Feasibility Study for Operable Unit 3
Anniston PCB Site

June 2010
Revision 1.0

SUBMITTED TO:
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
61 FORSYTH STREET, S.W.
ATLANTA, GA 30303-3104

SUBMITTED BY:
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June 18, 2010

SENT VIA FEDERAL EXPRESS

Ms. Pamela J. Langston Scully, P.E.
Remedial Project Manager
United States Environmental Protection Agency, Region IV
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303-3104

Re: Feasibility Study Report, Revision 1.0, for Operable Unit 3
Anniston PCB Site (Docket No. CV-02-PT-0749-E)
Anniston, Alabama

Dear Ms. Langston Scully:

On behalf of Solutia Inc. (Solutia) and Pharmacia Corporation (collectively, P/S), as parties to the Partial Consent Decrees (PCD) (Docket No. CV-02-PT-0749-E), please find enclosed eight hard copies and 10 electronic copies of P/S's Response to Comments and revised Feasibility Study (FS) Report for Operable Unit 3 (OU-3 FS Report) for the Solutia facility in Anniston, Alabama. The previous OU-3 FS Report was submitted to the United States Environmental Protection Agency (EPA) on May 7, 2009. The EPA provided multiple sets of comments on this report, and multiple conference calls and meetings were held between the EPA and P/S to discuss and resolve outstanding issues related to the EPA's comments. These issues were resolved during a meeting held between the EPA, P/S and the Technical Special Master on March 26, 2010. As a result of this meeting, the EPA issued its final set of comments on the OU-3 FS Report, which was received by P/S on April 21, 2010. P/S's responses to these comments are included herein, and the OU-3 FS Report has been revised to incorporate these responses.

Please do not hesitate to contact me at 256-231-8404 with any questions or comments that you may have regarding this matter.

Sincerely,

E. Gayle Macolly
Manager, Remedial Projects

cc: Mr. Jeffery Kitchens (ADEM)
Mr. G. Douglas Jones, Esq.
Mr. Thomas Dahl

Enclosures

USEPA REVIEW OF REPORT ON FEASIBILITY STUDY, OPERABLE UNIT 3, ANNISTON PCB SITE

RESPONSE TO EPA COMMENTS DATED 4/19/2010

Solutia Inc. (Solutia) and Pharmacia Corporation (Pharmacia), collectively referred to herein as P/S, provide the following responses to comments made by the United States Environmental Protection Agency (EPA) in its letter dated April 19, 2010 (received by P/S on April 21, 2010), on the Feasibility Study (FS) Report submitted to the EPA on May 7, 2009. The EPA's comments are provided below, using EPA's comment numbering sequence, followed by P/S's responses in *italics*.

General Comments:

1. Modify the Executive Summary and any section summaries to reflect the changes to the document required by the comments which follow.

   Response: The Executive Summary and section summaries have been modified to reflect changes required by the following comments.

2. Add summary information on the types and amounts of wastes that were disposed of in the landfills. In particular, the amount of PCB wastes and concentrations should be described, if known. Adjacent Area sampling and results should be discussed, relative to residual PCBs remaining under the landfill cap or adjacent area soil covers. In addition to describing the types of waste in each cell, the cell locations should be shown on a figure and the cover system over each cell should be identified, since there are four different cover systems existing at the landfills. In particular, for cells where the cover system was not upgraded, please describe the cover system components. The information from the report "Response to the Environmental Protection Agency Regarding Final Summary Report of Technical Review and Evaluation of Potential PCB Releases" (dated June 16, 2009) should be included in the text of the FS. The RI/FS should be stand-alone documents in the Administrative Record file. Reviewers such as a member of the public may not have ready access to the other documents referenced. Additionally, the P/S report dated June 2009 states "PCB-containing soils excavated from the adjacent areas of the landfill were either hauled off to Chemical Waste Management's hazardous waste landfill in Emelle, Alabama, or placed beneath the HDPE cover system constructed over the landfill." Please provide documentation on the extent of such excavation. Also, please provide sampling data for PCBs in soil remaining under the soil cover in the area north of Highway 202, known as the "walking trail area." For all areas where covers are in place, if insufficient information exists to allow EPA to determinate whether cover systems are protective, the needed information should be collected.

   Response: Waste types disposed in the landfills are discussed in Section 2.2 of the RI Report. More detailed information is presented in the August 1991 RCRA Facility Assessment (RFA) and the RCRA Facility Investigation / Confirmation Sampling (RFI/CS) Work Plan (Golder, 1997). The following summarizes the information provided in the 1991 RFA and RFI/CS Work Plan.

Closed South Landfill

Cells 1E and 2E – These cells received waste that was generated by the phosphorus and chlorine processes, including empty used fiber drums, empty used sample containers, rubber overshoes, gloves, filter papers, etc. According to facility representatives, approximately 2,600 tons of waste per year were disposed of in these cells beginning after 1960. Available information indicates that PCB wastes were disposed in Cells 1E and 2E. No additional information is available.

Cell 3E – Waste placed in this cell included non-hazardous chemical wastes and PCB wastes. According to facility representatives, approximately 45 tons of waste per year were disposed of in this cell from the early 1980s to an unknown date. No additional information is available.

Cell 4E – Cell 4E is a RCRA-regulated unit that received hazardous wastes from the dumpsters located around the Facility. The cell managed ignitable wastes, methyl parathion, parathion, acetone, benzene, cumene, methylene chloride, methanol, PNP, and xylene. The unit operated from the late 1970s to 1988.

Cell 5E – Cell 5E is a RCRA-regulated unit that managed ignitable wastes, methyl parathion, parathion, acetone, benzene, cumene, methylene chloride, methanol, PNP, xylene, spent limestone, limestone, clay, acid brick, and concrete rubble. The unit received approximately 1,000 tons of spent limestone from the cleaning of the Old Limestone Bed in 1985 and approximately 3,000 tons of limestone, clay, acid brick and concrete rubble when the Old Limestone Bed was closed in 1988. The unit operated from 1981 to 1989. According to facility representatives, approximately 102,750 tons of parathion and PNP wastes were disposed of in Cells 4E and 5E combined.

Available information indicates that PCB waste placement in the former South Landfill was limited to Cells 1E, 2E and/or 3E, only.

Cells 1W, 2W, 2WA, 3W – These cells received waste materials that contained parathion, methyl parathion, asbestos, PNP, biological solids from the waste water treatment facility, and plant trash. According to facility representatives, approximately 300 tons of waste per year combined were disposed of in these cells from the late 1960s to 1975. In the late 1970s (approximately 1978), waste material from Cell 1W was excavated and relocated to the RCRA-regulated cell, 4E. This work was performed as part of the realignment of Highway 202. No additional information is available.

Cell 4W – This cell received waste materials that contained organophosphate contaminated sulfur, parathion, methyl parathion, asbestos, PNP, and biological solids from the waste water treatment facility, and plant trash. According to facility representatives, approximately 1,500 tons of waste per year were disposed of in this cell from 1973 to 1983. No additional information is available.

Closed West End Landfill

Waste materials disposed in the closed West End Landfill included production wastes and general trash from the Facility. The landfill operated from approximately 1930 to approximately 1960. No additional information is available.

The following provides a summary of the adjacent area sampling and results for both the closed South Landfill and closed West End Landfill. This information was provided in a letter to the EPA dated June 16, 2009 titled "Response to the Environmental Protection Agency Regarding Final Summary Report of Technical Review and Evaluation of Potential PCB Releases." This letter report is included as Appendix A-1 to the RI Report and includes a discussion of residual PCBs remaining under the existing caps or soil covers at the two landfills.

Closed South Landfill

The PCB concentrations measured in soil prior to placing the upgraded cover system at the closed South Landfill are included in the letter report described above. These samples were collected in 1996 under a Consent Decree with ADEM. This report also shows PCB concentrations in surface soil over the eastern cells south of WMA I where an upgraded cover system was not installed. Surface soil samples were collected from the closed South Landfill (following completion of the upgraded cover systems) and analyzed for PCBs. The PCB concentrations ranged from non detect to 10 mg/kg for both the closed portions of the landfill, and the areas where no cover improvements were made.

Closed West End Landfill

The PCB concentrations measured in soil prior to constructing the cover system over the closed West End Landfill are included in the letter report described previously. The samples included were collected in 1994 through 1996 and reported to ADEM. P/S excavated and removed soil from the adjacent areas of the landfill prior to placing the soil cover (available documentation is included in Appendix A-3 of the RI Report). The PCB concentrations included in this letter report represent the concentrations measured prior to and after conducting soil removal activities and capping the area. The areas of the West End Landfill with elevated PCB concentrations were capped with a multi-media HDPE liner system or covered with clean soil and vegetative cover.

Additionally, as reported by members of the remediation team, soil was excavated from outside the fence line of the West End Landfill along 1st Avenue to address PCBs found in soil/sediment and to improve drainage in the area. The area addressed includes a strip of grass between the road and the fence line approximately eight to ten feet wide. Post-excavation sample results for this area are included in the letter report (Appendix A-1 of the RI Report).

Surface soil samples were collected from the closed West End Landfill following completion of the cover systems and analyzed for PCBs. The PCB concentrations ranged from non detect to 21 mg/kg. The higher concentrations were measured along the fence line adjacent to the Alabama Power Company switch yard.

Elevated PCB concentrations were detected in the soil underlying the Alabama Power Company switch yard located within the limits of the West End Landfill property. The samples were collected from beneath the gravel present in the switch yard. Although no additional capping of this area was completed as part of the interim measures, Alabama Power maintains a substantial gravel cover over the area and restricts access to the switch yard to its employees only. The area is enclosed with a chain link fence, which remains locked to prevent unauthorized entry or trespass.

Pertinent information presented above has been included in Section 2.2 of the RI Report, and some of the information has been included in Section 2.6 of the FS Report. Figure 1-3 of the RI Report shows the cell locations for the South Landfill, and Figure 2-3 of the FS Report shows the existing cover system for each portion of the landfills (South Landfill and West End Landfill). The PCB data for soil remaining under the cap in the "walking trail area" was provided in Geraghty & Miller, Inc.'s report dated June 9, 1995, titled "Soil Sampling Results for Area A, Monsanto Company". A copy of the report figure depicting the PCB results in this area for soil prior to placement of clean cover material is included as Appendix A-2 of the RI Report. In addition, the following discussion of the "walking trail area" has been added to Section 2.1 of the RI Report and Section 2.6 of the FS Report. "In May 1995, prior to the placement of a geotextile and soil cover, soil and sediment samples were collected from the 'walking trail area' located in the southeast corner of the plant site. The samples were field screened for PCBs, and approximately 10% of the field samples were submitted for laboratory analysis of PCBs. The results of these analyses are included in Appendix A-2 of the RI Report. Of the samples collected, nine soil and eight sediment samples exceeded the screening level of 10 mg/kg. Laboratory concentrations ranged from 6.1 mg/kg to 157 mg/kg. Appendix A-2 of the RI Report provides the locations and results of the samples collected in the 'walking trail area'."

In a meeting held on March 26, 2010, between the EPA and P/S, the EPA indicated that insufficient information was available for portions of the South Landfill (Cells 1E, 2E, and 3E) and the adjacent areas of the West End Landfill (previous characterization area AA2) in order to determine whether the cover systems are protective. As a result, P/S collected and provided additional data for these areas to the EPA in an RI addendum report. The results are summarized in Section 2.6 of the FS Report as follows:

"In conjunction with the completion of the RI, additional investigation activities were conducted at the South Landfill and the West End Landfill in accordance with a meeting held on March 26, 2010 between the EPA and P/S (Golder, 2010c). In this meeting, the EPA indicated that insufficient information was available for portions of the South Landfill (Cells 1E, 2E, and 3E) and the adjacent areas of the West End Landfill (previous characterization area AA2) in order to determine whether the cover systems are protective. The scope of work for the South Landfill focused on collecting data necessary to evaluate the performance of the existing cap/cover overlying the 'PCB Cells' (Cells 1E, 2E, and 3E) including: 1) conducting a cap/cover thickness survey; 2) determining the permeability of the cap/cover soil materials; 3) analyzing a suspected surface water 'seep' that had been previously observed in the vicinity of the cells (analyzed for constituents of interest at the Site); and 4) collecting and analyzing a groundwater sample from well OWR-5D, which is located downgradient of the South Landfill (analyzed for PCBs). At the West End Landfill, P/S performed confirmation soil sampling in the vicinity of the historic composite sample AA2 (Adjacent Area 2). AA2 was collected prior to excavating and relocating PCB-containing soil from the area and capping the area with a soil cap, which was completed in 1996. The result from the original '8-point' composite sample (AA2) collected in this area was 1,940 mg/kg.

Findings of the investigation activities conducted at the South Landfill show that the cap/cover material overlying Cells 1E, 2E, and 3E was generally 24 inches thick or greater, and the cover soils consisted of low plasticity silt and clay with a mean permeability of 4.14 x 10^{-6} cm/sec. However, some gravel-sized material was encountered intermixed with the soil matrix that prevented a direct measurement of the cover thickness at some locations.

Analytical results of the groundwater samples (original and field duplicate) collected at OWR-5D indicated that total PCB concentrations for unfiltered samples ranged from 447 J (estimated value) µg/l to 596 J µg/l depending upon the method used to analyze the samples.

The PCB concentrations for the filtered samples ranged from non detect to 2.62 UJ (estimated non detect value) µg/l.

Results for the unfiltered seep samples were non detect for volatile organic compounds and pesticides, while the semi-volatile organic compound 1,4-dichlorobenzene was detected at a concentration of 1.4 J µg/l for the original sample and 1.6 J µg/l for the duplicate sample. PCB results for the unfiltered samples (original and field duplicate) ranged from non detect to 0.59 J µg/l depending upon the method used to analyze the samples. The PCB results for the filtered sample were non detect. Metals results for the unfiltered sample indicate a detection of 0.13 milligrams per liter (mg/l) for barium and 0.19 mg/l for manganese, with associated filtered results of 0.12 mg/l for barium and 0.17 mg/l for manganese.

PCB results for samples collected from the West End Landfill (original and duplicate sample) ranged from 14.86 J mg/kg to 89.8 J mg/kg depending upon the method used to analyze the samples. These results confirm that the high level PCB concentrations originally detected in soil at this location were removed prior to placing the soil cap/cover at the West End Landfill Adjacent Area 2."

With regards to the documentation of disposal of soils excavated at the West End Landfill, an appendix was added to the May 20, 2010 Revised RI Report (new Appendix A-3), which includes available documentation regarding the excavation and off-site disposal of PCB-containing soil from the West End Landfill during construction of an upgraded multi-layer cover in 1995 - 1996. Field monitoring reports are provided indicating that PCB-contaminated material was loaded onto semi-trailer dump trucks and hauled to an off-site disposal facility. Additionally, waste manifests from this period document the disposal of over 2,300 tons of contaminated material at Waste Management's TSCA-approved landfill in Emelle, Alabama.

The following changes have been made to the FS Report.

- **Section 2.3, Regulatory History, page 10**

  Section: Section reference has not been included due to the length of this section.

  Response: A reference has been added to this section indicating that information regarding waste disposal is located in Section 2.2 of the RI Report.

- **Section 2.6, Nature and Extent of Contamination, 2nd paragraph, page 14**

  Section: At the closed South and West End Landfills, surface soil samples were collected and analyzed for PCBs. The concentrations in samples from the closed South Landfill ranged from non-detect to 10 milligrams per kilogram (mg/kg) and were non-detect from the closed West End Landfill.

  Response: The above sentence has been revised to read as follows: "At the closed South and West End Landfills, surface soil samples were collected from the top cover material after implementing the cover system upgrades and analyzed for PCBs. The concentrations in samples from the closed South Landfill ranged from non detect to 10 milligrams per kilogram (mg/kg), and from the closed West End Landfill ranged from non detect to 21 mg/kg." The surface samples collected from the closed South and West End Landfills referred to in this section were taken from the top cover material after implementing the cover system upgrades. This has been clarified in the text.

The following has been added to this section: "Additional characterization data for the closed South and West End Landfills are included as Appendix A-1 in the RI Report and summarized below. The summary includes a discussion of residual PCBs remaining under the existing caps or soil covers at the two landfills.

Closed South Landfill

The PCB concentrations measured in soil prior to placing the upgraded cover system at the closed South Landfill are included in Appendix A-1 of RI Report. These samples were collected in 1996 under a Consent Decree with ADEM. Appendix A-1 of the RI Report also includes PCB concentrations in surface soil over the eastern cells south of WMA I where an upgraded cover system was not installed.

Closed West End Landfill

The PCB concentrations measured in soil prior to constructing the cover system over the closed West End Landfill are included in Appendix A-1 of the RI Report. The samples included were collected in 1994 through 1996 and reported to ADEM. P/S excavated and removed soil from the adjacent areas of the landfill prior to placing the soil cover. The PCB concentrations included in Appendix A-1 represent the concentrations measured prior to and after conducting soil removal activities and capping the area. The areas of the West End Landfill with elevated PCB concentrations were capped with a multi-media HDPE liner system or covered with clean soil and vegetative cover.

Additionally, as reported by members of the remediation team, soil was excavated from outside the fence line of the West End Landfill along 1st Avenue to address PCBs found in soil/sediment and to improve drainage in the area. The area addressed includes a strip of grass between the road and the fence line approximately eight to ten feet wide. Post excavation sample results for this area are included in Appendix A-1 of the RI Report.

Elevated PCB concentrations were detected in the soil underlying the Alabama Power Company switch yard located within the limits of the West End Landfill property. The samples were collected from beneath the gravel present in the switch yard. Although no additional capping of this area was completed as part of the interim measures, Alabama Power maintains a substantial gravel cover over the area and restricts access to the switch yard to its employees only. The area is enclosed with a chain link fence, which remains locked to prevent unauthorized entry or trespass.

In May 1995, prior to the placement of a geotextile and soil cover, soil and sediment samples were collected from the 'walking trail area' located in the southeast corner of the plant site. The samples were field screened for PCBs, and approximately 10% of the field samples were submitted for laboratory analysis of PCBs. The results of these analyses are included in Appendix A-2 of the RI Report. Of the samples collected, nine soil and eight sediment samples exceeded the screening level of 10 mg/kg. Laboratory concentrations ranged from 6.1 mg/kg to 157 mg/kg. Appendix A-2 of the RI Report provides the locations and results of the samples collected in the 'walking trail area'."

- **Section 3.2.3.1, Closed West End Landfill, 1st paragraph, page 24**

  Section: The closed West End Landfill is located along the western boundary of the Facility and operated as a single landfill cell from approximately 1930 to approximately 1960. The landfill received production wastes and general trash from the Facility.

  Response: This is now Section 3.2.3.2. A reference to Section 2.2.3 of the RI Report that includes information about past on-site disposal practices at the closed West End Landfill along with a reference to Appendix A-1 of the RI Report have been included in this section.

- **Section 3.2.3.3, Closed South Landfill, 1st paragraph, page 26**

  Section: The closed South Landfill previously operated with ten individual cells from 1960 to 1988 and was used for the disposal of production wastes, demolition materials, and general trash from the Facility. Two of the cells (Cells 4E and 5E), as previously described, were closed with RCRA compliant caps in 1989 (WMA 1). Initially, the remaining cells in the South Landfill, closed prior to the effective date of RCRA, were covered with compacted soil and a vegetative layer. In 1997 and 1998, additional ICMs were constructed for the South Landfill to reduce the infiltration of surface water into the landfill and prevent the transport of affected soils.

  Response: This is now Section 3.2.3.4. A reference to Section 2.2.1 of the RI Report that includes information about the past on-site disposal practices at the closed South Landfill along with a reference to Appendix A-1 of the RI Report has been included in this section.

3. Clarify the extent of regulatory oversight by both ADEM and EPA with respect to the Facility or unit. ADEM issued Solutia a RCRA Post-Closure Permit for the Facility on October 31, 2008. Under that RCRA Post-Closure Permit, ADEM retained authority over the groundwater monitoring and detection monitoring program for WMA-I, and over the corrective action monitoring program for WMA-II. ADEM deferred 19 SWMUs to be evaluated for further investigation and assessment of providing long-term protection of human health and the environment under CERCLA. Furthermore, ADEM has stated that PCBs are not included in the scope of the WMA-II corrective action, although Table III.3 in the RCRA Post-Closure Permit provides a groundwater concentration of 0.5 µg/L for PCBs and Permit Section III.E(2)(a) requires Solutia to remove or treat any constituents that exceed levels in Table III.3.

   Response: See specific responses below clarifying the extent of regulatory oversight by both ADEM and EPA with respect to the Facility. Regarding EPA's comment about ADEM's assertion that PCBs are not included in the scope of the WMA II corrective action, P/S assume that the EPA is referring to ADEM's approval to address any groundwater concentration exceedance in the RFI/CS Program, which ADEM has deferred further action to the EPA. P/S acknowledge that the RCRA Post-Closure Permit includes a concentration limit of 0.5 µg/L for PCBs in groundwater. P/S are in the process of addressing all constituents of concern in groundwater as part of the RI/FS process.

   The following changes have been made to the FS Report.

   - **Section 2.3, Regulatory History, 2nd full paragraph, page 12**

     Section: Prior to falling under CERCLA jurisdiction, P/S was in the process of gaining approval from ADEM under RCRA for the extensive interim measures that had been completed at the Facility. However, before P/S could complete the approval process, the

EPA assumed regulatory control of the Site from ADEM. At that time, the completed interim measures became the baseline for considering additional remediation requirements in the CERCLA process. The Human Health Risk Assessment (HHRA) and the Ecological Risk Assessment were completed using these existing conditions as the basis for the evaluations. For compliance with the Facility's RCRA Permit, P/S must continue to operate and maintain existing interim measures completed at the Site including operation of the installed corrective action systems. Any remedial actions required under CERCLA will be in addition to the extensive work already completed under RCRA. Once finalized, it is anticipated that these completed corrective measures and CERCLA Remedial Actions will be accepted and approved under RCRA as part of the Facility's RCRA Permit.

Response: The section has been modified to read as follows: "Prior to falling under CERCLA jurisdiction, P/S were in the process of gaining approval from ADEM under RCRA for the extensive interim measures that had been completed at the Facility. However, before P/S could complete the approval process, the EPA assumed regulatory control of the Site from ADEM. At that time, the completed interim measures became the baseline for considering additional remediation requirements in the CERCLA process, and any remedial actions required under CERCLA will be in addition to the extensive work already completed under RCRA. The HHRA and the Ecological Risk Assessment were completed using these existing conditions as the basis for the evaluations. Under the renewed RCRA Post-Closure Permit issued on October 31, 2008, ADEM retained authority over the groundwater monitoring and detection monitoring program for WMA I, and over the corrective action monitoring program for WMA II. In addition, ADEM deferred investigation and the determination of the need for further remedial action for 19 SWMUs to the EPA under CERCLA."

- **Section 3.1, Introduction, 3rd paragraph, 6th sentence, pages 21 to 22**

Section: For compliance with the Facility's RCRA Permit, P/S must continue to operate and maintain existing corrective measures completed at the Facility including operation of the installed corrective action systems.

Response: The sentence has been modified to read as follows: "For compliance with the Facility's RCRA Permit under the authority of ADEM, P/S must continue to operate and maintain existing corrective measures completed at the Facility including operation of the installed corrective action systems."

- **Section 3.2.2, Groundwater Corrective Action Systems, page 23**

Section: The existing groundwater corrective action system at the Facility consists of two systems: the SWMU 1 Corrective Action System and WMA II Corrective Action System. The SMWU 1 Corrective Action System addresses constituents released to groundwater from the closed South Landfill. The WMA II Corrective Action System, previously referred to as the Old Limestone Bed Surface Impoundment (OLBSI) Corrective Action System, addresses groundwater impacts resulting from releases from the OLBSI (SWMU 8), a Former Lagoon (SWMU 9), and the New Limestone Bed Surface Impoundment (WMA II). A description of each of these corrective action systems follows:

Response: This section has been revised as follows: "The existing groundwater corrective action …. Old Limestone Bed Surface Impoundment (OLBSI) Corrective Action System, addresses groundwater impacts resulting from releases from the OLBSI (SWMU 8), a Former Lagoon (SWMU 9), and the New Limestone Bed Surface Impoundment (WMA II). Note that SWMU 8 and SWMU 9 were deferred to EPA by

ADEM in the RCRA Post-Closure Permit issued on October 31, 2008. A description of each of these corrective action systems follows:"

- **Section 3.3.1, Groundwater Monitoring Program, 2nd paragraph, 4th sentence, page 29**

  Section: The Corrective Action Effectiveness Program consists of monitoring the existing corrective action systems: the SWMU 1 Corrective Action System and the WMA II Corrective Action System. Each of the corrective action systems includes a series of recovery wells and monitoring wells. The monitoring wells are subdivided into effectiveness wells, point-of-compliance wells, and boundary wells. As part of the CERCLA process, P/S will devise a final groundwater monitoring program that will meet the requirements of both CERCLA and RCRA. Long-term groundwater monitoring will be performed under a single program.

  Response: The last two sentences of this section have been replaced with the following: "Currently, the corrective action system for WMA II and the groundwater detection monitoring system for WMA I are regulated by ADEM under the October 31, 2008 RCRA Post-Closure Permit. Additionally, while the RCRA Post-Closure Permit does not specifically name the SWMU 1 Corrective Action System, it is included in monitoring and financial assurance requirements stipulated in the Permit. EPA is in ongoing discussions with ADEM regarding the respective roles of the agencies during and following selection of the CERCLA groundwater remedy. Based on the language of the RCRA Post-Closure Permit, it appears that any continued monitoring of these three regulated units would continue under the permit conditions, independent of any long-term monitoring program developed for the purposes of the CERCLA groundwater remedy."

4. Explain that EPA does not accept the results from filtered samples for purposes of characterization of the nature and extent of contamination and for purposes of determining compliance with cleanup goals in groundwater. However, EPA can use filtered sampling information to understand fate and transport mechanisms at the site, which is what was done in the investigations described. Please clarify this distinction in the document.

   Response: P/S acknowledge that the nature and extent of contamination and remedial efforts will be judged based upon the results of unfiltered samples. However, given the usefulness of filtered results in assessing the fate and limited transport of PCBs in shallow groundwater, certain references to filtered results will be included in the FS. The purpose of these data will be clarified.

   The following changes have been made to the FS Report.

   - **Section 2.6, Nature and Extent of Contamination 6th and 7th bullets, page 15**

     Section:

     - The potential for colloidal transport as a mechanism for PCB migration at monitoring wells OW-08A, OW-16A, OW-21A, and OWR-15D was addressed by collecting 1.0-micron filtered samples and analyzing the samples for PCBs. The sample results were non detect for all the filtered samples indicating that colloidal transport is not a valid mechanism responsible for PCB migration at these locations.

     - During a later investigation of Site bedrock, groundwater samples filtered using the 1.0-micron filter were collected from wells T-05 and T-06. These results indicated that either colloidal particles were present with PCBs adsorbed to the particles, or

that PCBs were present in the dissolved phase. Colloidal-size particles were also examined during the OU-1/OU-2 groundwater investigations. In general, these results indicate that colloidal-size particles were detected with this sampling. Consequently, colloidal transport is possible, although a large Site-wide plume does not appear to have coalesced together.

Response: These two bullets have been revised to read as follows: "The potential for colloidal transport as a mechanism for PCB migration at monitoring wells OW-08A, OW-16A, OW-21A, and OWR-15D was investigated by collecting filtered samples (i.e., 2-micron and 0.1-micron filters) and analyzing the samples for PCBs. The sample results were non detect for all the filtered samples.

During a later investigation of site bedrock, filtered groundwater samples were collected from wells T-05 and T-06. These results indicated that either colloidal particles were present with PCBs adsorbed to the particles, or that PCBs were present in the dissolved phase. Colloidal-size particles were also examined during the OU-1/OU-2 groundwater investigations. In general, these results indicate that colloidal-size particles were detected with this sampling. Consequently, colloidal transport is possible, although a large site-side plume does not appear to have coalesced together."

- **Section 4.2.4.1, PCBs in Groundwater, pages 47 thru 49**

  Section: Section reference has not been included due to the length of this section.

  Response: The following sentence has been added at the end of the first paragraph of Section 4.2.4.1: "The results from filtered analyses have been included for certain wells to evaluate the potential fate and transport of PCBs at these locations. The filtered results have not been used to determine the nature and extent of contamination or to judge remedial efforts."

5. The document indicates that surface water is not considered a significant migration pathway from the Facility. Part of that justification was based on the fact that surface water leaves the facility through drainage discharges that are monitored and regulated under an NPDES permit. However, Section 4.5 of the Revised Draft RI states that three drainage discharge outfalls are not currently sampled under the NPDES permit (DSN 003, 005, and 006). The effectiveness of the West End Landfill and possibly several other SWMUs is no longer monitored under the NPDES permit. Please clarify this information in the document.

   Response: *As indicated in Section 2.7 of the RI Report, stormwater outfall DSN 004 also represents stormwater flow from both DSN 003 and DSN 005. DSN 004 was monitored until the shutdown of the PNP plant when the new NPDES Permit was issued in January 2007. As approved by ADEM, the requirement to monitor DSN 004 was removed from the January 2007 NPDES Permit. The DSN 006 stormwater outfall conveys drainage from the closed West End Landfill. Monitoring requirements for this outfall were removed from the NPDES Permit after no detections of PCBs were measured from December 1997 through May 2001. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. This has been clarified in the report to indicate that these discharge locations continue to discharge stormwater but are no longer monitored.*

   Based on discussions between the EPA and P/S during the March 26, 2010 meeting, P/S acknowledge that if a containment remedy is selected, stormwater discharge monitoring may

be necessary to verify that interim and final remedial measures under CERCLA are effective.

The following changes have been made to the FS Report.

- **Section 2.7, Contaminant Fate and Transport, 1st paragraph, page 17**

  Section: The fate and transport characteristics of the prevalent constituents were reviewed, and potential migration routes were considered. Most areas of impacted soil are under cover systems making the release from soil to surface water unlikely. Groundwater impacts may occur locally due to leaching from impacted soil in areas with permeable cover systems. Four constituents (lead, manganese, mercury, and PCBs) have been retained for further consideration in the FS for potential leaching to groundwater. Surface water is controlled on the Site via a system of sewers and ditches. All process-related water is piped to the Facility's former WWTF and then discharged to the Anniston POTW. Precipitation falling at the Facility is collected in ditches and discharged via an NPDES regulated outfall. Consequently, constituent concentrations in surface water have been sporadic and low. Thus, surface water is not considered a significant migration pathway from the Facility. Groundwater migration is controlled by natural and man-made means. Migration is limited because the rate of groundwater flow is very low and there are natural attenuation processes for parathion and PNP and natural adsorption for PCBs and metals. These natural processes combined with the existing interceptor well systems control the migration of constituents from the Facility. In addition, perimeter monitoring has indicated that with only two potential exceptions (OW-21A and OW-10 areas), impacted groundwater is contained within the Facility boundary.

  Response: This section has been revised as follows: "The fate and transport ….. Most areas of impacted soil are under cover systems reducing the likelihood of potential releases from soil to surface water…. Much of the precipitation falling at the Facility is collected in ditches and discharged via an NPDES regulated outfall. Constituent concentrations measured in the outfall have been sporadic and low. However, some areas of the Facility do not drain to the upgraded stormwater collection system. These areas are primarily in the northwest portion of the Facility and include the closed West End Landfill and adjacent areas. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater from these areas but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. If a containment remedy is selected for these areas, stormwater discharge monitoring may be necessary to verify that interim and final remedial measures under CERCLA are effective.

  Groundwater migration is controlled by natural and man-made means. Migration is limited because the rate of groundwater flow is very low and there are natural attenuation processes for parathion and PNP and natural adsorption for PCBs and metals. These natural processes combined with the existing interceptor well systems control the migration of constituents from the Facility. In addition, perimeter monitoring has indicated that with only two potential exceptions (OW-21A and OW-10 areas), impacted groundwater is contained within the Facility boundary."

- **Section 3.2.3.1, Closed West End Landfill, 1st and 2nd set of bullets, page 25**

  Section: Following an investigation of the landfill in 1994, ADEM and the EPA approved a plan for stormwater improvements and an upgrade to the cap that had been placed on the area. The specific ICMs included the following:

- Construction of a multi-media cap and a soil cover on the landfill and immediately surrounding area. The cap included a six-inch thick compacted clay foundation layer, a 60-mil thick textured high density polyethylene (HDPE) geomembrane liner, a geosynthetic drainage layer consisting of a continuous non-woven geotextile and one-foot wide and one-inch thick geosynthetic wick drains placed every 50 feet, an 18-inch thick soil cover layer, and a vegetative layer. The geosynthetic drainage layer daylights into a ditch that runs along the toe of the western and northern slopes of the covered area; and

- Collection of stormwater run-off from the landfill and installation of hard piping to transport run-off through areas of affected soils. This allowed the closure of drainage ditches with affected sediments.

These measures were completed in 1996. The effectiveness of these completed corrective measures is demonstrated by the following:

- The cover system remains intact, and there have not been any significant erosion, slides, or geotechnical failures. The cover system has been effective at reducing exposures to landfill content as was demonstrated by the HHRA which indicated no unacceptable risk associated with the landfill;

- Ambient air monitoring conducted at the landfill indicates that the landfill is not a source of airborne PCBs either through particulate suspension or evaporation;

- Stormwater runoff from the landfill was routed to a stormwater outfall designated as DSN 006. Surface water monitoring at this outfall reported no detections for PCBs between December 1997 and May 2001. As a result, monitoring at this outfall is no longer required as per the Facility's NPDES Permit. Therefore, the landfill is effective at minimizing the migration of constituents through surface water; and

- Access restrictions (perimeter fencing and signage) have been effective at minimizing the potential for trespassers. As indicated in the HHRA, there are no unacceptable risks associated with a trespasser at the landfill.

Response: This is now Section 3.2.3.2. The second bullet above has been revised to read: "Collection of stormwater run-off from the landfill and installation of hard piping to transport run-off through areas of affected soils. This allowed the closure of drainage ditches with affected sediments. Surface water from the West End Landfill drains to DSN 006 and not through the upgraded stormwater collection system." The fourth bullet above has been revised to read as follows: "Although historical emissions of PCBs from the West End Landfill may have occurred, an extensive air pathway monitoring study was conducted documenting that air impacts are ***currently*** *low, consistent with ambient conditions in other areas of the United States, and concluding that the closed West End Landfill is* ***not now*** *considered a unique source for PCBs in air." The following has been added to the end of the fifth bullet: "However, if a containment remedy is selected for this area, stormwater discharge monitoring may be necessary to verify that interim and final remedial measures under CERCLA are effective."*

- **Section 3.2.3.2, Stormwater Drainage System, 1st paragraph, last sentence, page 26**

Section: The continued effectiveness of this completed corrective measure is demonstrated by the NPDES monitoring and reporting program.

Response: This is now Section 3.2.3.3. The sentence has been modified to read as follows: "The effectiveness of this corrective measure has been demonstrated through quarterly surface water sampling at DSN 012, conducted in accordance with the Facility's NPDES Permit." Additionally, the following has been added after this sentence: "However, some areas of the Facility do not drain to the upgraded stormwater collection system. These areas are primarily in the northwest portion of the Facility and include the closed West End Landfill and adjacent areas. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater from these areas but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. Should containment be selected as a remedy, stormwater discharge monitoring may be necessary to verify the continued effectiveness of interim and final remedial measures under CERCLA."

6. EPA disagrees that gravel covers make the release from soil to surface water unlikely. Although gravel may provide some limited direct physical worker access to soil, it is not effective in the long-term at isolating PCB contaminated soil from continual releases. For those alternatives where PCB contaminated soils are left in-place exceeding the cleanup level, the proposed cap description should include a discussion to identify the purpose of a cap and the data that supports the purpose identified. Typically a cap is used to perform one or more of the following functions: minimize percolation of water into the contaminated material; provide slopes to promote surface water runoff; control the release of gas from the contaminated material; and separate the contaminated material from humans, animals, and plants. For areas where interim caps already exist, P/S should present information to justify why the existing caps are or are not sufficient to protect human health and groundwater resources.

   P/S may propose a cap based on 40 C.F.R. § 761.61(a) or a different cap under 40 C.F.R. § 761.61(c) as long as EPA agrees that the cap proposed is protective of human health or the environment. The ARARs Tables should reflect that the requirements under 40 C.F.R. § 761.61 (a), 40 C.F.R. § 761.61 (b), 40 C.F.R. § 761.61(c) are potentially relevant and appropriate.

   Response: Gravel covers were placed to minimize or reduce the potential for workers and/or the general public to come in contact with impacted soils. Furthermore, upgrades to the onsite storm water conveyance system minimize or reduce the potential for the areas where gravel covers exist to become flooded. The two systems, working in concert, minimize or reduce exposure to both on-site and off-site impacted materials by making the release of contaminants from soil to surface water unlikely. As requested by the EPA, P/S has provided the appropriate justification for the existing/proposed cover systems in the FS Report by presenting information to justify whether the caps are protective to human health and the environment. Extensive studies have evaluated the migration of contaminants from the Facility via groundwater, surface water, and air. Additionally, at the request of the EPA, P/S recently collected further data for the South Landfill and the West End Landfill to address the final data gaps noted by the EPA. The results of these investigations were reported to the EPA in an RI addendum report, and the results are summarized in Section 2.6 of the FS Report. Collectively, these data have been used to support the use of the specific cover types.

   P/S acknowledge that EPA may approve caps that are different than those included under 40 CFR 761.61(a) provided that the cap is protective of human health and the environment. The ARARs table has been updated as indicated in the comment.

The following changes have been made to the FS Report.

- **Section 2.1.5, Demography and Land use, 2nd full paragraph, 2nd sentence, page 6**

  Section: As shown in Figure 2-3, impervious surfaces (buildings, roads, parking lots and concrete or asphalt surfaces) make up approximately 12% of the total area of the Facility.

  Response: This statement has been revised to: "As shown on Figure 2-3, many interim measures have been implemented at the Facility resulting in approximately 72% of the area being covered with asphalt pavement, concrete pavement, buildings, soil or gravel covers reducing the potential for direct contact with contaminated soil. Throughout OU-3, approximately 27% of the area is covered with impervious covers such as buildings, asphalt and concrete pavement, and high density polyethylene (HDPE) liner systems. An additional 19% is covered with relatively impervious grass and soil covers. The soil covers placed to isolate PCBs from direct contact typically have a low permeability (the permeability of in-place residual soils are on the order of 1.0×10^{-5} to 1.0×10^{-7} cm/sec) and are thus relatively impervious. Approximately 26% of the OU-3 area is covered with gravel covers to prevent direct contact and reduce the mobilization of PCB-containing soil."

- **Section 2.6, Nature and Extent of Contamination, 1st paragraph, 3rd and 4th sentences, page 14**

  Section: Within the plant area, the majority of soil samples were taken in areas covered with gravel, asphalt pavement, or concrete pavement. These covers prevent direct contact and minimize the potential for erosion of underlying soils.

  Response: The 4th sentence has been changed to read as follows: "These covers prevent direct contact and minimize or reduce the potential for erosion of underlying soils."

- **Section 4.2.4.2, PCBs in Soil, pages 49 thru 50**

  Section: Section reference has not been included due to the length of this section.

  Response: The following was added to the end of the fourth paragraph of this section: "As part of the RI, delineation sampling and a removal action were conducted at SSRI-11 to remove the 'principal threat waste' material identified in this area. However, PCB concentrations remain that has the potential to impact groundwater." Additionally, the following was added (new paragraphs) following the fifth paragraph: "Additional characterization data for the closed South and West End Landfills and the 'walking trail area' are included as Appendix A-1 in the RI Report and summarized in Section 2.6. The summary includes a discussion of residual PCBs remaining under the existing caps or soil covers constructed in these areas.

  Further discussions regarding the closed South Landfill – Cells 1E, 2E, and 3E, the closed West End Landfill – adjacent areas, and the 'walking trail area', and the adequacy of the existing cover systems in these areas to mitigate the potential for PCBs to leach to groundwater is presented in Section 5.3.1."

- **Section 5.3.1, Identification of Soil Impact Areas, General Comment, page 64**

  Section: Section reference has not been included due to the length of this section.

Response: The RI adequately defined the nature and extent of soil impacts for evaluation in the FS process. Areas A, B, C, D, E, F, G, and H were identified as potentially requiring GRAs in order to achieve the RAOs. As indicated, further evaluation of these areas is performed in the FS to determine soil remediation areas. In addition, the existing caps for Cells 1E, 2E and 3E of the South Landfill (the PCB cells), the surrounding areas of the West End landfill and the "walking trail area" have been evaluated and show that with the potential exception of Cells 1E, 2E, and 3E of the South Landfill, the existing caps are protective of human health and the environment. The PCB cells have been evaluated as a potential soil remediation area.

- **Section 5.3.2, Identification of Soil Remediation Areas, Surface Soil Impacts, page 66**

  Section: Section reference has not been included due to the length of this section.

  Response: Refer to the response to the comment above. The PCB cells have been added as a potential remediation area based on an evaluation of the existing cover system over these cells.

- **Section 5.3.3.3, Containment – Capping, pages 69 to 70**

  Section: Section reference has not been included due to the length of this section.

  Response: The gravel layer cover option has been removed from the proposed cover types and only soil, soil/geomembrane, asphalt, or concrete covers will be considered in areas that require a remedial action. Additionally, each cover type proposed will be evaluated with regards to its intended purpose (i.e., isolation, minimize erosion, prevent infiltration, etc.)

7. Concentrations of PCBs greater than 500 ppm are considered "principal threat waste" pursuant to EPA guidance and generally requires excavation, treatment, and disposal consistent with CERCLA Section 121 (b) and EPA expectations at 40 C.F.R. § 300.430(a)(1)(iii)(A). *See Superfund PCB Guidance* at p. 40. Revise this report to reflect this expectation.

   Response: P/S agree that PCBs greater than 500 ppm are considered "principal threat waste". As such, a review of site-specific PCB data indicated three areas that potentially contained soil with PCB concentrations greater than the "principal threat waste" threshold. These areas included sample location SSRI-11 (930 J mg/kg), SSR-18 (16,620 J mg/kg) and the composite soil sample taken at Adjacent Area 2 of the West End Landfill (1,940 mg/kg) prior to construction of the upgraded cap.

   Pursuant to the March 26, 2010 meeting between EPA and P/S, P/S implemented delineation sampling and a removal action to address "principal threat waste" material at SSRI-11. The material was delineated and subsequently removed and disposed at a TSCA-approved landfill. Additionally, an investigation was conducted to collect a confirmation sample within Adjacent Area 2 of the West End Landfill, which confirmed that the previously observed "principal threat waste" was removed for offsite disposal and/or relocated beneath the West End Landfill upgraded cap. Details of these investigations and removal action have been presented in RI Report Addenda with the findings incorporated into this revised FS report.

   With regards to sample SSRI-18, in 2002, soil was excavated from the SSR-18 area, and the area was capped with a concrete cover. P/S believe that it would be most appropriate to address the SSR-18 area by containing any residual material to prevent access that might

result in exposures exceeding protective levels (as has been done). This is consistent with PCB guidance documents. However, EPA and P/S have agreed that a confirmation sample will be collected at SSR-18 as part of the Pre-Remedial Design Investigation.

The following changes have been made to the FS Report.

- **Executive Summary, RI and CSM, 2nd full paragraph, page 2 of 14**

  Section: Soil samples were collected within the area of the plant, the closed South Landfill, and the closed West End Landfill during the RFI/CS and RI Programs. The more prevalent constituents detected in soils at the Facility include PCBs, benzo(a)pyrene, arsenic, cobalt, lead, manganese, mercury, and nickel. Within the plant area, the majority of soil samples were taken in areas covered with gravel, asphalt pavement, or concrete pavement. These covers prevent direct contact and minimize the potential for erosion of underlying soils. These areas are maintained and inspected as part of the plant's ongoing operation and maintenance programs. One exception is the grassy area north of the Former Phosphoric Acid Basin where one sample (SSRI-11) indicated elevated levels of PCBs, arsenic and lead relative to the rest of the Facility. Although this area is generally unoccupied and unused, there is the potential for direct contact with these surface soils.

  Response: The last two sentences have been replaced with the following: "P/S implemented delineation sampling and a removal action to address 'principal threat waste' material at SSRI-11. The material was delineated and subsequently removed and disposed at a TSCA-approved landfill. An additional area with elevated PCB concentrations above the 'principal threat waste' threshold, observed near SSRI-18, was excavated previously as an interim corrective measure (ICM) and covered with a concrete cap. Confirmation sampling to identify residuals potentially remaining in this area will be conducted as part of the Pre-Remedial Design Investigation."

- **Section 4.2.5, Summary, page 50**

  Section: As indicated in the RI Report, P/S have addressed principal threat wastes with PCB concentrations in excess of 500 mg/kg (EPA, 1990) as such material has been encountered. With the exception of the area near SSRI-11, which is being addressed through the RI/FS, principal threat zones have been removed or placed under impermeable covers. This includes the closed South Landfill, WMA I, the closed West End Landfill, the Old Limestone Bed, etc. However, releases from these areas have already occurred and likely impacted groundwater at the Facility. Thus, much of the groundwater impacts are from historical releases. However, as described in the RI, the continued migration of COCs from soil to groundwater could be occurring. If occurring, the most likely areas where soil impacts could be leaching to groundwater include (1) the open area adjacent to the Phosphoric Acid Basins (mercury and PCBs) and north of the facility parking lot, and (2) the open area located adjacent and to the east of the former PCB Production Area (PCBs).

  Response: This section has been revised to read as follows: "As indicated in the RI Report, P/S have addressed 'principal threat wastes' with PCB concentrations in excess of 500 mg/kg (EPA, 1990) as such material has been encountered. Most recently, P/S conducted delineation sampling and a removal action to address 'principal threat waste' at SSRI-11. Principal threat zones have been removed or placed under impermeable covers…"

8. EPA disagrees that the "point of compliance" (POC) be established at the Facility boundary for OU-3 because that waste management area approach is not consistent with the circumstances at this Facility considering the two RCRA regulated units, the West End and South Landfills, and apparent groundwater contamination. The RAO for ground water should state: "Restore groundwater to meet cleanup goals such as MCLs throughout each plume, or at and beyond the edge of the waste management area(s)." If P/S wish to seek a Technical Impracticability (TI) Waiver for the achievement of groundwater ARARs (i.e., MCLs), there is a process that would need to be followed, pursuant to EPA's Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration (Sept. 1993). EPA wishes to be clear about what will be acceptable for a TI demonstration. Firstly, a TI containment zone for the whole of OU3 is NOT acceptable. EPA will expect that individual TI zones in areas where the restoration is not practicable is acceptable. Secondly, containment of that zone will be expected to be accomplished either hydraulically, with a physical engineered remedy, or a demonstration that this is already occurring with monitoring data (for a more robust dataset than the current RCRA semi-annual monitoring). One thing to note here is that a robust TI waiver demonstration was developed at the Anniston Army Ammunition Depot and the State did not accept it. Lastly, restoration to the MCL will be expected for the area outside of the TI containment zone. .

   EPA believes that with the excavation and/or capping proposed in the identified source areas, ground water contamination will improve groundwater *(sic)*. Following the first Five Year Review, ground water samples analyzed for Aroclors and Homologues would allow the evaluation of the effect of this remedial response. Ground water is moving very slowly (0.5 to 5.0 ft/year) so in 5 years the movement of contamination could be as great as 25', but because of contaminant retardation could be as little as 2.5'. In either case test driving this hypothesis has merit and does not pose a threat to receptors, when used in conjunction with an upgrade to the existing P&T containment system.

   Response: The groundwater RAO indicated above has been revised as requested by the EPA, and P/S have removed all references to P/S seeking a TI waiver for groundwater. P/S concur with the EPA that with the excavation and/or capping proposed in the identified source areas (in conjunction with an upgraded pump and treat system), groundwater quality will improve and that sampling data will be the subject of evaluation during the first Five Year Review period. Additionally, EPA and P/S have agreed that an expanded monitoring program, beyond that regulated by ADEM under the RCRA Post-Closure Permit, will be developed during or in advance of performance of a Pre-Remedial Design Investigation.

   The following changes have been made to the FS Report.

   - **Executive Summary, RAOs for Groundwater, 4th bullet, page 6 of 14**

     Section: Restore groundwater to MCLs at and beyond the point of compliance.

     Response: This sentence has been revised as follows: "Restore groundwater to meet cleanup goals such as MCLs throughout each plume, or at and beyond the edge of the waste management area(s)."

- **Section 4.5.2, RAOs for Groundwater, bullets, page 59**

  Section: Restore groundwater to MCLs at and beyond the point of compliance.

  Response: This sentence has been revised as follows: "Restore groundwater to meet cleanup goals such as MCLs throughout each plume, or at and beyond the edge of the waste management area(s)."

- **Section 4.5.2, Groundwater Point of Compliance Discussion and associated bullets, page 60**

  Section: Section reference has not been included due to the length of this section.

  Response: The portion of this section referenced above has been removed.

9. MNA is a remedial approach limited to certain sites with site-specific data demonstrating its efficacy and is not considered in-situ treatment by EPA. Text should be included to indicate the range of timeframes for restoration of the groundwater plumes to attain cleanup levels under MNA. *See MNA Guidance*. Revise the following sections and any other language in the FS inconsistent with this information.

   Response: As described in detail in Section 5.4 of the RI Report, MNA was investigated to determine its potential viability as a remediation technology for parathion and PNP. P/S provide strong support that MNA is active at the Facility. The RI Report includes specific details regarding the timeframe required to achieve reductions in contaminant concentrations for parathion and PNP. This language has been included in the FS Report. As requested by the EPA, P/S have revised the FS Report to indicate that MNA is not considered in-situ treatment.

10. Indicate whether other TSCA regulations for treatment of PCBs are considered Action-Specific ARARs for the proposed treatment method. Also, under CERCLA Section 121 (e)(1), federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely on-site as defined in 40 C.F.R. § 300.5. See also 40 C.F.R. §§ 300.400(e)(1) & (2).

    Response: Potential ARARs and TBC requirements are included in Section 4.3. Other TSCA regulations for the treatment of PCBs have been identified as potential Action-Specific ARARs. The final ARARs will be identified by the EPA as part of the ROD for the Site.

    With regards to permitting, P/S concur with the EPA that federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely on-site as defined in 40 CFR 300.5. Furthermore, the 1992 OSWER Directive 9355.7-03 (EPA, 1992) states, "the 1990 NCP [section 40 CFR 300.400(e)(1)] implements this permit exemption for "on-site" actions, defining "on-site" as "the areal extent of contamination and all suitable areas within very close proximity to the contamination necessary for implementation of the response action." The preamble to the NCP explains that "areal" refers both to the surface areas and the air above the site. EPA policy further defines "on-site" to include soil and the groundwater plume that are to be remediated.

The following changes have been made to the FS Report.

- **Section 7.3.4.3, Compliance with ARARs, page 114**

  Section: This alternative will continue to comply with the action- and chemical-specific ARARs as identified in Table 7-2. Monitoring of air emissions during the treatment processes will be required to ensure that the action- and chemical-specific standard for National Emissions Standards for Hazardous Air Pollutants (Federal Register, 2008, 40 CFR Part 61) are maintained. Extensive permitting will likely be required for compliance with federal and state air emission requirements, but compliance is likely attainable.

  Response: The last sentence has been deleted and the section modified as follows: "Although the Site is exempt from obtaining federal, state, or local permits, this exemption does not waive requirements to meet the substantive provisions of the permitting regulations. Regular interaction with federal, state, and local agencies will be required to comply with federal and state air emission requirements."

- **Section 7.3.5.3, Compliance with ARARs, page 120**

  Section: This alternative will comply with the action- and chemical-specific ARARs identified in Table 7-2. Monitoring of air emissions during the treatment processes will be required to ensure that the action- and chemical-specific standards for National Emissions Standards for Hazardous Air Pollutants (Federal Register, 40 CFR Part 61) are maintained. Extensive permitting will likely be required for compliance with federal and state air emission requirements, but compliance is likely attainable.

  Response: The last sentence has been deleted and the section modified as follows: "Although the Site is exempt from obtaining federal, state, or local permits, this exemption does not waive requirements to meet the substantive provisions of the permitting regulations. Regular interaction with federal, state, and local agencies will be required to comply with federal and state air emission requirements."

Specific Comments:

11. **Section 2.6, Nature and Extent of Contamination, 2nd paragraph after bulleted list, page 16** - Although air may not currently be a pathway, it is EPA's position that the Facility and closed South and West End Landfills were historic sources of PCBs in air, and that the airborne pathway from the Facility was significant. Please clarify that the Facility and West End and South Landfills are not *currently* unique sources for PCBs in air, and make no reference to the historic air pathway.

    Response: EPA's position that significant air emissions of PCBs occurred historically at the site is unsupported by the myriad of technical data collected from OU-3. The widely scattered pattern of PCB concentrations in soils is not consistent with the prevailing wind direction for the area or air dispersion patterns in general. Thus, the air pathway is not believed to have been and is not currently a significant fate and transport pathway for PCBs at the site.

    *Nonetheless, the referenced sentence has been revised to read as follows: "An extensive air pathway monitoring study was conducted documenting that air impacts are **currently** low, consistent with ambient conditions in other areas of the United States, and concluding that the closed South and West End Landfills, and Facility are **not now** considered a unique source for PCBs in air."*

12. **Section 2.7, Contaminant Fate and Transport, 2nd paragraph, last sentence, page 17** - Clarify what the abbreviation "CCL" means, and whether it originates from the RCRA Post-Closure Permit. Also, indicate whether these contaminants have exceeded SDWA MCLs or risk-based concentrations that are used to establish preliminary remediation goals consistent with 40 C.F.R. §§ 300.430(e)(2)(i)(A)(1) and (2).

    Response: CCL is an abbreviation for Constituent Concentration Limit. The following paragraph has been added to Section 2.6 of the FS Report to clarify its meaning: "The nature and extent of constituents of interest in groundwater were compared to published EPA maximum contaminant levels (MCLs), as available. However, some constituents do not have published MCLs. For these constituents, the EPA Region IX Preliminary Remediation Goals (PRGs) were used for comparison. Since 4-nitrophenol and o,o,o-triethylphosphorothioate do not currently have Federal MCLs or Region IX PRGs, site-specific limits were developed for these two constituents using procedures established for calculating the Region IX PRGs (Region IX PRGs User's Guide). The term constituent concentration limit (CCL) used throughout the RI and FS Reports is a term used to collectively define the values (MCLs, Region IX PRGs, or calculated site-specific limit) used to compare against measured site groundwater concentrations."

13. **Section 2.8, Summary of Risk, page 20** - Add a paragraph that specifies EPA's acceptable risk range for both carcinogens and non-carcinogens, consistent with appropriate provisions in the NCP, such as 40 C.F.R. § 300.430(e)(2)(i)(A)(2).

    Response: The following paragraphs have been taken directly from the HHRA and added to this section.

    "Generally, EPA uses a target cancer risk range of 10^{-6} to 10^{-4} (1 in 1,000,000 to 1 in 10,000) to evaluate the need for remediation or mitigation at a site. Cancer risks below 1 in 1,000,000 are typically assumed to be de minimus and would require no remediation or mitigation. Risks within the risk range are typically considered acceptable, but decisions on whether to remediate or mitigate risks that fall in this range are made on a site-specific basis. Risks that exceed 1 in 10,000 often require remediation and/or mitigation; however, no 'bright line' has been established at the upper end of the risk range, and again, risk management decisions are made on a site-by-site basis.

    For non-cancer hazards, EPA typically uses a target hazard index (HI) of unity (one). Where HIs exceed this target, remediation and/or mitigation may be indicated. However, no bright line is established at an HI of one, and risk management decisions are made on a site-by-site basis. Estimates of cancer risk and hazard indices are compared to the above targets as a means of providing perspective on levels of risk and hazard for the risk manager."

14. **Section 3.1, Introduction, 2nd paragraph, 1st sentence, page 21** - EPA believes the statement that ICMs to-date "have been shown to be effective at producing major reductions in the concentrations and/or mobility of chemicals in various media," is potentially misleading because there are at least eight Soil Impact Areas and/or SWMUs that have significant PCB contamination and could be continuing sources. Revise to reflect that, although ICMs may have been somewhat effective at reducing off-site releases of contaminants, additional remediation is required to address contamination at the Facility, including areas with ICMs.

    Section: These closures, corrective action systems and ICMs (collectively, completed corrective measures) were completed for individual SWMUs and for other locations at the Facility, and have been shown to be effective at producing major reductions in the concentrations and/or mobility of chemicals in various media.

Response: The following sentence has been added after the above sentence: "However, additional remediation is required at the Facility as described in this FS."

15. **Section 4.1, Media and Chemicals of Concern, page 37** - Identify why each chemical is listed. The HHRA identified 13 COCs. Three of the 13 have MCLs. There are an additional 4 contaminants detected in groundwater that have MCL violations at the site, including Benzo(a)pyrene, Beryllium, Lead, and Methylene Chloride. Identify why 1,1,2,2-Tetrachloroethane and Manganese are listed. Because the HHRA considered manganese at a concentration of 1300 ppm, which did not generate a high enough non-cancer risk to warrant concern for any future exposure scenario, it should be noted that in 1998 data at least three sampling locations (OW-10, OWR-11, and OWR-12) were found to have manganese concentrations ranging from 1500 ppm to 12,000 ppm, well above the concentration considered in the risk assessment. Is manganese retained for that reason? Identify that 4-Nitrophenol, o,o,o-Triethylphosphorothiote, and Tetraethyldithiopyrophosphate (Sulfotepp) are site-related groundwater contaminants that were not evaluated in the HHRA because toxicity data was not available, but that 4-Nitrophenol and Tetraethyldithiopyrophosphate (Sulfotepp) are being maintained based on goals calculated in the Addendum to Remedial Goals in Appendix A, and o,o,o-Triethylphosphorothiote is being maintained based on goals calculated by Solutia and with which EPA concurs. *See* Comment No. 24.

Response: The list of COCs included in Section 4.1 of the FS Report has been updated in accordance with the tables provided by the EPA. Additionally, the rationale for selecting each constituent as presented in these comments has been included in this section. The following language has been added to replace the second paragraph and sections that follow:

"Following completion of the RI and the HHRA, constituents detected in various media at the Facility were evaluated to determine the COCs for the Facility based on the results of the investigation and risk assessment. Since there are no promulgated soil standards, the soil COCs include only those constituents that were identified as risk drivers[1] in the HHRA. In groundwater, the COCs include those constituents that exceed a numerical standard (ARAR) or were risk drivers in the 2008 HHRA and/or the 2009 Addendum to the HHRA for exposures to groundwater. The following provides a list by media of the COCs with the reason that they are listed:

Surface Soil COCs based on potential site-specific risks as determined in the HHRA:

- *PCBs*
- *arsenic*
- *benzo(a)pyrene*
- *dibenzo(a,h)anthracene*
- *dioxin TEQs*

Subsurface Soil COCs based on potential site-specific risks as determined in the HHRA:

- *PCBs*
- *arsenic*
- *dioxin TEQs*

[1] Risk driving chemicals are those chemicals that (1) have individual excess lifetime cancer risk levels of 1E-10^{-06} (or greater) or an HQ of 0.1 (or greater) in an exposure scenario that exceeds an excess cancer risk level of 1E-10^{-04} or an HQ of 1; and/or (2) exceed a state or federal ARAR.

Groundwater COCs:

Constituent	***Basis for Inclusion as COC***
o,o,o-Triethylphosphorothioate	*Risk Driver in 2009 Addendum to HHRA*
1,1,2,2-Tetrachloroethane	*Exceedance of RSLs*
1,2,4-Trichlorobenzene	*Exceedance of MCL*
2,4,6-Trichlorophenol	*Risk Driver in 2008 HHRA*
PNP	*Risk Driver in 2009 Addendum to HHRA*
Benzo(a) pyrene	*Exceedance of MCL*
Beryllium	*Exceedance of MCL*
Cobalt	*Exceedance of RSLs*
Gamma-BHC	*Exceedance of MCL*
Indeno(1,2,3-cd)pyrene	*Risk Driver in 2008 HHRA*
Lead	*Exceedance of MCL*
Manganese	*Exceedance of RSLs*
Mercury	*Exceedance of MCL*
Methyl Parathion	*Risk Driver in 2008 HHRA*
Methylene Chloride	*Exceedance of MCL*
Parathion	*Risk Driver in 2008 HHRA*
PCBs	*Exceedance of MCL*
Pentachlorophenol	*Exceedance of MCL*
Tetraethyldithiopyrophosphate (Sulfotepp)	*Risk Driver in 2009 Addendum to HHRA*
Trichloroethylene	*Exceedance of MCL*

RSL – EPA Regional Screening Level

16. **Section 4.2, Evaluation of Soil Leaching to Groundwater, Lead, pages 38 to 41** - Include a map showing both soil sample locations and groundwater sample locations referenced in the discussion. Discuss soil screening numbers protective of groundwater. Only one soil sample has a lead concentration that exceeds 400 ppm (SSRI-11).

Response: The requested figure showing both soil and groundwater data for lead is included as Figure 4-1. The SSL for lead as presented in the RI Report is 14 mg/kg. The soil sample collected at SSRI-11 contained elevated levels of lead in excess of the SSL and the residential exposure criteria (400 ppm); however, as reported in the RI Report, the nearest monitoring wells (OW-10 and OW-6D) showed no detections of lead above the MCL. As indicated in Section 4.2.1, there is no discernible pattern or correlation of lead concentrations between soil and groundwater at many locations across the Facility. This is supportive of the following conclusion presented in this section of the FS, "Although the potential for leaching of lead from soil to groundwater exists, the existing soil and groundwater data for lead do not show a clear correlation indicative of an elevated risk. Based on this analysis of the detections of lead in groundwater and soil, additional action to prevent further leaching of lead is not warranted." Figure 4-1 and a reference to this figure have been included in this section.

17. **Section 4.2, Evaluation of Soil Leaching to Groundwater, Manganese, pages 41 to 43** - Include a map showing both soil sample locations and groundwater sample locations referenced in the discussion.

    Response: The requested figure showing both soil and groundwater data for manganese is included as Figure 4-2. A reference to this figure has been included in this section.

18. **Section 4.2, Evaluation of Soil Leaching to Groundwater, Mercury, pages 44 to 46** - Include a map showing both soil sample locations and groundwater sample locations referenced in the discussion. In the group one data evaluation, MW-15 data does not really support the conclusion, and for MW-16, the conclusion should be revised to reflect that continued leaching to groundwater is not currently occurring at high enough levels to cause exceedances of the MCL," which is different than the current statement. In addition, soil mercury concentrations at SSR-10 and SSR-17 may be below soil concentrations considered protective of groundwater. In the group two data evaluation, soil mercury concentrations at SSR-12 and SSR-13 may be below soil concentrations considered protective of groundwater. This statement does not hold for SSR-18, but that soil may have been removed, backfilled, and covered with concrete. Confirmation soil samples should be collected during remedial design at SWMU 44.

    Response: The requested figure showing both soil and groundwater data for mercury is included as Figure 4-3. Although the most recent sampling results for MW-15 were 2.0 µg/L for the unfiltered sample and non detect for the filtered sample, P/S have revised this section to include MW-15 in well group 2 (wells with recent detections only slightly above the MCL). The conclusion for well MW-16 (Group 1) has been revised to read as follows: "This provides strong support that continued leaching to groundwater is not currently occurring at high enough levels to cause exceedances of the MCL." P/S acknowledge EPA's statement that mercury concentrations observed in soil at SSR-10 and SSR-17 "may be below" soil concentrations considered protective of groundwater, and are in fact an order of magnitude below the SSLs. Therefore, groundwater impacts would not be expected at these locations.

    With regards to the area near SSR-18, soil from this area has been excavated, backfilled and covered with concrete (i.e., eliminating infiltration) thus reducing the potential for soil leaching to groundwater. P/S will conduct confirmation sampling as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. P/S acknowledge EPA's statement that mercury concentrations observed at SSR-12 and SSR-13 "may be below" soil concentrations considered protective of groundwater and are in fact an order of magnitude below the SSLs. Therefore, groundwater impacts would not be expected at these locations.

    Figure 4-3 and a reference to this figure have been included in this section.

19. **Section 4.2, Evaluation of Soil Leaching to Groundwater, PCBs, page 46 to 50** - Include a map showing both soil sample locations and groundwater sample locations referenced in the discussion. Include a graph (e.g., showing concentrations vs. time for OW-21/21A, OW-22, and OW-24) of the data being discussed so that the reader can evaluate conclusions without having to plot the data. Soil concentrations under permeable caps such as capped drainage features and gravel or soil covered areas should be considered when evaluating if additional areas should be addressed for leaching to groundwater.

    Section: Section reference has not been included due to the length of this section.

    Response: The requested figure showing both soil and groundwater data for PCBs is included as Figure 4-4. As requested, a graph showing total PCB concentration (log) vs. time

has been prepared for OW-21/21A, OW-22, and OW-24 (Figure 4-5). In order to support other conclusions in this section, data from wells OW-08/08A, OW-15, and OW-16/16A have been included on this figure. All soil sample locations with elevated PCB concentrations identified in Section 4.2.4 as having the potential to leach to groundwater have been addressed in Section 5.3.1 (Identification of Soil Impact Areas).

Figures 4-4 and 4-5, and references to respective figures have been included in this section.

20. **Section 4.3, Identification of Potential ARARs and TBCs Requirements, pages 51 to 55** - Include the following new Section 4.3, except where noted. Because there are no Location-Specific ARARs for the Facility, delete Table 4-7.

4.3.1 Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate *(i.e.,* ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver. *See* also 40 C.F.R. § 300.430(f)(1)(ii)(B). ARARs include only federal and state environmental or facility siting laws/regulations and do not include occupational safety or worker protection requirements. Compliance with OSHA standards is required by 40 C.F.R. § 300.150 and therefore the CERCLA requirement for compliance with or wavier (sic) of ARARs does not apply to OSHA standards.

Under CERCLA Section 121(e)(1), federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely on-site as defined in 40 C.F.R. § 300.5. *See also* 40 C.F.R. §§ *300.400(e)(1)* & (2). Also, CERCLA actions must only comply with the "substantive requirements," not the administrative requirements of a regulation. Administrative requirements include permit applications, reporting, record keeping, and consultation with administrative bodies. Although consultation with state and federal agencies responsible for issuing permits is not required, it is recommended for determining compliance with certain requirements, such as those typically identified as Location-Specific ARARs.

Applicable requirements, as defined in 40 C.F.R. § 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be applicable. *Relevant and appropriate requirements,* as defined in 40 C.F.R. § 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Per 40 C.F.R. § 300.400(g)(5), only those state standards which are promulgated, are identified in a timely manner, and are more stringent than federal requirements may be applicable or relevant and appropriate. For the purposes of identification and notification of promulgated state standards, the term "promulgated" means that the standards are of general applicability and are legally enforceable. State ARARs are considered more stringent where

there is no corresponding federal ARAR, where the State ARAR provides a more stringent concentration of a contaminant, or the where a State ARAR is broader in scope than a federal requirement.

In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to-be-considered" (TBC) category consists of advisories, criteria, or guidance that were developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies. *See* 40 C.F.R. § 300.400(g)(3). TBCs can be used in the absence of ARARs, when ARARs are insufficient to develop cleanup goals, or when multiple contaminants may be posing a cumulative risk. *See* EPA, OSWER Directive No. 9234.0-05, *Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements* (July 9, 1987).

In accordance with 40 C.F.R. § 300.400(g), EPA and ADEM have identified the potential ARARs and TBCs for the evaluated alternatives. Tables 4-5 and 4-6 list respectively the Chemical-and Action-Specific *ARARs/TBCs* for remedial actions in the evaluated alternatives.

4.3.2 ARAR Categories

For purposes of ease of identification, the EPA has created three categories of ARARs: Chemical-, Location-and Action-Specific. Under 40 C.F.R. § 300.400(g)(5), the lead and support agencies shall identify their specific ARARs for a particular site and notify each other in a timely manner as described in 40 C.F .R. § 300.515(d). Chemical-and Location-Specific ARARs should be identified as early as the scoping phase of the Remedial Investigation, while Action-Specific ARARs are identified as part of the Feasibility Study for each remedial alternative. *See* 40 C.F.R. §§ 300.430(b)(9) & 300.430(d)(3).

4.3.2.1 Action-Specific ARARs/TBC Guidance

Action-Specific ARARs are usually technology-based or activity-based requirements or limitations that control actions taken at hazardous waste sites. Action-Specific requirements often include performance, design and controls, or restrictions on particular kinds of activities related to management of hazardous substances. Action-Specific ARARs are triggered by the types of remedial activities and types of wastes that are generated, stored, treated, disposed, emitted, discharged, or otherwise managed. Potential Action-Specific ARARs include TSCA standards for PCB waste at 40 C.F.R. § 761 et. seq. and in particular those at § 761.61 for the cleanup, capping, storing, and disposing of PCB remediation waste. As indicated in the preamble to the PCB Disposal Amendments Final Rule, EPA expects that CERCLA cleanups would comply with the substantive requirements of one (or all), of three options (self-implementing, performance-based, and risk-based) provided in § 761.61 upon completion of the cleanups. *See* 63 Fed. Reg. 35,384, 35,407 (June 29, 1998).

Table 4-6 lists potential Action-Specific ARARs for OU-3 remedial action alternatives.

4.3.2.2 Chemical-Specific ARARs/TBC Guidance

Chemical-Specific ARARs are usually health-or risk-based numerical values limiting the amount or concentration of a chemical that may be found in, or discharged to, the environment. The Safe Drinking Water Act (SDWA) MCLs at 40 C.F.R. Part 141 and the state or federal ambient water quality criteria established under Section 303 or 304 of the Clean Water Act are examples of Chemical-Specific ARARs that are used to establish remediation levels for restoration of groundwater and surface water that are current or potential sources of drinking water. *See* 40 C.F.R. §§ 300.430(e)(2)(i)(B), (C), & (E).

Table 4-5 lists Chemical-Specific *ARARs/TBCs* for the Facility, which include SDWA MCLs for some of the groundwater COCs at the Facility. In the absence of an MCL or other Chemical-Specific ARARs, site-specific risk-based remedial goals were developed for the groundwater COCs 2,4,6-trichlorophenol, indeno(1,2,3-cd)pyrene, methyl parathion, parathion, o,o,o-Triethylphosphorothioate, Tetraethyldithiopyrophosphate, and 4-Nitrophenol, and for soil COCs PCB and arsenic remedial goals. *See* Section 4.4.

4.3.2.3 Location-Specific ARARs/TBC Guidance

Location-Specific requirements establish restrictions on permissible concentrations of hazardous substances or establish requirements for how activities will be conducted because they are in special locations (e.g., wetlands, floodplains, critical habitats, streams). There are no Location-Specific *ARARs/TBC* guidance for the evaluated Facility remedial alternatives.

4.3.2.4 ARARs Applicable to Off-Site Activities

Any remediation wastes that are generated and subsequently transferred off-site or transported in commerce along public right-of-ways must meet any applicable requirements such as those for packaging, labeling, marking, manifesting, and placarding requirements for hazardous materials. In addition, CERCLA Section 121(d)(3) provides that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, or disposal facility that is in compliance with applicable federal and state laws and has been approved by EPA for acceptance of CERCLA waste. *See* also 40 C.F.R. § 300.440 (so called "Off-Site Rule").

4.3.3 Evaluation and Waiver of ARARs

All of the remedial alternatives are evaluated in this FS to determine whether they comply with identified Chemical-and Action-Specific ARARs. As stated above, compliance with ARARs is a threshold requirement of CERCLA that every remedy must meet, unless an ARAR waiver can be used. *See* 40 C.F.R. § 300.430(f)(1)(A). Under CERCLA Section 121(d)(4), a remedial action that does not attain an ARAR may be selected if EPA finds that one of the six waivers is justified. "

[Retain Second and Third full paragraphs as written]

Response: Section 4.3 of the FS and associated tables (Tables 4-5 and 4-6) have been modified to reflect the above. As requested, Table 4-7 has been removed.

21. **Section 4.4, Remedial Goals, 1st paragraph, 4th sentence, page 56** - The FS states, "[Remedial goals] are not enforceable as cleanup standards and generally [are] not used in this capacity." This sentence is incorrect, and should be deleted. Revise this sentence to state: "Final remediation goals will be determined when a remedy is selected by EPA in a signed ROD. The remediation goals will establish acceptable contaminant concentrations and exposure levels that are protective of human health and the environment." *See* 40 C.F.R. § 300.430(e)(2)(i).

    Response: The referenced sentence will be replaced with, "Final remedial goals will be determined when a remedy is selected by EPA in a signed Record of Decision (ROD). The remedial goals will establish acceptable contaminant concentrations and exposure levels that are protective of human health and the environment."

22. **Section 4.4.1, RGs for Soil Table 4-8, page 56** - Indicate with a footnote to the table whether the concentrations for surface and subsurface soil are based upon a particular risk

range *(e.g.,* 10^{-6}) or hazard index (HI) and whether it is the most stringent level for the reasonable maximum exposure scenario considered during the baseline risk assessment. EPA's *Superfund PCB Guidance* suggests EPA uses remedial goals for PCBs between 10 and 25 ppm for the cleanup of soils at industrial sites. EPA considered the proposed PCB goal in soil of 25 ppm appropriate because it is generally consistent with the remedial goal options developed as part of the human health risk assessment and with goals selected nationally at other PCB-impacted sites. Revise the surface soil remedial goal for PCBs accordingly.

Response: The remedial goal for surface soil PCBs has been revised to 25 mg/kg as requested by the EPA. Footnotes have been added to Table 4-8 (now Table 4-7) indicating whether the concentrations for surface and subsurface soil are based upon a particular risk range or hazard index (as indicated in the table below) and whether it is the most stringent level for the reasonable maximum exposure scenario.

The first paragraph of Section 4.4.1 and Table 4-8 (now Table 4-7) have been replaced with the following:

"Remedial Goals for soil COCs were developed based on the HHRA. In particular, on behalf of the EPA, CDM developed Remedial Goal Options (RGOs) for all receptors/scenarios evaluated in the risk assessment. These RGOs were developed using a method which takes a ratio of the target risks and the calculated risk. This ratio provides the multiplier for the exposure point concentration and the product is the RGO. RGOs were presented separately for cancer and non-cancer effects at corresponding risk levels (cancer risks of 1.0E-04, 1.0E-05, and 1.0E-06 and hazard quotients of 0.1, 1, and 3.) The calculations prepared by CDM including the RGOs addendum are presented in Appendix B. Based on these calculations, Remedial Goals for Soil COCs were selected by the EPA and presented to P/S in response to the RAO Memorandum. The Remedial Goals for PCBs and arsenic in surface soil were updated by EPA in response to its review of the Draft FS Report (Golder, 2008f). The Remedial Goals for PCBs in surface soil and arsenic in subsurface soil were updated again by the EPA in response to its review of the Final FS Report (Golder, 2009). The updated numbers are incorporated into the table below. The following summarizes the Remedial Goals for Soil COCs.

TABLE 4-7
Soil Remedial Goals

Constituent	***Surface Soil Remedial Goal (mg/kg)***	***Subsurface Soil Remedial Goal (mg/kg)***
PCBs	*25*	*45*
Arsenic	*66*	*217*
Benzo(a)pyrene	*None*	*N/A*
Dibenzo(a,h)anthracene	*None*	*N/A*
Dioxin TEQs	*None*	*None*

N/A = not applicable; i.e., not a COC for listed medium
None = exposure point concentration below acceptable risk level

Basis for Remedial Goals:
Surface PCBs RG = 25 mg/kg based on EPA's Superfund PCB Guidance

Subsurface PCBs RG = 45 mg/kg based on site specific risk for a future operations worker at an HQ=3

Surface Arsenic RG = 66 mg/kg based on site specific risk for a current operations worker of 10^{-5}

Subsurface Arsenic RG = 217 mg/kg based on site specific risk for construction worker at an HQ=1"

23. **Section 4.4.2 RGs for Groundwater Table 4-9 page 58** - Based on Table 4-10 of the FS, there were 10 contaminants in groundwater with concentrations that exceeded MCLs, including: 1,2,4-Trichlorobenzene; Methylene Chloride; Trichloroethylene; Beryllium; Lead; Mercury; Benzo(a) pyrene; Gamma-BHC; Total PCBs; and Pentachlorophenol. Although several were not identified in the HHRA, they should be identified as exceeding ARARs.

