: 806214B1.d
Prepared: 05/28/08 16:26
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/30/08 16:30
Instrument: 195
QC Batch: 0806214
Sequence: 8060612
Calibration: 8F06011

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.013	0.50	0.50	ug/L	U
208-96-8	Acenaphthylene	0.012	0.50	0.50	ug/L	U
98-86-2	Acetophenone	0.043	5.0	5.0	ug/L	U
120-12-7	Anthracene	0.014	0.50	0.50	ug/L	U
1912-24-9	Atrazine	0.026	5.0	5.0	ug/L	U
100-52-7	Benzaldehyde	0.051	5.0	5.0	ug/L	U
56-55-3	Benzo(a)anthracene	0.037	0.50	0.50	ug/L	U
50-32-8	Benzo(a)pyrene	0.023	0.50	0.50	ug/L	U
205-99-2	Benzo(b)fluoranthene	0.040	0.50	0.50	ug/L	U
207-08-9	Benzo(k)fluoranthene	0.036	0.50	0.50	ug/L	U
191-24-2	Benzo(g,h,i)perylene	0.022	0.50	0.50	ug/L	U
92-52-4	1,1'-Biphenyl	0.015	5.0	5.0	ug/L	U
101-55-3	4-Bromophenyl Phenyl Ether	0.026	5.0	5.0	ug/L	U
85-68-7	Butyl Benzyl Phthalate 3.9	0.029	5.0	0.390	ug/L	J
105-60-2	Caprolactam	0.14	5.0	5.0	ug/L	U
86-74-8	Carbazole	0.018	5.0	5.0	ug/L	U
59-50-7	4-Chloro-3-methylphenol	0.021	5.0	5.0	ug/L	U
106-47-8	4-Chloroaniline	0.021	5.0	5.0	ug/L	U
111-91-1	Bis(2-chloroethoxy)methane	0.016	5.0	5.0	ug/L	U
111-44-4	Bis(2-chloroethyl) Ether	0.016	5.0	5.0	ug/L	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.047	5.0	5.0	ug/L	U
91-58-7	2-Chloronaphthalene	0.012	5.0	5.0	ug/L	U
95-57-8	2-Chlorophenol	0.016	5.0	5.0	ug/L	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.016	5.0	5.0	ug/L	U
218-01-9	Chrysene	0.020	0.50	0.50	ug/L	U
53-70-3	Dibenz(a,h)anthracene	0.026	0.50	0.50	ug/L	U
132-64-9	Dibenzofuran	0.016	5.0	5.0	ug/L	U
84-74-2	Di-n-butyl Phthalate	0.38	5.0	5.0	ug/L	U
91-94-1	3,3´-Dichlorobenzidine	0.21	5.0	5.0	ug/L	U
120-83-2	2,4-Dichlorophenol	0.015	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-56

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0806214-BLK1 File ID: 806214B1.d

Prepared: 05/28/08 16:26 Preparation: 3510C Liquid-Liquid Ext Initial/Final: 1000 mL / 1 mL

Analyzed: 05/30/08 16:30 Instrument: 195

QC Batch: 0806214 Sequence: 8060612 Calibration: 8F06011

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate 0.4	0.034	5.0	0.0400	ug/L	J
105-67-9	2,4-Dimethylphenol	0.33	5.0	5.0	ug/L	U
131-11-3	Dimethyl Phthalate	0.016	5.0	5.0	ug/L	U
534-52-1	4,6-Dinitro-2-methylphenol	0.12	5.0	5.0	ug/L	U
51-28-5	2,4-Dinitrophenol	1.5	5.0	5.0	ug/L	U
121-14-2	2,4-Dinitrotoluene	0.21	5.0	5.0	ug/L	U
606-20-2	2,6-Dinitrotoluene	0.050	5.0	5.0	ug/L	U
117-84-0	Di-n-octyl Phthalate	0.34	5.0	5.0	ug/L	U
117-81-7	Bis(2-ethylhexyl) Phthalate 4.6	0.41	5.0	0.460	ug/L	J
206-44-0	Fluoranthene	0.016	0.50	0.50	ug/L	U
86-73-7	Fluorene	0.011	0.50	0.50	ug/L	U
118-74-1	Hexachlorobenzene	0.019	5.0	5.0	ug/L	U
87-68-3	Hexachlorobutadiene	0.018	5.0	5.0	ug/L	U
77-47-4	Hexachlorocyclopentadiene	0.13	5.0	5.0	ug/L	U
67-72-1	Hexachloroethane	0.038	5.0	5.0	ug/L	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.014	0.50	0.50	ug/L	U
78-59-1	Isophorone	0.031	5.0	5.0	ug/L	U
91-57-6	2-Methylnaphthalene	0.015	5.0	5.0	ug/L	U
95-48-7	2-Methylphenol	0.14	5.0	5.0	ug/L	U
106-44-5	4-Methylphenol	0.16	5.0	5.0	ug/L	U
91-20-3	Naphthalene	0.023	0.50	0.50	ug/L	U
88-74-4	2-Nitroaniline	0.12	5.0	5.0	ug/L	U
99-09-2	3-Nitroaniline	0.13	5.0	5.0	ug/L	U
100-01-6	4-Nitroaniline	0.14	5.0	5.0	ug/L	U
98-95-3	Nitrobenzene	0.026	5.0	5.0	ug/L	U
100-02-7	4-Nitrophenol	1.3	5.0	5.0	ug/L	U
88-75-5	2-Nitrophenol	0.026	5.0	5.0	ug/L	U
86-30-6	N-Nitroso-diphenylamine	0.019	5.0	5.0	ug/L	U
621-64-7	N-Nitroso-di-n-propylamine	0.030	5.0	5.0	ug/L	U
87-86-5	Pentachlorophenol	0.19	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0806214-BLK1
File ID: 806214B1.d
Prepared: 05/28/08 16:26
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 05/30/08 16:30
Instrument: 195
QC Batch: 0806214
Sequence: 8060612
Calibration: 8F06011

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
85-01-8	Phenanthrene	0.015	0.50	0.50	ug/L	U
108-95-2	Phenol 0.3	0.028	5.0	0.0600	ug/L	J
129-00-0	Pyrene	0.047	0.50	0.50	ug/L	U
95-94-3	1,2,4,5-Tetrachlorobenzene	0.024	5.0	5.0	ug/L	U
58-90-2	2,3,4,6-Tetrachlorophenol	0.16	5.0	5.0	ug/L	U
88-06-2	2,4,6-Trichlorophenol	0.027	5.0	5.0	ug/L	U
95-95-4	2,4,5-Trichlorophenol	0.11	5.0	5.0	ug/L	U

System Monitoring Compound	Added (ug/L)	Conc. (ug/L)	% REC	QC Limits	Q
2-Fluorophenol	20.2	11.7	58	20 - 110	
Phenol-d6	20.0	8.48	42	10 - 115	
Nitrobenzene-d5	10.4	10.0	96	40 - 110	
2-Fluorobiphenyl	10.0	10.4	104	50 - 110	
2,4,6-Tribromophenol	20.1	19.6	97	40 - 125	
o-Terphenyl	10.0	10.4	104	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	173602	4.87	189490	4.86	
Naphthalene-d8	560783	6.36	609978	6.36	
Acenaphthene-d10	329334	8.35	357547	8.35	
Phenanthrene-d10	508355	10.01	537983	10	
Chrysene-d12	409745	12.93	450845	12.93	
Perylene-d12	376865	14.4	358240	14.39	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY
USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL

Laboratory ID: 0806214-MS1
QC Batch: 0806214

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Acenaphthene	9.40	0.0200	8.51	90	45 - 110	ug/L
Acenaphthylene	9.40	0.0200	9.08	96	50 - 105	ug/L
Acetophenone	10.0	0.0600	9.02	90	54 - 113	ug/L
Anthracene	9.40	ND	9.14	97	55 - 110	ug/L
Atrazine	10.0	ND	9.20	92	61 - 139	ug/L
Benzaldehyde	10.0	ND	8.81	88	25 - 141	ug/L
Benzo(a)anthracene	9.40	ND	9.21	98	55 - 110	ug/L
Benzo(a)pyrene	9.40	ND	9.47	101	55 - 110	ug/L
Benzo(b)fluoranthene	9.40	ND	8.75	93	45 - 120	ug/L
Benzo(k)fluoranthene	9.40	ND	9.42	100	45 - 125	ug/L
Benzo(g,h,i)perylene	9.40	ND	8.70	93	40 - 125	ug/L
1,1'-Biphenyl	10.0	0.0300	8.91	89	59 - 114	ug/L
4-Bromophenyl Phenyl Ether	9.40	ND	8.68	92	50 - 115	ug/L
Butyl Benzyl Phthalate	9.40	0.410	8.56	87	45 - 115	ug/L
Caprolactam	10.0	ND	2.72	27	25 - 135	ug/L
Carbazole	19.4	ND	23.8	123 *	50 - 115	ug/L
4-Chloro-3-methylphenol	9.80	ND	9.50	97	45 - 110	ug/L
4-Chloroaniline	10.0	ND	7.30	73	15 - 110	ug/L
Bis(2-chloroethoxy)methane	9.40	0.0300	8.99	95	45 - 105	ug/L
Bis(2-chloroethyl) Ether	9.40	ND	8.70	93	35 - 110	ug/L
Bis(2-chloroisopropyl) Ether	9.40	ND	9.10	97	25 - 130	ug/L
2-Chloronaphthalene	9.40	ND	8.49	90	50 - 105	ug/L
2-Chlorophenol	9.80	0.0600	8.66	88	35 - 105	ug/L
4-Chlorophenyl Phenyl Ether	9.40	ND	8.70	93	50 - 110	ug/L
Chrysene	9.40	ND	8.71	93	55 - 110	ug/L
Dibenz(a,h)anthracene	9.40	ND	8.23	88	40 - 125	ug/L
Dibenzofuran	10.0	0.0200	9.35	93	55 - 105	ug/L
Di-n-butyl Phthalate	9.40	ND	14.0	149 *	55 - 115	ug/L
3,3'-Dichlorobenzidine	20.0	ND	15.2	76	20 - 110	ug/L
2,4-Dichlorophenol	9.80	ND	8.92	91	50 - 105	ug/L
Diethyl Phthalate	9.40	0.0900	8.32	88	40 - 120	ug/L
2,4-Dimethylphenol	9.80	ND	6.85	70	30 - 110	ug/L
Dimethyl Phthalate	9.40	ND	9.12	97	25 - 125	ug/L

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45MW4

USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Water

SDG: 36440-56

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3510C Liquid-Liquid Extraction

Initial/Final: 1000 mL / 1 mL

Laboratory ID: 0806214-MS1

QC Batch: 0806214

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
4,6-Dinitro-2-methylphenol	9.80	ND	8.91	91	40 - 130	ug/L
2,4-Dinitrophenol	9.80	ND	7.67	78	15 - 140	ug/L
2,4-Dinitrotoluene	9.40	ND	8.30	88	50 - 120	ug/L
2,6-Dinitrotoluene	9.40	ND	8.84	94	50 - 115	ug/L
Di-n-octyl Phthalate	9.40	ND	9.12	97	35 - 135	ug/L
Bis(2-ethylhexyl) Phthalate	9.40	0.660	9.03	89	40 - 125	ug/L
Fluoranthene	9.40	ND	9.46	101	55 - 115	ug/L
Fluorene	9.40	ND	8.76	93	50 - 110	ug/L
Hexachlorobenzene	9.40	ND	8.58	91	50 - 110	ug/L
Hexachlorobutadiene	9.40	ND	8.28	88	25 - 105	ug/L
Hexachlorocyclopentadiene	9.40	ND	7.77	83	30 - 141	ug/L
Hexachloroethane	9.40	0.0700	8.57	90	30 - 95	ug/L
Indeno(1,2,3-cd)pyrene	9.40	ND	8.89	95	45 - 125	ug/L
Isophorone	9.40	ND	9.13	97	50 - 110	ug/L
2-Methylnaphthalene	10.0	0.0300	9.10	91	45 - 105	ug/L
2-Methylphenol	9.60	ND	7.07	74	40 - 110	ug/L
4-Methylphenol	9.60	ND	7.79	81	30 - 110	ug/L
Naphthalene	9.40	0.0400	8.37	89	40 - 100	ug/L
2-Nitroaniline	10.0	ND	11.0	110	50 - 115	ug/L
3-Nitroaniline	10.0	ND	9.46	95	20 - 125	ug/L
4-Nitroaniline	10.0	ND	10.1	101	35 - 120	ug/L
Nitrobenzene	9.40	ND	8.80	94	45 - 110	ug/L
4-Nitrophenol	9.80	ND	5.10	52	0 - 125	ug/L
2-Nitrophenol	9.80	ND	8.76	89	40 - 115	ug/L
N-Nitroso-diphenylamine	9.40	ND	6.23	66	50 - 110	ug/L
N-Nitroso-di-n-propylamine	9.40	ND	9.29	99	35 - 130	ug/L
Pentachlorophenol	9.80	ND	6.60	67	40 - 115	ug/L
Phenanthrene	9.40	ND	8.52	91	50 - 115	ug/L
Phenol	9.80	0.0400	4.02	41	0 - 115	ug/L
Pyrene	9.40	ND	8.45	90	50 - 130	ug/L
1,2,4,5-Tetrachlorobenzene	5.00	ND	4.82	96	40 - 140	ug/L
2,3,4,6-Tetrachlorophenol	9.80	ND	12.7	129 *	40 - 115	ug/L
2,4,6-Trichlorophenol	9.80	ND	8.78	90	50 - 115	ug/L

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Water

Laboratory ID: 0806214-MSD1

SDG: 36440-56

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3510C Liquid-Liquid Extraction

Initial/Final: 1000 mL / 1 mL

QC Batch: 0806214

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Acenaphthene	9.40	8.52	90	0.1	30	45 - 110	ug/L
Acenaphthylene	9.40	9.36	99	3	30	50 - 105	ug/L
Acetophenone	10.0	9.41	94	4	30	54 - 113	ug/L
Anthracene	9.40	9.42	100	3	30	55 - 110	ug/L
Atrazine	10.0	9.43	94	2	30	61 - 139	ug/L
Benzaldehyde	10.0	9.05	90	3	30	25 - 141	ug/L
Benzo(a)anthracene	9.40	9.49	101	3	30	55 - 110	ug/L
Benzo(a)pyrene	9.40	9.74	104	3	30	55 - 110	ug/L
Benzo(b)fluoranthene	9.40	9.81	104	11	30	45 - 120	ug/L
Benzo(k)fluoranthene	9.40	8.95	95	5	30	45 - 125	ug/L
Benzo(g,h,i)perylene	9.40	8.78	93	0.9	30	40 - 125	ug/L
1,1'-Biphenyl	10.0	9.15	91	3	30	59 - 114	ug/L
4-Bromophenyl Phenyl Ether	9.40	8.82	94	2	30	50 - 115	ug/L
Butyl Benzyl Phthalate	9.40	8.90	90	4	30	45 - 115	ug/L
Caprolactam	10.0	2.81	28	3	30	25 - 135	ug/L
Carbazole	19.4	25.1	129 *	5	30	50 - 115	ug/L
4-Chloro-3-methylphenol	9.80	9.23	94	3	30	45 - 110	ug/L
4-Chloroaniline	10.0	6.72	67	8	30	15 - 110	ug/L
Bis(2-chloroethoxy)methane	9.40	9.15	97	2	30	45 - 105	ug/L
Bis(2-chloroethyl) Ether	9.40	8.93	95	3	30	35 - 110	ug/L
Bis(2-chloroisopropyl) Ether	9.40	9.44	100	4	30	25 - 130	ug/L
2-Chloronaphthalene	9.40	8.81	94	4	30	50 - 105	ug/L
2-Chlorophenol	9.80	9.11	92	5	30	35 - 105	ug/L
4-Chlorophenyl Phenyl Ether	9.40	8.89	95	2	30	50 - 110	ug/L
Chrysene	9.40	9.25	98	6	30	55 - 110	ug/L
Dibenz(a,h)anthracene	9.40	8.45	90	3	30	40 - 125	ug/L
Dibenzofuran	10.0	9.64	96	3	30	55 - 105	ug/L
Di-n-butyl Phthalate	9.40	16.9	179 *	18	30	55 - 115	ug/L
3,3'-Dichlorobenzidine	20.0	10.6	53	35 *	30	20 - 110	ug/L
2,4-Dichlorophenol	9.80	9.00	92	0.9	30	50 - 105	ug/L
Diethyl Phthalate	9.40	8.44	89	1	30	40 - 120	ug/L
2,4-Dimethylphenol	9.80	5.26	54	26	30	30 - 110	ug/L
Dimethyl Phthalate	9.40	9.44	100	3	30	25 - 125	ug/L
4,6-Dinitro-2-methylphenol	9.80	9.11	93	2	30	40 - 130	ug/L

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY
USEPA-8270C

45MW4

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL

Laboratory ID: 0806214-MSD1
QC Batch: 0806214

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
2,4-Dinitrophenol	9.80	7.60	78	0.9	30	15 - 140	ug/L
2,4-Dinitrotoluene	9.40	8.34	89	0.5	30	50 - 120	ug/L
2,6-Dinitrotoluene	9.40	8.90	95	0.7	30	50 - 115	ug/L
Di-n-octyl Phthalate	9.40	9.63	102	5	30	35 - 135	ug/L
Bis(2-ethylhexyl) Phthalate	9.40	9.28	92	3	30	40 - 125	ug/L
Fluoranthene	9.40	9.78	104	3	30	55 - 115	ug/L
Fluorene	9.40	9.23	98	5	30	50 - 110	ug/L
Hexachlorobenzene	9.40	8.92	95	4	30	50 - 110	ug/L
Hexachlorobutadiene	9.40	8.35	89	0.8	30	25 - 105	ug/L
Hexachlorocyclopentadiene	9.40	8.20	87	5	30	30 - 141	ug/L
Hexachloroethane	9.40	9.16	97 *	7	30	30 - 95	ug/L
Indeno(1,2,3-cd)pyrene	9.40	9.17	98	3	30	45 - 125	ug/L
Isophorone	9.40	9.22	98	1	30	50 - 110	ug/L
2-Methylnaphthalene	10.0	9.37	93	3	30	45 - 105	ug/L
2-Methylphenol	9.60	6.93	72	2	30	40 - 110	ug/L
4-Methylphenol	9.60	7.62	79	2	30	30 - 110	ug/L
Naphthalene	9.40	8.72	92	4	30	40 - 100	ug/L
2-Nitroaniline	10.0	11.1	111	0.6	30	50 - 115	ug/L
3-Nitroaniline	10.0	9.76	98	3	30	20 - 125	ug/L
4-Nitroaniline	10.0	10.8	108	6	30	35 - 120	ug/L
Nitrobenzene	9.40	8.75	93	0.6	30	45 - 110	ug/L
4-Nitrophenol	9.80	4.84	49	5	30	0 - 125	ug/L
2-Nitrophenol	9.80	9.13	93	4	30	40 - 115	ug/L
N-Nitroso-diphenylamine	9.40	5.51	59	12	30	50 - 110	ug/L
N-Nitroso-di-n-propylamine	9.40	9.50	101	2	30	35 - 130	ug/L
Pentachlorophenol	9.80	7.23	74	9	30	40 - 115	ug/L
Phenanthrene	9.40	8.80	94	3	30	50 - 115	ug/L
Phenol	9.80	3.96	40	2	30	0 - 115	ug/L
Pyrene	9.40	8.79	94	4	30	50 - 130	ug/L
1,2,4,5-Tetrachlorobenzene	5.00	4.83	97	0.2	30	40 - 140	ug/L
2,3,4,6-Tetrachlorophenol	9.80	12.8	131 *	1	30	40 - 115	ug/L
2,4,6-Trichlorophenol	9.80	8.93	91	2	30	50 - 115	ug/L
2,4,5-Trichlorophenol	9.60	9.74	101	2	30	50 - 110	ug/L

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

Laboratory ID: 0806214-BS1

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL
QC Batch: 0806214
Sequence: 8060612

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Acenaphthene	9.40	8.61	92	45 - 110	ug/L
Acenaphthylene	9.40	9.26	99	50 - 105	ug/L
Acetophenone	10.0	8.80	88	54 - 113	ug/L
Anthracene	9.40	9.55	102	55 - 110	ug/L
Atrazine	10.0	9.87	99	61 - 139	ug/L
Benzaldehyde	10.0	7.36	74	25 - 141	ug/L
Benzo(a)anthracene	9.40	9.64	103	55 - 110	ug/L
Benzo(a)pyrene	9.40	9.79	104	55 - 110	ug/L
Benzo(b)fluoranthene	9.40	9.37	100	45 - 120	ug/L
Benzo(k)fluoranthene	9.40	9.19	98	45 - 125	ug/L
Benzo(g,h,i)perylene	9.40	8.73	93	40 - 125	ug/L
1,1'-Biphenyl	10.0	9.07	91	59 - 114	ug/L
4-Bromophenyl Phenyl Ether	9.40	9.33	99	50 - 115	ug/L
Butyl Benzyl Phthalate	9.40	9.37	100	45 - 115	ug/L
Caprolactam	10.0	3.08	31	25 - 135	ug/L
Carbazole	19.4	25.4	131 *	50 - 115	ug/L
4-Chloro-3-methylphenol	9.80	9.35	95	45 - 110	ug/L
4-Chloroaniline	10.0	8.37	84	15 - 110	ug/L
Bis(2-chloroethoxy)methane	9.40	8.83	94	45 - 105	ug/L
Bis(2-chloroethyl) Ether	9.40	7.87	84	35 - 110	ug/L
Bis(2-chloroisopropyl) Ether	9.40	8.69	92	25 - 130	ug/L
2-Chloronaphthalene	9.40	8.75	93	50 - 105	ug/L
2-Chlorophenol	9.80	8.82	90	35 - 105	ug/L
4-Chlorophenyl Phenyl Ether	9.40	9.13	97	50 - 110	ug/L
Chrysene	9.40	9.39	100	55 - 110	ug/L
Dibenz(a,h)anthracene	9.40	8.45	90	40 - 125	ug/L
Dibenzofuran	10.0	9.57	96	55 - 105	ug/L
Di-n-butyl Phthalate	9.40	10.3	110	55 - 115	ug/L
3,3´-Dichlorobenzidine	20.0	20.0	100	20 - 110	ug/L

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

Laboratory ID: 0806214-BS1

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL
QC Batch: 0806214
Sequence: 8060612

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
N-Nitroso-di-n-propylamine	9.40	9.28	99	35 - 130	ug/L
Pentachlorophenol	9.80	7.09	72	40 - 115	ug/L
Phenanthrene	9.40	8.85	94	50 - 115	ug/L
Phenol	9.80	4.92	50	0 - 115	ug/L
Pyrene	9.40	9.14	97	50 - 130	ug/L
1,2,4,5-Tetrachlorobenzene	5.00	4.86	97	40 - 140	ug/L
2,3,4,6-Tetrachlorophenol	9.80	12.8	130 *	40 - 115	ug/L
2,4,6-Trichlorophenol	9.80	9.05	92	50 - 115	ug/L
2,4,5-Trichlorophenol	9.60	9.83	102	50 - 110	ug/L

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

DATA VALIDATION WORKSHEET

Pesticides/PCBs

Reviewer: RA
Date: 6/12/08
DV Level: II III IV
Review Document:
X SW-846 - 8081/8082
X NFG - Region III Modifications
X project QAPP

Project Name: Radford
Project Number: 11654351
Laboratory: TriMatrix
SDG No.: 30440-56
Test Name: Pest/PCBs
Method No.: 8081/8082

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, or special circumstances affecting the quality of the data?		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were received with the cooler temperature exceeding 20 °C, then flag L(+)/UL(-).			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.			✓

Notes:

2.0 Holding Times

		Yes	No	NA
2.2	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). Extraction: (aqueous) 7 days and (soil) 14 days; and Analysis: 40 days.		✓	
2.3	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks prepared at the appropriate frequency (one per 20 samples or batch and matrix)?	✓		
3.2	Do any blanks have positive results? If yes, positive sample results should be reported and qualified "B", if the [sample≤5X[blank].		✓	
3.3	Do any field equipment blanks have positive results? If yes, use same rules above.		✓	

Notes:

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are at least five standards included in the calibration curve for 1016, 1260, toxaphene, and technical chlordane; and at least one point for the other arochlors reported? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 12 hours or twenty samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±15%) or %D(≤15%) within the control limits?	✓		
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>15%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 15%, J(+), only. Negative Bias - %D>-15% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes:

5.0 GC/ECD Instrument Performance Check

		Yes	No	NA
5.1	Has a Performance Evaluation Mixture (PEM) been analyzed at the beginning, every 12 hours, and at the end of every sequence.	✓		
5.2	Is the 4,4'-DDT breakdown </= to 20%? If No, for positive DDT results, DDT-L(+), DDD/DDE - NJ(+). For non-detect DDT results, DDD/DDE - R(+).	✓		
5.3	Is the endrin breakdown </= to 20%? If No, for positive endrin results, endrin-L(+), endrin aldehyde/ketone - NJ(+). For non-detect DDT results, endrin aldehyde/ketone - R(+).	✓		
5.4	Is the combined breakdowns less than or equal to 30%? If No, for positive DDT/endrin results, DDT/endrin-L(+), DDD/DD/endrin aldehyde/endrin ketone - NJ(+). For non-detect DDT/endrin results, DDD/DDE/endrin aldehyde/endrin ketone - R(+).	✓		

Notes:

6.0 Surrogate Recovery

		Yes	No	NA
6.1	Do all surrogate retention times fall within the RT windows established during the initial calibration sequence? If No, the associated sample result should be carefully evaluated.	✓		
6.2	Are surrogate recoveries within acceptance criteria for all samples and method blanks? Advisory limit: 60-150%.		✓	
6.3	If No in Section 6.3, are these sample(s) or method blank(s) reanalyzed?		✓	
6.4	If No in Section 6.4, is any sample dilution factor greater than 10? (recoveries may be diluted out.)		✓	

# of outliers	Recovery	Sample result from column with non-conformance	Sample result from column without non-conformance
1 out	high/low	No action	No action
2 out	2 high same column	K	No action
	2 low same column	L, UL	No action
	mixed same column	J, UJ	No action
	2 high diff columns	J	Not applicable
	2 low diff columns	J, UJ	Not applicable
	mixed diff columns	Professional judgement	Not applicable
3 out	All high	K	Not applicable
	All low	L, UL	Not applicable
	2 high, 1 low	K (2 high)	J (1 low 2nd column)
	2 low, 1 high	L, UJ (2 low)	J (1 high 2nd column)
	other mixed	J, UJ	Not applicable
4 out	All high	K	Not applicable
	All low	L, UL	Not applicable
	Mixed	J, UJ	Not applicable
If any recovery is >0% and <10% then L(+)/R(-).			
If any recovery is 0% then R(+/-).			

Notes: Reset → Method blank decachlorobiphenyl 1356 Y, 1355 L, No action since this is a QC sample.

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
7.4	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data.			

Notes:

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			

Notes:

9.0 Field Duplicate

		Yes	No	NA
9.2	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: PCBs → 45MW2 & DUP-3 both NDs ✓ Pest → 45MW2 & DUP-3 both NDs ✓

10.0 Compound Identification and Detection Limit Verification

		Yes	No	NA
10.1	Is the percent difference calculated for the positive sample results on both columns <40%? If No, J(+).			✓
10.2	Do detection limits meet those required by the project QAPP and were properly adjusted for dilution factors and moisture?	✓		

Notes:

11.0 Data Completeness

		Yes	No	NA
11.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
11.1.1	Number of samples: Pest_____ PCB_____			
11.1.2	Number of target compounds in each analysis: PEST_____ PCB_____			
11.1.3	Number of results rejected and not reported: Pest_____ PCB_____			
11.1.4	% Completeness = (11.1.1 x 11.1.2 - 11.1.3) x 100/(11.1.1 x 11.1.2)			
	% Completeness = Pest 100% PCB 100%			

Notes:

URS

SURROGATE STANDARD RECOVERY AND RT SUMMARY
USEPA-8081A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8061120
Matrix: Water

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument: 199
Calibration: 8F11003

Lab Sample Id Surrogate Compound Name	RT	Calibration Mean RT	RT Diff	RT Diff Limit	% Recovery	Recovery Limits	Q
45MW4 (0805546-01)		**Lab File ID: A72_022-0**		**Analyzed: 06/10/08 05:25**			
Tetrachloro-m-xylene	8.19	8.18	0.01	+/-1.0	74	25 - 140	
Tetrachloro-m-xylene [2C]	9.95	9.94	0.01	+/-1.0	76	25 - 140	
Decachlorobiphenyl	22.60	22.60	0.00	+/-1.0	90	30 - 135	
Decachlorobiphenyl [2C]	27.28	27.27	0.01	+/-1.0	91	30 - 135	
DUP-3 (0805500-02)		**Lab File ID: A72_023-0**		**Analyzed: 06/10/08 06:04**			
Tetrachloro-m-xylene	8.18	8.18	0.00	+/-1.0	66	25 - 140	
Tetrachloro-m-xylene [2C]	9.95	9.94	0.01	+/-1.0	67	25 - 140	
Decachlorobiphenyl	22.61	22.60	0.01	+/-1.0	91	30 - 135	
Decachlorobiphenyl [2C]	27.29	27.27	0.02	+/-1.0	92	30 - 135	
LCS (0806158-BS4)		**Lab File ID: A72_024-0**		**Analyzed: 06/10/08 06:44**			
Tetrachloro-m-xylene	8.19	8.18	0.01	+/-1.0	85	25 - 140	
Tetrachloro-m-xylene [2C]	9.95	9.94	0.01	+/-1.0	87	25 - 140	
Decachlorobiphenyl	22.61	22.60	0.01	+/-1.0	90	30 - 135	
Decachlorobiphenyl [2C]	27.29	27.27	0.02	+/-1.0	87	30 - 135	
Blank (0806158-BLK3)		**Lab File ID: A72_026-0**		**Analyzed: 06/10/08 08:04**			
Tetrachloro-m-xylene	8.19	8.18	0.01	+/-1.0	131	25 - 140	
Tetrachloro-m-xylene [2C]	9.96	9.94	0.02	+/-1.0	133	25 - 140	
Decachlorobiphenyl	22.61	22.60	0.01	+/-1.0	138	30 - 135	*
Decachlorobiphenyl [2C]	27.29	27.27	0.02	+/-1.0	138	30 - 135	*
Calibration Check (8061120-CCV1)		**Lab File ID: A72_027-0**		**Analyzed: 06/10/08 08:43**			
Tetrachloro-m-xylene	8.19	8.18	0.01	+/-1.0	113	80 - 120	
Tetrachloro-m-xylene [2C]	9.95	9.94	0.01	+/-1.0	116	80 - 120	
Decachlorobiphenyl	22.61	22.60	0.01	+/-1.0	103	80 - 120	
Decachlorobiphenyl [2C]	27.30	27.27	0.03	+/-1.0	104	80 - 120	
Calibration Check (8061120-CCV2)		**Lab File ID: A72_028-0**		**Analyzed: 06/10/08 09:23**			
Tetrachloro-m-xylene	8.19	8.18	0.01	+/-1.0	100	80 - 120	
Tetrachloro-m-xylene [2C]	9.95	9.94	0.01	+/-1.0	99	80 - 120	
Decachlorobiphenyl	22.61	22.60	0.01	+/-1.0	100	80 - 120	
Decachlorobiphenyl [2C]	27.29	27.27	0.02	+/-1.0	98	80 - 120	

00370

STATEMENT OF DATA QUALIFICATIONS

Organochlorine Pesticides by EPA Method 8081A

Qualification: One or more surrogate recoveries for the sample exceeded the upper control limit. Positive results are considered estimated. Non-detect results are not qualified.

Analysis: USEPA-8081A

0806158-BLK3

DATA VALIDATION WORKSHEET

Explosives

Reviewer: RA
Date: 4/24/08
DV Level: II (III) IV

Review Document:

_X__ Region III Modified for National Functional Guidelines
_X__ SW-846
_X__ Project QAPP/SAP

Project Name: Radford
Project Number: 116563511
Laboratory: Trimatrix
SDG No.: 36440-56
Test Name: Explosives
Method No.: 8330

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were received with the cooler temperature exceeding 20 °C, then flag L(+)/UL(-).			
1.4	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). Extraction: (aqueous) 7 days and (soil) 14 days; and Analysis: 40 days.		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".		✓	
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.		✓	

Notes:

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are at least five standards included in the calibration curve? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 12 hours or twenty samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±15%) or %D(≤15%) within	✓		
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>15%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 15%, J(+), only. Negative Bias - %D>-15% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes:

5.0 Laboratory Control Sample (LCS)

		Yes	No	NA
5.1	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.2	Are there any %R for LCS/LCSD recoveries outside the QC limits?	✓		
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
5.3	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.		✓	

Notes: LCS for sequence 50602H4 71.60% for RDX at 23%. and result ND, No action

6.0 Surrogate Recovery

		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.3, are these sample(s) or method blank(s) reanalyzed?			✓
6.3	If No in Section 6.4, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓

	<10%	low	high
Positives	L	L	K
Non-detects	R	UL	No action

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
7.1	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.2	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
7.3	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Action: No action is required based on MS/MSd failure alone. Note in the report and use professional judgement.			

Notes:

8.0 Field Duplicate

		Yes	No	NA
8.1	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: 45MW2 & DUP-3
Both NDs ✓

9.0 Compound Identification and Detection Limit Verification

		Yes	No	NA
9.1	Are any target compounds detected in the field samples? If Yes, is all positive identifications were confirmed in second column? Apply J flag if RPD >40% between first and second columns.	✓		
9.2	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes: HMX 740% in 45MW3 at 45.7% → J/g

10.0 Data Completeness

		Yes	No	NA
10.1	Is % completeness within the control limits? (Control limit $95\%_{aq}$ and $90\%_{so}$)	✓		
10.1.1	Number of samples:_____			
10.1.2	Number of target compounds in each analysis: 14			
10.1.3	Number of results rejected or not reported:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			

STATEMENT OF DATA QUALIFICATIONS

Nitroaromatics & Nitramines by EPA Method 8330

Qualification:	The RPD between the detected values from the primary and confirmation analyses exceeded 40%. The higher concentration result has been reported.	
Analysis:	USEPA-8330	
Sample/Analyte:	0805546-02RE1 45MW3	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
Qualification:	The LCS recovery was outside of the control limit with no allowed marginal exceedences. The result for this analyte in any sample from the associated QC batch is considered qualified.	
Analysis:	USEPA-8330	
Sample/Analyte:	0805546-02RE1 45MW3	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

00011

LCS / LCS DUPLICATE RECOVERY
USEPA-8330

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Matrix: Water

Laboratory ID: 0806212-BS2

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Preparation: 8330 Extraction
Initial/Final: 770 mL / 10 mL
QC Batch: 0806212
Sequence: 8060244

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
1,3,5-Trinitrobenzene	2.60	2.03	78	65 - 140	ug/L
1,3-Dinitrobenzene	2.60	1.92	74	45 - 160	ug/L
2,4,6-Trinitrotoluene	2.60	1.58	61	50 - 145	ug/L
2,4-Dinitrotoluene	2.60	2.07	80	60 - 135	ug/L
2,6-Dinitrotoluene	2.60	2.15	83	60 - 135	ug/L
2-Amino-4,6-dinitrotoluene	5.19	4.01	77	50 - 155	ug/L
2-Nitrotoluene	2.60	2.47	95	45 - 135	ug/L
3-Nitrotoluene	2.60	1.73	66	50 - 130	ug/L
4-Amino-2,6-dinitrotoluene	2.60	2.12	82	55 - 155	ug/L
4-Nitrotoluene	2.60	2.08	80	50 - 130	ug/L
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	2.60	5.99	230 *	50 - 160	ug/L
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	2.60	1.80	69	20 - 175	ug/L
Nitrobenzene	2.60	1.69	65	50 - 140	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2.60	2.25	86	80 - 115	ug/L

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

SINGLE-COMPONENT IDENTIFICATION SUMMARY

REVISED
AB 6/26/08

EPA SAMPLE #: 45MW3 LAB SAMPLE # 0805546-02

	COLUMN 1	COLUMN 2
Inst.ID:	221	221
Column:	ACCLAIM E1	ACCLAIM E2
ID(mm):		

Compound	Column	Retention Time	RT Window From	RT Window To	Concentration (ug/L)	RPD
HMX	1	4.93	4.84	5.02	0.48070	45.7%
	2	8.10	7.52	8.58	0.76580	

DATA VALIDATION WORKSHEET

Nitroglycerin

Reviewer: RA
Date: 4/24/08
DV Level: II (III) IV
Review Document:

_X__ Region III Modified for National Functional Guidelines
____ NFG for organic Data review (February 1994)
____ Project QAPP/SAP

All QC OKV

Project Name: Radford
Project Number: 114563.51
Laboratory: Trimatrix
SDG No.: 30440-56
Test Name: Nitroglycerin
Method No.: 8332-HPLC

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	
1.4	Are the sample preparation benchsheets present and complete with sample volume/weights, dilutions, final volumes. %	✓		
1.5	Are the measurement read out records legible and complete (properly labeled, and include all samples and QC)?	✓		

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Do sample preservation, collection and storage condition meet method requirement?	✓		
	Action: If the temperature of the cooler was elevated (> 10 °C), then flag all positive results with a "J" and all non-detects "UJ".			✓
2.2	Have any technical holding times, determined from date of sampling to date of analysis (including dilution and reanalyese, been exceeded? Action: If yes, apply J (+) and UJ (-) to all analytes in the sample. For aqueous matrix - 7 days (extraction) and 40 days (analysis) For soil matrix - 14 days (extraction) and 40 days (analysis).		✓	
2.3	Have any technical holding times been grossly (twice the holding time) exceeded? If yes, note in the DV report.		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".		✓	
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.		✓	
3.4	Are there field equipment blank/trip blanks associated with every sample? If No, note in the DV report.	✓		

Notes:

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are sufficient standards (5 for first order, 6 for second order, or 7 for third order) included in the calibration curve? If no, apply professional judgement towards usability.	✓		
4.2	Was an initial calibration analyzed at the beginning of each analysis? If No, apply R to all results for specific analyte(s) for all samples associated with the calibration.	✓		
4.3	Are all calibration standard (ICV and CCV) %RSD (or correlation coefficient) or % drift within the control limits? Control Limits: r≥0.99, %RSD < ± 20% and %D < ± 15%	✓		
	For initial Calibration: for %RSD > ± 20%, but < ± 50%, J(+) only. for %RSD > ± 50%, but < ± 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).			✓
	For Continuing Calibration: displaying a negative bias: %D > + 15% and < + 50%, J(+)/UJ(-), >50%J(+)/R(-); displaying a positive bias >15%, J(+).			✓
4.4	Has a continuing calibration verification been analyzed prior to and after every 10 samples and at the end of the analysis sequence? If no, apply R to associated samples.	✓		

Notes:

5.0 Surrogate Recovery

		Yes	No	NA
5.1	Are all samples listed on the appropriate Surrogate Recovery Summary Form ?	✓		
5.2	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
5.3	If No in Section 5.2, are these sample(s) or method blank(s) reanalyzed?			✓
5.4	If No in Section 5.3, is any sample DF greater than 10? No action is taken if surrogate is expected to be diluted out.			✓
	Action: If No, for any %R > UCL, apply K to all positive results of analytes; for any %R < LCL, but > 10%, L(+)/UL (-); for any %R < 10%, apply L (+) and R (-) to all results of analytes asociated with the surrogate.			