    Another 4 contaminants were identified as COCs based on the HHRA (2,4,6-Trichlorophenol, Indeno(1,2,3-cd)pyrene, Methyl Parathion, and Parathion). EPA has revised the HHRA toxicity information for 2,4,6-Trichlorophenol and provided that information to P/S.

    Additionally, three contaminants that are prevalent in groundwater at the facility but were not quantified in the initial HHRA (Tetraethyldithiopyrophosphate (Sulfotepp), 4-Nitrophenol, and o,o,o-Triethylphosphorothioate) have been evaluated. EPA has provided proposed goals to P/S.

    Three contaminants (1,1,2,2-Tetrachloroethane, cobalt, manganese) are detected in groundwater, but the concentrations used in the HHRA may not have been the highest concentration found at the site. When compared to RSLs, these contaminants warrant inclusion for at least monitoring in the FS.

    Therefore, the final list of groundwater COCs should include: 1,1,2,2-Tetrachloroethane; 1,2,4-Trichlorobenzene; Methylene Chloride; Trichloroethylene; Beryllium; Cobalt; Lead; Manganese; Mercury; 2,4,6-Trichlorophenol; 4-Nitrophenol; Indeno(1,2,3-cd)pyrene; o,o,o-Triethylphosphorothioate; Benzo(a) pyrene; Gamma-BHC; Methyl Parathion; Parathion; Total PCBs; Pentachlorophenol; Tetraethyldithiopyrophosphate (Sulfotepp).

    Response: Section 4.4.2 including Table 4-9 (now Table 4-8) will be replaced with the following:

    "Different methods were used to develop the Remedial Goals for Groundwater COCs depending on the chemical. MCLs were used as the Remedial Goals if they were available for specific COCs. For chemicals without MCLs that were identified as COCs based on the HHRA, the Remedial Goals were calculated based on data provided in the HHRA, similar to the method described above for soil COCs[2]. The Remedial Goals for manganese and cobalt were selected based on the information presented in the HHRA. For 1,1,2,2-Tetrachloroethane, the EPA Regional Screening Level (RSL) for Chemical Contaminants at Superfund Sites, RSL Table Update September 2008, was used as the Remedial Goal. Table 4-8 below provides a summary of the Remedial Goals for Groundwater COCs.

[2] These Remedial Goals are based on a back-calculation from the HHRA and were selected by the EPA. Supporting calculations were completed by CDM on behalf of the EPA and are presented in Appendix B.

TABLE 4-8
Groundwater Remedial Goals

Constituent	***Remedial Goal (µg/l)***	***Basis for RG***
o,o,o-Triethylphosphorothioate	*310*	*HHRA*[2]
1,1,2,2-Tetrachloroethane	*0.067*	*RSL*
1,2,4-Trichlorobenzene	*70*	*MCL*
2,4,6-Trichlorophenol	*13*	*HHRA*[1]
PNP	*125*	*HHRA*[1]
Benzo(a) pyrene	*0.2*	*MCL*
Beryllium	*4*	*MCL*
Cobalt	*62*	*HHRA*
Gamma-BHC	*0.2*	*MCL*
Indeno(1,2,3-cd)pyrene	*0.02*	*HHRA*
Lead	*15*	*MCL*
Manganese	*1300*	*HHRA*
Mercury	*2*	*MCL*
Methyl Parathion	*4*	*HHRA*
Methylene Chloride	*5*	*MCL*
Parathion	*85*	*HHRA*
PCBs	*0.5*	*MCL*
Pentachlorophenol	*1*	*MCL*
Tetraethyldithiopyrophosphate (Sulfotepp)	*7*	*HHRA*[1]
Trichloroethylene	*5*	*MCL*

[1] Based on the September 3, 2009 "Addendum to RGOs for Anniston PCB Site, OU3." [2] Based on the Technical Support Section September 25, 2009 "Memorandum: Review of the Proposed Remedial Level for Triethylphosporothioate."

24. **Section 5.3, Remedial Technologies for Soil, Table 5-2** - As indicated in the table, a subsurface sample is not available in Soil Impact Areas B and should be collected during remedial design for confirmation purposes. There should be a table that identifies the estimated area and volume of impacted soil for each area used in cost calculations to protect human health and groundwater.

    Section: Section reference has not been included due to the length of this section.

    Response: As indicated on Figures 7-1, 7-6 and 7-8, the depth of impacts has been estimated and presented for each remediation area, and the corresponding volumes have been calculated and reported on the appropriate cost tables for each remedial alternative.

Additionally, Table 5-2B has been added to include the estimated area and volume of impacted soil for each area used in the cost calculations. With regards to Area B, in 2002 soil was excavated from the area and the area was capped with a concrete cover. P/S believe that it would be most appropriate to address the area by containing any residual material to prevent access that would result in exposures exceeding protective levels (as has been done). This is consistent with PCB guidance documents. However, EPA and P/S have agreed that a confirmation sample will be collected at SSR-18 as part of the Pre-Remedial Design Investigation.

25. **Section 5.3.2, Identification of Soil Remediation Areas, Surface Soil Impacts, page 66** - The RI states that Areas F, G, and H exhibited surface soil PCB contamination levels of 37.6, 38.6, and 38.4 ppm, respectively. These levels exceed the risk-based soil surface remedial goal of 25 ppm. Explain why General Remedial Actions (GRAs) are not required for soil impact Areas F, G, and H. Are actions in any of these areas required?

    Section: Section reference has not been included due to the length of this section.

    Response: GRAs are not required at areas F, G, and/or H. As described in this section, once Areas A, C, D, and E are addressed and their relevant exposure pathways are eliminated, the resulting exposure point concentrations for surface soil at the Site would reduce to 24 mg/kg for PCBs and 7.6 mg/kg for arsenic. Both of these values are below the revised Remedial Goals proposed by the EPA in these comments. No modification has been made to this section.

26. **Section 5.3.2, Identification of Soil Remediation Areas, Surface soil Impacts and Leaching to Groundwater, pages 66 to 67** - Considering the high concentration found in a soil sample collected 3 to 6 inches below the gravel surface in the Waste Drum Satellite Accumulation Area (estimated at 16,620 ppm PCB), additional sampling will be warranted during remedial design to confirm that concentrations in Area B do not leach to groundwater or exceed principle threat waste concentrations.

    Section: Section reference has not been included due to the length of this section.

    Response: Refer to response to comment No. 24. EPA and P/S have agreed that a confirmation sample will be collected as part of the Pre-Remedial Design Investigation.

27. **Section 5.3.3.2, Institutional Controls and Engineering Controls, 1st paragraph, page 68** - Revise the first paragraph to read as follows:

    The term "Institutional Controls" (ICs) generally refers to non-engineering measures intended to affect human activities to prevent or reduce exposure to COCs, often by limiting land or resource use. ICs are also sometimes referred to as Land Use Controls (LUCs), although LUCs can also include engineering controls such as fences and warning signs. The LUC or IC component of the remedial alternatives will include the existing deed notice recorded with the Calhoun County Office of Judge of Probate in Deed Book 3027, page 150 (October 21,2002). The deed notice contains: (1) a restriction for use of land for industrial purposes only; and (2) a restriction on groundwater use so that it shall not be used or consumed for potable, industrial, agricultural, or other supply purposes. Although this deed notice is not an enforceable instrument, it serves to provide notice as to the hazardous substances present at the Facility and appropriate uses of land and groundwater.

    In addition, an environmental covenant drafted and recorded in accordance with ADEM Admin. Code r. 335-5 et seq. may be another IC utilized as part of the remedy. A properly drafted and recorded environmental covenant which provides the land/groundwater use

restrictions runs with the land and allows a "holder" (or grantee), including ADEM, to enforce violation of the covenant terms. Pursuant to ADEM Admin. Code r. 335-5, such an environmental covenant must include: (1) a statement that the instrument is an environmental covenant executed pursuant to the Alabama Uniform Environmental Covenants Act; (2) a legally sufficient description of the real property that is subject to the covenant; (3) a description of the activity and use limitations on the real property; (4) identification of every holder; (5) the signatures of the ADEM Director, every holder of the covenant, and every owner of the real property subject to the covenant; and (6) the name and location of any administrative record for the remedial action reflected in the covenant. A notice of the environmental covenant must be recorded with the Calhoun County Office of Judge of Probate Recording Division. The covenant remains perpetual unless terminated or modified as described in ADEM Admin. Code r. 335-5-4-.01.

Other ICs contemplated as part of the remedy could include governmental controls, such as zoning ordinances or overlay districts, and regulatory controls, such as well drilling regulations.

[Retain the second paragraph, beginning "Engineering controls in the form of fencing ..." as written, but subject to Comment No. 29 below].

Response: The proposed changes have been included in this section.

28. **Section 5.3.3.2, Institutional Controls and Engineering Controls, 2nd paragraph, page 68** - Add language that: "A deed restriction/notice is also required where PCBs are left in-place in soil at levels that require either a cap or fencing.

Section: Section reference has not been included due to the length of this section.

Response: The language included for Comment Response No. 27 addresses the use of a deed restriction/notice for the Site.

29. **Section 5.3.3.4, Excavation/Disposal or Ex-Situ Treatment, page 70** - Areas containing "principal threat" waste *(i.e.,* containing PCBs greater than 500 ppm in industrial areas) should generally be excavated, treated, and disposed in accordance with EPA's *Superfund PCB Guidance. See also* 40 C.F.R. § 300.430(a)(1)(iii)(A). The TSCA requirements for treatment and disposal of bulk PCB remediation such as provided in 40 C.F.R. § 761.61(a)(5)(i) and the performance based disposal options provided in 40 C.F.R. § 761.61(b) are considered Action-Specific ARARs and should be referenced in this Subsection.

Section: Section reference has not been included due to the length of this section.

Response: The following has been added after the first sentence of the first paragraph in this section: "Areas containing 'principal threat' waste (i.e., containing PCBs greater than 500 ppm in industrial areas) should generally be excavated, treated, and disposed in accordance with EPA's Superfund PCB Guidance and 40 CFR 300.430(a)(1)(iii)(A)." Additionally, the following text has been added after the third sentence of the first paragraph in this section: "Additionally, for PCBs, the TSCA requirements for treatment and disposal of bulk PCB remediation [40 CFR 761.61(a)(5)(i)] and the performance based disposal options provided in 40 CFR 761.61(b) are considered Action-Specific ARARs for off-site disposal of PCBs."

30. **Section 5.4.2.4, Groundwater Extraction/Ex-Situ Treatment/Discharge, 1st bullet, page 77** - Revise this bullet to reflect that while the RCRA Post-Closure Permit does not name the SWMU-1 Corrective Action System specifically, it does indicate that monitoring of the corrective action systems be conducted as indicated in the permit application sections E.4 and

E.6. The intent is to accurately reflect what is in the RCRA permit.

Section: The SWMU 1 Corrective Action System intercepts and recovers groundwater from the closed South Landfill and the plant site. Interceptor wells IW-1 through IW-15 were installed prior to 1988. Interceptor wells IW-1, IW-3, IW-4, and IW-15 were deactivated in 1998 pursuant to the Facility's RCRA Permit, but the wells are still maintained. The total groundwater extraction for the period of July 2005 to July 2007 averaged 127,000 gallons per year (approximately 0.24 gpm). Groundwater from each of the recovery wells, except IW-10, is pumped to an equalization basin and then discharged to the Anniston POTW. Groundwater from IW-10 is passed through a carbon filtration system before being discharged to the equalization basin. As reported in the RI Report, the SWMU I system has been effective at recovering groundwater impacted with COCs.

Response: This is now Section 5.4.2.5. The following has been added after the first sentence: "While the RCRA Post-Closure Permit does not name the SWMU-1 Corrective Action System specifically, it is included in monitoring and financial assurance requirements stipulated in the Permit." In the permit, general monitoring requirements (III B.(1) (a)) require maintenance of all wells listed in Table III.1, which includes all of the wells of the SWMU-1 Corrective Action System. The permit requires cost estimates (I.G) and financial assurance (I.H), both of which include the cost for operation, maintenance, and monitoring of the SWMU-1 Corrective Action System. Consequently, the SWMU-1 Corrective Action System is regulated under the RCRA Post-Closure Permit.

31. **Section 6.4.2.1, Description of Alternative, page 94** - Clarify whether the expanded extraction wells are treating all COCs, including PCBs in groundwater.

Section: Alternative 2GW includes the continued operation and expansion of the existing Groundwater Corrective Action System to provide further containment and ex-situ treatment of groundwater. The existing Groundwater Corrective Action System would be operated, and additional extraction wells would be installed to provide hydraulic capture of areas denoted on Figure 5-1, where COCs are migrating from the Facility. The current deed restrictions limiting groundwater use would remain in place and an environmental covenant would be added to further protect against the potential future use of groundwater beneath the Site. The existing long-term O&M program would be expanded to include inspection and maintenance of the newly installed extraction wells.

Response: The first sentence has been modified to read as follows. "Alternative 2GW includes the continued operation and expansion of the existing Groundwater Corrective Action System to provide further containment and ex-situ treatment of all COCs in groundwater."

32. **Section 8.1.4, Long-term Effectiveness and Permanence, page 135** - Capping or covering a PCB-contaminated area should be described as having the lowest long-term effectiveness and permanence. EPA is not arguing that capping is sometimes appropriate. The analysis should appear to be objective on this issue. EPA notes that, pursuant to EPA's Superfund PCB Guidance, "[g]enerally, alternatives relying solely on caps to provide protection have the lowest long-term effectiveness and permanence." Superfund PCB Guidance at p. 61.

Section: The long-term effectiveness and permanence of Alternatives S-B and S-C are expected to be higher than Alternatives S-D and S-E, which have effectiveness and implementability concerns that could potentially reduce their long-term effectiveness and permanence. Alternatives S-B and S-C include highly effective and proven remedial components (excavation with off-Site disposal and containment, respectively).

Response: This section will be revised as follows. "The long-term effectiveness and permanence of Alternative S-B is expected to be higher than Alternatives S-D and S-E, which are slightly higher than Alternative S-C. S-D and S-E are ranked slightly higher than S-C due to the residuals remaining on site with capping. Alternative S-B includes effective and proven remedial components (excavation with off-Site disposal)."

33. **Section 8.1.5, Reduction of Toxicity, Mobility, and Volume Through Treatment, page 135** - Covering the PCB-contaminated soil does not reduce toxicity, mobility, or volume through treatment and should not be described as doing so under this criterion. The operative word in the statement is "treatment." Containment is not "treatment." According to EPA's Superfund PCB Guidance, "Alternatives that do not involve treatment achieve no reduction of toxicity, mobility, or volume through treatment and should not be described as doing so under this criterion." *Superfund Guidance at p. 61* Therefore, placing a cap over contaminated soil does not reduce mobility of PCBs through **treatment.**

Section: The reduction of toxicity, mobility, and volume through treatment is highest for alternatives that treat impacted soil. Alternatives S-D and S-E treat impacted soil via chemical dehalogenation and thermal desorption, respectively. Pilot studies for both of these technologies have shown reductions in the concentration of PCBs in treated soil. Both of these processes, however, produce a significant amount of residual products that require treatment or off-Site disposal. In addition, reuse of the treated soil on the Site is not always appropriate due to the change in physical characteristics of the materials. In addition, both alternatives have the potential for producing off-gases that may require treatment. Due to the effectiveness and implementability concerns with these alternatives, they are not considered to be ranked significantly higher for reducing the toxicity, mobility, and volume of impacted soil than those alternatives which have either a containment or excavation with off-Site component for impacted soils.

Response: This section will be revised as follows. "… Both of these processes, however, produce a significant amount of residual products that require treatment or off-Site disposal. In addition, reuse of the treated soil on the Site is not always appropriate due to the change in physical characteristics of the materials. Alternatives S-D and S-E are ranked higher for reducing the toxicity, mobility, and volume of impacted soil through treatment than those alternatives which have either a containment or excavation with off-Site disposal component for impacted soils."

EXECUTIVE SUMMARY

On behalf of Solutia Inc. (Solutia) and Pharmacia Corporation (collectively, P/S), Golder Associates Inc. (Golder) has prepared this Final Feasibility Study (FS) Report for Operable Unit 3 (OU-3) of the Anniston Polychlorinated Biphenyl (PCB) Site (Site) in accordance with Section IX.29.H.2 in Appendix A of the Remedial Investigation/Feasibility Study (RI/FS) Agreement as required under the Partial Consent Decree (PCD) (Docket No. CV-02-PT-0749-E) between the United States Environmental Protection Agency (EPA) and P/S. The United States District Court for the Northern District of Alabama entered the PCD on August 4, 2003. In this report, the term Site includes only the OU-3 area, which may also be referred to as the "plant site", "on-Site", "OU-3", "the Facility", or "plant site and landfills."

The PCD requires performance of a RI/FS at the Anniston PCB Site. The requirements for the RI/FS are identified in Appendix A of the PCD, RI/FS Agreement, and further defined in Appendix B of the PCD, Statement of Work (SOW). The SOW provides a description of the tasks to be performed for the completion of the RI/FS. The tasks include: scoping, community relations, site characterization, treatability studies, baseline risk assessment, development and screening of remedial alternatives, and detailed analysis of remedial alternatives. The requirements for the development and screening of remedial alternatives and the detailed analysis of remedial alternatives include the preparation of a FS Report, which was submitted to the EPA on May 7, 2009 (Golder, 2009a). This revised Final FS Report, Revision 1.0, is being submitted to address the EPA's comments on the last version of the report.

Three Technical Memoranda, a Draft FS Report, and a Final FS Report associated with the FS for OU-3 have been submitted to the EPA. This FS Report documents all FS phases and has been prepared in accordance with regulations and guidance documents, including the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300, Subpart E), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (EPA, 1988). The Final FS Report, Revision 1.0, includes the information presented in the previously submitted three Technical Memoranda, the Draft FS Report and the Final FS Report, revised to incorporate comments received by the EPA.

Remedial Investigation and Conceptual Site Model

Extensive investigations of soil, surface water/sediment, ambient air, and groundwater have been conducted as part of the environmental programs at the Facility dating back over 30 years. These investigations have included the Resource Conservation and Recovery Act (RCRA) Permit Compliance Program, RCRA Facility Investigation and Confirmatory Sampling (RFI/CS) Program, the Supplemental RFI/CS Program, and the Remedial Investigation (RI).

Soil samples were collected within the area of the plant, the closed South Landfill, and the closed West End Landfill during the RFI/CS and RI Programs. The more prevalent constituents detected in soils at the Facility include PCBs, benzo(a)pyrene, arsenic, cobalt, lead, manganese, mercury, and nickel. Within the plant area, the majority of soil samples were taken in areas covered with gravel, asphalt pavement, or concrete pavement. These covers prevent direct contact and minimize or reduce the potential for erosion of underlying soils. These areas are maintained and inspected as part of the plant's ongoing operation and maintenance programs. One exception was the grassy area north of the Former Phosphoric Acid Basin where one sample (SSRI-11) indicated elevated levels of PCBs, arsenic and lead relative to the rest of the Facility. P/S implemented delineation sampling and a removal action to address "principal threat waste" material at SSRI-11. The material was delineated and subsequently removed and disposed at a TSCA-approved landfill. An additional area with elevated PCB concentrations above the "principal threat waste" threshold, observed near SSRI-18, was excavated previously as an interim corrective measure (ICM) and covered with a concrete cap. Confirmation sampling to identify residuals potentially remaining in this area will be conducted as part of the Pre-Remedial Design Investigation.

At the closed South and West End Landfills, surface soil samples were collected from the top cover material after implementing the cover system upgrades and analyzed for PCBs. The concentrations in samples from the closed South Landfill ranged from non detect to 10 milligrams per kilogram (mg/kg), and from the closed West End Landfill ranged from non detect to 21 mg/kg. Additional characterization data for the closed South and West End Landfills are included as Appendix A-1 in the RI Report.

In conjunction with the completion of the RI, additional investigation activities were conducted at the South Landfill and the West End Landfill in accordance with a meeting held on March 26, 2010

between the EPA and P/S (Golder, 2010c). In this meeting, the EPA indicated that insufficient information was available for portions of the South Landfill (Cells 1E, 2E, and 3E) and the adjacent areas of the West End Landfill (previous characterization area AA2) in order to determine whether the cover systems are protective. The scope of work for the South Landfill focused on collecting data necessary to evaluate the performance of the existing cap/cover overlying the "PCB Cells" (Cells 1E, 2E, and 3E) including: 1) conducting a cap/cover thickness survey; 2) determining the permeability of the cap/cover soil materials; 3) analyzing a suspected surface water "seep" that had been previously observed in the vicinity of the cells (analyzed for constituents of interest at the Site); and 4) collecting and analyzing a groundwater sample from well OWR-5D, which is located downgradient of the South Landfill (analyzed for PCBs). At the West End Landfill, P/S performed confirmation soil sampling in the vicinity of the historic composite sample AA2 (Adjacent Area 2). AA2 was collected prior to excavating and relocating PCB-containing soil from the area and capping the area with a soil cap, which was completed in 1996. The result from the original "8-point" composite sample (AA2) collected in this area was 1,940 mg/kg.

Findings of the investigation activities conducted at the South Landfill show that the cap/cover material overlying Cells 1E, 2E, and 3E was generally 24 inches thick or greater, and the cover soils consisted of low plasticity silt and clay with a mean permeability of 4.14×10^{-6} centimeters per second (cm/sec). However, some gravel-sized material was encountered intermixed with the soil matrix that prevented a direct measurement of the cover thickness at some locations. Analytical results of the groundwater samples collected at OWR-5D indicated total PCB concentrations for unfiltered samples that ranged from 447 J (estimated value) micrograms per liter (µg/l) to 596 J µg/l, and PCB concentrations for filtered samples that ranged from non detect to 2.62 UJ (estimated non detect value) µg/l. Results for the seep samples were non detect for volatile organic compounds and pesticides but showed low level detections of 1,4-dichlorobenzene and PCBs in the unfiltered sample. Low level detections of barium and manganese were also noted.

PCB results for samples collected from the West End Landfill (original and duplicate sample) ranged from 14.86 J mg/kg to 89.8 J mg/kg depending upon the method used to analyze the samples. These results confirm that the high level PCB concentrations originally detected in soil at this location were removed prior to placing the soil cap/cover at the West End Landfill Adjacent Area 2.

The hydrogeology at the Facility has been well studied, and extensive investigations have been performed. An evaluation of existing data at the Facility indicates that the most prevalent constituents detected in groundwater are PCBs, parathion, para-nitrophenol (PNP), 1,2-dichlorobenzene, 1,4-dichlorobenzene, chlorobenzene, pentachlorophenol, o,o,o-triethylphosphorothioate, cobalt, mercury, and manganese. Local areas of groundwater impact exist within the Facility and are either currently controlled by the existing groundwater capture system or are being addressed through the FS process. At most impacted locations, downgradient wells exist that demonstrate that contaminants are not migrating from the Facility. At the locations where contaminants have been confirmed at the downgradient boundary, groundwater capture systems have been installed with the exception of the OW-21A area and near OW-10.

The fate and transport characteristics of the prevalent constituents were reviewed, and potential migration routes were considered. Most areas of impacted soil are under cover systems reducing the likelihood of potential releases from soil to surface water. Groundwater impacts may occur locally due to leaching from impacted soil in areas with permeable cover systems. Four constituents (lead, manganese, mercury, and PCBs) have been retained for further consideration in the FS for potential leaching to groundwater. Surface water is controlled on the Site via a system of sewers and ditches. All process-related water is piped to the Facility's former waste water treatment facility (WWTF) and then discharged to the Anniston publicly-owned treatment works (POTW).

Much of the precipitation falling at the Facility is collected in ditches and discharged via a National Pollutant Discharge Elimination System (NPDES) regulated outfall. Constituent concentrations measured in the outfall have been sporadic and low. However, some areas of the Facility do not drain to the upgraded stormwater collection system. These areas are primarily in the northwest portion of the Facility and include the closed West End Landfill and adjacent areas. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater from these areas but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. If a containment remedy is selected for these areas, stormwater discharge monitoring may be necessary to verify that interim and final remedial measures under CERCLA are effective.

Groundwater migration is controlled by natural and man-made means. Migration is limited because the rate of groundwater flow is very low and there are natural attenuation processes for parathion and PNP and natural adsorption for PCBs and metals. These natural processes combined with the existing interceptor well systems control the migration of constituents from the Facility. In addition, perimeter monitoring has indicated that with only two potential exceptions (OW-21A and OW-10 areas), impacted groundwater is contained within the Facility boundary.

Summary of Existing Conditions

Investigations at OU-3 have extended over the last 30 years, and a multitude of interim and final corrective measures have already been completed. The Facility previously operated two hazardous waste management areas (WMA I and WMA II). These WMAs were closed in compliance with provisions contained in the Facility's RCRA Permit. Additionally, P/S has installed corrective action systems and completed numerous ICMs under the Facility's RCRA Permit or through actions taken to decommission discontinued operations. The goal of these ICMs is to control or abate threats to human health and the environment from releases at the Facility. These ICMs were completed as interim measures in order to expedite approval and construction under RCRA.

These closures, corrective action systems and ICMs (collectively, completed corrective measures) were completed for individual solid waste management units (SWMUs) and for other locations at the Facility, and have been shown to be effective at producing major reductions in the concentrations and/or mobility of chemicals in various media. However, additional remediation is required at the Facility as described in this FS. These previously completed corrective measures have included landfill capping, contaminated soil excavation, in-plant surface improvements (e.g., pavements), decommissioning of units and tank removals, and the installation and operation of groundwater corrective action systems. As a result of these measures, the majority of the plant surface area is covered with asphalt pavement, concrete pavement, buildings, soil and gravel covers, which limits access to underlying soil. The closed South Landfill and West End Landfill covers have eliminated direct contact with landfill contents and have prevented off-Site migration of contaminated soil from these locations.

The WMA closures and corrective action systems completed for OU-3 were approved by the Alabama Department of Environmental Management (ADEM) as part of the Facility's RCRA Permit.

Prior to falling under CERCLA jurisdiction, P/S were in the process of gaining approval from ADEM under RCRA for the extensive interim measures that had been completed at the Facility. However, before P/S could complete the approval process, the EPA assumed regulatory control of the Site from ADEM. At that time, the completed interim measures became the baseline for considering additional remediation requirements in the CERCLA process. The human health risk assessment (HHRA) and the Ecological Risk Assessment were completed using these existing conditions as the basis for the evaluations. For compliance with the Facility's RCRA Permit under the authority of ADEM, P/S must continue to operate and maintain existing corrective measures completed at the Facility including operation of the installed corrective action systems. Any remedial actions required under CERCLA will be in addition to the extensive work already completed under RCRA. Once finalized, it is anticipated that these completed corrective measures and CERCLA Remedial Actions will be accepted and approved under RCRA as part of the Facility's RCRA permit.

The cost to complete the RCRA closures, install the corrective action systems and complete the above listed ICMs was over $22,500,000 expressed in 2010 dollars. These costs represent a portion of the amount of capital improvements completed by P/S for OU-3 prior to initiating the CERCLA process with the EPA. This estimate is conservative since it does not include the ICMs completed prior to 1995. Since the completion of these corrective measures represents the beginning of the CERCLA process, these costs are not included in the detailed analysis of alternatives, but are presented to document the substantial remedial efforts that have been undertaken at the Facility to date. The cost of future obligations for operation and maintenance (O&M) activities associated with these completed measures is included in the detailed analysis of alternatives, with the exception of the no action alternative. Although some of these obligations are required under Solutia's RCRA Permit, P/S maintain that many of these elements have never been approved under RCRA as final corrective measures and that the future obligations to maintain these measures are not presently covered under the RCRA Permit. Therefore, P/S have included these items under CERCLA to have them approved with the final remedy selected for the Site.

Development of Remedial Action Objectives

Based on the RI, Site background and completed corrective measures, results of the HHRA, media and constituents of concern (COCs), evaluation of potential soil impacts to groundwater, potential

federal and state Applicable or Relevant and Appropriate Requirements (ARARs), and the Remedial Goals, the following Remedial Action Objectives (RAOs) have been established for OU-3.

RAOs for Soils

RAOs for soils (On-property commercial/industrial) include:

- Reduce or eliminate risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soil above the Remedial Goals;
- Reduce or eliminate risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil above the Remedial Goals. During soil disturbance activities, prevent ingestion or inhalation of soil particulates in air that contain COCs in soil in excess of the Remedial Goals;
- Prevent migration and leaching of contaminants in surface and subsurface soils to groundwater that could result in groundwater contamination in excess of maximum contaminant levels (MCLs) or health-based risk levels at the point of groundwater compliance;
- Permanently and/or significantly reduce the mobility, toxicity, and/or volume of characteristic hazardous waste with treatment;
- Prevent migration of contaminants in excess of the Remedial Goals in surface soil to surface water; and
- Control future releases of contaminants to ensure protection of human health and the environment.

RAOs for Groundwater

RAOs for groundwater include:

- Reduce or eliminate risks to receptors from direct contact with or ingestion of COCs in groundwater at concentrations above the Remedial Goals;
- Prevent the migration of pollutants beyond the existing limits of the known contaminant plume or established point of compliance;
- Control future releases of COCs in groundwater to ensure protection of human health and the environment; and
- Restore groundwater to meet cleanup goals such as MCLs throughout each plume, or at and beyond the edge of the waste management area(s).

P/S and the EPA believe that with the excavation and/or capping proposed in the identified source areas (in conjunction with an upgraded pump and treat system), groundwater quality will improve and that sampling data will be the subject of evaluation during the first Five Year Review period. Additionally, EPA and P/S have agreed that an expanded monitoring program, beyond that regulated by ADEM under the RCRA Post-Closure Permit, will be developed during or in advance of performance of a Pre-Remedial Design Investigation.

General Response Actions and Remedial Technologies

For the first step in the FS process, General Response Actions (GRAs) and remedial technologies for soil and groundwater at the Facility were developed and screened. The potential technologies were first screened based on technical implementability only. Surviving technologies were then screened based on effectiveness, implementability and cost. The technologies that are not feasible or have limitations that might prevent achievement of RAOs were eliminated in the screening process, with the remaining technologies considered to be better suited for further consideration in developing remedial alternatives. The retained technologies are summarized as follows:

Retained Soil Technologies

- No Action
- Institutional Controls/ Engineering Controls
- Containment - Capping
- Excavation with Off-Site Disposal
- Ex-situ Treatment using Chemical Dehalogenation
- Ex-situ Treatment using Thermal Desorption

Retained Groundwater Technologies

- No Action
- Institutional Controls/ Engineering Controls
- Monitored Natural Attenuation (MNA)
- Extraction and Discharge to POTW (i.e. Expansion of Existing System)
- In-situ Treatment Using Funnel and Gate System with Zero Valent Iron (ZVI)

Screening of Remedial Alternatives

The retained technologies were assembled into ten remedial action alternatives, five for soil and five for groundwater, to be considered for further evaluation. A No Action Alternative (Alternative 1 for each medium) was identified in accordance with the NCP. The alternatives selected are the following:

Remedial Alternatives for Soil:

- Alternative 1S is a no action alternative;
- Alternative 2S includes additional institutional and engineering controls, and excavation and off-Site disposal of impacted soil;
- Alternatives 3S includes additional institutional and engineering controls, and capping of impacted soil areas. For this alternative, two options are proposed. Option 1 includes constructing or supplementing caps over Areas A, C, D and E, while Option 2 includes addressing these four areas plus upgrading the cap over Cells 1E, 2E, and 3E at the South Landfill;
- Alternative 4S includes additional institutional and engineering controls, and ex-situ treatment of soil using chemical dehalogenation; and
- Alternative 5S includes additional institutional and engineering controls, and ex-situ treatment of soil using thermal desorption.

Remedial Alternatives for Groundwater:

- Alternative 1GW is a no action alternative;
- Alternative 2GW includes additional institutional controls and extraction of groundwater in areas outside the capture zone of the existing Groundwater Corrective Action System;
- Alternative 3GW includes additional institutional controls and MNA for groundwater;
- Alternative 4GW, a combination of Alternatives 2GW and 3GW, combines extraction of groundwater in areas outside the capture zone of the existing Groundwater Corrective Action System and MNA for groundwater; and
- Alternative 5GW includes additional institutional controls, with in-situ treatment of groundwater using a funnel and gate system with ZVI treatment.

A description and screening level evaluation of each alternative are presented in Tables E-1 and E-2. The screening level evaluation is based on the same NCP criteria used for screening the remedial technologies. Descriptive terms such as high, moderate, and low are used to evaluate the effectiveness, implementability, and cost.

Based on the evaluation of each alternative regarding effectiveness, implementability, and cost; all five of the soil alternatives evaluated were retained for further evaluation. These alternatives are summarized below:

Previous Alternative ID	Forward Alternative ID	Description of Alternative
1S	S-A	No Action
2S	S-B	Additional Institutional and Engineering Controls and Soil Excavation with off-Site Disposal
3S	S-C	Additional Institutional and Engineering Controls and Soil Containment (Capping)
4S	S-D	Additional Institutional and Engineering Controls and Soil Excavation with Treatment Using on-Site Chemical Dehalogenation
5S	S-E	Additional Institutional and Engineering Controls and Soil Excavation with on-Site Thermal Desorption

Based on the evaluation of each alternative regarding effectiveness, implementability, and cost; four groundwater alternatives were retained for further evaluation. Alternative 3GW (MNA) was eliminated from further consideration as a stand-alone alternative as it has been incorporated into Alternative 4GW. These alternatives are summarized below:

Previous Alternative ID	Forward Alternative ID	Description of Alternative
1GW	GW-A	No Action
2GW	GW-B	Additional Institutional Controls and Expanded Groundwater Extraction
4GW	GW-C	Additional Institutional Controls, Expanded Groundwater Extraction and MNA
5GW	GW-D	Additional Institutional Controls and Groundwater Treatment using Funnel and Gate ZVI Walls

Comparative Evaluation of Alternatives

Each retained alternative was compared to the NCP evaluation criteria. The nine evaluation criteria consisting of threshold criteria, primary balancing criteria, and modifying criteria are summarized as follow:

NCP Evaluation Criteria

Threshold Criteria	• Overall protection of human health and the environment • Compliance with ARARs
Primary Balancing Criteria	• Long term effectiveness and permanence • Reduction of toxicity, mobility, or volume • Short-term effectiveness • Implementability • Cost
Modifying Criteria	• State acceptance • Community acceptance

The comparative analysis of alternatives evaluates the relative performance of the various alternatives against each other in relation to the seven threshold and balancing NCP evaluation criteria. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another. A comparison of the alternatives for each criterion by media is provided below.

Soil Remedial Alternatives

Overall Protection of Human Health and the Environment

Under the current and future scenarios, all retained alternatives, except Alternative S-A, No Action, provide protection of human health and the environment. However, there are varying degrees to which the alternatives provide such protection. For soil, the combination of either excavation of soil or containment of soil and enhanced institutional and engineering controls, Alternatives S-B and S-C, respectively, are equally protective of human health and the environment. The degree of protection provided by Alternatives S-D and S-E are considered to be lower than Alternatives S-B and S-C due to the short-term impacts anticipated during treatment and long-term uncertainties regarding feasibility.

Compliance with ARARs

With the exception of Alternative S-A, No Action, all other alternatives are expected to achieve compliance with chemical-specific and action-specific ARARs. Alternatives S-D and S-E, which include treatment of soil via chemical dehalogenation and thermal desorption, respectively, will require extensive design, pilot studies, and air monitoring in order to achieve the action and chemical-specific ARARs associated with air emissions.

Short-term Effectiveness

Alternative S-A will result in the least short-term adverse impacts. Alternative S-C is anticipated to have a similar degree of minimal short-term impacts. Alternative S-B will have some additional short-term impacts due to the hauling activities associated with off-Site disposal of soil. Alternatives S-D and S-E are both anticipated to have a high potential for short-term impacts compared to the other alternatives due to the soil treatment components of these alternatives. Both of these alternatives require on-Site treatment of impacted soil using systems that will be in operation 24 hours a day throughout treatment. As a result, there is the continued potential for noise, light, and air emissions to the plant workers and surrounding communities. In addition, the fuel and power demands, staging areas, and health and safety requirements have the potential to cause disturbances to the existing plant operations. Particular attention would be required for air monitoring during treatment activities to provide protection for the construction worker, plant worker, and local community.

Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of Alternative S-B is expected to be higher than Alternatives S-D and S-E, which are slightly higher than Alternative S-C. S-D and S-E are ranked slightly higher than S-C due to the residuals remaining on site with capping. Alternative S-B includes effective and proven remedial components (excavation with off-Site disposal).

Reduction of Toxicity, Mobility, and Volume through Treatment

The reduction of toxicity, mobility, and volume through treatment is highest for alternatives that treat impacted soil. Alternatives S-D and S-E treat impacted soil via chemical dehalogenation and thermal desorption, respectively. Pilot studies for both of these technologies have shown reductions in the concentration of PCBs in treated soil. Both of these processes, however, produce a significant amount of residual products that require treatment or off-Site disposal. In addition, reuse of the

treated soil on the Site is not always appropriate due to the change in physical characteristics of the materials. Alternatives S-D and S-E are ranked higher for reducing the toxicity, mobility, and volume of impacted soil through treatment than those alternatives which have either a containment or excavation with off-Site disposal component for impacted soils.

Implementability

In general, all five alternatives are implementable but to differing degrees. Alternative S-A is the easiest to implement, followed by Alternatives S-C and then S-B. Alternatives S-D and S-E are equally difficult to implement.

Cost

The sequence of alternatives, in order of least to most costly, is as follows: Alternative S-A, Alternative S-C, Alternatives S-E and S-B, and Alternative S-D.

Summary

Table E-3 provides a summary of the relative rankings of the five retained soil remedial alternatives for each of the seven NCP criteria. Alternatives assigned a rank of "Most Favorable" were considered the most preferable in the associated category (i.e., least cost, most effective, most easily implemented, etc.). As shown on Table E-3, the soil remedial alternatives were ranked in the following order from most to least favorable: Alternative S-C, Alternative S-B, Alternative S-E, Alternative S-D, and Alternative S-A.

Groundwater Remedial Alternatives

Overall Protection of Human Health and the Environment

Under the current and future scenarios, all retained alternatives, except Alternative GW-A, No Action, provide protection of human health and the environment relating to groundwater. Alternative GW-B, expanded groundwater extraction, is protective of human health and the environment. However, Alternative GW-C offers an additional component of MNA, which allows for continuous monitoring of the long-term effectiveness of the groundwater component of this alternative and associated natural attenuation processes. This additional data collection would allow for adjustments in the system to enhance natural attenuation. The degree of protection provided by Alternative GW-D is considered to be lower than Alternatives GW-B and GW-C due to its potential to be less

effective at successfully treating groundwater; short-term impacts anticipated during treatment; and long-term uncertainties regarding feasibility.

Compliance with ARARs

With the exception of Alternative GW-A, No Action, all other alternatives are expected to achieve compliance with chemical-specific and action-specific ARARs. Alternatives GW-B, GW-C, and GW-D, include a monitoring component that can be used to demonstrate long-term compliance with groundwater ARARs. Additional MNA monitoring is included in Alternative GW-C, which would allow for adjustments to be made in the system that may accelerate the attainment of chemical-specific ARARs. Alternative GW-D, which includes treatment of groundwater through ZVI will require extensive design, pilot studies, and monitoring in order to achieve the chemical and action-specific ARARs.

Short-term Effectiveness

Alternative GW-A will not add additional short-term adverse impacts. Similarly, Alternatives GW-B and GW-C are anticipated to result in minimal, if any, short-term impacts. Alternative GW-D is anticipated to have a higher potential for short-term impacts compared to the other alternatives due to the installation of the ZVI system.

Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of Alternatives GW-B and GW-C is expected to be higher than Alternative GW-D, which has implementability concerns that could potentially reduce its long-term effectiveness and permanence. Alternatives GW-B and GW-C include a highly effective and proven remedial component (groundwater extraction). Alternative GW-C provides an additional degree of effectiveness, compared to Alternative GW-B, through the use of monitoring to continuously evaluate the long-term effectiveness of the remediation and associated natural attenuation processes.

Alternative GW-B and GW-C will likely be more effective and permanent than Alternative GW-D due to the potential difficulties associated with the installation and long-term performance of the ZVI.

Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives GW-B and GW-C will reduce the toxicity, mobility, and volume of groundwater impacts through extraction and on-Site treatment, followed by additional off-Site treatment at the POTW. Alternative GW-C provides an additional monitoring component, which will continuously evaluate the natural degradation of groundwater constituents. Alternative GW-D provides for in-situ treatment of groundwater, which is intended to reduce the toxicity of groundwater. However, due to the potential effectiveness concerns with this technology, this alternative is ranked lower than the others in regards to groundwater treatment.

Considering each alternative individually, Alternatives GW-B and GW-C are considered to offer the highest reductions in toxicity, mobility, and volume, followed by Alternative GW-D, then GW-A.

Implementability

In general, all four alternatives are implementable but to differing degrees. Alternative GW-A is the easiest to implement, followed by Alternatives GW-B and GW-C. Alternative GW-D is the most difficult to implement.

Cost

The sequence of alternatives, in order of least to most costly, is as follows: Alternative GW-A, Alternative GW-B, Alternative GW-C, and Alternative GW-D.

Summary

Table E-4 provides a summary of the relative rankings of the four retained groundwater remedial alternatives for each of the seven NCP criteria. Alternatives assigned a rank of "Most Favorable" were considered the most preferable in the associated category (i.e., least cost, most effective, most easily implemented, etc.). As shown on Table E-4, the groundwater remedial alternatives were ranked in the following order from most to least favorable: Alternative GW-C, Alternative GW-B, Alternative GW-D, and Alternative GW-A.

TABLE E-1
QUALITATIVE SCREENING OF REMEDIAL ALTERNATIVES FOR SOILS

General Response Actions	Retained Technologies	Remedial Alternatives				
		1S	2S	3S	4S	5S
Soil Remediation		No Action	Excavation	Containment	Treatment (BCD)	Treatment (TD)
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (residential land use restrictions) Administrative policies		X	X	X	X	X
Institutional and Engineering Controls	ADEM Environmental Covenant, additional fencing, signage, implementation of no dig policy		X	X	X	X
Containment	Capping (soil, asphalt pavement, concrete)			X		
Excavation /Disposal	Excavation & disposal off-site		X			
Excavation /Treatment	Excavation & treatment with chemical dehalogenation (BCD)				X	
	Excavation & treatment with thermal desorption (TD)					X
Evaluation						
Criteria	Effectiveness	Low	High	High	Moderate / High	Moderate / High
	Implementability	High	Moderate / High	High	Moderate / Low	Moderate
	Cost	Low	High	Moderate to Low	High	High
Forward Decision	Retain / Eliminate	Retain	Retain	Retain	Retain	Retain

BCD = base catalyzed decomposition; COC = Constituent of Concern; S = soil; MNA = Monitored Natural Attenuation; O&M = Operations and Maintenance; RAO = Remedial Action Objective

Screening Criteria Definitions:

Effectiveness (Short and Long Term)

High - Alternative is highly effective at meeting RAOs for all COCs under site-specific conditions.
Moderate - Alternative is moderately effective at meeting RAOs for most COCs under site-specific conditions. May require combination of other alternatives to meet RAOs.
Low - Alternative is ineffective at meeting RAOs for any COCs under site-specific conditions. Would require complex array of other alternatives to meet RAOs.

Implementability

High - No difficulties with implementing alternative under site-specific conditions. Alternative readily available, proven, and reliable.
Moderate - Some difficulties with implementing alternative under site-specific conditions but no fatal flaws. Alternative available, proven, and of average reliability.
Low - Major difficulties with implementing alternative under site-specific conditions. Fatal flaws identified. Alternative not readily available, proven, and with low reliability.

Cost

High - High degree of capital investment and O&M intensity.
Moderate - Moderate degree of capital investment and O&M intensity.
Low - Low degree of capital investment and O&M intensity.

TABLE E-2
QUALITATIVE SCREENING OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

General Response Actions	Retained Technologies	Remedial Alternatives				
		1GW	2GW	3GW	4GW	5GW
Groundwater Remediation		No Action	Extraction	MNA	Extraction & MNA	Treatment
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (groundwater use restrictions) Administrative policies Corrective action systems		X	X	X	X	X
Institutional Controls	ADEM Environmental Covenant		X	X	X	X
Natural Attenuation	Monitored natural attenuation (MNA)			X	X	
Extraction / Ex-situ Treatment	Expansion of the existing corrective action system with discharge to the POTW with or without pretreatment (e.g. carbon filtering)		X		X	
In-situ Treatment	Funnel & gate system with in-situ treatment using zero valent iron					X
Evaluation						
Criteria	Effectiveness	Moderate	High	Moderate to Low	High	Moderate
	Implementability	High	High	High	High	Moderate
	Cost	Low	Moderate / Low	Low	Moderate	High
Forward Decision	Retain / Eliminate	Retain	Retain	Eliminate (incorporated into 4GW)	Retain	Retain

COC = Constituent of Concern; GW = groundwater; MNA = Monitored Natural Attenuation; O&M = Operations and Maintenance; RAO = Remedial Action Objective

Screening Criteria Definitions:

Effectiveness (Short and Long Term)

High - Alternative is highly effective at meeting RAOs for all COCs under site-specific conditions.
Moderate - Alternative is moderately effective at meeting RAOs for most COCs under site-specific conditions. May require combination of other alternatives to meet RAOs.
Low - Alternative is ineffective at meeting RAOs for any COCs under site-specific conditions. Would require complex array of other alternatives to meet RAOs.

Implementability

High - No difficulties with implementing alternative under site-specific conditions. Alternative readily available, proven, and reliable.
Moderate - Some difficulties with implementing alternative under site-specific conditions but no fatal flaws. Alternative available, proven, and of average reliability.
Low - Major difficulties with implementing alternative under site-specific conditions. Fatal flaws identified. Alternative not readily available, proven, and with low reliability.

Cost

High - High degree of capital investment and O&M intensity.
Moderate - Moderate degree of capital investment and O&M intensity.
Low - Low degree of capital investment and O&M intensity.

TABLE E-3
NCP SCREENING CRITERIA RANKING OF SOIL ALTERNATIVES

	Ranking of Alternatives					
NCP Screening Criteria	**Most Favorable**					**Least Favorable**
Overall protection of human health and the environment	**S-B / S-C**	**S-D / S-E**				**S-A**
Compliance with ARARs	**S-B / S-C**		**S-D / S-E**			**S-A**
Short-term effectiveness		**S-A / S-C**		**S-B**		**S-D / S-E**
Long term effectiveness and permanence	**S-B**	**S-D / S-E**	**S-C**			**S-A**
Reduction of toxicity, mobility, or volume	**S-D / S-E**				**S-B / S-C**	**S-A**
Implementability	**S-A**	**S-C**	**S-B**		**S-D / S-E**	
Cost	**S-A**	**S-C**			**S-E / S-B**	**S-D**
Overall Ranking		**S-C**	**S-B**	**S-E**	**S-D**	**S-A**

Description of Alternatives for Soil Remedial Action	Alternatives
No Action	S-A
Additional Institutional and Engineering Controls, Soil Excavation with off-Site Disposal	S-B
Additional Institutional and Engineering Controls, Soil Containment (Capping)	S-C
Additional Institutional and Engineering Controls, Soil Excavation with Treatment Using on-Site Chemical Dehalogenation	S-D
Additional Institutional and Engineering Controls, Soil Excavation with on-Site Thermal Desorption	S-E

TABLE E-4
NCP SCREENING CRITERIA RANKING OF GROUNDWATER ALTERNATIVES

	Ranking of Groundwater Alternatives			
NCP Screening Criteria				
	Most Favorable			**Least Favorable**
Overall protection of human health and the environment	**GW-C**	**GW-B**	**GW-D**	**GW-A**
Compliance with ARARs	**GW-C / GW-B**		**GW-D**	**GW-A**
Short-term effectiveness	**GW-A**	**GW-B/GW-C**	**GW-D**	
Long term effectiveness and permanence	**GW-C**	**GW-B**	**GW-D**	**GW-A**
Reduction of toxicity, mobility, or volume	**GW-B / GW-C**		**GW-D**	**GW-A**
Implementability	**GW-A**	**GW-B / GW-C**	**GW-D**	
Cost	**GW-A**	**GW-B**	**GW-C**	**GW-D**
Overall Ranking	**GW-C**	**GW-B**	**GW-D**	**GW-A**

Description of Alternatives for Groundwater Remedial Action	Alternatives
No Action	GW-A
Additional Institutional Controls, Expanded Groundwater Extraction	GW-B
Additional Institutional Controls, Expanded Groundwater Extraction and MNA	GW-C
Additional Institutional Controls, In-situ Zero Valent Iron Groundwater Treatment	GW-D

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REPORT ON

FEASIBILITY STUDY FOR OPERABLE UNIT 3

FOR THE

ANNISTON PCB SITE (Docket No. CV-02-PT-0749-E)

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1.0 INTRODUCTION

On behalf of Solutia Inc. (Solutia) and Pharmacia Corporation (collectively, P/S), Golder Associates Inc. (Golder) has prepared this Final Feasibility Study (FS) Report for Operable Unit 3 (OU-3) of the Anniston PCB Site (Site) in accordance with Section IX.29.H.2 of the Remedial Investigation/Feasibility Study (RI/FS) Agreement as required under the Partial Consent Decree (PCD) (Docket No. CV-02-PT-0749-E) between the United States Environmental Protection Agency (EPA) and P/S. The United States District Court for the Northern District of Alabama entered the PCD on August 4, 2003. In this report, the term Site includes only the OU-3 area, which may also be referred to as the "plant site", "on-Site", "OU-3", "the Facility", or "plant site and landfills."

The PCD requires performance of a RI/FS at the Anniston PCB Site. The requirements for the RI/FS are identified in Appendix A of the PCD, RI/FS Agreement, and further defined in Appendix B of the PCD, Statement of Work (SOW). The SOW provides a description of the tasks to be performed for the completion of the RI/FS. The tasks include: scoping, community relations, site characterization, treatability studies, baseline risk assessment, development and screening of remedial alternatives, and detailed analysis of remedial alternatives. The requirements for the development and screening of remedial alternatives and the detailed analysis of remedial alternatives include the preparation of a Draft FS Report, previously submitted to EPA on August 24, 2008 (Golder, 2008f), and a Final FS Report, which was submitted to the EPA on May 7, 2009 (Golder, 2009a). This revised Final FS Report, Revision 1.0, is being submitted to address the EPA's comments on the last version of the report.

Initially, P/S elected and the EPA agreed to subdivide the Anniston PCB Site into four operable units (OUs). The description of and rationale for defining the OUs were provided in the Phase I Conceptual Site Model (CSM) Report (BBL, 2003). Subsequently, P/S, in consultation with the EPA, determined that OU-1 and OU-2 could be combined into a single OU. The OUs are now defined as:

- OU-1/OU-2 – Residential Properties/Non-Residential Properties;
- OU-3 – Facility (including the landfills); and
- OU-4 – Choccolocco Creek.

Three Technical Memoranda, a Draft FS Report, and a Final FS Report associated with the FS for OU-3 have been submitted to the EPA. The first Technical Memorandum, submitted on March 1,

2008, presented the Chemicals of Concern (COCs), potential federal and state Applicable or Relevant and Appropriate Requirements (ARARs), Remedial Goals, and the Remedial Action Objectives (RAOs) for OU-3 (Golder, 2008a). The second Technical Memorandum, submitted on April 2, 2008, presented the proposed remedial technologies, alternatives, and screening of these alternatives (Golder, 2008b). The EPA provided comments on these two Technical Memoranda in letters dated May 6, 2008, which were received by P/S on May 8, 2008 (EPA, 2008a; 2008b). The third Technical Memorandum, submitted on June 6, 2008, presented the results of the detailed and comparative analysis of alternatives (Golder, 2008c). A presentation to the EPA summarizing the RI/FS was conducted on June 25, 2008. Following this presentation, the EPA provided comments on the FS, specifically on the third Technical Memorandum, by electronic mail dated July 15, 2008. The EPA's comments were then incorporated into the Draft FS Report, submitted to the EPA on August 24, 2008 (Golder, 2008f). The EPA provided comments on the Draft FS Report in a letter dated January 22, 2009 (EPA, 2009), which were incorporated into the Final FS Report. The EPA provided additional comments on the Final FS Report in a letter dated April 19, 2010 (EPA, 2010), which have been incorporated into this Final FS Report, Revision 1.0.

This Final FS Report documents all FS phases and has been prepared in accordance with regulations and guidance documents, including the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300, Subpart E), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (EPA, 1988). The Final FS Report, Revision 1.0, includes the information presented in the previously submitted three Technical Memoranda, the Draft FS report and the Final FS Report, revised to incorporate comments received by the EPA.

This Final FS Report is divided into nine sections as follow:

- Section 1.0 provides an introduction and description of the purpose of this document;
- Section 2.0 provides a summary of the RI and the CSM as presented in the Remedial Investigation Report, Revision 2.0 (RI Report, Golder, 2010a);
- Section 3.0 presents a summary of the existing conditions, specifically the corrective measures already completed to date;
- Section 4.0 presents the development of RAOs for various Site media and includes the identification of Site ARARs;

- Section 5.0 summarizes the remedial technology/process option screening process, and development and screening of remedial technologies;
- Section 6.0 summarizes the assembly and screening of Site-wide remedial alternatives;
- Section 7.0 presents the results of the detailed analysis of alternatives;
- Section 8.0 presents a summary of the comparative analysis of alternatives; and
- Section 9.0 provides the references relied upon to prepare this report.

2.0 REMEDIAL INVESTIGATION AND CONCEPTUAL SITE MODEL SUMMARY

The following is a summary of the RI and CSM for OU-3. A more detailed discussion is presented in the RI Report, Revision 2.0, which was submitted to the EPA on May 20, 2010 (Golder, 2010a). Selected tables and figures from the RI Report have been included in Appendix A for reference.

2.1 Physical and Environmental Setting

2.1.1 OU-3 Description

OU-3 is located in Calhoun County in the north-central part of Alabama (Figure 2-1) and has been subject to environmental investigation and interim/corrective actions for approximately 30 years. The Facility is currently active and operates in accordance with a variety of environmental permits. Environmental activities at the Facility have included a combination of investigative and remedial efforts conducted pursuant to these permits. The environmental response efforts performed under the Resource Conservation and Recovery Act (RCRA) generally included areas of the Solutia Facility, which were termed the "On-Site" area, and areas downstream of the Solutia Facility, termed the "Off-Site" area. The "On-Site" area includes the manufacturing plant and the two former Facility landfills and is generally synonymous with OU-3. The borders of OU-3, depicted on Figure 2-2, are the railroad to the north, the closed South Landfill and Highway 202 to the south, Clydesdale Avenue to the east, and First Avenue to the west. Any groundwater impacts that originate within the Facility boundary and have migrated beyond the physical boundaries of OU-3 described above are also included in OU-3.

2.1.2 Climate

Calhoun County is characterized as humid sub-tropical, with hot summers, mild winters, and some precipitation during all months of the year. Precipitation is primarily in the form of rainfall with an average of 54 inches per year, the majority of which occurs during the winter. Droughts are infrequent, and the average annual evapotranspiration rate in the area is approximately 42 inches. The mean annual temperature is 62 degrees Fahrenheit (^{o}F) and ranges from approximately 43 ^{o}F in January to 80 ^{o}F in July.

Based on data collected in Anniston from April 1, 2003 to March 31, 2004 (ENSR, 2004), the atmosphere is generally thermally stable (category D through F during most of the year). Based on these data, the prevailing winds generally originate from the southeast approximately 11% of the year

and from the west-southwest approximately 8% of the year. Additionally, the winds are calm 17% of the year (i.e., 0-1 miles per hour or less).

2.1.3 Physiography and Topography

Topography in the area is characterized by flat to gently rolling, northeastward trending valleys that are paralleled by ridges and mountains. The highest point at the Facility, at approximately 940 feet above mean sea level (msl), is near the southern property line. The ground surface declines rapidly across the closed South Landfill (moving south to north) and then slopes gently to the north across the rest of the Facility.

The majority of the ground surface in the plant area is covered by asphalt pavement, concrete pavement, buildings, soil or gravel covers. The adjacent closed landfills and surrounding areas are primarily grass covered. Existing surface types across the Facility are displayed on Figure 2-3.

2.1.4 Drainage

There are many natural and man-made features at the Facility that govern surface water drainage. The most influential natural features are the steep side slopes of Coldwater Mountain near the closed South Landfill and the moderately-dipping slopes which trend southwest to northeast across the production area of the Facility. During precipitation events, these moderate-to-steep slopes formerly contributed significant quantities of surface water flow across the closed South Landfill, along the eastern and western sides of the Facility, and into various man-made ditches. This flow generally discharged into the 11th Street Ditch north of the Facility. The 11th Street Ditch discharges in an easterly direction to Snow Creek. Snow Creek in turn flows to the south and eventually drains into Choccolocco Creek, which in turn flows to the west into Lake Logan Martin on the Coosa River.

In the past, when surface water came into contact with affected soils or Facility production areas, constituents could have become entrained in the water and subsequently transported off of the Facility. Consequently, extensive interim/corrective measures conducted under the RCRA Program, consisting of caps and covers over affected areas, upgraded storm sewers, diversion ditches, retention basins, and various drainage structures, have been constructed at the Facility to control stormwater run-on and run-off and mitigate the transport of constituents. These interim/corrective measures are discussed later in this report.

2.1.5 Demography and Land Use

Land use information for the areas around the Facility was developed based on a review of aerial photographs from 1999 and confirmed as part of a parcel by parcel land use inventory conducted in 2001 for properties within the floodplain of Snow Creek (Golder, 2001). The land uses reflect the urbanized nature of the area surrounding the Facility and includes heavy industry, manufacturing, residences, and light commercial.

The Facility itself is largely occupied by buildings, parking lots, other areas actively used for industrial purposes, and impervious surfaces. As shown on Figure 2-3, many interim measures have been implemented at the Facility resulting in approximately 72% of the area being covered with asphalt pavement, concrete pavement, buildings, soil or gravel covers reducing the potential for direct contact with contaminated soil. Throughout OU-3, approximately 27% of the area is covered with impervious covers such as buildings, asphalt and concrete pavement, and high density polyethylene (HDPE) liner systems. An additional 19% is covered with relatively impervious grass and soil covers. The soil covers placed to isolate PCBs from direct contact typically have a low permeability (the permeability of in-place residual soils are on the order of 1.0×10^{-5} to 1.0×10^{-7} cm/sec) and are thus relatively impervious. Approximately 26% of the OU-3 area is covered with gravel covers to prevent direct contact and reduce the mobilization of PCB-containing soil. As such, only about 28% of the OU-3 area can be considered undeveloped.

In addition, the property where the Facility is located (including the landfills) is encumbered by a legal deed restriction. The deed restriction prohibits residential development or any use of groundwater for industrial, potable, or irrigation purposes. A copy of the deed restriction was provided in the RCRA Facility Investigation/Confirmatory Sampling (RFI/CS) Report (Golder, 2002).

2.1.6 Regional Geology and Hydrogeology

Approximately 90 percent of Calhoun County, including the Facility, lies within the Valley and Ridge physiographic province of the southern Appalachian Highlands. The Facility is located in the Weisner Ridges subsection of the Valley and Ridge province, which consists of maturely dissected, faulted and folded ridges of high relief separated by flat to gently rolling valleys. Regional geologic maps indicate that tightly folded Weisner Formation sandstones underlie Coldwater Mountain southeast of the Facility. Sandstones and mudstones of the Rome Formation and sandy dolostone and dolomitic limestone of the Shady Dolomite underlie the valley where the Facility is located. Much of

this valley is covered with a mantle of unconsolidated alluvial, residual and/or colluvial soils up to 100 feet thick, making delineation of geologic structures difficult to interpret.

The Jacksonville Fault, a regional thrust fault, extends northeastward from the Town of Bynum, Alabama through Anniston, Piedmont, and Jacksonville. A regional map of the fault estimates that the fault occurs northwest of the northern boundary of the Facility, as illustrated along with the bedrock geology of the area on Figure 1-4 of Appendix A (Osborne and Szabo, 1984; and Warman and Causey, 1962). The fault is mapped as a northeast-trending thrust fault that dips gently to the southeast. Although the magnitude of dip on the fault surface is not published, the fault is considered to be a low-angle thrust fault (pers. comm. with Mr. W. Edward Osborne of the Geologic Survey of Alabama [GSA]). This fault juxtaposes older Shady Dolomite, Rome Formation and Weisner Formation rocks to the southeast with younger Conasauga Formation and Knox Group rocks to the northwest. High-angle reverse and normal faults are also shown to occur in this geologic terrain.

Calhoun County is underlain by carbonate rocks (limestone and dolostone), which form important aquifers, and silicate rocks (quartzite, sandstone, shale, and siltstone), which typically yield less water to wells. The carbonate rocks are typically the most prolific groundwater producing units and locally yield sufficient water for industrial and municipal use. Groundwater yield from carbonate rocks is controlled by solution-enlarged joints and bedding planes and interconnectivity of these features. Lesser quantities of groundwater are obtained from sandstone, shale, mudstone, and quartzite units present in the County. These groundwater sources can be sufficient for domestic uses; however, it is difficult to obtain sufficient amounts of groundwater from these sources for municipal or industrial uses. The groundwater yield from these rocks is controlled by discontinuity orientation and interconnectivity, grain size, grain size distribution, and secondary permeability.

Regional groundwater flow is controlled by topography, primary sedimentary features, secondary permeability and porosity, and geologic structures of the underlying formations. Groundwater flow occurs in the overlying soil/residuum/saprolite and within the fresh, competent bedrock. Flow within the bedrock is largely controlled by interconnected discontinuities such as joints, bedding, faults and solution-enlarged conduits in carbonate rocks; flow within the unconsolidated alluvial, colluvial and residual soils occurs through pore space within the soil; and flow within the transitional zone occurs through both pore space within the soil and along discontinuities and solution-enlarged conduits in less weathered rock. Although vertical conductivity in these units varies, there is no readily identifiable regional confining layer or layers to isolate the units into separate systems.

Approximately 150 springs have been identified and located in the County during studies of the area. The discharge of these springs is variable, ranging from less than 1 gallon per minute (gpm) to over 17,000 gpm. Many of these springs are found along the trace of thrust faults and produce enough water for domestic uses and, in some instances, for municipal supply. It is estimated that 80 percent of these springs are used for domestic, farm, stock, municipal, industrial, or recreational water supplies.

Coldwater Spring, a major spring in the Anniston area, is located approximately 5 miles southwest of the Facility. The spring is the primary water source for the City of Anniston, Fort McClellan, Anniston Ordnance Depot, and other municipalities and communities within the County. Although the hydrogeology of the spring is considered to be highly complex, the recharge area for the spring is thought to generally include the area northwest of the crests of Coldwater and Choccolocco Mountain (Kidd, 2001). Groundwater is interpreted to move south and west along the Jacksonville Fault, joining groundwater from distant sources moving parallel to the fault at depth, ultimately discharging at Coldwater Spring. Based on geochemical modeling (Robinson, 2004), the quality of water flowing from Coldwater Spring ranges from 1 to 25 percent rainwater and 75 to 99 percent groundwater, with a reported groundwater age of 15 years. The spring is reported to discharge from 24 to 33 million gallons per day (Robinson 2004).

2.2 Manufacturing History

A thorough discussion of the manufacturing history at the Facility was included in the RFI/CS Work Plan for the Anniston, Alabama Facility (Golder, 1997). As reported therein, manufacturing operations at the Facility began in 1917 with the production of ferro-manganese, ferro-silicon, ferro-phosphorous compounds, and phosphoric acid (added later) by the Southern Manganese Corporation. In 1927, the production of organic chemicals began with the introduction of biphenyl, which still remains a major product of the Facility. In 1930, Southern Manganese Corporation became Swann Chemical Company (Swann), which Monsanto Chemical Company (MCC) purchased in May 1935. MCC created Solutia, the present owner, as a spin-off company in 1997.

A variety of organic and inorganic chemicals have been produced at the Facility during its history, including PCBs, parathion, phosphorus pentasulfide, and 4-nitrophenol. The Facility currently manufactures polyphenyl compounds (utilized in a variety of heat transfer fluid, plasticizer, and lubricant applications). These compounds have been produced for many years using the same raw materials and intermediates, even though there have been several expansions and process

modifications. In addition, the Facility commenced the manufacture of phosphate ester-based non-flammable hydraulic fluids in 2006. A summary description of the various manufacturing and associated support processes is provided below:

- Polyphenyl Production (1927 to Present) - Polyphenyls are manufactured from benzene and cumene (isopropyl benzene) in a continuous pyrolysis unit. The crude product is separated into various polyphenyl products including Santotar®.

- PNP Production (1965 to 2004) - PNP (4-nitrophenol, para-nitrophenol) was manufactured by the hydrolysis of para-nitrochlorobenzene (PNCB). PNCB and sodium hydroxide were reacted and acidified with sulfuric acid before the product was filtered and dried.

- Therminol Production (1983 to Present) - Therminol is produced from polyethylbenzene. Distillation residues (Therminol® ends) are managed in a totally enclosed treatment facility. The ends are blended with Santotar® and burned as a non-hazardous back-up fuel in the Facility's boiler.

- Parathion and Methyl Parathion Production (1957 to 1986) - Parathion (or Niran®) and methyl parathion were produced on a seasonal basis. These materials were produced by reacting ethanol or methanol with phosphorus pentasulfide to form 'thio acid.' The thio acid was stripped, chlorinated and then distilled to produce an intermediate. The intermediate was either sold or reacted with acetone, PNP, and soda ash to produce crude parathion. Wet acetone from the operation was recovered in a solvent recovery system. The residue from the distillation of the chlorinated thio acid was recycled to a crystallizer. The filtrate was returned to the parathion process, and sulfur waste was returned to the production process or landfilled.

- Phosphorus Pentasulfide Production (1967 to 1988) - Phosphorus pentasulfide (P_2S_5) was produced by reacting elemental sulfur and phosphorus. The resulting phosphorus pentasulfide was drummed for sale or used in the parathion process.

- PCB Production (late 1929 to 1971) - The Facility manufactured Aroclors (PCBs) by reacting chlorine and biphenyl. Chlorine was produced at the Facility between 1952 and 1969 solely for this purpose. The manufacture of PCBs generated miscellaneous production-related wastes which were disposed in the West End Landfill prior to 1960 and in the South Landfill after 1960. The manufacture of PCBs ceased in 1971, and the associated production facilities were dismantled in 1972. Decommissioning included the removal of buildings and plant production equipment. Waste materials generated during these activities were placed into the South Landfill.

- Hydraulic Fluid Manufacturing (2006 to Present) – Various phosphate ester compounds (e.g., butyl and phenyl phosphates) are processed to produce non-flammable hydraulic fluids, primarily for use in aviation hydraulic systems. Facility operations are limited to the processing of base raw materials and packaging, and no actual production of the base stock materials occurs.

2.3 Regulatory History

The Facility operations began in advance of modern environmental regulations. However, as early as the 1970s, investigations and remedial activities began at the Facility. The Facility operated two hazardous waste management areas, or WMAs (WMA I and WMA II). These WMAs were closed in compliance with provisions contained in the Facility's operating permit issued under the Alabama Hazardous Waste Management and Minimization Act (AHWMMA) and RCRA. Refer to Section 2.2 of the RI Report for information regarding waste disposal at the Facility. Under provisions of the Hazardous and Solid Waste Amendments of 1984 (HSWA), an EPA contractor conducted a RCRA Facility Assessment (RFA) in 1991 to identify solid waste management units (SWMUs) that might be subject to potential corrective action. In December 1994, and as amended in July 1995, and May 1996, the Facility applied for the re-issuance, with modifications, of its AHWMMA Permit. In October 1996, the Alabama Department of Environmental Management (ADEM) issued a Draft Hazardous Waste Post-Closure Permit to regulate the Facility's post-closure responsibilities for WMA I and WMA II and to address corrective action for SWMUs and potential Areas of Concern (AOCs) located both on and off of the Facility (RCRA Permit). This draft permit was finalized and issued on January 7, 1997 (No. ALD004019048) and subsequently modified on November 13, 1997, May 3, 2001, December 11, 2003, and May 5, 2006. P/S submitted a permit renewal application on July 10, 2006, which was ultimately approved by ADEM on October 31, 2008. Included as part of the requirements of this permit were the completion of a RCRA RFI/CS and post-closure care groundwater monitoring. The RFI/CS Program included investigations of soil, groundwater, surface/stormwater, and air. Discussions of these investigations along with results from the post-closure care groundwater monitoring are presented in later sections of this report.

On April 5, 1995, the Facility entered into a Consent Order with ADEM to develop and implement a sampling plan for sediments in the stormwater drainage system. The Facility collected sediment samples throughout the reach of the drainage ditches and soil samples extending outward on both sides of the ditches on the Facility's property and related areas. PCBs were reported at varying concentrations in the sediments of the drainage ditches that flow from the area of the closed South Landfill and from the production area to an area east of the manufacturing plant. PCBs were also reported at various concentrations in soil samples outside of the drainage ditches, but within areas potentially flooded by the drainage ditches during heavy rains.

On March 8, 1996, the Facility entered into a second Consent Order with ADEM that expanded and defined the scope of the Facility's ongoing investigation and remedial activities close to the Facility.

Under this Consent Order, the Facility agreed to sample four additional areas for the presence of PCBs and to identify and sample other areas potentially affected by PCBs.

The Facility's obligations under the terms of both Consent Orders have been completed, and results of these activities have been reported to ADEM. These results confirm that PCBs released from the Facility were detected in areas directly adjacent to drainage ditches or in areas affected by stormwater flooding from these ditches. The drainage ditches in which PCBs have been detected ultimately flow toward the 11th Street Ditch joining Snow Creek just south of West 11th Street. Sediment samples have also been collected from Snow Creek, the 11th Street Ditch and other drainage ditches and analyzed for the presence of PCBs. The results of these analyses have been reported to ADEM and EPA.

Investigation and remedial work were also conducted in the vicinity of the Facility under CERCLA pursuant to an Administrative Order on Consent (Removal Order) between EPA and Solutia effective October 27, 2000, rescinded and replaced by a Removal Order effective October 5, 2001. The Removal Order provides for the performance of a time critical removal action to address PCB impacted residential properties within the Anniston PCB Site. The Removal Order also required a removal response for a portion of the 11th Street Ditch, sampling of a portion of the West 9th Street Creek, and a removal response at off-Facility areas related to activities previously completed at Quintard Mall and the Oxford Lake Softball Complex. This Removal Order is incorporated as Appendix C to the CD. A Non Time Critical (NTC) Removal Agreement (Appendix G to the CD) was issued to address residential properties within the Anniston PCB Site with PCB levels at or above 1 part per million. The NTC Removal Agreement was later modified by the issuance of a Stipulation and Agreement between EPA and P/S (EPA, 2006) on July 18, 2006. The primary purpose of the Stipulation and Agreement was to address the phasing and extent for removal actions to be completed. Efforts taken to comply with the Removal Order and the NTC Removal Agreement are being addressed under OU-1/OU-2.

The Facility also maintains a National Pollutant Discharge Elimination System (NPDES) Permit under the Clean Water Act (CWA). This permit, which has an effective date of January 1, 2007, regulates the discharge of stormwater run-off from stormwater outfall DSN 012. The Facility's NPDES Permit previously allowed the discharge of non-contact cooling water and condensate through the on-Site stormwater sewer system. However, in 1996, all of this process related water was

re-piped to discharge to the Facility's former Waste Water Treatment Facility (WWTF). Consequently, only stormwater is discharged by the stormwater outfalls.

All process water from the Facility discharges from the Facility's former WWTF to the City of Anniston's Publicly-Owned Treatment Works (POTW) under provisions of the Facility's State Indirect Discharge (SID) Permit (Permit No. IU 35-08-00048). The biological treatment component of the WWTF was decommissioned in conjunction with the PNP plant shutdown in 2004 such that the former WWTF currently consists of only an equalization basin with pH adjustment capabilities.

Prior to falling under CERCLA jurisdiction, P/S were in the process of gaining approval from ADEM under RCRA for the extensive interim measures that had been completed at the Facility. However, before P/S could complete the approval process, the EPA assumed regulatory control of the Site from ADEM. At that time, the completed interim measures became the baseline for considering additional remediation requirements in the CERCLA process, and any remedial actions required under CERCLA will be in addition to the extensive work already completed under RCRA. The HHRA and the Ecological Risk Assessment were completed using these existing conditions as the basis for the evaluations. Under the renewed RCRA Post-Closure Permit issued on October 31, 2008, ADEM retained authority over the groundwater monitoring and detection monitoring program for WMA I, and over the corrective action monitoring program for WMA II. In addition, ADEM deferred investigation and the determination of the need for further remedial action for 19 SWMUs to the EPA under CERCLA.

2.4 Investigation and Remediation Activities

Extensive investigations of soil, surface water/sediment, ambient air, and groundwater were conducted as part of the environmental programs at the Facility dating back over 30 years. These investigations included the RCRA Permit Compliance Program, RFI/CS Program, the Supplemental RFI/CS Program, and the RI.

2.5 Physical Characteristics Investigation Results

The stratigraphy of the Facility consists of residuum underlain by bedrock. The residuum consists of low permeability silts and clays that are products of bedrock weathering. Locally, the residuum extends to depths of over 100 feet below ground surface (bgs) and acts as a semi-confining unit to the underlying Shady Dolomite bedrock. The residuum becomes denser with depth and has been loosely divided into two units, the shallow residuum and the deep residuum. The transition between the units

is located approximately 45 feet bgs. Across most of the Facility, the deep residuum is underlain by the Shady Dolomite formation, which is typically described as an argillaceous to sandy dolostone to dolomitic limestone.

Horizontal groundwater flow in the shallow residuum is generally northward with a northwest component in the vicinity of the WMA II Corrective Action System and a northeast component in the northeast part of the Facility. The horizontal groundwater flow in the deep residuum and shallow bedrock is generally to the north-northwest throughout most of the Facility. The horizontal rate of groundwater flow in the shallow residuum was calculated to vary from approximately 0.53 feet/year to 5.3 feet/year, while flow in the deep residuum was calculated to vary from approximately 0.51 feet/year to 5.1 feet/year.

An evaluation was performed to identify active groundwater wells in the vicinity of the Facility, and only four active wells were identified within a one-mile radius; see Figure 2-7 of Appendix A. None of these wells are used for drinking water since all residents in the area obtain water from the local water utility.

A biological survey and quantitative habitat assessment were performed to evaluate habitat characteristics in OU-3. The findings of this assessment were used to support an analysis of the relationship between ecological receptors and exposures at the Facility. Habitats were assessed based on a general description of primary habitat, approximate percent cover of habitat types, dominant vegetation, vegetation density, vegetation height, bordering land use, and evidence of natural or anthropogenic disturbance. In general, the habitats evaluated were poor, reflecting maintenance activities (cutting and mowing), low plant diversity, and poor soil conditions. Since the Facility is expected to continue operations for the foreseeable future, a risk-management decision was made that no further assessment of ecological risk is necessary. Any actions taken to protect human health risk at the Facility will reduce risk to ecological receptors. If all operations at the Facility cease, ecological risks should be re-evaluated.

2.6 Nature and Extent of Contamination

Soil samples were collected within the area of the plant, and the closed South and West End Landfills during the RFI/CS and RI Programs. The more prevalent constituents detected in soils at the Facility include PCBs, benzo(a)pyrene, arsenic, cobalt, lead, manganese, mercury, and nickel. Within the plant area, the majority of soil samples were taken in areas covered with gravel, asphalt pavement, or

concrete pavement. These covers prevent direct contact and minimize or reduce the potential for erosion of underlying soils. These areas are maintained and inspected as part of the plant's ongoing operation and maintenance programs. One exception was the grassy area north of the Former Phosphoric Acid Basin where one sample (SSRI-11) indicated elevated levels of PCBs, arsenic and lead relative to the rest of the Facility. However, as part of the RI, delineation sampling and a removal action were conducted at the location of SSRI-11 to remove the "principal threat waste" material identified in this area (Golder, 2010b).

At the closed South and West End Landfills, surface soil samples were collected from the top cover material after implementing the cover system upgrades and analyzed for PCBs. The concentrations in samples from the closed South Landfill ranged from non detect to 10 milligrams per kilogram (mg/kg), and from the closed West End Landfill ranged from non detect to 21 mg/kg.

Additional characterization data for the closed South and West End Landfills are included as Appendix A-1 in the RI Report and summarized below. The summary includes a discussion of residual PCBs remaining under the existing caps or soil covers at the two landfills.

Closed South Landfill

The PCB concentrations measured in soil prior to placing the upgraded cover system at the closed South Landfill are included in Appendix A-1 of RI Report. These samples were collected in 1996 under a Consent Decree with ADEM. Appendix A-1 of the RI Report also includes PCB concentrations in surface soil over the eastern cells south of WMA I where an upgraded cover system was not installed.

Closed West End Landfill

The PCB concentrations measured in soil prior to constructing the cover system over the closed West End Landfill are included in Appendix A-1 of the RI Report. The samples included were collected in 1994 through 1996 and reported to ADEM. P/S excavated and removed soil from the adjacent areas of the landfill prior to placing the soil cover. The PCB concentrations included in Appendix A-1 represent the concentrations measured prior to and after conducting soil removal activities and capping the area. The areas of the West End Landfill with elevated PCB concentrations were capped with a multi-media HDPE liner system or covered with clean soil and vegetative cover.

Additionally, as reported by members of the remediation team, soil was excavated from outside the fence line of the West End Landfill along 1st Avenue to address PCBs found in soil/sediment and to improve drainage in the area. The area addressed includes a strip of grass between the road and the fence line approximately eight to ten feet wide. Post excavation sample results for this area are included in Appendix A-1 of the RI Report.

Elevated PCB concentrations were detected in the soil underlying the Alabama Power Company switch yard located within the limits of the West End Landfill property. The samples were collected from beneath the gravel present in the switch yard. Although no additional capping of this area was completed as part of the interim measures, Alabama Power maintains a substantial gravel cover over the area and restricts access to the switch yard to its employees only. The area is enclosed with a chain link fence, which remains locked to prevent unauthorized entry or trespass.

In May 1995, prior to the placement of a geotextile and soil cover, soil and sediment samples were collected from the "walking trail area" located in the southeast corner of the plant site. The samples were field screened for PCBs, and approximately 10% of the field samples were submitted for laboratory analysis of PCBs. The results of these analyses are included in Appendix A-2 of the RI Report. Of the samples collected, nine soil and eight sediment samples exceeded the screening level of 10 mg/kg. Laboratory concentrations ranged from 6.1 mg/kg to 157 mg/kg. Appendix A-2 of the RI Report provides the locations and results of the samples collected in the "walking trail area".

In conjunction with the completion of the RI, additional investigation activities were conducted at the South Landfill and the West End Landfill in accordance with a meeting held on March 26, 2010 between the EPA and P/S (Golder, 2010c). In this meeting, the EPA indicated that insufficient information was available for portions of the South Landfill (Cells 1E, 2E, and 3E) and the adjacent areas of the West End Landfill (previous characterization area AA2) in order to determine whether the cover systems are protective. The scope of work for the South Landfill focused on collecting data necessary to evaluate the performance of the existing cap/cover overlying the "PCB Cells" (Cells 1E, 2E, and 3E) including: 1) conducting a cap/cover thickness survey; 2) determining the permeability of the cap/cover soil materials; 3) analyzing a suspected surface water "seep" that had been previously observed in the vicinity of the cells (analyzed for constituents of interest at the Site); and 4) collecting and analyzing a groundwater sample from well OWR-5D, which is located downgradient of the South Landfill (analyzed for PCBs). At the West End Landfill, P/S performed confirmation soil sampling in

the vicinity of the historic composite sample AA2 (Adjacent Area 2). AA2 was collected prior to excavating and relocating PCB-containing soil from the area and capping the area with a soil cap, which was completed in 1996. The result from the original "8-point" composite sample (AA2) collected in this area was 1,940 mg/kg.

Findings of the investigation activities conducted at the South Landfill show that the cap/cover material overlying Cells 1E, 2E, and 3E was generally 24 inches thick or greater, and the cover soils consisted of low plasticity silt and clay with a mean permeability of 4.14×10^{-6} cm/sec. However, some gravel-sized material was encountered intermixed with the soil matrix that prevented a direct measurement of the cover thickness at some locations.

Analytical results of the groundwater samples (original and field duplicate) collected at OWR-5D indicated that total PCB concentrations for unfiltered samples ranged from 447 J (estimated value) micrograms per liter (µg/l) to 596 J µg/l depending upon the method used to analyze the samples. The PCB concentrations for the filtered samples ranged from non detect to 2.62 UJ (estimated non detect value) µg/l.

Results for the unfiltered seep samples were non detect for volatile organic compounds and pesticides, while the semi-volatile organic compound 1,4-dichlorobenzene was detected at a concentration of 1.4 J µg/l for the original sample and 1.6 J µg/l for the duplicate sample. PCB results for the unfiltered samples (original and field duplicate) ranged from non detect to 0.59 J µg/l depending upon the method used to analyze the samples. The PCB results for the filtered sample were non detect. Metals results for the unfiltered sample indicate a detection of 0.13 milligrams per liter (mg/l) for barium and 0.19 mg/l for manganese, with associated filtered results of 0.12 mg/l for barium and 0.17 mg/l for manganese.

PCB results for samples collected from the West End Landfill (original and duplicate sample) ranged from 14.86 J mg/kg to 89.8 J mg/kg depending upon the method used to analyze the samples. These results confirm that the high level PCB concentrations originally detected in soil at this location were removed prior to placing the soil cap/cover at the West End Landfill Adjacent Area 2.

The hydrogeology at the Facility has been well studied, and extensive investigations have been performed. The nature and extent of constituents of interest in groundwater were compared to published EPA maximum contaminant levels (MCLs), as available. However, some constituents do

not have published MCLs. For these constituents, the EPA Region IX Preliminary Remediation Goals (PRGs) were used for comparison. Since 4-nitrophenol and o,o,o-triethylphosphorothioate do not currently have Federal MCLs or Region IX PRGs, site-specific limits were developed for these two constituents using procedures established for calculating the Region IX PRGs (Region IX PRGs User's Guide). The term constituent concentration limit (CCL) used throughout the RI and FS Reports is a term used to collectively define the values (MCLs, Region IX PRGs, or calculated site-specific limit) used to compare against measured site groundwater concentrations. Local areas of groundwater impact exist within the Facility and are either currently controlled by the existing groundwater capture system (see Figure 2-4 of Appendix A) or are being addressed through the FS process, as discussed in Sections 5 through 8. As presented in the RI Report, the following key points summarize groundwater characteristics at the Facility. Select tables and figures from the RI Report have been included in Appendix A for reference purposes.

- Transport of groundwater and any dissolved constituents is governed by the groundwater flow paths. Some of the infiltrating water moves laterally within the residuum, while another component of this groundwater movement is controlled by the downward gradient present within the residuum. Because the horizontal hydraulic conductivity is generally much greater than the vertical hydraulic conductivity, the majority of the groundwater flux is in the horizontal direction.

- The groundwater flow rate in the shallow residuum is low, calculated to range from 0.53 feet/year to 5.3 feet/year based on Darcy's equation and porous media flow. Higher velocities can be present with preferential flow through secondary porosity features. However, the lateral extent of interconnectivity appears low as widespread groundwater impacts were not noted. In addition, transport by colloidal-size particles is possible, but again, the lack of widespread contamination suggests that this is not a significant mechanism across the Facility.

- An evaluation of existing data at the Facility indicates that the most prevalent constituents detected in groundwater are PCBs, parathion, PNP, 1,2-dichlorobenzene, 1,4-dichlorobenzene, chlorobenzene, pentachlorophenol, o,o,o-triethylphosphorothioate, cobalt, mercury, and manganese. Other constituents have been detected, but the detections have been sporadic and the areal extent localized.

- There are five main areas with PCB detections; north of the closed South Landfill, the Old Limestone Bed, the vicinity of OW-21A, the vicinity of OWR-13/OWR-14D, and the vicinity of OW-10/OWR-11. Elevated PCB concentrations found in groundwater in the areas of the closed South Landfill and the Old Limestone Bed likely originated from these units. The former PCB Production Area was located in the south central portion of the Facility and is likely responsible for the detections observed in the OWR-13/OWR-14D area, which is located downgradient of the former production area. Observation well

OWR-11 was installed to evaluate the groundwater quality in the vicinity of the former north and south Phosphoric Acid Basins. The detections at observation wells OWR-11 and OW-10 are likely a remnant impact associated with the Phosphoric Acid Basins.

- Low level concentrations of PCBs detected in the deep residuum and shallow bedrock wells represent a progressive vertical concentration decline from shallow groundwater to deeper groundwater. The semi-confining unit observed in the deep residuum during previous investigations extends through the weathered bedrock zone, to the top of bedrock. As a result, more significant impacts are generally restricted to groundwater in the shallow residuum.

- The potential for colloidal transport as a mechanism for PCB migration at monitoring wells OW-08A, OW-16A, OW-21A, and OWR-15D was investigated by collecting filtered samples (i.e., 2-micron and 0.1-micron filters) and analyzing the samples for PCBs. The sample results were non detect for all the filtered samples.

- During a later investigation of site bedrock, filtered groundwater samples were collected from wells T-05 and T-06. These results indicated that either colloidal particles were present with PCBs adsorbed to the particles, or that PCBs were present in the dissolved phase. Colloidal-size particles were also examined during the OU-1/OU-2 groundwater investigations. In general, these results indicate that colloidal-size particles were detected with this sampling. Consequently, colloidal transport is possible, although a large site-side plume does not appear to have coalesced together.

- Parathion and PNP have been detected in groundwater in three main areas: north of the closed South Landfill, the Old Limestone Bed, and the vicinity of OW-21A. The detections in each of these areas are likely associated with the closed South Landfill, acidic wastewater neutralization, and a localized source near OW-21A, respectively. There were no detections of PNP or parathion in soil samples collected at these locations.

- Volatile organic compounds are present in groundwater in the vicinity of OW-16A and OWR-15D, the WMA II Corrective Action System, and in the vicinity of the OW-21/21A area. However, all detected concentrations were less than the CCL presented in the RI Report for each constituent.

- o,o,o-triethylphosphorothioate and pentachlorophenol are both present in groundwater at the closed South Landfill and the WMA II Corrective Action System. Only pentachlorophenol exceeded the CCL, while o,o,o-triethylphosphorothioate did not exceed its respective CCL. However, with the exception of the OWR-05D detection and detections in MW-20A, pentachlorophenol has not been detected in groundwater since 1998. As a result, the analysis for pentachlorophenol was removed from the RCRA monitoring program except for well MW-20A.

- Historical data indicate that cobalt is present in groundwater throughout the Facility. However, no concentrations have exceeded the CCL of 730 µg/l.

- Manganese concentrations in groundwater were detected above the CCL in a number of locations spread out across the Facility. However, the magnitude and distribution are consistent with background levels and do not seem to have a common source as concentrations well below the CCL were detected among the locations where exceedances were noted.

- Mercury in groundwater is most frequently detected around the Old Limestone Bed Surface Impoundment (OLBSI), the former PCB Production Area, downgradient of the Phosphoric Acid Basins, and to a lesser extent the SWMU 1 area.

- There was no visual evidence to support the presence of dense non-aqueous phase liquid (DNAPL) at depth, although the presence of localized DNAPL ganglia as a source of groundwater impacts could not be ruled out.

A number of actions, as described in Section 3.0, have been taken to reduce the transport of constituents off of the Facility. These actions include closure of the former South and West End Landfills, the lining and re-routing of storm drains, and numerous corrective actions in former production areas of the plant. The effectiveness of these actions has previously been demonstrated through quarterly surface water sampling conducted in accordance with the Facility's NPDES Permit, although additional monitoring may be required to confirm continued effectiveness.

An extensive air pathway monitoring study was conducted documenting that air impacts are currently low, consistent with ambient conditions in other areas of the United States, and concluding that the closed South and West End Landfills, and Facility are not now considered a unique source for PCBs in air.

2.7 Contaminant Fate and Transport

The fate and transport characteristics of the prevalent constituents were reviewed, and potential migration routes were considered. Most areas of impacted soil are under cover systems reducing the likelihood of potential releases from soil to surface water. Groundwater impacts may occur locally due to leaching from impacted soil in areas with permeable cover systems. Four constituents (lead, manganese, mercury, and PCBs) have been retained for further consideration in the FS for potential leaching to groundwater. Surface water is controlled on the Site via a system of sewers and ditches. All process-related water is piped to the Facility's former WWTF and then discharged to the Anniston POTW.

Much of the precipitation falling at the Facility is collected in ditches and discharged via an NPDES regulated outfall. Constituent concentrations measured in the outfall have been sporadic and low.

However, some areas of the Facility do not drain to the upgraded stormwater collection system. These areas are primarily in the northwest portion of the Facility and include the closed West End Landfill and adjacent areas. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater from these areas but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. If a containment remedy is selected for these areas, stormwater discharge monitoring may be necessary to verify that interim and final remedial measures under CERCLA are effective.

Groundwater migration is controlled by natural and man-made means. Migration is limited because the rate of groundwater flow is very low and there are natural attenuation processes for parathion and PNP and natural adsorption for PCBs and metals. These natural processes combined with the existing interceptor well systems control the migration of constituents from the Facility. In addition, perimeter monitoring has indicated that with only two potential exceptions (OW-21A and OW-10 areas), impacted groundwater is contained within the Facility boundary.

The contaminant migration behavior for the prevalent constituents of interest found in both groundwater and soil (PCBs, parathion, PNP, 1,2-dichlorobenzene, 1,4-dichlorobenzene, chlorobenzene, benzo(a)pyrene, pentachlorophenol, o,o,o-triethylphosphorothioate, arsenic, cobalt, lead, mercury, manganese, and nickel) was reviewed. Although some research has provided positive indications for the degradation of PCBs in the natural environment, adsorption primarily controls PCB distribution. With a low solubility and a high partitioning coefficient, PCBs are not very mobile in groundwater. As a result, areas with PCBs detected in groundwater are generally localized and represent a number of discrete releases, instead of wide-spread occurrences. PNP and parathion are more mobile in groundwater; both, however, degrade biologically. Volatile organic compounds and semi-volatile organic compounds (with the exception of PNP as described above) are not prevalent across the Facility, and only isolated detections have been reported above the appropriate CCLs.

The prevalent metals at the Facility have varying degrees of mobility. For instance, mercury has a high partitioning coefficient limiting its mobility, while manganese's mobility varies widely depending on the cation exchange capacity. However, the clay soils and the relatively low concentrations measured for many of the metals act to limit mobility at the Facility. Groundwater migration from the closed South Landfill and the SWMUs in the vicinity of WMA II, which were initial source areas, is currently being addressed by two groundwater corrective action systems.

2.8 Summary of Risks

The HHRA completed by CDM Federal Programs Corporation (CDM) under the direction of EPA, was finalized on February 1, 2008 (CDM, 2008). The purpose of the HHRA was to characterize the potential risks to human health associated with exposure to constituents identified at the Facility. The Constituents of Potential Concern (COPCs) for the Facility were identified in the HHRA, and, the final list of COCs to be used throughout the FS was developed based upon these COPCs.

The OU-3 area covers approximately 138 acres and includes the active plant area, buildings, access roads, smaller grassed areas, and the closed South and West End Landfills. Many interim measures have been implemented at the Facility resulting in approximately 72% of the area being covered with asphalt pavement, concrete pavement, buildings, soil or gravel covers reducing the potential for direct contact with contaminated soil. Throughout OU-3, approximately 27% of the area is covered with impervious covers such as buildings, asphalt and concrete pavement, and HDPE liner systems. An additional 19% is covered with relatively impervious grass and soil covers. The soil covers placed to isolate PCBs from direct contact typically have a low permeability (the permeability of in-place residual soils are on the order of 1.0×10^{-5} to 1.0×10^{-7} cm/sec) and are thus relatively impervious. Approximately 26% of the OU-3 area is covered with gravel covers to prevent direct contact and reduce the mobilization of PCB-containing soil. In the HHRA, OU-3 was separated into four areas - the Facility area; the closed South Landfill; the closed West End Landfill; and off-Site areas. A description of each is provided as follows:

- Facility Area – The Facility area covers approximately 68 acres and includes the active plant area and administration building. Currently, the Facility is used for industrial purposes only and is under 24-hour security controls restricting access to authorized personnel only. In addition, the use of groundwater for any purpose, as well as non-industrial land use, is strictly prohibited by deed restrictions. The plant mandates health and safety procedures in accordance with Occupational Safety and Health Act (OSHA) requirements for its workers;

- Closed South Landfill – this landfill covers approximately 53 acres where significant interim measures have been completed. These measures effectively prevent exposures to landfill contents. The landfill has been closed with engineered caps with vegetative covers and is enclosed with fencing and other access controls (warning signs and locked gates). These controls are effective at reducing the potential for trespassing. Operation and maintenance of the landfill are on-going and include mowing, general maintenance and routine inspections of the landfill caps, fencing, access controls, surface water management structures, and access roads.

- Closed West End Landfill – this landfill covers approximately 17 acres. Similar to the closed South Landfill, significant interim measures have been completed at

the closed West End Landfill. These measures effectively prevent exposures to landfill contents. The landfill has been closed with engineered caps with vegetative covers and is enclosed with fencing and other access controls (warning signs and locked gates). These controls are effective at reducing the potential for trespassing. Operation and maintenance of the landfill interim corrective measures (ICMs) are on-going and include mowing, general maintenance and routine inspections of the landfill caps, fencing, access controls, surface water management structures, and access roads.

- Off-Site Areas – the areas immediately surrounding the Facility include commercial properties, vacant property owned by Solutia, and some residential properties. Only four active wells were identified within a one-mile radius of the Facility, none of which are used for drinking water since all residents in the area obtain water from the local water utility[1].

The media evaluated in the HHRA included surface soil, subsurface soil, ambient air, and groundwater. Surface water is not a medium of concern at the Site as there are no permanent surface water bodies within OU-3. The potentially exposed receptors identified in the HHRA include the operations area worker, operations and maintenance (O&M) worker, construction worker, trespasser, and off-Site resident. Different receptors were evaluated for different areas within OU-3. For example, in the Facility area the receptors include the operations area worker, O&M worker, construction worker, and trespasser while the landfills only include the O&M worker and trespasser. Off-Site receptors include residents. Each receptor is exposed to media differently as described below.

The HHRA calculated risks for each receptor based on two conditions: current use and future use. The current use is the more relevant when assessing risk since it is meant to assess existing conditions within OU-3. The future use scenarios assume that no further remedial actions are implemented at the Site and that some of the interim measures already completed, such as covered surfaces within the plant area and deed restrictions for groundwater use, are no longer maintained. Risks calculated for future conditions are hypothetical and should only be used to guide risk management decisions.

Generally, EPA uses a target cancer risk range of 10^{-6} to 10^{-4} (1 in 1,000,000 to 1 in 10,000) to evaluate the need for remediation or mitigation at a site. Cancer risks below 1 in 1,000,000 are typically assumed to be de minimus and would require no remediation or mitigation. Risks within the risk range are typically considered acceptable, but decisions on whether to remediate or mitigate risks that fall in this range are made on a site-specific basis. Risks that exceed 1 in 10,000 often require

[1] Note that these areas are actually part of OU-2; however, they include monitoring wells that monitor OU-3.

remediation and/or mitigation; however, no "bright line" has been established at the upper end of the risk range, and again, risk management decisions are made on a site-by-site basis.

For non-cancer hazards, EPA typically uses a target hazard index (HI) of unity (one). Where HIs exceed this target, remediation and/or mitigation may be indicated. However, no bright line is established at an HI of one, and risk management decisions are made on a site-by-site basis. Estimates of cancer risk and hazard indices are compared to the above targets as a means of providing perspective on levels of risk and hazard for the risk manager.

The HHRA considered several current and future use scenarios and receptors, as indicated on Table 2-1. The following presents a summary of the conclusions of the HHRA:

- Risks for the current facility operations area worker slightly exceed EPA's acceptable risk range. These risk estimates were calculated from data that included concentrations from one soil sampling location in a remote, unoccupied portion of the Facility Area that has since been excavated and removed from the Facility (SSRI-11). If data from this sample (SSRI-11) were excluded, risk estimates would fall within EPA's acceptable risk range;
- Risks for the current facility O&M worker and trespasser are within or only slightly exceed EPA's acceptable risk limit;
- Risk for the facility construction worker exceed EPA's acceptable risk range for non-carcinogenic exposure;
- Exposure to ambient air alone does not pose unacceptable risks to any of the receptors evaluated including the off-Site resident;
- No unacceptable risks were associated with the closed West End Landfill, and risks at the closed South Landfill were below or only slightly within the EPA risk range; and
- Risks associated with future, hypothetical groundwater exposures exceed EPA's acceptable risk range.

In addition, a biological survey and habitat assessment were performed to evaluate habitat characteristics in OU-3. Since the Facility is expected to continue operations for the foreseeable future, a risk-management decision was made that no further assessment of ecological risk is necessary. Any actions taken to protect human health risk at the Facility will reduce risk to ecological receptors. If all operations at the Facility cease, ecological risks should be re-evaluated.

3.0 SUMMARY OF EXISTING CONDITIONS

3.1 Introduction

Investigations at OU-3 have extended over the last 30 years, and a multitude of interim and final corrective measures have already been completed. This section provides a summary of the existing conditions at OU-3 including a description of the corrective measures that have been completed. The existing conditions including previously completed corrective measures are shown on Figure 3-1. The Facility previously operated two WMAs (WMA I and WMA II). These WMAs were closed in compliance with provisions contained in the Facility's RCRA Permit. Additionally, P/S has installed corrective action systems and completed numerous ICMs under the Facility's RCRA Permit or through actions taken to decommission discontinued operations. The goal of these ICMs is to control or abate threats to human health and the environment from releases at the Facility. These ICMs were completed as interim measures in order to expedite approval and construction under RCRA.

These closures, corrective action systems and ICMs (collectively, completed corrective measures) were completed for individual SWMUs and for other locations at the Facility, and have been shown to be effective at producing major reductions in the concentrations and/or mobility of chemicals in various media. However, additional remediation is required at the Facility as described in this FS. These corrective measures have included landfill capping, contaminated soil excavation, in-plant surface improvements (e.g., pavements), decommissioning of units and tank removals, and the installation and operation of groundwater corrective action systems. As a result of these measures, the majority of the plant surface area is covered with asphalt pavement, concrete pavement, buildings, soil and gravel covers, as shown on Figure 3-1, which limits access to underlying soil. The closed South Landfill and West End Landfill covers have eliminated direct contact with landfill contents and have prevented off-Site migration of contaminated soil from these locations.

The WMA closures and corrective action systems completed for OU-3 were approved by the ADEM as part of the Facility's RCRA Permit. Prior to falling under CERCLA jurisdiction, P/S were in the process of gaining approval from ADEM under RCRA for the extensive interim measures that had been completed at the Facility. However, before P/S could complete the approval process, the EPA assumed regulatory control of the Site from ADEM. At that time, the completed interim measures became the baseline for considering additional remediation requirements in the CERCLA process. The HHRA and the Ecological Risk Assessment were completed using these existing conditions as the basis for the evaluations. For compliance with the Facility's RCRA Permit under the authority of

ADEM, P/S must continue to operate and maintain existing corrective measures completed at the Facility including operation of the installed corrective action systems. Any remedial actions required under CERCLA will be in addition to the extensive work already completed under RCRA. Once finalized, it is anticipated that these completed corrective measures and CERCLA Remedial Actions will be accepted and approved under RCRA as part of the Facility's RCRA permit.

The following sections describe the completed corrective measures and the associated O&M activities required to maintain the integrity of the implemented measures.

3.2 RCRA Closures, Corrective Actions and Interim Corrective Measures

Over the past 30 years, P/S has completed two approved RCRA closures, installed and operated four groundwater corrective action systems (which have subsequently been combined into two corrective action systems), and completed numerous ICMs. The following sections of this report describe these completed corrective measures.

3.2.1 Final RCRA Closures

Two cells (Cells 4E and 5E) of the South Landfill were operated as hazardous waste disposal cells under RCRA and are designated as WMA I. The two cells were closed with a RCRA compliant cap in 1989. From the bottom up, the RCRA compliant cap consists of a 24-inch thick compacted clay base, a 12-inch thick sand drainage layer, a geotextile fabric layer, and a 24-inch thick soil cover layer with vegetation. ADEM provided certification of the WMA I closure in August 1989.

WMA II consisted of a limestone bed, storage area, and sump and was used to partially neutralize acidic wastewaters generated by the parathion intermediates operation, prior to biological treatment in the Facility's former WWTF from 1977 to 1988. WMA II was closed as a landfill in 1988 by removing the unit to a depth of 12 feet bgs, backfilling and vegetating the soil cover. ADEM certified this area closed in July 1988. Both areas are inspected as part of the routine O&M activities at the Facility.

3.2.2 Groundwater Corrective Action Systems

The existing groundwater corrective action system at the Facility consists of two systems: the SWMU 1 Corrective Action System[2] and WMA II Corrective Action System. The SMWU 1 Corrective Action System addresses constituents released to groundwater from the closed South Landfill. The WMA II Corrective Action System, previously referred to as the Old Limestone Bed Surface Impoundment (OLBSI) Corrective Action System, addresses groundwater impacts resulting from releases from the OLBSI (SWMU 8), a Former Lagoon (SWMU 9), and the New Limestone Bed Surface Impoundment (WMA II). Note that SWMU 8 and SWMU 9 were deferred to EPA by ADEM in the RCRA Post-Closure Permit issued on October 31, 2008. A description of each of these corrective action systems follows:

- **SWMU 1 Corrective Action System** - Interceptor wells IW-1, IW-2, IW-3, and IW-4 were installed at SWMU 1 in 1982 to intercept and recover shallow groundwater from the western side of the subsequently closed South Landfill. Interceptor wells IW-5 and IW-6 were installed later in 1982, and IW-7, IW-8, IW-9, IW-10, IW-11, IW-12, and IW-13 were installed in late 1987 through early 1988. These wells were installed to intercept and recover groundwater along the northern side of the landfill. Interceptor wells IW-14[3] and IW-15 were installed in 1987, and the pumping operations began in early 1988 to intercept and recover groundwater from the plant area downgradient of the closed South Landfill. These three systems have since been combined into the SWMU 1 Corrective Action System. Interceptor wells IW-1, IW-3, IW-4, and IW-15 were deactivated in 1998 pursuant to the RCRA Permit, but the wells are still maintained for water level measurement. Extracted groundwater from each of the recovery wells except IW-10 is pumped to an equalization basin and then discharged to the Anniston POTW. Groundwater from IW-10 is passed through a carbon filtration system before discharging to the equalization basin. The flow rate from the SWMU 1 extraction system is less than one gpm on average. While the RCRA Post-Closure Permit does not name the SWMU-1 Corrective Action System specifically, it is included in monitoring and financial assurance requirements stipulated in the Permit.

- **WMA II Corrective Action System** – This system was installed in 1988, and recovery operations began in February 1989. The WMA II system originally consisted of six interceptor wells (IW-16 through IW-21). Well DW-01 was subsequently incorporated into the interceptor well system in 1997 (Golder, 2002). In 2003, four additional interceptor wells were installed as part of the Supplemental RFI Program to improve the effectiveness of the collection system (IW-22, IW-23, IW-24, and IW-25). Groundwater removed from the recovery wells is pumped to a collection tank, and then pumped to an equalization basin which discharges to the Anniston POTW. The flow rate from this extraction system is generally less than two gpm.

The effectiveness of the two existing Groundwater Corrective Action Systems was evaluated in the RFI/CS Report (Golder, 2002). Based on an evaluation of pumping test data, potentiometric data and

[2] The SWMU-1 Corrective Action System was formed by combining three formerly separate corrective action systems (the west landfill, north landfill, and plant corrective action systems).
[3] In 2003, IW-14 was replaced with IW-14A to address construction problems with the original interceptor well.

water quality data from the interceptor wells and observation wells, it is apparent that these systems have been effective at removing constituents from groundwater and mitigating the downgradient transport of these constituents. Concentrations of parathion and PNP from data collected in 1989 were compared to concentration data collected in 1996. Over this seven-year period, the size of the area of impact decreased substantially, as did the magnitude of concentrations. Consequently, the groundwater impacts from the closed South Landfill are controlled from migrating off the Facility. Effectiveness of the WMA II Corrective Action System is monitored with observation wells MW-14, MW-09A, MW-08, OW-22, T-04, MW-07, and OW-21A. Analytical results for all of these wells, with the exception of OW-21A, have been favorable with either no or low-level detections of constituents.

3.2.3 Interim Corrective Measures

Prior to the mid-1990s, P/S completed numerous ICMs that consisted mostly of contaminated soil excavation, in-plant surface improvements (e.g., pavements), and decommissioning of units and tank removals. These ICMs have been described in the RI Report. Additionally, beginning in the mid-1990s under the RCRA Corrective Action Program, P/S completed extensive ICMs to cover existing landfills, manage surface water flow through the Facility, and remediate potential contaminant exposure areas. These corrective measures were completed as interim measures in order to expedite approval and construction under RCRA. A complete list of RCRA Final Closures and ICMs completed at the Facility is provided in Table 3-1. The inspection and maintenance of these measures have been incorporated into the O&M Program for the Facility. The more extensive ICMs are described below.

3.2.3.1 Plant Site

Soil sample SSR-18 was collected near the Waste Drum Satellite Accumulation Area and yielded the highest PCB concentration reported in soil of 16,620 J mg/kg. The sample location is located immediately downgradient from the former PCB Production Area. As part of the ICMs completed at the Facility, this area was partially excavated and covered with a concrete cap. The area is inspected and maintained as part of the Site's O&M Program.

Sample location SSRI-11 is located on the plant site west of Clydesdale Avenue and north of the employee parking area. Samples were originally collected at SSRI-11 in conjunction with the RI program. A primary surface sample and field duplicate sample were collected from the 0 to 6-inch depth interval, while a depth sample was collected from this location at 3 to 4 feet bgs. PCBs were

detected in the primary surface sample at an estimated (i.e., "J" laboratory qualifier) concentration of 930 milligrams per kilogram (mg/kg), greater than the principal threat waste threshold of 500 mg/kg. The PCB concentration for the field duplicate surface soil sample was 154 mg/kg. The depth sample showed a PCB concentration of 1.89 "J" mg/kg, thereby providing vertical delineation of the principal threat waste material at 3 feet bgs. P/S implemented delineation sampling and a removal action to address "principal threat waste" material at SSRI-11. The material was delineated and subsequently removed and disposed at a TSCA-approved landfill (Golder, 2010b).

3.2.3.2 Closed West End Landfill

The closed West End Landfill is located along the western boundary of the Facility and operated as a single landfill cell from approximately 1930 to approximately 1960. The landfill received production wastes and general trash from the Facility. Refer to Section 2.2.3 and Appendix A-1 of the RI Report for information regarding past on-site disposal practices at the closed West End Landfill.

Following an investigation of the landfill in 1994, ADEM and the EPA approved a plan for stormwater improvements and an upgrade to the cap that had been placed on the area. The specific ICMs included the following:

- Construction of a multi-media cap and a soil cover on the landfill and immediately surrounding area. The cap included a six-inch thick compacted clay foundation layer, a 60-mil thick textured HDPE geomembrane liner, a geosynthetic drainage layer consisting of a continuous non-woven geotextile and one-foot wide and one-inch thick geosynthetic wick drains placed every 50 feet, an 18-inch thick soil cover layer, and a vegetative layer. The geosynthetic drainage layer daylights into a ditch that runs along the toe of the western and northern slopes of the covered area; and
- Collection of stormwater run-off from the landfill and installation of hard piping to transport run-off through areas of affected soils. This allowed the closure of drainage ditches with affected sediments. Surface water from the West End Landfill drains to DSN 006 and not through the upgraded stormwater collection system.

These measures were completed in 1996. The effectiveness of these completed corrective measures is demonstrated by the following:

- The cover system remains intact, and there have not been any significant erosion, slides, or geotechnical failures. The cover system has been effective at reducing exposures to landfill content as was demonstrated by the HHRA which indicated no unacceptable risk associated with the landfill;
- Although historical emissions of PCBs from the West End Landfill may have occurred, an extensive air pathway monitoring study was conducted documenting that air impacts are

currently low, consistent with ambient conditions in other areas of the United States, and concluding that the closed West End Landfill is not now considered a unique source for PCBs in air;

- Stormwater runoff from the landfill was routed to a stormwater outfall designated as DSN-006. Surface water monitoring at this outfall reported no detections for PCBs between December 1997 and May 2001. As a result, monitoring at this outfall is no longer required as per the Facility's NPDES Permit. Therefore, the landfill is effective at minimizing the migration of constituents through surface water. However, if a containment remedy is selected for this area, stormwater discharge monitoring may be necessary to verify that interim and final remedial measures under CERCLA are effective; and

- Access restrictions (perimeter fencing and signage) have been effective at minimizing the potential for trespassers. As indicated in the HHRA, there are no unacceptable risks associated with a trespasser at the landfill.

3.2.3.3 Stormwater Drainage System

The stormwater drainage system is a Facility-wide network of catch basins, sewers, and lined and unlined storm drainage ditches. The system includes approximately 22,150 linear feet of underground piping and open trenches. The majority of the system consists of piping of varying age and construction, including vitrified clay, reinforced concrete and polyethylene materials. Pipe sizes range from 2 inches to 36 inches in diameter. The Facility's NPDES Permit previously allowed the discharge of non-contact cooling water and condensate through the stormwater sewer system. However, in 1996, all of this process-related water was re-piped to discharge to the former WWTF. Consequently, only stormwater is discharged through the stormwater drainage system. The stormwater system is permitted by ADEM and currently includes one regulated NPDES outfall (DSN 012).

In 1997, additional sewer system enhancements were constructed. These enhancements included sealing a number of unused collection sewers which discharged into a trunk main that was lined with an epoxy resin-impregnated felt liner. The trunk main discharges to one of the previously designated NPDES monitoring points, DSN 001, which discharges to DSN 012. The effectiveness of this corrective measure has been demonstrated through quarterly surface water sampling at DSN 012, conducted in accordance with the Facility's NPDES Permit. However, some areas of the Facility do not drain to the upgraded stormwater collection system. These areas are primarily in the northwest portion of the Facility and include the closed West End Landfill and adjacent areas. In accordance with the Facility's current NPDES permit, DSN 004 and DSN 006 continue to discharge stormwater from these areas but are not currently monitored. They were both removed from the NPDES sampling program after sources of potential impacts were removed or mitigated and data collection indicated no further monitoring was necessary. Should containment be selected as a remedy,

stormwater discharge monitoring may be necessary to verify the continued effectiveness of interim and final remedial measures under CERCLA.

All process wastewater from the Facility is discharged to the Anniston POTW through discharge point DSN 002, permitted through the Facility's SID Permit (Permit No. IU 35-08-00048).

3.2.3.4 Closed South Landfill

The closed South Landfill previously operated with ten individual cells from 1960 to 1988 and was used for the disposal of production wastes, demolition materials, and general trash from the Facility. Two of the cells (Cells 4E and 5E), as previously described, were closed with RCRA compliant caps in 1989 (WMA 1). Refer to Section 2.2.1 and Appendix A-1 of the RI Report for information regarding past on-site disposal practices at the closed South Landfill. Initially, the remaining cells in the South Landfill, closed prior to the effective date of RCRA, were covered with compacted soil and a vegetative layer. In 1997 and 1998, additional ICMs were constructed for the South Landfill to reduce the infiltration of surface water into the landfill and prevent the transport of affected soils. These measures included the following:

- Upgraded portions of the cap consisting of a 6-inch soil layer, a 40-mil thick textured HDPE geomembrane, a geocomposite drainage layer, an 18-inch thick soil cover layer, and a 6-inch thick topsoil layer with vegetative cover. Additionally, a 12-inch thick soil cover and vegetative layer were placed above a non-woven geotextile layer over adjacent areas of the closed South Landfill;
- Construction of a retention structure to collect stormwater run-off from the landfill; and
- Diversion of stormwater run-on from unaffected areas upstream of the landfill, and installation of culverts to pass this stormwater through areas of affected soil prior to discharging from the Facility. This allowed for the closure of ditches containing affected sediments.

The closed South Landfill is subject to long-term monitoring and maintenance under provisions of the Facility's RCRA Permit. The effectiveness of these completed corrective measures is demonstrated by the following:

- The cover system remains intact, and there have not been any significant erosion, slides, or geotechnical failures. The cover system has been effective at reducing exposures to landfill content as was demonstrated by the HHRA which indicated no unacceptable risks associated with the landfill;
- Although historical emissions of PCBs from the South Landfill may have occurred, an extensive air pathway monitoring study was conducted documenting that air impacts are

currently low, consistent with ambient conditions in other areas of the United States, and concluding that the closed South Landfill is not now considered a unique source for PCBs in air;

- Data from the surface water monitoring station (DSN-012), which includes runoff from the landfill, indicates mostly no or low-level detections of PCBs in the years following construction of the stormwater system enhancements. These data indicate that the South Landfill stormwater system enhancements and cover systems have been effective at minimizing the migration of constituents through surface water transport;
- As discussed in the RI Report, it appears that the water levels across the landfill have lowered due to upgrades in the cap and redirection of surface water run-off away from the landfill. This drop in the water table indicates that the amount of infiltration entering the landfill has been reduced; and
- Access restrictions (perimeter fencing and signage) have been effective at minimizing the potential for trespassers. As indicated in the HHRA, there are no unacceptable risks associated with a trespasser at the landfill.

Further evaluation of the closed South Landfill with respect to soil impact areas is presented in Section 5.3.1.

3.2.3.5 MCC Warehouse

The MCC Warehouse is a pre-engineered, slab on grade, single span, rigid frame steel building measuring 300 feet long by 120 feet wide. The building was identified as a potential source for low level PCBs detected in stormwater run-off from the Facility. ICMs completed included the following:

- Removal of all visible PCB residues and subsequent cleaning of all exterior foundation walls and drainage ditches;
- Removal of loose dust and debris from affected areas;
- Dismantling and replacing affected building components (e.g. siding and supports);
- Decontamination of affected areas of the concrete floor, steel columns, exterior foundation walls and concrete ditches;
- Encapsulation of decontaminated concrete surfaces; and
- Placement of an asphalt cap over an adjacent rail spur.

To evaluate the effectiveness of this ICM, voluntary industrial hygiene surveys were conducted at the MCC Warehouse during the winter and summer months of 2004. These surveys indicated airborne PCB concentrations were well below the OSHA permissible exposure limit (PEL). Specifically, the surveys included a total of 23 personnel and area samples, with 15 (65%) of the samples showing no

detectable levels of PCBs. The maximum PCB concentration detected was 0.0013 milligrams per cubic meter (mg/m^3; approximately 750 times below the OSHA PEL of 1 mg/m^3).

3.2.4 Cost Summary

P/S has conducted extensive corrective measure activities for OU-3 through completion of RCRA final closures, the installation of corrective action systems, and the completion of ICMs. Many of the ICMs were completed prior to the 1990s, and cost information for completing these activities has not been retained. Therefore, this summary of costs only includes the cost to implement the final RCRA closures and substantial ICMs completed at the Site after 1995. As described above, many of the more extensive ICMs were completed after 1995 under RCRA. Although portions of the groundwater corrective action system were completed prior to 1995, the costs presented below include an estimate for the installation of the current active system. The capital costs are presented below in 2010 dollars:

Completed Remedial Measures	Capital Cost (2010 dollars)	Comments
WMA I	$840,000	Costs have been calculated based on estimated 2010 unit rates.
WMA II	$30,000	Costs have been calculated based on estimated 2010 unit rates.
SWMU I Corrective Action System	$210,000	Costs have been calculated based on estimated 2010 rates for installing interceptor wells plus 20% for piping and instrumentation.
WMA II Corrective Action System	$140,000	Costs have been calculated based on estimated 2010 rates for installing interceptor wells plus 20% for piping and instrumentation.
Closed West End Landfill with Stormwater Improvements	$4,200,000	Actual costs escalated to 2010 dollars[4].
Stormwater Drainage System Improvements	$1,700,000	Actual costs escalated to 2010 dollars.
Closed South Landfill with Stormwater Improvements	$15,200,000	Actual costs escalated to 2010 dollars.
MCC Warehouse Improvements	$240,000	Actual costs escalated to 2010 dollars.

As shown above, the cost to complete the RCRA closures, install the corrective action systems and complete the above listed ICMs was over $22,500,000 expressed in 2010 dollars. These costs represent a portion of the amount of capital improvements completed by P/S for OU-3 prior to

[4] A 3% rate of inflation was used to convert to 2009 dollars.

initiating the CERCLA process with the EPA. This estimate is conservative since it does not include the ICMs completed prior to 1995. Since the completion of these corrective measures represents the beginning of the CERCLA process, these previously incurred capital costs are not included in the detailed analysis of alternatives, but are presented to document the substantial remedial efforts that have been undertaken at the Facility to date. The cost of future obligations for O&M activities associated with these completed measures is included in the detailed analysis of alternatives, with the exception of the no action alternative. Although some of these obligations are required under Solutia's RCRA Permit, P/S maintain that many of these elements have never been approved under RCRA as final corrective measures and that the future obligations to maintain these measures are not presently covered under the RCRA Permit. Therefore, P/S have included these items under CERCLA to have them approved with the final remedy selected for the Site.

3.3 Operation and Maintenance Activities

3.3.1 Groundwater Monitoring Program

The current RCRA Permit has an effective date of October 31, 2008. Under RCRA, two groundwater monitoring programs (the detection monitoring program and the corrective action effectiveness program) are currently in effect at the Facility. Both programs consist of semi-annual and annual sampling and water level measurements. The Groundwater Detection Monitoring Program consists of three downgradient point-of-compliance monitoring wells and one background well, all of which monitor WMA I, the closed Hazardous Waste Cells 4E and 5E in the eastern portion of the closed South Landfill.

The Corrective Action Effectiveness Program consists of monitoring the existing corrective action systems: the SWMU 1 Corrective Action System and the WMA II Corrective Action System. Each of the corrective action systems includes a series of recovery wells and monitoring wells. The monitoring wells are subdivided into effectiveness wells, point-of-compliance wells, and boundary wells. Currently, the corrective action system for WMA II and the groundwater detection monitoring system for WMA I are regulated by ADEM under the October 31, 2008 RCRA Post-Closure Permit. Additionally, while the RCRA Post-Closure Permit does not specifically name the SWMU 1 Corrective Action System, it is included in monitoring and financial assurance requirements stipulated in the Permit. EPA is in ongoing discussions with ADEM regarding the respective roles of the agencies during and following selection of the CERCLA groundwater remedy. Based on the language of the RCRA Post-Closure Permit, it appears that any continued monitoring of these three

regulated units would continue under the permit conditions, independent of any long-term monitoring program developed for the purposes of the CERCLA groundwater remedy.

3.3.2 Comprehensive Operations and Maintenance Program

As discussed, the Facility has two waste management areas (WMA I and WMA II) subject to post-closure care requirements under RCRA. Additionally, on-Site corrective actions and ICMs are monitored under a Site-wide O&M program. O&M requirements are described in the "Comprehensive Operations and Maintenance Plan for Remedial/Corrective Action Projects (O&M Plan), Solutia Inc., Anniston Alabama," Revision 3.0, dated July 2007. This O&M Plan includes the organization and documentation requirements, and a description of routine inspection, maintenance and repair activities for a number of O&M activities at the Facility.

A variety of protective systems have been installed as part of the corrective measure activities. These systems include:

- Protective soil, asphalt, concrete and paint covers;
- Engineered multi-layer covers;
- Security fences, signs and access roads;
- Groundwater interceptor well systems;
- Groundwater monitoring well systems;
- Surface water monitoring systems; and
- Surface water management systems including sediment ponds, piping, erosion control berms, and grassed and riprap-lined channels.

The on-Facility projects that are individually addressed in the O&M Plan include the following:

- The South Landfill Cover System;
- SWMU 1 Corrective Action System;
- WMA I Cover System;
- The South Surface Water Diversion Berm;
- The West End Landfill Cover System;
- WMA II Cover System;
- OLBSI Cover System;
- WMA II Corrective Action System;
- The MCC Warehouse;

- The Lined Plant Sewer System; and
- The Carbon Treatment Unit for the SWMU I Corrective Action System.

3.3.2.1 Inspections

Routine inspections are conducted by the field inspector(s) on a weekly, monthly, quarterly and/or semi-annual basis. Additional inspections are performed following significant storm events that occur at the Site. During inspections, an area, system, or item identified as requiring maintenance and/or repair is marked with survey staking and/or flagging and the needed work is described on the appropriate forms. Inspections are focused on the security systems, cover systems, surface water control features, etc. For the security systems, inspection items include: access controls such as fences, gates, and locks; and reference items such as access roads, benchmarks, survey monuments, and warning signs. The following items are inspected and, if required, identified for repair:

- Locks: inspect to make sure they are operational and have not been vandalized;
- Warning signs: confirm that signs are still posted and are legible;
- Fencing and gates: walk fence perimeter to identify breaks in the fence that may have occurred due to vandalism or fallen trees, and inspect gates to make sure they are operational;
- Access Roads: identify erosion, pot holes, depressions, water ponding, fallen trees, or other conditions that would restrict passage; and
- Benchmarks and survey monuments: inspect for accessibility and integrity.

A visual inspection of the condition of the cover system's surface is also performed. The cover inspections include observation of the following:

- Poor vegetation (e.g., bare or unvegetated areas);
- Whether mowing and /or seeding and fertilizing is required;
- Differential settlement producing areas of ponding;
- Significant surface erosion;
- Significant surface soil/asphalt/concrete cracking; and
- Other disturbances such as fallen trees that may adversely affect cap performance.

Visual inspection of the conditions of the surface water management components is performed. The inspections include observations of the following:

- Ponds (although not technically part of OU-3, the pond collects stormwater from OU-3) including conditions of vegetation, water elevation, inlet and outlet structures;
- Presence of debris, silt, or other blockages at headwalls, inlets and outlets, culverts, and pipes;
- Conditions of manholes and covers;
- Blockage or breaks in pipes;
- Standing water in the Facility and ditches and channels; and
- Other observations to determine whether the surface water drainage system functions properly, repairs are needed, and the type of repairs that are appropriate.

3.3.2.2 Maintenance

Procedures for providing maintenance, and for repairing deficiencies identified during routine inspections, are discussed in the O&M Plan. The field inspector records, initiates, and tracks needed maintenance and/or repairs until they are completed. Properly trained and qualified Solutia personnel or contract personnel perform the necessary maintenance and/or repairs. Maintenance and/or repairs are documented on the proper form or a SAP (Systems, Applications and Products in Data Processing; Proprietary Software) System completion report.

No regular maintenance is scheduled for the security measures. Repairs are made as necessary to correct items identified during routine inspections or at other times. Possible repairs include:

- Replacement of gate locks;
- Repairs to fencing and gates;
- Replacement of signs;
- Replacement of benchmarks or survey monuments;
- Placement of soil in areas where there is a breach below the fence;
- Placement of coarse aggregate material and/or regrading to eliminate low spots or potholes; and
- Removing fallen trees from access roadways and top of fences.

Cap and cover systems with vegetated surfaces are mowed and fertilized on an as-needed basis or as otherwise required by the O&M Plan. Specific mowing and fertilizing of vegetated surfaces are performed in the Spring and the Fall. Paths for access to wells and/or other monitoring locations are mowed to a height of about 6 inches and maintained at about the same location during each mowing. Repairs are performed on the items identified during routine inspections or identified at other times. Possible repairs include:

- Reseeding and fertilizing areas having insufficient vegetation;
- Correcting erosion damage by placement and compaction of soil and revegetation;
- Repairing surface damage caused by fallen trees, which may include removal of the tree and attached roots, placement and compaction of low-permeability cover soil and surface re-vegetation;
- Repairing cracks in soil covers that might allow excess infiltration. Repairs are accomplished by excavating along the crack to a depth of 6 inches below the crack and compacting the existing cap materials. Where necessary, additional material is added to achieve the proper grade, and the repaired area is re-vegetated;
- Repairing damage or disturbances by people or equipment;
- Removing undesirable vegetation growing on the cover or access roads; and
- Removing woody vegetation.

Maintenance and/or repairs of the surface water management system are completed as needed and indicated by the inspections. Possible repairs and action items include the following:

- Ponds (although not technically part of OU-3, the pond collects stormwater from OU-3) – reseeding, repairing erosion, riprap replacement, adjusting inlet and outlet structures, replacing/repairing structures, and cleaning out of sediment/silt/trash;
- Repairing erosion on ditches, berms, headwall areas, culvert openings, and discharge areas;
- Regrading to restore positive flow;
- Replacing and repairing damaged pipes/culverts; and
- Cleaning out sediment/silt/trash from structures.

As Remedial Actions are completed under CERCLA, P/S will incorporate those actions into a final comprehensive O&M Plan for the Site.

3.3.3 O&M Cost Summary

The total present worth cost of implementing the current O&M program detailed above is summarized in the following table which estimates, in 2010 US dollars, 30 years of continuous O&M activities and contingencies.

Annual Operation & Maintenance (O&M)				
	Unit Costs	**Units**	**Quantity**	**Estimated Cost**
Maintain Residential and Groundwater Deed Restrictions (includes costs of legal counsel)	$5,000	Annual	1	$5,000
Monitoring and Reporting for Groundwater Corrective Action System and Other Site Wells (Semi-Annually)	$42,500	Semi-Annual	2	$85,000
Maintenance Costs (Required upgrades and replacement to existing systems: landfills, ICMs, wells, pumps, surface covers, etc.)	$45,000	Annual	1	$45,000
NPDES Monitoring and Analytical Costs	$10,000	Annual	1	$10,000
Electricity	$5,000	Annual	1	$5,000
ANNUAL O&M COST				**$150,000**
Discount rate over time	7%	for	30	years
PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)				**$1,861,000**

Notes:
1. All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

3.4 Security

The OU-3 area is fenced with a seven-foot high chain link fence, topped with three strands of barbed wire. All gates into the manufacturing portion of the Facility or the landfills are kept locked at all times with the exception of the front main gate into the manufacturing portion of the Facility. The main gate is manned by a staff of security guards from 7:00 a.m. to 3:30 p.m., Monday through Friday, and is opened and closed during these hours to allow only authorized access into and out of the Facility. During off-shift hours, the main gate remains closed with access allowed only to authorized personnel.

3.5 Notices Required under RCRA for Disposal Facilities

The Solutia Anniston plant has two waste management areas (WMA I and WMA II) under RCRA that require notice and a survey plat indicating the location and dimensions of the disposal areas with respect to permanently established benchmarks. The required notices also include statements that:

- The property has been used to manage hazardous waste;
- The use of the land is restricted to activities that will not disturb the integrity of the final cover system, or monitoring system during the post-closure care period; and
- The survey plat and record of type, location, and quantity of the hazardous waste disposed of on the Facility are on file with the EPA Regional Administrator and ADEM.

The notices have been submitted to ADEM and EPA.

The Facility also includes a restriction on the property deed, in accordance with Alabama law, that will notify any potential purchaser of the property that:

- The property use has been restricted for industrial purposes only; and
- The use of groundwater underlying the Facility is restricted such that groundwater shall not be used for potable, industrial, agricultural, or any other supply purpose.

4.0 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

This section of the report describes the development of RAOs and provides a list of the RAOs for various media. As described in the RI Report, RAOs are not required for potential ecological receptors, as the Screening Level Ecological Risk Assessment conducted for the Facility concluded that there are no complete exposure pathways for such receptors. RAOs are used as the basis for developing a range of remedial alternatives that are analyzed more fully in the detailed analysis section of the FS. The RAOs for OU-3 were developed based on the RI and CSM (Section 2.0), Site background and completed corrective measures (Section 3.0), results of the HHRA (Section 2.8), media of concern and COCs (Section 4.1), an evaluation of potential impacts to groundwater from soil (Section 4.2), and potential federal and state ARARs (Section 4.3). The Remedial Goals, numerical targets for the COCs that are intended to guide the development and evaluation of remedial alternatives, are described in Section 4.4. Collectively, this information is used to develop the RAOs, which are presented in Section 4.5. The RAOs also build on, and refine Preliminary RAOs previously prepared for the Site in 2002 (P/S, *Technical Memorandum on Preliminary Remedial Action Objectives and Alternatives*, April 23, 2002) and subsequently clarified in 2005 (EPA, *Document Clarification, Anniston PCB Site, Anniston, Alabama*, August 19, 2005).

4.1 Media and Chemicals of Concern

The media of concern, based on the results of the RI program and the HHRA, include surface and subsurface soils and groundwater. Surface water is not a media of concern at the Facility as there are no permanent surface water bodies within OU-3. In addition, actions taken to control surface water drainage from the Facility are effectively controlling the transport of COPCs off of the Facility through this pathway. The HHRA determined that evaluation of surface water was not warranted. An extensive air pathway monitoring study was conducted documenting that air impacts are currently low and concluding that the closed South Landfill, closed West End Landfill, and Facility are not now a unique source for PCBs in air. Based on the results of this and previous studies, the air pathway does not contribute significantly to the total PCB risk. No unacceptable risks to any receptors were identified for ambient air; therefore, ambient air is not included as a medium of concern.

Following completion of the RI and the HHRA, constituents detected in various media at the Facility were evaluated to determine the COCs for the Facility based on the results of the investigation and risk assessment. Since there are no promulgated soil standards, the soil COCs include only those

constituents that were identified as risk drivers[5] in the HHRA. In groundwater, the COCs include those constituents that exceed a numerical standard (ARAR) or were risk drivers in the 2008 HHRA and/or the 2009 Addendum to the HHRA for exposures to groundwater. The following provides a list by media of the COCs with the reason that they are listed:

Surface Soil COCs based on potential site-specific risks as determined in the HHRA:

- PCBs
- arsenic
- benzo(a)pyrene
- dibenzo(a,h)anthracene
- dioxin TEQs

Subsurface Soil COCs based on potential site-specific risks as determined in the HHRA:

- PCBs
- arsenic
- dioxin TEQs

Groundwater COCs:

Constituent	Basis for Inclusion as COC
o,o,o-Triethylphosphorothioate	Risk Driver in 2009 Addendum to HHRA
1,1,2,2-Tetrachloroethane	Exceedance of RSLs
1,2,4-Trichlorobenzene	Exceedance of MCL
2,4,6-Trichlorophenol	Risk Driver in 2008 HHRA
PNP	Risk Driver in 2009 Addendum to HHRA
Benzo(a) pyrene	Exceedance of MCL
Beryllium	Exceedance of MCL
Cobalt	Exceedance of RSLs
Gamma-BHC	Exceedance of MCL
Indeno(1,2,3-cd)pyrene	Risk Driver in 2008 HHRA
Lead	Exceedance of MCL
Manganese	Exceedance of RSLs
Mercury	Exceedance of MCL
Methyl Parathion	Risk Driver in 2008 HHRA

[5] Risk driving chemicals are those chemicals that (1) have individual excess lifetime cancer risk levels of $1E\text{-}10^{-06}$ (or greater) or an HQ of 0.1 (or greater) in an exposure scenario that exceeds an excess cancer risk level of $1E\text{-}10^{-04}$ or an HQ of 1; and/or (2) exceed a state or federal ARAR.

Constituent	Basis for Inclusion as COC
Methylene Chloride	Exceedance of MCL
Parathion	Risk Driver in 2008 HHRA
PCBs	Exceedance of MCL
Pentachlorophenol	Exceedance of MCL
Tetraethyldithiopyrophosphate (Sulfotepp)	Risk Driver in 2009 Addendum to HHRA
Trichloroethylene	Exceedance of MCL

RSL – EPA Regional Screening Level

4.2 Evaluation of Soil Leaching to Groundwater

As described in Section 4.1, the media-specific COCs identified for OU-3 were based on the RI and HHRA. The RI Report also concluded that the leaching of constituents to groundwater has or could be occurring at the Facility. A preliminary screening evaluation was completed as part of the RI to determine the constituents in soil that have the potential to impact groundwater. The constituents retained from the preliminary screening were evaluated further through a more detailed screening process. The results of this second analysis indicate that the following constituents in soil have or could be leaching to groundwater and should be retained for evaluation in the FS:

- Lead,
- Manganese,
- Mercury, and
- PCBs.

As presented in the RI, of these constituents, only PCBs have established RGOs in soil based on potential human health risks.

This section evaluates Site-specific distribution data for each of these constituents to determine its potential to continue leaching to groundwater and thus contribute to on-going groundwater contamination at the Site. The evaluation was performed to identify areas within OU-3 that have elevated levels of these constituents in soil and corresponding impacts to groundwater in nearby wells above the MCLs or EPA Region IX PRGs. Where these conditions exist, and where ICMs have not been completed to address leaching, on-going leaching to groundwater may be occurring and should be evaluated as part of the remedy selection process. Each of the retained constituents is discussed below.

4.2.1 Lead

Figure 4-1 includes a comparison of lead concentrations in soil and groundwater. Since 1998, six wells have shown reported concentrations of lead in groundwater above the lead MCL of 15 µg/l. These wells include OW-09, OWR-5D, OWR-8S, WEL-01, WEL-02, and WEL-04. The data for these wells over the past ten years are presented below.

TABLE 4-1
Lead Concentrations in Groundwater

Well	Date	QA Type	Filtered (1)	Parameter	Value	Unit
OW-09	07/28/98	Original	No	Lead	ND	µg/l
OW-09	07/28/98	Original	Yes	Lead	18	µg/l
OW-09	06/29/05	Original	No	Lead	ND	µg/l
OW-09	06/29/05	Original	Yes	Lead	ND	µg/l
OWR-05D	08/10/98	Original	No	Lead	ND	µg/l
OWR-05D	08/10/98	Original	Yes	Lead	21	µg/l
OWR-08S	08/03/98	Original	No	Lead	ND	µg/l
OWR-08S	08/03/98	Original	Yes	Lead	27 J	µg/l
OWR-08S	08/03/98	Field Duplicate	No	Lead	6	µg/l
OWR-08S	08/03/98	Field Duplicate	Yes	Lead	45 J	µg/l
WEL-01	10/18/98	Original	No	Lead	33	µg/l
WEL-01	10/20/98	Original	Yes	Lead	ND	µg/l
WEL-01	06/29/05	Original	No	Lead	ND	µg/l
WEL-01	06/29/05	Original	Yes	Lead	ND	µg/l
WEL-02	10/17/98	Original	No	Lead	18	µg/l
WEL-02	10/18/98	Original	Yes	Lead	ND	µg/l
WEL-02	06/29/05	Original	No	Lead	ND	µg/l
WEL-02	06/29/05	Original	Yes	Lead	ND	µg/l
WEL-04	10/15/98	Original	No	Lead	16	µg/l
WEL-04	10/15/98	Original	Yes	Lead	ND	µg/l
WEL-04	10/15/98	Field Duplicate	No	Lead	ND	µg/l
WEL-04	10/15/98	Field Duplicate	Yes	Lead	ND	µg/l

ND – Non detect
(1) Filtered samples were collected through a 0.45-micron in-line filter followed by a 0.1-micron filter system.

The wells included in the table above fall into two categories: (1) Group 1: wells with 1998 detections that have since been non detect; and (2) Group 2: wells with detections in 1998 that have not been further analyzed for lead. Each of these groupings is discussed below:

- Group 1: OW-09, WEL-01, and WEL-02

  Although MCL exceedances were noted in these wells in 1998, more recent data collected were non detect for lead. This provides strong support that continued leaching to groundwater is not occurring in these areas, and the past exceedances observed were due to historical releases.

- Group 2: OWR-05D, WEL-04, and OWR-08S

  Data collected from OWR-05D and WEL-04 in 1998 show slight exceedances above the MCL for the filtered and/or unfiltered samples. No further sampling for lead has been completed at these locations. The exceedance at OWR-05D is likely due to historic releases and is influenced by the groundwater extraction system at this location. Although slightly exceeding the MCL (original unfiltered sample exceeded the MCL with a concentration of 16 µg/l, while the filtered sample and duplicate samples were non detect), the results for WEL-04 indicate that lead concentrations in groundwater are not a significant issue at this location.

  Lead concentrations measured at OWR-08S in 1998 for both the original (filtered) and duplicate (filtered) samples exceeded the MCL with a maximum detected value of 45 J µg/l. Both of the unfiltered results were below the MCL. No further testing for lead has been completed at this location. Since OWR-08S is located within the influence zone of the WMA II Corrective Action System, lead concentrations measured downgradient of this well at MW-14 were evaluated. Both filtered and unfiltered samples collected at this location in 2005 (latest sampling event for lead) were non detect for lead. In order to evaluate the potential of on-going impacts to groundwater, the soil sample results collected in the vicinity of OWR-08S were evaluated. The results were as follow: SSR-17 (35 mg/kg), SSR-10 (39 J mg/kg), SSR-16 (15 mg/kg), and SSR-19 (52 mg/kg). Although these lead concentrations exceed the Soil Screening Level (SSL) of 14 mg/kg (EPA, 2008c) presented in the RI Report, each of these results are significantly lower than the residential exposure criteria of 400 mg/kg, and, as such, do not represent an elevated risk for future impacts to groundwater.

In soil, the highest concentrations of lead were found as follows: SSRI-11 (4,700 mg/kg), SSR-07 (220 mg/kg), SSR-09 (150 mg/kg), and SSR-18 (110 J mg/kg). The nearest well locations to each of these soil samples and the highest concentration of lead detected in these wells since 1998 are presented below.

TABLE 4-2
Comparison of Lead Concentrations in Soil and Groundwater

Soil Sample Location	Nearby Wells	Max. Conc. µg/l	Comment
SSRI-11	OW-10, OWR-6D	14 J	No exceedances above MCL
SSR-07	WEL-04	16	Refer to description above
SSR-09	Not Applicable	NA	No adjacent well
SSR-18	OWR-13	ND	No exceedances above MCL

ND – Non detect; NA – Not Analyzed

These data indicate that the highest soil concentrations do not necessarily correlate with elevated groundwater concentrations relative to other locations on the Site.

Although the potential for leaching of lead from soil to groundwater exists, the existing soil and groundwater data for lead do not show a clear correlation indicative of an elevated risk. Based on this analysis of the detections of lead in groundwater and soil, additional action to prevent further leaching of lead is not warranted.

4.2.2 Manganese

The distribution of manganese detections in groundwater has been sporadic, and a Site-wide groundwater plume is not present. Figure 4-2 includes a comparison of manganese concentrations in soil and groundwater. Since 1998, eleven wells have shown reported concentrations of manganese in groundwater above the PRG of 880 µg/l. These wells include OW-10, OW-21A, OWR-01D, OWR-02S, OWR-05D, OWR-08S, OWR-11, OWR-12, WEL-01, WEL-02, and WEL-04. The data for these wells over the past ten years are presented below.

TABLE 4-3
Manganese Concentrations in Groundwater

Well	Date	QA Type	Filtered [(1)]	Parameter	Value	Unit
OW-10	7/30/98	Original	No	Manganese	1500	µg/l
OW-10	7/31/98	Original	Yes	Manganese	1400 J	µg/l
OW-10	7/6/05	Original	No	Manganese	1500	µg/l
OW-10	7/6/05	Original	Yes	Manganese	1200	µg/l
OW-21A	2/17/03	Original	No	Manganese	1300	µg/l
OW-21A	2/17/03	Original	Yes	Manganese	1300	µg/l
OWR-01D	8/3/98	Original	No	Manganese	2300	µg/l
OWR-01D	8/7/98	Original	Yes	Manganese	830	µg/l
OWR-02S	8/3/98	Original	No	Manganese	4500	µg/l
OWR-02S	8/3/98	Original	Yes	Manganese	4500 J	µg/l
OWR-05D	8/10/98	Original	No	Manganese	1300	µg/l
OWR-05D	8/10/98	Original	Yes	Manganese	1300	µg/l
OWR-08S	8/3/98	Original	No	Manganese	1400	µg/l
OWR-08S	8/3/98	Original	Yes	Manganese	1100 J	µg/l
OWR-08S	8/3/98	Field Duplicate	No	Manganese	1500	µg/l
OWR-08S	8/3/98	Field Duplicate	Yes	Manganese	1400 J	µg/l
OWR-11	2/11/03	Original	No	Manganese	6500	µg/l
OWR-11	2/11/03	Original	Yes	Manganese	6600	µg/l
OWR-12	2/17/03	Original	No	Manganese	12000	µg/l
OWR-12	2/17/03	Original	Yes	Manganese	12000	µg/l
WEL-01	10/18/98	Original	No	Manganese	2000	µg/l
WEL-01	10/20/98	Original	Yes	Manganese	130	µg/l
WEL-01	6/29/05	Original	No	Manganese	37	µg/l
WEL-01	6/29/05	Original	Yes	Manganese	32	µg/l
WEL-01	6/29/05	Field Blank	No	Manganese	ND	µg/l
WEL-02	10/17/98	Original	No	Manganese	1700	µg/l
WEL-02	10/18/98	Original	Yes	Manganese	190	µg/l
WEL-02	6/29/05	Original	No	Manganese	94	µg/l
WEL-02	6/29/05	Original	Yes	Manganese	83	µg/l
WEL-04	10/15/98	Original	No	Manganese	1100	µg/l
WEL-04	10/15/98	Original	Yes	Manganese	58	µg/l
WEL-04	10/15/98	Field Duplicate	No	Manganese	53	µg/l
WEL-04	10/15/98	Field Duplicate	Yes	Manganese	55	µg/l

ND – Non detect

(1) Filtered samples were collected through a 0.45-micron in-line filter followed by a 0.1-micron filter system.

Manganese is present in the groundwater in several areas across the Facility. However, the distribution does not seem to have a common source as concentrations well below the PRG were located among the locations where exceedances were noted. For example, manganese was present in the interior of the plant site at concentrations above the PRG in the shallow residuum wells WEL-04, OWR-11, and OWR-12, but not in shallow residuum well OWR-13 or deep residuum well OWR-14D. Exceedances were noted in the vicinity of WMA II at OWR-02S and OWR-08S, but not in the deep zone at OWR-02D or downgradient of the WMA II Corrective Action System in wells MW-14, T-04, and deep residuum well OWR-04D. In the vicinity of SWMU 1, manganese was detected above the PRG in the sample from well OWR-05D, but not in samples downgradient of the extraction well system at OW-16A and OWR-15D.

Based on these data, the distribution of manganese does not seem to follow a recognizable pattern. Concentrations above the PRG were detected throughout the Site; however, in comparison, manganese concentrations below the PRG at the Site were more numerous.

The locations of the highest concentrations of manganese detected in soil [SSR-09 (12,000 mg/kg), SSR-17 (5,500 mg/kg), and SSR-19 (2,600 mg/kg)] were evaluated with regard to the locations of the highest concentrations measured in groundwater. SSR-09 is located in the southwest portion of the Facility near the closed West End Landfill; SSR-17 and SSR-19 are located in the northwest portion of the Facility. In contrast, wells OWR-11 and OWR-12 (wells with highest reported manganese concentrations) are located in the middle of the Facility and to the east. Neither of these wells are within close proximity to the locations where elevated levels were detected in soil. However, well OWR-02S, which also showed elevated manganese concentrations in groundwater, is located near SSR-17 and SSR-19, but is upgradient/side-gradient to these sample locations, and is therefore not likely affected by the soil impacts in these areas.

Manganese is naturally occurring in the environment. Furthermore, the locations of the higher detections of manganese measured at the Facility in soil do not correspond to the locations of the higher groundwater concentrations measured. Therefore, additional action to prevent further leaching for manganese is not warranted.

4.2.3 Mercury

The distribution of mercury detections in groundwater has been sporadic, and a Site-wide groundwater plume is not present. Figure 4-3 includes a comparison of mercury concentrations in

soil and groundwater. Since 1998, five wells have shown reported concentrations of mercury in groundwater above the MCL of 2 µg/l. These wells include MW-15, MW-16, OW-10, OWR-11, and OWR-13. The data for these wells over the past ten years are presented below.

TABLE 4-4
Mercury Concentrations in Groundwater

Well	Date	QA Type	Filtered [(1)]	Parameter	Value	Unit
MW-15	04/13/99	Original	No	Mercury	0.8	µg/l
MW-15	04/13/99	Original	Yes	Mercury	0.9	µg/l
MW-15	04/17/00	Original	No	Mercury	0.2	µg/l
MW-15	04/17/00	Original	Yes	Mercury	ND	µg/l
MW-15	04/09/01	Original	No	Mercury	0.5	µg/l
MW-15	04/09/01	Original	Yes	Mercury	ND	µg/l
MW-15	04/15/02	Original	No	Mercury	1.4	µg/l
MW-15	04/15/02	Original	Yes	Mercury	ND	µg/l
MW-15	04/14/03	Original	No	Mercury	1.2	µg/l
MW-15	04/14/03	Original	Yes	Mercury	0.41	µg/l
MW-15	04/12/04	Original	No	Mercury	2.5	µg/l
MW-15	04/12/04	Original	Yes	Mercury	0.68	µg/l
MW-15	04/25/05	Original	No	Mercury	4.1	µg/l
MW-15	04/25/05	Original	Yes	Mercury	0.66	µg/l
MW-15	04/14/06	Original	No	Mercury	3.2	µg/l
MW-15	04/14/06	Original	Yes	Mercury	ND	µg/l
MW-15	04/05/07	Original	No	Mercury	3.3	µg/l
MW-15	04/05/07	Original	Yes	Mercury	ND	µg/l
MW-15	04/16/08	Original	No	Mercury	2	µg/l
MW-15	04/16/08	Original	Yes	Mercury	ND	µg/l
MW-16	04/14/99	Original	No	Mercury	1	µg/l
MW-16	04/14/99	Original	Yes	Mercury	0.5	µg/l
MW-16	04/17/00	Original	No	Mercury	0.3	µg/l
MW-16	04/17/00	Original	Yes	Mercury	0.2	µg/l
MW-16	04/17/01	Original	No	Mercury	0.9	µg/l
MW-16	04/17/01	Original	Yes	Mercury	0.9	µg/l
MW-16	04/12/02	Original	No	Mercury	0.97	µg/l
MW-16	04/10/03	Original	No	Mercury	2.1	µg/l
MW-16	04/19/04	Original	No	Mercury	1	µg/l
MW-16	04/25/05	Original	No	Mercury	1.1	µg/l
MW-16	04/13/06	Original	No	Mercury	1	µg/l
MW-16	04/05/07	Original	No	Mercury	0.75	µg/l
MW-16	04/16/08	Original	No	Mercury	1.7	µg/l
OW-10	07/30/98	Original	No	Mercury	50	µg/l

Well	Date	QA Type	Filtered [(1)]	Parameter	Value	Unit
OW-10	07/31/98	Original	Yes	Mercury	ND	µg/l
OW-10	07/06/05	Original	No	Mercury	16	µg/l
OW-10	07/06/05	Original	Yes	Mercury	23	µg/l
OWR-11	02/11/03	Original	No	Mercury	3.3	µg/l
OWR-11	02/11/03	Original	Yes	Mercury	0.65	µg/l
OWR-13	02/14/03	Original	No	Mercury	2.3	µg/l
OWR-13	02/14/03	Original	Yes	Mercury	2.2	µg/l
OWR-13	02/14/03	Field Duplicate	No	Mercury	2.4	µg/l
OWR-13	02/14/03	Field Duplicate	Yes	Mercury	2.1	µg/l

ND – Non detect
(1) Filtered samples were collected through a 0.45-micron in-line filter followed by a 0.1-micron filter system.

The wells included above fall into three categories: (1) Group 1: wells with detections at or below the MCL of 2 µg/l based on the most recent sampling results available; (2) Group 2: wells with detections only slightly above the MCL; and (3) Group 3: wells with detections above the MCL indicating the potential for leaching to groundwater. The following summarizes the mercury detections in groundwater using the above categories:

- Group 1: MW-16

  The most recent sampling results for MW-16 are below the MCL of 2 µg/l. This provides strong support that continued leaching to groundwater is not currently occurring at high enough levels to cause exceedances of the MCL.

- Group 2: MW-15 and OWR-13

  Detections of mercury above the MCL have been measured at MW-15 and OWR-13. However, the concentrations ranged from non detect to 4.1 µg/l, which only slightly exceeds the MCL of 2 µg/l. For MW-15, the latest sampling results were at the MCL thus indicating that further leaching to groundwater is not significant in this area. A potential source of mercury in soil upgradient from OWR-13 was identified near sample location SSR-18 (near former PCB Production Area and Waste Drum Satellite Accumulation Area). Both of these areas have been capped with an impermeable cover reducing the potential for future leaching to groundwater.

- Group 3: OW-10 and OWR-11

  Data collected in 2005 at OW-10 show that groundwater concentrations still exceed the MCL with a measured concentration of 16 µg/l in the unfiltered sample (23 µg/l in the filtered sample). However, the previous concentration measured at this location in 1998 was 50 µg/l in the unfiltered sample indicating that concentrations in groundwater at this location are likely due to a historical release as the concentrations are decreasing. Detections of mercury above the MCL have been measured at OWR-11 (2003). The concentrations ranged from 0.65 µg/l to 3.3 µg/l, which only slightly exceeds the MCL of 2 µg/l.

In order to evaluate the potential of on-going impacts to groundwater, the soil samples results collected in the vicinity of OW-10 and OWR-11 were evaluated. The results were as follow: SSRI-11 (1.1 mg/kg), SWMU-12-24G (0.94 mg/kg), SSR-04 (1.1 mg/kg), and SSR-15 (3.3 J mg/kg). These concentrations exceed the SSL of 0.1 mg/kg. Soil concentrations measured at this location (north and south Phosphoric Acid Basins; SWMU-12) have the potential to impact groundwater and could be contributing to the impacts noted at OW-10 and OWR-11.

Other detections of mercury in soil have been reported throughout the Facility above the SSL; however, as indicated above, corresponding exceedances in groundwater do not exist.

As a result of this analysis, the potential for mercury leaching to groundwater will be evaluated with respect to the effectiveness of each proposed remedy for the one area indicated, the Phosphoric Acid Basins, in the vicinity of wells OW-10 and OWR-11.

4.2.4 PCBs

Groundwater concentration data indicate that PCBs are present in groundwater above the MCL (0.5 µg/l) at the Facility. Additionally, soil concentrations have been detected above the SSL of 45 µg/kg indicating that concentrations of PCBs in soil remain that may be leaching to groundwater. Figure 4-4 includes a comparison of PCB concentrations in soil and groundwater, and the following provides an evaluation of these detections. The groundwater data presented on Figure 4-4 includes the data provided in Table 4-4 of the RI Report and represents the most recent data for each well prior to submission of the RI Report.