Notes:

6.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
6.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
6.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
6.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data. If determined to affect only the sample spiked, then qualify the parent sample alone. If determined that problem is systematic, flag all associated samples.			

Notes:

7.0 Laboratory Control Sample (LCS)

		Yes	No	NA
7.1	Is the LCS/LCSD recovery form present?	✓		
7.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.3	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
7.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits?			✓
	Action: If Yes, J(+) only.			

Notes:

8.0 Field Duplicate

		Yes	No	NA
8.1	Were field duplicate prepared and analyzed at the corrected frequency (one per 20 samples, per matrix and per level)?	✓		
	For sample results > 5 x RL, a control limit of 25% RPD for water and 35% RPD for soil will be used. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 X RL for soil will be used.			
8.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓	✓	

Notes: 4SMW2 & DUP-3
both NDs ✓

9.0 Compound Identification and Detection Limit Verification

		Yes	No	NA
9.1	Are any target compounds detected in the field samples? If Yes, is all positive identifications were confirmed in second column? Apply J flag if RPD >40% between first and second columns.		✓	
9.2	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

10.0 Data Completeness

		Yes	No	NA
10.1	Is % completeness within the control limits? (Control limit 90%)	✓		
10.1.1	Number of samples:_____			
10.1.3	Number of results rejected and not reported:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = _____			
	% Completeness = 100			

Notes:

DATA VALIDATION WORKSHEET
INORGANIC - ICP, CVAA, AND CYANIDE
REGION III - NATIONAL FUNCTIONAL GUIDELINES

SDG No.: 36446-56
Project No.: 11605435 1

Project Name: Radford
Reviewer: RA
Date: 4/29/08

1.0 Chain of Custody/Sample Condition/Raw Data		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples which were analyzed?	✓			✓			✓					
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓			✓			✓					
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓			✓			✓				
1.4	Does sample preservation, collection and storage meet method requirement? (For metal: water samples: with Nitric Acid to pH < 2, and soil/sediment samples: 4 ^{o}C $\pm$ 2 ^{o}C)	✓			✓			✓					
1.5	Are the digestion logs present and complete with pH values, sample weights, dilutions, final volumes. % solids (for soil samples), and preparation dates? For any missing or incomplete documentation, contact the laboratory for explanation/resubmittal.	✓			✓			✓					

Note: _____

2.0 Holding Time		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
2.1	Have any technical holding times, determined from date of collection to date of analysis, been exceeded? (Hg: 28days, CN: 14 days, other metals: 6 months) Action:L(+)/UL(-). If the holding time is grossly exceeded (twice the holding time criteria), L(+)/R(-).		✓			✓			✓				

Note: _____

URS

3.0 Instrument Calibration

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
3.1	Are sufficient standards included in the calibration curve? (ICP& ICPMS: blank + one standard & a RL standard OR 3 standards and a blank with one standard at the RL; CVAA: blank + five standards with one standard at the RL). If not, qualify with "R".	✓			✓			✓					
3.2	Are the correlation coefficients > 0.99? Action: J(+)/UJ(-).	✓			✓			✓					
3.3	Once per calibration, did a high and low distilled standard recovery within 85-115%? If no, follow 3.6.												
3.4	Was an initial calibration check standard (ICV) analyzed immediately after instrument system had been calibrated? Action: If no, all associated data are rejected "R".	✓			✓			✓					
3.5	Was continuing calibration standard (CCS) analyzed at a minimum frequency of 10% (every 10 samples) during an analytical run and at the end of the analytical run? If not, document and flag based on professional judgement.	✓			✓			✓					
3.6	Are all calibration standard percent recoveries (ICV and CCV) within the control limits? FOR ICP 90%-110%, FOR Hg 80-120%, FOR CN 85-115%.	✓			✓			✓					
	ICV and CCV: Action: L(+)/R(-) L(+)/UL(-) K(+) Mercury < 65% 65% - 79% > 120% Cyanide < 65% 65% - 84% > 115% Other Metals < 75% 75% - 89% > 110%												
3.7	For ICP & ICPMS, did the CRDL standard recover between 80-120%?	✓			✓								
	<50% 50%-79% >120% 2xCRDL>[sample]>IDL L(+)/R(-) L(+)/UL(-) K												

Note: _____

4.0 Blanks

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
4.1	Were method blank (MB) prepared at the appropriate frequency (one per 20 samples, per batch, per matrix and per level)?	✓			✓			✓					
4.2	Were calibration blanks (ICB and CCBs) analyzed immediately after each and every ICV and CCVs? Action: If no ICB was run, all associated data are rejected. If the frequency of the CCBs does not follow requirement, all associated data are qualified "J".	✓			✓			✓					
4.3	Are there reported MB or ICB/CCBs values > MDL?	✓			✓			✓	✓				
	Sample Results > MDL												
	< 5X Blank Contamination B												
4.4	Are there negative blank results with the absolute value > MDL?		✓		✓			✓					
	Sample Results Non-detects > MDL												
	< 5X absolute Blank Contamination UL L												
4.5	Are there reported field blank > ± MDL?	✓			✓				✓				
	Sample Results > MDL												
	< 5X Blank Contamination B												

Note: 6010 → MB pos diss Al, diss potassium < 5X, B, P. CCBs, neg for potassium. and pos 75X absolute value. No action
EQBK-3 total Fe at 84 ug/L all 75X, No action
6020 → MB Diss Cr < 5X → B, P ICB, CCB, pos for Sb, Cr, V, Se < 5X, B, O
EQBK-3 total Cr (total Zn) < 5X, B, X
Diss Zn

5.0 ICP Interference Check Sample (ICS)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
5.1	Was ICS analyzed at beginning of each ICP run?	✓			✓								
5.2	Are the ICS AB recoveries within 80% - 120%?	✓			✓								
5.3	Are the results for unspiked analytes (in ICS A) < ± RL?	✓			✓								
5.4	If not, are the associated sample Al, Ca, Fe, and Mg concentrations less than the level in the ICS?			✓			✓						
	If not...												
	Action: Not Spiked Analytes: < -MDL L(+)/UL(-); > MDL K(+). Spiked analytes (ICS AB analytes): < 50% L(+)/R(-); 50% - 79% L(+)/UL(-); >120% K(+)												

Note:

one
→ Hg → CCB neg. for Hg ND → UL O

URS

6.0 Laboratory Control Sample (LCS)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
6.1	Was an LCS prepared and analyzed at the correct frequency (one per 20 samples, per batch, per matrix and per level)? Action: If no, J(+) any sample not associated with LCS results.	√			√			√					
6.2	Is any LCS recovery outside the control limits? (Aqueous limits: 80% - 120% - except Ag and Sb; Solid limits: as per EPA-EMSL/LV)		√			√			√				
	Action: Solid: < LCL L(+)/UL(-); > UCL K(+). Aqueous: < 50% L(+)/R(-); 50% - 79% L(+)/UL(-); > 120% K(+)												

Note:

7.0 Laboratory Duplicates (MSD)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
7.1	Were Laboratory duplicates prepared and analyzed at the correct frequency (one per 20 samples, per batch, per matrix and per level)? Action: If no, J(+), using professional judgement, analytes not associated with duplicate results.	√			√			√					
	For aqueous 6010B and Hg - RPD< 25%, aqueous CN - RPD < 20%, aqueous 6020 - RPD < 20%, and for soil - use laboratory generated limits for MS/MSD.												
7.2	Are all analyte duplicate results within control limits? If no, qualify all associated field samples J(+)/UJ(-) for the analyte with results that fall outside criteria.	√			√			√					

Note:

8.0 Spike Sample Analysis -Pre-Digestion/Post-Digestion

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
8.1	Was a spiked sample prepared and analyzed at the correct frequency (one per 20 samples, batch, matrix and level)? If not, J(+) with professional judgement.	✓			✓			✓					
8.2	For all analytes with sample concentration > 4 x spike concentration, are spike recoveries within the control limit of 75-125% for aqueous matrices or lab limits for soil matrices?												
		%R > 125%	30%< %R < 74%	< 30%									
	Positive	K	L	L									
	Non-detect	None	UL	R									
8.3	Where pre-digestion matrix spike analytes were outside the acceptable recovery limits(except Ag), was a post-digestion spike performed? Note any failures in DV report, but no data qualifying action is required.			✓	✓				✓				

Note: 6010 → MS/MSD for 45MW4 >125%. For total Al 159%/154%. pos results → K/M

9.0 Instrument Detection Limits (IDL)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
9.1	Are all IDLs/RLs equal to or less than the reporting limits specified?	✓			✓			✓					

Note:

10.0 ICP/AA Serial Dilutions (Not for Mercury Analysis)

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
10.1	Were serial dilutions performed?	✓			✓								
10.2	Was a five-fold dilution performed?	✓			✓								
10.3	Did the serial dilution results agree within 10% for ICP analyte concentration > 5 X the RL for 6010 or > 20 X the RL for 6020 in the original sample? If no, J(+).	✓			✓								

Note:

11.0 Field Duplicate Samples

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
11.1	Were any field duplicates submitted for metal analysis?	✓			✓			✓					
	For sample results > 5 x RL, a control limit of ~~25~~ 50% RPD for water and ~~35~~ 50% RPD for soil will be used. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 X RL for soil will be used.												
11.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report		✓		✓			✓					

Note: see attached
6020/45MW2/DUP-3 total Cr, Co, Ni: outside QC → J, f

12.0 Result Verification/ Internal Standards/ Tune

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
12.1	Were all results and detection limits for solid-matrix samples reported on a dry-weight basis?			✓			✓			✓			
12.2	Were all dilution reflected in the positive results and detection limits?	✓					✓	✓					
12.3	Were the Internal Standard recoveries within 30-120%	✓			✓								
12.4	Were the tunes run at a minimum of four times with RSD < 5% for analytes in solution?	✓											
12.5	Were the tune mass calibrations < 0.1 amu from the true value?	✓											
12.6	Was the resolution check peak width < 0.9 amu at 10% peak height?	✓											

Note:

13.0 Completeness Calculation

		6020			6010B			CVAA-Hg			Cyanide		
		Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
13.1	Is % completeness within the control limits? (Control limit 90%)	✓			✓			✓					
13.1.1	Number of samples:												
13.1.2	Number of target compounds in each analysis:												
13.1.3	Number of results rejected and not reported:												
	% Completeness = (13.1.1 x 13.1.2 - 13.1.3) x 100/(13.1.1 x 13.1.2) % Completeness = 100 %												

Note:

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by _____ Date _____

_____ Checked by _____ Date _____

Reference

Field Dups for Cooza

	45MW2	&	DUP-3	RL	RPD
total Ba	56		52	2	7% ✓
total Cr	4.9		12	2	84%
total Co	3.6		11	1	101%
total Cu	1.2		1.9	1	OK ✓
total Pb	0.77J		1.2	1	OK ✓
total Mn	44		57	3	25% ✓
total Ni	2.7		9.8	2	113%
total Se	0.88J		0.67J	3	OK ✓
total Ag	0.16J		0.64	0.5	OK ✓
total V	1.9J		2.8J	5	OK ✓
total Cd	ND		0.064J		OK ✓

	45MW2	&	DUP-3	RL	RPD
Diss Ba	47		45	2	4% OK ✓
Diss Co	2.2		1.4	1	OK ✓
Diss Mn	4.2		2.8J	3	OK ✓
Diss Ni	2.6		1.9J	2	OK ✓
Diss Se	0.54J		0.62J	3	OK ✓
Diss V	0.44J		0.36J	5	OK ✓
~~Diss Cr~~	~~ND~~				

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by _____ Date _____

_____ Checked by _____ Date _____

Reference

Field Dups for 6010

	45MW2	&	DUP-3	RL	RPD
total Al	550		890	50	47.2% ✓
total Ca	75,000		60,000	500	22% ✓
total Fe	1,100		1,800	20	48% ✓
total Mg	23,000		20,000	500	14% ✓
total K	450		560	500	22% ✓
total Na	4,200		4,100	500	2% ✓

	45MW2	&	DUP-3	RL	RPD
Diss Ca	62,000		60,000	500	3% ✓
Diss Fe	10J		ND	20	OK ✓
Diss Mg	20,000		19,000	500	5% ✓
Diss K	270		250	200	8% ✓
Diss Na	3,900		3,900	500	0% ✓

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8060304

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 311
Calibration: 8F03006

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060304-ICB1	Aluminum	-19.9	50	20	ug/L	U	06/03/08 08:40
	Potassium	-0.0484	0.20	0.062	mg/L	U	06/03/08 08:40
	Calcium	-0.0246	0.50	0.069	mg/L	U	06/03/08 08:40
	Iron	-1.71	20	9.6	ug/L	U	06/03/08 08:40
	Magnesium	-0.0287	0.50	0.063	mg/L	U	06/03/08 08:40
8060304-CCB1	Aluminum	-19.5	50	20	ug/L	U	06/03/08 09:10
	Potassium	-0.0471	0.20	0.062	mg/L	U	06/03/08 09:10
	Calcium	-0.0260	0.50	0.069	mg/L	U	06/03/08 09:10
	Iron	-1.53	20	9.6	ug/L	U	06/03/08 09:10
	Magnesium	-0.0307	0.50	0.063	mg/L	U	06/03/08 09:10
0806374-BLK1	Aluminum, Dissolved	50	50	20	ug/L	J	06/03/08 09:14
	Potassium, Dissolved	200	200	62	ug/L	J	06/03/08 09:14
	Calcium, Dissolved	500	500	69	ug/L	U	06/03/08 09:14
	Iron, Dissolved	20	20	9.6	ug/L	U	06/03/08 09:14
	Magnesium, Dissolved	500	500	63	ug/L	U	06/03/08 09:14
8060304-CCB2	Aluminum	-16.5	50	20	ug/L	U	06/03/08 10:05
	Potassium	-0.120	0.20	0.062	mg/L	J	06/03/08 10:05
	Calcium	-0.0288	0.50	0.069	mg/L	U	06/03/08 10:05
	Iron	-1.55	20	9.6	ug/L	U	06/03/08 10:05
	Magnesium	-0.0301	0.50	0.063	mg/L	U	06/03/08 10:05
8060304-CCB3	Aluminum	-19.4	50	20	ug/L	U	06/03/08 10:22
	Potassium	-0.0803	0.20	0.062	mg/L	J	06/03/08 10:22
	Calcium	-0.0268	0.50	0.069	mg/L	U	06/03/08 10:23
	Iron	-2.20	20	9.6	ug/L	U	06/03/08 10:23
	Magnesium	-0.0292	0.50	0.063	mg/L	U	06/03/08 10:23

* Values outside of QC limits

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8053004

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 311
Calibration: 8E30008

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8053004-ICB1	Aluminum	-5.28	50	20	ug/L	U	05/30/08 09:12
	Potassium	-0.0131	0.20	0.062	mg/L	U	05/30/08 09:12
	Sodium	-0.0164	0.50	0.21	mg/L	U	05/30/08 09:12
	Calcium	-0.00616	0.50	0.069	mg/L	U	05/30/08 09:13
	Iron	-1.21	20	9.6	ug/L	U	05/30/08 09:13
	Magnesium	-0.0255	0.50	0.063	mg/L	U	05/30/08 09:13
8053004-CCB1	Aluminum	-3.42	50	20	ug/L	U	05/30/08 09:38
	Potassium	-0.0938	0.20	0.062	mg/L	J	05/30/08 09:38
	Sodium	-0.0409	0.50	0.21	mg/L	U	05/30/08 09:38
	Calcium	-0.00969	0.50	0.069	mg/L	U	05/30/08 09:38
	Iron	-0.369	20	9.6	ug/L	U	05/30/08 09:38
	Magnesium	-0.0186	0.50	0.063	mg/L	U	05/30/08 09:38
0806244-BLK1	Aluminum, Total	50	50	20	ug/L	U	05/30/08 09:42
	Potassium, Total	200	200	62	ug/L	U	05/30/08 09:42
	Sodium, Total	500	500	210	ug/L	U	05/30/08 09:42
	Calcium, Total	500	500	69	ug/L	U	05/30/08 09:43
	Iron, Total	20	20	9.6	ug/L	U	05/30/08 09:43
	Magnesium, Total	500	500	63	ug/L	U	05/30/08 09:43
8053004-CCB2	Aluminum	-14.2	50	20	ug/L	U	05/30/08 10:26
	Potassium	-0.0851	0.20	0.062	mg/L	J	05/30/08 10:26
	Sodium	-0.0428	0.50	0.21	mg/L	U	05/30/08 10:26
	Calcium	-0.0109	0.50	0.069	mg/L	U	05/30/08 10:26
	Iron	-1.16	20	9.6	ug/L	U	05/30/08 10:26
	Magnesium	-0.0231	0.50	0.063	mg/L	U	05/30/08 10:26
8053004-CCB3	Aluminum	-9.68	50	20	ug/L	U	05/30/08 10:42
	Potassium	-0.0995	0.20	0.062	mg/L	J	05/30/08 10:42
	Sodium	-0.0434	0.50	0.21	mg/L	U	05/30/08 10:42
	Calcium	-0.0116	0.50	0.069	mg/L	U	05/30/08 10:43
	Iron	-1.56	20	9.6	ug/L	U	05/30/08 10:43
	Magnesium	-0.0188	0.50	0.063	mg/L	U	05/30/08 10:43

* Values outside of QC limits

01474

BLANKS
USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8060304
Instrument ID: 311
Calibration: 8F03006