4.2.4.1 Groundwater

There are four main areas within OU-3 with PCB detections: (1) the Old Limestone Bed/WMA II area (including well OW-21A); (2) north of the closed South Landfill; (3) the vicinity of OW-10/OWR-11 (Phosphoric Acid Basins, SWMU-12); and (4) the vicinity of OWR-13 (former PCB Production Area). The data from these areas are presented in the RI Report and select tables and figures showing the data are included in Appendix A. The results from filtered analyses have been included for certain wells to evaluate the potential fate and transport of PCBs at these locations. The filtered results have not been used to determine the nature and extent of contamination or to judge remedial efforts. PCB impacts in each of these areas are discussed below:

(1) Old Limestone Bed/WMA II: Elevated PCB concentrations found in groundwater in this area, likely originated from the two units, which have subsequently been closed as described in the RI. These areas were either excavated or capped with an impermeable cover. PCBs have been detected in unfiltered samples from observation wells OW-21/21A, OW-22 and OW-24. The concentrations from samples reported at OW-22 and OW-24 have generally been sporadic and low over the last eight years with a maximum concentration of 4.3 µg/l. The concentrations from samples reported at OW-21/21A, however, have been more consistent and higher with unfiltered results ranging from 64 µg/l to 15,500 µg/l. A graph showing total PCB concentration (log) vs. time has been prepared for OW-21/21A, OW-22, and OW-24 (Figure 4-5).

(2) North of Closed South Landfill: PCB concentrations is this area likely originated from the South Landfill, which has since been closed. During semi-annual groundwater monitoring, PCBs have detected in samples from observation wells OW-08/08A, OW-15, and OW-16/16A. For OW-08/08A, detections have been fairly consistent at concentrations generally ranging from about 8 µg/l to 130 µg/l. An outlier concentration was reported at 600 µg/l in an unfiltered sample in 2003. The 2003 concentration represented an increase from 11.5 µg/l in the previous sample, followed by a reduction to 11 µg/l in the subsequent sample. For OW-15, the concentrations have been low and sporadic with six detected concentrations (maximum of 14.5 µg/l in 1999) for the last 18 samples analyzed. For OW-16/16A, detections have been fairly consistent at concentrations generally ranging from about 100 to 300 µg/l. A graph showing total PCB concentration (log) vs. time has been prepared for OW-08/08A, OW-15, and OW-16/16A (Figure 4-5).

(3) Phosphoric Acid Basins (vicinity of OW-10/OWR-11): PCB detections at observation wells OW-10 and OWR-11 are likely remnant impacts associated with the Phosphoric Acid Basins. Observation well OWR-11 was installed to evaluate the groundwater quality in the vicinity of the Phosphoric Acid Basins (SWMU 12) where PCBs were detected in the soil. PCBs were detected in an unfiltered sample in February 2003 at a concentration of 170 µg/l and in the filtered sample at 20 µg/l. Downgradient well OW-09 did not show an elevated concentration of PCBs indicative of potential impacts from SWMU 12. OW-10, also downgradient of OWR-11, had a concentration of 6.2 J µg/l of PCBs reported in the unfiltered sample in July 2005.

(4) Former PCB Production Area (vicinity of OWR-13): The former PCB Production Area was located in the south central portion of the Facility and is likely responsible for the detections observed in OWR-13 located downgradient of this area. The former production area has been closed and covered with an asphalt/concrete cover as described in the RI Report. Observation well OWR-13 was installed to evaluate the groundwater quality in the vicinity of the former PCB Production Area and the Waste Drum Satellite Accumulation Area where PCBs were detected. PCBs were detected in the unfiltered sample at a concentration of 250 µg/l and in the filtered sample at 68 µg/l.

Additional wells outside of the areas described above where PCBs have been measured at low concentrations above the MCL include OWR-12, WEL-01, and OWR-07D, as described in more detail below:

(1) OWR-12: Observation well OWR-12 was installed to evaluate the groundwater quality in the vicinity of the Underground Product Storage Tanks, but is believed to more accurately represent potential impacts associated with the former Waste Drum Satellite Accumulation Area based on its location. PCBs were detected at a concentration of 4.4 µg/l in the unfiltered sample in February 2003, but were not detected in the associated filtered sample. PCB concentrations for samples collected from downgradient wells CB-85, T-02, and OWR-01S were non detect.

(2) WEL-01 and OWR-07D: Low level detections of PCBs reported in WEL-01 and OWR-07D are likely associated with the disposal of wastes from the former PCB Production Area in the closed West End Landfill prior to 1960. The West End Landfill has been

closed with an impermeable cover as described in the RI Report. WEL-01 had detections of PCBs for two of the eight samples that have been collected; however, results for both events (0.69 µg/l for October 2002 and 0.66 µg/l for June 2005) only slightly exceeded the MCL of 0.5 µg/l, and there were no detections in the last four sampling events. PCB concentrations at OWR-07D have ranged between 0.61 and 2.2 µg/l since 1998.

4.2.4.2 Soil

Elevated PCB detections in surface soils include SSR-7 (229 mg/kg) at the former location of the Phosphate Landfill and SSR-9 (282 mg/kg) in the Old Santotar® Pit. These areas are currently covered by a gravel layer to prevent direct contact with and erosion from surface water. Both wells (WEL-04 and OWR-03S) immediately downgradient of this area were non detect for PCBs in the most recent sampling event.

Soil sample SSR-18 was collected near the Waste Drum Satellite Accumulation Area and yielded the highest PCB concentration reported in soil of 16,620 J mg/kg. SSR-18 was collected immediately downgradient from the former PCB Production Area. This area has subsequently been partially excavated and covered with a concrete cap.

Two samples collected in the open areas of the Facility as part of the RI showed elevated concentrations of PCBs. These samples were SSRI-07 (250 mg/kg at the surface and 56 mg/kg at depth) and SSRI-05 (38 mg/kg at the surface and 85 mg/kg at depth) located adjacent to the former PCB Production Area and northeast of the Old Boiler Scrap Yard, respectively. These areas are currently grassed. Soil concentrations measured at SSRI-07 have the potential to impact groundwater and could be contributing to the impacts noted at OWR-13. For SSRI-05, wells T-02 and CB-85 located downgradient of this location were non detect for PCBs.

Surface soil sample SSR-5, which is located downgradient from the Phosphoric Acid Basins, had a PCB concentration of 106 mg/kg. Samples SWMU-12-24C and SWMU-12-24E also located near the Phosphoric Acid Basins had PCB concentrations of 84 and 169 mg/kg, respectively. PCBs were also detected in two subsurface soil samples collected from this area, SSR-4 (104 mg/kg) and SSR-15 (65 J mg/kg). A surface sample (SSRI-11) collected as part of the RI from a grassed area located north of the Phosphoric Acid Basins had a PCB concentration of 930 J mg/kg. Soil concentrations measured at these locations have the potential to impact groundwater and could be contributing to the impacts noted at OWR-11 and OW-10. As part of the RI, delineation sampling and a removal action were

conducted at SSRI-11 to remove the "principal threat waste" material identified in this area. However, PCB concentrations remain that has the potential to impact groundwater.

Additional characterization data for the closed South and West End Landfills and the "walking trail area" are included as Appendix A-1 in the RI Report and summarized in Section 2.6. The summary includes a discussion of residual PCBs remaining under the existing caps or soil covers constructed in these areas.

Further discussions regarding the closed South Landfill – Cells 1E, 2E, and 3E, the closed West End Landfill – adjacent areas, and the "walking trail area", and the adequacy of the existing cover systems in these areas to mitigate the potential for PCBs to leach to groundwater is presented in Section 5.3.1.

4.2.4.3 PCB Summary

The RI indicates that there are four main areas within OU-3 with PCB detections in groundwater: the Old Limestone Bed/WMA II area (including well OW-21A), north of the closed South Landfill, the vicinity of OW-10/OWR-11 (Phosphoric Acid Basins, SWMU 12), and the vicinity of OWR-13 (former PCB Production Area). Additionally, low level PCB concentrations have been measured in groundwater at OWR-12 (Waste Drum Satellite Accumulation Area), WEL-01, and OWR-07D (West End Landfill). Based on an evaluation of PCB concentrations in soil, two areas (area east of former PCB Production Area and the Phosphoric Acid Basins) have been identified that have the potential for continued releases of PCBs from soil to groundwater.

PCB-containing soil located at most of the areas described above including the Old Limestone Bed/WMA II area, the closed South Landfill, the former PCB Production Area, the Waste Drum Satellite Accumulation Area, and the closed West End Landfill have been excavated or covered with an impermeable cover reducing the potential for continued releases to groundwater. Therefore, the potential for PCBs leaching into groundwater will only be evaluated for the two remaining areas: a) area east of the former PCB Production Area (SSRI-07), and b) the Phosphoric Acid Basins. The potential for PCBs leaching to groundwater will be evaluated with respect to the effectiveness of each proposed remedy for these two areas.

4.2.5 Summary

As indicated in the RI Report, P/S have addressed "principal threat wastes" with PCB concentrations in excess of 500 mg/kg (EPA, 1990) as such material has been encountered. Most recently, P/S conducted delineation sampling and a removal action to address "principal threat waste" at SSRI-11. Principal threat zones have been removed or placed under impermeable covers. This includes the closed South Landfill, WMA I, the closed West End Landfill, the Old Limestone Bed, etc. However, releases from these areas have already occurred and likely impacted groundwater at the Facility. Thus, much of the groundwater impacts are from historical releases. However, as described in the RI, the continued migration of COCs from soil to groundwater could be occurring. If occurring, the most likely areas where soil impacts could be leaching to groundwater include (1) the open area adjacent to the Phosphoric Acid Basins (mercury and PCBs) and north of the facility parking lot, and (2) the open area located adjacent and to the east of the former PCB Production Area (PCBs).

4.3 Identification of Potential ARARs and TBCs Requirements

4.3.1 Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver. See also 40 CFR 300.430(f)(1)(ii)(B). ARARs include only federal and state environmental or facility siting laws/regulations and do not include occupational safety or worker protection requirements. Compliance with OSHA standards is required by 40 CFR 300.150 and therefore the CERCLA requirement for compliance with or wavier of ARARs does not apply to OSHA standards.

Under CERCLA Section 121(e)(1), federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely on-site as defined in 40 CFR 300.5. See also 40 CFR 300.400(e)(1) & (2). Also, CERCLA actions must only comply with the "substantive requirements," not the administrative requirements of a regulation. Administrative requirements include permit applications, reporting, record keeping, and consultation with administrative bodies. Although consultation with state and federal agencies responsible for issuing permits is not required, it is recommended for determining compliance with certain requirements, such as those typically identified as Location-Specific ARARs.

Applicable requirements, as defined in 40 CFR 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be applicable. *Relevant and appropriate requirements*, as defined in 40 CFR 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Per 40 CFR 300.400(g)(5), only those state standards which are promulgated, are identified in a timely manner, and are more stringent than federal requirements may be applicable or relevant and appropriate. For the purposes of identification and notification of promulgated state standards, the term “promulgated” means that the standards are of general applicability and are legally enforceable. State ARARs are considered more stringent where there is no corresponding federal ARAR, where the State ARAR provides a more stringent concentration of a contaminant, or the where a State ARAR is broader in scope than a federal requirement.

In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The “to-be-considered” (TBC) category consists of advisories, criteria, or guidance that were developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies. See 40 CFR 300.400(g)(3). TBCs can be used in the absence of ARARs, when ARARs are insufficient to develop cleanup goals, or when multiple contaminants may be posing a cumulative risk. See EPA, OSWER Directive No. 9234.0-05, *Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements* (EPA, 1987).

In accordance with 40 CFR 300.400(g), EPA and ADEM have identified the potential ARARs and TBCs for the evaluated alternatives. Tables 4-5 and 4-6 list respectively the Chemical-and Action-Specific ARARs/TBCs for remedial actions in the evaluated alternatives.

4.3.2 ARAR Categories

For purposes of ease of identification, the EPA has created three categories of ARARs: Chemical-, Location-and Action-Specific. Under 40 CFR 300.400(g)(5), the lead and support agencies shall identify their specific ARARs for a particular site and notify each other in a timely manner as described in 40 CFR 300.515(d). Chemical-and Location-Specific ARARs should be identified as early as the scoping phase of the RI, while Action-Specific ARARs are identified as part of the FS for each remedial alternative. See 40 CFR 300.430(b)(9) & 300.430(d)(3).

4.3.2.1 Action-Specific ARARs/TBC Guidance

Action-Specific ARARs are usually technology-based or activity-based requirements or limitations that control actions taken at hazardous waste sites. Action-Specific requirements often include performance, design and controls, or restrictions on particular kinds of activities related to management of hazardous substances. Action-Specific ARARs are triggered by the types of remedial activities and types of wastes that are generated, stored, treated, disposed, emitted, discharged, or otherwise managed. Potential Action-Specific ARARs include TSCA standards for PCB waste at 40 CFR 761 et. seq. and in particular those at 40 CFR 761.61 for the cleanup, capping, storing, and disposing of PCB remediation waste. As indicated in the preamble to the PCB Disposal Amendments Final Rule, EPA expects that CERCLA cleanups would comply with the substantive requirements of one (or all), of three options (self-implementing, performance-based, and risk-based) provided in 40 CFR 761.61 upon completion of the cleanups. See 63 Fed. Reg. 35,384, 35,407 (June 29, 1998).

Table 4-6 lists potential Action-Specific ARARs for OU-3 remedial action alternatives.

4.3.2.2 Chemical-Specific ARARs/TBC Guidance

Chemical-Specific ARARs are usually health-or risk-based numerical values limiting the amount or concentration of a chemical that may be found in, or discharged to, the environment. The Safe Drinking Water Act (SDWA) MCLs at 40 CFR Part 141 and the state or federal ambient water quality criteria established under Section 303 or 304 of the Clean Water Act are examples of Chemical-Specific ARARs that are used to establish remediation levels for restoration of groundwater and surface water that are current or potential sources of drinking water. See 40 CFR 300.430(e)(2)(i)(B), (C), & (E).

Table 4-5 lists Chemical-Specific *ARARs/TBCs* for the Facility, which include SDWA MCLs for some of the groundwater COCs at the Facility. In the absence of an MCL or other Chemical-Specific ARARs, site-specific risk-based remedial goals were developed for other groundwater COCs as included in Section 4.4.

4.3.2.3 Location-Specific ARARs/TBC Guidance

Location-Specific requirements establish restrictions on permissible concentrations of hazardous substances or establish requirements for how activities will be conducted because they are in special locations *(e.g.,* wetlands, floodplains, critical habitats, streams). There are no Location-Specific *ARARs/TBC* guidance for the evaluated Facility remedial alternatives.

4.3.2.4 ARARs Applicable to Off-Site Activities

Any remediation wastes that are generated and subsequently transferred off-site or transported in commerce along public right-of-ways must meet any applicable requirements such as those for packaging, labeling, marking, manifesting, and placarding requirements for hazardous materials. In addition, CERCLA Section 121(d)(3) provides that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, or disposal facility that is in compliance with applicable federal and state laws and has been approved by EPA for acceptance of CERCLA waste. See also 40 CFR 300.440 (so called "Off-Site Rule").

4.3.3 Evaluation and Waiver of ARARs

All of the remedial alternatives are evaluated in this FS to determine whether they comply with identified Chemical-and Action-Specific ARARs. As stated above, compliance with ARARs is a threshold requirement of CERCLA that every remedy must meet, unless an ARAR waiver can be used. See 40 CFR 300.430(f)(1)(A). Under CERCLA Section 121(d)(4), a remedial action that does not attain an ARAR may be selected if EPA finds that one of the six waivers is justified.

Once a preferred remedial action alternative is formally selected, all chemical, location, and action-specific ARARs will be identified for a final evaluation. If it is found that the most suitable remedial action alternative does not meet an ARAR, the NCP provides for waivers of ARARs under certain circumstances. According to 40 CFR 300.430(f)(1)(ii)(C), an alternative that does not meet an ARAR under federal environmental or state environmental or facility siting laws may be selected under the following circumstances:

1. The alternative is an interim measure and will become part of a total remedial action that will attain the applicable or relevant and appropriate federal or state requirement.

2. Compliance with the requirement will result in greater risk to human health and the environment than other alternatives.

3. Compliance with the requirement is technically impracticable from an engineering perspective.

4. The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method or approach.

5. With respect to a state requirement, the state has not consistently applied, or demonstrated the intention to consistently apply, the promulgated requirement in similar circumstances at other remedial actions within the state.

6. For Fund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Fund monies to respond to other sites may present a threat to human health and the environment.

Accordingly, if any of the alternatives selected for the Site are not expected to attain an ARAR, this expectation will be expressed together with an appropriate justification that relates to at least one of the ARAR waiver circumstances identified above. An evaluation of compliance of the various remedial alternatives for OU-3 of the Anniston PCB Site with ARARs is presented in Section 7.0.

4.4 Remedial Goals

Remedial Goals are chemical- and media-specific concentrations that are intended to be generally protective of human and ecological receptors. The Remedial Goals are developed from chemical-specific ARARs or risk-based goals. The Remedial Goals consist of numerical targets for the COCs, in specific media, and are intended to guide the development and evaluation of remedial alternatives. Final remedial goals will be determined when a remedy is selected by EPA in a signed Record of Decision (ROD). The remedial goals will establish acceptable contaminant concentrations and exposure levels that are protective of human health and the environment. Risk-based Remedial Goals described in this section were developed based on direct exposure pathways. Methods used to determine the Remedial Goals for Soil COCs and Groundwater COCs are presented in this section.

4.4.1 Remedial Goals for Soil COCs

Remedial Goals for soil COCs were developed based on the HHRA. In particular, on behalf of the EPA, CDM developed Remedial Goal Options (RGOs) for all receptors/scenarios evaluated in the

risk assessment. These RGOs were developed using a method which takes a ratio of the target risks and the calculated risk. This ratio provides the multiplier for the exposure point concentration and the product is the RGO. RGOs were presented separately for cancer and non-cancer effects at corresponding risk levels (cancer risks of 1.0E-04, 1.0E-05, and 1.0E-06 and hazard quotients of 0.1, 1, and 3.) The calculations prepared by CDM including the RGOs addendum are presented in Appendix B. Based on these calculations, Remedial Goals for Soil COCs were selected by the EPA and presented to P/S in response to the RAO Memorandum. The Remedial Goals for PCBs and arsenic in surface soil were updated by EPA in response to its review of the Draft FS Report (Golder, 2008f). The Remedial Goals for PCBs in surface soil and arsenic in subsurface soil were updated again by the EPA in response to its review of the Final FS Report (Golder, 2009a). The updated numbers are incorporated into the table below. The following summarizes the Remedial Goals for Soil COCs.

TABLE 4-7
Soil Remedial Goals

Constituent	Surface Soil Remedial Goal (mg/kg)	Subsurface Soil Remedial Goal (mg/kg)
PCBs	25	45
Arsenic	66	217
Benzo(a)pyrene	None	N/A
Dibenzo(a,h)anthracene	None	N/A
Dioxin TEQs	None	None

N/A = not applicable; i.e., not a COC for listed medium
None = exposure point concentration below acceptable risk level

Basis for Remedial Goals:
Surface PCBs RG = 25 mg/kg based on EPA's Superfund PCB Guidance

Subsurface PCBs RG = 45 mg/kg based on site specific risk for a future operations worker at an HQ=3

Surface Arsenic RG = 66 mg/kg based on site specific risk for a current operations worker of 10^{-5}

Subsurface Arsenic RG = 217 mg/kg based on site specific risk for construction worker at an HQ=1

In surface soil, Remedial Goals are not provided for benzo(a)pyrene and dibenzo(a,h)anthracene, since the exposure point concentration used in the HHRA resulted in a risk level of less than 10^{-5} and

therefore Remedial Goals are not required. For dioxin TEQs in surface soil, the exposure point concentration was less than 1 microgram per kilogram (ug/kg) which does not require a Remedial Goal per EPA national policy, as identified in EPA's comments on the Memorandum on Remedial Action Objectives. In subsurface soil, a remedial goal is not provided for dioxin TEQs since the exposure point concentration used in the HHRA resulted in a risk level of less than 10^{-5}. As a result, benzo(a)pyrene, dibenzo(a,h)anthracene, and dioxin TEQs will not be considered further when evaluating remedial technologies and alternatives.

As discussed in the HHRA, RGOs can be interpreted as exposure point concentrations that would be protective for a given exposure scenario. Additionally the HHRA states that, exposure point concentrations are calculated for exposure units – areas within which receptors may contact contaminated media more or less randomly, and as such RGOs are appropriately used in conjunction with considerations of current and/or future land use and receptor behavior.

4.4.2 Remedial Goals for Groundwater COCs

Different methods were used to develop the Remedial Goals for Groundwater COCs depending on the chemical. MCLs were used as the Remedial Goals if they were available for specific COCs. For chemicals without MCLs that were identified as COCs based on the HHRA, the Remedial Goals were calculated based on data provided in the HHRA, similar to the method described above for soil COCs[6]. The Remedial Goals for manganese and cobalt were selected based on the information presented in the HHRA. For 1,1,2,2-Tetrachloroethane, the EPA Regional Screening Level (RSL) for Chemical Contaminants at Superfund Sites, RSL Table Update September 2008, was used as the Remedial Goal. Table 4-8 below provides a summary of the Remedial Goals for Groundwater COCs.

[6] These Remedial Goals are based on a back-calculation from the HHRA and were selected by the EPA. Supporting calculations were completed by CDM on behalf of the EPA and are presented in Appendix B.

TABLE 4-8
Groundwater Remedial Goals

Constituent	Remedial Goal (µg/l)	Basis for RG
o,o,o-Triethylphosphorothioate	310	HHRA[2]
1,1,2,2-Tetrachloroethane	0.067	RSL
1,2,4-Trichlorobenzene	70	MCL
2,4,6-Trichlorophenol	13	HHRA[1]
PNP	125	HHRA[1]
Benzo(a) pyrene	0.2	MCL
Beryllium	4	MCL
Cobalt	62	HHRA
Gamma-BHC	0.2	MCL
Indeno(1,2,3-cd)pyrene	0.02	HHRA
Lead	15	MCL
Manganese	1300	HHRA
Mercury	2	MCL
Methyl Parathion	4	HHRA
Methylene Chloride	5	MCL
Parathion	85	HHRA
PCBs	0.5	MCL
Pentachlorophenol	1	MCL
Tetraethyldithiopyrophosphate (Sulfotepp)	7	HHRA[1]
Trichloroethylene	5	MCL

[1] Based on the September 3, 2009 "Addendum to RGOs for Anniston PCB Site, OU3." [2] Based on the Technical Support Section September 25, 2009 "Memorandum: Review of the Proposed Remedial Level for Triethylphosphorothioate."

4.5 Establishment of Remedial Action Objectives

Based on the RI and CSM (Section 2.0), Site background and completed corrective measures (Section 3.0), results of the HHRA (Section 2.8), media of concern and COCs (Section 4.1), an evaluation of potential impacts to groundwater from soil (Section 4.2), potential federal and state ARARs (Section 4.3), and the Remedial Goals (Section 4.4), the following RAOs have been established for OU-3.

4.5.1 RAOs for Soils

RAOs for soils (On-property commercial/industrial) include:

- Reduce or eliminate risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soil above the Remedial Goals;
- Reduce or eliminate risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil above the Remedial Goals. During soil disturbance activities, prevent ingestion or inhalation of soil particulates in air that contain COCs in soil in excess of the Remedial Goals;
- Prevent migration and leaching of contaminants in surface and subsurface soils to groundwater that could result in groundwater contamination in excess of MCLs or health-based risk levels at the point of groundwater compliance;
- Permanently and/or significantly reduce the mobility, toxicity, and/or volume of characteristic hazardous waste with treatment;
- Prevent migration of contaminants in excess of the Remedial Goals in surface soil to surface water; and
- Control future releases of contaminants to ensure protection of human health and the environment.

4.5.2 RAOs for Groundwater

RAOs for groundwater include:

- Reduce or eliminate risks to receptors from direct contact with or ingestion of COCs in groundwater at concentrations above the Remedial Goals;
- Prevent the migration of pollutants beyond the existing limits of the known contaminant plume or established point of compliance;
- Control future releases of COCs in groundwater to ensure protection of human health and the environment; and
- Restore groundwater to meet cleanup goals such as MCLs throughout each plume, or at and beyond the edge of the waste management area(s).

The RAOs require the restoration of groundwater to meet cleanup goals at the Facility. As indicated in the RI Report, monitored natural attenuation (MNA) is occurring for certain constituents, including parathion and PNP. From 1989 to 1996, the mass of parathion in the vicinity of the SWMU 1 Corrective Action System decreased by 85%. For more recent data, the number of wells where parathion has been detected has decreased providing further evidence of a decrease in parathion mass. These results show an order of magnitude decrease in approximately seven years, which is generally

in agreement with guidance provided by the EPA that successful MNA sites typically show a 10 fold decrease in 10 years. Extrapolated to 10 years, the predicted mass for parathion in the SWMU 1 area would show over a 15 times reduction.

From 1989 to 1996, the mass of PNP in the vicinity of the SWMU 1 Corrective Action System decreased by 95%. These results above show over a 19 times reduction in seven years, which exceeds the EPA's requirements for successful MNA sites (a 10 fold decrease in 10 years, EPA, 2008).

P/S and the EPA believe that with the excavation and/or capping proposed in the identified source areas (in conjunction with an upgraded pump and treat system), groundwater quality will improve and that sampling data will be the subject of evaluation during the first Five Year Review period. Additionally, EPA and P/S have agreed that an expanded monitoring program, beyond that regulated by ADEM under the RCRA Post-Closure Permit, will be developed during or in advance of performance of a Pre-Remedial Design Investigation.

5.0 GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES

This section presents General Response Actions (GRAs, Section 5.1) and the identification and screening of remedial technologies for soil and groundwater at the Facility. Potential technologies are first screened based on technical implementability only (Section 5.2). Surviving technologies are then screened based on effectiveness, implementability and cost (Section 5.3 – Soil; Section 5.4 – Groundwater). This section also includes an evaluation of the areas of affected media at the Facility (Sections 5.3 and 5.4), and concludes with a summary of the technology screening process (Section 5.5). Comments provided by the EPA on the Technical Memorandum on Remedial Technologies, Alternatives and Screening submitted to the EPA on April 2, 2008 (Golder, 2008b) the Draft FS Report submitted to the EPA on August 24, 2008, and the Final FS Report submitted to the EPA on May 7, 2009 have been incorporated herein.

5.1 General Response Actions

This section presents the GRAs identified to address the RAOs defined in Section 4.4. GRAs are medium-specific and are based upon the RAOs. Refer to Sections 5.3 and 5.4 for the areas to be addressed for soil and groundwater, respectively.

For soil, the GRAs include:

- No Action;
- Institutional Controls;
- Engineering Controls;
- Containment;
- Excavation/Disposal or Ex-Situ Treatment; and
- In-Situ Treatment.

For groundwater, the GRAs include:

- No Action;
- Institutional Controls;
- Engineering Controls;
- Containment;
- Extraction/Ex-Situ Treatment/Discharge; and
- In-Situ Treatment.

5.2 Identification and Preliminary Screening of Technologies

Using the RAOs and GRAs, the remedial technologies identified for soil and groundwater are listed and briefly described in Tables 5-1A and 5-1B, respectively. These technologies were preliminarily screened based on technical implementability, as summarized in Tables 5-1A and 5-1B. The reason for eliminating specific GRAs from further consideration is included in the tables.

Retained soil technologies from the preliminary screening include the following:

- *No Action* – Implement no additional remedial actions but continue all O&M of existing interim measures, institutional controls, access controls and engineering controls;
- *Institutional Controls* – Deed restrictions and/or environmental covenants, administrative policies and worker training;
- *Engineering Controls* – Access controls;
- *Containment* – Capping;
- *Excavation/Disposal or Ex-Situ Treatment* – Excavation, landfilling, chemical dehalogenation, and thermal desorption; and
- *In-Situ Treatment* – In-Situ thermal desorption.

Retained groundwater technologies from the preliminary screening include the following:

- *No Action* – Implement no additional remedial actions; continue all O&M of existing interim measures, institutional controls, access controls, and engineering controls; and continue operation of the groundwater corrective action systems;
- *Institutional Controls* – Deed restrictions and/or environmental covenants and access controls;
- *Containment* – Vertical barriers;
- *Extraction/Ex-situ Treatment/Discharge* – Filtration / carbon filter / activated carbon filter, POTW and on-Site discharge; and
- *In-situ Treatment* – Bioremediation, nanoscale zero valent iron (NZVI), funnel and gate system using zero valent iron (ZVI), and MNA.

These retained technologies are evaluated further in the following sections.

5.3 Remedial Technologies for Soil

The primary objectives for addressing soil-based risks at the Facility are to mitigate the risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soil; to mitigate risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil; to mitigate risk to the construction worker during soil disturbance activities from ingestion or inhalation of soil particulates in air that contain COCs; and to mitigate potential risks related to soil COCs leaching to groundwater and surface water. Remedial technologies for soil focus on preventing contact with impacted soil, reducing erosion, and reducing infiltration as appropriate for specific areas where constituents may be leaching to groundwater. Technologies that further reduce erosion will additionally address potential migration of contaminants in surface soil to surface water.

5.3.1 Identification of Soil Impact Areas

The soil sampling results presented in the RI Report (see Appendix A, Table 4-1) were preliminarily screened, as shown on Table 5-2A:

- to identify sample locations exceeding the Remedial Goals for surface soil (impact type 1),
- to identify sample locations exceeding the Remedial Goals for subsurface soil (impact type 2), and
- to identify those locations/areas identified in Section 4.2 that pose a potential threat of releasing constituents to groundwater (impact type 3).

The identified sample locations were grouped into soil impact areas based on the nature and extent of contamination and the existing Site conditions as shown on Figure 3-1.

For soil, a total of eight Impact Areas were identified as potentially requiring GRAs to achieve soil RAOs. These areas are summarized in Table 5-2A, shown on Figure 5-1, and described below.

- Area A – this soil impact area consists of the open, currently grassed, area to the north of the employee parking lot in the vicinity of the former Phosphoric Acid Basins (SWMU-12) and is approximately 3.3 acres in size. PCB concentrations measured in soil exceeded both the surface soil and subsurface soil Remedial Goals. Subsurface impacts extend to a depth of 10 feet bgs. Arsenic concentrations also exceeded the surface soil Remedial Goal. Additionally, as discussed in Section 4.2, PCBs and mercury detected in soil are potentially impacting groundwater in this area. Prior to completing the FS, P/S implemented delineation sampling

and a removal action to address "principal threat waste" material at SSRI-11 (within Area A). The material was delineated and subsequently removed and disposed at a TSCA-approved landfill.

- Area B – this soil impact area is located in the center of the Site at the location of the former Waste Drum Satellite Accumulation Area (SWMU-44) and is approximately 0.5 acres in size. Due to the detection of PCBs in soil above 500 mg/kg, this area was previously remediated by P/S through soil removal and the placement of a substantial concrete cover. This ICM is detailed in Table 3-1 and in the RI Report.

- Area C – this soil impact area is located in the southwest portion of the Site in the vicinity of the former Santotar® Pit (SWMU-07), is currently covered with between 7 and 12 inches of clean coarse gravel, and is approximately 1.5 acres in size. PCB concentrations measured in soil exceeded the surface soil Remedial Goal.

- Area D – this soil impact area is located in the southwest portion of the Site in the vicinity of the Phosphate Landfill (SWMU-06) to the northwest of Area C, is currently covered with between 7 and 12 inches of clean coarse gravel, and is approximately 1.0 acre in size. PCB concentrations measured in soil exceeded the surface soil Remedial Goal. The lateral extents of Area D are less than Area C since adjacent surface samples have PCB concentrations well below the Remedial Goal.

- Area E – this soil impact area consists of the open, currently grassed, area to the west of the main office building and to the east of the former PCB Production Area (SWMU-42) as located on Figure 5-1, and is approximately 0.75 acres in size. PCB concentrations measured in soil exceeded both the surface soil and subsurface soil Remedial Goals. Subsurface impacts extend to a depth of 4 feet bgs. Additionally, as discussed in Section 4.2, PCBs in soil are potentially impacting groundwater in this area.

- Area F – this soil impact area consists of the open, currently grassed area to the northwest of the MCC Warehouse and is approximately 1.5 acres in size as shown on Figure 5-1. PCB concentrations measured in soil exceeded both the surface soil and subsurface soil Remedial Goals.

- Area G – this soil impact area consists of an approximately 0.3 acre area in the southeastern portion of the Facility near to the administration building, as shown on Figure 5-1. PCB concentrations measured in soil exceeded the surface soil Remedial Goal.

- Area H – this soil impact area consists of the small, grassed area along the southern portion of the parking lot and is approximately 0.4 acres in size as shown on Figure 5-1. PCB concentrations measured in soil exceeded the surface soil Remedial Goal.

The following three additional areas as shown on Figure 5-1 were evaluated as potential soil impact areas that may require GRAs based on historical data that had been collected at the Facility prior to the construction of ICMs to address PCBs identified in these areas. These areas include:

- Closed South Landfill (Cells 1E, 2E, and 3E)
- Closed West End Landfill (surrounding areas)
- "Walking Trail Area"

The following provides a discussion of each of these areas and a determination of whether the existing cover systems over these areas adequately protect human health and the environment.

Closed South Landfill (Cells 1E, 2E, and 3E)

As described in the RI Report, the portions of the South Landfill designated as WMA I were closed with a RCRA-compliant cap in 1989, while the remaining cells, closed prior to the effective date of RCRA, were covered with compacted soil and a vegetative layer. In 1997 and 1998, portions of the cap on the closed South Landfill were upgraded with a multi-media cover. However, the existing cover over Cells 1E, 2E, and 3E was not upgraded at this time.

The PCB concentrations measured in soil prior to placing the upgraded cover system described above are shown on the figure entitled "Sampling Results South Landfill Prior to Implementing Interim Measures" included in Appendix A-1 of the RI Report. These samples were collected in 1996 under a Consent Decree with ADEM. This figure also shows PCB concentrations in surface soil over the eastern cells south of WMA I (Cells 1E, 2E, and 3E) where an upgraded cover system was not installed. As part of the RI, surface soil samples were collected from the closed South Landfill (following completion of the upgraded cover systems) and analyzed for PCBs. The PCB concentrations ranged from non detect to 10 mg/kg. The results are shown on the figure entitled "PCB Soil Sample Results" included in Appendix A-1 of the RI Report. A composite sample was collected from the cover of Cells 1E, 2E, and 3E, which shows a corresponding PCB concentration of 6.29 mg/kg.

Various constituents have been reported in observation wells located around the closed South Landfill. The most recent detections are included in the RI Report. During the RFI/CS Program, well

OWR-05D was sampled and exceedances above the CCLs were reported for lead, manganese, PCBs, PNP, and pentachlorophenol. During the semi-annual sampling events, sporadic detections of PCBs have been reported in samples from OW-02 and OW-04 at concentrations less than 1 µg/l. Each of these three wells are located either upgradient or within the cone of influence of the groundwater recovery system located on the closed South Landfill, and impacts are controlled by this recovery system. There have been no recent exceedances detected in monitoring wells MW-11A, MW-12A, and MW-13A located downgradient of Cells 1E, 2E, and 3E.

At the conclusion of the RI, additional investigations were conducted at the South Landfill to address data gaps identified by the EPA. Sampling was conducted to evaluate groundwater concentrations at well OWR-05D. Analytical results of the groundwater samples (original and field duplicate) collected at OWR-5D indicated that total PCB concentrations for unfiltered samples ranged from 447 J µg/l to 596 J µg/l depending upon the method used to analyze the samples. These results are slightly higher than the concentration measured in the previous sampling event; however, this well is located within the influence of the SWMU-1 Groundwater Corrective Action System. The PCB concentrations for the filtered samples ranged from non detect to 2.62 UJ µg/l.

As part of these additional investigations, P/S sampled water that was emanating from a seep that had been identified on the cover near Cell 3E. Results for the unfiltered seep samples were non detect for volatile organic compounds and pesticides, while the semi-volatile organic compound 1,4-dichlorobenzene was detected at a concentration of 1.4 J µg/l for the original sample and 1.6 J µg/l for the duplicate sample. PCB results for the unfiltered samples (original and field duplicate) ranged from non detect to 0.59 J µg/l depending upon the method used to analyze the samples. The PCB results for the filtered sample were non detect. Metals results for the unfiltered sample indicate a detection of 0.13 mg/l for barium and 0.19 mg/l for manganese, with associated filtered results of 0.12 mg/l for barium and 0.17 mg/l for manganese. The results were reported to both ADEM and the EPA along with P/S's recommendation to conduct further monitoring over the next year.

Findings of the investigation activities conducted show that the cap/cover material overlying Cells 1E, 2E, and 3E was generally 24 inches thick or greater, and the cover soils consist of low plasticity silt and clay with a mean permeability of 4.14×10^{-6} cm/sec. However, some gravel-sized material was encountered intermixed with the soil matrix that prevented a direct measurement of the cover thickness at some locations.

Using the data collected from these investigations, P/S evaluated the effectiveness of the cap by modeling the amount of surface water expected to infiltrate the existing cover system. The results are included in Appendix C and summarized below. The results were compared to alternative cover systems provided in CERCLA (composite cover system with flexible membrane and soil cover) and TSCA (low permeability soil cover) guidance documents.

Percolation through the Cover System

	Peak Daily (cf/day/ac)	Avg. Daily (cf/day/ac)	Peak Daily (gal/day/ac)	Avg. Daily (gal/day/ac)
CERCLA Guidelines	0.2	0.02	1.5	0.1
TSCA Guidelines	20	12	148	87
Existing Cover System	673	172	5031	1288[7]

1) cf/day/ac – cubic feet per day per acre
2) gal/day/ac – gallon per day per acre

The results show that more water will infiltrate the existing cover system as compared to the alternative cover systems proposed by CERCLA and TSCA guidelines as a result of the higher permeability of the cover soils used to construct the cap; however, surface water infiltration is captured by existing downgradient interceptor wells and monitored by downgradient monitoring wells.

The interim measures completed at the closed South Landfill are subject to long-term monitoring and maintenance under provisions of the Facility's RCRA Permit. These interim measures have eliminated direct contact with landfill contents and have prevented off-Site migration of contaminated soil from these locations. Operation and maintenance of the closed landfill includes mowing, general maintenance and routine inspections of the landfill caps, fencing, access controls, surface water management structures, and access roads. The effectiveness of these completed measures is demonstrated by the following:

- The cover system remains intact, and there have not been any significant erosion, slides, or geotechnical failures. The cover system has been effective at reducing exposures to landfill content;

[7] The results calculated for the existing cover system are likely overstated based on the total discharge measured from the on-site interceptor wells.

- Ambient air monitoring conducted at the landfill indicates that the landfill is not a source of airborne PCBs either through particulate suspension or evaporation. Based on the results of the studies performed, the air pathway does not contribute significantly to the total PCB risk at the Site;
- Data from the surface water monitoring station (DSN-012), which includes runoff from the landfill, indicates mostly no or low-level detections of PCBs in the years following construction of the stormwater system enhancements. These data (as presented in the RI Report) indicate that the South Landfill stormwater system enhancements and cover systems have been effective at minimizing the migration of constituents through surface water transport;
- As discussed in the RI Report, it appears that the groundwater levels across the landfill have lowered due to upgrades in the cap and redirection of surface water run-off away from the landfill. This drop in the water table indicates that the amount of infiltration entering the landfill has been reduced; and
- Access restrictions (perimeter fencing and signage) have been effective at minimizing the potential for trespassers.

The above analysis shows that the existing cover systems over the closed South Landfill (including the cover over Cells 1E, 2E, and 3E) are protective of human health and the environment. Additionally, PCB concentrations measured in the wells located immediately downgradient of Cells 1E, 2E, and 3E (MW-11A, MW-12A, and MW-13A) have shown no reported exceedances in groundwater indicating that leaching to groundwater is not occurring. However, due to the now archaic design of the soil cover over these cells, an upgraded cover should be considered for Cells 1E, 2E, and 3E to provide additional protection to groundwater. With the existing groundwater corrective action system at the South Landfill, constituents in groundwater are captured and treated. However, GRAs may be required if EPA determines that the existing controls are not sufficient to restore groundwater within a reasonable timeframe.

Closed West End Landfill (surrounding areas)

As described in the RI Report, remedial activities were completed at the West End Landfill in 1996, which included constructing a multi-media HDPE cover system over the landfill area, excavating and removing PCB-containing soil and placing clean soil cover over adjacent areas of the landfill, and collecting stormwater run-off from the landfill and installing hard piping and lined channels to transport the run-off. PCB-containing soils excavated from the adjacent areas of the landfill were either hauled off to Chemical Waste Management's TSCA-approved landfill in Emelle, Alabama or placed beneath the HDPE cover system constructed over the landfill. The soil cover for the surrounding area extends to the fence line around the closed West End Landfill, and the cover is approximately two to three feet thick to the east and north of the landfill. A complete description of the cover systems and additional background information is included in the RI Report.

The PCB concentrations measured in soil prior to constructing the cover system described above are shown on the figures entitled "Concentration of PCB's in Soil at the Anniston West End Landfill", "Concentrations of PCB's in Ditch Samples at the Anniston West End Landfill", "West End Historical Soil Sampling Locations", "West End Present Soil Sampling Locations", and "West End Landfill Ditch Samples (adjacent to 1st Avenue)" included in Appendix A-1 of the RI Report. The samples included on these figures were collected in 1994 through 1996 and reported to ADEM. As indicated above, P/S excavated and removed soil from the adjacent areas of the landfill prior to placing the soil cover. With the exception of Figure A-6 (included in the appendix), the PCB concentrations shown on these figures represent the concentrations measured prior to conducting soil removal activities and capping the area. Figure A-6 represents PCB concentrations post-excavation activities but prior to placing the soil cover on the adjacent areas. Areas of the West End Landfill with elevated PCB concentrations were capped with a multi-media HDPE liner system or covered with clean soil and vegetative cover.

As shown on Figure A-3 (Appendix A-1 of the RI Report), elevated PCB concentrations were detected in the soil underlying the Alabama Power Company switch yard located within the limits of the West End Landfill property. The samples were collected from beneath the gravel present in the switch yard. Although no additional capping of this area was completed as part of the interim measures, Alabama Power maintains a substantial gravel cover over the area and restricts access to the switch yard to its employees only. The area is enclosed with a chain link fence, which remains locked while the area is not in use. Due to these security restrictions, the presence of high voltage power lines, and the active use of the site, conducting additional work is this area would be very difficult to impractical.

At the conclusion of the RI, additional investigations were conducted at the closed West End Landfill to address data gaps identified by the EPA. At the West End Landfill, P/S performed confirmation soil sampling in the vicinity of the historic composite sample AA2 (Adjacent Area 2). AA2 was collected prior to excavating and relocating PCB-containing soil from the area and capping the area with a soil cap, which was completed in 1996. The result from the original "8-point" composite sample (AA2) collected in this area was 1,940 mg/kg. EPA was concerned with this area since pre-excavation results indicated the presence of 'principal threat waste".

PCB results for samples collected from AA2 (original and duplicate sample) ranged from 14.86 J mg/kg to 89.8 J mg/kg depending upon the method used to analyze the samples. These results

confirm that the high level PCB concentrations originally detected in soil at this location were removed prior to placing the soil cap/cover over this area.

Interim measures completed at the closed West End Landfill are subject to long-term monitoring and maintenance under RCRA. The interim measures have eliminated direct contact with landfill contents and have prevented off-Site migration of contaminated soil from these locations. Operation and maintenance of the closed landfill include mowing, general maintenance and routine inspections of the landfill caps, fencing, access controls, surface water management structures, and access roads. The effectiveness of these completed measures is demonstrated by the following:

- The cover system remains intact, and there have not been any significant erosion, slides, or geotechnical failures. The cover system has been effective at reducing exposures to landfill content;
- Ambient air monitoring conducted at the landfill indicates that the landfill is not a source of airborne PCBs either through particulate suspension or evaporation. Based on the results of the studies performed, the air pathway does not contribute significantly to the total PCB risk at the Site;
- Stormwater runoff from the landfill was routed to a stormwater outfall designated as DSN-006. Surface water monitoring at this outfall reported no detections for PCBs between December 1997 and May 2001. As a result, monitoring at this outfall is no longer required by the Facility's NPDES Permit. Therefore, the landfill is effective at minimizing the migration of constituents through surface water. However, if a containment remedy is selected for the closed West End Landfill, additional NPDES monitoring may be required to demonstrate the long-term effectiveness of the selected measures; and
- Access restrictions (perimeter fencing and signage) have been effective at minimizing the potential for trespassers.

Groundwater monitoring in the vicinity of the closed West End Landfill has not been a requirement of the RCRA Permit. However, as part of the RFI/CS Program, P/S agreed to conduct semi-annual groundwater monitoring for a two-year period. The two-year monitoring was completed in 2004; however, at the request of EPA, P/S agreed to conduct one additional round of sampling as part of the RI Program. PCBs were the only constituent detected above the CCLs for all sampling conducted at the closed West End Landfill over the last eight years prior to completing the RI. The concentrations of PCBs in the wells have consistently remained low with values from non detect to just above the CCL of 0.5 µg/l. Further information on groundwater results for the closed West End Landfill is presented in the RI Report.

The above analysis shows that the existing cover systems over the closed West End Landfill and surrounding areas are protective of human health and the environment. PCB-containing soils are

adequately isolated to prevent direct contact with these soils. Additionally, no significant groundwater or surface water impacts have been noted. Lastly, confirmation sampling indicates that previously identified "principal threat waste" in Adjacent Area 2 has been excavated and removed from the Site. No additional GRAs are required for this area.

"Walking Trail Area"

In May 1995, prior to the placement of a geotextile and soil cover, soil and sediment samples were collected from the "walking trail area" located in the southeast corner of the plant site. The samples were field screened for PCBs, and approximately 10% of the field samples were submitted for laboratory analysis of PCBs. The results of these analyses are included in Appendix A-2 of the RI Report. Of the samples collected, nine soil and eight sediment samples exceeded the screening level of 10 mg/kg. Laboratory concentrations ranged from 6.1 mg/kg to 157 mg/kg. Appendix A-2 of the RI Report provides the locations and results of the samples collected in the "walking trail area".

Surface water run-off from the "walking trail area" is routed to surface water monitoring station (DSN-012). The results from DSN-012 indicate mostly no or low-level detections of PCBs in the years following construction of the soil cover system over this area. These data (as presented in the RI Report) indicate that the cover system has been effective at minimizing the migration of constituents through surface water transport.

Well OW-15 is located directly within the "walking trail area". As indicated in Section 4.2.4.1, groundwater impacts measured near this location likely originated from the South Landfill. However, if significant leaching from soil to groundwater were occurring in the "walking trail area", PCB concentrations in OW-15 would likely be increasing. The concentrations measured at OW-15 have been low and sporadic with only six detected concentrations (maximum of 14.5 µg/l in 1999) for the last 18 samples analyzed. More recent events show either low level detections or non detect results for PCBs. Thus, PCB concentrations are not increasing over time indicating that continued leaching to groundwater is likely not occurring in this area.

The above analysis shows that the existing cover system over this area is protective of human health and the environment. PCB-containing soils are adequately isolated to prevent direct contact with these soils. Additionally, no significant groundwater or surface water impacts have been noted. Based on this evaluation and the limitations present in this area (for performing additional work) from the existing tree cover and cover soils, no additional GRAs are required for this area.

5.3.2 Identification of Soil Remediation Areas

The soil impact areas identified above were evaluated to determine where the application of GRAs would reduce Site risks to below acceptable levels. The following summarizes the evaluation for addressing surface soil impacts, subsurface soil impacts and potential impacts associated with COCs leaching to groundwater.

- Surface Soil Impacts (impact type 1): The application of GRAs for surface soil is limited to the top two feet of the soil matrix or to the limits of impact, whichever is less, in order to address surface soil RAOs. As discussed in Section 4.4.1, Remedial Goals were developed for PCBs (25 mg/kg) and arsenic (66 mg/kg). In order to achieve the applicable RAOs for surface soil, GRAs must be applied to soil impact areas such that the resulting exposure point concentrations at the Site are below the applicable Remedial Goals. As included in the HHRA, the exposure point concentrations for PCBs and arsenic prior to performing remedial actions are 374 mg/kg and 390 mg/kg, respectively. Note that these calculations were performed prior to conducting the limited removal action near sample SSRI-11. Based on the evaluation included in Appendix D, GRAs are required for soil impact areas A, C, D and E in order to address surface soil RAOs. Once these areas are addressed and their relevant exposure pathways are eliminated, the resulting exposure point concentrations for surface soil at the Site would reduce to 24 mg/kg for PCBs and 7.6 mg/kg for arsenic. Both of these values are below the Remedial Goals. The exposure point concentration calculations are included in Appendix D.

- Subsurface Soil Impacts (impact type 2): The application of GRAs for subsurface soil will extend to the limits of subsurface impacts exceeding the Remedial Goals. As shown on Table 5-2A, GRAs are required for three areas (A, E and F) to achieve subsurface RAOs. Two of these areas, Areas A and E, will also require GRAs to address potential impacts to groundwater.

- Leaching to Groundwater (impact type 3): The application of GRAs for potential leaching to groundwater will extend to the limits of subsurface impacts. As shown on Table 5-2A, GRAs are required for three areas (A, B and E) to achieve the applicable RAO for leaching to groundwater. However, as indicated in the RI Report, Area B has already been covered by an impermeable cover (concrete cap), which is sufficient to prevent exposure and to mitigate the potential for constituents in soil to leach to groundwater. Therefore, additional remedial

measures for this area will not be required except to collect a confirmation sample as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. As described in Section 5.3.1, GRAs may be required for Cells 1E, 2E, and 3E of the South Landfill (PCB Cells) to achieve the applicable RAO for leaching to groundwater. GRAs will be required if EPA determines that the existing cover system over these cells is not adequate to protect against leaching and must be enhanced. Therefore, for the remainder of the FS, Option 2 under the soil capping alternative has been included as a soil remedial alternative to address the potential capping upgrade for these cells.

In summary, GRAs will be required for Areas A, C, D and E to address surface soil impacts; Areas A, E, and F to address subsurface soil impacts; and Areas A, E, and potentially Cells 1E, 2E, and 3E (PCB Cells) to address the potential for COCs leaching to groundwater. GRAs for Areas A and E must address all three types of impacts. Thus, excavation-type remedial actions for these two areas should extend to the full depth of impact and containment options should include means for reducing further impacts to groundwater. GRAs for Areas C and D need only address surface soil impacts. If GRAs for Cells 1E, 2E, and 3E are required, they must address the potential for leaching to groundwater. GRAs for Area F must only address subsurface soil impacts and would likely include institutional/administrative controls.

For the excavation and treatment alternatives, Table 5-2B has been provided to summarize the estimated soil impact volumes that are used in the attached cost estimates.

5.3.3 Evaluation of Soil Remedial Technologies

Following the identification and preliminary screening of technologies, remedial technologies and process options (collectively technologies) for soil were identified that are: (1) technically implementable; (2) effective in mitigating potential risks posed by contaminants remaining at the Facility; and (3) capable of achieving the RAOs for soil. These technologies, described in the following sections, are screened based on their effectiveness, implementability, and cost. Retained technologies are identified and are evaluated further in Section 6.0. The results of this screening are summarized in Tables 5-3A and 5-3B and discussed below. In Table 5-3A, the three screening criteria used to evaluate the technologies are assessed based on high, moderate or low rankings. Table 5-3B provides a numerical ranking of the screening criteria, with 1 being the least favorable and 10 the most favorable.

5.3.3.1 No Action

The evaluation of a No Action alternative is required by the NCP to provide a baseline for comparison to other alternatives. The No Action Alternative for soil consists of applying no additional remedial technologies but continuing all operation, maintenance, and implementation of existing systems, institutional controls, and engineering controls. As required, the no action technology is retained for assembly of the soil remedial alternatives (Section 6.3) and the detailed evaluation of Site-wide remedial alternatives (Section 7.0).

5.3.3.2 Institutional Controls and Engineering Controls

The term "Institutional Controls" (ICs) generally refers to non-engineering measures intended to affect human activities to prevent or reduce exposure to COCs, often by limiting land or resource use. ICs are also sometimes referred to as Land Use Controls (LUCs), although LUCs can also include engineering controls such as fences and warning signs. The LUC or IC component of the remedial alternatives will include the existing deed notice recorded with the Calhoun County Office of Judge of Probate in Deed Book 3027, page 150 (October 21,2002). The deed notice contains: (1) a restriction for use of land for industrial purposes only; and (2) a restriction on groundwater use so that it shall not be used or consumed for potable, industrial, agricultural, or other supply purposes. Although this deed notice is not an enforceable instrument, it serves to provide notice as to the hazardous substances present at the Facility and appropriate uses of land and groundwater.

In addition, an environmental covenant drafted and recorded in accordance with ADEM Administrative Code 335-5 may be another IC utilized as part of the remedy. A properly drafted and recorded environmental covenant which provides the land/groundwater use restrictions runs with the land and allows a "holder" (or grantee), including ADEM, to enforce violation of the covenant terms. Pursuant to ADEM Administrative Code 335-5, such an environmental covenant must include: (1) a statement that the instrument is an environmental covenant executed pursuant to the Alabama Uniform Environmental Covenants Act; (2) a legally sufficient description of the real property that is subject to the covenant; (3) a description of the activity and use limitations on the real property; (4) identification of every holder; (5) the signatures of the ADEM Director, every holder of the covenant, and every owner of the real property subject to the covenant; and (6) the name and location of any administrative record for the remedial action reflected in the covenant. A notice of the environmental covenant must be recorded with the Calhoun County Office of Judge of Probate Recording Division. The covenant remains perpetual unless terminated or modified as described in ADEM Administrative Code 335-5-4-.01.

Other ICs contemplated as part of the remedy could include governmental controls, such as zoning ordinances or overlay districts, and regulatory controls, such as well drilling regulations.

Engineering controls in the form of fencing and security personnel restrict Site access. Warning signs have been installed to notify potential trespassers that the Facility is restricted and access is not permitted. Additionally, workers at the Facility are required to wear long-sleeve shirts while working in the main Facility area. This requirement reduces the potential for dermal exposure to COCs. In addition to maintaining these existing institutional controls and engineering controls, this technology would include further enhancements to the current controls such as instituting a "no dig policy" that would restrict excavations within the Facility to authorized personnel who are adequately trained and certified to work within contaminated media. This policy would include requirements for construction and utility workers to employ appropriate OSHA personal protective equipment and procedures to the extent required to monitor and mitigate potential adverse exposures to COCs in soil. Additional perimeter fencing in the northeast portion of the Facility and along the southern portion of the employee parking lot is proposed to improve upon the current Site access controls. Long-term O&M requirements would include the on-going review, inspection, and maintenance of these controls. This technology is effective at achieving the soil RAOs particularly related to protecting human contact with subsurface soil (Areas A, E and F). It is easily implemented with relatively low cost. Therefore, this technology is retained.

5.3.3.3 Containment - Capping

Containment remedies are often performed to prevent, or significantly reduce, the exposure of potential receptors to contaminated soil, and/or to prevent or significantly reduce the migration of contaminants to groundwater or surface water. Containment is desirable or necessary when contaminated soils are to be buried or left in place. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards, unrealistic cost, or lack of adequate treatment technologies. This type of remedy typically requires long-term periodic inspection for settlement, ponding of liquids, erosion, and naturally occurring invasion by vegetation or animals. Containment options for soil typically consist of some kind of physical barrier (surface barrier) or cover system over the contaminated soil. The purpose of the barrier or cover system is to perform one or more of the following functions:

- minimize percolation of water into the underlying contaminated materials;

- raise the ground surface and provide appropriate slopes to promote surface-water runoff (minimize erosion of contaminated soil);
- control the release of gas from the contaminated materials; and
- separate the contaminated materials from humans, animals and plants (e.g., reduce exposure potential).

Containment, in the form of surface covers, is already being effectively implemented throughout the Facility and landfills at the locations shown on Figure 3-1. The two cells of the South Landfill designated as WMA I were closed with a RCRA compliant cap in 1989. As described in Section 3.2, from the bottom up, the RCRA compliant cap consists of a 24-inch thick compacted clay base, a 12-inch thick sand drainage layer, a geotextile fabric layer, and a 24-inch thick soil cover layer with vegetation. The South Landfill had been previously covered with compacted soil and a vegetative layer. In 1998, portions of this cap were upgraded consisting of the following elements from the bottom up: a 6-inch soil layer, a 40-mil thick HDPE geomembrane, a geocomposite drainage layer, an 18-inch thick soil cover layer, and a 6-inch thick topsoil layer with vegetative cover. Additionally, a 12-inch thick soil cover and vegetative layer were placed above a non-woven geotextile layer over adjacent areas of the closed South Landfill. Within the plant area, the majority of the surface area is covered with gravel, asphalt, or concrete pavement, which limits access to underlying soils as shown on Figure 3-1.

Implementation of this technology would include placing additional or improved covers over impacted areas as described in Section 5.3.2. The proposed horizontal extent of these proposed covers are shown on Figure 5-2. The primary objective of containment at the Facility would be to reduce the exposure potential to contaminated surface soil (Areas A, C, D and E), to minimize erosion and the subsequent potential for movement of COCs to surface water (Areas A, C, D and E), and to minimize infiltration in areas where COCs are potentially leaching to groundwater (Areas A, E and potentially Cells 1E, 2E, and 3E). Several types of cover systems are appropriate depending upon the location and intended end use for that portion of the property. Typical cover options for containment include:

- soil cover underlain by a non-woven geotextile fabric,
- soil underlain by a drainage layer and geomembrane,
- gravel layer,
- an asphalt cover, or
- a concrete over.

Containment is highly effective at addressing potential direct contact exposures, as has already been demonstrated at the Facility. Depending upon the cover option selected, containment can also be effective at minimizing infiltration to prevent leaching of constituents to groundwater. Thus, the implementability of this technology is high. Depending on the type of cover selected, the cost of implementing this technology is expected to be moderate. This technology is a proven remedial strategy and has been retained for further consideration due to its high effectiveness and ease in implementation.

5.3.3.4 Excavation/Disposal or Ex-Situ Treatment

With excavation and removal remedies, contaminated material is removed and transported to disposal facilities for final disposition or the material is removed and treated ex-situ at the site. Areas containing "principal threat" waste *(i.e.,* containing PCBs greater than 500 ppm in industrial areas) should generally be excavated, treated, and disposed in accordance with EPA's *Superfund PCB Guidance and* 40 CFR 300.430(a)(1)(iii)(A). Excavation and disposal is applicable to the complete range of COCs for the Facility. The types and concentrations of COCs will typically dictate off-site disposal requirements. Additionally, for PCBs, the TSCA requirements for treatment and disposal of bulk PCB remediation [40 CFR 761.61(a)(5)(i)] and the performance based disposal options provided in 40 CFR 761.61(b) are considered Action-Specific ARARs for off-site disposal of PCBs. Another disposal option that may be applicable is to construct an appropriate disposal facility at the Site. Instead of disposing the material off the Facility, the material would be placed within a soil management area on Solutia-owned property. For ex-situ treatment, the impacted soil would be excavated, removed and treated ex-situ at the Facility. Based on the preliminary screening of technologies, the most applicable treatment technologies for ex-situ treatment of soil are chemical dehalogenation and thermal desorption.

The proposed horizontal extents for the excavation with disposal and/or ex-situ treatment technologies are shown on Figure 5-2. Note that Area F has not been included on Figure 5-2 since this area can be addressed with institutional/administrative controls. Over the areas shown, soil would be excavated to the indicated depths and replaced with imported clean fill material, or backfilled with the excavated soils following ex-situ treatment. The completed surface would typically consist of a grass and soil cover, a gravel cover, or other appropriate cover depending on the expected end use of that portion of the property. In general, excavation of impacted soil is highly effective in the long term at addressing potential direct contact exposures. However, in the short term workers could be exposed by dermal contact and fugitive dust during implementation. Details

associated with the implementation of this technology with regards to specific disposal and treatment options are discussed in the following sections. Cost is dependent on the particular disposal and treatment options selected. This technology is a proven remedial strategy and has been retained for further consideration due to its high effectiveness.

5.3.3.4.1 On-Site Landfill

This technology includes using a landfill/soil disposal unit on the Facility or on Solutia-owned property located adjacent to the Facility. The excavated material transported to the on-Site disposal area would be placed and covered with a geotextile marker layer and compacted soil with a minimum thickness of ten inches. Toxic Substance Control Act (TSCA) regulations, specifically 40 CFR 761.61, allow for PCB remediation waste with concentrations up to 100 mg/kg to remain on site, if the PCB remediation waste is covered by an appropriate cap. A cap as defined under the regulations is to consist of concrete or asphalt pavement with a minimum thickness of 15 centimeters (6 inches), compacted soil with a minimum thickness of 25 centimeters (10 inches), or synthetic membrane liner system consisting of appropriate protective soil underlying and covering the liner and a minimum liner thickness of 30 mils. Soil with higher PCB concentrations can be placed and managed within the Site if the landfill/soil disposal area is permitted as a TSCA-approved land disposal facility.

This technology has been successfully implemented as part of the removal actions currently being conducted under OU-1/OU-2. However, the PCB concentrations allowed in the current on-Site soil management unit are restricted; specifically the concentration of PCBs must be less than 10 mg/kg based on five-point composite sampling results. This PCB level was selected to ensure that no individual grab samples would have PCB concentrations greater than 50 mg/kg. Based on soil sampling results at the Facility, it is expected that excavated soil from the Facility will have PCB concentrations in excess of 50 mg/kg. Therefore, use of the existing soil management area would not be allowable for all of the materials proposed to be excavated, unless a variance or waiver is granted by the EPA. As a result, in order to implement this technology a new soil management unit would need to be constructed or the existing unit modified in order to allow for the disposal of all anticipated materials. As proven in the past with the existing on-Site soil management units, this technology is highly effective in the long term. However, short-term impacts as a result of fugitive dust and dermal contact associated with excavation, hauling, and placement, are of some concern. Although, the equipment, methods and materials needed to construct an on-Site soil management unit are conventional and readily available, there may be regulatory impediments to implementing this technology. Specifically, obtaining the necessary approvals and public acceptance for constructing a

new unit could be difficult, making the implementability of this technology low. The cost associated with constructing a new unit is high. Given the anticipated difficulties with implementation and cost, this technology has been eliminated from further consideration.

5.3.3.4.2 Off-Site Landfill

This technology consists of disposing of excavated materials at an off-Site landfill(s). The landfill(s) would be owned and operated by others under state or federal permits. Currently, this technology is being implemented as part of the removal actions being conducted under other OUs. Materials that are not suitable for disposal in the on-Site soil management unit are hauled to an off-Site landfill(s). This technology is highly effective in the long term. In the short term, workers could be exposed through dermal contact and fugitive dust during implementation. In addition, hauling requirements would result in increased local traffic and risk of transportation accidents. When implemented as a stand-alone remedial technology, the cost associated with this technology is moderate to high; however, the application of this method in combination with other technologies allows for cost savings to be achieved, especially for excavated materials that qualify for disposal at Subtitle D landfills. This technology has been retained for further consideration due to its effectiveness and implementability.

5.3.3.4.3 Ex-situ Treatment – Chemical Dehalogenation

For this technology, the excavated material would be treated ex-situ using chemical dehalogenation. The dehalogenation process is achieved by either the replacement of the halogen molecules or the decomposition and partial volatilization of the contaminants. The contaminants are entirely or partially decomposed. One method of chemical dehalogenation, base-catalyzed decomposition (BCD), is employed by using sodium hydroxide, sodium bicarbonate, or aliphatic hydrocarbons as hydrogen donors. The soil is first screened, processed through a crusher and pug mill, and stockpiled. For treatment of PCBs, the stockpiled material is typically mixed with sodium bicarbonate in the amount of 10 percent of the weight of the stockpile and is heated for about one hour at a temperature of approximately 343 degrees Celsius (^{o}C) (650 ^{o}F) in a rotary reactor. PCBs are completely dechlorinated and partially volatized in this step. The PCBs in the vapor condensate, residual dust, spent carbon, and filter cake are dechlorinated after about 2 hours at 349^{o}C (660^{o}F) in a stirred tank, boiling slurry (i.e., liquid phase) reactor (STR) utilizing a high boiling point hydrocarbon oil, catalyst, and sodium hydroxide. Based on pilot studies, a reduction in PCB concentrations of 98 to 99 percent, with treated soil samples ranging from less than the reported detection limit (generally equal to 0.4 to

0.5 mg/kg) to 1.8 mg/kg can be achieved through proper application of dehalogenation techniques (EPA, 1993). However, evidence of its effectiveness for arsenic is not available. Site-specific treatability studies and possibly field trials would be required to confirm treatment efficiency for the Facility and for the range of COCs. This is a specialized technology and the equipment, methods, and materials are not readily available. Furthermore, a large staging area for stockpiling and processing the material would be required. Implementation of this technology could disturb on-going plant operations, and there would be specific health and safety requirements. The cost of this technology is considered high. In accordance with comments received from the EPA, this technology has been retained for further consideration due to its potential effectiveness and destruction capability for PCBs (EPA, 2008b).

5.3.3.4.4 Ex-situ Treatment – Thermal Desorption

For this technology, the excavated material would be treated ex-situ using thermal desorption. Thermal desorption is a physical separation process not designed to destroy organic compounds. The material is heated enough to volatilize water and the organic compounds, which are conveyed to an off-gas treatment system. The temperatures and residence times used in the desorber are designed to volatilize selected organic compounds, but not destroy them. For PCBs, soil is heated to between 315^{o}C (600^{o}F) and 537^{o}C (1,000^{o}F). The off-gas is then cooled to about 230°C (450°F), and fine particulates are removed using conventional fabric filter particulate removal equipment. The PCBs remaining in the off-gas are removed through condensation followed by carbon adsorption, or they are destroyed at a high temperature, about 1,000°C (1,900°F), in a thermal oxidizer. According to the "ETCAP Compendium[8]," thermal desorption has been used on full-scale projects for PCB treatment and has been shown to decrease PCB concentrations in soil to below 1.0 mg/kg when properly applied. However, evidence of its effectiveness for arsenic is not available. Treatability studies and possibly field trials would be needed to fully assess the effectiveness of this technology under Site-specific conditions. This is a specialized technology and the equipment, methods, and materials are not readily available. Furthermore, a large staging area for stockpiling and processing the material would be required. Implementation of this technology would disturb on-going plant operations, and there would be specific health and safety requirements for this technology. The cost of this technology is considered high. In accordance with comments received from the EPA, this technology has been retained for further consideration due to its potential effectiveness for PCBs (EPA, 2008b).

[8] http://www.lanl.gov/orgs/d/d4/enviro/etcap/

5.3.3.5 In-Situ Thermal Desorption

In-situ thermal desorption uses thermal wells, typically consisting of a perforated outer steel casing and an interior heating element, in a closely spaced pattern throughout the impacted areas. The wells and an approximately 6-inch wide concentric halo around the wells would be heated to approximately 760^{o}C to 1040^{o}C (1,400^{o}F to 1,900^{o}F). The desired temperature and well spacing are design considerations and may vary. Heat propagating throughout the area would first vaporize moisture, and then increase soil temperatures to approximately 230^{o}C (450^{o}F). The constituents are stripped from the treatment zone and brought to the surface through soil vapor extraction. A heat resistant silica blanket would be placed over the area forming a seal to minimize losses and steam, as well as to reduce intrusion of atmospheric air. Extracted vapors would be treated utilizing an above ground treatment train, potentially consisting of a thermal oxidizer at the ground surface followed by a heat exchanger and vapor phase activated carbon (VPAC) system.

This technology may remove or reduce the concentrations of PCBs in soil. However, evidence of its effectiveness for arsenic is not available. Treatability studies and possibly field trials would be needed to fully assess the effectiveness of this technology under Site-specific conditions. This is a specialized technology and the equipment, methods, and materials are not readily available. Implementation of this technology could result in disturbances to the on-going plant operations, and there would be specific health and safety requirements. The cost of this technology is considered high. Based on the limited effectiveness, implementability concerns, and high cost potential, this technology is eliminated from further consideration.

5.4 Remedial Technologies for Groundwater

5.4.1 Delineation of Groundwater Impact Areas

There are four groundwater RAOs. The first and primary RAO for groundwater is to mitigate risks to receptors from direct contact with or ingestion of COCs in groundwater. The remaining RAOs aim at achieving this long-term goal while maintaining concentrations below the Remedial Goals (typically MCLs), as described in Section 4.5.2, and preventing further releases or migration of contaminants. Currently, the Facility is under deed restrictions that prohibit groundwater use at the Facility and there are no downgradient receptors of the impacted groundwater.

The hydrogeology at the Facility has been well studied, and extensive investigations have been performed as detailed in the RI Report. The CSM for the Facility acknowledges that local areas of

groundwater impact exist within the Facility (Golder, 2010a). However, at most impacted locations, downgradient wells exist that demonstrate contaminants are not migrating from the Facility. At the location where contaminants have been confirmed at the downgradient boundary, groundwater capture systems (see Figure 5-3) have been installed with the exception of the areas near OW-21A and OW-10. Groundwater GRAs may be applied to the areal extent of the Facility (approximately 138 acres) and a select location north of the Facility near OW-21A.

5.4.2 Evaluation of Groundwater Remedial Technologies

Following the identification and preliminary screening of technologies, remedial technologies and process options (collectively technologies) for groundwater were identified that are technically implementable, effective in mitigating potential risks posed by contaminants remaining at the Facility, and capable of achieving the RAOs for groundwater. These technologies, described in the following sections, are screened based on effectiveness, implementability, and cost. Retained technologies are identified and are evaluated further in Section 6.4. The results of this screening are summarized in Tables 5-3C and 5-3D. In Table 5-3C, the screening criteria used to evaluate the technologies are assessed based on high, moderate or low rankings. Table 5-3D provides a numerical ranking of the screening criteria, with 1 being the least favorable and 10 the most favorable.

5.4.2.1 No Action

The evaluation of a No Action alternative is required by the NCP to provide a baseline for comparison to other alternatives. The No Action Alternative for groundwater would include no additional remedial technologies, but continuing operation, maintenance, and implementation of existing systems, institutional controls, and engineering controls. As required, the no action technology is retained as a remedial alternative for groundwater (Section 6.4), and is included in the detailed evaluation of Site-wide remedial alternatives (Section 7.4).

5.4.2.2 Institutional Controls and Engineering Controls

Institutional controls or LUCs (e.g., deed restrictions or covenants, administrative controls) are a proven technology for addressing groundwater impacts. Currently, the Facility is under deed restrictions that prohibit current or future residential development or groundwater use. As described in Section 4.3.3.2, P/S intends to work with ADEM to develop an environmental covenant for the Site.

Engineering controls are employed in the form of access restrictions to the Facility that include fencing and security personnel. Warning signs have been installed to notify potential trespassers that the Facility is restricted and access is not permitted. Long-term operation and maintenance requirements will include review and inspection of these controls.

This technology has moderate to low effectiveness in achieving the groundwater RAOs. It is easily implemented with low cost. This technology is retained for further consideration based on favorable implementation and cost evaluations.

5.4.2.3 Monitored Natural Attenuation

Natural attenuation involves the combined effects of dispersion, dilution, adsorption, abiotic transformation (e.g., hydrolysis), volatilization and biological degradation. MNA is the standardized monitoring and tracking of natural attenuation processes. The attenuation mechanisms listed above can effectively, over time, reduce contaminant levels. Abiotic transformation and biodegradation are important "destructive" attenuation mechanisms, as they typically transform the constituents to less toxic compounds and can ultimately result in the complete degradation of a compound to benign end products such as ethane. The application of this technology includes a network of wells for monitoring groundwater over an extended period of time (e.g., 30 years). The parameters and frequency of analysis are a design consideration, but would likely include analysis of select COCs, field parameters, and natural attenuation parameters collected on an annual or less frequent basis. Field parameters and natural attenuation parameters to be monitored in a subset of wells could include dissolved oxygen, oxidation-reduction potential, turbidity, pH, specific conductance, methane, ethene, ethane, total organic carbon, alkalinity, total suspended solids, nitrate, sulfate, sulfide, ferrous iron, and chloride. Water levels would be measured during each sampling event, and equipotential maps would be constructed to monitor groundwater flow and direction.

Although natural degradation is occurring at the Facility for many COCs, some COCs, particularly PCBs and metals, are not prone to naturally degrade. These constituents would rely on other physical processes to attenuate (e.g., dispersion, dilution, and adsorption). A detailed discussion of the evaluation of natural attenuation under existing conditions is presented in the RI Report, which shows strong evidence that natural attenuation is effectively occurring at the Site for parathion and PNP. Based on a review of Site data and prior MNA applications conducted at similar sites, MNA is only being considered for parathion and PNP. As a result, the effectiveness of MNA alone is considered moderate. However, if used in combination with a containment technology, MNA is an effective

means of reducing chemical concentrations, as presented in the OSWER Directive 9200.4-17P regarding the use MNA at remediation sites (EPA, 1999). MNA is easily implementable, since it relies on natural biochemical and physical processes that already exist and that do not require enhancements, and since existing monitoring wells at the Site provide for simple implementation of the technology. The services and material required to implement this technology are standard within the industry and readily available. The cost of MNA is expected to be low. This technology is retained for further consideration.

5.4.2.4 Containment – Vertical Barriers

Vertical barriers, such as slurry walls or sheet pile walls, are a proven technology for groundwater containment. The vertical barrier would be installed at the perimeter of the Facility perpendicular to the downgradient flow path of groundwater to provide a relatively impermeable barrier to the horizontal flow of groundwater. A slurry wall is typically constructed using bentonite slurry, commonly mixed with soil and cementious materials. The slurry is placed in a trench that has been excavated to the desired depth. Once installed, the slurry solidifies and forms a permanent underground cut-off wall to control groundwater movement. A metal sheet pile wall consists of interlocking sheet piles to form a relatively impermeable barrier that would act in a similar manner as a slurry wall. Groundwater pumping wells or a collection trench would likely be installed on the upgradient side of such barriers to control groundwater levels and prevent hydrostatic buildup.

The effectiveness of this technology is considered to be moderate since the vertical barriers do not offer much additional benefit over the containment achieved by the number of groundwater pumping wells that would likely be needed to reduce groundwater mounding behind the wall. In addition, construction of the barrier could prove difficult due to the close proximity to the railroad tracks, depth to deep residuum or bedrock, and close proximity to other on-Facility utilities/structures. The cost associated with this technology is high. Based on the limited effectiveness, implementability concerns, and high cost, this technology is eliminated from further consideration.

5.4.2.5 Groundwater Extraction / Ex-situ Treatment / Discharge

This section describes the existing groundwater extraction system in place at the Facility and presents two separate alternatives for expanding upon the existing system, and treating and disposing of effluent from the system. The first option includes extraction, treatment and discharge to the POTW and the second option includes extraction, treatment and discharge through an on-Site NPDES permit.

There are currently two groundwater collections systems in place at the Facility: the SWMU 1 Corrective Action System and the WMA II Corrective Action System, collectively herein referred to as the Groundwater Corrective Action System. A description of the Groundwater Corrective Action System is presented in Section 3.0 and summarized below:

- The SWMU 1 Corrective Action System intercepts and recovers groundwater from the closed South Landfill and the plant site. While the RCRA Post-Closure Permit does not name the SWMU-1 Corrective Action System specifically, it is included in monitoring and financial assurance requirements stipulated in the Permit. Interceptor wells IW-1 through IW-15 were installed prior to 1988. Interceptor wells IW-1, IW-3, IW-4, and IW-15 were deactivated in 1998 pursuant to the Facility's RCRA Permit, but the wells are still maintained. The total groundwater extraction for the period of July 2005 to July 2007 averaged 127,000 gallons per year (approximately 0.24 gpm). Groundwater from each of the recovery wells, except IW-10, is pumped to an equalization basin and then discharged to the Anniston POTW. Groundwater from IW-10 is passed through a carbon filtration system before being discharged to the equalization basin. As reported in the RI Report, the SWMU I system has been effective at recovering groundwater impacted with COCs.
- The WMA II Corrective Action System was installed in 1988, and recovery operations began in February 1989. The WMA II system consists of eleven interceptor wells (IW-16 through IW-25 and DW-01). The total discharge for all the wells in the WMA II Corrective Action System for the period of July 2005 through July 2007 averaged 639,000 gallons per year (approximately 1.2 gpm). Groundwater removed from the recovery wells is pumped to a collection tank and then to an equalization basin that discharges to the Anniston POTW. As reported in the RI Report, the WMA II system has been effective at recovering groundwater impacted with COCs.

The existing Groundwater Corrective Action System is considered to be moderately effective, easy to implement, with moderate cost. Therefore, this technology is retained for further evaluation.

5.4.2.5.1 Groundwater Extraction and Disposal to POTW

This technology builds upon the existing Groundwater Corrective Action System by extending the system in the vicinity of the identified additional groundwater impact areas near wells OW-21A and OW-10, as identified on Figure 5-1. The precise number of additional extraction wells would be determined as part of a pre-remedial design investigation (PDI) effort. Pretreatment at individual pumping wells will be required based on the measured groundwater concentrations. This pretreatment would likely consist of carbon filtering which has previously been employed at the Facility and is highly effective. Extracted groundwater would be pumped to the existing holding tank and then discharged to the POTW. Installing additional pumping wells would complete perimeter containment for impacted groundwater originating from the Facility. Therefore, this technology is considered highly effective. As already demonstrated at the Facility, the equipment, methods, and

materials needed are conventional and readily obtainable. There is some concern with installing the conveyance system below the railroad tracks near well OW-21A, but there is an existing culvert that might be available for use as a conduit. The additional capital cost associated with installing new pumping wells and conveyance piping is considered moderate. The operating costs associated with pumping and discharging to the POTW represents a low to moderate relative cost. This technology has been retained for further consideration.

5.4.2.5.2 Groundwater Extraction and Discharge to NPDES Outfall

This option is similar to the technology described above since it would be an enhancement of the existing Groundwater Corrective Action System. Rather than discharging the extracted groundwater to the POTW, this option would treat the groundwater and then discharge it to surface water under a NPDES Permit. From a groundwater containment perspective, this option is equally as effective as the POTW discharge option, but additional pretreatment would likely be required to reliably achieve the anticipated NPDES Permit concentration limits. The degree of pretreatment and specific methods of treatment would be developed as part of a PDI effort, but would likely require construction of a treatment facility. Extensive monitoring of the discharge would also be required. Implementing this technology is difficult and potentially costly. Based on the implementability concerns, high cost potential, and limited benefits, as compared to the similar remedial technology option of discharge to the POTW, this technology is eliminated from further consideration.

5.4.2.6 In-situ Treatment

5.4.2.6.1 In-Situ Treatment by Enhanced Bioremediation

In-situ enhanced bioremediation is a natural degradation process that is often enhanced through control and manipulation of the natural environment and microbial processes to promote biological degradation. Bioremediation uses microorganisms to degrade organic contaminants. The microorganisms break down contaminants by using them as a food source or co-metabolizing them with a food source. Aerobic processes require an oxygen source, and typical end products are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and typical end products can include carbon dioxide, methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas. Enhanced in-situ techniques strive to stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source, generally by providing some combination of oxygen, nutrients, and moisture. Some microorganisms have been specifically adapted for degradation of specific contaminants, but this can create the need to have a diverse

microbial environment and set of microorganisms in order to successfully treat a range of contaminants. If multiple or complex contaminants are present, numerous decomposition products may be produced requiring further organisms to metabolize the resulting products to provide complete biodegradation.

The effectiveness of in-situ bioremediation for the primary groundwater COCs is considered to be moderate, based on results presented in the RI Report. This technology would be difficult to implement because the low formation permeability would require many injection locations to provide sufficient nutrient access to the COCs. The cost associated with this technology is moderate due to the requirement for numerous injection points. Based on the moderate effectiveness, implementability concerns related to the high number of injection points, and moderate cost, this technology is eliminated from further consideration.

5.4.2.6.2 In-Situ Treatment by Nanoscale Zero Valent Iron

NZVI is an effective reductant that can treat many contaminants and is particularly effective for chlorinated solvents, PCBs, pesticides, and dioxins. These compounds are completely reduced to non-toxic compounds such as ethane and ethene. In addition, NZVI is effective in the treatment of certain metals, including arsenic, cadmium, cobalt, nickel, lead, copper, mercury and chromium. While granular zero valent iron has been proven at multiple sites, NZVI particles have been shown to be more reactive and effective because of the increased surface area compared to coarser granular zero valent iron particles. In addition, NZVI can be readily placed in the subsurface in slurry form via injection wells using either gravity feed, or low pressure pumps, or in temporary soil borings using direct push technology (DPT).

The effectiveness of NZVI is considered moderate for the Facility, as it has not been shown to reduce all of the COCs present in groundwater. This technology would be difficult to implement because the low formation permeability would require many injection locations to provide sufficient NZVI distribution across impacted areas. The cost associated with this technology is moderate due to the requirement for many injection points. Based on the moderate effectiveness, implementability concerns related to the high number of injection points, and moderate cost, this technology is eliminated from further consideration.

5.4.2.6.3 Funnel and Gate System with Zero Valent Iron

This technology consists of combining two remediation technologies: vertical barriers and in-situ passive treatment. The application of this technology would likely include the placement of two in-situ treatment units, one near OW-21A and another near OW-10 to address the identified groundwater impact areas as shown on Figure 5-1. Each of these units would be constructed using "funnel and gate" technology. The funnel, a slurry wall constructed using a bentonite/soil mixture would be extended to approximately 45 feet bgs and would act as an impermeable barrier for groundwater flow. The slurry walls will be constructed using standard construction techniques (i.e., extending a trench to the necessary depth and length with simultaneous placement of bentonite slurry). Groundwater flow would be diverted along the wall to the gate system, or in-situ treatment area. The gate is essentially a permeable wall constructed of a zero valent iron (ZVI) mix. The treatment area will be constructed using similar techniques as the slurry wall portion of the system (i.e., a backhoe or crane operated clam-shell bucket will be used to excavate a trench into which a mixture of ZVI and sand will be placed). ZVI is an effective reductant that can treat many contaminants, and is particularly effective for chlorinated solvents, PCBs, pesticides, and dioxins. These compounds are completely reduced to non-toxic compounds such as ethane and carbon dioxide. In addition, ZVI is potentially effective in the treatment of certain metals, including cadmium, cobalt, nickel, lead, copper, mercury and chromium. As groundwater passes through the permeable treatment area, COCs are treated resulting in reduced groundwater concentrations downgradient from the treatment area. Treatment of all groundwater COCs using ZVI is not fully proven at this time, therefore a series of bench scale studies would be required during the PDI to establish the efficacy of ZVI for all groundwater COCs. Additionally, if the system is unable to treat all of the COCs, a secondary treatment system may be required. Implementing this technology could be difficult and the cost associated with this technology is considered high. This technology is retained for further consideration in accordance with comments received from the EPA based on its potential effectiveness (EPA, 2008b).

5.5 Technology Screening Summary

The technologies that are not feasible or have limitations that might prevent achievement of RAOs have been eliminated in the screening process, with the surviving technologies considered to be better suited for further consideration in developing remedial alternatives. A summary of the screening process described in this section is included on Tables 5-3A through 5-3D. The retained technologies are summarized as follow:

Retained Soil Technologies

- No Action
- Institutional Controls/ Engineering Controls
- Containment - Capping
- Excavation with Off-Site Disposal
- Ex-situ Treatment using Chemical Dehalogenation
- Ex-situ Treatment using Thermal Desorption

Retained Groundwater Technologies

- No Action
- Institutional Controls/ Engineering Controls
- MNA
- Extraction and Discharge to POTW (i.e., Expansion of Existing System)
- In-situ Treatment Using Funnel and Gate System with ZVI

6.0 SCREENING OF REMEDIAL ALTERNATIVES

This section presents the process of assembling and screening a number of remedial alternatives for impacted soils and groundwater that will be analyzed in detail in Sections 7.0 and 8.0. The majority of the information presented in this section was included in the Technical Memorandum on Remedial Technologies, Alternatives and Screening (Golder, 2008b). In addition, comments provided by the EPA on that memorandum, the Draft FS Report, and Final FS Report have been incorporated herein.

6.1 Summary of Assembled Remedial Alternatives

The retained technologies presented in Section 5.0 were assembled into ten remedial action alternatives, five for soil and five for groundwater, to be considered for further evaluation. A No Action Alternative (Alternative 1 for each medium) was identified in accordance with the NCP. The alternatives selected are the following:

Remedial Alternatives for Soil:

- Alternative 1S is a no action alternative;
- Alternative 2S includes additional institutional and engineering controls and excavation and off-Site disposal of impacted soil;
- Alternatives 3S includes additional institutional and engineering controls and capping of impacted soil areas;
- Alternative 4S includes additional institutional and engineering controls and ex-situ treatment of soil using chemical dehalogenation; and
- Alternative 5S includes additional institutional and engineering controls and ex-situ treatment of soil using thermal desorption.

Remedial Alternatives for Groundwater:

- Alternative 1GW is a no action alternative;
- Alternative 2GW includes additional institutional controls and extraction of groundwater in areas outside the capture zone of the existing Groundwater Corrective Action System;
- Alternative 3GW includes additional institutional controls and MNA for groundwater;
- Alternative 4GW, a combination of Alternatives 2GW and 3GW, combines extraction of groundwater in areas outside the capture zone of the existing Groundwater Corrective Action System and MNA for groundwater; and

- Alternative 5GW includes additional institutional controls, with in-situ treatment of groundwater using a funnel and gate system with ZVI treatment.

A description and screening level evaluation of each alternative are presented below, and a summary of the alternatives is presented in Table 6-1A (soil) and Table 6-1C (groundwater). The screening level evaluation is based on the same NCP criteria used for screening the remedial technologies. Descriptive terms such as high, moderate, and low are used to evaluate the effectiveness, implementability, and cost. In addition, a numerical ranking was applied to each alternative, as shown in Tables 6-1B (soil) and 6-1D (groundwater).

6.2 Existing Site-Conditions

As discussed in Section 3.0, several ICMs and final closures have been implemented at the Site over the years to provide for protection of human health and the environment. The condition of the Site at the onset of CERCLA regulatory control serves as the initial condition for evaluation of Site risks to human health and the environment and for use in the screening and evaluation of remedial actions. The existing Site conditions, including the extensive ICMs and final closures will continue to be implemented, operated, and maintained in conjunction with supplemental remedial actions as described in each of the remedial alternatives including the "No Action" Alternative. The implementation, operation, and maintenance of many of the ICMs and final closures are required under the Site's RCRA Permit. As such, the existing Site conditions, including: institutional and engineering controls, caps, the groundwater corrective action systems, and other measures are summarized herein and included in all of the evaluated remedial alternatives.

The predominant remedial components existing at the Site prior to CERCLA involvement, ("existing Site conditions") include the following:

- Continued operation of the existing Groundwater Corrective Action System and groundwater monitoring program consistent with the Facility's RCRA Permit requirements, as described in Sections 3.2.2 and 3.3.1.
- Maintenance of the existing institutional controls in the form of deed restrictions that prohibit residential use of the property and groundwater use.
- Inspection and maintenance of existing Site access controls in the form of perimeter fencing, signage, and gates, as described in Section 3.3.
- The current O&M program will be maintained as detailed in Section 3.3. This program provides for routine inspection and maintenance of corrective measures already completed at the Facility, including the following:

- WMA I;
- WMA II;
- Closed West End Landfill;
- Stormwater Drainage System;
- Closed South Landfill;
- MCC Warehouse;
- Facility surface covers and Site access controls, fencing, signage, and access road; and
- ICMs identified on Table 3-1[9].

6.3 Screening of Remedial Alternatives for Soils

6.3.1 Alternative 1S – No Action

6.3.1.1 Description of Alternative

Under Alternative 1S, no additional remedial technologies would be enacted at the Site, but the existing Site conditions would be maintained as required by the Facility's RCRA Permit. This alternative is presented and analyzed as required by the NCP.

6.3.1.2 Effectiveness

A summary of the effectiveness of this alternative is presented below:

- This alternative does not achieve the RAO related to mitigating risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with or incidental ingestion of COCs in surface soil. The current access controls appear to be effective at restricting access to the Facility by trespassers. However, risks to the current and future facility operations area worker and O&M worker would still exist.
- This alternative does not address mitigation of risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil since there is no specific policy in place restricting excavation or the exposure to impacted soils by the construction worker.
- This alternative does not achieve the RAO related to the migration and leaching of contaminants in surface and subsurface soil to groundwater.
- This alternative does not permanently and/or significantly reduce the mobility, toxicity, and/or volume of characteristic hazardous waste with treatment.
- This alternative only partially addresses the RAO related to preventing the migration of contaminants from surface soil to surface water as areas with surface soil concentrations above the Remedial Goals will not be addressed.

[9] The Facility's Comprehensive Operations and Maintenance Plan for Remedial/Corrective Action Projects will be updated and revised to incorporate all completed corrective measures and remedial actions following EPA approval of such measures/actions.

In summary, this alternative does not meet the RAOs for soil at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is low.

6.3.1.3 Implementability

This alternative is easily implementable.

6.3.1.4 Cost

The cost of this alternative is very low compared to the other alternatives.

6.3.1.5 Status: Retained

This alternative has been retained for detailed analysis consistent with the NCP.

6.3.2 Alternative 2S – Additional Institutional and Engineering Controls and Excavation with Off Site Disposal

6.3.2.1 Description of Alternative

Alternative 2S includes excavating and off-Site disposal of soil to address soil impacts described in Section 4.0. The limits of soil excavations would be as detailed on Figure 5-2. This alternative also includes collecting a confirmation sample from Area B as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. Excavated materials would be stockpiled and hauled to an appropriate off-Site disposal facility based on the characterization of contaminants in the soil. Clean imported fill would be used to backfill the excavations. The completed surfaces would consist of vegetative covers, gravel covers, or other equivalently protective covers depending on the intended end use for that portion of the Facility. Enhanced engineering controls in the form of extended perimeter fences, as needed, to further restrict access are included in this alternative. In addition, institutional and administrative controls in the form of an environmental covenant and a "no dig policy" would be implemented at the plant restricting future land use and requiring a permit prior to excavating at the Facility. Anyone performing such excavations would require the proper training.

Additionally, all existing corrective measures and institutional controls and engineering controls will be continued.

The existing long-term O&M program would be expanded to include inspection and maintenance of the areas excavated. Additionally, if the final remedy allows for residuals to remain in place, additional surface water monitoring may be required.

6.3.2.2 Effectiveness

A summary of the effectiveness of this alternative is presented below:

- This alternative addresses the RAO related to mitigating risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with or incidental ingestion of COCs in surface soil by removal of the impacted soil within two feet of the surface. Note that these receptors are only exposed to surface soils (top two feet of soil).
- This alternative addresses mitigation of risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil by excavating and disposing of subsurface soils for the areas noted on Figure 5-2 and by instituting an administrative policy or "no dig policy" that requires proper training and procedures for construction activities within remaining impacted areas.
- This alternative achieves the RAO related to the migration and leaching of contaminants in surface and subsurface soil to groundwater since impacted areas identified where COCs are potentially leaching to groundwater would be excavated and disposed off of the Facility, which will prevent the migration and leaching of contaminants in these soils to groundwater. Continued O&M of existing covers will also prevent leaching to groundwater.
- This alternative does reduce the toxicity, mobility, and volume of materials at the Facility. However, the overall toxicity and volume of materials containing COCs in excess of the Remedial Goals is not reduced since the materials are not treated but rather disposed of in a landfill.
- This alternative prevents migration of contaminants in excess of the Remedial Goals in surface soil to surface water through the removal of impacted soil, and the continued O&M of caps and the existing stormwater management system.
- This alternative also controls future releases of contaminants to ensure protection of human health and the environment, since materials containing COCs will be relocated to a regulated landfill.

In summary, this alternative substantially meets the RAOs for soils at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is high.

6.3.2.3 Implementability

This alternative is moderately difficult to implement.

6.3.2.4 Cost

The cost of this alternative is high compared to the other alternatives.

6.3.2.5 Status: Retained

This alternative has been retained for detailed analysis based on its effectiveness, implementability, and cost.

6.3.3 Alternative 3S – Additional Institutional and Engineering Controls and Soil Containment (Capping)

6.3.3.1 Description of Alternative

Alternative 3S includes containment in the form of caps as the remedy for soil. This alternative also includes collecting a confirmation sample from Area B as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. Since the majority of the plant is already under cover, as shown on Figure 3-1, this alternative includes extending and supplementing the existing covers as shown on Figure 5-2. For this alternative, two options are proposed as described in Section 5.3.2. Option 1 includes constructing or supplementing caps over Areas A, C, D and E, while Option 2 includes addressing these four areas plus upgrading the cap over Cells 1E, 2E, and 3E at the South Landfill. The exact design of the caps will depend on the intended future use for that portion of the Facility and the applicable hazards delineated for each area. Potential caps could include a minimum of twelve (12) inches of soil overlain by a vegetated surface (likely grass), or one of two impermeable capping options. Impermeable cap option 1 includes: a geomembrane, a geocomposite drainage layer, a minimum of 12 inches of protective soil layer, and six (6) inches of vegetated topsoil. Impermeable cap option 2 includes: six inches of concrete or asphalt cement pavement underlain by an appropriate prepared subgrade. Enhanced engineering controls in the form of extended perimeter fences, as needed, to further restrict access are included in this alternative. In addition, institutional and administrative controls in the form of an environmental covenant and a "no dig policy" would be implemented at the plant restricting future land use and requiring a permit prior to excavating at the Facility. Anyone performing such excavations would require the proper training.

The existing long-term O&M program would be extended to include inspection and maintenance of the newly capped areas. Additionally, if the final remedy allows for residuals to remain in place, additional surface water monitoring may be required.

6.3.3.2 Effectiveness

A summary of the effectiveness of this alternative is presented below:

- This alternative addresses the RAO related to mitigating risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with or incidental ingestion of COCs in surface soil through the placement of a cover over impacted areas. Containment, in the form of surface covers, is already being effectively implemented throughout the Facility.
- This alternative addresses mitigation of risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil by instituting an administrative policy or "no dig policy" which requires proper training and procedures for construction activities within impacted areas.
- This alternative achieves the RAO related to the migration and leaching of contaminants in surface and subsurface soil to groundwater through the continued O&M of the currently capped areas, and the addition of impermeable covers to areas identified where COCs are potentially leaching to groundwater.
- This alternative reduces the mobility of chemicals in surface soil. The covers isolate the COCs, mitigating potential direct contact and mobility through erosion. Containment does not reduce the volume of impacted soil but is designed to manage the toxicity of this soil.
- This alternative prevents migration of contaminants in excess of the Remedial Goals in surface soil to surface water through the installation of capping systems and the continued O&M of the existing caps and stormwater management system.

In summary, this alternative meets the RAOs for soils at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is high.

6.3.3.3 Implementability

This alternative is easy to implement.

6.3.3.4 Cost

The cost of this alternative is low compared to the other alternatives.

6.3.3.5 Status: Retained

This alternative has been retained for detailed analysis based on its effectiveness, implementability, and cost.

6.3.4 Alternative 4S – Additional Institutional and Engineering Controls and Excavation with On-Site Treatment Using Chemical Dehalogenation

6.3.4.1 Description of Alternative

Alternative 4S includes soil excavation and on-Site treatment using chemical dehalogenation to treat the excavated soil. The horizontal limits of soil excavation are detailed on Figure 5-2. This alternative also includes collecting a confirmation sample from Area B as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. Excavated materials would be stockpiled and treated using chemical dehalogenation on Site, or disposed of off-Site, if suitable for Subtitle D landfill disposal. The treated soil or clean imported fill would be used to backfill the excavations. The completed surface would consist of vegetative covers, gravel covers, or other equivalently protective covers depending on the intended end use for that portion of the Facility. Enhanced engineering controls in the form of extended perimeter fences, as needed, to further restrict access is included in this alternative. In addition, institutional and administrative controls in the form of an environmental covenant and a "no dig policy" would be implemented at the plant restricting future land use and requiring a permit prior to excavating at the Facility. Anyone performing such excavations would require the proper training.

The existing long-term O&M program would be expanded to include inspection and maintenance of the areas excavated. Additionally, if the final remedy allows for residuals to remain in place, additional surface water monitoring may be required.

6.3.4.2 Effectiveness

A summary of the effectiveness of this alternative is presented below:

- This alternative addresses the RAO related to mitigating risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with or incidental ingestion of COCs in surface soil through excavation and treatment using chemical dehalogenation.
- This alternative addresses mitigation of risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil by excavation and treatment of subsurface soils for the areas noted on Figure 5-2 and by instituting an administrative policy or "no dig policy" that requires proper training and procedures for construction activities within remaining impacted areas. Continued O&M of existing covers will also prevent leaching to groundwater.
- This alternative achieves the RAO related to the migration and leaching of contaminants in surface and subsurface soil to groundwater since areas identified where COCs are potentially leaching to groundwater would be excavated and treated which will prevent migration and leaching of contaminants in these soils to groundwater.

- This alternative reduces the toxicity and mobility of contaminants in surface and subsurface soil.
- This alternative prevents the migration of contaminants in excess of the Remedial Goals in surface soil to surface water through the excavation and treatment of impacted soil, and the continued O&M of the existing caps and stormwater management system.

In summary, this alternative meets the RAOs for soils at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is moderately high.

6.3.4.3 Implementability

This alternative is difficult to implement.

6.3.4.4 Cost

The cost of this alternative is high compared to the other alternatives.

6.3.4.5 Status: Retained

This alternative has been retained for detailed analysis based on its overall effectiveness.

6.3.5 Alternative 5S – Additional Institutional and Engineering Controls and Excavation with On-Site Treatment Using Thermal Desorption

6.3.5.1 Description of Alternative

Alternative 5S includes soil excavation and on-Site treatment using thermal desorption as the soil remedy. The horizontal limits of soil excavation are detailed on Figure 5-2. This alternative also includes collecting a confirmation sample from Area B as part of the Pre-Remedial Design Investigation to identify residuals potentially remaining in this area. Excavated materials would be stockpiled and treated using thermal desorption on Site, or disposed of off-Site if suitable for Subtitle D landfill disposal. The treated soil or clean imported fill would be used to backfill the excavations. The completed surface would consist of vegetative covers, gravel covers, or other equivalently protective covers depending on the intended future use for that portion of the Facility. Enhanced engineering controls in the form of extended perimeter fences, as needed, to further restrict access are included in this alternative. In addition, institutional and administrative controls in the form of an environmental covenant and a "no dig policy" would be implemented at the plant restricting future land use and requiring a permit prior to excavating at the Facility. Anyone performing such excavations would require the proper training.

The existing long-term O&M program would be expanded to include inspection and maintenance of the areas excavated. Additionally, if the final remedy allows for residuals to remain in place, additional surface water monitoring may be required.

6.3.5.2 Effectiveness

A summary of the effectiveness of this alternative is presented below:

- This alternative addresses the RAO related to mitigating risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with or incidental ingestion of COCs in surface soil through excavation and treatment using thermal desorption.
- This alternative addresses mitigation of risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil by excavation and treatment of subsurface soils for the areas noted on Figure 5-2 and by instituting an administrative policy or "no dig policy" that requires proper training and procedures for construction activities within remaining impacted areas.
- This alternative achieves the RAO related to the migration and leaching of contaminants in surface and subsurface soil to groundwater since impacted areas identified where COCs are potentially leaching to groundwater would be excavated and treated preventing migration and leaching of contaminants in these soils to groundwater. Continued O&M of existing covers will also prevent leaching to groundwater.
- This alternative reduces the toxicity and mobility of contaminants in surface and subsurface soil.
- This alternative prevents migration of contaminants in excess of the Remedial Goals in surface soil to surface water through continued O&M of the existing caps and stormwater management system.

In summary, this alternative would meet the RAOs for soils for the Site. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is moderately high.

6.3.5.3 Implementability

This alternative is difficult to implement.

6.3.5.4 Cost

The cost of this alternative is high compared to the other alternatives.

6.3.5.5 Status: Retained

This alternative has been retained for detailed analysis based on its overall effectiveness.

6.3.6 Summary of Alternative Screening for Soils

Based on the evaluation of each alternative regarding effectiveness, implementability, and cost; all five of the alternatives evaluated were retained for further evaluation. These alternatives are summarized below:

Previous Alternative ID	Forward Alternative ID	Description of Alternative
1S	S-A	No Action
2S	S-B	Additional Institutional and Engineering Controls and Soil Excavation with off-Site Disposal
3S	S-C	Additional Institutional and Engineering Controls and Soil Containment (Capping)
4S	S-D	Additional Institutional and Engineering Controls and Soil Excavation with Treatment Using on-Site Chemical Dehalogenation
5S	S-E	Additional Institutional and Engineering Controls and Soil Excavation with on-Site Thermal Desorption

6.4 Screening of Remedial Alternatives for Groundwater

6.4.1 Alternative 1GW – No Action

6.4.1.1 Description of Alternative

Under Alternative 1GW, no additional remedial actions, beyond those already completed to date, would be implemented. Under this alternative, the continued O&M of the existing Groundwater Corrective Action System and operation and maintenance of the existing caps, institutional controls, and engineering controls would continue as many of these activities are required by the Facility's RCRA Permit. This alternative is presented and analyzed as required by the NCP.

6.4.1.2 Effectiveness

This alternative does not adequately address the groundwater RAOs. The continued use of a deed restriction prohibiting residential development of the property and groundwater use, and the continued operation of the Groundwater Corrective Action System currently prevents exposure to groundwater COCs. However, there are two potential locations, outside of the capture zone of the Groundwater Corrective Action System, where groundwater is potentially migrating off of the Facility. Although the surrounding residents use water provided by the local utility and do not use groundwater, this alternative does not prevent future exposures since off-Facility areas are not under a groundwater use restriction and isolated areas would remain outside of the corrective action system

capture zone. Due to the locations that are outside of the capture zones, prevention of migration of pollutants beyond the existing limits of the known contaminant plume cannot be achieved.

In summary, this alternative does not meet the RAOs for groundwater at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is low.

6.4.1.3 Implementability

This alternative is easily implementable.

6.4.1.4 Cost

The cost of this alternative is very low compared to the other alternatives.

6.4.1.5 Status: Retained

This alternative has been retained for detailed analysis consistent with the NCP requirements.

6.4.2 Alternative 2GW – Additional Institutional Controls and Expanded Groundwater Extraction

6.4.2.1 Description of Alternative

Alternative 2GW includes the continued operation and expansion of the existing Groundwater Corrective Action System to provide further containment and ex-situ treatment of all COCs in groundwater. The existing Groundwater Corrective Action System would be operated, and additional extraction wells would be installed to provide hydraulic capture of areas denoted on Figure 5-1, where COCs are migrating from the Facility. The current deed restrictions limiting groundwater use would remain in place and an environmental covenant would be added to further protect against the potential future use of groundwater beneath the Site. The existing long-term O&M program would be expanded to include inspection and maintenance of the newly installed extraction wells and to monitor residuals that remain on Site.

6.4.2.2 Effectiveness

This alternative addresses all of the groundwater RAOs. Mitigation of risks to receptors from direct contact with or ingestion of COCs in groundwater is achieved through the continued use of a deed restriction and supplemental environmental covenant prohibiting residential development of the property and groundwater use and continued operation and expansion of the Groundwater Corrective Action System. Expansion of the Groundwater Corrective Action System would provide

groundwater capture and containment and prevent migration beyond the existing limits of known contamination. Further release of contaminants is prevented through the combination of the remedial components included in this alternative. Additionally, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

In summary, this alternative meets the RAOs for groundwater at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is high.

6.4.2.3 Implementability

This alternative is relatively easy to implement.

6.4.2.4 Cost

The cost of this alternative is moderate to low compared to the other alternatives.

6.4.2.5 Status: Retained

This alternative has been retained for detailed analysis based on its effectiveness, implementability, and cost.

6.4.3 Alternative 3GW – Additional Institutional Controls and MNA

6.4.3.1 Description of Alternative

This alternative includes MNA instead of an expansion of the current extraction system. The existing Groundwater Corrective Action System would be maintained, and groundwater outside of the current capture zone would be addressed with MNA. It is anticipated that groundwater treatment would extend over 30 years. The long-term O&M program would be expanded to include inspection, maintenance and long-term monitoring of the wells used in the MNA program and to monitor residuals that remain on Site.

6.4.3.2 Effectiveness

This alternative only partially addresses the groundwater RAOs. Mitigation of risks to receptors from direct contact with or ingestion of COCs in groundwater is achieved through the continued use of a deed restriction and supplemental environmental covenant prohibiting groundwater use and the continued operation of the existing Groundwater Corrective Action System. MNA would be used to

address affected groundwater areas outside of the current capture zone for parathion and PNP. The long-term effectiveness of this alternative is moderate to low as some groundwater concentrations would decline over time (parathion and PNP) while others (e.g., PCBs) would not be affected. The short-term effectiveness is low since this alternative does not provide for further groundwater containment. In the short term, mitigation of risks to receptors off the Facility would not be achieved.

In summary, this alternative only partially meets the RAOs for groundwater at the Site. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is moderate to low.

6.4.3.3 Implementability

This alternative is easy to implement.

6.4.3.4 Cost

The cost of this alternative is low compared to the other alternatives.

6.4.3.5 Status: Eliminated

This alternative is eliminated from further consideration as it does not fully address the groundwater RAOs.

6.4.4 Alternative 4GW – Additional Institutional Controls, Expanded Groundwater Extraction and MNA

6.4.4.1 Description of Alternative

Alternative 4GW includes all of the components from Alternative 2GW and 3GW, including expansion of the existing Groundwater Corrective Action System as the groundwater remedy and MNA for further groundwater treatment of Parathion and PNP. MNA provides an additional level of treatment for groundwater to facilitate attainment of groundwater concentrations meeting the Remedial Goals in the long term.

6.4.4.2 Effectiveness

This alternative addresses all of the groundwater RAOs. Mitigation of risks to receptors from direct contact with or ingestion of COCs in groundwater is achieved through continued use of a deed restriction and a supplemental environmental covenant prohibiting residential development of the

property and groundwater use and continued operation and expansion of the Groundwater Corrective Action System. Expansion of the Groundwater Corrective Action System would provide groundwater capture and containment and prevent migration beyond the existing limits of known contamination. Further release of contaminants is prevented through the combination of remedial components included in this alternative. The addition of MNA for parathion and PNP would further facilitate attainment of groundwater concentrations consistent with Remedial Goals. Additionally, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

In summary, this alternative meets the RAOs for groundwater at the Facility. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is high.

6.4.4.3 Implementability

This alternative is moderately easy to implement.

6.4.4.4 Cost

The cost of this alternative is moderate compared to the other alternatives.

6.4.4.5 Status: Retained

This alternative has been retained for detailed analysis based on its effectiveness, implementability, and cost.

6.4.5 Alternative 5GW – Additional Institutional Controls and Groundwater Treatment using Funnel and Gate ZVI Walls

6.4.5.1 Description of Alternative

Alternative 5GW includes groundwater treatment using Funnel and Gate ZVI Walls. The existing Groundwater Corrective Action System would be maintained, and groundwater outside of the current capture zone would be treated using a funnel and gate type system with ZVI.

6.4.5.2 Effectiveness

This alternative addresses all of the groundwater RAOs. Mitigation of risks to receptors from direct contact with or ingestion of COCs in groundwater is achieved through the continued use of a deed restriction and a supplemental environmental covenant prohibiting residential development of the

property and groundwater use and continued operation of the Groundwater Corrective Action System. Areas outside of the capture zone of the existing Groundwater Correction Action System will be addressed with a funnel and gate type system and ZVI further reducing the risks to off-Site receptors. Depending on the results of treatability studies (e.g., ZVI is unable to treat all Site COCs), a secondary treatment system may be required. Migration of pollutants beyond the existing limits of the known contaminant plume will be prevented by the in-situ treatment of groundwater and secondary treatment as necessary. The combination of all remedial components included in this alternative will further prevent future releases of contaminants. Additionally, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

In summary, this alternative would meet the RAOs for groundwater at the Site. Therefore, the effectiveness of this alternative in providing protection of human health and the environment is moderate to high.

6.4.5.3 Implementability

This alternative is moderately difficult to implement.

6.4.5.4 Cost

The cost of this alternative is high compared to the other alternatives.

6.4.5.5 Status: Retained

This alternative has been retained for detailed analysis based on its overall effectiveness.

6.4.6 Summary of Alternative Screening for Groundwater

Based on the evaluation of each alternative regarding effectiveness, implementability, and cost; four alternatives were retained for further evaluation. These alternatives are summarized below:

Previous Alternative ID	Forward Alternative ID	Description of Alternative
1GW	GW-A	No Action
2GW	GW-B	Additional Institutional Controls and Expanded Groundwater Extraction
4GW	GW-C	Additional Institutional Controls, Expanded Groundwater Extraction and MNA
5GW	GW-D	Additional Institutional Controls and Groundwater Treatment using Funnel and Gate ZVI Walls

7.0 ALTERNATIVES EVALUATION BASED ON NCP CRITERIA

Each of the retained alternatives from Section 6.0 is evaluated in this detailed analysis section and included for the subsequent comparative analysis described in Section 8.0. The majority of the information presented in this Section was initially included in the Technical Memorandum Summarizing the Results of the Comparative Analysis of Alternatives (Golder, 2008c), and subsequently presented in the Draft FS Report (Golder 2008f) and Final FS Report (Golder, 2009a). Comments provided by the EPA to previous related submissions have been incorporated herein.

7.1 Evaluation Criteria

Each alternative will be evaluated using the NCP criteria. The nine NCP evaluation criteria consist of threshold criteria, primary balancing criteria, and modifying criteria, and are summarized in Table 7-1 below:

TABLE 7-1
NCP Evaluation Criteria

Threshold Criteria	• Overall protection of human health and the environment • Compliance with ARARs
Primary Balancing Criteria	• Long term effectiveness and permanence • Reduction of toxicity, mobility, or volume • Short-term effectiveness • Implementability • Cost
Modifying Criteria	• State acceptance • Community acceptance

The retained alternatives were not evaluated using the modifying criteria (State acceptance and community acceptance) in this report because these will be applied to the Preferred Alternative selected by EPA during the public comment period. The remaining seven criteria are further described below.

Threshold criteria are statutory requirements and must be met in order for a remedy to be eligible for selection. The two threshold criteria are:

- Overall Protection of Human Health and the Environment

  Under this criterion, an alternative should be assessed to determine whether it can adequately protect human health and the environment, in both the short-term and long-term, from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the Site, by eliminating, reducing or controlling exposures to chemical impacts in Site media. This criterion is an overall assessment of protection based on a composite of factors assessed under other evaluation criteria, especially long-term effectiveness and permanence and short-term effectiveness.

- Compliance with ARARs

  This criterion evaluates whether the alternative will likely be able to attain ARARs under federal environmental laws and state environmental or facility siting laws, or provides grounds for invoking a legal waiver of such requirements.

ARARs may relate to the substances addressed by the remedial action (chemical-specific), to the location of the remedial action (location-specific), or the manner in which the remedial action is implemented (action-specific). The remedial actions associated with Site-wide alternatives need comply only with the substantive aspects of ARARs, not with the corresponding administrative requirements (e.g., consultation, issuance of permits, documentation, record keeping, and enforcement). A summary of the chemical specific and action specific ARARs for OU-3 are presented in Tables 4-5 and 4-6, respectively. No location specific ARARs have been identified for OU-3. In addition to ARARs, other advisories, criteria, or guidance, collectively referred to as TBCs may be used during the FS. TBCs are generally not promulgated and are only used as guides, not requirements. A summary of the chemical specific and action specific TBCs for OU-3 are also provided in Tables 4-5 and 4-6, respectively. In addition, Table 7-2 provides a summary of the ARARs that apply to each alternative.

Primary Balancing criteria are used to weigh the alternatives in order to determine the best selection for the Site. The five balancing criteria are:

- Short-Term Effectiveness

  This criterion evaluates the impacts of the alternative during implementation with respect to human health and the environment. The short-term impacts of an alternative are assessed considering: short-term risks that might be posed to the community during implementation of an alternative; potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; potential environmental impacts of the remedial action; and the effectiveness and reliability of mitigation measures during implementation.

- Reduction of Toxicity, Mobility, and Volume Through Treatment

  Under this criterion, the degree to which an alternative employs recycling or treatment that reduces toxicity, mobility, or volume are assessed, including how treatment is used to address the principal threats posed at the Site. Factors that are considered include: the treatment or recycling processes; the alternatives employed and the materials they will treat; the amount of hazardous substances, pollutants or contaminants that will be destroyed, treated, or recycled; the degree of expected reduction in toxicity, mobility or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring; the degree to which the treatment is irreversible; the type and quantity of residuals that will remain following treatment considering the persistence, toxicity, and mobility of such hazardous substances and their constituents; and the degree to which treatment reduces the inherent hazards posed by principal threats at the site.

- Long-Term Effectiveness and Permanence

  Under this criterion, an alternative is assessed for the long-term effectiveness and permanence it affords, along with the degree of uncertainty that the alternative will prove successful. Factors that are considered, as appropriate, include: the magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities; and the adequacy and reliability of controls such as containment systems and institutional and engineering controls that are necessary to manage treatment residuals and untreated waste.

- Reduction of Toxicity, Mobility, and Volume Through Implementability

  This criterion addresses the technical and administrative feasibility of implementing the alternative as well as the availability of various services and materials required.

- Cost

  Cost items evaluated include capital and O&M expenditures to implement the alternative, presented as a present worth[10] estimate.

Each of the retained alternatives is described in detail and evaluated in accordance with the above seven NCP criteria in the following section.

7.2 Existing Site-Wide Corrective Measures

There are several ICMs and Final Closures that have already been implemented at the Site and will continue to be part of each of the alternatives. These measures were presented in Sections 3.0 and 6.2 and are re-iterated below:

- Continued operation of the existing Groundwater Corrective Action Systems and groundwater monitoring programs consistent with the Facility's RCRA Permit requirements, as described in Section 3.3.

[10] A 7% discount rate was used in the present worth calculations, as prescribed by EPA (EPA, 2009).

- Maintain existing institutional and engineering controls in the form of deed restrictions that prohibit residential use of the property and groundwater use.
- Inspection and maintenance of existing Site access controls in the form of perimeter fencing, signage, and gates, as described in Section 3.3.
- O&M consistent with the current O&M program will be maintained as detailed in Section 3.3. This program provides for routine inspection and maintenance of interim measures already completed at the Facility, including the following:
    - WMA I;
    - WMA II;
    - Closed West End Landfill;
    - Stormwater Drainage System;
    - Closed South Landfill;
    - MCC Warehouse;
    - Facility surface covers and Site access controls, fencing, signage, and access road; and
    - ICMs and Final Closures identified on Table 3-1[11].

The costs of continuing the O&M of these measures are summarized in Tables 7-3A and 7-3B for those applicable to soil, and in Tables 7-4A and 7-4B for those applicable to groundwater. These costs are included in the total cost of the remaining soil and groundwater alternatives except for the No Action alternative. The costs are not included in the No Action Alternative since these costs are required even without a CERCLA Action. The remedial alternatives for soil and groundwater are further described and evaluated below.

7.3 Remedial Alternatives for Soil

7.3.1 Alternative S-A – No Action

7.3.1.1 Description of Alternative

Alternative S-A is the No Action alternative, which means that no additional remedial actions will be conducted. Under Alternative S-A, the existing corrective measures would be continued (i.e. operated or maintained), but no new actions would be implemented. As noted in Section 6.3.1, this alternative is presented and analyzed as required by the NCP.

[11] The Facility's Comprehensive Operations and Maintenance Plan for Remedial/Corrective Action Projects will be updated and revised to incorporate all completed corrective measures and remedial actions following EPA approval of such measures/actions.

7.3.1.2 Overall Protection of Human Health and the Environment

The No Action alternative does not provide adequate protection of human health and the environment. As described in the HHRA (summarized in Section 2.8), unacceptable risks were identified for certain receptors (operations area worker, trespasser) due to exposures to surface soils at the Facility and to the construction worker due to exposures to subsurface soil. The No Action alternative will not address these unacceptable risks. Additionally, the No Action alternative does not address the areas where COCs are potentially leaching to groundwater. The deed restriction that is currently in place restricting residential development of the Facility currently prevents exposure to impacted soils. Overall this alternative does not provide adequate protection of human health and the environment.

7.3.1.3 Compliance with ARARs

This alternative will mostly comply with the action and chemical-specific ARARs identified in Table 7-2, except that continued exceedances of the MCLs may result from constituents leaching to groundwater.

7.3.1.4 Short-Term Effectiveness

No additional short-term risks to the community, workers, or the environment are posed by implementation of this alternative.

7.3.1.5 Long-Term Effectiveness and Permanence

This alternative does not provide long-term effectiveness as it does not: address all current and hypothetical future exposure pathways, mitigate surface soil, require maintenance of existing preventive measures, or protect the construction worker from subsurface soil exposures. Additionally, this alternative does not address potential impacts to groundwater.

7.3.1.6 Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative will provide no quantifiable reduction of toxicity, mobility or volume of COCs.

7.3.1.7 Implementability

The No Action alternative is straightforward and easy to implement.

7.3.1.8 Cost

There is no cost to implement this alternative.

7.3.2 Alternative S-B – Additional Institutional and Engineering Controls and Excavation and Off-Site Disposal

7.3.2.1 Description of Alternative

Alternative S-B includes the continuation and maintenance of all the existing corrective measures described in Sections 3.0 and 6.2 and includes excavation and off-Site disposal of impacted soil designated in Section 5.3.2. Areas that have been excavated will be backfilled with clean soils. In addition, enhanced institutional and engineering controls are included in this alternative. The proposed locations for application of the remedial components for Alternative S-B are shown on Figure 7-1.

The horizontal and vertical limits of excavation are shown on Figure 7-1. Prior to any surface disturbance, appropriate temporary erosion and sedimentation control measures and surface water management structures will be put in place to prevent off-Site migration of contaminants during excavation. Continuous air monitoring will be conducted at the location of the excavation and the perimeter of the Facility to monitor air for soil particulates containing COCs in excess of Remedial Goals. Excavations are proposed to extend to the limits shown on Figure 7-1, as determined to adequately protect human health and the environment as discussed in Section 5.3.2. Excavated materials will be stockpiled and then hauled to an appropriate off-Site disposal facility. Clean imported fill will be used to backfill the excavations. The surface of the excavated areas will consist of vegetative, gravel, or equivalently protective covers depending on the intended end use for that portion of the Facility. Final determination of the cover type will be made during a PDI. Figure 7-2 shows schematic details for the proposed backfill and cover type alternatives.

Enhanced institutional controls including an environmental covenant will be included to restrict future uses of the Facility, and engineering controls including extended perimeter fences, as shown on Figures 7-2 and 7-3, are also included in this alternative to further restrict access. In addition, administrative controls in the form of a “no dig policy” will be implemented at the plant requiring a permit prior to excavating at the Facility. Anyone performing such excavations will require the proper training. Appropriate air monitoring will be required during any soil disturbance activities.

Operation, monitoring, and maintenance of the existing and proposed additional remedial components are included in this alternative.

7.3.2.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

- Risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soils will be mitigated to protective levels with the resulting exposure point concentrations for the Site below the Remedial Goals;
- Risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil above the Remedial Goals will be mitigated through excavation of prescribed areas and administrative controls which require proper training, soil handling procedures, etc. Air monitoring during soil disturbance activities will be used to prevent ingestion or inhalation of soil particulates in air;
- The limits for excavation were based on removing impacted soil in areas where leaching of COCs to groundwater is potentially occurring. This material will be disposed off the Facility, which will prevent migration and leaching of contaminants from these soils to groundwater. The impact of leaching from soils is further mitigated by the existing perimeter controls and an environmental covenant that serve to mitigate exposures to groundwater contaminants above Remedial Goals;
- Through continued O&M of the existing caps and stormwater management systems, and further removal of impacted soil, migration of contaminants in surface soil to surface water is prevented. Prior to any excavation activities, there will be a requirement for the installation of erosion and sedimentation controls; and
- The remedial components included in this alternative are intended to prevent future releases of contaminants.

7.3.2.3 Compliance with ARARs

This alternative will continue to comply with the action and chemical-specific ARARs identified in Table 7-2.

7.3.2.4 Short-Term Effectiveness

The activities associated with this alternative may result in manageable short-term impacts to construction workers primarily as a result of excavation of impacted soil. These impacts will be managed through the use of engineering controls, administrative controls, and appropriate health and safety measures. Short-term impacts to the community will be moderate and will generally be

associated with traffic caused by trucks hauling materials to and from the Facility. These impacts can be mitigated by requiring protocols that reduce dust and debris on roadways, and by adhering to traffic laws. Construction of all the remedial components included in this alternative will take four to eight months, and work will likely be completed during normal construction hours (e.g., during daylight). Typical construction equipment (e.g., excavators, backhoes, drill rigs, and dump trucks) will be used. Some disturbances to existing plant operations are anticipated due to the increased activity and truck traffic on the Site.

7.3.2.5 Long-Term Effectiveness and Permanence

This alternative provides long-term permanent protection of human health and the environment through the removal of impacted soils that result in acceptable risk levels. Excavation of impacted soil will eliminate long-term risk to receptors and will prevent any further leaching to groundwater. On-Site institutional and engineering controls and administrative controls will prevent risks from subsurface soils within the Facility. Operation, monitoring, and maintenance will be regularly conducted to provide continued long-term effectiveness of the remedy. This alternative meets the RAOs for soil.

7.3.2.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Excavation and off-Site disposal of impacted soil will reduce the toxicity, mobility, and volume of materials at the Facility. Off-Site disposal, however, will not reduce the overall toxicity and volume of materials containing COCs since the materials are not treated off the Facility, but rather disposed of in a landfill. The volume of impacted soil is simply relocated. However, the disposal facility is designed to handle the material in a manner that prevents mobilization of contaminants.

7.3.2.7 Implementability

The remedial components provided in this alternative are easily implemented as they utilize well-established practices and the services and materials required are standard within the industry and are readily available. The long-term O&M requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.3.2.8 Cost

A cost estimate for Alternative S-B is shown in Tables 7-3, 7-3C, and 7-3D. The estimated capital cost (without contingencies) is $19,190,000, and additional O&M costs for these elements are estimated at $6,000 per year. The total present worth cost for this alternative, including 30 years of O&M and contingencies, is approximately $29,498,000. The majority of the cost associated with this alternative is related to excavation, handling, and disposal of the excavated soils.

7.3.3 Alternative S-C – Additional Institutional and Engineering Controls and Soil Containment (Capping)

7.3.3.1 Description of Alternative

Alternative S-C includes all of the existing corrective measures described in Sections 3.0 and 6.2, and adds a containment remedy to address impacted surface soil. In addition, enhanced institutional and engineering controls are included in this alternative. The proposed locations of components for remedial Alternative S-C are shown on Figure 7-4.

The areal extents of the proposed caps are shown on Figure 7-4, and are defined in Section 5.3.2. For this alternative, two options are proposed as described in Section 5.3.2. Option 1 includes constructing or supplementing caps over Areas A, C, D and E, while Option 2 includes addressing these four areas plus upgrading the cap over Cells 1E, 2E, and 3E at the South Landfill. Three different cap systems are proposed for different areas of the Site as shown on Figure 7-5 and include two impermeable caps and one soil/vegetative cap. For Option 1, the capping system for those areas requiring an impermeable cap (Areas A and E) to minimize potential soil leaching to groundwater will be selected during a PDI based on the intended end use of the capped area. For Option 2, the capping system for Cells 1E, 2E, and 3E at the South Landfill will consist of the following as shown on Figure 7-5:

- Earthfill material to provide the proper drainage for the cover system;
- 40-mil HDPE geomembrane liner (or equivalent) to reduce infiltration;
- Geocomposite drainage layer to collect and convey surface water that infiltrates through the cover soils; and
- Protective cover / vegetative soil layer.

The areas shown on Figure 7-4 as being capped with a vegetated soil cover (soil and grass cover, Areas C and D) are currently under a gravel cover, which will be augmented with the proposed cap.

Cover materials will be imported to the Site. Any existing materials that are cut or excavated for grading purposes will be contained under the proposed caps. The final surface will be graded to promote drainage away from the capped area. Wherever possible, existing surface water management structures will be used to convey stormwater away from the capped areas. New surface water management structures will be installed as needed. The final surfaces of the capped areas will be gently graded into the surrounding terrain, and no significant or noticeable changes from the existing topography are anticipated. Prior to any surface disturbance, appropriate temporary erosion and sedimentation control measures and surface water management structures will be put in place to prevent off-Site migration of contaminants during excavation. Continuous air monitoring will be conducted at the location of soil disturbances and the perimeter of the Facility to monitor air for soil particulates containing COCs in excess of Remedial Goals.

Enhanced institutional controls including an environmental covenant will be included to restrict future uses of the Facility, and enhanced engineering controls in the form of extended perimeter fences, as shown on Figure 7-4, are included in this alternative to further restrict access. In addition, administrative controls in the form of a "no dig policy" will be implemented at the plant requiring a permit prior to excavating at the Facility. Anyone performing such excavations will require the proper training. Appropriate air monitoring will be required during any soil disturbance activities. Operation, monitoring, and maintenance of the existing (Section 3.3) and proposed additional remedial components are included in this alternative.

7.3.3.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

- Risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soils will be mitigated to protective levels with the resulting exposure point concentrations for the Site below the Remedial Goals;
- Risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil will be mitigated through administrative controls which require proper training and soil handling procedures. Air monitoring during soil disturbance activities will be used to prevent ingestion or inhalation of soil particulates in air;
- Impacts from leaching of soils to groundwater is mitigated by a combination of proposed impermeable covers, the existing Site perimeter controls, and an environmental covenant to prevent exposures to groundwater contaminants above Remedial Goals;

- Through continued O&M of the existing and proposed caps and stormwater management systems, migration of contaminants in surface soil to surface water is prevented. Prior to any excavation activities, there will be a requirement for installation of erosion and sedimentation controls; and
- The remedial components included in this alternative are intended to prevent future releases of contaminants.

7.3.3.3 Compliance with ARARs

This alternative will continue to comply with the action- and chemical -specific ARARs as identified in Table 7-2.

7.3.3.4 Short-Term Effectiveness

The activities associated with this alternative may result in manageable short-term impacts to construction workers primarily as a result of exposures to impacted soils for a short time period, since impacted soils will not be exposed once the installation of the capping system begins. These impacts will be managed through the use of engineering controls, administrative controls, and appropriate health and safety measures. Short-term impacts to the community are not expected. Construction of all remedial components included in this alternative will take three to five months, and work will likely be completed during normal construction hours (e.g., during daylight). Typical construction equipment (e.g., excavators, backhoes, drill rigs, and dump trucks) will be used, in addition to moderately specialized equipment and personnel for the placement of the impermeable cover system components. Minimal disturbances to existing plant operations are anticipated.

7.3.3.5 Long-Term Effectiveness and Permanence

This alternative provides long-term permanent protection of human health and the environment through the containment of impacted soils to levels protective of human health and the environment. The proposed caps will eliminate long-term risks to receptors and mitigate COCs leaching to groundwater. On-Site institutional, engineering, and administrative controls will prevent risks from subsurface soils within the Facility. Operation, monitoring, and maintenance will be regularly conducted to provide continued long-term effectiveness of the remedy. This alternative meets the RAOs for soil.

7.3.3.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Containment of impacted soil provides for reduction of the mobility of chemicals in surface soil. The covers will isolate underlying COCs, mitigating potential direct contact and mobility through erosion. Similar to Alternative S-B, containment does not reduce the volume of impacted soil. However, the capping component is designed to manage the toxicity of impacted materials.

7.3.3.7 Implementability

All remedial components provided in this alternative are easily implemented as they utilize well-established practices and the services and material required are standard within the industry and are readily available. The long-term O&M requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.3.3.8 Cost

A cost estimate for Alternative S-C is shown in Tables 7-3, 7-3E, 7-3F, 7-3G and 7-3H. For Option 1, the estimated capital cost (without contingencies) is $1,384,000, and additional O&M costs for these elements are estimated at $11,000 per year. The total present worth cost for this alternative, including 30 years of O&M and contingencies, is approximately $2,859,000. For Option 2, the estimated capital cost (without contingencies) is $2,938,000 and additional O&M costs for these elements are estimated at $21,000 per year. The total present worth cost for this alternative, including 30 years of O&M and contingencies, is approximately $5,118,000.

7.3.4 Alternative S-D – Additional Institutional and Engineering Controls and Excavation with On-Site Treatment Using Chemical Dehalogenation

7.3.4.1 Description of Alternative

Alternative S-D includes soil excavation and on-Site treatment using chemical dehalogenation. Following excavation, soils will be analyzed to determine COC concentrations. Soils qualifying for Subtitle D landfill disposal will be disposed of accordingly in lieu of treatment in order to reduce the cost to implement this option. In addition, enhanced institutional and engineering controls are included in this alternative. The proposed locations of components for remedial Alternative S-D are shown on Figure 7-6.

Soil from the areas designated on Figure 7-6, will be excavated to the indicated depths and prepared for treatment. The soil will be treated using a chemical dehalogenation process. There are a number of chemical dehalogenation technologies including base-catalyzed decomposition (BCD), alkaline metal hydroxide polyethylene glycol (APEC), and potassium metal hydroxide polyethylene glycol (KPEGTM). BCD appears to be the most proven, efficient, and cost effective of these processes; therefore, BCD is the only one considered in this alternative. However, prior to implementation, a treatability study will need to be conducted at the Site to determine what technology is most appropriate for Site conditions. The presence of multiple COCs could affect the effectiveness of this technology and therefore will need to be evaluated further during the treatability study.

The dehalogenation process is achieved by either the replacement of the halogen molecules or the decomposition and partial volatilization of the contaminants. The contaminants exposed to the dehalogenation process are entirely or partially decomposed. BCD is employed by using sodium hydroxide, sodium bicarbonate, or aliphatic hydrocarbons as hydrogen donors. Figure 7-7 shows a typical BCD process schematic. The soil is first screened, processed through a crusher and pug mill, and stockpiled. In a typical application, the stockpiled material is mixed with sodium bicarbonate in the amount of 10 percent of the weight of the stockpile and is heated for about one hour at a temperature of approximately 340 ^{o}C (644 ^{o}F) in a rotary reactor. PCBs are completely dechlorinated and partially volatized in this step. The PCBs in vapor condensate, residual dust, spent carbon, and filter cake are dechlorinated after about 2 hours at 350 ^{o}C (662 ^{o}F) in a boiling slurry (i.e., liquid phase) STR utilizing a high boiling point hydrocarbon oil, catalyst, and sodium hydroxide.

The BCD process produces biphenyl, sodium chloride and low-boiling olefinics, which are not water soluble and less toxic than other typical by-products of other chemical dehalogenation processes. The treated water and condensate from the treatment process will likely be discharged to the Anniston POTW after being pumped through a condenser followed by an activated carbon unit. The decontaminated sludge from the STR will be disposed as municipal sewage sludge. Prior to any off-Site disposal of the residuals, analytical testing will be conducted to evaluate conformance with disposal requirements. Off-gases from the process will be treated and monitored. Treated soils will be sampled and analyzed for COCs. Soil meeting the Remedial Goals will be backfilled within the areas of excavation. However, pilot studies have shown that this treatment technology can cause a loss in cohesiveness in silty clay soils, such as those at the Site. Therefore, after treatment, should the treated soils not be suitable for use as backfill, the treated soils will be disposed off the Facility at a non-hazardous waste landfill, and imported fill will be used as backfill. Soil not meeting the

Remedial Goals will be retreated or disposed off-Site. A six-inch thick vegetative soil cover or gravel cover will be used above the treated soil backfill.

The Site is adequately equipped to permit this treatment option since there are access roads suitable for supporting equipment delivery. Diesel fuel or natural gas will be used to fuel the primary reactors, and standard 440 volt three-phase electrical service is available to support the process. Water for use in cooling and washing is available, but can be substantial and may require construction of additional infrastructure. Provision will be made for an activated carbon unit for water pre-treatment, as well as for off-Site disposal at the Anniston POTW. An extensive activity-specific health and safety plan will be required, including provisions for emergency shutdown. Measures to handle stockpiled contaminated soils and any process residual streams will be made including employing erosion and sedimentation control measures and surface water management techniques. Continuous air monitoring within the work zone and at the perimeter of the Facility will be required to monitor air quality for remedial workers, Solutia workers, and the local community. Temporary disturbances to plant activities due to the required area for the work, power usage, and residual handling are likely.

Based on pilot studies performed at other sites, a reduction in PCB concentrations of 98 to 99 percent, with treated soil samples ranging from less than the reported detection limit (generally equal to 0.4 to 0.5 mg/kg) to 1.8 mg/kg, can be achieved through proper application of dehalogenation techniques (EPA, 1993). Site-specific treatability studies will be required to confirm treatment efficiency for the Site.

Enhanced institutional controls including an environmental covenant will be included to restrict future uses of the Facility, and enhanced engineering controls in the form of extended perimeter fences, as shown on Figure 7-6, are also included in this alternative to provide further access restriction. In addition, administrative controls in the form of a “no dig policy” will be implemented at the plant requiring a permit prior to excavating at the Facility. Anyone performing such excavations will require the proper training. Appropriate air monitoring will be required during any soil disturbance activities. Operation, monitoring, and maintenance of the existing and proposed additional remedial components are included in this alternative.

7.3.4.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

- Risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soils will be mitigated to protective levels with the resulting exposure point concentrations for the Site below the Remedial Goals;
- Risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil will be mitigated through soil removal and treatment, and administrative controls which require proper training and procedures. Air monitoring during soil treatment activities is a critical component of this alternative and will be used to prevent ingestion and inhalation of soil particulates in air and treatment off-gases;
- The treated soil will result in COC concentrations protective of risks associated with leaching to groundwater. Impacts from leaching of soils to groundwater is further mitigated by the existing Site perimeter controls, and an environmental covenant that prevent exposures to groundwater contaminants above Remedial Goals;
- Through excavation and treatment of impacted soil and continued O&M of the existing caps and stormwater management systems, migration of contaminants in surface soil to surface water is prevented. Prior to any surface disturbance activities, there will be a requirement for installation of erosion and sedimentation controls; and
- All remedial components included in this alternative in combination are intended to prevent future releases of contaminants.

7.3.4.3 Compliance with ARARs

This alternative will continue to comply with the action- and chemical-specific ARARs as identified in Table 7-2. Monitoring of air emissions during the treatment processes will be required to ensure that the action- and chemical-specific standard for National Emissions Standards for Hazardous Air Pollutants (Federal Register, 2008, 40 CFR Part 61) are maintained. Although the Site is exempt from obtaining federal, state, or local permits, this exemption does not waive requirements to meet the substantive provisions of the permitting regulations. Regular interaction with federal, state, and local agencies will be required to comply with federal and state air emission requirements.

7.3.4.4 Short-Term Effectiveness

Construction of this remedy is likely to span over one and a half to two years for the soil treatment components. However, prior to commencing construction, treatability studies/pilot studies will be required and necessary permits must be secured. These activities are likely to require 12 to 18

months to complete. Pilot studies performed at other sites have shown a treatment rate of around 8 to 10 tons per hour. Assuming that the treatment system is operated 24 hours a day at 80% efficiency, treatment of the soil will likely take one to one and a half years. Mobilization, demobilization, treatability studies, staging and backfilling will likely take an additional three to six months. During this time period, disruptions to plant activities and the surrounding community are likely due to the noise associated with running the treatment unit, lights required during night time construction and operation, and traffic associated with hauling equipment to and from the Facility. In addition, although continuous air monitoring will be required, there is a greater chance of off-gas and fugitive dust releases as a result of materials being stockpiled for an extended period of time prior to and after treatment. The short-term negative effects of this technology are greater than those anticipated for other technologies such as excavation with direct off-Site disposal or capping.

7.3.4.5 Long-Term Effectiveness and Permanence

This alternative can provide long-term permanent protection of human health and the environment through the ex-situ treatment of excavated soils. Pilot studies have shown that this is a viable technology for treatment of PCBs in soil. However, Site-specific treatability studies are required to evaluate the effectiveness of this technology especially considering the variable soil conditions. On-Site institutional and engineering controls and administrative controls will prevent risks from contact with subsurface soils within the Facility. Operation, monitoring, and maintenance will be regularly conducted to assure the continued long-term effectiveness of the remedy. This alternative meets the RAOs for soil.

7.3.4.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Treatment of impacted soils using chemical dehalogenation will reduce the toxicity and mobility of contaminants in soil through dechlorination of the soil.

7.3.4.7 Implementability

Chemical dehalogenation is an innovative technology that requires special training, design, and equipment. An extensive design and treatability study will be required to evaluate the Site-specific implementability of this technology. Treatment of the soil using this technology will require extensive use of diesel fuel or natural gas, power, and water. There is the potential for disturbances to the plant workers and local community due to noise, light, and air emissions during the treatment process. Compared to other technologies such as capping, chemical dehalogenation offers greater

implementability challenges. The long-term O&M requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.3.4.8 Cost

A cost estimate for Alternative S-D is shown in Tables 7-3, 7-3I, and 7-3J. The estimated capital cost (without contingencies) is $26,204,000, and additional O&M costs for these elements are estimated at $6,000 per year. The total present worth cost for this alternative, including 30 years of O&M with contingencies, is approximately $40,018,000. This cost estimate assumes that 30 percent of the excavated soil is disposed off the Site at a Subtitle D facility rather than being treated. Disregarding this assumption would unfavorably weigh the cost of this alternative based upon the treatment of non-principal threat waste. The driving cost components associated with this alternative include soil treatment using chemical dehalogenation and mobilization/demobilization of equipment.

7.3.5 Alternative S-E – Additional Institutional and Engineering Controls and Excavation with On-Site Treatment Using Thermal Desorption

7.3.5.1 Description of Alternative

Alternative S-E includes soil excavation and on-Site treatment of the excavated soil using thermal desorption. Following excavation, soils will be analyzed to determine the COC concentrations. Soils qualifying for Subtitle D landfill disposal will be disposed of accordingly in lieu of treatment in order to reduce the cost to implement this option. In addition, enhanced institutional and engineering controls are included in this alternative. The proposed locations of the components for remedial Alternative S-E are shown on Figure 7-8.

Soil from the areas designated on Figure 7-8 will be excavated to the indicated depths analyzed for COCs, and prepared for treatment. Soils exceeding COC limits for non-hazardous landfill disposal standards will be treated using an ex-situ thermal desorption process. Thermal desorption is a physical separation technology, not a destruction technology. Thermal desorbers are designed to heat soils to temperatures sufficient to cause constituents to volatilize and desorb (physically separate) from the soil.

The primary stages of a thermal desorption system are staging, material handling, desorption, particulate removal, and off-gas treatment. Prior to any surface disturbance, appropriate erosion and

sedimentation control measures and surface water management structures will be put in place to prevent off-Site migration of contaminants during construction. Continuous air monitoring will be conducted within the work zones and at the perimeter of the Facility to monitor off-gases and air for soil particulates containing COCs in excess of Remedial Goals. A staging area for treatment and handling, including necessary utilities, materials, and equipment, will be established. Material handling will include excavation and hauling to the staging area. It is expected that it will be necessary to pre-excavate and stockpile the soils to allow for COC analysis and pre-treatment to achieve required optimum treatment conditions (e.g., material sizing and moisture control). While the exact soil property limitations of the thermal desorption unit will depend on different equipment factors, some general pre-treatment requirements are to screen out particles larger than 1 to 2 inches; to dry plastic fine-grained soils to at least below 15 to 20% moisture content (EPA, 1997b); to shred or otherwise de-aggregate clumps of fine grained materials; and to test for potentially unsuitable materials that could be dangerous to the equipment or nearby personnel. The existence of significant large diameter gravel (on the order of 1 to 2 inches in diameter) at two of the areas to be excavated, and the fine grained, moderately plastic, and potentially wet nature of the surface soils at the Site have led to the conclusion that pre-screening and/or treatment of the target soils will be required.

Following screening, soil is delivered to the desorber inlet or conveyed by augers to a feed hopper, rotary airlock, or other equipment. There are several types of thermal desorption equipment, including: rotary dryers, asphalt plant aggregate dryers, thermal screws, and conveyor furnaces. Although all thermal desorption systems use heat to separate organic contaminants from the soil matrix, each system has a different configuration with its own set of advantages and disadvantages. The decision to use one system over another depends on the nature of the contaminants as well as machine availability, system performance, and economic considerations. Because of the significant specialty associated with the operation and selection of the type of thermal desorption best suited to the specific Site conditions, and the economics likely dependent on equipment availability, it is proposed that the specific type of thermal desorption technology remain flexible at this point in the FS process. However, in general as the contaminants are desorbed, they volatilize and are transferred to a gas stream. Using a thermal oxidizer, PCBs are converted to carbon dioxide and water vapor, and a small amount of chlorine. Thermal oxidizers typically operate at temperatures ranging from about 1,600ºF to 1,800ºF (about 870 ºC to 1,000 ºC).

For purposes of this evaluation, the thermal desorption has been assumed to be a direct fired unit outfitted with an inline oxidizer for destruction of the desorbed materials that will be operated 24

hours per day, 7 days a week, at an assumed 85% efficiency to account for downtime and required maintenance. A generic schematic of a typical thermal desorption process is presented on Figure 7-9.

During the treatment production period, grab samples of treated soil will be taken from the desorber each day and composited for analysis. At least one composite sample will be taken for each 1,000 tons of treated soil, or one per 24-hour period of operation, whichever yields the more frequent sampling. Any treated soil from the desorber that is above the Remedial Goal for PCBs will be re-treated.

Residual streams from this process may include treated soil, oversized or rejected materials, condensed contaminants, water, particulate control system dust, clean off-gas, spent carbon, and aqueous phase activated carbon. If suitable, treated soil will be used as backfill within the limits of excavation. One of the backfill options shown on Figure 7-2 will be placed above the treated soil. However, pilot studies have shown that this treatment technology can cause a loss in cohesiveness in silty clay soils, such as those at the Site. Therefore, after treatment, should the treated soils not be suitable for use as backfill, the treated soils will be disposed off the Facility at a non-hazardous waste landfill, and imported fill will be used as backfill. Other residuals will also be disposed off the Site, as appropriate.

The Site is adequately equipped for this treatment option since there are access roads suitable for supporting equipment delivery. Diesel fuel or natural gas will be used along with standard 440 volt three-phase electrical service. Water for use in cooling and washing is available, but can be substantial and may require construction of additional infrastructure. An extensive activity-specific health and safety plan will be required including provisions for emergency shutdown. Measures to handle stockpiled contaminated soils and any process residual streams will be made including employing erosion and sedimentation control measures and surface water management techniques. Continuous air monitoring within the work zone and at the perimeter of the Facility will be required to monitor air quality for remedial workers, the Solutia workers, and the local community. There could be temporary disturbances to plant activities due to the required area for the work, power usage, and residual handling.

Based on pilot studies performed at other sites, a reduction in PCB concentrations of greater than 99% percent, with treated soil samples ranging from less than the reported detection limit (generally equal

to 0.4 to 0.5 mg/kg) to 2 mg/kg (EPA, 1997b) is expected. Site-specific treatability studies are required to confirm this treatment efficiency under Site conditions.

This process may be considered incineration by many regulatory agencies. Therefore, incineration emission standards may apply and there are a number of permits that would likely be required prior to initiation. Therefore, obtaining the necessary permits may prove to be a time consuming and difficult process.

7.3.5.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

- Risks to receptors (facility operations area worker, O&M worker, and trespasser) from direct contact with, inhalation of, or incidental ingestion of COCs in surface soils will be mitigated to protective levels with the resulting exposure point concentrations for the Site below the Remedial Goals;
- Risks to the construction worker from direct contact with or incidental ingestion of COCs in subsurface soil above the Remedial Goals will be mitigated through excavation/treatment of impacted soil and administrative controls which require proper training, and soil handling procedures. Air monitoring during soil treatment activities is a critical component of this alternative and will be used to prevent ingestion and inhalation of soil particulates in air and treatment of off-gases;
- The treated soil will result in COC concentrations protective of risks associated with leaching to groundwater. Impacts from leaching of soils to groundwater is further mitigated by the existing Site perimeter controls, and an environmental covenant that prevent exposures to groundwater contaminants above Remedial Goals;
- Through excavation and treatment of impacted soil and continued O&M of the existing caps and stormwater management systems, migration of contaminants in surface soil to surface water is prevented. Prior to any surface disturbance activities, there will be a requirement for installation of erosion and sedimentation controls; and
- All remedial components included in this alternative in combination are intended to prevent future releases of contaminants.

7.3.5.3 Compliance with ARARs

This alternative will comply with the action- and chemical-specific ARARs identified in Table 7-2. Monitoring of air emissions during the treatment processes will be required to ensure that the action- and chemical-specific standards for National Emissions Standards for Hazardous Air Pollutants (Federal Register, 40 CFR Part 61) are maintained. Although the Site is exempt from obtaining

federal, state, or local permits, this exemption does not waive requirements to meet the substantive provisions of the permitting regulations. Regular interaction with federal, state, and local agencies will be required to comply with federal and state air emission requirements.

7.3.5.4 Short-Term Effectiveness

Construction of this remedy is likely to span over a nine to 12 month period for the soil treatment components. However, prior to commencing construction, treatability studies/pilot studies will be required and necessary permits must be secured. These activities are likely to require 12 to 18 months to complete. During this time period, disruptions to plant activities and the surrounding community are likely, due to the noise associated with running the treatment unit, lights required during night time construction and operation, and traffic associated with hauling equipment to and from the Facility. In addition, although continuous air monitoring will be required there is a greater chance of the release of fugitive dust and off gases as compared to Alternatives S-A through S-C. The short-term negative effects of this technology are greater than those anticipated for other technologies such as excavation with off-Site disposal and capping.

7.3.5.5 Long-Term Effectiveness and Permanence

This alternative can provide long-term permanent protection of human health and the environment through the treatment of impacted soils. Pilot studies and full-scale operations have shown that thermal desorption is a viable technology for treatment of PCBs in soil. However, Site-specific treatability studies are required to evaluate the effectiveness of this technology especially considering the variable soil conditions. The remedial techniques in this alternative will likely require specialized personnel and equipment.

7.3.5.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Treatment of impacted soils using thermal desorption will reduce the toxicity and mobility of COCs in soil remaining at the Facility. However, the waste streams still require off-Site disposal, and that volume of material will just be transferred to another location.

7.3.5.7 Implementability

Thermal desorption is an innovative technology that requires special training, design, and equipment. An extensive design and treatability study is required to evaluate the Site-specific implementability of this technology. An extensive permitting process will likely be required as a result of the potential air

emissions. It is anticipated that the permitting process will require several months of permit preparation and review. Treatment of the soil using this technology requires extensive use of diesel fuel or natural gas, power, and water. There is the potential for disturbances to the plant workers and local community due to noise, light, and air emission during the treatment process. Compared to other technologies such as capping, thermal desorption offers greater implementability challenges. The long-term operation and maintenance requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.3.5.8 Cost

A cost estimate for Alternative S-E is shown in Tables 7-3, 7-3K, and 7-3L. The estimated capital cost (without contingencies) is $18,046,000, and O&M costs for these elements are estimated at $6,000 per year. The total present worth cost for this alternative, including 30 years of O&M, with contingencies, is approximately $27,782,000. This cost estimate assumes that 30 percent of the excavated soil is disposed off the Site at a Subtitle D facility rather than being treated. Disregarding this assumption would unfavorably weigh the cost of this alternative based upon the treatment of non-principal threat waste. The driving costs associated with this alternative include soil treatment using thermal desorption, and mobilization/demobilization of equipment.

7.4 Remedial Alternatives for Groundwater

7.4.1 Alternative GW-A – No Action

7.4.1.1 Description of Alternative

Alternative GW-A is the No Action alternative, which means that no additional remedial actions will be conducted. Under Alternative GW-A, the existing corrective measures would be continued (i.e., operated or maintained), but no new actions would be implemented. This alternative is presented and analyzed as required by the NCP.

7.4.1.2 Overall Protection of Human Health and the Environment

The No Action alternative does not provide any additional protection of human health and the environment. As described in the HHRA (summary provided in Section 2.8), unacceptable risks were identified for the hypothetical future receptors (residential receptors, operations area worker) due to exposure to groundwater. The No Action alternative will not address these unacceptable risks. The deed restriction that is currently in place restricting groundwater use currently prevents exposure to

groundwater on the Facility but will not achieve groundwater restoration. Additionally, potential exposures to groundwater beyond the Facility boundaries are not prevented by this alternative. Overall this alternative does not provide adequate protection of human health and the environment.

7.4.1.3 Compliance with ARARs

This alternative would result in non-compliance with the ARARs. Although, groundwater monitoring data suggest that the concentrations of some COCs in groundwater are declining over time, this No Action alternative will not likely achieve all of the groundwater chemical-specific ARARs (e.g., MCLs) within a determinant timeframe.

7.4.1.4 Short-Term Effectiveness

No additional short-term risks to the community, workers, or the environment are posed by implementation of this alternative.

7.4.1.5 Long-Term Effectiveness and Permanence

This alternative does not provide long-term effectiveness as it does not address all current and hypothetical future exposure pathways, and does not address locations where groundwater is potentially migrating off the Facility.

Natural attenuation of groundwater chemical impacts may serve to reduce the volume of contaminants over time; however, no additional groundwater monitoring specific for natural attenuation assessment is included in this alternative.

7.4.1.6 Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative will provide no quantifiable reduction of toxicity, mobility or volume of COCs.

7.4.1.7 Implementability

The No Action alternative is straightforward and easy to implement.

7.4.1.8 Cost

There are no costs associated with this action.

7.4.2 Alternative GW-B – Additional Institutional Controls and Expanded Groundwater Extraction

7.4.2.1 Description of Alternative

Alternative GW-B includes the expansion of the existing Groundwater Corrective Action System to provide further containment of groundwater at the Facility. In addition, enhanced institutional controls are included in this alternative. The proposed locations of the remedial components for Alternative GW-B are shown on Figure 7-10.

The existing Groundwater Corrective Action System will continue to be operated, and will be expanded through the incorporation of additional interceptor wells to provide for complete perimeter control of groundwater impacts. Figure 7-10 shows the locations of the proposed expansion to the Groundwater Corrective Action System. For evaluation and comparative analysis, two new interceptor wells have been assumed to be required at the two proposed expansion locations, with the spacing of these wells based on available hydrogeologic data from existing wells in close proximity to the proposed expansion locations. Three observation wells, two existing and one proposed, will be used to monitor the effectiveness of the new interceptor wells. These observation wells will be incorporated into the Site-wide groundwater monitoring program. A PDI will be required to determine the exact location and number of interceptor well and monitoring well locations. Nominal schematics of the proposed interceptor and observations wells[12] are included in Figures 7-11 and 7-12. Extracted water will be pre-treated using a carbon filtration system, as shown on Figure 7-13 and then sent to the on-Site equalization basin. From the equalization basin, extracted groundwater is discharged to the Anniston POTW for further treatment.

Enhanced institutional controls including extension of the deed restriction prohibiting groundwater use to include the North Side and East Side Properties (in the vicinity of monitoring well OW-21A and OW-10) and entering into an environmental covenant with ADEM is included in this alternative. Operation, monitoring, and maintenance of the existing and proposed additional remedial components are included in this alternative.

7.4.2.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

[12] The term observation well is used interchangeably with monitoring well.

- Through continued operation and expansion of the Groundwater Corrective Action System, perimeter control of groundwater impacts is maintained; further mitigating risks to off-Site receptors from direct contact with or ingestion of COCs in groundwater at concentrations above the Remedial Goals and preventing migration of pollutants beyond the existing limits of the known contaminant plume or established point of compliance (the OU-3 boundary). Within the Facility, deed restrictions and a groundwater covenant with ADEM will prohibit the use of groundwater at the Facility. O&M will be consistent with the existing groundwater monitoring program, as described in Section 3.3, and will be used to verify the effectiveness of the Groundwater Corrective Action System; and

- The remedial components included in this alternative are intended to prevent future releases of contaminants.