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060304-ICB1	Aluminum	-19.9	50	20	ug/L	U	06/03/08 08:40
	Potassium	-0.0484	0.20	0.062	mg/L	U	06/03/08 08:40
	Calcium	-0.0246	0.50	0.069	mg/L	U	06/03/08 08:40
	Iron	-1.71	20	9.6	ug/L	U	06/03/08 08:40
	Magnesium	-0.0287	0.50	0.063	mg/L	U	06/03/08 08:40
8060304-CCB1	Aluminum	-19.5	50	20	ug/L	U	06/03/08 09:10
	Potassium	-0.0471	0.20	0.062	mg/L	U	06/03/08 09:10
	Calcium	-0.0260	0.50	0.069	mg/L	U	06/03/08 09:10
	Iron	-1.53	20	9.6	ug/L	U	06/03/08 09:10
	Magnesium	-0.0307	0.50	0.063	mg/L	U	06/03/08 09:10
0806374-BLK1	Aluminum, Dissolved	50	50	20	ug/L	U	06/03/08 09:14
	Potassium, Dissolved	200	200	62	ug/L	U	06/03/08 09:14
	Calcium, Dissolved	500	500	69	ug/L	U	06/03/08 09:14
	Iron, Dissolved	20	20	9.6	ug/L	U	06/03/08 09:14
	Magnesium, Dissolved	500	500	63	ug/L	U	06/03/08 09:14
8060304-CCB2	Aluminum	-16.5	50	20	ug/L	U	06/03/08 10:05
	Potassium	-0.120	0.20	0.062	mg/L	J	06/03/08 10:05
	Calcium	-0.0288	0.50	0.069	mg/L	U	06/03/08 10:05
	Iron	-1.55	20	9.6	ug/L	U	06/03/08 10:05
	Magnesium	-0.0301	0.50	0.063	mg/L	U	06/03/08 10:05
8060304-CCB3	Aluminum	-19.4	50	20	ug/L	U	06/03/08 10:22
	Potassium	-0.0803	0.20	0.062	mg/L	J	06/03/08 10:22
	Calcium	-0.0268	0.50	0.069	mg/L	U	06/03/08 10:23
	Iron	-2.20	20	9.6	ug/L	U	06/03/08 10:23
	Magnesium	-0.0292	0.50	0.063	mg/L	U	06/03/08 10:23

* Values outside of QC limits

: 01475

METHOD BLANK DATA SHEET
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0806373-BLK1
File ID: 8060260-038
Prepared: 05/30/08 08:27
Preparation: General Metals Prep
Initial/Final: 25 mL / 125 mL
Analyzed: 06/02/08 19:33
Instrument: 201
QC Batch: 0806373
Sequence: 8060260
Calibration: 8F02017

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
7440-36-0	Antimony, Dissolved	0.32	3.0	3.0	ug/L	U
7440-38-2	Arsenic, Dissolved	0.24	3.0	3.0	ug/L	U
7440-39-3	Barium, Dissolved	0.23	2.0	2.0	ug/L	U
7440-41-7	Beryllium, Dissolved	0.23	2.0	2.0	ug/L	U
7440-43-9	Cadmium, Dissolved	0.056	0.20	0.20	ug/L	U
7440-47-3	Chromium, Dissolved	0.33	2.0	0.615	ug/L	J
7440-48-4	Cobalt, Dissolved	0.050	1.0	1.0	ug/L	U
7440-50-8	Copper, Dissolved	0.29	1.0	1.0	ug/L	U
7439-92-1	Lead, Dissolved	0.29	1.0	1.0	ug/L	U
7439-96-5	Manganese, Dissolved	0.30	3.0	3.0	ug/L	U
7440-02-0	Nickel, Dissolved	0.35	2.0	2.0	ug/L	U
7440-22-4	Silver, Dissolved	0.061	0.50	0.50	ug/L	U
7440-28-0	Thallium, Dissolved	0.050	0.20	0.20	ug/L	U
7440-62-2	Vanadium, Dissolved	0.27	5.0	5.0	ug/L	U
7440-66-6	Zinc, Dissolved	1.8	10	10	ug/L	U

3.075

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8060260
Instrument ID: 201
Calibration: 8F02017

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060260-ICB1	Antimony	0.0762	0.60	0.065	ug/L	J	06/02/08 17:33
all samples	Antimony	0.0762	0.60	0.065	ug/L	J	06/02/08 17:33
	Arsenic	-0.00419	0.60	0.048	ug/L	U	06/02/08 17:33
	Arsenic	-0.00419	0.60	0.048	ug/L	U	06/02/08 17:33
	Barium	-0.000964	0.40	0.047	ug/L	U	06/02/08 17:33
	Barium	-0.000964	0.40	0.047	ug/L	U	06/02/08 17:33
	Beryllium	0.00900	0.40	0.046	ug/L	U	06/02/08 17:33
	Beryllium	0.00900	0.40	0.046	ug/L	U	06/02/08 17:33
	Cadmium	0.00151	0.040	0.011	ug/L	U	06/02/08 17:33
	Cadmium	0.00151	0.040	0.011	ug/L	U	06/02/08 17:33
	Chromium	-0.0100	0.40	0.065	ug/L	U	06/02/08 17:33
	Chromium	-0.0100	0.40	0.065	ug/L	U	06/02/08 17:33
	Cobalt	-0.000132	0.20	0.010	ug/L	U	06/02/08 17:33
	Cobalt	-0.000132	0.20	0.010	ug/L	U	06/02/08 17:33
	Copper	0.000800	0.20	0.058	ug/L	U	06/02/08 17:33
	Copper	0.000800	0.20	0.058	ug/L	U	06/02/08 17:33
	Lead	0.00105	0.20	0.058	ug/L	U	06/02/08 17:33
	Lead	0.00105	0.20	0.058	ug/L	U	06/02/08 17:33
	Manganese	0.00343	0.60	0.059	ug/L	U	06/02/08 17:33
	Manganese	0.00343	0.60	0.059	ug/L	U	06/02/08 17:33
	Nickel	-0.00242	0.40	0.070	ug/L	U	06/02/08 17:33
	Nickel	-0.00242	0.40	0.070	ug/L	U	06/02/08 17:33
	Silver	0.00126	0.10	0.012	ug/L	U	06/02/08 17:33
	Silver	0.00126	0.10	0.012	ug/L	U	06/02/08 17:33
	Thallium	-0.000846	0.040	0.0099	ug/L	U	06/02/08 17:33
	Thallium	-0.000846	0.040	0.0099	ug/L	U	06/02/08 17:33
	Vanadium	0.0140	1.0	0.054	ug/L	U	06/02/08 17:33
	Vanadium	0.0140	1.0	0.054	ug/L	U	06/02/08 17:33
	Zinc	-0.00640	2.0	0.36	ug/L	U	06/02/08 17:33
	Zinc	-0.00640	2.0	0.36	ug/L	U	06/02/08 17:33
8060260-CCB1	Antimony	0.0402	0.60	0.065	ug/L	U	06/02/08 18:04
	Antimony	0.0402	0.60	0.065	ug/L	U	06/02/08 18:04
	Arsenic	-0.00469	0.60	0.048	ug/L	U	06/02/08 18:04

: 01732

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8060260
Instrument ID: 201
Calibration: 8F02017

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060260-CCB2	Thallium	-0.00137	0.040	0.0099	ug/L	U	06/02/08 19:20
	Thallium	-0.00137	0.040	0.0099	ug/L	U	06/02/08 19:20
	Vanadium	0.0321	1.0	0.054	ug/L	U	06/02/08 19:20
	Vanadium	0.0321	1.0	0.054	ug/L	U	06/02/08 19:20
	Zinc	0.0237	2.0	0.36	ug/L	U	06/02/08 19:20
	Zinc	0.0237	2.0	0.36	ug/L	U	06/02/08 19:20
0806373-BLK1	Antimony, Dissolved	3.0	3.0	0.32	ug/L	U	06/02/08 19:33
	Arsenic, Dissolved	3.0	3.0	0.24	ug/L	U	06/02/08 19:33
	Barium, Dissolved	2.0	2.0	0.23	ug/L	U	06/02/08 19:33
	Beryllium, Dissolved	2.0	2.0	0.23	ug/L	U	06/02/08 19:33
	Cadmium, Dissolved	0.20	0.20	0.056	ug/L	U	06/02/08 19:33
	Chromium, Dissolved	0.615	2.0	0.33	ug/L	J	06/02/08 19:33
	Cobalt, Dissolved	1.0	1.0	0.050	ug/L	U	06/02/08 19:33
	Copper, Dissolved	1.0	1.0	0.29	ug/L	U	06/02/08 19:33
	Lead, Dissolved	1.0	1.0	0.29	ug/L	U	06/02/08 19:33
	Manganese, Dissolved	3.0	3.0	0.30	ug/L	U	06/02/08 19:33
	Nickel, Dissolved	2.0	2.0	0.35	ug/L	U	06/02/08 19:33
	Silver, Dissolved	0.50	0.50	0.061	ug/L	U	06/02/08 19:33
	Thallium, Dissolved	0.20	0.20	0.050	ug/L	U	06/02/08 19:33
	Vanadium, Dissolved	5.0	5.0	0.27	ug/L	U	06/02/08 19:33
	Zinc, Dissolved	10	10	1.8	ug/L	U	06/02/08 19:33
8060260-CCB3	Antimony	0.0593	0.60	0.065	ug/L	U	06/02/08 20:28
	Antimony	0.0593	0.60	0.065	ug/L	U	06/02/08 20:28
	Arsenic	0.00338	0.60	0.048	ug/L	U	06/02/08 20:28
	Arsenic	0.00338	0.60	0.048	ug/L	U	06/02/08 20:28
	Barium	-0.000709	0.40	0.047	ug/L	U	06/02/08 20:28
	Barium	-0.000709	0.40	0.047	ug/L	U	06/02/08 20:28
	Beryllium	0.0106	0.40	0.046	ug/L	U	06/02/08 20:28
	Beryllium	0.0106	0.40	0.046	ug/L	U	06/02/08 20:28
	Cadmium	0.00272	0.040	0.011	ug/L	U	06/02/08 20:28
all but 45MW2	Cadmium	0.00272	0.040	0.011	ug/L	U	06/02/08 20:28
	Chromium	0.0687	0.40	0.065	ug/L	J	06/02/08 20:28
	Chromium	0.0687	0.40	0.065	ug/L	J	06/02/08 20:28

01735

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8060260

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 201
Calibration: 8F02017

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060260-CCB3	Cobalt	0.0000900	0.20	0.010	ug/L	U	06/02/08 20:28
	Cobalt	0.0000900	0.20	0.010	ug/L	U	06/02/08 20:28
	Copper	0.00593	0.20	0.058	ug/L	U	06/02/08 20:28
	Copper	0.00593	0.20	0.058	ug/L	U	06/02/08 20:28
	Lead	0.00483	0.20	0.058	ug/L	U	06/02/08 20:28
	Lead	0.00483	0.20	0.058	ug/L	U	06/02/08 20:28
	Manganese	0.0178	0.60	0.059	ug/L	U	06/02/08 20:28
	Manganese	0.0178	0.60	0.059	ug/L	U	06/02/08 20:28
	Nickel	0.00170	0.40	0.070	ug/L	U	06/02/08 20:28
	Nickel	0.00170	0.40	0.070	ug/L	U	06/02/08 20:28
	Silver	0.00100	0.10	0.012	ug/L	U	06/02/08 20:28
	Silver	0.00100	0.10	0.012	ug/L	U	06/02/08 20:28
	Thallium	-0.00164	0.040	0.0099	ug/L	U	06/02/08 20:28
	Thallium	-0.00164	0.040	0.0099	ug/L	U	06/02/08 20:28
	Vanadium	0.0193	1.0	0.054	ug/L	U	06/02/08 20:28
	Vanadium	0.0193	1.0	0.054	ug/L	U	06/02/08 20:28
	Zinc	0.0362	2.0	0.36	ug/L	U	06/02/08 20:28
	Zinc	0.0362	2.0	0.36	ug/L	U	06/02/08 20:28
8060260-CCB4	Antimony	0.0811	0.60	0.065	ug/L	J	06/02/08 21:15
	Antimony	0.0811	0.60	0.065	ug/L	J	06/02/08 21:15
all but 45MW2	Arsenic	-0.0357	0.60	0.048	ug/L	U	06/02/08 21:15
	Arsenic	-0.0357	0.60	0.048	ug/L	U	06/02/08 21:15
	Barium	0.00224	0.40	0.047	ug/L	U	06/02/08 21:15
	Barium	0.00224	0.40	0.047	ug/L	U	06/02/08 21:15
	Beryllium	0.00394	0.40	0.046	ug/L	U	06/02/08 21:15
	Beryllium	0.00394	0.40	0.046	ug/L	U	06/02/08 21:15
	Cadmium	0.000433	0.040	0.011	ug/L	U	06/02/08 21:15
	Cadmium	0.000433	0.040	0.011	ug/L	U	06/02/08 21:15
	Chromium	0.113	0.40	0.065	ug/L	J	06/02/08 21:15
	Chromium	0.113	0.40	0.065	ug/L	J	06/02/08 21:15
	Cobalt	0.000658	0.20	0.010	ug/L	U	06/02/08 21:15
	Cobalt	0.000658	0.20	0.010	ug/L	U	06/02/08 21:15
	Copper	0.00383	0.20	0.058	ug/L	U	06/02/08 21:15

01736

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8060260

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 201
Calibration: 8F02017

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060260-CCB4	Copper	0.00383	0.20	0.058	ug/L	U	06/02/08 21:15
	Lead	0.00446	0.20	0.058	ug/L	U	06/02/08 21:15
	Lead	0.00446	0.20	0.058	ug/L	U	06/02/08 21:15
	Manganese	0.0189	0.60	0.059	ug/L	U	06/02/08 21:15
	Manganese	0.0189	0.60	0.059	ug/L	U	06/02/08 21:15
	Nickel	0.00409	0.40	0.070	ug/L	U	06/02/08 21:15
	Nickel	0.00409	0.40	0.070	ug/L	U	06/02/08 21:15
	Silver	0.000954	0.10	0.012	ug/L	U	06/02/08 21:15
	Silver	0.000954	0.10	0.012	ug/L	U	06/02/08 21:15
	Thallium	-0.00128	0.040	0.0099	ug/L	U	06/02/08 21:15
	Thallium	-0.00128	0.040	0.0099	ug/L	U	06/02/08 21:15
	Vanadium	0.0636	1.0	0.054	ug/L	J	06/02/08 21:15
	Vanadium	0.0636	1.0	0.054	ug/L	J	06/02/08 21:15
	Zinc	0.0420	2.0	0.36	ug/L	U	06/02/08 21:15
	Zinc	0.0420	2.0	0.36	ug/L	U	06/02/08 21:15

* Values outside of QC limits

0.318

01737

BLANKS
USEPA-6020A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Sequence: 8060308
Instrument ID: 114
Calibration: 8F03010

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060308-ICB1	Chromium	0.00115	0.40	0.065	ug/L	U	06/03/08 08:41
	Chromium	0.00115	0.40	0.065	ug/L	U	06/03/08 08:41
	Selenium	0.0629	0.60	0.061	ug/L	J	06/03/08 08:41
	Selenium	0.0629	0.60	0.061	ug/L	J	06/03/08 08:41
8060308-CCB1	Chromium	-0.0426	0.40	0.065	ug/L	U	06/03/08 08:52
	Chromium	-0.0426	0.40	0.065	ug/L	U	06/03/08 08:52
	Selenium	0.0663	0.60	0.061	ug/L	J	06/03/08 08:52
	Selenium	0.0663	0.60	0.061	ug/L	J	06/03/08 08:52
0806248-BLK2	Selenium, Total	3.0	3.0	0.30	ug/L	U	06/03/08 08:55
8060308-CCB2	Chromium	0.0268	0.40	0.065	ug/L	U	06/03/08 09:27
	Chromium	0.0268	0.40	0.065	ug/L	U	06/03/08 09:27
	Selenium	0.0660	0.60	0.061	ug/L	J	06/03/08 09:27
	Selenium	0.0660	0.60	0.061	ug/L	J	06/03/08 09:27
0806373-BLK2	Selenium, Dissolved	3.0	3.0	0.30	ug/L	U	06/03/08 09:36
8060308-CCB3	Chromium	0.0160	0.40	0.065	ug/L	U	06/03/08 10:05
	Chromium	0.0160	0.40	0.065	ug/L	U	06/03/08 10:05
	Selenium	0.0595	0.60	0.061	ug/L	U	06/03/08 10:05
	Selenium	0.0595	0.60	0.061	ug/L	U	06/03/08 10:05
8060308-CCB4	Chromium	0.0231	0.40	0.065	ug/L	U	06/03/08 10:28
	Chromium	0.0231	0.40	0.065	ug/L	U	06/03/08 10:28
	Selenium	0.0168	0.60	0.061	ug/L	U	06/03/08 10:28
	Selenium	0.0168	0.60	0.061	ug/L	U	06/03/08 10:28

* Values outside of QC limits

01736

BLANKS
USEPA-7470A

Laboratory: TriMatrix Laboratories, Inc.
Client: URS Corporation
Sequence: 8060638

SDG: 36440-56
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Instrument ID: 216
Calibration: 8F06010

Lab Sample ID	Analyte	Found	MRL	MDL	Units	C	Analyzed
8060638-ICB1	Mercury	-0.0142	0.20	0.046	ug/L	U	06/05/08 10:36
	Mercury	-0.0142	0.20	0.046	ug/L	U	06/05/08 10:36
8060638-CCB1	Mercury	-0.0510	0.20	0.046	ug/L	J	06/05/08 10:58
	Mercury	-0.0510	0.20	0.046	ug/L	J	06/05/08 10:58
0806474-BLK1	Mercury, Total	0.20	0.20	0.046	ug/L	U	06/05/08 11:03
0806475-BLK1	Mercury, Dissolved	0.20	0.20	0.046	ug/L	U	06/05/08 11:47
8060638-CCB2	Mercury	-0.0248	0.20	0.046	ug/L	U	06/05/08 11:56
	Mercury	-0.0248	0.20	0.046	ug/L	U	06/05/08 11:56
8060638-CCB3	Mercury	-0.0340	0.20	0.046	ug/L	U	06/05/08 12:56
	Mercury	-0.0340	0.20	0.046	ug/L	U	06/05/08 12:56

* Values outside of QC limits

45 MW 9, MW 3, MW 1, EQBK

020029

STATEMENT OF DATA QUALIFICATIONS

Dissolved Metals by EPA 6000/7000 Series Methods

Qualification:	The % difference between the values of the isotopes monitored for this analyte exceeded 25%; the lower of the two results has been reported.	
Analysis:	USEPA-6020A	
Sample/Analyte:	0805500-01 45MW2	Nickel
	0805500-02 DUP-3	Nickel
	0805546-02 45MW3	Nickel
	0805546-03 45MW1	Nickel
Qualification:	This analyte was not present in this sample at a concentration greater than 100 times the MDL, therefore serial dilution is not required.	
Analysis:	USEPA-6020A	
Sample/Analyte:	0805546-01 45MW4	Chromium
	0805546-01 45MW4	Nickel

00012

STATEMENT OF DATA QUALIFICATIONS

Total Metals by EPA 6000/7000 Series Methods

Qualification:	The MS and/or MSD recovery was outside the control limit. The non-spiked sample concentration for the same analyte was less than 4 times the spiked amount; the non-spiked sample result is considered estimated.	
Analysis:	USEPA-6010B	
Sample/Analyte:	0805546-01 45MW4	Aluminum
Qualification:	The % difference between the values of the isotopes monitored for this analyte exceeded 25%; the lower of the two results has been reported.	
Analysis:	USEPA-6020A	
Sample/Analyte:	0805500-01 45MW2	Nickel
	0805546-02 45MW3	Nickel
Qualification:	This analyte was not present in this sample at a concentration greater than 50 times the MDL, therefore serial dilution is not required.	
Analysis:	USEPA-6010B	
Sample/Analyte:	0805546-01 45MW4	Potassium

00013

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

USEPA-6010B

45MW4

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Water

SDG: 36440-56

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3010A Digestion

Initial/Final: 25 mL / 25 mL

Laboratory ID: 0806244-MS1

QC Batch: 0806244

Analyte	Spike Added	Sample Conc.	MS Conc.	MS % Rec. #	QC Limits Rec.	Units
Aluminum, Total	2000	2420	5590	159 *	80 - 120	ug/L
Calcium, Total	20000	73600	94600	105	80 - 120	ug/L
Iron, Total	400	4090	4570	120	80 - 120	ug/L
Magnesium, Total	20000	33000	52400	97	80 - 120	ug/L
Potassium, Total	20000	981	22500	108	80 - 120	ug/L
Sodium, Total	20000	6960	27400	102	80 - 120	ug/L

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

01487

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

45MW4

USEPA-6010B

Laboratory: TriMatrix Laboratories, Inc.