- Over time, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

7.4.2.3 Compliance with ARARs

This alternative will comply with the action- specific ARARs as identified on Table 7-2, and the chemical-specific ARARs. By expansion of the existing Groundwater Corrective Action System, groundwater exceeding the Remedial Goals will be captured and treated. Within the Facility, a deed restriction and environmental covenant will be in place prohibiting the use of groundwater. Additionally, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

7.4.2.4 Short-Term Effectiveness

Construction of all the remedial components included in this alternative will take four to five weeks, and work will likely be completed during normal construction hours (e.g., during daylight), thus the short-term impacts due to construction are manageable. However, prior to implementing this alternative, a PDI must be completed and access must be obtained from Norfolk Southern to run conveyance piping beneath its railroad tracks. These activities could require up to six months to complete. Typical well drilling equipment will be used. Minimal disturbances to existing plant operations are anticipated.

7.4.2.5 Long-Term Effectiveness and Permanence

This alternative provides long-term permanent protection of human health and the environment through the extraction and treatment of impacted groundwater. Extraction of groundwater will

prevent the potential off-Site migration of groundwater contaminants. On-Site institutional and administrative controls will prevent risks from contact with groundwater within the Facility. The environmental covenant would prevent the use of groundwater for any purpose on the Facility, and the "no dig policy" would prevent workers without the proper training from coming into contact with groundwater during operation and maintenance activities. Operation, monitoring, and maintenance will be regularly conducted to provide continued long-term effectiveness of the remedy. This alternative meets the RAOs for groundwater.

7.4.2.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Recovery and on-Site treatment (carbon filtration) and/or off-Site (Anniston POTW) treatment of groundwater will reduce the toxicity, mobility, and volume of contaminants in groundwater.

7.4.2.7 Implementability

All remedial components provided in this alternative are easily implemented as they utilize well-established practices and the services and material required are standard within the industry and are readily available. The long-term O&M requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.4.2.8 Cost

A cost estimate for Alternative GW-B is shown in Tables 7-4, 7-4C, and 7-4D. The estimated capital cost (without contingencies) is $195,000, and additional O&M costs for these elements are estimated at $16,000 per year. The total present worth cost for this alternative, including 30 years of O&M and contingencies, is approximately $2,307,000. The majority of the cost associated with this alternative is related to installation, operation, and maintenance of the groundwater corrective action systems.

7.4.3 Alternative GW-C – Additional Institutional Controls, Expanded Groundwater Extraction and In-Situ Treatment of Groundwater through MNA

7.4.3.1 Description of Alternative

Alternative GW-C includes MNA for in-situ groundwater pre-treatment of PNP and parathion. MNA provides an additional level of groundwater treatment to facilitate attainment of groundwater concentrations meeting Remedial Goals in the long term. The proposed locations of components for remedial Alternative GW-C are shown on Figure 7-14.

There is strong evidence that natural attenuation is effectively occurring at the Site for PNP and parathion as discussed in the RI Report. Natural attenuation involves the combined effects of dispersion, dilution, adsorption, abiotic transformation (e.g., hydrolysis), volatilization and biological degradation. These mechanisms can effectively, over time, reduce contaminant levels. Abiotic transformation and biodegradation are important "destructive" attenuation mechanisms, as they typically transform the constituents to less toxic compounds and can ultimately result in the complete degradation of a compound to benign end products such as carbon dioxide and ethane. The MNA component of this alternative will use existing wells (OW-08A, OW-16A, OW-21A, OW-10, MW-20A, and OWR-13), as shown on Figure 7-14. Further evaluation of wells to include in the MNA program will be completed as part of a PDI. The MNA program will include sampling and analysis of select COCs, field parameters, and natural attenuation parameters collected on an annual or less frequent basis. Field parameters and natural attenuation parameters to be monitored include dissolved oxygen, oxidation-reduction potential, turbidity, pH, specific conductance, methane, ethane, ethene, total organic carbon, alkalinity, total suspended solids, nitrate, sulfate, sulfide, ferrous iron, and chloride. Water levels will be measured during each sampling event, and equipotential maps will be constructed to monitor groundwater flow and direction. This monitoring differs from the Corrective Action Effectiveness monitoring that is part of the existing and expanded Groundwater Corrective Action System component.

Although natural degradation is occurring at the Facility for many COCs, some COCs, particularly PCBs and metals, are not prone to degrade naturally. These constituents typically rely on other physical processes to attenuate (e.g., dispersion, dilution, and adsorption). As a result, MNA is coupled with the expanded extraction system to achieve maximum effectiveness as recommended in the EPA OSWER Directive 9200.4-17P (EPA, 1999).

7.4.3.2 Overall Protection of Human Health and the Environment

This alternative provides the same overall level of protection of human health and the environment as Alternative GW-B but further facilitates attainment of groundwater concentrations consistent with Remedial Goals over time by allowing a more detailed characterization of natural attenuation processes occurring during the remedial process. Additional data collection and evaluation could allow for adjustments to the system.

7.4.3.3 Compliance with ARARs

Consistent with Alternative GW-B, this alternative will comply with ARARs as identified on Table 7-2.

7.4.3.4 Short-Term Effectiveness

Similar to Alternative GW-B, the activities associated with this alternative would result in manageable short-term impacts due to limited construction activities. However, prior to implementing this alternative, a PDI must be completed and access must be obtained from Norfolk Southern to run conveyance piping beneath its railroad tracks. These activities could require up to six months to complete. No additional short-term impacts are anticipated, beyond those identified for Alternative GW-B as a result of the inclusion of MNA.

7.4.3.5 Long-Term Effectiveness and Permanence

The same level of long-term effectiveness and permanence is provided by this alternative as for Alternative GW-B, except this alternative facilitates continual assessment and verification of groundwater natural attenuation processes.

7.4.3.6 Reduction of Toxicity, Mobility, and Volume through Treatment

The reduction of toxicity, mobility, and volume of contaminants is the same as that identified for Alternative GW-B, except in this alternative an additional level of monitoring and verification is provided by MNA.

7.4.3.7 Implementability

All remedial components provided in this alternative are easily implemented as they utilize well-established practices and the services and material required are standard within the industry and are readily available. The long-term O&M requirements for all remedial components provided by this alternative can be readily performed, and the personnel, equipment, and spare parts are expected to be readily available.

7.4.3.8 Cost

A cost estimate for Alternative GW-C is shown in Tables 7-4, 7-4E, and 7-4F. The estimated capital cost (without contingencies) is $265,000, and additional O&M costs for these elements are estimated

at $76,000 per year. The total present worth cost for this alternative, including 30 years of O&M and contingencies, is approximately $3,369,000.

7.4.4 Alternative GW-D – Additional Institutional Controls and Groundwater Treatment using Funnel and Gate ZVI Walls

7.4.4.1 Description of Alternative

Alternative GW-D includes groundwater treatment using ZVI. In addition, enhanced institutional and engineering controls are included in this alternative. The locations of proposed components for remedial Alternative GW-D are shown on Figure 7-15.

The groundwater component of this alternative includes continued operation of the existing Groundwater Corrective Action System and in-situ treatment of groundwater. The existing Groundwater Corrective Action System will operate as described in Section 3.3.1. Two in-situ treatment units will be installed as shown on Figure 7-15, one near OW-21A and the other near OW-10. Each of these units will be constructed using "funnel and gate" technology, as shown on Figure 7-16. The funnel will consist of slurry walls constructed of a bentonite/soil mix and extended to approximately 45 feet bgs to act as local impermeable barriers to groundwater flow. The slurry walls will be constructed using standard construction techniques (i.e., extending a trench to the necessary depth and length with simultaneous injection of bentonite slurry). Groundwater flow is diverted along the wall to the gate system, or in-situ treatment area.

The horizontal hydraulic conductivity in soil such as the upper residuum is typically one to two orders of magnitude greater than the vertical hydraulic conductivity, as shown in the permeability data for the upper residuum presented and summarized in the RI Report. Consequently, any hydraulic head build-up is likely to be dissipated horizontally, rather than vertically. Any downward gradients will be substantially reduced by the presence of the highly permeable gate described below. This high permeability zone (gate) will act as a "sink" for groundwater, and will dissipate any increased hydraulic heads, which might build up along the upgradient side of the wall, thereby eliminating the need to key the wall into the bedrock.

The gate is essentially a permeable wall constructed of a ZVI mix. The treatment area will be constructed using similar techniques as the slurry wall portion of the system (i.e., a backhoe or crane operated clam-shell bucket will be used to excavate a trench into which a mixture of ZVI and sand will be placed). ZVI is an effective reductant that can treat many contaminants, and is particularly

effective for chlorinated solvents, PCBs, pesticides, and dioxins. These compounds are completely reduced to non-toxic compounds such as ethane and carbon dioxide. In addition, ZVI is potentially effective in the treatment of certain metals, including cadmium, cobalt, nickel, lead, copper, mercury and chromium. As groundwater passes through the permeable treatment area, COCs are treated resulting in reduced groundwater concentrations downgradient from the treatment area.

Treatment of all groundwater COCs using ZVI is not fully proven at this time; therefore, a series of bench scale studies will be performed during a PDI to establish the efficacy of ZVI on all groundwater COCs. Once a demonstration has been made of which COCs are treated using ZVI, a secondary treatment option will be established for the remaining COCs. Secondary treatment could include other in-situ treatment methods within the wall or immediately downgradient of the wall. One potential secondary treatment might be the use of iron sulfide to fixate the mercury in-situ. Other options for secondary treatment include extraction of the treated groundwater and ex-situ treatment and reinjection or off-Site disposal. For costing purposes, it has been assumed that secondary treatment will consist of groundwater extraction beyond the ZVI wall and discharge to the Anniston POTW. Institutional controls including extension of the deed restriction prohibiting groundwater use to include the North Side and East Side Properties (in the vicinity of monitoring well OW-21A and OW-10) and establishing an environmental covenant is included in this alternative.

7.4.4.2 Overall Protection of Human Health and the Environment

This alternative will provide both short-term and long-term protection of human health and the environment as a result of the following:

- Through continued operation of the Groundwater Corrective Action System, partial perimeter control of groundwater impacts is maintained. Areas outside of the capture zone of the existing Groundwater Corrective Action System will be treated using in-situ treatment with secondary treatment further reducing risks to off-Site receptors from direct contact with or ingestion of COCs in groundwater at concentrations above the Remedial Goals. Migration of pollutants beyond the existing limits of the known contaminant plume will be prevented by in-situ treatment of groundwater and by secondary treatment. Within the Facility, deed restrictions and groundwater covenants will prohibit residential development and use of groundwater, preventing exposure to COCs in groundwater. O&M will be consistent with the existing groundwater monitoring program, as described in Section 3.3, and will be used to verify the effectiveness of the groundwater corrective action system; and
- All remedial components included in this alternative in combination are intended to prevent future releases of contaminants.

- Over time, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

7.4.4.3 Compliance with ARARs

This alternative will comply with the action-specific ARARs as identified on Table 7-2, and the chemical-specific ARARs beyond the point of compliance. By installing a ZVI funnel and gate system with the existing Groundwater Corrective Action System, groundwater exceeding the Remedial Goals will be captured and treated. Within the Facility, a deed restriction and environmental covenant will be in place prohibiting the use of groundwater. Additionally, it is expected that groundwater concentrations in the interior of the Facility will be reduced as a result of these measures and measures that will be employed to address constituents in soil.

7.4.4.4 Short-Term Effectiveness

Construction of all the remedial components included in this alternative will take approximately three months, and work will likely be completed during normal construction hours (e.g., during daylight), thus the short-term impacts due to construction are manageable. However, prior to implementing this alternative, a PDI must be completed and access must be obtained from Norfolk Southern to install the system adjacent to the railroad tracks. These activities could require up to 12 months to complete. Minimal disturbances to existing plant operations are anticipated.

7.4.4.5 Long-Term Effectiveness and Permanence

Treatment of groundwater using ZVI alone may not fully treat all of the groundwater contaminants and secondary treatment will likely be necessary. In the event that an effective in-situ secondary treatment is not identified, it is likely that the secondary treatment will be in the form of groundwater extraction and above-ground treatment. In this case, the use of this groundwater treatment technology does not offer any additional advantages over traditional extraction. Over a 30 year O&M period, it is likely that the ZVI wall will need to be replaced once. Operation, monitoring, and maintenance will be regularly conducted to provide continued long-term effectiveness of the remedy. Operation, monitoring, and maintenance of the groundwater treatment component will include replacement of iron as needed. The remedial techniques in this alternative will likely require specialized personnel and equipment.

7.4.4.6 Reduction of Toxicity, Mobility, and Volume through Treatment

Recovery and off-Site treatment of groundwater using the existing Groundwater Corrective Action System will continue to reduce the toxicity, mobility, and volume of contaminants in groundwater. However, the in-situ treatment component of the groundwater remedy may not achieve all required reductions in toxicity without secondary treatment.

7.4.4.7 Implementability

In regards to the groundwater in-situ treatment component, specialized equipment and personnel are required. Additionally, treatability studies and design of the funnel and gate approach is required. Secondary treatment may be required for certain COCs depending on the effluent concentrations from the system. Over a 30 year O&M period, it is likely that the ZVI wall will need to be replaced once. Operation, monitoring, and maintenance of the groundwater treatment component will include replacement of iron as needed.

7.4.4.8 Cost

A cost estimate for Alternative GW-D is shown in Tables 7-4, 7-4G, and 7-4H. The estimated capital cost (without contingencies) is $5,807,000, and additional O&M costs for these elements are estimated at $166,000 per year[13]. The total present worth cost for this alternative, including 30 years of O&M, with contingencies, is approximately $13,450,000. The driving costs associated with this alternative include construction of an impermeable wall and mobilization/demobilization of equipment.

[13] Annual O&M costs will likely be lower; however, costs for replacement of the in-situ treatment wall were averaged annually over 30 years.

8.0 COMPARATIVE EVALUATION OF ALTERNATIVES

The comparative analysis of alternatives evaluates the relative performance of the various alternatives against each other in relation to the seven threshold and balancing NCP evaluation criteria. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another.

The NCP and the EPA CERCLA reforms require that a remedial action selected for a site be cost effective provided that it first satisfies the two threshold criteria. Cost-effectiveness is determined by evaluating the following three of the five balancing criteria to determine overall effectiveness: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. A remedy shall be cost-effective if its costs are proportional to its overall effectiveness.

8.1 Soil Remedial Alternatives

The retained remedial alternatives for soil are the following:

Alternative	Description of Alternative
S-A	No Action
S-B	Additional Institutional and Engineering Controls, Soil Excavation with off-Site Disposal
S-C	Additional Institutional and Engineering Controls, Soil Containment (Capping)
S-D	Additional Institutional and Engineering Controls, Soil Excavation with Treatment Using on-Site Chemical Dehalogenation
S-E	Additional Institutional and Engineering Controls, Soil Excavation with on-Site Thermal Desorption

8.1.1 Overall Protection of Human Health and the Environment

Under the current and future scenarios, all retained alternatives, except Alternative S-A, No Action, provide protection of human health and the environment. However, there are varying degrees to which the alternatives provide such protection. For soil, the combination of either excavation of soil or containment of soil and enhanced institutional and engineering controls, Alternatives S-B and S-C, respectively, are equally protective of human health and the environment. The degree of protection provided by Alternatives S-D and S-E are considered to be lower than Alternatives S-B and S-C due

to the short-term impacts anticipated during treatment and long-term uncertainties regarding feasibility.

8.1.2 Compliance with ARARs

With the exception of Alternative S-A, No Action, all other alternatives are expected to achieve compliance with chemical-specific and action-specific ARARs. Alternatives S-D and S-E, which include treatment of soil via chemical dehalogenation and thermal desorption, respectively, will require extensive design, pilot studies, and air monitoring in order to achieve the action and chemical-specific ARARs associated with air emissions.

8.1.3 Short-term Effectiveness

Alternative S-A will result in the least short-term adverse impacts. Alternative S-C is anticipated to have a similar degree of minimal short-term impacts. Alternative S-B will have some additional short-term impacts due to the hauling activities associated with off-Site disposal of soil. Alternatives S-D and S-E are both anticipated to have a high potential for short-term impacts compared to the other alternatives due to the soil treatment components of these alternatives. Both of these alternatives require on-Site treatment of impacted soil using systems that will be in operation 24 hours a day throughout treatment. As a result, there is the continued potential for noise, light, and air emissions to the plant workers and surrounding communities. In addition, the fuel and power demands, staging areas, and health and safety requirements have the potential to cause disturbances to the existing plant operations. Particular attention would be required for air monitoring during treatment activities to provide protection for the construction worker, plant worker, and local community.

8.1.4 Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of Alternative S-B is expected to be higher than Alternatives S-D and S-E, which are slightly higher than Alternative S-C. S-D and S-E are ranked slightly higher than S-C due to the residuals remaining on site with capping. Alternative S-B includes effective and proven remedial components (excavation with off-Site disposal).

8.1.5 Reduction of Toxicity, Mobility, and Volume through Treatment

The reduction of toxicity, mobility, and volume through treatment is highest for alternatives that treat impacted soil. Alternatives S-D and S-E treat impacted soil via chemical dehalogenation and thermal

desorption, respectively. Pilot studies for both of these technologies have shown reductions in the concentration of PCBs in treated soil. Both of these processes, however, produce a significant amount of residual products that require treatment or off-Site disposal. In addition, reuse of the treated soil on the Site is not always appropriate due to the change in physical characteristics of the materials. Alternatives S-D and S-E are ranked higher for reducing the toxicity, mobility, and volume of impacted soil through treatment than those alternatives which have either a containment or excavation with off-Site disposal component for impacted soils.

8.1.6 Implementability

In general, all five alternatives are implementable but to differing degrees. Alternative S-A is the easiest to implement, followed by Alternatives S-C and then S-B. Alternatives S-D and S-E are equally difficult to implement.

8.1.7 Cost

As shown on Table 7-3, the sequence of alternatives, in order of least to most costly, is as follows: Alternative S-A, Alternative S-C, Alternatives S-E and S-B, and Alternative S-D.

8.2 Groundwater Remedial Alternatives

The retained remedial alternatives for groundwater are the following:

Alternative	Description of Alternative
GW-A	No Action
GW-B	Additional Institutional Controls and Expanded Groundwater Extraction
GW-C	Additional Institutional Controls, Expanded Groundwater Extraction and MNA
GW-D	Additional Institutional Controls and Groundwater Treatment using Funnel and Gate ZVI Walls

8.2.1 Overall Protection of Human Health and the Environment

Under the current and future scenarios, all retained alternatives, except Alternative GW-A, No Action, provide protection of human health and the environment relating to groundwater. Alternative GW-B, expanded groundwater extraction, is protective of human health and the environment. However, Alternative GW-C offers an additional component of MNA, which allows for continuous

monitoring of the long-term effectiveness of the groundwater component of this alternative and associated natural attenuation processes. This additional data collection would allow for adjustments in the system to enhance natural attenuation. The degree of protection provided by Alternative GW-D is considered to be lower than Alternatives GW-B and GW-C due to its potential to be less effective at successfully treating groundwater; short-term impacts anticipated during treatment; and long-term uncertainties regarding feasibility.

8.2.2 Compliance with ARARs

With the exception of Alternative GW-A, No Action, all other alternatives are expected to achieve compliance with chemical-specific and action-specific ARARs. Alternatives GW-B, GW-C, and GW-D, include a monitoring component that can be used to demonstrate long-term compliance with groundwater ARARs. Additional MNA monitoring is included in Alternative GW-C, which would allow for adjustments to be made in the system that may accelerate the attainment of chemical-specific ARARs. Alternative GW-D, which includes treatment of groundwater through ZVI will require extensive design, pilot studies, and monitoring in order to achieve the chemical and action-specific ARARs.

8.2.3 Short-term Effectiveness

Alternative GW-A will not add additional short-term adverse impacts. Similarly, Alternatives GW-B and GW-C are anticipated to result in minimal, if any, short-term impacts. Alternative GW-D is anticipated to have a higher potential for short-term impacts compared to the other alternatives due to the installation of the ZVI system.

8.2.4 Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of Alternatives GW-B and GW-C is expected to be higher than Alternative GW-D, which has implementability concerns that could potentially reduce its long-term effectiveness and permanence. Alternatives GW-B and GW-C include a highly effective and proven remedial component (groundwater extraction). Alternative GW-C provides an additional degree of effectiveness, compared to Alternative GW-B, through the use of monitoring to continuously evaluate the long-term effectiveness of the remediation and associated natural attenuation processes.

Alternative GW-B and GW-C will likely be more effective and permanent than Alternative GW-D due to the potential difficulties associated with the installation and long-term performance of the ZVI.

8.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives GW-B and GW-C will reduce the toxicity, mobility, and volume of groundwater impacts through extraction and on-Site treatment, followed by additional off-Site treatment at the POTW. Alternative GW-C provides an additional monitoring component, which will continuously evaluate the natural degradation of groundwater constituents. Alternative GW-D provides for in-situ treatment of groundwater, which is intended to reduce the toxicity of groundwater. However, due to the potential effectiveness concerns with this technology, this alternative is ranked lower than the others in regards to groundwater treatment.

Considering each alternative individually, Alternatives GW-B and GW-C are considered to offer the highest reductions in toxicity, mobility, and volume, followed by Alternative GW-D, then GW-A.

8.2.6 Implementability

In general, all four alternatives are implementable but to differing degrees. Alternative GW-A is the easiest to implement, followed by Alternatives GW-B and GW-C. Alternative GW-D is the most difficult to implement.

8.2.7 Cost

As shown on Table 7-4, the sequence of alternatives, in order of least to most costly, is as follows: Alternative GW-A, Alternative GW-B, Alternative GW-C, and Alternative GW-D.

8.3 Summary

Tables 8-1A and 8-1B provide a summary of the relative rankings of the retained remedial alternatives for soil and groundwater using each of the seven NCP criteria. Alternatives assigned a rank of "Most Favorable" were considered the most preferred in the associated category (i.e., least cost, most effective, most easily implemented, etc.). As shown on Table 8-1A, the soil remedial alternatives were ranked in the following order from most to least favorable: Alternative S-C, Alternative S-B, Alternative S-E, Alternative S-D, and Alternative S-A. Additionally, as shown on Table 8-1B, the groundwater remedial alternatives were ranked in the following order from most to least favorable: Alternative GW-C, Alternative GW-B, Alternative GW-D, and Alternative GW-A.

9.0 REFERENCES

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TABLES

TABLE 2-1
SUMMARY OF HUMAN HEALTH RISK ASSESSMENT RESULTS
RME, CTE AND MODIFIED EXPOSURES

Area	Receptor	Cancer Risk			Noncancer Hazard Index (HI)		
		RME	CTE	Modified	RME	CTE	Modified
Current/Future Land Use							
South Landfill	O&M Worker	$3x10^{-6}$	$1x10^{-7}$	$4x10^{-7}$	0.2	0.04	0.02
	Trespasser - Adolescent (7-16 years)	$2x10^{-6}$	$1x10^{-7}$	$6x10^{-7}$	0.3	0.04	0.1
West End Landfill	O&M Worker	$1x10^{-8}$	$3x10^{-9}$	$3x10^{-8}$	NA	NA	NA
	Trespasser - Adolescent (7-16 years)	$7x10^{-9}$	$7x10^{-10}$	$8x10^{-9}$	NA	NA	NA
Facility Area	Construction Worker	$1x10^{-4}$	$3x10^{-5}$	$8x10^{-5}$	250	90	124
Current Land Use							
Facility Area	Operation Area Worker	$2x10^{-4}$	$4x10^{-5}$	NA	8	3	NA
	O&M Worker	$1x10^{-4}$	$8x10^{-6}$	$2x10^{-5}$	5	1	1
	Trespasser - Adolescent (7-16 years)	$8x10^{-5}$	$1x10^{-5}$	$4x10^{-5}$	8	1	3
Site Wide	Off-Site Resident - Child to Adult (Lifetime Resident)	$2x10^{-6}$	NA	NA	NA	NA	NA
	Off-Site Resident - Child (0-6 yrs)	$1x10^{-6}$	NA	NA	NA	NA	NA
Future Land Use							
Facility Area	Operation Area Worker	$6x10^{-3}$	$1x10^{-3}$	NA	416	364	NA
	O&M Worker	$1x10^{-3}$	$6x10^{-5}$	$2x10^{-4}$	79	20	11
	Trespasser - Adolescent (7-16 years)	$7x10^{-4}$	$6x10^{-5}$	$3x10^{-4}$	124	20	48
Site Wide	Off-Site Resident - Child to Adult (Lifetime Resident)	$4x10^{-1}$	NA	NA	30445	NA	NA
	Off-Site Resident - Child (0-6 yrs)	$2x10^{-1}$	NA	NA	46553	NA	NA
	Operation Area Worker	$2x10^{-2}$	$3x10^{-3}$	NA	1212	432	NA
	O&M Worker	$2x10^{-3}$	$2x10^{-4}$	NA	116	66	NA

Notes:

CTE - Central Tendency Exposures (USEPA, 2000); NA - Not Analyzed; O&M - Operations and Maintenance;
RME - Reasonable Maximum Exposures (USEPA, 2000);

TABLE 3-1
SUMMARY OF RCRA FINAL CLOSURES AND INTERIM CORRECTIVE MEASURES

RCRA Area Type	RCRA Area ID	Area Description / Site Designation	Description of Interim Corrective Measures (ICMs)	Dimensions (if Applicable)
SWMU	1	South Landfill (unregulated cells) Note - Regulated Cells are designated WMA-I	• Portions covered with multi-layer cap and drainage controls over waste; clay and vegetated cap around disposal area, soil stabilization measures to control erosion (1997-1998) • Cap portions over waste, from top: vegetative cover; 6 inches of topsoil; minimum of 18 inches of cover soil; geocomposite drainage layer anchored along the entire perimeter 3-sides (west, north, and east) of which contain a toe drain consisting of a 4-inch corrugated, slotted HDPE pipe surrounded by a filter sock and sand bedding, with 4-inch solid pipe toe drain outlets installed every 200 feet that daylight outside the limits of the cover system; 40-mil High Density Polyethylene (HDPE) textured geomembrane, 6-inches of foundation soil, waste • Cap portions around disposal area, from top: vegetative cover, either a geotextile with 12 inches of compacted soil or varying thicknesses of clay, former soil surface • Drainage controls - construction of South Diversion Berm, and associated channels and hard piping to transfer water around South Landfill to DSN-012 • In the late 1970s (approximately 1978), waste material from Cell 1W was excavated and relocated to the RCRA-regulated cell, 4E.	21.6 Acres
SWMU	2	Landfill Catchment Basins (south landfill)	• Located immediately downgradient of Cells 3E, 4E, and 5E • Part of WMA-I Closure: clay cover and seeding when landfill cells closed	
WMA	I	WMA-I - South Landfill (regulated cells 4E/5E)	• Multi-Layer Cap (and drainage controls) • Cap, from top to bottom: vegetative cover, 24-inches of topsoil, geotextile fabric, 12-inch sand drainage layer, 24-inch compacted clay base, waste • Drainage control includes diversion of storm water run-off from unaffected upgradient areas, allowing closure of ditches in areas of potentially affected soils • Collection of runoff from South Landfill (SWMU-1 and WMA-1), hard piped to ~6.2 Acre detention pond in East Side Area then discharged to DSN-012 • Soil stabilization measures to control erosion	4.41 Acres
SWMU	4	Leachate Storage Tank	• Unit previously located on western edge of South landfill • 1000 gallon steel tank mounted in steel frame above concrete pad, previously pumped leachate from Cell 5E, and then received water from the Western Landfill Groundwater Extraction System • Removed 1996	1000 gallon steel tank in steel frame over concrete pad
SWMU	6	Phosphate Landfill	• Gravel cover (2 to 8 inches thick) early 1980s	~150' x 170'
SWMU	7	Santotar® Pit	• Removal - remaining solidified Santotar® removed from the pits (12 to 16 feet below grade), and pits backfilled with clay in 1989, currently under gravel cover (7 to 12 inches thick)	1.1 Acres

Notes:
1 The term “Decommission” means the removal of above-grade facilities and connections to underground sewer and process lines.
2 The term “Removal” means the excavation of soils and underground structures (including process lines and sewers).

TABLE 3-1
SUMMARY OF RCRA FINAL CLOSURES AND INTERIM CORRECTIVE MEASURES

RCRA Area Type	RCRA Area ID	Area Description / Site Designation	Description of Interim Corrective Measures (ICMs)	Dimensions (if Applicable)
SWMU	8	Old Limestone Bed Surface Impoundment (OLBSI)	• Removal (min 3 feet below old liner) / clay backfill to surface / asphalt cover (end of 1984) • Closed as landfill with ADEM approved closure + post closure monitoring plan (in 1984 - 1985) • Portion of surface concrete • Groundwater corrective action system in place, see details below	0.14 Acres
SWMU	9	Former Lagoon	• Removal (several feet below grade) / clay / gravel cover (< 2") (1965) • Corrective action system in place, see details below.	0.53 Acres
WMA	II	WMA-II - New Limestone Bed	• Removal (12 feet below grade) / soil backfill / seed • Fenced in area with warning signage • Groundwater corrective action system in place, see details below	0.2 Acres
SWMU	12	Phosphoric Acid Basin (South Basin)	• Removal / clay / seed then asphalt cover - under extension of employee parking lot (1994) • Removal - clean fill clay placed 10 to 12 ft-bgs, then seeded • Cover - asphalt cover (employee parking lot - 2")	0.24 Acres
SWMU	12	Phosphoric Acid Basin (North Basin)	• Decommission / backfill / seed (1980s) • Horizontal and vertical delineation and removal of impacted soil at SSRI-11 (2010)	0.11 Acres
SWMU	13	Closed Container Storage Area	• Unit was located on southwest corner of ACL warehouse • Closed with ADEM approved closure plan in 1989 (steam clean, decon, wipe test, submit data)	4" epoxy coated concrete pad
SWMU	14	Hazardous Materials Storage Area	• Unit located east of Benzene Satellite Accumulation Area in SE portion of facility, consisting of a 10'x10'x8' metal building on a concrete pad (capacity of 660 gallons, secondary containment of 190 gallons).	10'x10'x8' steel building on concrete pad
SWMU	15	Spent Nickel Catalyst Storage Area	• Unit located north of the Therminol Production Area in center of facility. • 20'x20' concrete pad surrounded by 3' concrete wall on two sides, stores 55-gallon drums on pallets.	20'x20' concrete 3' wall on two sides

Notes:
1 The term “Decommission” means the removal of above-grade facilities and connections to underground sewer and process lines.
2 The term “Removal” means the excavation of soils and underground structures (including process lines and sewers).

TABLE 3-1
SUMMARY OF RCRA FINAL CLOSURES AND INTERIM CORRECTIVE MEASURES

RCRA Area Type	RCRA Area ID	Area Description / Site Designation	Description of Interim Corrective Measures (ICMs)	Dimensions (if Applicable)
SWMU	16	Laboratory Satellite Accumulation Area	• Previously 5-gallon red plastic jugs labeled hazardous waste in each lab room. • Now, waste lab solvents are stored in 55-gallon drum maintained outside the laboratory building in special secondary containment bins designed to hold 2 55-gallon drums with an overspill capacity of 55 gallons.	Special secondary containment for 2 55-gallon drums with 55-gallons of secondary containment
SWMU	17	Scrap Yard Waste Oil Satellite Accumulation Area	• Gravel cover • Contains 28'x12' concrete pad with roof and 15'x25' concrete pad with partial roof	~50'x220'
SWMU	21	Former Boiler	• Previously located north of PNP production unit on concrete pad within a steel building • Operated until 1989, consisted of a 181.7 Million British Thermal Unit (MBTU) / hr boiler • Unit and steel building removed, concrete pad remains, replaced by current boiler (SWMU 22) • Unit operated under Alabama Air Pollution Control Commission Permit No. 301-0007-Z0003 from June 1978 through Jan 1989	
SWMU	29	Wastewater Treatment Plant	• Located on the western border of the facility • Consists of: two hold tanks (SWMU 29A), two aeration basins (SWMU 29B), one clarifier (SWMU 29C), one wet well (SWMU 29D), and associated process sewer piping • Demolition in place of the hold tanks, four aeration basins, and three clarifiers; conversion of two aeration basins to hold tanks (1987-1991) • Only used as equilibration and neutralization area since 2004 after end of PNP production, and water is currently discharged through DSN-002 to the Anniston Publicly Owned Treatment Works (POTW) • Discharge to Anniston POTW is permitted under a State Indirect Discharge Permit	
SWMU	37A	Stormwater Drainage System - Production Area Portion	• Separation of process and stormwater systems 1996 • Sealing of unused collection sewers, installation of sediment control measures at stormwater inlets, and lining of the main stormwater trunk line (~ 1400 LF) with a polyurethane Cure-Line liner system in 1997 to reduce sediment transport, infiltration, and leakage • Additional stormwater sewer repairs and upgrades in 2006/2007	
SWMU	41	Former Parathion Production Area	• End of production in 1986 • Removal - potentially affected soil up to 20 feet bgs and associated process sewer piping • Backfill with soil / gravel cover (1 - 2" thick)	460'x85'

Notes:
1 The term “Decommission” means the removal of above-grade facilities and connections to underground sewer and process lines.
2 The term “Removal” means the excavation of soils and underground structures (including process lines and sewers).

TABLE 3-1
SUMMARY OF RCRA FINAL CLOSURES AND INTERIM CORRECTIVE MEASURES

RCRA Area Type	RCRA Area ID	Area Description / Site Designation	Description of Interim Corrective Measures (ICMs)	Dimensions (if Applicable)
SWMU	42	Former PCB Production Area	• Decommission / concrete / asphalt cap (1972) • Supplemental asphalt cover - (additional 1 -2" thickness in 1993/1994)	Asphalt cap 180'x100'
SWMU	43	Former Phosphorous Pentasulphide Production Area	• Decommission (1988) • Removal of potentially affected soils (most along drainage ditch - 6' - 8' on N to < 1' on S) • Maintenance of concrete-gravel cover (existing slab left in place, gravel down to 1 - 2" thick)	551'x205'
SWMU	44	Waste Drum Satellite Accumulation Area	• Partial removal / concrete backfill in former pit and area (near soil sample location SSR-18) of 2 conical sumps to 6' - 8' deep / 4-inch thick Concrete Cover over surrounding area (2002)	Previously 19'x16' concrete pit with 4" curbing containment
SWMU	46	Former Hold Tanks, Aeration Basins and Clarifiers	• Units cleaned, demolished (basin walls pushed down) and landfilled in place (1987-1988) • Soil backfill to grade / gravel cover (1-2 " thick)	330'x160'
SWMU	47	West End Landfill	• Multi-layer cap and drainage controls (1996) • Cap, from top to bottom: vegetative layer, 18-inch soil cover, geosynthetic drainage layer of continuous nonwoven geotextile with 1'x1" geosynthetic wick drains placed every 50 feet daylighting into a ditch near the toe of the western and northern slopes of the covered area, 60-mil textured HDPE geomembrane, 6-inch compacted clay foundation layer, waste • Surrounding area cap, from bottom up, consists of: former soil surface, cover soil, vegetation • Drainage control included collection of storm water run-off and installation of hard piping to replace ditches for run-off through areas of affected soils	8.93 Acres
SWMU	MCC Ware-house	MCC Warehouse	• Replacement of lower 12 feet of siding panels along entire south and portions of east and west sidewall, plus additional 20 feet from the east wall north of the loading dock • Decontamination and paint encapsulation of a 5-foot strip of the concrete floor surface along the entire inside perimeter • Decontamination and paint encapsulation of the exterior concrete foundation walls adjacent to replaced siding and two concrete drainage ditches along the exterior of the south and east walls. • Replacement of southern 1/4 of roof panels • Concrete ditches (40-LF on E sidewall, 100-LF on south sidewall, 12" wide by 8" deep, cleaned and coated with epoxy • Asphalt capping of a rail spur adjacent to the west wall (6 to 12 inches of dense graded aggregate topped by 2 inches of asphalt)	~120'x300'

Notes:
1 The term “Decommission” means the removal of above-grade facilities and connections to underground sewer and process lines.
2 The term “Removal” means the excavation of soils and underground structures (including process lines and sewers).

TABLE 3-1
SUMMARY OF RCRA FINAL CLOSURES AND INTERIM CORRECTIVE MEASURES

RCRA Area Type	RCRA Area ID	Area Description / Site Designation	Description of Interim Corrective Measures (ICMs)	Dimensions (if Applicable)
AOC	A	AOC-A - Product Storage Tank	• Located in central portion of facility to the east of SWMU 15 • Consists of 11,000-gallon Santowax product tank located within a 4-foot high concrete secondary containment wall • Removal of stained gravel, upgrade of spill containment to concrete floor, backup secondary level control circuits (1991/1992)	10' diameter 15,600 gallon tank with 30'x27'x2.5' concrete secondary containment
AOC	C	AOC-C - Product Underground Storage Tanks	• Removal of 4 tanks (mid to late 1980s)	
SUMMARY OF CORRECTIVE ACTION SYSTEMS				
SWMU WMA	1 I	South Landfill Corrective Action System	Western Landfill Groundwater Extraction System • Installation and operation of 4 interceptor wells (IW-1, IW-2, IW-3, and IW-4) in 1983 • Monitoring and observation wells (OW-02 and OW-04) • IW-1, IW-3, and IW-4 turned off in 1998 per RCRA Permit	
SWMU WMA	1 I	South Landfill Corrective Action System	Northern Landfill Groundwater Extraction System 1982-1983 (IW-5 & IW-6) 1987-1988 (other IWs) • Installation and operation of 9 interceptor wells (IW-5, IW-6, IW-7, IW-8, IW-9, IW-10, IW-11, IW-12, and IW-13) • Monitoring and observation wells (MW-1B, OW-6A, OW-7, OW-15, and OW-16A) • IW-10 has been pre-treated by pumping through a carbon filter drum	
SWMU WMA	1 I	South Landfill Corrective Action System	Plant Site Groundwater Extraction System • Installation and operation of 2 interceptor wells (IW-14 and IW-15) (1987-1988) • Monitoring and observation well (OW-08A) • Currently only IW-14 in operation (IW-15 turned off as per RCRA Permit) • IW-14 replaced with IW-14A 200 feet to north (downgradient of OW-8 & OW-8A on Feb 2003)	
SWMU WMA	8 II	WMA II Corrective Action System	Old Limestone Bed Surface Impoundment Groundwater Extraction System • Installation and operation of 6 interceptor wells (IW-16, IW-17, IW-18, IW-19, IW-20, and IW-21 in 1988; addition of DW-1 in 1997; addition of IW-22, IW-23, IW-34, IW-25 in Jan-Feb 2003) • Monitoring and observation wells (MW-1B, MW-8, MW-9R, MW-15, MW-16, MW-20A, OW-19, OW-21, OW-22, OW-24, and SBP-5)	

Notes:
1 The term “Decommission” means the removal of above-grade facilities and connections to underground sewer and process lines.
2 The term “Removal” means the excavation of soils and underground structures (including process lines and sewers).

TABLE 4-5
POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs

Action / Medium	Requirements	Prerequisite	Citation
Restoration of groundwater to its beneficial uses	May not exceed MCLs for organics and inorganics established under the Safe Drinking Water Act National Revised Primary Drinking Water Regulations for community water systems.	Presence of contaminants in groundwater of the State designated as potential underground sources of drinking water as defined in ADEM Admin. Code. r. 335-6-8-.03 – **relevant and appropriate**	40 C.F.R. § 141.61(a) and (c)
			40 C.F.R. § 141.62(b)
			ADEM Admin. Code r. 335-7-2-.03(1)
			ADEM Admin. Code r. 335-7-2-.04(1)
			ADEM Admin. Code r. 335-7-2-.05(1)
Cleanup of PCB contaminated soil at sites in industrial areas	Recommends cleanup levels should be established within a range of 10 to 25ppm PCB.	CERCLA site with PCB contamination in soil requiring response action – **To Be Considered (TBC)**	U.S. EPA *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* [EPA/540/G-90/007]
	Recommends treatment, where practicable, for principle threat wastes (i.e., soils contaminated with PCBs greater than or equal to 500ppm).		

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
General Construction Standards – All Land Disturbing Activities			
Activities causing stormwater runoff (e.g., clearing, grading, excavation)	Shall fully implement and regularly maintain effective best management practices (BMPs) to the maximum extent practicable, and in accordance with the operator's Construction Best Management Practices Plan (CBMPP).	All new and existing construction activities as defined in ADEM Admin. Code r. 335-6-12-.02(e) disturbing one (1) acre or more in size - **applicable**	ADEM Admin. Code r. 335-6-12-.05(2)
	Appropriate, effective pollution abatement/prevention facilities, structural and nonstructural BMPs, and management strategies shall be fully implemented prior to and concurrent with commencement of the regulated activities and regularly maintained during construction as needed at the site to meet or exceed the requirements of this chapter until construction is complete, effective reclamation and/or stormwater quality remediation is achieved.		
	The operator shall take all reasonable steps to prevent and/or minimize, to the maximum extent practicable, any discharge in violation of this chapter or which has a reasonable likelihood of adversely affecting the quality of groundwater or surface water receiving the discharge(s).		ADEM Admin. Code r. 335-6-12-.06(4)
	Implement a comprehensive CBMPP appropriate for site conditions consistent with the substantive requirements of ADEM Admin. Code r. 335-6-12-.21 that has been prepared and certified by a Qualified Credentialed Professional (QCP).		ADEM Admin. Code r. 335-6-12-.21(2)(a)
	The CBMPP shall include a description of appropriate, effective water quality BMPs to be implemented at the site as needed to ensure compliance with this chapter and include but not limited to the measures provided in subsections 1. thru 14.		ADEM Admin. Code r. 335-6-12-.21(2)(b)
	BMPs shall be designed, implemented, and regularly maintained to provide effective treatment of discharges of pollutants in stormwater resulting from runoff generated by probable storm events expected/predicted during construction disturbance based on historic precipitation information, and during extended periods of adverse weather and seasonal conditions.		ADEM Admin. Code r. 335-6-12-.21(4)
Activities causing fugitive dust emissions	Shall not cause, suffer, allow or permit any materials to be handled, transported, or stored; or a building, its appurtenances, or a road to be used . . . without taking reasonable precautions to prevent particulate matter from becoming airborne.	Fugitive emissions from construction operations, grading, or the clearing of land – **TBC**	ADEM Admin. Code r. 335-3-4-.02(1)[1]
	Shall not cause or permit the discharge of visible fugitive dust emissions beyond the lot line of the property on which the emissions originate.		ADEM Admin. Code r. 335-3-4-.02(2)[2]
Groundwater Monitoring/Extraction Well Installation, Operation, and Abandonment			
Construction of extraction and monitoring wells	All materials used in the construction of a water well shall have the structural strength to accomplish the purpose for which they are installed.	Installation of wells as defined in ADEM Admin. Code r. 335-9-1-.02(g) – **relevant and appropriate**	ADEM Admin. Code r. 335-9-1-.05(a)- (c)
	Must meet any relevant substantive requirements under ADEM Admin. Code r. 335-9-1.-.05 Materials and Admin. Code r. 335-9-1.-.06 Construction Standards related to casings, liners, screens, development and capping of wells.		ADEM Admin. Code r. 335-9-1-.06(a), (b), (c), (d), (e) & (h)
	Any holes remaining after construction or testing attempts shall be properly backfilled.		ADEM Admin. Code r. 335-9-1-.06(h)

TABLE 4-6
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Action	Requirements	Prerequisite	Citation
Construction of monitoring wells	Must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated, and packed with gravel or sand where necessary, to enable sample collection at depths where appropriate aquifer flow zones exist. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth must be sealed with a suitable material (e.g., cement grout or bentonite slurry) to prevent contamination of samples and the groundwater.	Installation of groundwater monitoring wells at a RCRA facility in order to detect any statistically significant amounts of hazardous waste or hazardous waste constituents – **relevant and appropriate**	ADEM Admin. Code r. 335-14-5-.06(8)(c)
	Monitoring wells must be operated and maintained in a manner to prevent soil, surface water, and/or groundwater contamination. This requirement includes the installation of protective barriers around monitoring wells where necessary to prevent damage to the well from traffic or other causes.		
	All monitoring wells must have functional key or combination locks on the wellhead covers to prevent unauthorized access. All monitoring wells must be assigned an identifying number by the facility, and such numbers must be permanently affixed to the outer casing of each monitoring well.		
Abandonment of extraction wells, monitoring wells, and boreholes	Any well to be abandoned shall be permanently sealed in the following manner: The well must be filled with a puddled clay material containing 50 ppm of chlorine to within 20 feet of the top of the well. The top 20 feet shall be filled with cement grout or concrete.	Abandonment of extraction wells, monitoring wells, and boreholes – **relevant and appropriate**	ADEM Admin. Code r. 335-9-1-.06(g)
Activity associated with Class V injection wells (e.g., ZVI injections)	Injection activity cannot allow the movement of fluid containing any contaminant into drinking water, if the presence of that contaminant may cause a violation of the primary drinking water standards under 40 CFR part 141, other health based standards, or may otherwise adversely affect the health of persons.	Construction, operation, maintenance, conversion, plugging, or closure of Class V injection wells associated with remedial activity – **relevant and appropriate**	40 C.F.R. § 144.82(a)(1)
			ADEM Admin. Code r. 335-6-8-.05(1)(d)
Plugging and abandonment of Class V injection wells	Shall close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may otherwise adversely affect the health of persons.	Operation of a Class V injection well – **relevant and appropriate**	40 C.F.R. § 146.10(c)(1)
	Shall dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements.		40 C.F.R. § 146.10(c)(2)
Waste Generation, Characterization, Segregation, and Storage—Primary Wastes (e.g., excavated soils) and Secondary Wastes (e.g., treatment residues)			
Characterization of solid waste (all primary and secondary wastes)	Must determine if solid waste is excluded from regulation under 40 C.F.R. § 261.4(b); and	Generation of solid waste as defined in 40 C.F.R. § 261.2 —**applicable**	40 C.F.R. § 262.11(a)
	Must determine if waste is listed as hazardous waste under subpart D 40 C.F.R. Part 261; or	Generation of solid waste which is not excluded under 40 C.F.R. § 261.4(a) —**applicable**	40 C.F.R.§ 262.11(b)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR part 261by either: (1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or (2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.		40 C.F.R. § 262.11(c)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste – **applicable**	40 C.F.R. § 262.11(d)
Characterization of hazardous waste (all primary and secondary wastes)	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 C.F.R. Parts 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 264.13(a)(1)
Determinations for management of hazardous waste	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 CFR 268 et seq. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)
	Must determine the underlying hazardous constituents [as defined in 40 C.F.R. § 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)
	Must determine if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. Note: This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.		40 C.F.R. § 268.7(a)
Temporary on-site storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. § 260.10 – **applicable**	40 C.F.R. § 262.34(a)
	· Waste is placed in containers that comply with 40 C.F.R. §§ 265.171-173; and		40 C.F.R. § 262.34(a)(1)(i)
	· The date upon which accumulation begins is clearly marked and visible for inspection on each container; and		40 C.F.R. § 262.34(a)(2)
	· Container is marked with the words “hazardous waste”; or		40 C.F.R. § 264.34(a)(3)
	· Container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation – **applicable**	40 C.F.R. § 262.34(c)(1)
Use and management of hazardous waste in containers	If container is not in good condition (e.g., severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers – **applicable**	40 C.F.R. § 265.171
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 C.F.R. § 265.172
	Keep containers closed during storage, except to add/remove waste.		40 C.F.R. § 265.173(a)
	Open, handle, and store containers in a manner that will not cause containers to rupture or leak.		40 C.F.R. § 265.173(b)
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 C.F.R. § 264.175(b).	Storage of RCRA hazardous waste in containers with free liquids – **applicable**	40 C.F.R. § 264.175(a)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that do not contain free liquids (other than F020, F021, F022, F023, F026 and F027) –**applicable**	40 C.F.R. § 264.175(c)
Temporary on-site storage of remediation waste in staging piles (e.g., excavated soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated.	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 C.F.R. § 260.10 –**applicable**	40 C.F.R. § 264.554(a)(1)
	May be temporarily stored, (including mixing, sizing, blending or other similar physical operations intended to prepare the wastes for subsequent management or treatment) at a facility if used only during remedial operations provided that the staging pile:		40 C.F.R. § 264.554(a)(1)
	· Must facilitate a reliable, effective and protective remedy;		40 C.F.R. § 264.554(d)(1)(i)
	· Must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g., use of liners, covers, run-off/run-on controls); and		40 C.F.R. § 264.554(d)(1)(ii)
	· Must not operate for more than 2 years, except when an operating term extension under 40 CFR 264.554(i) is granted. Note: Must measure the 2-year limit (or other operating term specified) from first time remediation waste placed in staging pile.		40 C.F.R. § 264.554(d)(1)(iii)
	Must not use staging pile longer than the length of time designated by EPA in appropriate decision document.		40 C.F.R. § 264.554(i)(1)
	Extension of up to an additional 180 days beyond the operating term limit may be granted provided the continued operation of the staging pile: · Will not pose a threat to human health and the environment; and · Is necessary to ensure timely and efficient implementation of remedial actions at the facility.		40 CFR 264.554(i)(1)(i) and (ii)
	In setting standards and design criteria, must consider the following factors: · Length of time pile will be in operation; · Volumes of waste you intend to store in the pile; · Physical and chemical characteristics of the wastes to be stored in the unit; · Potential for releases from the unit; · Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases; and · Potential for human and environmental exposure to potential releases from the unit.		40 C.F.R. § 264.554(d)(2)(i) –(vi)
	Must not place ignitable or reactive remediation waste in a staging pile unless the remediation waste has been treated, rendered, or mixed before placed in the staging pile so that:	Storage of ignitable or reactive remediation waste in staging pile—**applicable**	40 C.F.R. §264.554(e)
	The remediation waste no longer meets the definition of ignitable or reactive under 40 CFR 261.21 or 40 CFR 261.23; and You have complied with 40 C.F.R. §264.17(b); or		40 C.F.R. §264.554(e)(1)(i) and ii)
	Must manage the remediation waste to protect it from exposure to any material or condition that may cause it to ignite or react.		40 C.F.R. §264.554(e)(2)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
	Must not place in the same staging pile unless you have complied with 40 C.F.R. § 264.17(b)	Storage of "incompatible" remediation waste (as defined in 40 C.F.R. § 260.10) in staging pile in – **applicable**	40 C.F.R. § 264.554(f)(1)
	Must separate the incompatible waste or materials, or protect them from on another by using a dike, berm, wall, or other device.	Staging pile of remediation waste stored nearby to incompatible wastes or materials in containers, other piles, open tanks or land disposal units—**applicable**	40 C.F.R. § 264.554(f)(2)
	Must not pile remediation waste on same base where incompatible wastes or materials were previously piled unless you have sufficiently decontaminated the base to comply with 40 C.F.R. § 264.17(b).		40 C.F.R. § 264.554(f)(3)
Closure of staging piles of remediation waste	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.	Storage of remediation waste in staging pile in previously contaminated area – **applicable**	40 C.F.R. § 264.554(j)(1)
	Must decontaminate contaminated sub-soils in a manner that EPA determines will protect human and the environment.		40 C.F.R. § 264.554(j)(2)
	Must be closed within 180 days after the operating term according to 40 C.F.R. §§ 264.258(a) and 264.111, or 265.258(a) and 265.111.	Storage of remediation waste in staging pile in uncontaminated area – **applicable**	40 C.F.R. § 264.554(k)
Waste Treatment and Disposal — Contaminated Groundwater, Excavated Soils, Debris, and Secondary Wastes			
Discharge of treated groundwater to surface water	Comply with any applicable substantive water quality requirements under the Alabama Water Pollution Control Act (AWPCA) or the Clean Water Act (CWA) including application of technology- or ambient water quality-based effluent limitations to ensure discharge does not cause or contribute to violation of water quality standards.	Discharge of pollutants into waters of the State – **applicable**	ADEM Admin. Code r. 335-6-6-.04(f), (h), (i), and (j)
	Conditions for the discharge shall meet the requirements, as appropriate, provided in ADEM Admin. Code r. 335-6-6-.14 such as the following: · Technology based effluent limitations and standards under Sections 301, 302, 303, 304, 307, 318, and 405 of the Clean Water Act, including any applicable toxic effluent standard or prohibition under 40 CFR Subchapter N. · Other requirements in addition to or more stringent than promulgated effluent limitations, guidelines, or standards under Sections 301, 306, 307, 318, and 405 of the Clean Water Act where necessary to achieve water quality standards established under Section 303 of the Clean Water Act and AWPCA §2-22-9(g)		ADEM Admin. Code r. 335-6-6-.14 (3)(a), (b), (e)
	Limitations must be applied to control all pollutants or pollutant parameters that are or may be discharged at a level which cause, have reasonable potential to cause or contribute to an exceedance of a narrative or numerical water quality standard.		ADEM Admin. Code r. 335-6-6-.14(e)(1)(i)
Discharge of treated groundwater to POTW	Shall not introduce into publicly or privately owned treatment works any pollutant(s) which, alone on in conjunction with a discharge or discharges from other sources, cause pass through or interference or in any other manner adversely impact the operation or performance of the treatment works, to include the method of sludge disposal in use by the publicly or privately owned treatment works.	Discharge pollutants into POTW or privately-owned treatment facility operated by a person other than the indirect discharger – **applicable**	ADEM Admin. Code r. 335-6-5-.03(1)
	The following pollutants may not be introduced into a POTW:		ADEM Admin. Code r. 335-6-5-.03(2)
	· Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 C.F.R. § 261.21;		ADEM Admin. Code r. 335-6-5-.03(2)(a)

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Action	Requirements	Prerequisite	Citation
	· Pollutants which will cause corrosive structural damage to the treatment works, but in no case discharges with pH lower than 5.0, unless the treatment works are specifically designed to accommodate such discharges;		ADEM Admin. Code r. 335-6-5-.03(2)(b)
	· Solid or viscous pollutants in amounts which will cause obstruction to the flow in sewers, or other interference with the operation of the treatment works;		ADEM Admin. Code r. 335-6-5-.03(2)(c)
	· Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge of such volume or strength as to cause interference in the treatment works;		ADEM Admin. Code r. 335-6-5-.03(2)(d)
	· Heat in amounts which will inhibit biological activity in the treatment plant resulting in interference but in no case in such quantities that the temperature of the influent, at the treatment plant, exceeds 40 °C (104 °F) unless the treatment plant is designed to accommodate such heat;		ADEM Admin. Code r. 335-6-5-.03(2)(e)
	· Pollutants which result in the presence of toxic gases, vapors, or fumes within the treatment works in a quantity that may cause acute worker health and safety problems;		ADEM Admin. Code r. 335-6-5-.03(2)(f)
	· Any trucked or hauled pollutants, except at discharge points designated by the treatment works; and		ADEM Admin. Code r. 335-6-5-.03(2)(g)
	· Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.		ADEM Admin. Code r. 335-6-5-.03(2)(h)
Disposal of RCRA hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 C.F.R. § 268.40 before land disposal.	Land disposal, as defined in 40 C.F.R. § 268.2, of restricted RCRA waste – **applicable**	40 C.F.R. § 268.40(a)
	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards, found in 40 CFR 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **applicable**	40 C.F.R. §268.40(e)
Transport and treatment of collected RCRA wastewater	Any dedicated tank systems, conveyance systems, and ancillary equipment used to treat, store or convey wastewater to an on-site NPDES-permitted wastewater treatment facility are exempt from the requirements of RCRA Subtitle C standards.	On-site wastewater treatment unit (as defined in 40 CFR 260.10) subject to regulation under § 402 or § 307(b) of the CWA (i.e., NPDES-permitted) that manages hazardous wastewaters -**applicable**	40 C.F.R. §264.1(g)(6)
Disposal of RCRA characteristic wastewaters in an NPDES permitted wastewater treatment unit	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under 402 the CWA (i.e., NPDES permitted), unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Land disposal of hazardous wastewaters that are hazardous only because they exhibit a characteristic and are not otherwise prohibited under 40 CFR 268 – **applicable**	40 C.F.R. §268.1(c)(4)(i)
Disposal of RCRA characteristic wastewaters in a POTW	Are not prohibited, if the wastes are treated for purposes of the pretreatment requirements of Section 307 of the CWA, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.		40 C.F.R. §268.1(c)(4)(ii)
Disposal of RCRA-hazardous waste soil in a land-based unit	Must be treated according to the alternative treatment standards of 40 C.F.R. § 268.49(c) or according to the UTSs specified in 40 C.F.R. § 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 C.F.R. 268.2, of restricted hazardous soils – **applicable**	40 C.F.R. § 268.49(b)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
Treatment of RCRA hazardous waste soil	Prior to land disposal, all "constituents subject to treatment" as defined in 40 C.F.R. § 268.49(d) must be treated as follows:	Treatment of restricted hazardous waste soils – **applicable**	40 C.F.R. § 268.49(c)(1)
	· **For non-metals** (except carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations, except as provided in 40 C.F.R. § 268.49(c)(1)(C).		40 C.F.R. § 268.49(c)(1)(A)
	· **For metals** and carbon disulfide, cyclohexanone, and methanol,), treatment must achieve a 90 percent reduction in total constituent concentrations as measured in leachate from the treated media (tested according to TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal technology is used), except as provided in 40 C.F.R. § 268.49(c)(1)(C).		40 C.F.R. § 268.49(c)(1)(B)
	· When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. [Universal Treatment Standards are identified in 40 C.F.R. § 268.48 Table UTS].		40 C.F.R. § 268.49(c)(1)(C)
	In addition to the treatment requirement required by paragraph (c)(1) of this section, soils must be treated to eliminate these characteristics.	Land disposal of soils that exhibit the characteristic of ignitability, corrosivity, or reactivity – **applicable**	40 C.F.R. § 268.49(c)(2)
	Provides methods on how to demonstrate compliance with the alternative treatment standards for contaminated soils that will be land disposed.	Treatment of restricted hazardous waste soils following alternative soil treatment of 40 C.F.R. § 268.49(c) – **To Be Considered**	Guidance on Demonstrating Compliance with the LDR Alternative Soil Treatment Standards [EPA 530-R-02-003, July 2002]
Treatment of contaminated soils with RCRA hazardous constituents	Unit must be located, designed, constructed, operated and maintained, and closed in a manner that will ensure protection of human health and the environment.	Treatment of RCRA hazardous waste in miscellaneous units, except as provided in 40 CFR 264.1 - **relevant and appropriate**	40 C.F.R. § 264.601
	Protection of human health and the environment includes, but is not limited to: prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering the factors listed in 40 CFR 264.601(c)(1) thru (7)		40 C.F.R. § 264.601(c)
	The requirements of RCRA Subpart AA-Air Emission Standards for Process Vents do not apply to process vents that would otherwise be subject to this subpart when equipped with emission controls and operated in accordance with an applicable Clean Air Act regulation codified under 40 CFR part 60, part 61 or part 63.	Process vents associated with air or steam stripping operations that manage hazardous wastes with organic concentrations of at least 10ppmw - **relevant and appropriate**	40 C.F.R. § 264.1030(e)
	The requirements of RCRA Subpart CC – Air Emission Standards for Tanks, Surface Impoundments, and Containers do not apply to a waste management unit that is solely used for on-site treatment or storage of hazardous waste that is placed in the unit as result of implementing remedial activities required under RCRA 3004(u) and (v), or 3008(h), or CERCLA authorities.	Air pollutant emissions with volatile organics from a hazardous waste tank, surface impoundment, or container - **relevant and appropriate**	40 C.F.R. § 264.1080(a)(5)
PCB Waste Generation, Management and Storage			
Management of PCB waste (e.g., contaminated PPE, equipment, wastewater)	Any person storing or disposing of PCB waste must do so in accordance with 40 C.F.R. § 761, Subpart D.	Generation of waste containing PCBs at concentrations ≥50 ppm —**applicable**	40 C.F.R. § 761.50(a)
Management of PCB remediation waste	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 C.F.R. § 761.3 — **applicable**	40 C.F.R. § 761.61
Temporary storage of PCB waste in a container(s)	Container(s) shall be marked as illustrated in 40 C.F.R. § 761.45(a).	Storage of PCBs and PCB Items at concentrations ≥50 ppm for disposal— **applicable**	40 C.F.R. § 761.40(a)(1)
	Storage area must be properly marked as required by 40 C.F.R. § 761.40(a)(10).		40 C.F.R. § 761.65(c)(3)
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked non-leaking container(s).		40 C.F.R. § 761.65(c)(5)
	Container(s) shall be in accordance with requirements set forth in DOT HMR at 49 C.F.R. §§ 171-180.		40 C.F.R. § 761.65(c)(6)

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Action	Requirements	Prerequisite	Citation
Storage of PCB waste in non-RCRA regulated unit	Storage facility must have:	Storage of PCBs and PCB Items at concentrations 50 ppm or greater for disposal — **applicable**	40 C.F.R. § 761.65(b)(1)
	· Adequate roof and walls to prevent rainwater from reaching stored PCBs and PCB items;		40 C.F.R. § 761.65(b)(1)(i)
	· Adequate floor that has continuous curbing with a minimum six-inch high curb. Floor and curb must provide a containment volume equal to at least two times the internal volume of the largest PCB article or container or 25% of the internal volume of all articles or containers stored there, whichever is greater.		40 C.F.R. § 761.65(b)(1)(ii)
	· No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area;		40 C.F.R. § 761.65(b)(1)(iii)
	· Floors and curbing constructed of Portland cement, concrete, or a continuous, smooth, non-porous surface that prevents or minimizes penetration of PCBs; and		40 C.F.R. § 761.65(b)(1)(iv)
	Storage facility must not located at a site that is below the 100-year flood water elevation.		40 C.F.R. § 761.65(b)(1)(v)
	Storage area must be properly marked as required by 40 C.F.R. § 761.40(a)(10).		40 C.F.R. § 761.65(c)(3)
Storage of PCB waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 C.F.R. § 761.65(b)(1) provided unit:	Storage of PCBs and PCB Items designated for disposal — **applicable**	40 C.F.R. § 761.65(b)(2)
	· Is permitted by EPA under RCRA § 3004 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761; or		40 C.F.R. § 761.65(b)(2)(i)
	· Qualifies for interim status under RCRA § 3005 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761; or		40 C.F.R. § 761.65(b)(2)(ii)
	· Is permitted by an authorized state under RCRA § 3006 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761.		40 C.F.R. § 761.65(b)(2)(iii)
Temporary storage of Bulk PCB remediation waste in a waste pile	May be stored at the clean-up site or site of generation for 180 days subject to the following conditions: · Waste must be placed in a pile is designed and operated to control dispersal by wind, where necessary, by means other than wetting;	Storage of PCB remediation waste or PCB bulk product waste in a waste pile—**applicable**	40 C.F.R. § 761.65(c)(9)(i)
	· Waste must not generate leachate through decomposition or other reactions.		40 C.F.R. § 761.65(c)(9)(ii)
	Storage site must have a liner designed, constructed, and installed to prevent any migration of wastes off or through liner into adjacent subsurface soil, groundwater or surface water at any time during the active life (including closure period) of the storage site.		40 C.F.R. § 761.65(c)(9)(iii)(A)
	Liner must be: · Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure because of pressure gradients, physical contact with waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;		40 C.F.R. § 761.65(c)(9)(iii)(A)(1)
	· Placed on foundation or base capable of providing support to liner and resistance to pressure gradients above and below the liner to present failure because of settlement compression or uplift;		40 C.F.R. § 761.65(c)(9)(iii)(A)(2)
	· Installed to cover all surrounding earth likely to be in contact with waste.		40 C.F.R. § 761.65(c)(9)(iii)(A)(3)
	Has a cover that meets the above requirements and installed to cover all of the stored waste likely to be contacted by precipitation, and is secured so as not to be functionally disabled by winds expected under normal weather conditions at the storage site; and		40 C.F.R. § 761.65(c)(9)(iii)(B)
	Has a run-on control system designed, constructed, operated and maintained such that it:		40 C.F.R. § 761.65(c)(9)(iii)(C)
	· Prevents flow on the stored waste during peak discharge from at least a 25-year storm;		40 C.F.R. § 761.65(c)(9)(iii)(C)(1)
	· Collects and controls at least the water volume resulting from a 24-hour, 25-year storm.		40 C.F.R. § 761.65(c)(9)(iii)(C)(2)
	Collection and holding facilities (e.g., tanks or basins) must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.		
	Requirements of 40 C.F.R. § 761.65(c)(9) may be modified under the risk-based disposal option of 40 C.F.R.§ 761.61(c).		40 C.F.R. § 761.65(c)(9)(iv)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
PCB Treatment/Disposal			
Disposal of decontamination waste and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 C.F.R. § 761.79(g)(1) – (6).	Decontamination waste and residues — **applicable**	40 C.F.R. § 761.79(g)
	Are regulated for disposal as PCB remediation waste.	Distillation bottoms or residues and filter media — **applicable**	40 C.F.R. § 761.79(g)(1)
	Are regulated for disposal at their original concentration.	PCBs physically separated from regulated waste during decontamination, other than distillation bottoms and filter media — **applicable**	40 C.F.R. § 761.79(g)(2)
	Must be burned and marketed in accordance with used oil requirements in 40 C.F.R. § 761.20(e), or disposed of in accordance with 40 C.F.R. § 761.60(a) or (e), or decontaminated pursuant to the section.	Hydrocarbon solvent used or reused for decontamination that contains < 50 ppm PCBs — **applicable**	40 C.F.R. § 761.79(g)(3)
	Shall be disposed of in an incinerator operating in compliance with 40 C.F.R. § 761.70, or decontaminated pursuant to this section.	Chlorinated solvent at any concentration PCBs used for decontamination — **applicable**	40 C.F.R. § 761.79(g)(4)
	Shall be disposed of in accordance with 40 C.F.R. § 761.60(a), or decontaminated pursuant to this section.	Solvents ≥50 ppm PCBs [other than those described in 40 C.F.R. § 761.79(g)(3) and (g)(4)] — **applicable**	40 C.F.R. § 761.79(g)(5)
	Shall be disposed of in accordance with provisions for wastes from cleanup of PCB remediation waste at 40 C.F.R. § 761.61(a)(5)(v).	Non-liquid cleaning materials and PPE at any concentration PCBs, including non-porous surfaces and other non-liquid materials (e.g., rags, gloves, booties) resulting from decontamination — **applicable**	40 C.F.R. § 761.79(g)(6)
Disposal of bulk PCB remediation waste off-site (self- implementing option)	May be sent off-site for decontamination or disposal provided the waste is either dewatered on-site or transported off-site in containers meeting the requirements of DOT HMR at 49 C.F.R. Parts 171-180.	Generation of bulk PCB remediation waste (as defined in 40 C.F.R. § 761.3) for disposal — **applicable**	40 C.F.R. § 761.61(a)(5)(i)(B)
	Must provide written notice including the quantity to be shipped and highest concentration of PCBs [using extraction EPA Method 3500B/3540C or Method 3500B/3550B followed by chemical analysis using Method 8082 in SW-846 or methods validated under 40 C.F.R. §§ 761.320 – 761.326 (Subpart Q)] at least 15 days before the first shipment of waste to each off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval.		40 C.F.R. § 761.61(a)(5)(i)(B)(2)(iv)
	Shall be disposed of in accordance with the provisions for Cleanup wastes at 40 C.F.R. § 761.61(a)(5)(v)(A).	Bulk PCB remediation waste which has been de-watered and with a PCB concentration < 50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(B)(2)(ii)
	Shall be disposed of: · In a hazardous waste landfill permitted by EPA under §3004 of RCRA; · In a hazardous waste landfill permitted by a State authorized under §3006 of RCRA; or · In a PCB disposal facility approved under 40 C.F.R. § 761.60.	Bulk PCB remediation waste which has been de-watered and with a PCB concentration, ≥50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(B)(2)(iii)
Disposal of PCB contaminated porous surfaces	Shall be disposed on-site or off-site as bulk PCB remediation waste according to 40 C.F.R. § 761.61(a)(5)(i) or decontaminated for use according to 40 C.F.R. § 761.79(b)(4).	PCB remediation waste porous surfaces (as defined in 40 C.F.R. § 761.3) **— relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(iii)
Disposal liquid PCB remediation waste	Shall either: · Decontaminate the waste to the levels specified in 40 C.F.R. § 761.79(b)(1) or (2); or	Liquid PCB remediation waste (as defined in 40 C.F.R. § 761.3) — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(iv)(A)
	· Dispose of the waste in accordance with 40 C.F.R. § 761.61(b) or a risk-based approval under 40 C.F.R. § 761.61(c).		40 C.F.R. § 761.61(a)(5)(iv)(B)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials)	Shall be disposed of either: · In a facility permitted, licensed or registered by a State to manage municipal solid waste under 40 C.F.R. § 258 or non-municipal, non-hazardous waste subject to 40 C.F.R. §§ 257.5 thru 257.30; or · In a RCRA Subtitle C landfill permitted by a State to accept PCB waste; or · In an approved PCB disposal facility; or · Through decontamination under 40 C.F.R. § 761.79(b) or (c).	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(v)(A)
Disposal of PCB cleaning solvents, abrasives, and equipment	May be reused after decontamination in accordance with 40 C.F.R. §761.79; or	Generation of PCB wastes from the cleanup of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(v)(B)
	For liquids, disposed in accordance with 40 C.F.R. § 761.60(a).		40 C.F.R. § 761.60(b)(1)(i)(B)
Performance-based disposal of PCB remediation waste	May dispose by one of the following methods:	Disposal of non-liquid PCB remediation waste (as defined in 40 C.F.R. § 761.3) — **relevant and appropriate**	40 C.F.R. § 761.61(b)(2)
	· In a high-temperature incinerator approved under 40 C.F.R. § 761.70(b); · By an alternate disposal method approved under 40 C.F.R. § 761.60(e); · In a chemical waste landfill approved under 40 C.F.R. § 761.75; · In a facility with a coordinated approval issued under 40 C.F.R. § 761.77; or		40 C.F.R. § 761.61(b)(2)(i)
	· Through decontamination in accordance with 40 C.F.R. § 761.79.		40 C.F.R. § 761.61(b)(2)(ii)
	Shall be disposed according to 40 C.F.R. § 761.60(a) or (e), or decontaminate in accordance with 40 C.F.R. § 761.79.	Disposal of liquid PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(b)(1)
Risk-based disposal of PCB remediation waste (e.g., West End and South Landfills)	May dispose of in a manner other than prescribed in 40 C.F.R. § 761.61(a) or (b) if approved in writing by EPA and method will not pose an unreasonable risk of injury to human health or the environment.	Disposal of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(c)
PCB Decontamination/Cleanup			
Decontamination of PCB contaminated water	For discharge to a treatment works as defined in 40 C.F.R. § 503.9 (aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or	Water containing PCBs regulated for disposal — **applicable**	40 C.F.R. § 761.79(b)(1)(ii)
	For unrestricted use, meet standard of 0.5 ppb PCBs.		40 C.F.R. § 761.79(b)(1)(iii)
Cleanup of porous surfaces with PCBs (self-implementing)	In both high and low occupancy areas, any person disposing of such, must do so based on the levels in 40 C.F.R. § 761.61(a)(4)(i).	PCB remediation waste porous surfaces (as defined in 40 C.F.R. § 761.3) on which PCBs have been spilled — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(iii)
	May be cleaned up for use in accordance with 40 C.F.R. § 761.79(b)(4) or § 761.30(p).		
Cleanup of bulk PCB remediation waste on-site (self-implementing)	May do so subject to all of the following:	Cleanup of PCB remediation waste on-site or using a soil washing process — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(A)
	· A non-chlorinated solvent is used;		40 C.F.R. § 761.61(a)(5)(i)(A)(1)
	· The process occurs at ambient temperature;		40 C.F.R. § 761.61(a)(5)(i)(A)(2)
	· The process is not exothermic;		40 C.F.R. § 761.61(a)(5)(i)(A)(3)
	· The process uses no external heat;		40 C.F.R. § 761.61(a)(5)(i)(A)(4)
	· The process has secondary contaminant to prevent any solvent from being released to the underlying or surrounding soils or surface waters; and		40 C.F.R. § 761.61(a)(5)(i)(A)(5)
	· Solvent disposal, recovery, and/or reuse is in accordance with relevant provisions of 40 C.F.R. § 761.61(b)(1) or § 761.61(c) or applicable paragraphs of 40 C.F.R. § 761.79.		40 C.F.R. § 761.61(a)(5)(i)(A)(6)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
Bulk PCB remediation waste left in place at cleanup site (self-implementing)	May remain onsite without further conditions.	Bulk PCB remediation waste remaining in a high occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations ≤1 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(A)
	Shall be covered with a cap meeting the requirements of 40 C.F.R. § 761.61(a)(7) and 40 C.F.R. § 761.61(a)(8) [See below].	Bulk PCB remediation waste remaining in a high occupancy area (as defined in 40 C.F.R. 761.3) at concentrations > 1 ppm and. 10 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(A)
	May remain onsite without further conditions.	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations ≤ 25 — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(1)
	May remain on-site if the site is secured by a fence and marked with a sign including the M_L mark.	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations > 25 ppm and ≤ [sic] 50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(2)
	May remain onsite if the site is covered with a cap meeting the requirements of 40 C.F.R. § 761.61(a)(7) and (8). [See below]	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. 761.3) at concentrations > 50 ppm and ≤ 100 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(3)
Cap requirements for Bulk PCB remediation waste left in place at cleanup site (self-implementing)	Must do so in accordance with 40 C.F.R. 264.310(a) and ensure it complies with the permeability, sieve, liquid limit and plasticity index parameters in 40 C.F.R. § 761.75(b)(1)(ii) thru (b)(1)(v). · A cap of compacted soil shall have a minimum thickness of 15 cm (10 inches). · A concrete or asphalt cap shall have a minimum thickness of 15 cm (6 inches). · A cap must be of sufficient strength to maintain its effectiveness and integrity. · A cap shall not be contaminated at a level ≥ 1 ppm PCB per AroclorTM (or equivalent) or per congener. · Repairs shall begin within 72 hours of discovery for any breaches that would impair the integrity of the cap.	Designing and constructing a cap where PCB remediation waste was removed or left in place in order to prevent or minimize human exposure, infiltration of water, and erosion **— relevant and appropriate**	40 C.F.R. § 761.61(a)(7)
Verification for cleanup of PCB remediation waste (self-implementing option)	Must collect and analyze the wastes in accordance with 40 C.F.R. §§ 761.280-761.298 (Subpart O).	Collection and analysis of samples to verify cleanup and on-site disposal of bulk PCB remediation wastes and porous surfaces — **relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(i)
	Must collect and analyze the waste in accordance with 40 C.F.R. §§ 761.300-761.316 (Subpart P).	Collection and analysis of samples from PCB remediation waste non-porous surfaces **— relevant and appropriate**	
	Must collect and analyze the waste in accordance with 40 C.F.R. § 761.269.	Collection and analysis of samples from liquid PCB remediation waste **— relevant and appropriate**	
	May use PCB field screening tests to determine when to sample to verify that cleanup is complete.	Interim sampling during PCB remediation waste cleanup **— relevant and appropriate**	
	Self-implementing cleanup of PCB remediation waste is complete.	Sample analysis results in measurement of PCBs less than or equal to levels specified in 40 C.F.R. § 761.61(a) **— relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(ii)(A)
	Cleanup is not complete and must either dispose of the sampled PCB remediation waste, or reclean the waste represented by the sample and reinitiate sampling and analysis in accordance with 40 C.F.R. § 761.61(a)(6)(i).	Sample analysis results in measurement of PCBs greater than or equal to levels specified in 40 C.F.R. § 761.61(a) **— relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(ii)(B)
Institutional Controls for PCB Remediation Waste Left-In-Place			
Deed restrictions for caps, fences and low occupancy areas	Must maintain the fence or cap, in perpetuity.	Use of a cap or fence at PCB remediation waste cleanup site — **relevant and appropriate**	40 C.F.R. § 761.61(a)(8)

TABLE 4-6
POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Action	Requirements	Prerequisite	Citation
	Within 60 days of completion of cleanup activity shall record, in accordance with State law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will in perpetuity notify any potential purchaser of the property:	Use of a cap or fence at low occupancy area of PCB remediation waste cleanup site — **relevant and appropriate**	40 C.F.R. § 761.61(a)(8)(i)(A)
	· That land has been used for PCB remediation waste disposal and is restricted to use as a low occupancy area as defined in 40 C.F.R. § 761.3.		40 C.F.R. § 761.61(a)(8)(i)(A)(1)
	· Of existence of the fence or cap and the requirements to maintain the fence or cap.		40 C.F.R. § 761.61(a)(8)(i)(A)(2)
	· The applicable cleanup levels left at the site, inside the fence, and/or under the cap.		40 C.F.R. § 761.61(a)(8)(i)(A)(3)
	May remove a fence or cap after conducting additional cleanup activities and achieving levels specified in 40 C.F.R. § 761.61(a)(4) which do not require a cap or fence and remove the notice on the deed no earlier than 30 days after achieving these levels.		40 C.F.R. § 761.61(a)(8)(ii)
Transportation of Wastes			
Transportation of hazardous waste on-site	The generator manifesting requirements of 40 C.F.R. §§ 262.20-262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 C.F.R. §§ 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 C.F.R. § 262.20(f)
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 C.F.R. §§ 262.20-23 for manifesting, § 262.30 for packaging, § 262.31 for labeling, § 262.32 for marking, § 262.33 for placarding, §§ 262.40 and 262.41(a) for record keeping requirements, and § 262.12 to obtain EPA ID number.	Preparation and initiation of shipment of hazardous waste off-site – **applicable**	40 C.F.R. § 262.10(h)
Transportation of PCB wastes off-site	Must comply with the manifesting provisions at 40 C.F.R. §§ 761.207 through 761.218.	Relinquishment of control over PCB wastes by transporting or offering for transport – **applicable**	40 C.F.R.§ 761.207(a)
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 C.F.R. §§ 171-180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **applicable**	49 C.F.R. § 171.1(c)

[1] ADEM Admin. Code r. 335-3-4-.02(1) and (2) were held unconstitutional for being unduly vague (335-3-4-.02(1)) and too restrictive (335-3-4-.02(2)). See Ross Neeley Express, Inc. v. Ala. Dep't of Envtl. Mgmt., 437 So.2d 82 (Ala. 1983).
[2] See supra n.1.