Client: URS Corporation

Matrix: Water

SDG: 36440-56

Project: RFAAP SWMU 45 RFI/CMS, WO 002

Preparation: 3010A Digestion

Initial/Final: 25 mL / 25 mL

Laboratory ID: 0806244-MSD1

QC Batch: 0806244

Analyte	Spike Added	MSD Conc.	MSD % Rec. #	% RPD #	QC Limits RPD	QC Limits Rec.	Units
Aluminum, Total	2000	5510	154 *	2	20	80 - 120	ug/L
Calcium, Total	20000	93800	101	0.9	20	80 - 120	ug/L
Iron, Total	400	4550	115	0.4	20	80 - 120	ug/L
Magnesium, Total	20000	52400	97	0.06	20	80 - 120	ug/L
Potassium, Total	20000	22400	107	0.6	20	80 - 120	ug/L
Sodium, Total	20000	27500	103	0.3	20	80 - 120	ug/L

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

DATA VALIDATION WORKSHEET

Wet Chemistry

Reviewer: RA
Date: 12/26/08
DV Level: II (III) IV
Review Document:
_X__ Region III Modified for National Functional Guidelines
_

Project Name: Radford
Project Number: 11456351
Laboratory: TriMatrix
SDG No.: 36440-56
Test Name: CN
Method No.: 9012

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do sample preservation, collection and storage condition meet method requirement? (4C and <2)	✓		
	If samples were received with the cooler temperature exceeding 20 °C, then flag L(+)/UL(-).			
1.4	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Have any technical holding times determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-).		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per 20 samples, per batch per matrix?)	✓		
3.2	Do any method blanks have positive results? Action: If Yes, positive sample results< 5 Xblank conc. in the associated should be reported and qualified "B".	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.	✓		

Notes: MB → CN at 2.1, 2.2 ug/L all <5x B/P
EQBK-3 also pos hit for CN which was flagged for MB, No more action

URS

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are two standards included in the calibration curve run with four injections each? If no, flag "R".	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve? If no, flag "R".	✓		
4.3	Were continuing calibration standards analyzed every 10 samples? If no, flag "R".	✓		
4.4	Are all calibration standard %RSD (<20%, r>0.995, or r^2<0.99), second source (±10%) or %D(≤10%) within	✓		
For initial calibration: %RSD > 20%, but < 50%, J(+), only; %RSD > 50%, but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>10%, J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 10%, J(+), only. Negative Bias - %D>-10% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				

Notes:

5.0 Laboratory Control Sample (LCS)

		Yes	No	NA
5.1	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.2	Are there any %R for LCS/LCSD recoveries outside the QC limits?		✓	
	Action: If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).			
5.3	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.			✓

Notes:

6.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

		Yes	No	NA
6.1	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
6.2	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
6.3	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits?		✓	
	Action: No action is required based on MS/MSd failure alone. Note in the report and use professional judgement.			

Notes:

7.0 Laboratory Duplicate

		Yes	No	NA
7.1	Were laboratory duplicate prepared and analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
7.2	Was a field blank used for duplicate analysis? If yes, comment in the report.		✓	
7.3	Are all RPDs within the QC limits? If no, J (+)Are all RPDs within the QC limits? If no, J (+)	✓		
7.4	Were there any transaction, calculation errors?			

8.0 Field Duplicate

		Yes	No	NA
8.1	Evaluate field duplicate results? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended should be noted during data validation and discussed in the DV report.	✓		

Notes:

Hg 45MW2 2.25 J ✓ DUP-3 3.46 J OK ✓

9.0 Compound Identification and Detection Limit Verification

		Yes	No	NA
9.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture (including adjustment of wet weight aliquot)?	✓		

Notes:

10.0 Data Completeness

		Yes	No	NA
10.1	Is % completeness for certainty? (Control limit 90%)	✓		
10.2	Number of samples:_____			
10.3	Number of target compounds in each analysis:_____			
10.4	Number of results that are uncertain at comparison criteria standard:_____			
	% Completeness = (10.1.1 x 10.1.2 - 10.1.3) x 100/(10.1.1 x 10.1.2)			
	% Completeness = 100%			

Notes:

METHOD BLANK DATA SHEET
USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0806168-BLK1
File ID: 052908cn1-014
Prepared: 05/27/08 07:20
Preparation: 9010B Cyanide Distillatic
Initial/Final: 50 mL / 50 mL
Analyzed: 05/29/08 13:54
Instrument: 298
QC Batch: 0806168
Sequence: 8060240
Calibration: 8F02010

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
57-12-5	Cyanide, Total	1.90	10.0	2.19	ug/L	J

02092

METHOD BLANK DATA SHEET
USEPA-9012A

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-56
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0806168-BLK2
File ID: 052908cn1-037
Prepared: 05/28/08 07:00
Preparation: 9010B Cyanide Distillatic
Initial/Final: 50 mL / 50 mL
Analyzed: 05/29/08 14:06
Instrument: 298
QC Batch: 0806168
Sequence: 8060240
Calibration: 8F02010

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
57-12-5	Cyanide, Total	1.90	10.0	2.20	ug/L	J

02093

TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124321

36440 -- SL

Page 1 of 1

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Cart: 3

VOA Rack/Tray: 451 B

Receipt Log No.: 29-15

Project Chemist: GMH

Laboratory Project No.: E 0805500

Client Name: URS Group, Inc.

Address: 5540 Falmouth St., Suite 201

Richmond, VA 23230

Phone: 804-474-5444

Fax: 804-965-9764

Project Name: Radford AAP, SWMU 45

Client Project No./P.O. No.: NCA-07-1107, WO-002

Invoice No. ☑ Client ☐ Other (comments)

Contact/Report To: Lee Anne Mareck

Analyses Requested

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	D VOC - 8260	A SVOC - 8270	A PCB - 8082	A Pesticides - 8081	A Explosives - 8330 Nitroglycerin PETN - 8332	A Total TAL Metals	B Dissolved TAL Metals	B Cyanide - 9012	E NaOH pH>12	Total	Sample Comments
				Container Type (corresponds to Container Packing List)							1	2	2	2	2	2	6	15	5		
				Number of Containers Submitted																	
17	N WG	-01	1	45MW2	TM0758	5-21-08	1510		X	GW	3	2	2	1	2	1	4	4	1	14	
18	FD WG	-02	2	DUP-3	TM0758	5-21-08	—		X	GW	3	2	2	1	2	1	4	4	1	3+11	
05	TB WQ	-03	3	Trip Blank	TM0758	5-21-08	—		X	W	1	—	—	—	—	—	—	—	—	1	
			4																		
			5																		
			6																		
			7																		
			8																		
			9																		
			10																		

PRESERVATIVES
A NONE pH<7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter

Sampler's Signature: Jim Carter

Company: URS Corp.

How Shipped? Hand Carrier Fed Ex

Tracking No.

Comments

	1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
	Jim Carter	5-21-08	1700						
	1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							Lynn Romeyn	5-22-08	0845

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TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124319

36440-56

Page 1 of 1

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Cart: 3
VOA Rack/Tray: 451 B
Receipt Log No.: 29-15
Project Chemist: CMH
Laboratory Project No.: E0805500

Client Name: URS Group, Inc.
Address: 5540 Falmouth St., Suite 201
Richmond, VA 23230
Phone: 804-474-5444
Fax: 804-965-9764

Project Name: Radford AAP, SWMU 45
Client Project No./P.O. No.: NCA-07-1107, WO-002
Invoice No.: ☑ Client ☐ Other (comments)
Contact/Report To: Lee Anne Mareck

Analyses Requested

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	D VOC-8260	A SVOC-8270	A PCB-8082	A Pesticides-8081	A Explosives-8330 Nitroglycerine PETN-8332	A Total TAL Metals	B Dissolved TAL Metals	B Cyanide-9014 (Total)	E	Total	Sample Comments
				Container Type (corresponds to Container Packing List)							1	2	2	2	2	2	6	15	5		
				Number of Containers Submitted																	
See COC 124321			1	DUP-3		5-21-08	—		X	GW	—	✓	✓	✓	✓	✓	✓	✓	✓	11	
			2																		
			3																		
			4																		
			5																		
			6																		
			7																		
			8																		
			9																		
			10																		

Preservatives
A NONE pH<5
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter
Sampler's Signature: Jim Carter
Company: URS Corp.

How Shipped? Hand Carrier: Fed Ex
Tracking No.:

Comments:

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	5-21-08	1701						
1. Received By	**Date**	**Time**	**2. Received By**	**Date**	**Time**	**3. Received For Lab By**	**Date**	**Time**
						Lisa Tomczyk	5-22-08	0845

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TriMatrix Laboratories, Inc.

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www.trimatrixlabs.com

Chain of Custody Record

COC No. 124320

Page 1 of 1

36440-56

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Cart: 3
VOA Rack/Tray: 420w
Receipt Log No.: 31.5
Project Chemist: CMH
Laboratory Project No.: 0805546

Client Name: URS Group, Inc.
Address: 5540 Falmouth St., Suite 201
Richmond, VA 23230
Phone: 804-474-5444
Fax: 804-965-9764

Project Name: Radford AAP, SWMU 45
Client Project No./P.O. No.: NCA-07-1107, WO-002
Invoice No.: ☑ Client ☐ Other (comments)
Contact/Report To: Lee Anne Mareck

Analyses Requested

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	D VOC-8260	A SVOC-8270	A PCB-8082	A Pesticides-8081	A Explosives-8330	A Nitroglycerin PETN-8332	B Total TAL Metals	B Dissolved TAL Metals	E Cyanide-9014		Total	Sample Comments
				Container Type (corresponds to Container Packing List)							1	2	2	2	2	2	6	15	5			
				Number of Containers Submitted																		
19	WG	01	1	45MW4 MS/MSD	TM1118	5-22-08	1130		X	GW	3	4	2	4	4	4	4	4	4		17	+12
17		02	2	45MW3	TM1118	5-22-08	1340		X	GW	3	2	2	1	2	1	1	1	1		3	+11
17		03	3	45MW1	TM1118	5-22-08	1030		X	GW	3	2	2	1	2	1	1	1	1		3	+11
20	WB	04	4	EQBK-3	TM1118	5-22-08	1430		X	W	3	2	2	1	2	1	1	1	1		3	+11
05	WB	05	5	Trip Blank	TM1118	5-22-08	—		X	W	1	—	—	—	—	—	—	—	—		1	
			6																			
			7																			
			8																			
			9																			
			10																			

PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Sampled By (print): Jim Carter
Sampler's Signature: Jim Carter
Company: URS Corp.

How Shipped? Hand Carrier FedEx
Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	5-22-08	1640						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
						[illegible]	5-23-08	1015

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TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
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Chain of Custody Record

COC No. 124315

Page 1 of 1

3644D-576

For Lab Use Only	
Cart	3
VOA Rack/Tray	420W
Receipt Log No.	315
Project Chemist	MLT
Laboratory Project No.	0805546

Client Name	URS Group, Inc.
Address	5540 Falmouth Street, Suite 201
	Richmond, VA 23230
Phone	804-474-5444
Fax	804-965-9764
Project Name	Radford AAP, SWMU 45
Client Project No./P.O. No.	NCA-07-1107, WO-002
Invoice No.	☒ Client ☐ Other (comments)
Contact/Report To	Lee Anne Mareck

Analyses Requested

D	A	A	A	A	A	B	B	E	
VOC - 8260	SVOC - 8270	PCB - 8082	Pesticides - 8081	Explosives - 8330 Nitroglycerine PETN - 8332		Total TAL Metals	Dissolved TAL Metals	Cyanide - 9014 7412 (357) M	

Container Type (corresponds to Container Packing List)

1	2	2	2	2	2	6	15	5	

Number of Containers Submitted

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix											Total	Sample Comments
See COC 124320			1	45MW4 MS/MSD	TMO951	5-22-08	1130		X	GW	-	4	4	4	-	-	-	-	-	-	12	
			2																			
			3																			
			4																			
			5																			
			6																			
			7																			
			8																			
			9																			
			10																			

Preservatives: A NONE pH~7; B HNO_3 pH<2; C H_2SO_4 pH<2; D 1+1 HCl pH<2; E NaOH pH>12; F ZnAc/NaOH pH>9; G MeOH; H Other (note below)

Sampled By (print)	How Shipped? Hand Carrier Fed Ex	Comments
Jim Carter		
Sampler's Signature	Tracking No.	
Jim Carter		
Company	1. Relinquished By / Date / Time	2. Relinquished By / Date / Time
URS Corp.	Jim Carter 5-22-08 1645	
	1. Received By / Date / Time	2. Received By / Date / Time

3. Relinquished By / Date / Time

3. Received For Lab By / Date / Time: 5-23-08 1015

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TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124318

36440-526

Page 1 of 1

For Lab Use Only

Cart: 3

VOA Rack/Tray:

Receipt Log No.: 31.5

Project Chemist: MH

Laboratory Project No.: 0805546

Client Name: URS Group, Inc.

Address: 5540 Falmouth St., Suite 201

Richmond, VA 23230

Phone: 804-474-5444

Fax: 804-965-9764

Project Name: Radford AAP, SWMU 45

Client Project No./P.O. No.: NCA-07-1107, WO-002

Invoice No.: ☑ Client ☐ Other (comments)

Contact/Report To: Lee Anne Mareck

Analyses Requested

D	A	A	A	A	A	B	B	E	
VOC - 8260	SVOC - 8270	PCB - 8082	Pesticide - 8081	Explosives - 8330 Nitroglycerine PETN - 8332		Total TAL Metals	Dissolved TAL Metals	Cyanide - 9014 (9012 Lachat)	
Container Type (corresponds to Container Packing List)									
1	2	2	2	2	2	6	15	5	
Number of Containers Submitted									Total
2	2	1	2	1	4	4	4		11

⇦ PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	Sample Comments
See COC 124320			1	EQBK-3	Tub1702	5-22-08	1430		X	W	
			2								
			3								
			4								
			5								
			6								
			7								
			8								
			9								
			10								

Sampled By (print): Jim Carter

Sampler's Signature: Jim Carter

Company: URS Corp.

How Shipped? Hand Carrier FedEx

Tracking No.:

Comments:

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	5-22-08	1655						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
							5-23-08	1015

TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124322

For Lab Use Only

Cart: 3

VOA Rack/Tray:

Receipt Log No.: 315

Project Chemist: MH

Laboratory Project No.: 0805546

3d440-56

Client Name: URS Group, Inc.

Address: 5540 Falmouth St., Suite 201

Richmond, VA 23230

Phone: 804-474-5444

Fax: 804-965-9764

Project Name: Radford AAP, SWMU 45

Client Project No./P.O. No.: NCA-07-1107, WO-002

Invoice No. ☑ Client ☐ Other (comments)

Contact/Report To: Lee Anne Marecki

Page 1 of 1

Analyses Requested

D	A	A	A	A	A	B	B	E	
VOC - 8260	SVOC - 8270	PCB - 8082	Pesticides - 8081	Explosives - 8330	Nitroglycerin PETN - 8332	Total TAL Metals	Dissolved TAL Metals	Cyanide - 9014	

Container Type (corresponds to Container Packing List)

1	2	2	2	2	2	6	15	5	

Number of Containers Submitted

PRESERVATIVES

- **A** NONE pH~7
- **B** HNO_3 pH<2
- **C** H_2SO_4 pH<2
- **D** 1+1 HCl pH<2
- **E** NaOH pH>12
- **F** ZnAc/NaOH pH>9
- **G** MeOH
- **H** Other (note below)

	Test Group	Matrix Code	Laboratory Sample Number	Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	Total	Sample Comments
1			See COC 124320	45MW1	TM1110	5-22-08 ~~5-21-08~~	1030		X	GW	11	
2												
3												
4												
5												
6												
7												
8												
9												
10												

Sampled By (print): Jim Carter

Sampler's Signature: Jim Carter

Company: URS Corp.

How Shipped? Hand Carrier FedEx

Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	5-22-08	1650						
1. Received By	**Date**	**Time**	**2. Received By**	**Date**	**Time**	**3. Received For Lab By**	**Date**	**Time**
							5-23-08	1015

TriMatrixCOC -- COC

WHITE COPY - REPORT YELLOW COPY - LABORATORY PINK COPY - FIELD

TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 124317

36440-56

For Lab Use Only

Cart: 3
VOA Rack/Tray:
Receipt Log No.: 21-5
Project Chemist: MH
Laboratory Project No.: 0805546

Client Name: URS Group, Inc
Address: 5540 Falmouth St, Suite 201
Richmond, VA 23230
Phone: 804-474-5444
Fax: 804-965-9764

Project Name: Radford AAP - SWMU 45
Client Project No./P.O. No.: UCA-07-1107, WO-002
Invoice No.: ☒ Client ☐ Other (comments)
Contact/Report To: Lee Anne Mareck

Page 1 of 1

Analyses Requested

A	A	A	A	A	B	B	E
SVOC - 8270	PCB - 8082	Pesticides - 8081	Explosives - 8330	Nitrocellulose - 8332	Total TAL Metals	Dissolved TAL Metals	Cyanide - 9014

⇦ PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	Container Type / Number of Containers Submitted										Total	Sample Comments
											2	2	2	2	2	6	15	5				
See COC 124320			1	45MW3	TM0671	5-22-08	1340		X	GW	✓	✓	✓	✓	✓	✓	✓	✓			11	
			2																			
			3																			
			4																			
			5																			
			6																			
			7																			
			8																			
			9																			
			10																			

Sampled By (print): Jim Carter
Sampler's Signature: Jim Carter
Company: URS Corp.

How Shipped? Hand Carrier Fedex
Tracking No.