ARAR = applicable or relevant and appropriate requirement
C.F.R. = Code of Federal Regulations
DOT = U.S. Department of Transportation
> = greater than
< = less than
≥ = greater than or equal to
≤ = less than or equal to
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976
TSCA = Toxic Substances Control Act of 1976

TABLE 5-1A
PRELIMINARY SCREENING OF SOIL REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
No Action	No Action	Continue operation and maintenance of existing interim measures, institutional and engineering controls, access controls, and deed restrictions.	YES
Institutional and Engineering Controls	Administrative Policies	Deed restrictions / ADEM environmental covenant, no dig policy, appropriate OSHA training, and long sleeve shirt requirements.	YES
	Access Controls	Fencing, signage, or other physical barriers.	YES
Containment	Capping	Engineered barriers for pollutant containment. Surface containment options typically consist of landfill caps, asphalt or concrete surfaces, natural clean soil fill caps, geosynthetic covers or a combination of these.	YES
Excavation/ Disposal or Ex-situ Treatment	Excavation	Removal of impacted soil/media through excavation and replacement with clean soil.	YES
	Landfill Disposal	An engineered system for pollutant containment. Containment options vary by level and type of contaminants, and can consist of any combination of: natural, synthetic, or composite caps; natural, synthetic, or composite bottom containment; leachate collection; gas collection, and surface water control.	YES
	Bioreactor Landfills	A bioreactor landfill operates to rapidly transform and degrade organic waste. The increase in waste degradation and stabilization is accomplished through the addition of liquid and air to enhance microbial processes. This bioreactor concept differs from the traditional "dry tomb" municipal landfill approach. A bioreactor landfill is not just a single design as the type is also dependent on the operational process invoked. There are three different general types of bioreactor landfill configurations: Aerobic - Leachate is removed from the bottom layer, piped to liquids storage tanks, and recirculated into the landfill in a controlled manner. Air is injected into the waste mass, using vertical or horizontal wells, to promote aerobic activity and accelerate waste stabilization. Anaerobic - Moisture is added to the waste mass in the form of recirculated leachate and other sources to obtain optimal moisture levels. Biodegradation occurs in the absence of oxygen (anaerobically) and produces landfill gas. Landfill gas, primarily methane, can be captured to minimize greenhouse gas emissions and for energy projects. Hybrid (Aerobic-Anaerobic) - The hybrid bioreactor landfill accelerates waste degradation by employing a sequential aerobic-anaerobic treatment to rapidly degrade organics in the upper sections of the landfill and collect gas from lower sections. Operation as a hybrid results in an earlier onset of methanogenesis compared to aerobic landfills.	NO Limited to no effectiveness for COCs. PCBs and arsenic are not highly biologically reactive.
	Bioremediation	Bioremediation uses microorganisms to degrade organic contaminants. Ex-situ bioremediation includes slurry-phase bioremediation, in which the soils are mixed in water to form a slurry to keep solids suspended and microorganisms in contact with the soil contaminants, and solid-phase bioremediation, in which the soils are placed in a cell or building and tilled with added water and nutrients. Land farming, biopiles, and composting are examples of ex-situ, solid-phase bioremediation.	NO Limited to no effectiveness for COCs. PCBs and arsenic are not highly biologically reactive.
	Oxidation / Reduction	Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents most commonly used for treatment of hazardous contaminants in soil are ozone, hydrogen peroxide, hypochlorites, chlorine, chlorine dioxide, potassium permanganate, and Fentons reagent (hydrogen peroxide and iron). Cyanide oxidation and dechlorination are examples of chemical treatment. This method may be applied in-situ or ex-situ.	NO Limited effectiveness for COCs. PCBs and arsenic are not easily oxidized or reduced.
	Soil Vapor Extraction	Soil vapor extraction (SVE) is used to remediate unsaturated (vadose) zone soil. A vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile organic contaminants from the soil. SVE usually is performed in-situ; however, in some cases, it can be used as an ex-situ technology.	NO Limited to no effectiveness with COCs.
	Solvent Extraction	Solvent extraction uses an organic solvent as an extractant to separate organic and metal contaminants from soil. The organic solvent is mixed with contaminated soil in an extraction unit. The extracted solution then is passed through a separator, where the contaminants and extractant are separated from the soil. Organically bound metals may be extracted along with the target organic contaminants.	NO Limited to no effectiveness with COCs.
	Soil Washing	For soil washing, contaminants sorbed onto fine soil particles are separated from bulk soil in a water-based system on the basis of particle size. The wash water may be augmented with a basic leaching agent, surfactant, or chelating agent or by adjustment of pH to help remove organics and heavy metals. Soils and wash water are mixed ex-situ in a tank or other treatment unit. The wash water and various soil fractions are usually separated using gravity settling.	NO Difficulties with implementation.

TABLE 5-1A
PRELIMINARY SCREENING OF SOIL REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
Excavation/ Disposal or Ex-situ Treatment	Chemical Dehalogenation	The dehalogenation process is achieved by either the replacement of the halogen molecules or the decomposition and partial volatilization of the contaminants. The contaminants are entirely or partially decomposed. One method of chemical dehalogenation, base-catalyze decomposition (BCD), is employed by using sodium hydroxide, sodium bicarbonate, or aliphatic hydrocarbons as hydrogen donors. The soil is first screened, processed with a crusher and pug mill, and stockpiled. The stockpiled material is mixed with sodium bicarbonate and is heated in a rotary reactor.	YES
	Thermal Desorption	Ex-situ thermal treatment generally involves the destruction or removal of contaminants through exposure to high temperature in treatment cells, combustion chambers, or other means used to contain the contaminated media during the remediation process. The main advantage of ex-situ treatment is that it generally requires shorter time periods, and there is more certainty about the uniformity of treatment because of the ability to screen, homogenize, and continuously mix the contaminated media; however, ex-situ processes require excavation of soils, which increases costs and engineering for equipment, permitting, and materials handling.	YES
In-Situ Treatment	Bioremediation	Bioremediation uses microorganisms to degrade organic contaminants. The microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas. In-situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Generally, this means providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.	NO Limited to no effectiveness for COCs. PCBs and arsenic are not highly biologically reactive.
	Bioventing and Biosparging	Bioventing is a common form of in-situ bioremediation. Bioventing uses wells to circulate air through the ground, sometimes pumping air into the ground. Bioventing is meant to stimulate the natural in-situ biodegradation of any aerobically degradable compounds in soil by providing oxygen to existing soil microorganisms. In contrast to soil vapor vacuum extraction, bioventing uses low air flow rates to provide only enough oxygen to sustain microbial activity. Oxygen is most commonly supplied through direct air injection into residual contamination in soil. In addition to degradation of adsorbed residuals, volatile compounds are biodegraded as vapors move slowly through biologically active soil.	NO Limited to no effectiveness for COCs. PCBs and arsenic are not highly biologically reactive.
	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, and groundwater. The mechanisms of phytoremediation include enhanced rhizosphere biodegradation (takes place in soil or groundwater immediately surrounding plant roots), phytoextraction (also known as phytoaccumulation, the uptake of contaminants by plant roots and the translocation/accumulation of contaminants into plant shoots and leaves), phytodegradation (metabolism of contaminants within plant tissues), and phytostabilization (production of chemical compounds by plants to immobilize contaminants at the interface of roots and soil). Phytoremediation applies to all biological, chemical, and physical processes that are influenced by plants (including the rhizosphere) and that aid in cleanup of the contaminated substances. Plants can be used in site remediation, both through the mineralization of toxic organic compounds and through the accumulation and concentration of heavy metals and other inorganic compounds from soil into aboveground shoots.	NO Limited to no effectiveness for COCs (not effective for strongly sorbed constituents like PCBs).
	Oxidation / Reduction	Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents most commonly used for treatment of hazardous contaminants in soil are ozone, hydrogen peroxide, hypochlorites, chlorine, chlorine dioxide, potassium permanganate, and Fentons reagent (hydrogen peroxide and iron). Cyanide oxidation and dechlorination are examples of chemical treatment. This method may be applied in-situ or ex-situ.	NO Limited effectiveness for COCs. PCBs and arsenic are not easily oxidized or reduced.
	Soil Vapor Extraction	Soil vapor extraction (SVE) is used to remediate unsaturated (vadose) zone soil. A vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile organic contaminants from the soil. SVE usually is performed in-situ; however, in some cases, it can be used as an ex-situ technology.	NO Limited effectiveness for COCs. Shallow groundwater table not conducive to in-situ SVE.

TABLE 5-1A
PRELIMINARY SCREENING OF SOIL REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
In-Situ Treatment	Electrokinetics	Electrokinetics relies upon application of a low-intensity direct current through the soil between ceramic electrodes that are divided into a cathode array and an anode array. This mobilizes charged species, causing ions and water to move toward the electrodes. Metal ions, ammonium ions, and positively charged organic compounds move toward the cathode. Anions such as chloride, cyanide, fluoride, nitrate, and negatively charged organic compounds move toward the anode. Removal of contaminants at the electrode may be accomplished by several means, among which are: electroplating at the electrode; precipitation or co-precipitation at the electrode; pumping of water near the electrode; or complexing with ion exchange resins.	NO Unproven technology and limited to no effectiveness for COCs. PCBs and arsenic are not highly mobile.
	Stabilization	Stabilization refers to techniques that chemically reduce the hazard potential of a waste by converting the contaminants into less soluble, mobile, or toxic forms. The physical nature and handling characteristics of the waste are not necessarily changed by stabilization.	NO COCs already have low solubility and a high partitioning coefficient.
	Solidification	Solidification refers to techniques that encapsulate the waste, forming a solid material, and does not necessarily involve a chemical interaction between the contaminants and the solidifying additives. The product of solidification, often known as the waste form, may be a monolithic block, a clay-like material, a granular particulate, or some other physical form commonly considered “solid.”	NO Difficulty with implementation.
	Fracturing	Fracturing is a way to crack rock or open fractures in dense soil below ground. It is not necessarily a cleanup method in itself. Rather, fracturing is used to break up the ground to help other cleanup methods work better. The cracks, which are called fractures, create paths through which harmful chemicals can be removed or destroyed.	NO Ground conditions not receptive and could potentially lead to contaminant transport.
	In-situ Flushing	In-situ soil flushing involves the application or injection of large volumes of water, at times supplemented with surfactants, co-solvents, or treatment compounds, into the soil to raise the water table into the contaminated soil zone. Injected water and treatment agents are isolated within the underlying aquifer and recovered together with flushed contaminants.	NO Limited to no effectiveness for COCs. PCBs and arsenic have low solubility potential and a high partitioning coefficient. Groundwater table already high.
	Natural Attenuation + Monitored Natural Attenuation (MNA)	Natural attenuation relies on natural processes to clean up or attenuate pollution in soil and groundwater. Natural attenuation occurs at most contaminated sites. However, the right conditions must exist underground to clean sites properly. If not, cleanup will not be quick enough or complete enough. Scientists monitor or test these conditions to make sure natural attenuation is working. This is called monitored natural attenuation or MNA.	NO Limited to no effectiveness for COCs. Difficult to implement for soil.
	Thermal Desorption	Many different methods and combinations of techniques can be used to apply heat to contaminated soil in-situ. The heat can destroy or volatilize organic chemicals. As the chemicals change into gases, their mobility increases, and the gases can be extracted via collection wells for capture and cleanup in an ex-situ treatment unit. Heat can be introduced to the subsurface by electrical resistance heating, radio frequency heating, dynamic underground stripping, thermal conduction, or injection of hot water, hot air, or steam.	YES

TABLE 5-1B
PRELIMINARY SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
No Action	No Action	Continue operation and maintenance of existing institutional and engineering controls, access controls, deed restrictions, and groundwater corrective action systems.	YES
Institutional and Engineering Controls	Institutional Controls	Deed restrictions / ADEM environmental covenant that prohibit current or future groundwater use.	YES
	Access Controls	Fencing, signage, or other physical barriers.	YES
Natural Attenuation	Natural Attenuation + Monitored Natural Attenuation (MNA)	Natural attenuation relies on natural processes to clean up or attenuate pollution in soil and groundwater. Natural attenuation occurs at most contaminated sites. However, the right conditions must exist underground to clean sites properly. If not, cleanup will not be quick enough or complete enough. Scientists monitor or test these conditions to make sure natural attenuation is working. This is called monitored natural attenuation or MNA.	YES
Containment	Vertical Barriers	Engineered barriers for pollutant containment and remediation can be separated into containment structures designed to prevent contaminant migration (slurry walls, sheet pile walls, etc.) and flow-through structures that direct contaminants into treatment zones (collection trenches, zero valent iron walls, etc.). Groundwater containment barriers typically consist of constructing low flow continuous barriers across or around the groundwater flow regime (slurry walls, sheet pile walls, etc.) in order to block contaminants from crossing the barrier. These systems are typically installed with active groundwater control in order to maintain water levels and proper flow balances.	YES
	Fracturing	Fracturing is a way to crack rock or dense soil in-situ. It is not necessarily a cleanup method in itself. Rather, fracturing is used to break up the ground to help other cleanup methods work better. The cracks, which are called fractures, create paths through which harmful chemicals can be removed or destroyed.	NO Ground conditions not receptive and could potentially lead to contaminant transport.
Ex-Situ Treatment	Bioremediation	Bioremediation uses microorganisms to degrade organic contaminants. The microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas. In situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Generally, this means providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.	NO Limited to no effectiveness for COCs, more effective ex-situ treatments are readily available.
	Carbon Filter / Activated Carbon Filter	The primary raw material used for activated carbon is any organic material with a high carbon content (coal, wood, peat, coconut shells). Granular activated carbon is most commonly produced by grinding the raw material, adding a suitable binder to give it hardness, re-compacting and crushing to the correct size. The carbon-based material is converted to activated carbon by thermal decomposition in a furnace using a controlled atmosphere and heat. The resultant product has a large surface area per unit volume, and a network of submicroscopic pores where adsorption takes place. The walls of the pores provide the surface layer molecules essential for adsorption. Physical adsorption is the primary means by which activated carbon works to remove contaminants from water. Carbon's highly porous nature provides a large surface area for contaminants (adsorbates) to collect. In simple terms, physical adsorption occurs because all molecules exert attractive forces, especially molecules at the surface of a solid (pore walls of carbon), and these surface molecules seek other molecules to adhere to. The large internal surface area of carbon has many attractive forces that work to attract other molecules. Thus, contaminants in water are adsorbed (or held) to the surface of carbon by surface attractive forces similar to gravitational forces. Adsorption from solution occurs as a result of differences in adsorbate concentration in the solution and in the carbon pores.	YES
	Oxidation / Reduction	Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents most commonly used for treatment of hazardous contaminants in soil are ozone, hydrogen peroxide, hypochlorites, chlorine, chlorine dioxide, potassium permanganate, and Fentons reagent (hydrogen peroxide and iron). Cyanide oxidation and dechlorination are examples of chemical treatment. This method may be applied in situ or ex situ, to soils, sludges, sediments, and other solids, and may also be applied for the in situ treatment of groundwater.	NO PCBs are not readily oxidized or reduced to non toxic substances.

TABLE 5-1B
PRELIMINARY SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
Ex-Situ Treatment	Publicly-Owned Treatment Works (POTW)	Collected groundwater is treated through the processes already in place at the local waste water treatment facility. Typically POTW systems incorporate several treatment techniques and are therefore effective at treating a range of contaminant types. POTW treatment is typically restricted to specific contaminant concentrations and so active monitoring of concentrations is usually required.	YES
	National Pollutant Discharge Elimination System (NPDES) Discharge	Collected groundwater is treated through on-site treatment facility. Treated groundwater is discharged to surface water. This action is regulated through a NPDES discharge permit.	YES
	Solvent Extraction	Solvent extraction is a separation technology which uses a fluid to remove hazardous contaminants. The solvent is chosen such that the contaminants have a higher affinity for the solvent than for the contaminated material. Solvent extraction does not destroy contaminants, it concentrates them so that they can be recycled or destroyed more cost effectively. When contaminants are not recycled, solvent extraction must be combined with other technologies in a treatment train to destroy the separated, concentrated contaminants. Solvent extraction has limited application as a treatment technology for inorganic contaminants.	NO Limited effectiveness for COCs.
In-Situ Treatment	Bioremediation	Bioremediation uses microorganisms to degrade organic contaminants. The microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas. In situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Generally, this means providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.	YES
	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, or destroy contaminants. The mechanisms of phytoremediation include enhanced rhizosphere biodegradation (takes place in soil or groundwater immediately surrounding plant roots), phytoextraction (also known as phytoaccumulation, the uptake of contaminants by plant roots and the translocation/accumulation of contaminants into plant shoots and leaves), phytodegradation (metabolism of contaminants within plant tissues), and phytostabilization (production of chemical compounds by plants to immobilize contaminants at the interface of roots and soil). Phytoremediation applies to all biological, chemical, and physical processes that are influenced by plants (including the rhizosphere) and that aid in cleanup of the contaminated substances. Plants can be used in site remediation, both through the mineralization of toxic organic compounds and through the accumulation and concentration of heavy metals and other inorganic compounds from soil into aboveground shoots.	NO Limited to no effectiveness for COCs (not effective for strongly sorbed constituents like PCBs).
	Multi-Phase Extraction	Multi-phase extraction uses a vacuum system to remove various combinations of contaminated groundwater, separate-phase petroleum product, and vapors from the subsurface. The system lowers the water table around the well, exposing more of the formation. Contaminants in the newly exposed vadose zone are then accessible to vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and groundwater are separated and treated.	NO COCs do not contain a vapor phase under standard conditions.
	Air Sparging	Air sparging involves the injection of air or oxygen through a contaminated aquifer. Injected air traverses horizontally and vertically in channels through the soil column, creating an underground stripper that removes volatile and semivolatile organic contaminants by volatilization. The injected air helps to flush the contaminants into the unsaturated zone. Soil Vapor Extraction (SVE) is usually implemented in conjunction with air sparging to remove the generated vapor-phase contamination from the vadose zone. Oxygen added to the contaminated groundwater and vadose-zone soils also can enhance biodegradation of contaminants below and above the water table.	NO Limited to no effectiveness for COCs. Most contaminants of concern are non- or semi- volatile.

TABLE 5-1B
PRELIMINARY SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES

General Response Action	Remedial Technology	Description of Technology	Technically Implementable YES = Retained NO = Critical Flaw as Discussed
In-Situ Treatment	Oxidation / Reduction	Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents most commonly used for treatment of hazardous contaminants in soil are ozone, hydrogen peroxide, hypochlorites, chlorine, chlorine dioxide, potassium permanganate, and Fentons reagent (hydrogen peroxide and iron). Cyanide oxidation and dechlorination are examples of chemical treatment. This method may be applied in situ or ex situ, to soils, sludges, sediments, and other solids, and may also be applied for the in situ treatment of groundwater.	NO Groundwater flow rates are too low to make in-situ treatment feasible and limited effectiveness for COCs.
	Permeable Reactive Barriers (PRB)	A PRB is defined as an in-situ method for remediating contaminated groundwater that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron, chelators, sorbents, and microbes to address a wide variety of ground-water contaminants, such as chlorinated solvents, other organics, metals, inorganics, and radionuclides. The contaminants are concentrated and either degraded or retained in the barrier material, which may need to be replaced periodically. PRBs can be installed as permanent or semi-permanent units. The most commonly used PRB configuration is that of a continuous permeable trench in which the treatment material is backfilled. The trench is perpendicular to and intersects the ground-water plume.	NO Enhanced Version of Technology (Funnel & Gate System) Retained
	Electrokinetics: Electric Current Technologies	Electrokinetics relies upon application of a low-intensity direct current through the soil between ceramic electrodes that are divided into a cathode array and an anode array. This mobilizes charged species, causing ions and water to move toward the electrodes. Metal ions, ammonium ions, and positively charged organic compounds move toward the cathode. Anions such as chloride, cyanide, fluoride, nitrate, and negatively charged organic compounds move toward the anode. Removal of contaminants at the electrode may be accomplished by several means, among which are: electroplating at the electrode; precipitation or co-precipitation at the electrode; pumping of water near the electrode; or complexing with ion exchange resins.	NO Unproven technology and limited effectiveness given the low flow rates observed within the groundwater unit.
	Groundwater Circulating Wells (CW)	CWs provide a technique for subsurface remediation by creating a three-dimensional circulation pattern of the groundwater. Groundwater is drawn into a well through one screened section and is pumped through the well to a second screened section where it is reintroduced to the aquifer. The flow direction through the well can be specified as either upward or downward to accommodate site-specific conditions. Because groundwater is not pumped above ground, pumping costs and permitting issues are reduced and eliminated, respectively. Also, the problems associated with storage and discharge are removed. In addition to groundwater treatment, CW systems can provide simultaneous vadose zone treatment in the form of bioventing or soil vapor extraction. CW systems can provide treatment inside the well, in the aquifer, or a combination of both. For effective in-well treatment, the contaminants must be adequately soluble and mobile so they can be transported by the circulating groundwater. Because CW systems provide a wide range of treatment options, they provide some degree of flexibility to a remediation effort.	NO COCs generally have low solubility and groundwater flow rates are too low to make this technique effective.
	Nanoscale Zero Valent Iron (NZVI)	NZVI is an effective reductant that can treat many contaminants, and is particularly effective for chlorinated solvents, PCBs, pesticides, and dioxins. These compounds are completely reduced to non-toxic compounds such as ethane and carbon dioxide. In addition, NZVI is effective in the treatment of certain metals, including cadmium, cobalt, nickel, lead, copper, mercury and chromium. While granular zero-valent iron has been proven at multiple sites, NZVI particles have been shown to be more reactive and extremely effective because of their increased surface area compared to granular coarser iron particles. In addition, they can be readily placed in the subsurface in slurry form via injection wells using either gravity feed, or low pressure pumps, or in temporary soil borings using direct push technology (DPT).	YES
	Funnel & Gate System using Zero Valent Iron (ZVI)	A funnel and gate configuration is similar to a PRB except that low-permeability walls (the funnel) direct the groundwater plume toward a permeable treatment zone (the gate). Some gates are in situ reactors that are readily accessible to facilitate the removal and replacement of reactive media. These systems use collection trenches, funnels, or complete containment to capture the plume and pass the groundwater, by gravity or hydraulic head, through a vessel containing either a single treatment medium or sequential media. The gate is essentially a permeable wall constructed of a ZVI mix. ZVI is an effective reductant that can treat many contaminants, and is particularly effective for chlorinated solvents, PCBs, pesticides, and dioxins.	YES

TABLE 5-2A
SUMMARY OF SOIL REMEDIAL GOAL EXCEEDANCES AND ASSIGNED SOIL IMPACT AREA IDs

Sample ID	Surface Soil PCBs Concentration (mg/kg)	Subsurface Soil PCBs Concentration (mg/kg)	Surface Soil Arsenic Concentration (mg/kg)	Subsurface Soil Arsenic Concentration (mg/kg)	Assigned Soil Impact Area ID	Area Impact Assessment
SSRI-11	930 J	1.89	390	Not Analyzed	A	1, 2, and 3
SWMU-12-24E	169	No Sample	Not Analyzed	No Sample		
SSR-05	No Sample	106	No Sample	11		
SSR-04	No Sample	104	No Sample	4.2		
SWMU-12-24C	84	No Sample	Not Analyzed	No Sample		
SSR-15	No Sample	65 J	No Sample	7.2		
SWMU-12-24G	41.2	No Sample	Not Analyzed	No Sample		
SWMU-12-24F	28.1	No Sample	Not Analyzed	No Sample		
SWMU-12-24A	26.2	No Sample	Not Analyzed	No Sample		
SSR-18	16620 J	No Sample	33 J	No Sample	B	1 and 3
SSR-07	229	No Sample	12	No Sample	C	1
SSR-09	282	No Sample	14	No Sample	D	1
SSRI-07	250 J	56 J	7	Not Analyzed	E	1, 2, and 3
SSRI-06	31	0.865 J	Not Analyzed	Not Analyzed		
SSRI-05	37.6	85.0	Not Analyzed	Not Analyzed	F	1 and 2
SWMU-25-6A	38.6	No Sample	Not Analyzed	No Sample	G	1
SSRI-09	38.4 J	13.1 J	Not Analyzed	Not Analyzed	H	1

Note:

1. Shading indicates exceedance of the RG
2. Soil RGs are: surface PCB = 25 mg/kg, subsurface PCB = 45 mg/kg; surface Arsenic = 66 mg/kg, subsurface Arsenic = 217 mg/kg.
3. Refer to Figures 4-1 and 4-2 in Appendix A for the complete PCB and Arsenic soil data sets and sample locations.
4. Refer to Figure 5-1 for the location of the identified Soil Impact Areas.

Area Impact Assessment Legend:

1 = Impact area based on potential human contact with surface soil
2 = Impact area based on potential human contact with subsurface soil
3 = Impact area based on potential leaching to groundwater

TABLE 5-2B
Summary of Estimated Soil Impact Volumes
Used in Cost Estimates for Excavation and Treatment Alternatives

Area ID	Nominal Area (Acres)	Estimated Depth of Soil Impact (feet)	Estimated Volume of Impacted Soil (cubic yards)
A	3.3	10	53,240
B	See Detailed Note in Text (see Section 5.3)		
C&D COMBINED AREA	3.35	2	10,810
E	0.75	4	4,840
		Estimated Total	**68,900**

Notes:

1. Depth of soil impacts taken as 2 feet in surface impact areas, and maximum impacted depth from available soil sampling data in subsurface impact areas.
2. Nominal areas based on limits shown on Figure 5-1.
3. Total estimated volume calculated as product of area and depth, rounded to the nearest hundred cubic yards to be consistent with cost estimates (see Section 7.3).

TABLE 5-3A
QUALITATIVE SCREENING OF SOIL REMEDIAL TECHNOLOGIES

General Response Actions	Retained Technologies	Screening Criteria *(See Below for Definition of Criteria)*			Decision Retain/Eliminate
		Effectiveness	Implementability	Cost	
No Action	Continue operation and maintenance of existing interim measures, institutional controls, deed restrictions, and access controls	Low	High	Low	Retain
Institutional and Engineering Controls	Deed restrictions / ADEM environmental covenant, additional fencing, signage, training, facility policies (no dig policy)	Moderate	High	Low	Retain
Containment	Capping (soil covers, impermeable covers)	High	High	Moderate	Retain
Excavation/Disposal or Ex-situ Treatment	On-site landfill	High	Low	High	Eliminate (not feasible due to implementation difficulties and cost)
	Off-site disposal	High	Moderate to High	Moderate to High	Retain
	Chemical dehalogenation	Moderate to High	Moderate to Low	High	Retain
	Thermal desorption	Moderate to High	Moderate	High	Retain
In-situ Treatment	In-situ thermal desorption	Moderate	Moderate to Low (difficult to implement - will cause disruption to plant activities)	High	Eliminate (due to implementation difficulties and likely disruption to plant activities)

Screening Criteria Definitions:

Effectiveness (Short and Long Term)

High - Stand alone technology is highly effective at meeting RAOs for all COCs under site-specific conditions.

Moderate - Technology is moderately effective at meeting RAOs for most COCs under site-specific conditions. May require combination of other technologies to meet RAOs.

Low - Technology is ineffective at meeting RAOs for any COCs under site-specific conditions. Would require complex array of other technologies to meet RAOs.

Implementability

High - No difficulties with implementing technology under site-specific conditions. Technology readily available, proven, and reliable.

Moderate - Some difficulties with implementing technology under site-specific conditions but no fatal flaws. Technology available, proven, and of average reliability.

Low - Major difficulties with implementing technology under site-specific conditions. Fatal flaws identified. Technology not readily available, proven, and with low reliability.

Cost

High - High degree of capital investment and O&M intensity.

Moderate - Moderate degree of capital investment and O&M intensity.

Low - Low degree of capital investment and O&M intensity.

TABLE 5-3B
NUMERICAL SCREENING OF SOIL REMEDIAL TECHNOLOGIES

General Response Actions	Retained Technologies	Screening Criteria 1: Lowest (Less Favorable) and 10: Highest (More Favorable)				Decision Retain/Eliminate
		Effectiveness	Implementability	Cost	Total	
No Action	Continue operation and maintenance of existing interim measures, institutional controls, deed restrictions, and access controls	3	10	10	23	Retain
Institutional and Engineering Controls	Deed restrictions / ADEM environmental covenant, additional fencing, signage, training, facility policies (no dig policy)	6	9	9	24	Retain
Containment	Capping (soil covers, asphalt pavement, concrete)	8	8	6	22	Retain
Excavation/Disposal or Ex-situ Treatment	On-site landfill	8	2	3	13	Eliminate (not feasible due to implementation difficulties and cost)
	Off-site disposal	9	7	4	20	Retain
	Chemical dehalogenation	7	4	2	13	Retain
	Thermal desorption	7	5	3	15	Retain
In-situ Treatment	In-situ thermal desorption	6	3	3	12	Eliminate (due to implementation difficulties and likely disruption to plant activities)

Notes:
A rating of one (1) in any evaluation criteria was generally considered sufficient grounds for elimination of a particular technology, except for the No Action alternative which is required to be retained based on EPA guidance.

TABLE 5-3C
QUALITATIVE SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES

General Response Actions	Retained Technologies	Screening Criteria *(See Below for Definition of Criteria)*			Decision Retain/Eliminate
		Effectiveness	**Implementability**	**Cost**	
No Action	Continue operation and maintenance of existing institutional and engineering controls, access controls, deed restrictions, and groundwater corrective action systems	Moderate	High	Low	Retain
Institutional Controls	Deed restrictions / ADEM environmental covenant, access controls	Low to Moderate	High	Low	Retain
Natural Attenuation	Monitored Natural Attenuation (MNA)	Moderate (only applicable to some COCs)	High	Low	Retain
Containment	Vertical barriers (slurry wall, sheet pile wall)	Moderate (requires pumping wells)	Low (due to railroad tracks)	High	Eliminate (due to limited effectiveness, no extra advantages over pumping wells, and difficulties with implementing)
Extraction / Ex-situ Treatment	Disposal to POTW with or without pretreatment (e.g. carbon filtering)	High	High	Low to Moderate	Retain
	Disposal to NPDES discharge point with or without pretreatment (e.g. carbon filtering)	High	Low	Moderate to High	Eliminate (due to implementation difficulties, and lower effectiveness and higher cost than disposal to POTW)
In-situ Treatment	Enhanced bioremediation	Moderate (only applicable to some COCs)	Low (requires many injection points)	Moderate	Eliminate (due to limited effectiveness and difficulties with implementing)
	Nanoscale zero valent iron	Moderate (only applicable to some COCs)	Low (requires many injection points)	Moderate to High	Eliminate (due to limited effectiveness and difficulties with implementing)
	Funnel & gate with zero valent iron	Moderate (only applicable to some COCs)	Moderate	High	Retain

Screening Criteria Definitions:

Effectiveness

High - Stand alone technology is highly effective at meeting RAOs for all COCs under site-specific conditions.
Moderate - Technology is moderately effective at meeting RAOs for most COCs under site-specific conditions. May require combination of other technologies to meet RAOs.
Low - Technology is ineffective at meeting RAOs for any COCs under site-specific conditions. Would require complex array of other technologies to meet RAOs.

Implementability

High - No difficulties with implementing technology under site-specific conditions. Technology readily available, proven, and reliable.
Moderate - Some difficulties with implementing technology under site-specific conditions but no fatal flaws. Technology available, proven, and of average reliability.
Low - Major difficulties with implementing technology under site-specific conditions. Fatal flaws identified. Technology not readily available, proven, and with low reliability.

Cost

High - High degree of capital investment and O&M intensity.
Moderate - Moderate degree of capital investment and O&M intensity.
Low - Low degree of capital investment and O&M intensity.

TABLE 5-3D
NUMERICAL SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES

General Response Actions	Retained Technologies	Screening Criteria 1: Lowest (Less Favorable) and 10: Highest (More Favorable)				Decision Retain/Eliminate
		Effectiveness	Implementability	Cost	Total	
No Action	Continue operation and maintenance of existing institutional and engineering controls, access controls, deed restrictions, and groundwater corrective action systems	6	10	10	26	Retain
Institutional Controls	Deed restrictions / ADEM environmental covenant, access controls	4	8	8	20	Retain
Natural Attenuation	Monitored Natural Attenuation (MNA)	4	9	9	22	Retain
Containment	Vertical barriers (slurry wall, sheet pile wall)	5	2	2	9	Eliminate (due to limited effectiveness, no extra advantages over pumping wells, and difficulties with implementing)
Extraction / Ex-situ Treatment	Disposal to POTW with or without pretreatment (e.g. carbon filtering)	8	8	7	23	Retain
	Disposal to NPDES discharge point with or without pretreatment (e.g. carbon filtering)	8	3	4	15	Eliminate (due to implementation difficulties, remedy is also less effective than disposal to POTW with higher cost)
In-situ Treatment	Enhanced bioremediation	5	3	5	13	Eliminate (due to limited effectiveness and difficulties with implementing)
	Nanoscale zero valent iron	5	3	4	12	Eliminate (due to limited effectiveness and difficulties with implementing)
	Funnel & gate with zero valent iron	6	6	3	15	Retain (Retained as the best stand-alone in-situ treatment option)

Notes:
A rating of one (1) in any evaluation criteria was generally considered sufficient grounds for elimination of a particular technology, except for the No Action alternative which is required to be retained based on EPA guidance.

TABLE 6-1A
QUALITATIVE SCREENING OF REMEDIAL ALTERNATIVES FOR SOILS

General Response Actions	Retained Technologies	Remedial Alternatives				
		1S	2S	3S	4S	5S
Soil Remediation		No Action	Excavation	Containment	Treatment (BCD)	Treatment (TD)
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (residential land use restrictions) Administrative policies		X	X	X	X	X
Institutional and Engineering Controls	ADEM Environmental Covenant, additional fencing, signage, implementation of no dig policy		X	X	X	X
Containment	Capping (soil, asphalt pavement, concrete)			X		
Excavation /Disposal	Excavation & disposal off-site		X			
Excavation /Treatment	Excavation & treatment with chemical dehalogenation				X	
	Excavation & treatment with thermal desorption					X
Evaluation						
Criteria	Effectiveness	Low	High	High	Moderate / High	Moderate / High
	Implementability	High	Moderate / High	High	Moderate / Low	Moderate
	Cost	Low	High	Moderate to Low	High	High
Forward Decision	Retain / Eliminate	Retain	Retain	Retain	Retain	Retain

Screening Criteria Definitions:
See Table 5-3A or 5-3C for screening criteria definitions.
BCD - Base Catalyzed Dehalogenation; TD - Thermal Desorption

TABLE 6-1B
NUMERICAL SCREENING OF REMEDIAL ALTERNATIVES FOR SOILS

General Response Actions	Retained Technologies	Remedial Alternatives				
		1S	2S	3S	4S	5S
Soil Remediation		No Action	Excavation	Containment	Treatment (BCD)	Treatment (TD)
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (residential land use restrictions) Administrative policies		X	X	X	X	X
Institutional and Engineering Controls	ADEM Environmental Covenant, additional fencing, signage, implementation of no dig policy		X	X	X	X
Containment	Capping (soil, asphalt pavement, concrete)			X		
Excavation /Disposal	Excavation & disposal off-site		X			
Excavation /Treatment	Excavation & treatment with chemical dehalogenation				X	
	Excavation & treatment with thermal desorption					X
Evaluation						
Ranking	Effectiveness	3	9	8	7	7
	Implementability	10	7	8	4	5
	Cost	10	3	7	2	3
	Total	23	19	23	13	15
Forward Decision	Retain / Eliminate	Retain	Retain	Retain	Retain	Retain

Screening Criteria Definitions:

See Table 5-3A or 5-3C for screening criteria definitions.

A rating of one (1) in any evaluation criteria was generally considered sufficient grounds for elimination of a particular technology, except for the No Action alternative which is required to be retained based on EPA guidance.

BCD - Base Catalyzed Dehalogenation; TD - Thermal Desorption

TABLE 6-1C
QUALITATIVE SCREENING OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

General Response Actions	Retained Technologies	Remedial Alternatives				
		1GW	2GW	3GW	4GW	5GW
Groundwater Remediation		No Action	Extraction	MNA	Extraction & MNA	Treatment
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (groundwater use restrictions) Administrative policies Corrective action systems		**X**	**X**	**X**	**X**	**X**
Institutional Controls	ADEM Environmental Covenant		**X**	**X**	**X**	**X**
Natural Attenuation	Monitored natural attenuation (MNA)			**X**	**X**	
Extraction / Ex-situ Treatment	Expansion of the existing corrective action system with discharge to the POTW with or without pretreatment (e.g. carbon filtering)		**X**		**X**	
In-situ Treatment	Funnel & gate system with in-situ treatment using zero valent iron					**X**
Evaluation						
Criteria	Effectiveness	Moderate	High	Moderate to Low	High	Moderate
	Implementability	High	High	High	High	Moderate
	Cost	Low	Moderate / Low	Low	Moderate	High
Forward Decision	Retain / Eliminate	Retain	Retain	Eliminate (incorporated into 4GW)	Retain	Retain

Screening Criteria Definitions:
See Table 5-3A or 5-3C for screening criteria definitions.

TABLE 6-1D
NUMERICAL SCREENING OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

General Response Actions	Retained Technologies	Remedial Alternatives				
		1GW	2GW	3GW	4GW	5GW
Groundwater Remediation		No Action	Extraction	MNA	Extraction & MNA	Treatment
Continue operation and maintenance of existing: Institutional controls (access controls) Deed restrictions (groundwater use restrictions) Administrative policies Corrective action systems		**X**	**X**	**X**	**X**	**X**
Institutional Controls	ADEM Environmental Covenant		**X**	**X**	**X**	**X**
Natural Attenuation	Monitored natural attenuation (MNA)			**X**	**X**	
Extraction / Ex-situ Treatment	Expansion of the existing corrective action system with discharge to the POTW with or without pretreatment (e.g. carbon filtering)		**X**		**X**	
In-situ Treatment	Funnel & gate system with in-situ treatment using zero valent iron					**X**
Evaluation						
Ranking	Effectiveness	6	8	4	9	6
	Implementability	10	8	9	8	6
	Cost	10	7	9	6	3
	Total	26	23	22	23	15
Forward Decision	Retain / Eliminate	Retain	Retain	Eliminate (incorporated into 4GW)	Retain	Retain

Screening Criteria Definitions:
See Table 5-3A or 5-3C for screening criteria definitions.
A rating of one (1) in any evaluation criteria was generally considered sufficient grounds for elimination of a particular technology, except for the No Action alternative which is required to be retained based on EPA guidance.

TABLE 7-2
Compliance with ARARs and TBCs

				Remedial Action Alternative (See end of table for description of Alternatives)								
Action/Medium	**Requirements**	**Prerequisite**	**Citation**	**S-A**	**S-B**	**S-C**	**S-D**	**S-E**	**GW-A**	**GW-B**	**GW-C**	**GW-D**
Restoration of groundwater to its beneficial uses	May not exceed MCLs for organics and inorganics established under the Safe Drinking Water Act National Revised Primary Drinking Water Regulations for community water systems.	Presence of contaminants in groundwater of the State designated as potential underground sources of drinking water as defined in ADEM Admin. Code. r. 335-6-8-.03 – **relevant and appropriate**	40 C.F.R. § 141.61(a) and (c)	NA	NA	NA	NA	NA	X	X	X	X
			40 C.F.R. § 141.62(b)	NA	NA	NA	NA	NA	X	X	X	X
			ADEM Admin. Code r. 335-7-2-.03(1)	NA	NA	NA	NA	NA	X	X	X	X
			ADEM Admin. Code r. 335-7-2-.04(1)	NA	NA	NA	NA	NA	X	X	X	X
			ADEM Admin. Code r. 335-7-2-.05(1)	NA	NA	NA	NA	NA	X	X	X	X
Cleanup of PCB contaminated soil at sites in industrial areas	Recommends cleanup levels should be established within a range of 10 to 25ppm PCB. Recommends treatment, where practicable, for principle threat wastes (i.e., soils contaminated with PCBs greater than or equal to 500ppm).	CERCLA site with PCB contamination in soil requiring response action – **To Be Considered (TBC)**	U.S. EPA *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* [EPA/540/G-90/007]	X	X	X	X	X	NA	NA	NA	NA

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
General Construction Standards – All Land Disturbing Activities												
Activities causing stormwater runoff (e.g., clearing, grading, excavation)	Shall fully implement and regularly maintain effective best management practices (BMPs) to the maximum extent practicable, and in accordance with the operator's Construction Best Management Practices Plan (CBMPP).	All new and existing construction activities as defined in ADEM Admin. Code r. 335-6-12-.02(e) disturbing one (1) acre or more in size - **applicable**	ADEM Admin. Code r. 335-6-12-.05(2)	NA	X	X	X	X	NA	X	X	X
	Appropriate, effective pollution abatement/prevention facilities, structural and nonstructural BMPs, and management strategies shall be fully implemented prior to and concurrent with commencement of the regulated activities and regularly maintained during construction as needed at the site to meet or exceed the requirements of this chapter until construction is complete, effective reclamation and/or stormwater quality remediation is achieved.			NA	X	X	X	X	NA	X	X	X
	The operator shall take all reasonable steps to prevent and/or minimize, to the maximum extent practicable, any discharge in violation of this chapter or which has a reasonable likelihood of adversely affecting the quality of groundwater or surface water receiving the discharge(s).		ADEM Admin. Code r. 335-6-12-.06(4)	NA	X	X	X	X	NA	X	X	X
	Implement a comprehensive CBMPP appropriate for site conditions consistent with the substantive requirements of ADEM Admin. Code r. 335-6-12-.21 that has been prepared and certified by a Qualified Credentialed Professional (QCP).		ADEM Admin. Code r. 335-6-12-.21(2)(a)	NA	X	X	X	X	NA	X	X	X
	The CBMPP shall include a description of appropriate, effective water quality BMPs to be implemented at the site as needed to ensure compliance with this chapter and include but not limited to the measures provided in subsections 1. thru 14.		ADEM Admin. Code r. 335-6-12-.21(2)(b)	NA	X	X	X	X	NA	X	X	X
	BMPs shall be designed, implemented, and regularly maintained to provide effective treatment of discharges of pollutants in stormwater resulting from runoff generated by probable storm events expected/predicted during construction disturbance based on historic precipitation information, and during extended periods of adverse weather and seasonal conditions.		ADEM Admin. Code r. 335-6-12-.21(4)	NA	X	X	X	X	NA	NA	NA	NA
Activities causing fugitive dust emissions	Shall not cause, suffer, allow or permit any materials to be handled, transported, or stored; or a building, its appurtenances, or a road to be used . . . without taking reasonable precautions to prevent particulate matter from becoming airborne.	Fugitive emissions from construction operations, grading, or the clearing of land – **TBC**	ADEM Admin. Code r. 335-3-4-.02(1)[1]	NA	X	X	X	X	NA	NA	NA	NA
	Shall not cause or permit the discharge of visible fugitive dust emissions beyond the lot line of the property on which the emissions originate.		ADEM Admin. Code r. 335-3-4-.02(2)[2]	NA	X	X	X	X	NA	NA	NA	NA
Groundwater Monitoring/Extraction Well Installation, Operation, and Abandonment												
Construction of extraction and monitoring wells	All materials used in the construction of a water well shall have the structural strength to accomplish the purpose for which they are installed.	Installation of wells as defined in ADEM Admin. Code r. 335-9-1-.02(g) – **relevant and appropriate**	ADEM Admin. Code r. 335-9-1-.05(a)- (c)	NA	NA	NA	NA	NA	NA	X	X	X
	Must meet any relevant substantive requirements under ADEM Admin. Code r. 335-9-1.-.05 Materials and Admin. Code r. 335-9-1.-.06 Construction Standards related to casings, liners, screens, development and capping of wells.		ADEM Admin. Code r. 335-9-1-.06(a), (b), (c), (d), (e) & (h)	NA	NA	NA	NA	NA	NA	X	X	X
	Any holes remaining after construction or testing attempts shall be properly backfilled.		ADEM Admin. Code r. 335-9-1-.06(h)	NA	NA	NA	NA	NA	NA	X	X	X
Construction of monitoring wells	Must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated, and packed with gravel or sand where necessary, to enable sample collection at depths where appropriate aquifer flow zones exist. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth must be sealed with a suitable material (e.g., cement grout or bentonite slurry) to prevent contamination of samples and the groundwater.	Installation of groundwater monitoring wells at a RCRA facility in order to detect any statistically significant amounts of hazardous waste or hazardous waste constituents – **relevant and appropriate**	ADEM Admin. Code r. 335-14-5-.06(8)(c)	NA	NA	NA	NA	NA	NA	X	X	X
	Monitoring wells must be operated and maintained in a manner to prevent soil, surface water, and/or groundwater contamination. This requirement includes the installation of protective barriers around monitoring wells where necessary to prevent damage to the well from traffic or other causes.			NA	NA	NA	NA	NA	NA	X	X	X
	All monitoring wells must have functional key or combination locks on the wellhead covers to prevent unauthorized access. All monitoring wells must be assigned an identifying number by the facility, and such numbers must be permanently affixed to the outer casing of each monitoring well.			NA	NA	NA	NA	NA	NA	X	X	X
Abandonment of extraction wells, monitoring wells, and boreholes	Any well to be abandoned shall be permanently sealed in the following manner: The well must be filled with a puddled clay material containing 50 ppm of chlorine to within 20 feet of the top of the well. The top 20 feet shall be filled with cement grout or concrete.	Abandonment of extraction wells, monitoring wells, and boreholes – **relevant and appropriate**	ADEM Admin. Code r. 335-9-1-.06(g)	NA	NA	NA	NA	NA	NA	X	X	X
Activity associated with Class V injection wells (e.g., ZVI injections)	Injection activity cannot allow the movement of fluid containing any contaminant into drinking water, if the presence of that contaminant may cause a violation of the primary drinking water standards under 40 CFR part 141, other health based standards, or may otherwise adversely affect the health of persons.	Construction, operation, maintenance, conversion, plugging, or closure of Class V injection wells associated with remedial activity – **relevant and appropriate**	40 C.F.R. § 144.82(a)(1)	NA	NA	NA	NA	NA	NA	X	X	X
			ADEM Admin. Code r. 335-6-8-.05(1)(d)	NA	NA	NA	NA	NA	NA	X	X	X
Plugging and abandonment of Class V injection wells	Shall close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may otherwise adversely affect the health of persons.	Operation of a Class V injection well – **relevant and appropriate**	40 C.F.R. § 146.10(c)(1)	NA	NA	NA	NA	NA	NA	NA	NA	X
	Shall dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements.		40 C.F.R. § 146.10(c)(2)	NA	NA	NA	NA	NA	NA	NA	NA	X

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
Waste Generation, Characterization, Segregation, and Storage—Primary Wastes (e.g., excavated soils) and Secondary Wastes (e.g., treatment residues)												
Characterization of solid waste (all primary and secondary wastes)	Must determine if solid waste is excluded from regulation under 40 C.F.R. § 261.4(b); and	Generation of solid waste as defined in 40 C.F.R. § 261.2 —**applicable**	40 C.F.R. § 262.11(a)	NA	NA	NA	NA	NA	NA	NA	NA	X
	Must determine if waste is listed as hazardous waste under subpart D 40 C.F.R. Part 261; or	Generation of solid waste which is not excluded under 40 C.F.R. § 261.4(a) —**applicable**	40 C.F.R.§ 262.11(b)	NA	X	NA	X	X	NA	X	X	X
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR part 261by either: (1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or (2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.		40 C.F.R. § 262.11(c)	NA	X	NA	X	X	NA	X	X	X
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste – **applicable**	40 C.F.R. § 262.11(d)	NA	X	NA	X	X	NA	X	X	X
Characterization of hazardous waste (all primary and secondary wastes)	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 C.F.R. Parts 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 264.13(a)(1)	NA	X	NA	X	X	NA	X	X	X
Determinations for management of hazardous waste	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 CFR 268 et seq. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)	NA	X	NA	X	X	NA	X	X	X
	Must determine the underlying hazardous constituents [as defined in 40 C.F.R. § 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)	NA	X	NA	X	X	NA	X	X	X
	Must determine if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. Note: This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.		40 C.F.R. § 268.7(a)	NA	X	NA	X	X	NA	X	X	X
Temporary on-site storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. § 260.10 – **applicable**	40 C.F.R. § 262.34(a)	NA	X	NA	X	X	NA	X	X	X
	· Waste is placed in containers that comply with 40 C.F.R. §§ 265.171-173; and		40 C.F.R. § 262.34(a)(1)(i)	NA	X	NA	X	X	NA	X	X	X
	· The date upon which accumulation begins is clearly marked and visible for inspection on each container; and		40 C.F.R. § 262.34(a)(2)	NA	X	NA	X	X	NA	X	X	X
	· Container is marked with the words “hazardous waste”; or		40 C.F.R. § 264.34(a)(3)	NA	X	NA	X	X	NA	X	X	X
	· Container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation – **applicable**	40 C.F.R. § 262.34(c)(1)	NA	X	NA	X	X	NA	X	X	X
Use and management of hazardous waste in containers	If container is not in good condition (e.g., severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers – **applicable**	40 C.F.R. § 265.171	NA	X	NA	X	X	NA	X	X	X
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 C.F.R. § 265.172	NA	X	NA	X	X	NA	X	X	X
	Keep containers closed during storage, except to add/remove waste.		40 C.F.R. § 265.173(a)	NA	X	NA	X	X	NA	X	X	X
	Open, handle, and store containers in a manner that will not cause containers to rupture or leak.		40 C.F.R. § 265.173(b)	NA	X	NA	X	X	NA	X	X	X
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 C.F.R. § 264.175(b).	Storage of RCRA hazardous waste in containers with free liquids – **applicable**	40 C.F.R. § 264.175(a)	NA	X	NA	X	X	NA	X	X	X
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that do not contain free liquids (other than F020, F021, F022, F023, F026 and F027) –**applicable**	40 C.F.R. § 264.175(c)	NA	X	NA	X	X	NA	X	X	X
Temporary on-site storage of remediation waste in staging piles (e.g., excavated soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated.	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 C.F.R. § 260.10 –**applicable**	40 C.F.R. § 264.554(a)(1)	NA	X	NA	X	X	NA	X	X	X
	May be temporarily stored, (including mixing, sizing, blending or other similar physical operations intended to prepare the wastes for subsequent management or treatment) at a facility if used only during remedial operations provided that the staging pile:		40 C.F.R. § 264.554(a)(1)	NA	X	NA	X	X	NA	X	X	X
	· Must facilitate a reliable, effective and protective remedy;		40 C.F.R. § 264.554(d)(1)(i)	NA	X	NA	X	X	NA	X	X	X
	· Must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g., use of liners, covers, run-off/run-on controls); and		40 C.F.R. § 264.554(d)(1)(ii)	NA	X	NA	X	X	NA	X	X	X

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
	· Must not operate for more than 2 years, except when an operating term extension under 40 CFR 264.554(i) is granted. Note: Must measure the 2-year limit (or other operating term specified) from first time remediation waste placed in staging pile.		40 C.F.R. § 264.554(d)(1)(iii)	NA	X	NA	X	X	NA	X	X	X
	Must not use staging pile longer than the length of time designated by EPA in appropriate decision document.		40 C.F.R. § 264.554(i)(1)	NA	X	NA	X	X	NA	X	X	X
	Extension of up to an additional 180 days beyond the operating term limit may be granted provided the continued operation of the staging pile: · Will not pose a threat to human health and the environment; and · Is necessary to ensure timely and efficient implementation of remedial actions at the facility.		40 CFR 264.554(i)(1)(i) and (ii)	NA	X	NA	X	X	NA	X	X	X
	In setting standards and design criteria, must consider the following factors: · Length of time pile will be in operation; · Volumes of waste you intend to store in the pile; · Physical and chemical characteristics of the wastes to be stored in the unit; · Potential for releases from the unit; · Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases; and · Potential for human and environmental exposure to potential releases from the unit.		40 C.F.R. § 264.554(d)(2)(i) –(vi)	NA	X	NA	X	X	NA	X	X	X
	Must not place ignitable or reactive remediation waste in a staging pile unless the remediation waste has been treated, rendered, or mixed before placed in the staging pile so that:	Storage of ignitable or reactive remediation waste in staging pile—**applicable**	40 C.F.R. §264.554(e)	NA	X	NA	X	X	NA	X	X	X
	The remediation waste no longer meets the definition of ignitable or reactive under 40 CFR 261.21 or 40 CFR 261.23; and You have complied with 40 C.F.R. §264.17(b); or		40 C.F.R. §264.554(e)(1)(i) and (ii)	NA	X	NA	X	X	NA	X	X	X
	Must manage the remediation waste to protect it from exposure to any material or condition that may cause it to ignite or react.		40 C.F.R. §264.554(e)(2)	NA	X	NA	X	X	NA	X	X	X
	Must not place in the same staging pile unless you have complied with 40 C.F.R. § 264.17(b)	Storage of "incompatible" remediation waste (as defined in 40 C.F.R. § 260.10) in staging pile in – **applicable**	40 C.F.R. § 264.554(f)(1)	NA	X	NA	X	X	NA	X	X	X
	Must separate the incompatible waste or materials, or protect them from on another by using a dike, berm, wall, or other device.	Staging pile of remediation waste stored nearby to incompatible wastes or materials in containers, other piles, open tanks or land disposal units—**applicable**	40 C.F.R. § 264.554(f)(2)	NA	X	NA	X	X	NA	X	X	X
	Must not pile remediation waste on same base where incompatible wastes or materials were previously piled unless you have sufficiently decontaminated the base to comply with 40 C.F.R. § 264.17(b).		40 C.F.R. § 264.554(f)(3)	NA	X	NA	X	X	NA	X	X	X
Closure of staging piles of remediation waste	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.	Storage of remediation waste in staging pile in previously contaminated area – **applicable**	40 C.F.R. § 264.554(j)(1)	NA	X	NA	X	X	NA	X	X	X
	Must decontaminate contaminated sub-soils in a manner that EPA determines will protect human and the environment.		40 C.F.R. § 264.554(j)(2)	NA	X	NA	X	X	NA	X	X	X
	Must be closed within 180 days after the operating term according to 40 C.F.R. §§ 264.258(a) and 264.111, or 265.258(a) and 265.111.	Storage of remediation waste in staging pile in uncontaminated area – **applicable**	40 C.F.R. § 264.554(k)	NA	X	NA	X	X	NA	X	X	X
Waste Treatment and Disposal — Contaminated Groundwater, Excavated Soils, Debris, and Secondary Wastes												
Discharge of treated groundwater to surface water	Comply with any applicable substantive water quality requirements under the Alabama Water Pollution Control Act (AWPCA) or the Clean Water Act (CWA) including application of technology- or ambient water quality- based effluent limitations to ensure discharge does not cause or contribute to violation of water quality standards.	Discharge of pollutants into waters of the State – **applicable**	ADEM Admin. Code r. 335-6-6-.04(f), (h), (i), and (j)	NA	NA	NA	NA	NA	NA	X	X	NA
	Conditions for the discharge shall meet the requirements, as appropriate, provided in ADEM Admin. Code r. 335-6-6-.14 such as the following: · Technology based effluent limitations and standards under Sections 301, 302, 303, 304, 307, 318, and 405 of the Clean Water Act, including any applicable toxic effluent standard or prohibition under 40 CFR Subchapter N. · Other requirements in addition to or more stringent than promulgated effluent limitations, guidelines, or standards under Sections 301, 306, 307, 318, and 405 of the Clean Water Act where necessary to achieve water quality standards established under Section 303 of the Clean Water Act and AWPCA §2-22-9(g)		ADEM Admin. Code r. 335-6-6-.14 (3)(a), (b), (e)	NA	NA	NA	NA	NA	NA	X	X	NA
	Limitations must be applied to control all pollutants or pollutant parameters that are or may be discharged at a level which cause, have reasonable potential to cause or contribute to an exceedance of a narrative or numerical water quality standard.		ADEM Admin. Code r. 335-6-6-.14(e)(1)(i)	NA	NA	NA	NA	NA	NA	X	X	NA
Discharge of treated groundwater to POTW	Shall not introduce into publicly or privately owned treatment works any pollutant(s) which, alone on in conjunction with a discharge or discharges from other sources, cause pass through or interference or in any other manner adversely impact the operation or performance of the treatment works, to include the method of sludge disposal in use by the publicly or privately owned treatment works.	Discharge pollutants into POTW or privately-owned treatment facility operated by a person other than the indirect discharger – **applicable**	ADEM Admin. Code r. 335-6-5-.03(1)	NA	NA	NA	NA	NA	NA	X	X	NA
	The following pollutants may not be introduced into a POTW:		ADEM Admin. Code r. 335-6-5-.03(2)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 C.F.R. § 261.21;		ADEM Admin. Code r. 335-6-5-.03(2)(a)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Pollutants which will cause corrosive structural damage to the treatment works, but in no case discharges with pH lower than 5.0, unless the treatment works are specifically designed to accommodate such discharges;		ADEM Admin. Code r. 335-6-5-.03(2)(b)	NA	NA	NA	NA	NA	NA	X	X	NA

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
	· Solid or viscous pollutants in amounts which will cause obstruction to the flow in sewers, or other interference with the operation of the treatment works;		ADEM Admin. Code r. 335-6-5-.03(2)(c)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge of such volume or strength as to cause interference in the treatment works;		ADEM Admin. Code r. 335-6-5-.03(2)(d)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Heat in amounts which will inhibit biological activity in the treatment plant resulting in interference but in no case in such quantities that the temperature of the influent, at the treatment plant, exceeds 40 °C (104 °F) unless the treatment plant is designed to accommodate such heat;		ADEM Admin. Code r. 335-6-5-.03(2)(e)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Pollutants which result in the presence of toxic gases, vapors, or fumes within the treatment works in a quantity that may cause acute worker health and safety problems;		ADEM Admin. Code r. 335-6-5-.03(2)(f)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Any trucked or hauled pollutants, except at discharge points designated by the treatment works; and		ADEM Admin. Code r. 335-6-5-.03(2)(g)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.		ADEM Admin. Code r. 335-6-5-.03(2)(h)	NA	NA	NA	NA	NA	NA	X	X	NA
Disposal of RCRA hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 C.F.R. § 268.40 before land disposal.	Land disposal, as defined in 40 C.F.R. § 268.2, of restricted RCRA waste **– applicable**	40 C.F.R. § 268.40(a)	NA	X	X	X	X	NA	NA	NA	NA
	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards, found in 40 CFR 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well **– applicable**	40 C.F.R. §268.40(e)	NA	X	X	X	X	NA	NA	NA	NA
Transport and treatment of collected RCRA wastewater	Any dedicated tank systems, conveyance systems, and ancillary equipment used to treat, store or convey wastewater to an on-site NPDES-permitted wastewater treatment facility are exempt from the requirements of RCRA Subtitle C standards.	On-site wastewater treatment unit (as defined in 40 CFR 260.10) subject to regulation under § 402 or § 307(b) of the CWA (i.e., NPDES-permitted) that manages hazardous wastewaters **-applicable**	40 C.F.R. §264.1(g)(6)	NA	X	X	X	X	NA	X	X	NA
Disposal of RCRA characteristic wastewaters in an NPDES permitted wastewater treatment unit	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under 402 the CWA (i.e., NPDES permitted), unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Land disposal of hazardous wastewaters that are hazardous only because they exhibit a characteristic and are not otherwise prohibited under 40 CFR 268 **– applicable**	40 C.F.R. §268.1(c)(4)(i)	NA	X	X	X	X	NA	X	X	NA
Disposal of RCRA characteristic wastewaters in a POTW	Are not prohibited, if the wastes are treated for purposes of the pretreatment requirements of Section 307 of the CWA, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.		40 C.F.R. §268.1(c)(4)(ii)	NA	X	X	X	X	NA	X	X	NA
Disposal of RCRA-hazardous waste soil in a land-based unit	Must be treated according to the alternative treatment standards of 40 C.F.R. § 268.49(c) or according to the UTSs specified in 40 C.F.R. § 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 C.F.R. 268.2, of restricted hazardous soils **– applicable**	40 C.F.R. § 268.49(b)	NA	X	NA	X	X	NA	NA	NA	NA
Treatment of RCRA hazardous waste soil	Prior to land disposal, all "constituents subject to treatment" as defined in 40 C.F.R. § 268.49(d) must be treated as follows:	Treatment of restricted hazardous waste soils – **applicable**	40 C.F.R. § 268.49(c)(1)	NA	NA	NA	X	X	NA	NA	NA	NA
	· **For non-metals** (except carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations, except as provided in 40 C.F.R. § 268.49(c)(1)(C).		40 C.F.R. § 268.49(c)(1)(A)	NA	NA	NA	X	X	NA	NA	NA	NA
	· **For metals** and carbon disulfide, cyclohexanone, and methanol,), treatment must achieve a 90 percent reduction in total constituent concentrations as measured in leachate from the treated media (tested according to TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal technology is used), except as provided in 40 C.F.R. § 268.49(c)(1)(C).		40 C.F.R. § 268.49(c)(1)(B)	NA	NA	NA	X	X	NA	NA	NA	NA
	· When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. [Universal Treatment Standards are identified in 40 C.F.R. § 268.48 Table UTS].		40 C.F.R. § 268.49(c)(1)(C)	NA	NA	NA	X	X	NA	NA	NA	NA
	In addition to the treatment requirement required by paragraph (c)(1) of this section, soils must be treated to eliminate these characteristics.	Land disposal of soils that exhibit the characteristic of ignitability, corrosivity, or reactivity **– applicable**	40 C.F.R. § 268.49(c)(2)	NA	NA	NA	X	X	NA	NA	NA	NA
	Provides methods on how to demonstrate compliance with the alternative treatment standards for contaminated soils that will be land disposed.	Treatment of restricted hazardous waste soils following alternative soil treatment of 40 C.F.R. § 268.49(c) **– To Be Considered**	Guidance on Demonstrating Compliance with the LDR Alternative Soil Treatment Standards [EPA 530-R-02-003, July 2002]	NA	NA	NA	X	X	NA	NA	NA	NA
Treatment of contaminated soils with RCRA hazardous constituents	Unit must be located, designed, constructed, operated and maintained, and closed in a manner that will ensure protection of human health and the environment.	Treatment of RCRA hazardous waste in miscellaneous units, except as provided in 40 CFR 264.1 - **relevant and appropriate**	40 C.F.R. § 264.601	NA	NA	NA	X	X	NA	NA	NA	NA
	Protection of human health and the environment includes, but is not limited to: prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering the factors listed in 40 CFR 264.601(c)(1) thru (7)		40 C.F.R. § 264.601(c)	NA	NA	NA	X	X	NA	NA	NA	NA
	The requirements of RCRA Subpart AA-Air Emission Standards for Process Vents do not apply to process vents that would otherwise be subject to this subpart when equipped with emission controls and operated in accordance with an applicable Clean Air Act regulation codified under 40 CFR part 60, part 61 or part 63.	Process vents associated with air or steam stripping operations that manage hazardous wastes with organic concentrations of at least 10ppmw - **relevant and appropriate**	40 C.F.R. § 264.1030(e)	NA	NA	NA	X	X	NA	NA	NA	NA
	The requirements of RCRA Subpart CC – Air Emission Standards for Tanks, Surface Impoundments, and Containers do not apply to a waste management unit that is solely used for on-site treatment or storage of hazardous waste that is placed in the unit as result of implementing remedial activities required under RCRA 3004(u) and (v), or 3008(h), or CERCLA authorities.	Air pollutant emissions with volatile organics from a hazardous waste tank, surface impoundment, or container **- relevant and appropriate**	40 C.F.R. § 264.1080(a)(5)	NA	NA	NA	X	X	NA	NA	NA	NA

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
PCB Waste Generation, Management and Storage												
Management of PCB waste (e.g., contaminated PPE, equipment, wastewater)	Any person storing or disposing of PCB waste must do so in accordance with 40 C.F.R. § 761, Subpart D.	Generation of waste containing PCBs at concentrations ≥50 ppm —**applicable**	40 C.F.R. § 761.50(a)	NA	X	X	X	X	NA	X	X	X
Management of PCB remediation waste	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 C.F.R. § 761.3 — **applicable**	40 C.F.R. § 761.61	NA	X	X	X	X	NA	X	X	X
Temporary storage of PCB waste in a container(s)	Container(s) shall be marked as illustrated in 40 C.F.R. § 761.45(a).	Storage of PCBs and PCB Items at concentrations ≥50 ppm for disposal— **applicable**	40 C.F.R. § 761.40(a)(1)	NA	X	NA	X	X	NA	X	X	X
	Storage area must be properly marked as required by 40 C.F.R. § 761.40(a)(10).		40 C.F.R. § 761.65(c)(3)	NA	X	NA	X	X	NA	X	X	X
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked non-leaking container(s).		40 C.F.R. § 761.65(c)(5)	NA	X	NA	X	X	NA	X	X	X
	Container(s) shall be in accordance with requirements set forth in DOT HMR at 49 C.F.R. §§ 171-180.		40 C.F.R. § 761.65(c)(6)	NA	X	NA	X	X	NA	X	X	X
Storage of PCB waste in non-RCRA regulated unit	Storage facility must have:	Storage of PCBs and PCB Items at concentrations 50 ppm or greater for disposal — **applicable**	40 C.F.R. § 761.65(b)(1)	NA	X	NA	X	X	NA	X	X	X
	· Adequate roof and walls to prevent rainwater from reaching stored PCBs and PCB items;		40 C.F.R. § 761.65(b)(1)(i)	NA	X	NA	X	X	NA	X	X	X
	· Adequate floor that has continuous curbing with a minimum six-inch high curb. Floor and curb must provide a containment volume equal to at least two times the internal volume of the largest PCB article or container or 25% of the internal volume of all articles or containers stored there, whichever is greater.		40 C.F.R. § 761.65(b)(1)(ii)	NA	X	NA	X	X	NA	X	X	X
	· No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area;		40 C.F.R. § 761.65(b)(1)(iii)	NA	X	NA	X	X	NA	X	X	X
	· Floors and curbing constructed of Portland cement, concrete, or a continuous, smooth, non-porous surface that prevents or minimizes penetration of PCBs; and		40 C.F.R. § 761.65(b)(1)(iv)	NA	X	NA	X	X	NA	X	X	X
	Storage facility must not located at a site that is below the 100-year flood water elevation.		40 C.F.R. § 761.65(b)(1)(v)	NA	X	NA	X	X	NA	X	X	X
	Storage area must be properly marked as required by 40 C.F.R. § 761.40(a)(10).		40 C.F.R. § 761.65(c)(3)	NA	X	NA	X	X	NA	X	X	X
Storage of PCB waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 C.F.R. § 761.65(b)(1) provided unit:	Storage of PCBs and PCB Items designated for disposal — **applicable**	40 C.F.R. § 761.65(b)(2)	NA	X	NA	X	X	NA	X	X	X
	· Is permitted by EPA under RCRA § 3004 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761; or		40 C.F.R. § 761.65(b)(2)(i)	NA	X	NA	X	X	NA	X	X	X
	· Qualifies for interim status under RCRA § 3005 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761; or		40 C.F.R. § 761.65(b)(2)(ii)	NA	X	NA	X	X	NA	X	X	X
	· Is permitted by an authorized state under RCRA § 3006 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 C.F.R. § 761.		40 C.F.R. § 761.65(b)(2)(iii)	NA	X	NA	X	X	NA	X	X	X
Temporary storage of Bulk PCB remediation waste in a waste pile	May be stored at the clean-up site or site of generation for 180 days subject to the following conditions: · Waste must be placed in a pile is designed and operated to control dispersal by wind, where necessary, by means other than wetting;	Storage of PCB remediation waste or PCB bulk product waste in a waste pile—**applicable**	40 C.F.R. § 761.65(c)(9)(i)	NA	X	X	X	X	NA	X	X	X
	· Waste must not generate leachate through decomposition or other reactions.		40 C.F.R. § 761.65(c)(9)(ii)	NA	X	X	X	X	NA	X	X	X
	Storage site must have a liner designed, constructed, and installed to prevent any migration of wastes off or through liner into adjacent subsurface soil, groundwater or surface water at any time during the active life (including closure period) of the storage site.		40 C.F.R. § 761.65(c)(9)(iii)(A)	NA	X	X	X	X	NA	X	X	X
	Liner must be: · Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure because of pressure gradients, physical contact with waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;		40 C.F.R. § 761.65(c)(9)(iii)(A)(1)	NA	X	X	X	X	NA	X	X	X
	· Placed on foundation or base capable of providing support to liner and resistance to pressure gradients above and below the liner to present failure because of settlement compression or uplift;		40 C.F.R. § 761.65(c)(9)(iii)(A)(2)	NA	X	X	X	X	NA	X	X	X
	· Installed to cover all surrounding earth likely to be in contact with waste.		40 C.F.R. § 761.65(c)(9)(iii)(A)(3)	NA	X	X	X	X	NA	X	X	X
	Has a cover that meets the above requirements and installed to cover all of the stored waste likely to be contacted by precipitation, and is secured so as not to be functionally disabled by winds expected under normal weather conditions at the storage site; and		40 C.F.R. § 761.65(c)(9)(iii)(B)	NA	X	X	X	X	NA	X	X	X
	Has a run-on control system designed, constructed, operated and maintained such that it:		40 C.F.R. § 761.65(c)(9)(iii)(C)	NA	X	X	X	X	NA	X	X	X
	· Prevents flow on the stored waste during peak discharge from at least a 25-year storm;		40 C.F.R. § 761.65(c)(9)(iii)(C)(1)	NA	X	X	X	X	NA	X	X	X
	· Collects and controls at least the water volume resulting from a 24-hour, 25-year storm.		40 C.F.R. § 761.65(c)(9)(iii)(C)(2)	NA	X	X	X	X	NA	X	X	X
	Collection and holding facilities (e.g., tanks or basins) must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.											
	Requirements of 40 C.F.R. § 761.65(c)(9) may be modified under the risk-based disposal option of 40 C.F.R.§ 761.61(c).		40 C.F.R. § 761.65(c)(9)(iv)	NA	X	X	X	X	NA	X	X	X

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
PCB Treatment/Disposal												
Disposal of decontamination waste and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 C.F.R. § 761.79(g)(1) – (6).	Decontamination waste and residues — **applicable**	40 C.F.R. § 761.79(g)	NA	X	X	X	X	NA	X	X	X
	Are regulated for disposal as PCB remediation waste.	Distillation bottoms or residues and filter media — **applicable**	40 C.F.R. § 761.79(g)(1)	NA	X	X	X	X	NA	X	X	X
	Are regulated for disposal at their original concentration.	PCBs physically separated from regulated waste during decontamination, other than distillation bottoms and filter media — **applicable**	40 C.F.R. § 761.79(g)(2)	NA	X	X	X	X	NA	X	X	X
	Must be burned and marketed in accordance with used oil requirements in 40 C.F.R. § 761.20(e), or disposed of in accordance with 40 C.F.R. § 761.60(a) or (e), or decontaminated pursuant to the section.	Hydrocarbon solvent used or reused for decontamination that contains < 50 ppm PCBs — **applicable**	40 C.F.R. § 761.79(g)(3)	NA	X	X	X	X	NA	X	X	X
	Shall be disposed of in an incinerator operating in compliance with 40 C.F.R. § 761.70, or decontaminated pursuant to this section.	Chlorinated solvent at any concentration PCBs used for decontamination — **applicable**	40 C.F.R. § 761.79(g)(4)	NA	X	X	X	X	NA	X	X	X
	Shall be disposed of in accordance with 40 C.F.R. § 761.60(a), or decontaminated pursuant to this section.	Solvents ≥50 ppm PCBs [other than those described in 40 C.F.R. § 761.79(g)(3) and (g)(4)] — **applicable**	40 C.F.R. § 761.79(g)(5)	NA	X	X	X	X	NA	X	X	X
	Shall be disposed of in accordance with provisions for wastes from cleanup of PCB remediation waste at 40 C.F.R. § 761.61(a)(5)(v).	Non-liquid cleaning materials and PPE at any concentration PCBs, including non-porous surfaces and other non-liquid materials (e.g., rags, gloves, booties) resulting from decontamination — **applicable**	40 C.F.R. § 761.79(g)(6)	NA	X	X	X	X	NA	X	X	X
Disposal of bulk PCB remediation waste off-site (self- implementing option)	May be sent off-site for decontamination or disposal provided the waste is either dewatered on-site or transported off-site in containers meeting the requirements of DOT HMR at 49 C.F.R. Parts 171-180.	Generation of bulk PCB remediation waste (as defined in 40 C.F.R. § 761.3) for disposal — **applicable**	40 C.F.R. § 761.61(a)(5)(i)(B)	NA	X	NA	X	X	NA	X	X	X
	Must provide written notice including the quantity to be shipped and highest concentration of PCBs [using extraction EPA Method 3500B/3540C or Method 3500B/3550B followed by chemical analysis using Method 8082 in SW-846 or methods validated under 40 C.F.R. §§ 761.320 – 761.326 (Subpart Q)] at least 15 days before the first shipment of waste to each off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval.		40 C.F.R. § 761.61(a)(5)(i)(B)(2)(iv)	NA	X	NA	X	X	NA	X	X	X
	Shall be disposed of in accordance with the provisions for Cleanup wastes at 40 C.F.R. § 761.61(a)(5)(v)(A).	Bulk PCB remediation waste which has been de-watered and with a PCB concentration < 50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(B)(2)(ii)	NA	X	NA	X	X	NA	X	X	X
	Shall be disposed of: · In a hazardous waste landfill permitted by EPA under §3004 of RCRA; · In a hazardous waste landfill permitted by a State authorized under §3006 of RCRA; or · In a PCB disposal facility approved under 40 C.F.R. § 761.60.	Bulk PCB remediation waste which has been de-watered and with a PCB concentration ≥50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(B)(2)(iii)	NA	X	NA	X	X	NA	X	X	X
Disposal of PCB contaminated porous surfaces	Shall be disposed on-site or off-site as bulk PCB remediation waste according to 40 C.F.R. § 761.61(a)(5)(i) or decontaminated for use according to 40 C.F.R. § 761.79(b)(4).	PCB remediation waste porous surfaces (as defined in 40 C.F.R. § 761.3) — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(iii)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disposal liquid PCB remediation waste	Shall either: · Decontaminate the waste to the levels specified in 40 C.F.R. § 761.79(b)(1) or (2); or	Liquid PCB remediation waste (as defined in 40 C.F.R. § 761.3) — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(iv)(A)	NA	NA	NA	NA	NA	NA	X	X	NA
	· Dispose of the waste in accordance with 40 C.F.R. § 761.61(b) or a risk-based approval under 40 C.F.R. § 761.61(c).		40 C.F.R. § 761.61(a)(5)(iv)(B)	NA	NA	NA	NA	NA	NA	X	X	NA
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials)	Shall be disposed of either: · In a facility permitted, licensed or registered by a State to manage municipal solid waste under 40 C.F.R. § 258 or non-municipal, non-hazardous waste subject to 40 C.F.R. §§ 257.5 thru 257.30; or · In a RCRA Subtitle C landfill permitted by a State to accept PCB waste; or · In an approved PCB disposal facility; or · Through decontamination under 40 C.F.R. § 761.79(b) or (c).	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(v)(A)	NA	X	X	X	X	NA	X	X	X
Disposal of PCB cleaning solvents, abrasives, and equipment	May be reused after decontamination in accordance with 40 C.F.R. §761.79; or	Generation of PCB wastes from the cleanup of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(v)(B)	NA	X	X	X	X	NA	X	X	X
	For liquids, disposed in accordance with 40 C.F.R. § 761.60(a).		40 C.F.R. § 761.60(b)(1)(i)(B)	NA	X	X	X	X	NA	X	X	X
Performance-based disposal of PCB remediation waste	May dispose by one of the following methods:	Disposal of non-liquid PCB remediation waste (as defined in 40 C.F.R. § 761.3) — **relevant and appropriate**	40 C.F.R. § 761.61(b)(2)	NA	X	X	X	X	NA	X	X	X
	· In a high-temperature incinerator approved under 40 C.F.R. § 761.70(b); · By an alternate disposal method approved under 40 C.F.R. § 761.60(e); · In a chemical waste landfill approved under 40 C.F.R. § 761.75; · In a facility with a coordinated approval issued under 40 C.F.R. § 761.77; or		40 C.F.R. § 761.61(b)(2)(i)	NA	X	X	X	X	NA	X	X	X
	· Through decontamination in accordance with 40 C.F.R. § 761.79.		40 C.F.R. § 761.61(b)(2)(ii)	NA	X	NA	X	NA	NA	NA	NA	NA
	Shall be disposed according to 40 C.F.R. § 761.60(a) or (e), or decontaminate in accordance with 40 C.F.R. § 761.79.	Disposal of liquid PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(b)(1)	NA	X	NA	X	X	NA	NA	NA	NA