Comments

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
Jim Carter	5-22-08	1700						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
						Jim Carter	5-23-08	1015

TriMatrixCOC -- COC WHITE COPY - REPORT YELLOW COPY - LABORATORY PINK COPY - FIELD

SDG CASE NARRATIVE

URS Corporation
RFAAP SWMU 45 RFI/CMS, WO 002

SDG Executive Summary

This case narrative applies to samples received on May 22, 2008 through May 23, 2008. All samples were scheduled for analysis in accordance with parameters outlined on the field chain of custody record, the TriMatrix bid form, and/or oral and written correspondence between URS Corporation and TriMatrix Laboratories, Inc..

Each sample receipt event was assigned a unique TriMatrix work order number. Sample receipt documentation is included in section A of this data package.

Project Technical Issues/Problems

Project-related data qualification designations and reporting conventions are included in Attachment 1 - *Project Technical Narrative.*

QA/QC Data Qualifications/Narrations

Quality assurance issues and/or quality control data qualifications and narrations related to the analysis and reporting of this SDG are presented in Attachment 2 - *Statement of Data Qualifications.* The absence of a statement page for a particular analyte group (*e.g.* Percent Solids) implies that no qualifying statements were generated for that analyte.

Data Review and Approval

All data was peer-reviewed by a second analyst, and then by appropriate data management staff against laboratory quality control requirements and project specifications. It was then reviewed and approved by the group supervisor/manager prior to further review by the project chemist.

Data Deliverables

The data deliverables, both hardcopy and/or electronic (EDD), that comprise this data package are intended to comply with the documents referenced in the introductory section of this narrative. The EDD, if requested, will be issued separately from this hardcopy report. Hold time reports for each test procedure are presented following the CLP-like forms section of this report.

This report relates only to the sample(s) as received. Test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC). Estimates of analytical uncertainties for the test results contained within the report are available upon request.

Lisa M. Harvey, Project Chemist

06-19-2008
Date

SDG: 36440-56

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Individual sample results relate only to the sample tested.

SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0805500

TriMatrix Laboratories received the cooler(s) for this work order on May 22, 2008, at 08:45am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and Menlo Worldwide shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45MW2	0805500-01	Ground Water	5/21/2008
DUP-3	0805500-02	Ground Water	5/21/2008
Trip Blank	0805500-03	Water	5/21/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0805546

TriMatrix Laboratories received the cooler(s) for this work order on May 23, 2008, at 10:15am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and FedEx shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45MW4	0805546-01	Ground Water	5/22/2008
45MW3	0805546-02	Ground Water	5/22/2008
45MW1	0805546-03	Ground Water	5/22/2008
EQBK-3	0805546-04	Ground Water	5/22/2008
Trip Blank	0805546-05	Water	5/22/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Attachment 1
Project Technical Narrative

Sample Result Reporting Convention

Sample results are reported as RL 'U' (e.g., 0.001 U) if the target analyte was not detected above the MDL. If a sample for an organic parameter is reanalyzed and also reported, the second analysis includes the suffix 'REn' where n = the first, second, etc. reanalysis. If a sample is reanalyzed for confirmation purposes, is confirmed and also reported, the second analysis includes the suffix 'RE1'. If the confirmation was not performed simultaneously, the second set of sample results is reported on a second Form 1 since that confirmation analysis did not occur at the same time and/or date.

Method Detection Limits, Target Analytes, and Reporting Limits

All method detection limits (MDL) for analytes in this report are compliant with the DoD QSM specification that each reporting limit (RL) employed is to be at least three times the MDL. In addition, no RL is less than the equivalent concentration of the lowest instrument calibration standard.

Quality Control Limits

Quality control limits specified in the DoD QSM were employed. For cases in which the analyte is not listed in the QSM, internal laboratory control limits were used.

Data Qualifier Designation

If applicable, a sample result is qualified with:

- a "U" flag if the analyte was not detected at a concentration greater than the MDL,
- a "B", "J", and/or an "E" flag as defined in the Variance section,
- a LIMS-generated statement of qualification. Qualifying statements, if any, will be found in Attachment 2 to this narrative.

QC Batch and Analytical Batch Designation

A Quality Control (QC) Batch is a seven digit number that associates all samples that have been prepared together (or analyzed together if there is no preparation). Quality Control batches are limited to no more than twenty samples, excluding batch QC (method blanks, control spikes, etc.). Some batches may contain multiple sets of method blanks (BLK) and laboratory control samples (BS), where a set of method quality control analyses were prepared in concert with each set of samples on a given day.

An Analytical Batch (or Sequence) is a seven digit number that associates all samples analyzed as a set under one analytical sequence.

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Variances

Data Qualifier Flags

Data qualifier flags other than those listed in the DoD QSM were employed or the definition of an existing flag was modified.

J – Estimated: the analyte was detected at a concentration greater than the limit of detection (i.e., MDL) but less than the reporting limit (i.e., MRL).

B – Blank contamination: The analyte was detected above one-half the reporting limit in an associated method blank. The same analyte in the sample was detected at less than five times the method blank concentration. (If a common laboratory contaminant is present in the method blank at a concentration greater than one-half the reporting limit but less than or equal to that reporting limit, any associated sample results are flagged but corrective action is not necessarily taken. A text qualifier is also associated with such a result.)

E – Exceeds calibration range: The analyte response exceeded the calibrated range of the instrument. (With the exception of metals for which only the final non-qualified result is reported, both the initial E-qualified result and final non-qualified result from reanalysis-at-dilution are reported.)

Text Qualifier

A LIMS-generated text qualifier is substituted for many instances in which the DoD QSM "Q" flag would otherwise apply. The text qualifiers are listed in a summary format by parameter with applicable samples identified.

Methods 6010B and 6020A

The acceptance criterion of < 2 x RL is substituted for < 2 x MDL for interference check solution ICS-A.

Project Correspondence

Any additional correspondence with the Client, and potentially any third parties also involved in the project, regarding sample receipt and/or analysis follows.

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Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision-making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA Region III Modifications to the National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	Unreliable result. Analyte may or may not be present in the sample. Supporting data is necessary to confirm result.
U	Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
N	Tentative Identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
J	Analyte present. Reported value may not be accurate or precise.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UJ	Not detected, quantitation limit may be inaccurate or imprecise.
UL	Not detected, quantitation limit is probably higher.
NT	Not tested, no analytical result provided.

The other type of code used by URS is a "Reason Code". The reason code indicates the type of quality control failure that led to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
b	Bubble found in vial >6mm	b	Instrument performance failure	c	Calibration failure
c	Calibration failure; poor or unstable response	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
d	MS/MSD imprecision	d	MS/MSD imprecision	e	LCS/LCSD imprecision
e	LCSD imprecision	e	LCSD imprecision	f	Field duplicate imprecision
f	Field duplicate imprecision	f	Field duplicate imprecision	g	Laboratory duplicate imprecision
g	Tuning failure or poor mass spectrometer performance	g	Dual column confirmation imprecision	h	Holding time violation
h	Holding time violation	h	Holding time violation	k	Cooler receipt temperature exceeds limits
i	Internal standard failure	i	Internal standard failure	l	LCS recovery failure
k	Cooler receipt temperature exceeds limits	k	Cooler receipt temperature exceeds limits	m	MS/MSD recovery failure
l	LCS recovery failure	l	LCS recovery failure	n	ICS failure
m	MS/MSD recovery failure	m	MS/MSD recovery failure	o	Calibration blank contamination
p	Poor chromatography	p	Poor chromatography	p	Preparation blank contamination
q	Concentration exceeded the linear range of the instrument	q	Concentration exceeded the linear range	q	Concentration exceeded the linear range
r	Linearity failure in initial calibration	r	Linearity failure in initial calibration	r	Linearity failure in calibration or MSA
s	Surrogate failure	s	Surrogate failure	s	Serial dilution failure
t	TIC	u	No confirmation column	v	Post-digestion spike failure
w	Identification criteria failure	w	Retention time failure	w	CRDL Standard Failure
x	Field blank contamination	x	Field blank contamination	x	Field blank contamination
y	Trip blank contamination	z	Method blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	n	Failed Signal to noise ratio		

DATA VALIDATION REPORT - Level III Review

SDG No.: R2844064 **Fraction:** Perchlorate

Lab: Columbia Analytical Services **Project Name** Radford SWMU 45

Reviewer: RA **Date:** June 13, 2008

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied (as required), the completed data validation checklist, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the Region III Modifications to the USEPA National Functional Guidelines for Organic and Inorganic Data Review as pertains to the specifics of the analytical method employed and provisions of the approved project-specific QAPP.

Major Anomalies: None.

Minor Anomalies: None.

Correctable Anomalies: None.

Comments: On the basis of this evaluation, the laboratory appears to have followed the specified method. All data are usable for their intended purpose based on the data reviewed.

Signed: Rayan

CAS ASP/CLP BATCHING FORM / LOGIN SHEET

SDG#:45 MW1	BATCH COMPLETE: __yes_____	DATE REVISED:
SUBMISSION R2844064	DISKETTE REQUESTED: Y_X__ N____	DATE DUE: 6/13/08
CLIENT: URS Corp.	DATE: 5/28/08	PROTOCOL: SW846
CLIENT REP: Michael Perry	CUSTODY SEAL: PRESENT	SHIPPING No.:
PROJECT: RFAAP-SWMU 45 SSP	CHAIN OF CUSTODY: PRESENT	

CAS JOB #	CLIENT/EPA ID	MATRIX	REQUESTED PARAMETERS	DATE SAMPLED	DATE RECEIVED	pH (SOLIDS)	% SOLIDS	REMARKS SAMPLE CONDITION
1103242	45 MW1	WATER	6850-Perchlorate	5/22/2008	5/23/2008			
1103245	45 MW2	WATER	6850-Perchlorate	5/22/2008	5/23/2008			
1103246	45 MW3	WATER	6850-Perchlorate	5/22/2008	5/23/2008			
1103247	45 MW4	WATER	6850-Perchlorate	5/22/2008	5/23/2008			
1103248	DUP-3	WATER	6850-Perchlorate	5/22/2008	5/23/2008			
1103249	EQBK-3	WATER	6850-Perchlorate	5/22/2008	5/23/2008			

Dups + QC

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : 45 MW1

Date Sampled : 05/22/08 10:30 **Order #:** 1103242 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	4.7	UG/L

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : 45 MW2

Date Sampled : 05/22/08 15:10 **Order #:** 1103245 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	0.65	UG/L

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : 45 MW3

Date Sampled : 05/22/08 13:40 **Order #:** 1103246 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	0.81	UG/L

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : 45 MW4

Date Sampled : 05/22/08 11:30 **Order #:** 1103247 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	1.3	UG/L

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : DUP-3

Date Sampled : 05/22/08 **Order #:** 1103248 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	0.64	UG/L

COLUMBIA ANALYTICAL SERVICES

EXTRACTABLE ORGANICS
METHOD 6850
Reported: 06/05/08

URS Corp.
Project Reference: RFAAP-SWMU 45 SSP
Client Sample ID : EQBK-3

Date Sampled : 05/22/08 14:30 **Order #:** 1103249 **Sample Matrix:** WATER
Date Received: 05/23/08 **Submission #:** R2844064 **Analytical Run** 161991

ANALYTE	MDL	PQL	RESULT	UNITS
DATE EXTRACTED : 06/02/08				
DATE ANALYZED : 06/02/08				
ANALYTICAL DILUTION: 1.00				
PERCHLORATE	0.015	0.20	0.20 U	UG/L

DATA VALIDATION WORKSHEET

Perchlorate

Reviewer: RA
Date: 6/23/08
DV Level: II (III) IV
Review Document:
X NFG - Region III Modifications
X Project QAPP/SAP

Project Name: SWMU45 SSP
Project Number: 1160635I.10003
Laboratory: Columbia Analytical
SDG No.: R2844064
Test Name: Perchlorate
Method No.: 6850

1.0 Laboratory Deliverables		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data?		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
1.5	Are the measurement read out records legible and complete (properly labeled, and include all samples and QC?	✓		

Notes:

2.0 Holding Times		Yes	No	NA
2.1	Do sample collection, preservation, shipping, and storage condition meet the project controlling documents?	✓		
	Action: No chemical preservation required.			✓
2.2	Have any technical holding times (28 days), determined from date of sampling to date of analysis, (including dilution or reanalysis) been exceeded? If yes, J(+)/UJ(-).		✓	
2.3	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)		Yes	No	NA
3.1	Were method blanks prepared at the appropriate frequency? If not, note in DV report.	✓		
3.2	Do any method blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample]≤ 5X[associated blank].		✓	
3.3	Do any field equipment blanks blanks have positive results? If Yes, use same rules above.		✓	

Notes:

URS

4.0 Initial and Continuing Calibration		Yes	No	NA
4.1	Are five standards included in the calibration curve?If no apply R flags.	✓		
4.2	Are all initial calibration correlation coefficient within the control limits (r>0.99)?If no J(+), R (-)	✓		
4.3	Was an ICV analyzed and are %RSDs < 15%? If no J(+), UJ(-)	✓		
4.4	Has a continuing calibration verification been analyzed prior and after every 10 samples and at the end of the analysis sequence? Are %Ds < 25%. If no, R (-), J (+).	✓		

Notes:

5.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
5.1	Is the matrix spike/matrix spike duplicate recovery form present?	✓		
5.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
5.3	Are there any %R for matrix spike and matrix spike duplicate recoveries outside the QC limits?(75-125% for water and soil)		✓	
5.4	Are there any RPD for matrix spike and matrix spike duplicate recoveries outside the QC limits (i.e., 15%)?		✓	
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS and MSD results in conjunction with other QC criteria to determine the need for some qualification of the data.			

Notes:

6.0 Laboratory Control Sample(LCS)		Yes	No	NA
6.1	Is the LCS recovery form present?	✓		
6.2	Was LCS analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
6.3	Is the %R for LCS outside the QC limits(85-115% for water and soil)? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).		✓	
6.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits(i.e., 15%)? If Yes, J(+) only.		✓	

Notes:

7.0 Field Duplicate		Yes	No	NA
7.1	Was a field duplicate prepared and analyzed at the correct frequency (one per 20 samples, matrix, and level)?	✓		
	For sample results > 5 x RL, use 50% RPD. For sample results < 5 x RL, a control limit of 2 x RL for water and 4 x RL for soil will be used.			
7.2	Are all analyte duplicate results within control limits? Generally, no action is taken on percent difference of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV	✓		

Notes: 45MW2) DUP-3
Perchlorate 0.65 0.64 OK ✓

8.0 Laboratory Duplicates		Yes	No	NA
8.1	Was a lab duplicate prepared and analyzed at the correct frequency (one per 20 samples, matrix, and level)?	✓		
8.2	Are all analyte duplicate results within control limits (i.e., RPD < 15%)? If no, J(+) only.	✓		

Notes:

9.0 Internal Standards		Yes	No	NA
9.1	Are internal standard areas of every sample and blank within +/-30% of the ICV or CCV? If no, J(+), UJ(-)	✓		
	If the IS area count criteria is not met, corrective action should be taken to resolve the problem and the entire batch should		✓	
	be re-analyzed.	✓		

10.0 Detection Limit Verification		Yes	No	NA
10.1	Do detection limits meet those required by the project QAPP and were they properly adjusted to reflect all sample dilutions and dry weight factors?	✓		
10.2	Were sample concentrations above the highest standard run at a dilution? If not, note in DV report.	✓		✓

Notes:

11.0 Data Completeness		Yes	No	NA
11.1	Is % completeness within the control limits? (Control limit 90%)	X		
11.2	Number of samples:			
11.3	Number of target compounds in each analysis:			
11.4	Number of results rejected and not reported:			
	% Completeness = (11.1.1 x 11.1.2 - 11.1.3) x 100/(11.1.1 x 11.1.2)			
	% Completeness = 100 %			

Notes:

Columbia Analytical Services INC.
An Employee - Owned Company

ACCREDITED IN ACCORDANCE WITH nelac

Ethics Service Quality ACIL 2005 SEAL OF EXCELLENCE PROGRAM Environmental

ORGANIC QUALIFIERS

U - Indicates compound was analyzed for but not detected. The sample quantitation limit must be corrected for dilution and for percent moisture.

J - Indicates an estimated value. The flag is used either when estimating a concentration for tentatively identified compounds, or when the data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit and greater than the MDL. This flag is also used for DoD instead of "P" as indicated below.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search.

P - This flag is used for a pesticide/Aroclor target analyte when there is a greater than 40% (25% for CLP) difference for detected concentrations between the two GC columns. The concentration is reported on the Form I and flagged with a "P" ("J" for DoD).

Q - for DoD only – indicates a pesticide/Aroclor target is not confirmed. This flag is used when there is ≥ 100% difference for the detected concentrations between the two GC columns.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number on the Form I for the diluted sample, and ALL concentration values reported on that Form I are flagged with the "D" flag.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - As specified in Case Narrative.

* - This flag identifies compounds associated with a quality control parameter which exceeds laboratory limits.

CAS/Rochester Lab ID # for State Certifications

NELAP Accredited
Delaware Accredited
Connecticut ID # PH0556
Florida ID # E87674
Illinois ID #200047
Maine ID #NY0032
Massachusetts ID # M-NY032
Navy Facilities Engineering Service Center Approved
Nebraska Accredited
New Jersey ID # NY004
New York ID # 10145
New Hampshire ID # 294100 A/B
Pennsylvania ID# 68-786
Rhode Island ID # 158
West Virginia ID # 292

CASE NARRATIVE
COMPANY: URS
PROJECT: RFAAP-SWMU 45 SSP
SUBMISSION #: R2844064

Samples were collected on 5/22/08 and received at CAS/Rochester on 5/23/08 in good condition at a cooler temperature of 2 °C.

PERCHLORATE ANALYSIS

Six water samples were analyzed for Perchlorate by LC/MS method 6850 with DOD modifications from the DOD Perchlorate Handbook. Values detected between the MDL and PQL have been flagged with a "J" as estimated.

All the initial and continuing calibration criteria were met for all analytes.

Site-specific QC was not requested but was done on sample 45 MW4. The recoveries were and the RPD were within QC limits. The Blank Spike (LCS) and LODV spike recoveries were within QC limits.

The Laboratory Blank associated with these samples was free of contamination.

No other analytical or QC problems were encountered.

Columbia Analytical Services, Inc.
An Employee - Owned Company
www.caslab.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

One Mustard St., Suite 250 • Rochester, NY 14609-0859 • (585) 288-5380 • 800-695-7222 x11 • FAX (585) 288-8475 PAGE 1 OF 1

SR #

CAS Contact

Project Name: RFAAP - SWMU 45 SSP	Project Number: 11656351
Project Manager: Tina DeVine	Report CC: Lee Anne Mareck
Company/Address: URS Corporation 5540 Falmouth Street, Suite 201 Richmond, VA 23230	
Phone #: 804-965-9000	FAX#: 804-965-9764
Sampler's Signature: Jim Carter	Sampler's Printed Name: Jim Carter

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

PRESERVATIVE: O

CLIENT SAMPLE ID	FOR OFFICE USE ONLY LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	GC/MS VOA's ☐ 8260 ☐ 624 ☐ CLP	GC/MS SVOA's ☐ 8270 ☐ 625 ☐ CLP	GC VOA's ☐ 8021 ☐ 601/602	PESTICIDES ☐ 8081 ☐ 608 ☐ CLP	PCB's ☐ 8082 ☐ 608 ☐ CLP	METALS, TOTAL (List in comments below)	METALS, DISSOLVED (List in comments below)	Perchlorate-6850							REMARKS/ ALTERNATE DESCRIPTION
45MW1	1103242	5-22-08	1030	GW									X							
45MW2	45	5-21-08	1510	GW									X							
45MW3	46	5-22-08	1340	GW									X							
45MW4 MS/MSD	47	5-22-08	1130	GW									X							
DUP-3	48	5-21-08	—	GW									X							
EQBK-3	49	5-22-08	1430	W									X							

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL INSTRUCTIONS/COMMENTS
Metals

See QAPP ☐

TURNAROUND REQUIREMENTS
_____ **RUSH** (SURCHARGES APPLY)
____ 24 hr ____ 48 hr ____ 5 day
X **STANDARD**
REQUESTED FAX DATE
_____
REQUESTED REPORT DATE
_____

REPORT REQUIREMENTS
____ I. Results Only
____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
____ III. Results + QC and Calibration Summaries
____ IV. Data Validation Report with Raw Data
____ V. Specialized Forms / Custom Report
Edata ____ Yes ____ No

INVOICE INFORMATION
PO#
BILL TO:

SUBMISSION #: 92844064

SAMPLE RECEIPT: CONDITION/COOLER TEMP: 2°C CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature: Jim Carter	Signature: Amy Heatschke	Signature	Signature	Signature	Signature
Printed Name: Jim Carter	Printed Name: Amy Heatschke	Printed Name	Printed Name	Printed Name	Printed Name
Firm: URS	Firm: URS	Firm	Firm	Firm	Firm
Date/Time: 5-22-08 1700	Date/Time: 5/23/08 9:30	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - Return to Originator; Yellow - Lab Copy; Pink - Retained by Client

SCOC-1102-08

DATA VALIDATION REPORT - Level III Review

SDG No.: 36440-60 **Fraction:** SVOCs

Lab: TriMatrix **Project Name** Radford SWMU 45

Reviewer: RA **Date:** September 8, 2008

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied (as required), the completed data validation checklist, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the Region III Modifications to the USEPA National Functional Guidelines for Organic and Inorganic Data Review as pertains to the specifics of the analytical method employed and provisions of the approved project-specific QAPP.

Major Anomalies: None.

Minor Anomalies: The method blank displayed positive detections for di-n-butyl phthalate at 2.56 ug/L and diethyl phthalate at 0.05 ug/L. Positive associated field sample results less than ten times the method blank concentrations were flagged "B,z".

The laboratory control sample displayed a percent recovery greater than the upper control limit of 115% for di-n-butyl phthalate at 118%. The associated field sample results were previously qualified for method blank contamination, and no further data qualifying action was required.

Correctable Anomalies: None.

Comments: On the basis of this evaluation, the laboratory appears to have followed the specified method. All data are usable, as qualified, for their intended purpose based on the data reviewed.

Signed: Rayan

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-01 File ID: 80823901.D

Sampled: 08/12/08 12:30 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 10:36

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 980 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.15	5.0	0.029	J
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	3.2	5.0	0.38	JB B2Z
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.15	5.0	0.034	J B2Z
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	5.0	5.0	0.41	U
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-01 File ID: 80823901.D

Sampled: 08/12/08 12:30 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 10:36

Solids: Preparation: 3510C Liquid-Liquid Ext Initial/Final: 980 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
86-73-7	Fluorene	1	0.50	0.50	0.011	U
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.6	13.0	63	20 - 110	
Phenol-d6	20.4	6.74	33	10 - 115	
Nitrobenzene-d5	10.6	6.64	63	40 - 110	
2-Fluorobiphenyl	10.2	8.02	79	50 - 110	
2,4,6-Tribromophenol	20.5	16.1	79	40 - 125	
o-Terphenyl	10.2	10.0	98	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	124106	4.87	200938	4.88	
Naphthalene-d8	527103	6.37	653108	6.37	
Acenaphthene-d10	325941	8.36	392238	8.37	
Phenanthrene-d10	465719	10.02	587338	10.02	

00035

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

45MW2

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-01 File ID: 80823901.D

Sampled: 08/12/08 12:30 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 10:36

Solids: Preparation: 3510C Liquid-Liquid Extr Initial/Final: 980 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Chrysene-d12	359640	12.97	456073	12.96	
Perylene-d12	371515	14.44	449939	14.43	

* Values outside of QC limits

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-02 File ID: 80823902.D

Sampled: 08/12/08 00:00 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 11:03

Solids: Preparation: 3510C Liquid-Liquid Extn Initial/Final: 990 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
83-32-9	Acenaphthene	1	0.50	0.50	0.013	U
208-96-8	Acenaphthylene	1	0.50	0.50	0.012	U
98-86-2	Acetophenone	1	5.0	5.0	0.043	U
120-12-7	Anthracene	1	0.50	0.50	0.014	U
1912-24-9	Atrazine	1	5.0	5.0	0.026	U
100-52-7	Benzaldehyde	1	5.0	5.0	0.051	U
56-55-3	Benzo(a)anthracene	1	0.50	0.50	0.037	U
50-32-8	Benzo(a)pyrene	1	0.50	0.50	0.023	U
205-99-2	Benzo(b)fluoranthene	1	0.50	0.50	0.040	U
207-08-9	Benzo(k)fluoranthene	1	0.50	0.50	0.036	U
191-24-2	Benzo(g,h,i)perylene	1	0.50	0.50	0.022	U
92-52-4	1,1'-Biphenyl	1	5.0	5.0	0.015	U
101-55-3	4-Bromophenyl Phenyl Ether	1	5.0	5.0	0.026	U
85-68-7	Butyl Benzyl Phthalate	1	0.35	5.0	0.029	J
105-60-2	Caprolactam	1	5.0	5.0	0.14	U
86-74-8	Carbazole	1	5.0	5.0	0.018	U
59-50-7	4-Chloro-3-methylphenol	1	5.0	5.0	0.021	U
106-47-8	4-Chloroaniline	1	5.0	5.0	0.021	U
111-91-1	Bis(2-chloroethoxy)methane	1	5.0	5.0	0.016	U
111-44-4	Bis(2-chloroethyl) Ether	1	5.0	5.0	0.016	U
108-60-1	Bis(2-chloroisopropyl) Ether	1	5.0	5.0	0.047	U
91-58-7	2-Chloronaphthalene	1	5.0	5.0	0.012	U
95-57-8	2-Chlorophenol	1	5.0	5.0	0.016	U
7005-72-3	4-Chlorophenyl Phenyl Ether	1	5.0	5.0	0.016	U
218-01-9	Chrysene	1	0.50	0.50	0.020	U
53-70-3	Dibenz(a,h)anthracene	1	0.50	0.50	0.026	U
132-64-9	Dibenzofuran	1	5.0	5.0	0.016	U
84-74-2	Di-n-butyl Phthalate	1	3.9	5.0	0.38	JB B2E
91-94-1	3,3'-Dichlorobenzidine	1	5.0	5.0	0.21	U
120-83-2	2,4-Dichlorophenol	1	5.0	5.0	0.015	U
84-66-2	Diethyl Phthalate	1	0.18	5.0	0.034	J B2E
105-67-9	2,4-Dimethylphenol	1	5.0	5.0	0.33	U
131-11-3	Dimethyl Phthalate	1	5.0	5.0	0.016	U
534-52-1	4,6-Dinitro-2-methylphenol	1	5.0	5.0	0.12	U
51-28-5	2,4-Dinitrophenol	1	5.0	5.0	1.5	U
121-14-2	2,4-Dinitrotoluene	1	5.0	5.0	0.21	U
606-20-2	2,6-Dinitrotoluene	1	5.0	5.0	0.050	U
117-84-0	Di-n-octyl Phthalate	1	5.0	5.0	0.34	U
117-81-7	Bis(2-ethylhexyl) Phthalate	1	0.92	5.0	0.41	J
206-44-0	Fluoranthene	1	0.50	0.50	0.016	U
86-73-7	Fluorene	1	0.50	0.50	0.011	U

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-02 File ID: 80823902.D

Sampled: 08/12/08 00:00 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 11:03

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 990 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

CAS No.	Analyte	Dilution	CONC. (ug/L)	MRL	MDL	Q
118-74-1	Hexachlorobenzene	1	5.0	5.0	0.019	U
87-68-3	Hexachlorobutadiene	1	5.0	5.0	0.018	U
77-47-4	Hexachlorocyclopentadiene	1	5.0	5.0	0.13	U
67-72-1	Hexachloroethane	1	5.0	5.0	0.038	U
193-39-5	Indeno(1,2,3-cd)pyrene	1	0.50	0.50	0.014	U
78-59-1	Isophorone	1	5.0	5.0	0.031	U
91-57-6	2-Methylnaphthalene	1	5.0	5.0	0.015	U
95-48-7	2-Methylphenol	1	5.0	5.0	0.14	U
106-44-5	4-Methylphenol	1	5.0	5.0	0.16	U
91-20-3	Naphthalene	1	0.50	0.50	0.023	U
88-74-4	2-Nitroaniline	1	5.0	5.0	0.12	U
99-09-2	3-Nitroaniline	1	5.0	5.0	0.13	U
100-01-6	4-Nitroaniline	1	5.0	5.0	0.14	U
98-95-3	Nitrobenzene	1	5.0	5.0	0.026	U
100-02-7	4-Nitrophenol	1	5.0	5.0	1.3	U
88-75-5	2-Nitrophenol	1	5.0	5.0	0.026	U
86-30-6	N-Nitroso-diphenylamine	1	5.0	5.0	0.019	U
621-64-7	N-Nitroso-di-n-propylamine	1	5.0	5.0	0.030	U
87-86-5	Pentachlorophenol	1	5.0	5.0	0.19	U
85-01-8	Phenanthrene	1	0.50	0.50	0.015	U
108-95-2	Phenol	1	5.0	5.0	0.028	U
129-00-0	Pyrene	1	0.50	0.50	0.047	U
95-94-3	1,2,4,5-Tetrachlorobenzene	1	5.0	5.0	0.024	U
58-90-2	2,3,4,6-Tetrachlorophenol	1	5.0	5.0	0.16	U
88-06-2	2,4,6-Trichlorophenol	1	5.0	5.0	0.027	U
95-95-4	2,4,5-Trichlorophenol	1	5.0	5.0	0.11	U

System Monitoring Compound	ADDED (ug/L)	CONC (ug/L)	% REC.	QC Limits	Q
2-Fluorophenol	20.4	11.5	56	20 - 110	
Phenol-d6	20.2	5.92	29	10 - 115	
Nitrobenzene-d5	10.5	6.29	60	40 - 110	
2-Fluorobiphenyl	10.1	7.93	78	50 - 110	
2,4,6-Tribromophenol	20.3	15.5	77	40 - 125	
o-Terphenyl	10.1	9.48	94	50 - 135	

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
1,4-Dichlorobenzene-d4	121634	4.87	200938	4.88	
Naphthalene-d8	502450	6.37	653108	6.37	
Acenaphthene-d10	311763	8.36	392238	8.37	
Phenanthrene-d10	442251	10.02	587338	10.02	
Chrysene-d12	346423	12.97	456073	12.96	

ORGANIC ANALYSIS DATA SHEET
USEPA-8270C

DUP-1

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Ground Water Laboratory ID: 0808239-02 File ID: 80823902.D

Sampled: 08/12/08 00:00 Prepared: 08/15/08 07:41 Analyzed: 08/18/08 11:03

Solids: Preparation: 3510C Liquid-Liquid Extı Initial/Final: 990 mL / 1 mL

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010 Instrument: 195

Internal Standard	Area	RT	Ref. Area	Ref. RT	Q
Perylene-d12	355315	14.44	449939	14.43	

* Values outside of QC limits

00052

DATA VALIDATION WORKSHEET

Semivolatile Organic Analysis

Reviewer: RA
Date: 9/5/08
DV Level: II III IV
Review Document:
_X_ SW-846
_X_ NFG - Region III Modifications
_X_ Project QAPP/SAP

Project Name: Radford SWMU 45
Project Number:
Laboratory: TriMatrix
SDG No.: 30440-60
Test Name: SVOC
Method No.: 8270C

1.0 Laboratory Deliverables

		Yes	No	NA
1.1	Do Chain-of-Custody forms list all samples that were analyzed?	✓		
1.2	Are all Chain-of-Custody forms signed, indicating sample chain-of-custody was maintained?	✓		
1.3	Do the traffic Reports, chain-of-custody, and lab narrative indicate any problems with sample receipt, condition		✓	
1.4	Do sample preservation, collection and storage condition meet method requirement?	✓		
	If samples were not on ice or the ice was melted upon arrival at the laboratory and the temperature of the cooler was elevated (> 20 °C), then flag all positive results with a "L" and all non-detects "UL".			
1.5	Do any soil samples contain more than 50% water? If yes, no dry weight correction is made and make notes in the DV Report.			✓

Notes:

2.0 Holding Times

		Yes	No	NA
2.1	Have any technical holding times, determined from date of sampling to date of analysis, been exceeded? If yes, J(+)/UJ(-). For aqueous matrix - 7 days (extraction) and 40 days (analysis) For soil matrix - 14 days		✓	
2.2	Have any technical holding time grossly (twice the holding time) been exceeded? If yes, J(+)/R(-) .		✓	

Notes:

3.0 Blanks (Laboratory and Field)

		Yes	No	NA
3.1	Were method blanks (MB) prepared at the appropriate frequency (one per batch)?	✓		
3.2	Do any blanks have positive results? Action: If yes, positive sample results should be reported and qualified "B", if the [sample≤5X[blank] (or 10 times for the common phthalate contaminants).	✓		
3.3	Do any field equipment blanks/trip blanks have positive results? If yes, use same rules above.			✓

Notes: MB 7 di-n-butyl phthalate 2.56 ug/L POS ≤ 10X → B, Z
diethyl phthalate 0.05 ug/L in both samples.

4.0 Initial and Continuing Calibration

		Yes	No	NA
4.1	Are at least five standards included in the calibration curve?	✓		
4.2	Was a second source calibration verification analyzed for each calibration curve?	✓		
4.3	Has a continuing calibration standard been analyzed for every 12 hours of sample analysis?	✓		
4.4	Are all calibration standard %RSD ≤15%, r>0.995, or r^2<0.99), second source ±30% or %D(≤20%) within the control limits?	✓		
For initial calibration: %RSD > 15% but < 80%, J(+)/UJ(-); for %RSD > + 80%, J(+)/R(-).				
For second source: %D>30% J(+)/R(-).				
For continuing calibration: Positive Bias - %D >+ 20%, J(+), only. Negative Bias - %D>-20% but <-50%, J(+)/UJ(-) and %D>-50%, J(+)/R(-).				
4.5	Are any SPCCs RF < 0.05 and/or CCC >30%? If yes reject all associated data.		✓	

Notes:

5.0 GC/MS Instrument Performance Check

		Yes	No	NA
5.1	Are GC/MS Tuning and Mass Calibration forms present for decafluorotriphenylphosphine (DFTPP)?	✓		
5.2	Are DFTPP monitored ions within specification? If no, flag R.	✓		
5.3	Have all samples been analyzed within twelve hours of the DFTPP tune? If no, flag R.	✓		
5.4	Have ion abundance criteria for DFTPP been met for each instrument used? If no, flag R.	✓		

Notes:

6.0 Surrogate Recovery		Yes	No	NA
6.1	Are surrogate recoveries within acceptance criteria for all samples and method blanks?	✓		
6.2	If No in Section 6.2, are these sample(s) or method blank(s) reanalyzed?			✓
6.3	If any two base/neutral or acid fraction are out of specification, or if any one base/neutral or acid extractable surrogate has a recovery of less than 10%, then there should be a reanalysis to confirm that the non-compliance is because of sample matrix effects rather than laboratory deficiencies.			
6.4	If No in Section 6.3, is any sample dilution factor greater than 10? (recoveries may be diluted out.)			✓
	If No, for 2 or 3 %Rs > UCL, K(+) only; for 2 or 3 %Rs < LCL, but > 10%, L(+)/UL (-); for 2 or 3 %Rs mixed high/low, J(+)/UJ(-); for %R < 10%, L(+)/R(-).			

Notes:

7.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD)		Yes	No	NA
7.1	Is the matrix spike/matrix spike duplicate recovery form present?			
7.2	Were matrix spikes analyzed at required frequency (one per 20 samples per batch) for each matrix?			
7.3	Are there any %R for matrix spike and matrix spike duplicate outside the QC limits?			
7.4	Are there any RPD for matrix spike and matrix spike duplicate outside the QC limits?			
	No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of the data.			

Notes:

8.0 Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)		Yes	No	NA
8.1	Is the LCS/LCSD recovery form present?	✓		
8.2	Were LCS/LCSD analyzed at required frequency (one per 20 samples per batch) for each matrix?	✓		
8.3	Are there any %R for LCS outside the QC limits? If Yes, for %R > UCL, J(+) only; for %R < LCL, J(+)/R(-).	✓		
8.4	Are there any RPD for LCS/LCSD recoveries outside the QC limits? If Yes, J(+) only.			✓

Notes: LCS 115% for di-n-butyl phthalate at 118%
ass. results prev. flagged for MB, No more action

9.0 Internal Standard		Yes	No	NA
9.1	Are internal standard areas within +100% and -50% of the mid point initail calibration? If No, J(+)/UJ(-).	✓		
	If extremely low area counts are reported, or performance exhibits a major abrupt drop-off, then a severe loss of sensitivity is indicated. Non-detect target compounds should then be qualified as unusable (R).			
9.2	Are retention times of internal standards within 30 seconds of the associated calibration?			
	The chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction. Positive results should not needed to be qualified as "R", if the mass spectral criteria are met.	✓		

Notes:

10.0 Field Duplicate		Yes	No	NA
10.1	Are all analyte duplicate results within control limits (use RPD limits of matrix spikes)? Generally, no action is taken on the basis of field duplicate results. Results that fall outside criteria recommended above should be noted during data validation and discussed in the DV report.	✓		

Notes: 45MW2 & DUP-1 RL

butyl benzyl phthalate 0.15J 0.35J 5 OK ✓

bis(2-ethylhexyl)phthalate [redacted] ND 0.92J 5 OK ✓

11.0 Detection Limit Verification		Yes	No	NA
11.1	Do detection limits meet those required by the project QAPP and were they properly adjusted for dilution factors and moisture?	✓		

Notes:

12.0 Data Completeness		Yes ✓	No	NA
12.1	Is % completeness within the control limits? (Control limit 95%$_{aq}$ and 90%$_{so}$)	✓		
12.1.1	Number of samples:			
12.1.2	Number of target compounds in each analysis:			
12.1.3	Number of results rejected and not reported:			
	% Completeness = (12.1.1 x 12.1.2 - 12.1.3) x 100/(12.1.1 x 12.1.2)			
	% Completeness = 100%			

Notes:

SDG CASE NARRATIVE

Attachment 2
Statement of Data Qualifications

Semivolatile Organic Compounds by EPA Method 8270C

Qualification: The LCS recovery exceeded the control limit but it was within the marginal exceedance for a compound that is not a project-specific analyte of concern. The result for this analyte in any sample from the associated QC batch is not considered qualified.

Analysis: USEPA-8270C

Sample/Analyte:		
	0808239-01 45MW2	Di-n-butyl Phthalate
	0808239-02 DUP-1	Di-n-butyl Phthalate

Qualification: The analyte concentration in the MB for this common lab contaminant was greater than 1/2 the RL, but less than or equal to the RL. All associated samples had results less than the RL. No qualification is required.

Analysis: USEPA-8270C

Sample/Analyte:		
	0808239-01 45MW2	Di-n-butyl Phthalate
	0808239-02 DUP-1	Di-n-butyl Phthalate

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METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-60
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Laboratory ID: 0809346-BLK2
File ID: 809346B2.D
Prepared: 08/15/08 07:41
Preparation: 3510C Liquid-Liquid Ext
Initial/Final: 1000 mL / 1 mL
Analyzed: 08/18/08 09:15
Instrument: 195
QC Batch: 0809346
Sequence: 8081835
Calibration: 8H12010

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
83-32-9	Acenaphthene	0.013	0.50	0.50	ug/L	U
208-96-8	Acenaphthylene	0.012	0.50	0.50	ug/L	U
98-86-2	Acetophenone	0.043	5.0	5.0	ug/L	U
120-12-7	Anthracene	0.014	0.50	0.50	ug/L	U
1912-24-9	Atrazine	0.026	5.0	5.0	ug/L	U
100-52-7	Benzaldehyde	0.051	5.0	5.0	ug/L	U
56-55-3	Benzo(a)anthracene	0.037	0.50	0.50	ug/L	U
50-32-8	Benzo(a)pyrene	0.023	0.50	0.50	ug/L	U
205-99-2	Benzo(b)fluoranthene	0.040	0.50	0.50	ug/L	U
207-08-9	Benzo(k)fluoranthene	0.036	0.50	0.50	ug/L	U
191-24-2	Benzo(g,h,i)perylene	0.022	0.50	0.50	ug/L	U
92-52-4	1,1'-Biphenyl	0.015	5.0	5.0	ug/L	U
101-55-3	4-Bromophenyl Phenyl Ether	0.026	5.0	5.0	ug/L	U
85-68-7	Butyl Benzyl Phthalate	0.029	5.0	5.0	ug/L	U
105-60-2	Caprolactam	0.14	5.0	5.0	ug/L	U
86-74-8	Carbazole	0.018	5.0	5.0	ug/L	U
59-50-7	4-Chloro-3-methylphenol	0.021	5.0	5.0	ug/L	U
106-47-8	4-Chloroaniline	0.021	5.0	5.0	ug/L	U
111-91-1	Bis(2-chloroethoxy)methane	0.016	5.0	5.0	ug/L	U
111-44-4	Bis(2-chloroethyl) Ether	0.016	5.0	5.0	ug/L	U
108-60-1	Bis(2-chloroisopropyl) Ether	0.047	5.0	5.0	ug/L	U
91-58-7	2-Chloronaphthalene	0.012	5.0	5.0	ug/L	U
95-57-8	2-Chlorophenol	0.016	5.0	5.0	ug/L	U
7005-72-3	4-Chlorophenyl Phenyl Ether	0.016	5.0	5.0	ug/L	U
218-01-9	Chrysene	0.020	0.50	0.50	ug/L	U
53-70-3	Dibenz(a,h)anthracene	0.026	0.50	0.50	ug/L	U
132-64-9	Dibenzofuran	0.016	5.0	5.0	ug/L	U
84-74-2	Di-n-butyl Phthalate	0.38	5.0	2.56	ug/L	J
91-94-1	3,3'-Dichlorobenzidine	0.21	5.0	5.0	ug/L	U
120-83-2	2,4-Dichlorophenol	0.015	5.0	5.0	ug/L	U

METHOD BLANK DATA SHEET
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc. SDG: 36440-60

Client: URS Corporation Project: RFAAP SWMU 45 RFI/CMS, WO 002

Matrix: Water Laboratory ID: 0809346-BLK2 File ID: 809346B2.D

Prepared: 08/15/08 07:41 Preparation: 3510C Liquid-Liquid Extn Initial/Final: 1000 mL / 1 mL

Analyzed: 08/18/08 09:15 Instrument: 195

QC Batch: 0809346 Sequence: 8081835 Calibration: 8H12010

CAS No.	Analyte	MDL	MRL	Concentration	Unit	Q
84-66-2	Diethyl Phthalate	0.034	5.0	0.0500	ug/L	J
105-67-9	2,4-Dimethylphenol	0.33	5.0	5.0	ug/L	U
131-11-3	Dimethyl Phthalate	0.016	5.0	5.0	ug/L	U
534-52-1	4,6-Dinitro-2-methylphenol	0.12	5.0	5.0	ug/L	U
51-28-5	2,4-Dinitrophenol	1.5	5.0	5.0	ug/L	U
121-14-2	2,4-Dinitrotoluene	0.21	5.0	5.0	ug/L	U
606-20-2	2,6-Dinitrotoluene	0.050	5.0	5.0	ug/L	U
117-84-0	Di-n-octyl Phthalate	0.34	5.0	5.0	ug/L	U
117-81-7	Bis(2-ethylhexyl) Phthalate	0.41	5.0	5.0	ug/L	U
206-44-0	Fluoranthene	0.016	0.50	0.50	ug/L	U
86-73-7	Fluorene	0.011	0.50	0.50	ug/L	U
118-74-1	Hexachlorobenzene	0.019	5.0	5.0	ug/L	U
87-68-3	Hexachlorobutadiene	0.018	5.0	5.0	ug/L	U
77-47-4	Hexachlorocyclopentadiene	0.13	5.0	5.0	ug/L	U
67-72-1	Hexachloroethane	0.038	5.0	5.0	ug/L	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.014	0.50	0.50	ug/L	U
78-59-1	Isophorone	0.031	5.0	5.0	ug/L	U
91-57-6	2-Methylnaphthalene	0.015	5.0	5.0	ug/L	U
95-48-7	2-Methylphenol	0.14	5.0	5.0	ug/L	U
106-44-5	4-Methylphenol	0.16	5.0	5.0	ug/L	U
91-20-3	Naphthalene	0.023	0.50	0.50	ug/L	U
88-74-4	2-Nitroaniline	0.12	5.0	5.0	ug/L	U
99-09-2	3-Nitroaniline	0.13	5.0	5.0	ug/L	U
100-01-6	4-Nitroaniline	0.14	5.0	5.0	ug/L	U
98-95-3	Nitrobenzene	0.026	5.0	5.0	ug/L	U
100-02-7	4-Nitrophenol	1.3	5.0	5.0	ug/L	U
88-75-5	2-Nitrophenol	0.026	5.0	5.0	ug/L	U
86-30-6	N-Nitroso-diphenylamine	0.019	5.0	5.0	ug/L	U
621-64-7	N-Nitroso-di-n-propylamine	0.030	5.0	5.0	ug/L	U
87-86-5	Pentachlorophenol	0.19	5.0	5.0	ug/L	U

LCS / LCS DUPLICATE RECOVERY
USEPA-8270C

Laboratory: TriMatrix Laboratories, Inc.
SDG: 36440-60
Client: URS Corporation
Project: RFAAP SWMU 45 RFI/CMS, WO 002
Matrix: Water
Preparation: 3510C Liquid-Liquid Extraction
Initial/Final: 1000 mL / 1 mL
Laboratory ID: 0809346-BS2
QC Batch: 0809346
Sequence: 8081835

Analyte	Spike Added	LCS Conc.	LCS % Rec. #	QC Limits Rec.	Units
Acenaphthene	9.60	7.22	75	45 - 110	ug/L
Acenaphthylene	9.60	7.68	80	50 - 105	ug/L
Acetophenone	10.0	7.50	75	54 - 113	ug/L
Anthracene	9.60	8.80	92	55 - 110	ug/L
Atrazine	10.0	8.21	82	61 - 139	ug/L
Benzaldehyde	10.0	11.8	118	25 - 141	ug/L
Benzo(a)anthracene	9.60	7.82	81	55 - 110	ug/L
Benzo(a)pyrene	9.60	8.42	88	55 - 110	ug/L
Benzo(b)fluoranthene	9.60	6.47	67	45 - 120	ug/L
Benzo(k)fluoranthene	9.60	9.18	96	45 - 125	ug/L
Benzo(g,h,i)perylene	9.60	8.50	89	40 - 125	ug/L
1,1'-Biphenyl	10.0	7.81	78	59 - 114	ug/L
4-Bromophenyl Phenyl Ether	9.60	8.26	86	50 - 115	ug/L
Butyl Benzyl Phthalate	9.60	8.41	88	45 - 115	ug/L
Caprolactam	10.0	2.71	27	25 - 135	ug/L
Carbazole	9.60	9.22	96	50 - 115	ug/L
4-Chloro-3-methylphenol	9.60	6.79	71	45 - 110	ug/L
4-Chloroaniline	9.60	7.70	80	15 - 110	ug/L
Bis(2-chloroethoxy)methane	9.60	7.33	76	45 - 105	ug/L
Bis(2-chloroethyl) Ether	9.60	9.27	97	35 - 110	ug/L
Bis(2-chloroisopropyl) Ether	9.60	8.90	93	25 - 130	ug/L
2-Chloronaphthalene	9.60	7.55	79	50 - 105	ug/L
2-Chlorophenol	9.60	8.48	88	35 - 105	ug/L
4-Chlorophenyl Phenyl Ether	9.60	7.86	82	50 - 110	ug/L
Chrysene	9.60	8.90	93	55 - 110	ug/L
Dibenz(a,h)anthracene	9.60	8.58	89	40 - 125	ug/L
Dibenzofuran	9.60	7.69	80	55 - 105	ug/L
Di-n-butyl Phthalate	9.60	11.4	118 *	55 - 115	ug/L
3,3'-Dichlorobenzidine	20.0	19.0	95	20 - 110	ug/L

00273

SDG CASE NARRATIVE

URS Corporation
RFAAP SWMU 45 RFI/CMS, WO 002

SDG Executive Summary

This case narrative applies to samples received on August 13, 2008. All samples were scheduled for analysis in accordance with parameters outlined on the field chain of custody record, the TriMatrix bid form, and/or oral and written correspondence between URS Corporation and TriMatrix Laboratories, Inc..

Each sample receipt event was assigned a unique TriMatrix work order number. Sample receipt documentation is included in section A of this data package.

Project Technical Issues/Problems

Project-related data qualification designations and reporting conventions are included in Attachment 1 - *Project Technical Narrative.*

QA/QC Data Qualifications/Narrations

Quality assurance issues and/or quality control data qualifications and narrations related to the analysis and reporting of this SDG are presented in Attachment 2 - *Statement of Data Qualifications.* The absence of a statement page for a particular analyte group (*e.g.* Percent Solids) implies that no qualifying statements were generated for that analyte.

Data Review and Approval

All data was peer-reviewed by a second analyst, and then by appropriate data management staff against laboratory quality control requirements and project specifications. It was then reviewed and approved by the group supervisor/manager prior to further review by the project chemist.

Data Deliverables

The data deliverables, both hardcopy and/or electronic (EDD), that comprise this data package are intended to comply with the documents referenced in the introductory section of this narrative. The EDD, if requested, will be issued separately from this hardcopy report. Hold time reports for each test procedure are presented following the CLP-like forms section of this report.

This report relates only to the sample(s) as received. Test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC). Estimates of analytical uncertainties for the test results contained within the report are available upon request.

Lisa M. Harvey, Project Chemist

09-02-08
Date

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SDG CASE NARRATIVE

Sample Receipt and Login -- Work Order: 0808239

TriMatrix Laboratories received the cooler(s) for this work order on August 13, 2008, at 09:00am. Receiving documents include field chain-of-custody (COC) record(s), sample receipt form(s), and FedEx shipping document(s). The condition of the custody seals, the type and location of the coolant, and the temperatures recorded for each cooler are presented on the TriMatrix *Sample Receiving / Log-In Checklist* provided in section A of this package. The receipt temperature of the samples was determined by using an infrared thermometer to record the temperature of three random samples of varying container types and the accompanying temperature blank, if present.

Samples were scheduled for the analyses listed on the corresponding COC form. Field IDs and assigned laboratory identifiers are presented in the table below.

Field Sample Name	Laboratory Sample ID	Matrix	Date Sampled
45MW2	0808239-01	Ground Water	8/12/2008
DUP-1	0808239-02	Ground Water	8/12/2008

No administrative issues were encountered during the receipt and analysis of this work order.

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SDG CASE NARRATIVE

Attachment 1
Project Technical Narrative

Sample Result Reporting Convention

Sample results are reported as RL 'U' (e.g., 0.001 U) if the target analyte was not detected above the MDL. If a sample for an organic parameter is reanalyzed and also reported, the second analysis includes the suffix 'REn' where n = the first, second, etc. reanalysis. If a sample is reanalyzed for confirmation purposes, is confirmed and also reported, the second analysis includes the suffix 'RE1'. If the confirmation was not performed simultaneously, the second set of sample results is reported on a second Form 1 since that confirmation analysis did not occur at the same time and/or date.

Method Detection Limits, Target Analytes, and Reporting Limits

All method detection limits (MDL) for analytes in this report are compliant with the DoD QSM specification that each reporting limit (RL) employed is to be at least three times the MDL. In addition, no RL is less than the equivalent concentration of the lowest instrument calibration standard.

Quality Control Limits

Quality control limits specified in the DoD QSM were employed. For cases in which the analyte is not listed in the QSM, internal laboratory control limits were used.

Data Qualifier Designation

If applicable, a sample result is qualified with:

- a "U" flag if the analyte was not detected at a concentration greater than the MDL,
- a "B", "J", and/or an "E" flag as defined in the Variance section,
- a LIMS-generated statement of qualification. Qualifying statements, if any, will be found in Attachment 2 to this narrative.

QC Batch and Analytical Batch Designation

A Quality Control (QC) Batch is a seven digit number that associates all samples that have been prepared together (or analyzed together if there is no preparation). Quality Control batches are limited to no more than twenty samples, excluding batch QC (method blanks, control spikes, etc.). Some batches may contain multiple sets of method blanks (BLK) and laboratory control samples (BS), where a set of method quality control analyses were prepared in concert with each set of samples on a given day.

An Analytical Batch (or Sequence) is a seven digit number that associates all samples analyzed as a set under one analytical sequence.

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Variances

Data Qualifier Flags

Data qualifier flags other than those listed in the DoD QSM were employed or the definition of an existing flag was modified.

J – Estimated: the analyte was detected at a concentration greater than the limit of detection (i.e., MDL) but less than the reporting limit (i.e., MRL).

B – Blank contamination: The analyte was detected above one-half the reporting limit in an associated method blank. The same analyte in the sample was detected at less than five times the method blank concentration. (If a common laboratory contaminant is present in the method blank at a concentration greater than one-half the reporting limit but less than or equal to that reporting limit, any associated sample results are flagged but corrective action is not necessarily taken. A text qualifier is also associated with such a result.)

E – Exceeds calibration range: The analyte response exceeded the calibrated range of the instrument. (With the exception of metals for which only the final non-qualified result is reported, both the initial E-qualified result and final non-qualified result from reanalysis-at-dilution are reported.)

Text Qualifier

A LIMS-generated text qualifier is substituted for many instances in which the DoD QSM "Q" flag would otherwise apply. The text qualifiers are listed in a summary format by parameter with applicable samples identified.

Methods 6010B and 6020A

The acceptance criterion of < 2 x RL is substituted for < 2 x MDL for interference check solution ICS-A.

Project Correspondence

Any additional correspondence with the Client, and potentially any third parties also involved in the project, regarding sample receipt and/or analysis follows.

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TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No. 125528

36440-60

Page 1 of 1

For Lab Use Only

Cart: 4
VOA Rack/Tray: —
Receipt Log No.: 13.12
Project Chemist: LMH
Laboratory Project No.: 0808239

Client Name: URS Corp
Address: 5540 Falmouth St. Suite 201
Richmond VA 23230
Phone 804 965 9000
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Project Name: RFAAP SWMU 45
Client Project No./P.O. No.: 11658351
Invoice No.: [X] Client [ ] Other (comments)
Contact/Report To: Tina Devine/Lee Mercer

Analyses Requested

SVOCs 8270C

Container Type (corresponds to Container Packing List): A

Number of Containers Submitted: 2

PRESERVATIVES
A NONE pH~7
B HNO_3 pH<2
C H_2SO_4 pH<2
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Test Group	Matrix Code	Laboratory Sample Number		Sample ID	Cooler ID	Sample Date	Sample Time	COMP	GRAB	Matrix	Number of Containers Submitted	Total	Sample Comments
21	WG	01	1	45MW2 ✓		8/12/08	1330		X	GW	2	2	Level IV
21	↓	02	2	Dup-1 ✓		8/12/08	✓		X	GW	2	2	
			3										
			4										
			5										
			6										
			7										
			8										
			9										
			10										

Sampled By (print): Brett Fisher
Sampler's Signature: [signature]
Company:

How Shipped? Hand Carrier FedEx
Tracking No.:

Comments:

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
[signature]	8/12/08	1500						
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time
						[signature]	8.13.08	0900

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision-making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA Region III Modifications to the National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	Unreliable result. Analyte may or may not be present in the sample. Supporting data is necessary to confirm result.
U	Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
N	Tentative Identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
J	Analyte present. Reported value may not be accurate or precise.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UJ	Not detected, quantitation limit may be inaccurate or imprecise.
UL	Not detected, quantitation limit is probably higher.
NT	Not tested, no analytical result provided.

The other type of code used by URS is a "Reason Code". The reason code indicates the type of quality control failure that led to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
b	Bubble found in vial >6mm	b	Instrument performance failure	c	Calibration failure
c	Calibration failure; poor or unstable response	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
d	MS/MSD imprecision	d	MS/MSD imprecision	e	LCS/LCSD imprecision
e	LCSD imprecision	e	LCSD imprecision	f	Field duplicate imprecision
f	Field duplicate imprecision	f	Field duplicate imprecision	g	Laboratory duplicate imprecision
g	Tuning failure or poor mass spectrometer performance	g	Dual column confirmation imprecision	h	Holding time violation
h	Holding time violation	h	Holding time violation	k	Cooler receipt temperature exceeds limits
i	Internal standard failure	i	Internal standard failure	l	LCS recovery failure
k	Cooler receipt temperature exceeds limits	k	Cooler receipt temperature exceeds limits	m	MS/MSD recovery failure
l	LCS recovery failure	l	LCS recovery failure	n	ICS failure
m	MS/MSD recovery failure	m	MS/MSD recovery failure	o	Calibration blank contamination
p	Poor chromatography	p	Poor chromatography	p	Preparation blank contamination
q	Concentration exceeded the linear range of the instrument	q	Concentration exceeded the linear range	q	Concentration exceeded the linear range
r	Linearity failure in initial calibration	r	Linearity failure in initial calibration	r	Linearity failure in calibration or MSA
s	Surrogate failure	s	Surrogate failure	s	Serial dilution failure
t	TIC	u	No confirmation column	v	Post-digestion spike failure
w	Identification criteria failure	w	Retention time failure	w	CRDL Standard Failure
x	Field blank contamination	x	Field blank contamination	x	Field blank contamination
y	Trip blank contamination	z	Method blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	n	Failed Signal to noise ratio		