TABLE 7-2
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Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
Risk-based disposal of PCB remediation waste (e.g., West End and South Landfills)	May dispose of in a manner other than prescribed in 40 C.F.R. § 761.61(a) or (b) if approved in writing by EPA and method will not pose an unreasonable risk of injury to human health or the environment.	Disposal of PCB remediation waste — **relevant and appropriate**	40 C.F.R. § 761.61(c)	NA	X	X	X	X	NA	NA	NA	NA
			PCB Decontamination/Cleanup									
Decontamination of PCB contaminated water	For discharge to a treatment works as defined in 40 C.F.R. § 503.9 (aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or	Water containing PCBs regulated for disposal — **applicable**	40 C.F.R. § 761.79(b)(1)(ii)	NA	X	NA	X	X	NA	NA	NA	NA
	For unrestricted use, meet standard of 0.5 ppb PCBs.		40 C.F.R. § 761.79(b)(1)(iii)	NA	X	X	X	X	NA	X	X	X
Cleanup of porous surfaces with PCBs (self-implementing)	In both high and low occupancy areas, any person disposing of such, must do so based on the levels in 40 C.F.R. § 761.61(a)(4)(i).	PCB remediation waste porous surfaces (as defined in 40 C.F.R. § 761.3) on which PCBs have been spilled — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(iii)	NA	X	X	X	X	NA	X	X	NA
	May be cleaned up for use in accordance with 40 C.F.R. § 761.79(b)(4) or § 761.30(p).											
Cleanup of bulk PCB remediation waste on-site (self-implementing)	May do so subject to all of the following:	Cleanup of PCB remediation waste on-site or using a soil washing process — **relevant and appropriate**	40 C.F.R. § 761.61(a)(5)(i)(A)	NA	NA	NA	X	X	NA	NA	NA	NA
	· A non-chlorinated solvent is used;		40 C.F.R. § 761.61(a)(5)(i)(A)(1)	NA	NA	NA	X	NA	NA	NA	NA	NA
	· The process occurs at ambient temperature;		40 C.F.R. § 761.61(a)(5)(i)(A)(2)	NA	NA	NA	X	NA	NA	NA	NA	NA
	· The process is not exothermic;		40 C.F.R. § 761.61(a)(5)(i)(A)(3)	NA	NA	NA	X	NA	NA	NA	NA	NA
	· The process uses no external heat;		40 C.F.R. § 761.61(a)(5)(i)(A)(4)	NA	NA	NA	X	NA	NA	NA	NA	NA
	· The process has secondary contaminant to prevent any solvent from being released to the underlying or surrounding soils or surface waters; and		40 C.F.R. § 761.61(a)(5)(i)(A)(5)	NA	NA	NA	X	X	NA	NA	NA	NA
	· Solvent disposal, recovery, and/or reuse is in accordance with relevant provisions of 40 C.F.R. § 761.61(b)(1) or § 761.61(c) or applicable paragraphs of 40 C.F.R. § 761.79.		40 C.F.R. § 761.61(a)(5)(i)(A)(6)	NA	NA	NA	X	NA	NA	NA	NA	NA
Bulk PCB remediation waste left in place at cleanup site (self-implementing)	May remain onsite without further conditions.	Bulk PCB remediation waste remaining in a high occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations ≤1 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(A)	NA	X	X	X	X	NA	NA	NA	NA
	Shall be covered with a cap meeting the requirements of 40 C.F.R. § 761.61(a)(7) and 40 C.F.R. § 761.61(a)(8) [See below].	Bulk PCB remediation waste remaining in a high occupancy area (as defined in 40 C.F.R. 761.3) at concentrations > 1 ppm and 10 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(A)	NA	X	X	X	X	NA	NA	NA	NA
	May remain onsite without further conditions.	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations ≤ 25 — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(1)	NA	X	X	X	X	NA	NA	NA	NA
	May remain on-site if the site is secured by a fence and marked with a sign including the M_L mark.	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. § 761.3) at concentrations > 25 ppm and ≤ [sic] 50 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(2)	NA	X	X	X	X	NA	NA	NA	NA
	May remain onsite if the site is covered with a cap meeting the requirements of 40 C.F.R. § 761.61(a)(7) and (8). [See below]	Bulk PCB remediation waste remaining in a low occupancy area (as defined in 40 C.F.R. 761.3) at concentrations > 50 ppm and ≤ 100 ppm — **relevant and appropriate**	40 C.F.R. § 761.61(a)(4)(i)(B)(3)	NA	X	X	X	X	NA	NA	NA	NA
Cap requirements for Bulk PCB remediation waste left in place at cleanup site (self-implementing)	Must do so in accordance with 40 C.F.R. 264.310(a) and ensure it complies with the permeability, sieve, liquid limit and plasticity index parameters in 40 C.F.R. § 761.75(b)(1)(ii) thru (b)(1)(v). · A cap of compacted soil shall have a minimum thickness of 15 cm (10 inches). · A concrete or asphalt cap shall have a minimum thickness of 15 cm (6 inches). · A cap must be of sufficient strength to maintain its effectiveness and integrity. · A cap shall not be contaminated at a level ≥ 1 ppm PCB per AroclorTM (or equivalent) or per congener. · Repairs shall begin within 72 hours of discovery for any breaches that would impair the integrity of the cap.	Designing and constructing a cap where PCB remediation waste was removed or left in place in order to prevent or minimize human exposure, infiltration of water, and erosion — **relevant and appropriate**	40 C.F.R. § 761.61(a)(7)	NA	X	X	X	X	NA	NA	NA	NA
Verification for cleanup of PCB remediation waste (self-implementing option)	Must collect and analyze the wastes in accordance with 40 C.F.R. §§ 761.280-761.298 (Subpart O).	Collection and analysis of samples to verify cleanup and on-site disposal of bulk PCB remediation wastes and porous surfaces — **relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(i)	NA	X	X	X	X	NA	X	X	X
	Must collect and analyze the waste in accordance with 40 C.F.R. §§ 761.300-761.316 (Subpart P).	Collection and analysis of samples from PCB remediation waste non-porous surfaces — **relevant and appropriate**		NA	NA	NA	NA	NA	NA	NA	NA	NA
	Must collect and analyze the waste in accordance with 40 C.F.R. § 761.269.	Collection and analysis of samples from liquid PCB remediation waste — **relevant and appropriate**		NA	X	X	X	X	NA	X	X	X
	May use PCB field screening tests to determine when to sample to verify that cleanup is complete.	Interim sampling during PCB remediation waste cleanup — **relevant and appropriate**		NA	X	X	X	X	NA	X	X	X
	Self-implementing cleanup of PCB remediation waste is complete.	Sample analysis results in measurement of PCBs less than or equal to levels specified in 40 C.F.R. § 761.61(a) — **relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(ii)(A)	NA	X	X	X	X	NA	X	X	X
	Cleanup is not complete and must either dispose of the sampled PCB remediation waste, or reclean the waste represented by the sample and reinitiate sampling and analysis in accordance with 40 C.F.R. § 761.61(a)(6)(i).	Sample analysis results in measurement of PCBs greater than or equal to levels specified in 40 C.F.R. § 761.61(a) — **relevant and appropriate**	40 C.F.R. § 761.61(a)(6)(ii)(B)	NA	X	X	X	X	NA	X	X	X

TABLE 7-2
Compliance with ARARs and TBCs

Action	Requirements	Prerequisite	Citation	Remedial Action Alternative (See end of table for description of Alternatives)								
				S-A	S-B	S-C	S-D	S-E	GW-A	GW-B	GW-C	GW-D
Institutional Controls for PCB Remediation Waste Left-In-Place												
Deed restrictions for caps, fences and low occupancy areas	Must maintain the fence or cap, in perpetuity.	Use of a cap or fence at PCB remediation waste cleanup site — **relevant and appropriate**	40 C.F.R. § 761.61(a)(8)	NA	X	X	X	X	NA	NA	NA	NA
	Within 60 days of completion of cleanup activity shall record, in accordance with State law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will in perpetuity notify any potential purchaser of the property:	Use of a cap or fence at low occupancy area of PCB remediation waste cleanup site **— relevant and appropriate**	40 C.F.R. § 761.61(a)(8)(i)(A)	NA	X	X	X	X	NA	NA	NA	NA
	· That land has been used for PCB remediation waste disposal and is restricted to use as a low occupancy area as defined in 40 C.F.R. § 761.3.		40 C.F.R. § 761.61(a)(8)(i)(A)(1)	NA	X	X	X	X	NA	NA	NA	NA
	· Of existence of the fence or cap and the requirements to maintain the fence or cap.		40 C.F.R. § 761.61(a)(8)(i)(A)(2)	NA	X	X	X	X	NA	NA	NA	NA
	· The applicable cleanup levels left at the site, inside the fence, and/or under the cap.		40 C.F.R. § 761.61(a)(8)(i)(A)(3)	NA	X	X	X	X	NA	NA	NA	NA
	May remove a fence or cap after conducting additional cleanup activities and achieving levels specified in 40 C.F.R. § 761.61(a)(4) which do not require a cap or fence and remove the notice on the deed no earlier than 30 days after achieving these levels.		40 C.F.R. § 761.61(a)(8)(ii)	NA	X	X	X	X	NA	NA	NA	NA
Transportation of Wastes												
Transportation of hazardous waste on-site	The generator manifesting requirements of 40 C.F.R. §§ 262.20-262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 C.F.R. §§ 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 C.F.R. § 262.20(f)	NA	X	X	X	X	NA	X	X	X
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 C.F.R. §§ 262.20-23 for manifesting, § 262.30 for packaging, § 262.31 for labeling, § 262.32 for marking, § 262.33 for placarding, §§ 262.40 and 262.41(a) for record keeping requirements, and § 262.12 to obtain EPA ID number.	Preparation and initiation of shipment of hazardous waste off-site – **applicable**	40 C.F.R. § 262.10(h)	NA	X	NA	NA	NA	NA	NA	NA	NA
Transportation of PCB wastes off-site	Must comply with the manifesting provisions at 40 C.F.R. §§ 761.207 through 761.218.	Relinquishment of control over PCB wastes by transporting or offering for transport – **applicable**	40 C.F.R.§ 761.207(a)	NA	X	NA	NA	NA	NA	NA	NA	NA
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 C.F.R. §§ 171-180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **applicable**	49 C.F.R. § 171.1(c)	NA	X	X	X	X	NA	X	X	X

[1] ADEM Admin. Code r. 335-3-4-.02(1) and (2) were held unconstitutional for being unduly vague (335-3-4-.02(1)) and too restrictive (335-3-4-.02(2)). See Ross Neeley Express, Inc. v. Ala. Dep't of Envtl. Mgmt., 437 So.2d 82 (Ala. 1983).
[2] See supra n.1.

ARAR = applicable or relevant and appropriate requirement
C.F.R. = Code of Federal Regulations
DOT = U.S. Department of Transportation
> = greater than
< = less than
≥ = greater than or equal to
≤ = less than or equal to
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976
TSCA = Toxic Substances Control Act of 1976
NA = Not Applicable
X = Compliant/Applicable

Soil Remedial Action Alternative ID	Description of Alternative
S-A	No Action
S-B	Additional Institutional and Engineering Controls and Soil Excavation with off-Site Disposal
S-C	Additional Institutional and Engineering Controls and Soil Containment (Capping)
S-D	Additional Institutional and Engineering Controls and Soil Excavation with Treatment Using on-Site Chemical Dehalogenation
S-E	Additional Institutional and Engineering Controls and Soil Excavation with on-Site Thermal Desorption

Groundwater Remedial Action Alternative ID	Description of Alternative
GW-A	No Action
GW-B	Expanded Groundwater Extraction
GW-C	Expanded Groundwater Extraction and In-Situ Treatment (MNA)
GW-D	In-situ ZVI Groundwater Treatment

TABLE 7-3 SUMMARY
COST ESTIMATE FOR SOIL REMEDIAL ALTERNATIVES

Activity	Alternative					
	S-A	S-B	S-C Option 1	S-C Option 2	S-D	S-E
Soil Remedial Component and Institutional and Engineering Controls	$0	$19,264,000	$1,520,000	$3,199,000	$26,278,000	$18,120,000
Existing Soil Remedial Measures	$0	$496,000	$496,000	$496,000	$496,000	$496,000
SUBTOTAL	$0	$19,760,000	$2,016,000	$3,695,000	$26,774,000	$18,616,000
Construction Bonding	$0	$576,000	$42,000	$88,000	$786,000	$541,000
Project Management	$0	$989,000	$121,000	$185,000	$1,339,000	$931,000
Engineering Design/Permitting	$0	$1,151,000	$166,000	$235,000	$1,572,000	$1,083,000
Construction Management	$0	$1,151,000	$111,000	$176,000	$1,572,000	$1,083,000
SUBTOTAL	$0	$3,867,000	$440,000	$684,000	$5,269,000	$3,638,000
Contingency Capital Costs	$0	$5,757,000	$277,000	$588,000	$7,861,000	$5,414,000
Contingency Operation & Maintenance (O&M) Costs	$0	$114,000	$126,000	$151,000	$114,000	$114,000
SUBTOTAL	$0	$5,871,000	$403,000	$739,000	$7,975,000	$5,528,000
TOTAL NET PRESENT WORTH COST	**$0**	**$29,498,000**	**$2,859,000**	**$5,118,000**	**$40,018,000**	**$27,782,000**

Description of Alternatives for Soil Remedial Action	Alternatives
No Action	S-A
Additional Institutional and Engineering Controls, Soil Excavation with off-Site	S-B
Additional Institutional and Engineering Controls, Soil Containment (Capping)	S-C
Excludes supplemental HDPE cap of South Landfill PCB Cells (1E, 2E, and 3E)	S-C Option 1
Includes supplemental HDPE cap of South Landfill PCB Cells (1E, 2E, and 3E)	S-C Option 2
Additional Institutional and Engineering Controls, Soil Excavation with Treatment Using on-Site Chemical Dehalogenation	S-D
Additional Institutional and Engineering Controls, Soil Excavation with on-Site Thermal Desorption	S-E

TABLE 7-3A
EXISTING SOIL REMEDIAL MEASURES - COST ESTIMATE SUMMARY

Activity	Capital Cost	PW of O&M
Existing Soil Remedial Measures		
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$0**	**$496,000**
CAPITAL COST TOTAL		**$0**
CONSTRUCTION BONDING (3% of Capital Cost)		**$0**
PROJECT MANAGEMENT (8% of Capital Cost) [2]		**$0**
PROJECT MANAGEMENT (8% of O&M Cost)[2]		**$40,000**
ENGINEERING DESIGN/PERMITTING (15% of Capital Cost)[2]		**$0**
CONSTRUCTION MANAGEMENT (10% of Capital Cost)[2]		**$0**
TOTAL PW OF O&M COST		**$496,000**
SUBTOTAL		**$536,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$0**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$99,000**
TOTAL NET PRESENT WORTH COST		**$635,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-3B
EXISTING SOIL REMEDIAL MEASURES - COST DETAILS

Activity	Unit Cost	Units	Quantity	Est. Cost[2]
EXISTING SOIL REMEDIAL MEASURES				
Capital Costs				
Existing Soil Remedial Measures[1]	$0	Each	0	$0
			TOTAL CAPITAL COST	**$0**
Annual Operation & Maintenance (O&M)				
Maintenance Costs (Required upgrades and replacement to existing systems: landfills, ICMs, surface covers, etc.)	$30,000	Annual	1	$30,000
NPDES Monitoring and Analytical Costs	$10,000	Annual	1	$10,000
			ANNUAL O&M COST	**$40,000**
Present Worth of O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$496,000**
			TOTAL PRESENT WORTH	**$496,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-3C
ALTERNATIVE S-B - COST ESTIMATE SUMMARY
SOIL EXCAVATION AND OFF-SITE DISPOSAL

Activity	Capital Cost	PW of O&M
Alternative S-B		
Soil Excavation and Off-Site Disposal	$19,190,000	$74,000
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$19,190,000**	**$570,000**
CAPITAL COST TOTAL		**$19,190,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$576,000**
PROJECT MANAGEMENT (5% of Capital Cost) [2]		**$960,000**
PROJECT MANAGEMENT (5% of O&M Cost)[2]		**$29,000**
ENGINEERING DESIGN/PERMITTING (6% of Capital Cost)[2]		**$1,151,000**
CONSTRUCTION MANAGEMENT (6% of Capital Cost)[2]		**$1,151,000**
TOTAL PW OF O&M COST		**$570,000**
SUBTOTAL		**$23,627,000**
CONTINGENCY CAPITAL COSTS (15% scope + 15% bid)[2]		**$5,757,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$114,000**
TOTAL NET PRESENT WORTH COST		**$29,498,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-3D
ALTERNATIVE S-B - COST DETAILS
SOIL EXCAVATION AND OFF-SITE DISPOSAL

Activity	Unit Cost	Units	Quantity	Est. Cost[5]
SOIL TREATMENT - SOIL EXCAVATION WITH OFF-SITE DISPOSAL				
Capital Costs				
Mobilization / Demobilization	$200,000	Lump Sum	1	$200,000
Temporary Facilities and Utilities	$25,000	Lump Sum	1	$25,000
Clearing and Site Preparation	$1,000	Acre	7.4	$7,400
Soil Excavation, Handling, and Stockpiling	$20	Cubic Yard	68,900	$1,378,000
Erosion, Sediment, and Stormwater Control[1]	$75,000	Lump Sum	1	$75,000
Site Restoration	$5,000	Acre	7.4	$37,000
TSCA/Hazardous Waste Disposal (Includes Transport)[3,4]	$175	Ton[(2)]	77,200	$13,510,000
Non-Hazardous Solid Waste Disposal (Includes Transport)[3,4]	$50	Ton[(2)]	33,100	$1,655,000
Soil Sampling and Analytical Testing	$5	Ton[(2)]	110,300	$551,500
Grass and Soil Cover System (Off-Site Borrow)	$90,000	Acre	4.05	$364,500
Gravel Cover System	$110,000	Acre	3.35	$368,500
Clean Soil Backfill (Off-Site Borrow)	$20	Cubic Yard	45,000	$900,000
Surveying	$25,000	Lump Sum	1	$25,000
Contractor Health & Safety/Air Monitoring	$15,000	Month	4	$60,000
Enhanced Institutional Controls	$18,000	Lump Sum	1	$18,000
Pre-Design Investigation	$15,000	Lump Sum	1	$15,000
			TOTAL CAPITAL COST	**$19,190,000**
Additional Annual Operation & Maintenance				
Inspection and Maintenance of Replacement Cover Systems	$5,000	Annually	1	$5,000
Maintenance of Enhanced Institutional Controls	$1,000	Annually	1	$1,000
			ADDITIONAL ANNUAL O&M COST	**$6,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$74,000**
			TOTAL CAPITAL COSTS	**$19,190,000**
			TOTAL PRESENT WORTH	**$19,264,000**

Notes:

[1] Includes the cost of NPDES compliance sampling and monitoring.

[2] Conversion from cubic yards to tons assumed at 1.6 tons / cy for site soils.

[3] Excavated materials will be classified as requiring TSCA or Subtitle D disposal and handled accordingly.

[4] The % of excavated material suitable for Subtitle D disposal is conservatively assessed to be 30% of the total.

[5] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-3E
ALTERNATIVE S-C - COST ESTIMATE SUMMARY
SOIL CAPPING - OPTION 1

Activity	Capital Cost	PW of O&M
Alternative S-C		
Soil Capping	$1,384,000	$136,000
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$1,384,000**	**$632,000**
CAPITAL COST TOTAL		**$1,384,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$42,000**
PROJECT MANAGEMENT (6% of Capital Cost) [2]		**$83,000**
PROJECT MANAGEMENT (6% of O&M Cost)[2]		**$38,000**
ENGINEERING DESIGN/PERMITTING (12% of Capital Cost)[2]		**$166,000**
CONSTRUCTION MANAGEMENT (8% of Capital Cost)[2]		**$111,000**
TOTAL PW OF O&M COST		**$632,000**
SUBTOTAL		**$2,456,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$277,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$126,000**
TOTAL NET PRESENT WORTH COST		**$2,859,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

[3] Option 1 excludes supplemental HDPE capping of South Landfill PCB Cells (1E, 2E, and 3E).

TABLE 7-3F
ALTERNATIVE S-C - COST DETAILS
SOIL CAPPING - OPTION 1

Activity	Unit Cost	Units	Quantity	Est. Cost[4]
SOIL TREATMENT - SOIL CAPPING				
Capital Costs				
Mobilization / Demobilization[1]	$150,000	Lump Sum	1	$150,000
Temporary Facilities and Utilities	$25,000	Lump Sum	1	$25,000
Clearing and Site Preparation	$1,000	Acre	7.4	$7,400
Erosion, Sediment, and Stormwater Control[2]	$75,000	Lump Sum	1	$75,000
HDPE and Soil Cover System (Off-Site Borrow)	$150,000	Acre	4.05	$607,500
Grass and Soil Cover System (Off-Site Borrow)	$90,000	Acre	3.35	$301,500
Clean Soil Backfill (Off-Site Borrow)[3]	$20	Cubic Yard	3,000	$60,000
Surveying	$25,000	Lump Sum	1	$25,000
Soil Sampling and Analytical Testing	$25,000	Lump Sum	1	$25,000
Impermeable Cover Materials Sampling and Laboratory Testing	$10,000	Lump Sum	1	$10,000
Contractor Health & Safety/Air Monitoring	$10,000	Month	3	$30,000
Enhanced Institutional Controls	$18,000	Lump Sum	1	$18,000
Pre-Design Investigation	$50,000	Lump Sum	1	$50,000
			TOTAL CAPITAL COST	**$1,384,000**
Additional Annual Operation & Maintenance (O&M)				
Inspection and Maintenance of Cover Systems	$10,000	Annual	1	$10,000
Maintenance of Enhanced Institutional Controls	$1,000	Annual	1	$1,000
			ADDITIONAL ANNUAL O&M COST	**$11,000**
Present Worth of O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$136,000**
			TOTAL CAPITAL COSTS	**$1,384,000**
			TOTAL PRESENT WORTH	**$1,520,000**

Notes:

[1] Mobilization / Demobilization costs based on the cover types implemented.

[2] Includes the cost of NPDES compliance sampling and monitoring.

[3] Clean fill will be used to prepare areas to be covered where necessary to allow for adequate post cover drainage.

[4] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

[5] Option 1 excludes supplemental HDPE capping of South Landfill PCB Cells (1E, 2E, and 3E).

TABLE 7-3G
ALTERNATIVE S-C - COST ESTIMATE SUMMARY
SOIL CAPPING - OPTION 2

Activity	Capital Cost	PW of O&M
Alternative S-C		
Soil Capping	$2,938,000	$261,000
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$2,938,000**	**$757,000**
CAPITAL COST TOTAL		**$2,938,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$88,000**
PROJECT MANAGEMENT (5% of Capital Cost) [2]		**$147,000**
PROJECT MANAGEMENT (5% of O&M Cost)[2]		**$38,000**
ENGINEERING DESIGN/PERMITTING (8% of Capital Cost)[2]		**$235,000**
CONSTRUCTION MANAGEMENT (6% of Capital Cost)[2]		**$176,000**
TOTAL PW OF O&M COST		**$757,000**
SUBTOTAL		**$4,379,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$588,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$151,000**
TOTAL NET PRESENT WORTH COST		**$5,118,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

[3] Option 2 includes supplemental HDPE capping of South Landfill PCB Cells (1E, 2E, and 3E).

TABLE 7-3H
ALTERNATIVE S-C - COST DETAILS
SOIL CAPPING - OPTION 2

Activity	Unit Cost	Units	Quantity	Est. Cost[4]
SOIL TREATMENT - SOIL CAPPING				
Capital Costs				
Mobilization / Demobilization[1]	$250,000	Lump Sum	1	$250,000
Temporary Facilities and Utilities	$50,000	Lump Sum	1	$50,000
Clearing and Site Preparation	$1,000	Acre	14.6	$14,600
Erosion, Sediment, and Stormwater Control[2]	$150,000	Lump Sum	1	$150,000
HDPE and Soil Cover System (Off-Site Borrow)	$150,000	Acre	11.25	$1,687,500
Grass and Soil Cover System (Off-Site Borrow)	$90,000	Acre	3.35	$301,500
Clean Soil Backfill (Off-Site Borrow)[3]	$20	Cubic Yard	11,800	$236,000
Surveying	$50,000	Lump Sum	1	$50,000
Soil Sampling and Analytical Testing	$50,000	Lump Sum	1	$50,000
Impermeable Cover Materials Sampling and Laboratory Testing	$20,000	Lump Sum	1	$20,000
Contractor Health & Safety/Air Monitoring	$10,000	Month	6	$60,000
Enhanced Institutional Controls	$18,000	Lump Sum	1	$18,000
Pre-Design Investigation	$50,000	Lump Sum	1	$50,000
			TOTAL CAPITAL COST	**$2,938,000**
Additional Annual Operation & Maintenance (O&M)				
Inspection and Maintenance of Cover Systems	$20,000	Annual	1	$20,000
Maintenance of Enhanced Institutional Controls	$1,000	Annual	1	$1,000
			ADDITIONAL ANNUAL O&M COST	**$21,000**
Present Worth of O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$261,000**
			TOTAL CAPITAL COSTS	**$2,938,000**
			TOTAL PRESENT WORTH	**$3,199,000**

Notes:

[1] Mobilization / Demobilization costs based on the cover types implemented.

[2] Includes the cost of NPDES compliance sampling and monitoring.

[3] Clean fill will be used to prepare areas to be covered where necessary to allow for adequate post cover drainage.

[4] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

[5] Option 2 includes supplemental HDPE capping of South Landfill PCB Cells (1E, 2E, and 3E).

TABLE 7-3I
ALTERNATIVE S-D - COST ESTIMATE SUMMARY
SOIL EXCAVATION AND ON-SITE DEHALOGENATION

Activity	Capital Cost	PW of O&M
Alternative S-D		
Soil Excavation with On-site Chemical Dehalogenation	$26,204,000	$74,000
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$26,204,000**	**$570,000**
CAPITAL COST TOTAL		**$26,204,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$786,000**
PROJECT MANAGEMENT (5% of Capital Cost) [2]		**$1,310,000**
PROJECT MANAGEMENT (5% of O&M Cost)[2]		**$29,000**
ENGINEERING DESIGN/PERMITTING (6% of Capital Cost)[2,3]		**$1,572,000**
CONSTRUCTION MANAGEMENT (6% of Capital Cost)[2]		**$1,572,000**
TOTAL PW OF O&M COST		**$570,000**
SUBTOTAL		**$32,043,000**
CONTINGENCY CAPITAL COSTS (15% scope + 15% bid)[2]		**$7,861,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$114,000**
TOTAL NET PRESENT WORTH COST		**$40,018,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

[3] Engineering design and permitting for dehalogenation option to be completed by selected contractor as reflected in treatment costs.

TABLE 7-3J
ALTERNATIVE S-D - COST DETAILS
SOIL EXCAVATION AND ON-SITE DEHALOGENATION

Activity	Unit Cost	Units	Quantity	Est. Cost[7]
SOIL TREATMENT - SOIL EXCAVATION WITH ON-SITE DEHALOGENATION				
Capital Costs				
Mobilization / Demobilization	$1,000,000	Lump Sum	1	$1,000,000
Temporary Facilities and Utilities	$150,000	Lump Sum	1	$150,000
Clearing and Site Preparation	$1,000	Acre	15	$15,000
Soil Excavation, Handling, and Stockpiling	$20	Cubic Yard	68,900	$1,378,000
Erosion, Sediment, and Stormwater Control[1]	$100,000	Lump Sum	1	$100,000
Treatability Study, Startup, Optimization	$100,000	Lump Sum	1	$100,000
Soil Treatment by Base Catalyzed Dehalogenation (BCD)[2,3,4]	$250	Ton[(5)]	77,200	$19,300,000
TSCA/Hazardous Waste Disposal (Includes Transport)	$175	Ton[(5)]	1,600	$280,000
Dehalogenation Residual Decontaminated Sludge Disposal	$50	Ton[(5)]	1,600	$80,000
Non-Hazardous Solid Waste Disposal (Includes Transport)[3,4]	$50	Ton[(5)]	33,100	$1,655,000
Surveying	$25,000	Lump Sum	1	$25,000
Carbon Treatment for Cooling and Washing Water	$25,000	Each	1	$25,000
Soil Sampling and Analytical Testing	$5	Ton[(5)]	113,500	$567,500
Soil Backfill (Off-Site Borrow)	$20	Cubic Yard	8,700	$174,000
Soil Backfill (Treated Soils)	$10	Cubic Yard	48,300	$483,000
Surface Vegetative Cover (Off-Site Borrow)[6]	$50,000	Acre	4.05	$202,500
Gravel Surface Layer[6]	$60,000	Acre	3.35	$201,000
Site Restoration	$5,000	Acre	15	$75,000
Contractor Health & Safety/Air Monitoring	$25,000	Month	15	$375,000
Enhanced Institutional Controls	$18,000	Lump Sum	1	$18,000
			TOTAL CAPITAL COST	**$26,204,000**
Additional Annual Operation & Maintenance (O&M)				
Inspection and Maintenance of Replacement Cover Systems	$5,000	Annual	1	$5,000
Maintenance of Enhanced Institutional Controls	$1,000	Annual	1	$1,000
			ADDITIONAL ANNUAL O&M COST	**$6,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$74,000**
			TOTAL CAPITAL COSTS	**$26,204,000**
			TOTAL PRESENT WORTH	**$26,278,000**

Notes:

[1] Includes the cost of NPDES compliance sampling and monitoring.

[2] Cost for BCD treatment includes all operation costs (e.g. electricity, fuel, personnel, soil conditioning, etc.).

[3] Excavated materials will be classified as requiring treatment or suitable for Subtitle D disposal and handled accordingly.

[4] The % of excavated material suitable for Subtitle D disposal is conservatively assessed to be 30% of the total.

[5] Conversion from cubic yards to tons assumed at 1.6 tons / cy for site soils.

[6] The upper 1 foot of covers in areas backfilled with treated soils will use clean off-site borrow materials.

[7] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-3K
ALTERNATIVE S-E - COST ESTIMATE SUMMARY
SOIL EXCAVATION AND ON-SITE THERMAL DESORPTION AND OXIDATION

Activity	Capital Cost	PW of O&M
Alternative S-E		
Soil Excavation and On-Site Thermal Desorption	$18,046,000	$74,000
Existing Soil Remedial Measures[1]	$0	$496,000
SUBTOTAL	**$18,046,000**	**$570,000**
CAPITAL COST TOTAL		**$18,046,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$541,000**
PROJECT MANAGEMENT (5% of Capital Cost) [2]		**$902,000**
PROJECT MANAGEMENT (5% of O&M Cost)[2]		**$29,000**
ENGINEERING DESIGN/PERMITTING (6% of Capital Cost)[2]		**$1,083,000**
CONSTRUCTION MANAGEMENT (6% of Capital Cost)[2]		**$1,083,000**
TOTAL PW OF O&M COST		**$570,000**
SUBTOTAL		**$22,254,000**
CONTINGENCY CAPITAL COSTS (15% scope + 15% bid)[2]		**$5,414,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$114,000**
TOTAL NET PRESENT WORTH COST		**$27,782,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-3L
ALTERNATIVE S-E - COST DETAILS
SOIL EXCAVATION AND ON-SITE THERMAL DESORPTION AND OXIDATION

Activity	Unit Cost	Units	Quantity	Est. Cost[7]
SOIL TREATMENT - SOIL EXCAVATION WITH ON-SITE THERMAL DESORPTION AND OXIDATION				
Capital Costs				
Mobilization / Demobilization	$750,000	Lump Sum	1	$750,000
Temporary Facilities and Utilities	$200,000	Lump Sum	1	$200,000
Clearing and Site Preparation	$1,000	Acre	15	$15,000
Soil Excavation, Handling, and Stockpiling	$20	Cubic Yard	68,900	$1,378,000
Erosion, Sediment, and Stormwater Control[1]	$100,000	Lump Sum	1	$100,000
Treatability Study, Startup, Permitting, Optimization, Air Modeling	$150,000	Lump Sum	1	$150,000
Soil Treatment by Thermal Desorption with Off-Gas Oxidation[3,4,5]	$150	Ton[(2)]	77,200	$11,580,000
TSCA/Hazardous Waste Disposal (Includes Transport)	$175	Ton[(2)]	1,600	$280,000
Non-Hazardous Solid Waste Disposal (Includes Transport)[4,5]	$50	Ton[(2)]	33,100	$1,655,000
Surveying	$25,000	Lump Sum	1	$25,000
Soil Sampling and Analytical Testing	$5	Ton[(2)]	111,900	$559,500
Soil Backfill (Off-Site Borrow)	$20	Cubic Yard	8,700	$174,000
Soil Backfill (Treated Soils)	$10	Cubic Yard	48,300	$483,000
Surface Vegetative Cover (Off-Site Borrow)[6]	$50,000	Acre	4.05	$202,500
Surface Gravel Cover[6]	$60,000	Acre	3.35	$201,000
Site Restoration	$5,000	Acre	15	$75,000
Contractor Health & Safety/Air Monitoring	$25,000	Month	8	$200,000
Enhanced Institutional Controls	$18,000	Lump Sum	1	$18,000
			TOTAL CAPITAL COST	**$18,046,000**
Additional Annual Operation & Maintenance (O&M)				
Inspection and Maintenance of Replacement Cover Systems	$5,000	Annual	1	$5,000
Maintenance of Enhanced Institutional Controls	$1,000	Annual	1	$1,000
			ADDITIONAL ANNUAL O&M COST	**$6,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$74,000**
			TOTAL CAPITAL COSTS	**$18,046,000**
			TOTAL PRESENT WORTH	**$18,120,000**

Notes:

[1] Includes the cost of NPDES compliance sampling and monitoring.

[2] Conversion from cubic yards to tons assumed at 1.6 tons / cy for site soils.

[3] Cost for thermal desorption includes all operation costs (e.g. electricity, fuel, personnel, soil conditioning, etc.).

[4] Excavated materials will be classified as requiring treatment or suitable for Subtitle D disposal and handled accordingly.

[5] The % of excavated material suitable for Subtitle D disposal is conservatively assessed to be 30% of the total.

[6] The upper 1 foot of covers in areas backfilled with treated soils will use clean off-site borrow materials.

[7] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-4 SUMMARY
COST ESTIMATE FOR REMEDIAL GROUNDWATER ALTERNATIVES

Activity	Alternative GW-A	Alternative GW-B	Alternative GW-C	Alternative GW-D
Groundwater Remedial Component and Institutional Controls	$0	$394,000	$1,208,000	$7,867,000
Existing Groundwater Remedial Measures	$0	$1,365,000	$1,365,000	$1,365,000
SUBTOTAL	$0	$1,759,000	$2,573,000	$9,232,000
Construction Bonding	$0	$6,000	$8,000	$174,000
Project Management	$0	$141,000	$206,000	$461,000
Engineering Design/Permitting	$0	$29,000	$40,000	$465,000
Construction Management	$0	$20,000	$27,000	$348,000
SUBTOTAL	$0	$196,000	$281,000	$1,448,000
Contingency Capital Costs	$0	$39,000	$53,000	$1,742,000
Contingency Operation & Maintenance (O&M) Costs	$0	$313,000	$462,000	$1,028,000
SUBTOTAL	$0	$352,000	$515,000	$2,770,000
TOTAL NET PRESENT WORTH COST	**$0**	**$2,307,000**	**$3,369,000**	**$13,450,000**

Description of Alternatives for Groundwater Remedial Action	Alternatives
No Action	GW-A
Additional Institutional Controls, Expanded Groundwater Extraction	GW-B
Additional Institutional Controls, Expanded Groundwater Extraction and MNA	GW-C
Additional Institutional Controls, In-situ ZVI Groundwater Treatment	GW-D

TABLE 7-4A
EXISTING GROUNDWATER REMEDIAL MEASURES - COST ESTIMATE SUMMARY

Activity	Capital Cost	PW of O&M
Existing Groundwater Remedial Measures		
Existing Groundwater Remedial Measures[1]	$0	$1,365,000
SUBTOTAL	**$0**	**$1,365,000**
CAPITAL COST TOTAL		**$0**
CONSTRUCTION BONDING (3% of Capital Cost)		**$0**
PROJECT MANAGEMENT (8% of Capital Cost) [2]		**$0**
PROJECT MANAGEMENT (8% of O&M Cost)[2]		**$109,000**
ENGINEERING DESIGN/PERMITTING (15% of Capital Cost)[2]		**$0**
CONSTRUCTION MANAGEMENT (10% of Capital Cost)[2]		**$0**
TOTAL PW OF O&M COST		**$1,365,000**
SUBTOTAL		**$1,474,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$0**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$273,000**
TOTAL NET PRESENT WORTH COST		**$1,747,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-4B
EXISTING GROUNDWATER REMEDIAL MEASURES - COST DETAILS

Activity	Unit Cost	Units	Quantity	Est. Cost[2]
EXISTING GROUNDWATER REMEDIAL MEASURES				
Capital Costs				
Existing Groundwater Remedial Measures[1]	$0	Each	0	$0
			TOTAL CAPITAL COST	**$0**
Annual Operation & Maintenance (O&M)				
Monitoring and Reporting for Groundwater Corrective Action System and Other Site Wells (Semi-Annually)	$42,500	Semi-Annual	2	$85,000
Maintain Residential and Groundwater Deed Restrictions (includes costs of legal counsel)	$5,000	Annual	1	$5,000
Maintenance Costs (Required upgrades and replacement to existing systems: ICMs, wells, pumps, piping, etc.)	$15,000	Annual	1	$15,000
Electricity	$5,000	Annual	1	$5,000
			ANNUAL O&M COST	**$110,000**
Present Worth of O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$1,365,000**
			TOTAL PRESENT WORTH	**$1,365,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-4C
ALTERNATIVE GW-B - COST ESTIMATE SUMMARY
EXPANDED GROUNDWATER EXTRACTION

Activity	Capital Cost	PW of O&M
Alternative GW-B		
Expanded Groundwater Extraction	$195,000	$199,000
Existing Groundwater Remedial Measures[1]	$0	$1,365,000
SUBTOTAL	**$195,000**	**$1,564,000**
CAPITAL COST TOTAL		**$195,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$6,000**
PROJECT MANAGEMENT (8% of Capital Cost) [2]		**$16,000**
PROJECT MANAGEMENT (8% of O&M Cost)[2]		**$125,000**
ENGINEERING DESIGN/PERMITTING (15% of Capital Cost)[2]		**$29,000**
CONSTRUCTION MANAGEMENT (10% of Capital Cost)[2]		**$20,000**
TOTAL PW OF O&M COST		**$1,564,000**
SUBTOTAL		**$1,955,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$39,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$313,000**
TOTAL NET PRESENT WORTH COST		**$2,307,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-4D
ALTERNATIVE GW-B - COST DETAILS
EXPANDED GROUNDWATER EXTRACTION

Activity	Unit Cost	Units	Quantity	Est. Cost[2]
GROUNDWATER TREATMENT - EXPANDED GROUNDWATER EXTRACTION				
Capital Costs				
Proposed Interceptor Wells[1]	$15,000	Each	4	$60,000
Proposed Observation Wells[1]	$10,000	Each	1	$10,000
Trenching, Piping, and Right of Way Procurement	$20,000	Lump Sum	1	$20,000
Electrical Supply and Connection	$20,000	Lump Sum	1	$20,000
Carbon Treatment System	$25,000	Each	2	$50,000
Start-up/Optimization	$10,000	Lump Sum	1	$10,000
Pre-Design Investigation	$25,000	Lump Sum	1	$25,000
			TOTAL CAPITAL COST	**$195,000**
Additional Annual Operation & Maintenance (O&M)				
Electricity	$1,000	Annual	1	$1,000
Maintenance, Parts Replacement, and Carbon Replacement	$5,000	Annual	1	$5,000
Groundwater Monitoring and Reporting	$5,000	Semi-Annual	2	$10,000
			ADDITIONAL ANNUAL O&M COST	**$16,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$199,000**
			PRESENT WORTH OF CAPITAL COSTS	**$195,000**
			TOTAL PRESENT WORTH	**$394,000**

Notes:

[1] Costs for wells are inclusive (i.e., they include costs for drilling, logging, reporting, mob/demob, decon, disposal, a dedicated pump, well development, etc.).

[2] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-4E
ALTERNATIVE GW-C - COST ESTIMATE SUMMARY
EXPANDED GROUNDWATER EXTRACTION WITH MNA

Activity	Capital Cost	PW of O&M
Alternative GW-C		
Expanded Groundwater Extraction with MNA	$265,000	$943,000
Existing Groundwater Remedial Measures[1]	$0	$1,365,000
SUBTOTAL	**$265,000**	**$2,308,000**
CAPITAL COST TOTAL		**$265,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$8,000**
PROJECT MANAGEMENT (8% of Capital Cost) [2]		**$21,000**
PROJECT MANAGEMENT (8% of O&M Cost)[2]		**$185,000**
ENGINEERING DESIGN/PERMITTING (15% of Capital Cost)[2]		**$40,000**
CONSTRUCTION MANAGEMENT (10% of Capital Cost)[2]		**$27,000**
TOTAL PW OF O&M COST		**$2,308,000**
SUBTOTAL		**$2,854,000**
CONTINGENCY CAPITAL COSTS (10% scope + 10% bid)[2]		**$53,000**
CONTINGENCY O&M COSTS (10% scope + 10% bid)[2]		**$462,000**
TOTAL NET PRESENT WORTH COST		**$3,369,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-4F
ALTERNATIVE GW-C - COST DETAILS
EXPANDED GROUNDWATER EXTRACTION WITH MNA

Activity	Unit Cost	Units	Quantity	Est. Cost[2]
GROUNDWATER TREATMENT - EXPANDED EXTRACTION WITH MNA				
Capital Costs				
Proposed Interceptor Wells[1]	$15,000	Each	4	$60,000
Proposed Observation Wells[1]	$10,000	Each	1	$10,000
Trenching, Piping, and Right of Way Procurement	$20,000	Lump Sum	1	$20,000
Electrical Supply and Connection	$20,000	Lump Sum	1	$20,000
Carbon Treatment System	$25,000	Each	2	$50,000
Start-up/Optimization	$10,000	Lump Sum	1	$10,000
Pre-Design Investigation	$25,000	Lump Sum	1	$25,000
New MNA wells[1]	$10,000	Each	2	$20,000
Development of MNA Protocols	$50,000	Lump Sum	1	$50,000
			TOTAL CAPITAL COST	**$265,000**
Additional Annual Operation & Maintenance (O&M)				
Electricity	$1,000	Annual	1	$1,000
Maintenance, Parts Replacement, and Carbon Replacement	$5,000	Annual	1	$5,000
Groundwater Monitoring and Reporting	$5,000	Semi-Annual	2	$10,000
MNA Monitoring and Reporting	$30,000	Semi-Annual	2	$60,000
			ADDITIONAL ANNUAL O&M COST	**$76,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$943,000**
			PRESENT WORTH OF CAPITAL COSTS	**$265,000**
			TOTAL PRESENT WORTH	**$1,208,000**

Notes:

[1] Costs for wells are inclusive (i.e., they include costs for drilling, logging, reporting, mob/demob, decon, disposal, a dedicated pump, well development, etc.).

[2] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 7-4G
ALTERNATIVE GW-D - COST ESTIMATE SUMMARY
ZERO VALENT IRON (ZVI) GROUNDWATER TREATMENT

Activity	Capital Cost	PW of O&M
Alternative GW-D		
ZVI Funnel and Gate Groundwater Treatment with Contingent Secondary Treatment	$5,807,000	$2,060,000
Existing Groundwater Remedial Measures[1]	$0	$1,365,000
SUBTOTAL	**$5,807,000**	**$3,425,000**
CAPITAL COST TOTAL		**$5,807,000**
CONSTRUCTION BONDING (3% of Capital Cost)		**$174,000**
PROJECT MANAGEMENT (5% of Capital Cost) [2]		**$290,000**
PROJECT MANAGEMENT (5% of O&M Cost)[2]		**$171,000**
ENGINEERING DESIGN/PERMITTING (8% of Capital Cost)[2]		**$465,000**
CONSTRUCTION MANAGEMENT (6% of Capital Cost)[2]		**$348,000**
TOTAL PW OF O&M COST		**$3,425,000**
SUBTOTAL		**$10,680,000**
CONTINGENCY CAPITAL COSTS (15% scope + 15% bid)[2]		**$1,742,000**
CONTINGENCY O&M COSTS (15% scope + 15% bid)[2]		**$1,028,000**
TOTAL NET PRESENT WORTH COST		**$13,450,000**

Notes:

[1] Capital costs for existing remedial measures are not included as per EPA's comments.

[2] Cost factors based on "A Guide to Developing and Documenting Cost Estimates During Feasibility Study" prepared by USEPA and US Army Corps of Engineers, July 2000.

TABLE 7-4H
ALTERNATIVE GW-D - COST DETAILS
ZERO VALENT IRON (ZVI) GROUNDWATER TREATMENT

Activity	Unit Cost	Units	Quantity	Est. Cost[4]
GROUNDWATER TREATMENT - FUNNEL AND GATE ZERO VALENT IRON SYSTEM				
Capital Costs				
Mobilization / Demobilization	$250,000	Lump Sum	1	$250,000
Temporary Facilities and Utilities	$50,000	Lump Sum	1	$50,000
Clearing and Site Preparation	$1,000	Acre	2	$2,000
Soil Handling, and Stockpiling	$20	Cubic Yard	5,000	$100,000
Erosion, Sediment, and Stormwater Control[1]	$25,000	Lump Sum	1	$25,000
Treatability Study, Startup, Optimization	$100,000	Lump Sum	1	$100,000
Installation of Slurry Wall Funnel Components	$2,900	Linear Foot	300	$870,000
Installation of ZVI Gate Components	$5,000	Linear Foot	700	$3,500,000
Contingent Secondary Groundwater Treatment	$125,000	Lump Sum	1	$125,000
TSCA/Hazardous Waste Disposal (Includes Transport)	$175	Ton[(2)]	4,000	$700,000
New Monitoring Wells[3]	$10,000	Each	1	$10,000
Trenching, Piping, and Right of Way Procurement	$10,000	Lump Sum	1	$10,000
Electrical Supply and Connection	$10,000	Lump Sum	1	$10,000
Site Restoration	$5,000	Acre	2	$10,000
Contractor Health & Safety/Air Monitoring	$15,000	Month	3	$45,000
			TOTAL CAPITAL COST	**$5,807,000**
Additional Annual Operation & Maintenance (O&M)				
Maintenance, Monitoring, and Repair/Replacement of ZVI	$120,000	Lump Sum	1	$120,000
ZVI Groundwater Monitoring and Reporting	$15,000	Semi-Annual	2	$30,000
Electricity	$1,000	Annual	1	$1,000
Maintenance, Parts Replacement, and Carbon Replacement	$5,000	Annual	1	$5,000
Contingent Secondary Treatment Groundwater Monitoring and Reporting	$5,000	Semi-Annual	2	$10,000
			ADDITIONAL ANNUAL O&M COST	**$166,000**
Present Worth of Additional O&M Costs				
Years of O&M	30	Years		
Discount Rate	7	%		
			PRESENT WORTH OF ANNUAL O&M COSTS (YEARS 1-30)	**$2,060,000**
			PRESENT WORTH OF CAPITAL COSTS	**$5,807,000**
			TOTAL PRESENT WORTH	**$7,867,000**

Notes:

[1] Includes the cost of NPDES compliance sampling and monitoring.

[2] Conversion from cubic yards to tons assumed at 1.6 tons / cy for site soils.

[3] Costs for wells are inclusive (i.e., they include costs for drilling, logging, reporting, mob/demob, decon, disposal, a dedicated pump, well development, etc.).

[4] All subtotals, totals, and present worth values have been rounded to the nearest $1,000.

TABLE 8-1A
NCP SCREENING CRITERIA RANKING OF SOIL ALTERNATIVES

NCP Screening Criteria	Ranking of Soil Alternatives Most Favorable → Least Favorable
Overall protection of human health and the environment	S-B / S-C, S-D / S-E, S-A
Compliance with ARARs	S-B / S-C, S-D / S-E, S-A
Short-term effectiveness	S-A / S-C, S-B, S-D / S-E
Long term effectiveness and permanence	S-B, S-D / S-E, S-C, S-A
Reduction of toxicity, mobility, or volume through treatment	S-D / S-E, S-B / S-C, S-A
Implementability	S-A, S-C, S-B, S-D / S-E
Cost	S-A, S-C, S-E / S-B, S-D
Overall Ranking	**S-C, S-B, S-E, S-D, S-A**

Description of Alternatives for Soil Remedial Action	Alternatives
No Action	S-A
Additional Institutional and Engineering Controls, Soil Excavation with off-Site Disposal	S-B
Additional Institutional and Engineering Controls, Soil Containment (Capping)	S-C
Additional Institutional and Engineering Controls, Soil Excavation with Treatment Using on-Site Chemical Dehalogenation	S-D
Additional Institutional and Engineering Controls, Soil Excavation with on-Site Thermal Desorption	S-E

TABLE 8-1B
NCP SCREENING CRITERIA RANKING OF GROUNDWATER ALTERNATIVES

NCP Screening Criteria	Ranking of Groundwater Alternatives			
	Most Favorable			Least Favorable
Overall protection of human health and the environment	GW-C	GW-B	GW-D	GW-A
Compliance with ARARs	GW-C / GW-B		GW-D	GW-A
Short-term effectiveness	GW-A	GW-B/GW-C	GW-D	
Long term effectiveness and permanence	GW-C	GW-B	GW-D	GW-A
Reduction of toxicity, mobility, or volume through treatment	GW-B / GW-C		GW-D	GW-A
Implementability	GW-A	GW-B / GW-C	GW-D	
Cost	GW-A	GW-B	GW-C	GW-D
Overall Ranking	GW-C	GW-B	GW-D	GW-A

Description of Alternatives for Groundwater Remedial Action	Alternatives
No Action	GW-A
Additional Institutional Controls, Expanded Groundwater Extraction	GW-B
Additional Institutional Controls, Expanded Groundwater Extraction and MNA	GW-C
Additional Institutional Controls, In-situ ZVI Groundwater Treatment	GW-D

FIGURES

SOLUTIA FACILITY LOCATION

Fort McClellan
Blue Mountain
Anniston
202
Golden Springs
West End Anniston
21
Anniston Army Depot
SITE
Dearmanville
Boiling Spring
ROUTE 78
Oxford
INTERSTATE 20

LEGEND

- Military Reservation
- Property Boundary
- Alabama Power
- Facility
- Pipeline
- Powerline
- Railroad - Active
- Railroad - Abandoned
- Highway/Major Road
- Minor Road
- River
- Lakes
- Intermittent Stream
- Perennial Stream

NOTES

SOURCE USGS 1:100,000 DLG (1981); Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

SCALE

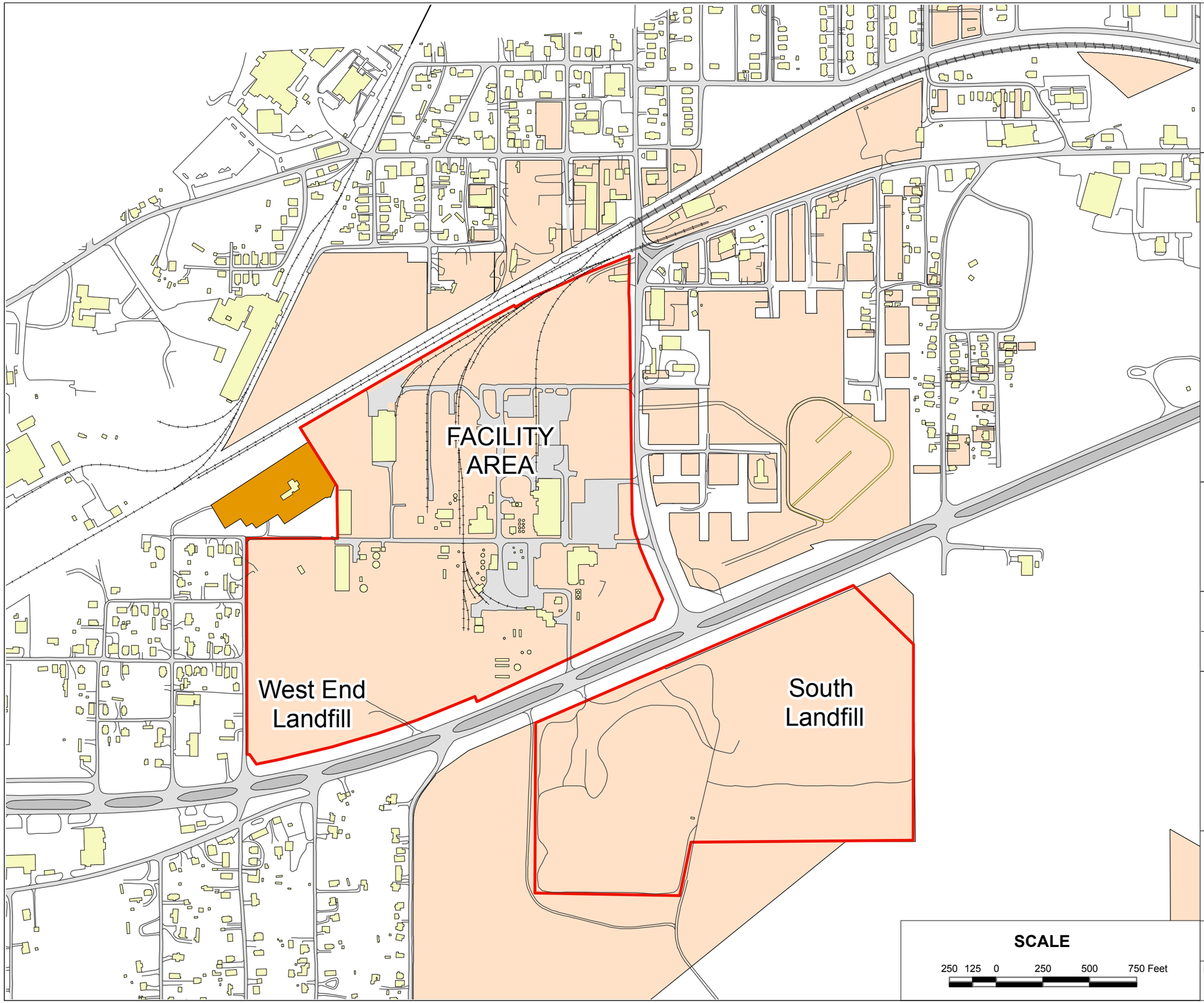
0.4 0.2 0 0.4 0.8 1.2 Miles

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
JLP	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 2-1

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Final\FS_Figure_2-1_Location.mxd



OU-3 AREA

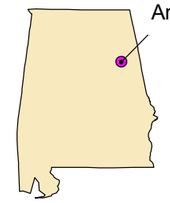
LEGEND

- OU-3 Area
- Roads
- Railroads
- Paved Areas
- Buildings
- Solutia Inc.
- Alabama Power

NOTES

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP



SCALE

250 125 0 250 500 750 Feet

PRODUCED BY: JLP	CHECKED BY: GLH	REVIEWED BY: SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 2-2

FILE: Q:\GIS\SOLUTIA+GIS\PROJECTS\OU-3_Feasibility_Study_FinalFS_Figure_2-2_OU3.mxd

EXISTING OU-3 SURFACE TYPES AND ENGINEERED COVERS

LEGEND

- OU-3 Area
- Railroad
- Roads
- Buildings
- Paved Areas
- Trees
- Grass
- Grass and Clay Cover
- Grass and HDPE Liner
- Grass and Soil Cover
- Trees and Soil Cover
- Gravel
- Gravel-Covered Asphalt

NOTES

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

N W E S

SOLUTIA

Golder Associates

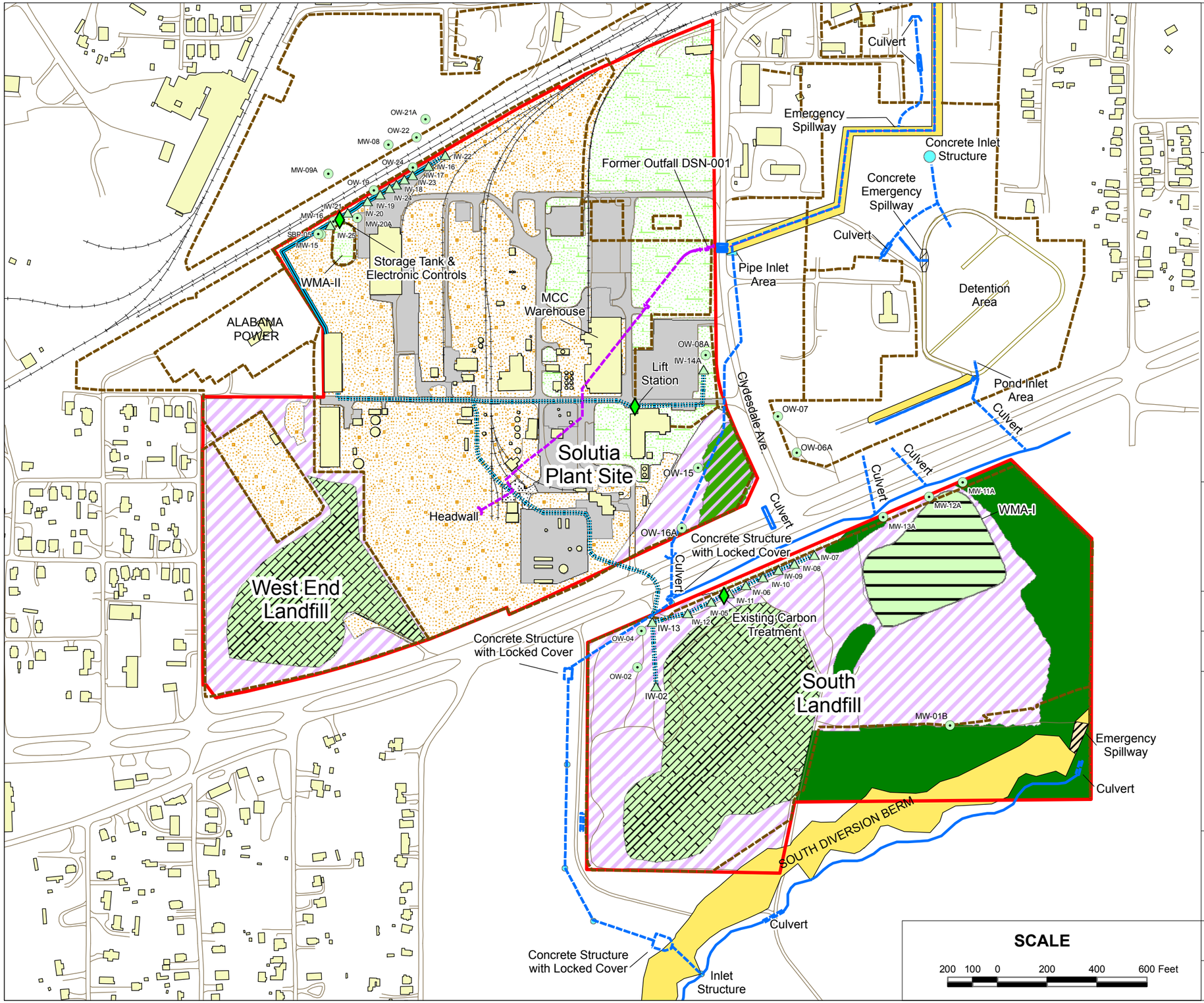
SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 2-3

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Final\FS_Figure_2-3_Surface_Types.mxd

EXISTING SITE CONDITIONS



LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Lined Storm Sewer
- Drainage Ditch
- Underground Stormwater Piping
- Existing Monitoring Well
- Existing Interceptor Well
- Groundwater Components
- Existing Surface Conveyance Piping
- Existing Underground Conveyance Piping
- Buildings
- Paved Areas
- Trees
- Grass
- Grass and Clay Cover
- Grass and HDPE Liner
- Berm
- Grass and Soil Cover
- Trees and Soil Cover
- Gravel
- Gravel-Covered Asphalt

NOTES

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP

SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	**PROJECT NO:** 0433746OU3	**FIGURE NO.** 3-1

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_3-1_Existing_Site.mxd

COMPARISON OF LEAD CONCENTRATIONS IN SOIL AND GROUNDWATER

MW-14 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	ND	Yes	Original
Jun-05	ND	No	Original

OWR-08S - Lead (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	ND	No	Original
Aug-98	27 J	Yes	Original
Aug-98	6	No	Field Duplicate
Aug-98	45 J	Yes	Field Duplicate

OWR-06D - Lead (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	ND	Yes	Original

OW-10 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	14 J	Yes	Original
Jul-05	ND	No	Original
Jul-05	ND	Yes	Original

OW-09 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	18	Yes	Original
Jun-05	ND	No	Original
Jun-05	ND	Yes	Original

OWR-13 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	ND J	No	Original
Feb-03	ND J	Yes	Original Field Duplicate
Feb-03	ND J	No	Field Duplicate
Feb-03	ND J	Yes	Field Duplicate

WEL-04 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	16	No	Original
Oct-98	ND	Yes	Original Field Duplicate
Oct-98	ND	No	Field Duplicate
Oct-98	ND	Yes	Duplicate

WEL-02 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	18	No	Original
Oct-98	ND	Yes	Original
Jun-05	ND	No	Original
Jun-05	ND	Yes	Original

WEL-01 - Lead (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	33	No	Original
Oct-98	ND	Yes	Original
Jun-05	ND	No	Original
Jun-05	ND	Yes	Original

OWR-05D - Lead (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	ND	No	Original
Aug-98	21	Yes	Original

SSR-17
35 mg/kg

SSR-10
39 J mg/kg

SSR-19
52 mg/kg

SSRI-11
4700 mg/kg

SSR-16
15 mg/kg

SSR-18
110 J mg/kg

SSR-07
220 mg/kg

SSR-09
150 mg/kg

Clydesdale Ave.

Solutia Plant Site

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Groundwater Monitoring Well
- Soil Sampling Location

NOTES

1 - Response to EPA Feasibility Study (FS) Comments dated April 19, 2010.

2 - The well and soil sampling locations shown are referenced in Section 4.2.1 of the FS Report.

3 - Lead results shown are referenced from Table 4-1 of the FS Report, and Tables 4-1 and 4-4 of the RI Report, Rev. 2.0.

4 - ND = Non-Detect; ug/l = micrograms per liter; mg/kg = milligrams per kilogram; J = estimated concentration.

5 - Maximum Contaminant Level = 15 ug/l; Soil Screening Level = 14 mg/kg; Residential Exposure Criterion = 400 mg/kg.

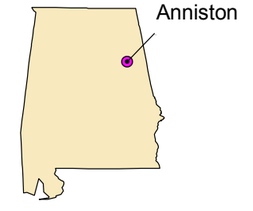
SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP



SCALE

150 75 0 150 300 450 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 4-1

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments_FS_Figure_4-1_Soil_GW_Lead4.mxd

COMPARISON OF MANGANESE CONCENTRATIONS IN SOIL AND GROUNDWATER

T-4 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	540 J	No	Original
Jun-05	530	Yes	Original Field
Jun-05	550	No	Duplicate Field
Jun-05	520	Yes	Duplicate

OWR-04D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	ND	Yes	Original

OWR-08S - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	1400	No	Original
Aug-98	1100 J	Yes	Original Field
Aug-98	1500	No	Duplicate Field
Aug-98	1400 J	Yes	Duplicate

OWR-01D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	2300	No	Original
Aug-98	830	Yes	Original

OW-21A - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	1300	No	Original
Feb-03	1300	Yes	Original

OW-10 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	1500	No	Original
Jul-98	1400 J	Yes	Original
Jul-05	1500	No	Original
Jul-05	1200	Yes	Original

MW-14 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	36	No	Original
Jun-05	32	Yes	Original

SSR-19
2600 mg/kg

SSR-17
5500 mg/kg

OWR-11 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	6500	No	Original
Feb-03	6600	Yes	Original

OWR-12 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	12000	No	Original
Feb-03	12000	Yes	Original

OWR-02D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	130	No	Original
Jul-98	13	Yes	Original Field
Jul-98	140	No	Duplicate Field
Jul-98	12 J	Yes	Duplicate

OWR-14D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jul-05	530	No	Original
Jul-05	9 J	Yes	Original

OWR-02S - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	4500	No	Original
Aug-98	4500 J	Yes	Original

OWR-13 - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	140	No	Original
Feb-03	140	Yes	Original Field
Feb-03	140	No	Duplicate Field
Feb-03	140	Yes	Duplicate

WEL-02- Manganese (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	1700	No	Original
Oct-98	190	Yes	Original
Jun-05	94	No	Original
Jun-05	83	Yes	Original

SSR-09
12000 mg/kg

OWR-15D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jul-05	96	No	Original
Jul-05	74 J	Yes	Original

OW-16A - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	580 J	No	Original
Jun-05	610	Yes	Original

WEL-01- Manganese (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	2000	No	Original
Oct-98	130	Yes	Original
Jun-05	37	No	Original
Jun-05	32	Yes	Original

WEL-04- Manganese (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	1100	No	Original
Oct-98	58	Yes	Original Field
Oct-98	53	No	Duplicate Field
Oct-98	55	Yes	Duplicate

OWR-05D - Manganese (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	1300	No	Original
Aug-98	1300	Yes	Original

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Groundwater Monitoring Well
- Soil Sampling Location

NOTES

1 - Response to EPA Feasibility Study (FS) Comments dated April 19, 2010.

2 - The well and soil sampling locations shown are referenced in Section 4.2.2 of the FS report.

3 - Manganese results shown are referenced from Table 4-3 of the FS Report, and Tables 4-1 and 4-4 of the RI Report, Rev. 2.0.

4 - ND = Non-Detect; ug/l = micrograms per liter; mg/kg = milligrams per kilogram; J = estimated concentration.

5 - Preliminary Remediation Goal = 880 ug/l.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

SCALE

180 90 0 180 360 540 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 4-2

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_4-2_Soil_GW_Manganese3.mxd

COMPARISON OF MERCURY CONCENTRATIONS IN SOIL AND GROUNDWATER

MW-16 - Mercury (ug/l)			
Date	Value	Filtered	QA Type
Apr-99	1	No	Original
Apr-99	0.5	Yes	Original
Apr-00	0.3	No	Original
Apr-00	0.2	Yes	Original
Apr-01	0.9	No	Original
Apr-01	0.9	Yes	Original
Apr-02	0.97	No	Original
Apr-03	2.1	No	Original
Apr-04	1	No	Original
Apr-05	1.1	No	Original
Apr-06	1	No	Original
Apr-07	0.75	No	Original
Apr-08	1.7	No	Original

MW-15 - Mercury (ug/l)			
Date	Value	Filtered	QA Type
Apr-99	0.8	No	Original
Apr-99	0.9	Yes	Original
Apr-00	0.2	No	Original
Apr-00	ND	Yes	Original
Apr-01	0.5	No	Original
Apr-01	ND	Yes	Original
Apr-02	1.4	No	Original
Apr-02	ND	Yes	Original
Apr-03	1.2	No	Original
Apr-03	0.41	Yes	Original
Apr-04	2.5	No	Original
Apr-04	0.68	Yes	Original
Apr-05	4.1	No	Original
Apr-05	0.66	Yes	Original
Apr-06	3.2	No	Original
Apr-06	ND	Yes	Original
Apr-07	3.3	No	Original
Apr-07	ND	Yes	Original
Apr-08	2	No	Original
Apr-08	ND	Yes	Original

OW-10 - Mercury (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	50	No	Original
Jul-98	ND	Yes	Original
Jul-05	16	No	Original
Jul-05	23	Yes	Original

OWR-13 - Mercury (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	2.3	No	Original
Feb-03	2.2	Yes	Original Field
Feb-03	2.4	No	Duplicate Field
Feb-03	2.1	Yes	Duplicate

OWR-11 - Mercury (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	3.3	No	Original
Feb-03	0.65	Yes	Original

SSRI-11
1.1 mg/kg

SWMU-12-24G
0.94 mg/kg

SSR-04
1.1 mg/kg

SSR-15
3.3 J mg/kg

SSR-18
0.42 J mg/kg

SSR-12
0.05 mg/kg

SSR-13
0.046 mg/kg

Plant Site

West End Landfill

South Landfill

Hydesdale

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Groundwater Monitoring Well
- Soil Sampling Location

NOTES

1 - Response to EPA Feasibility Study (FS) Comments dated April 19, 2010.

2 - The well and soil sampling locations shown are referenced in Section 4.2.3 of the FS Report.

3 - Mercury results shown are referenced from Table 4-4 of the FS Report, and Tables 4-1 and 4-4 of the RI Report, Rev 2.0.

4 - ug/l = micrograms per liter; mg/kg = milligrams per kilogram; J = estimated concentration.

5 - Maximum Contaminant Level = 2 ug/l; Soil Screening Level = 0.1 mg/kg.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

SCALE

150 75 0 150 300 450 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 4-3

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments_FS_Figure_4-3_Soil_GW_Mercury3.mxd

COMPARISON OF PCB CONCENTRATIONS IN SOIL AND GROUNDWATER

T-2 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jul-05	ND	No	Original
Jul-05	ND J	Yes	Original

OWR-01S - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	ND	No	Original
Aug-98	ND	Yes	Original
Jul-05	ND	No	Original
Jul-05	ND J	Yes	Original

CB-85 - PCBs (ug/L)			
Date	Value	Filtered	QA Type
Jul-98	ND	Yes	Original
Jul-98	ND	No	Original

OW-21/21A - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Apr-07	96.3	No	Original
Apr-07	ND	Yes	Original

OW-10 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	ND	Yes	Original
Jul-05	6.2 J	No	Original
Jul-05	ND	Yes	Original

OW-22 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Apr-07	0.83	No	Original
Apr-07	ND J	Yes	Original

SSRI-11
930 J mg/kg (surface)
1.89 mg/kg (subsurface)

OW-24 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Apr-07	4.3	No	Original
Apr-07	ND	Yes	Original

SSRI-05
38 mg/kg (surface)
85 mg/kg (subsurface)

OW-09 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	ND	Yes	Original
Jun-05	ND	No	Original
Jun-05	ND	Yes	Original

SSR-15
65 J mg/kg

SWMU-12-24E
169 mg/kg

OWR-12 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	4.4	No	Original
Feb-03	ND	Yes	Original

SWMU-12-24C
84 mg/kg

OWR-11 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	170	No	Original
Feb-03	20	Yes	Original

SSR-04
104 mg/kg

SSR-05
106 mg/kg

OWR-03S - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jul-98	ND	No	Original
Jul-98	ND	Yes	Original

OW-08/08A - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	30 J	No	Original
Jun-05	2.1 J	Yes	Original
Apr-07	28.6	No	Original
Apr-07	ND J	Yes	Original

SSR-18
16620 J mg/kg

WEL-04 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	ND	No	Original
Oct-98	ND	No	Field Duplicate
Oct-98	ND	Yes	Original
Oct-98	ND	Yes	Field Duplicate

SSRI-07
250 J mg/kg (surface)
56 J mg/kg (subsurface)

SSR-07
229 mg/kg

OW-15 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Apr-07	ND	No	Original
Apr-07	ND J	Yes	Original

SSR-09
282 mg/kg

OW-16/16A - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Jun-05	170	No	Original
Jun-05	16 JN	Yes	Original
Apr-07	190 J	No	Original
Apr-07	ND J	Yes	Original

OWR-13 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Feb-03	250	No	Original
Feb-03	68	Yes	Original Field Duplicate
Feb-03	72	Yes	Field Duplicate
Feb-03	240	No	Original

WEL-01 - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Oct-98	ND	No	Original
Oct-98	ND	Yes	Original
Jun-05	0.66	No	Original
Jun-05	ND	Yes	Original

OWR-07D - PCBs (ug/l)			
Date	Value	Filtered	QA Type
Aug-98	2.2	No	Original
Aug-98	ND	Yes	Original
Jun-05	0.72	No	Original
Jun-05	ND J	Yes	Original

Clydesdale Ave.

Old Limestone Bed

WMA II

Phosphoric Acid Basins

West End Landfill

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Groundwater Monitoring Well
- Soil Sampling Location

NOTES

1 - Response to EPA Feasibility Study (FS) Comments dated April 19, 2010.

2 - The well and soil sampling locations shown are referenced in Section 4.2.4 of the FS Report.

3 - PCB results shown are referenced from Tables 4-1 and 4-4 of the RI Report, Rev. 2.0.

4 - ND = Non-Detect; ug/l = micrograms per liter; mg/kg = milligrams per kilogram; J = estimated concentrations; JN = estimated value based on presumptive evidence; compound tentatively identified.

5 - Maximum Contaminant Level = 0.5 ug/l; Soil Screening Level = 45 ug/kg

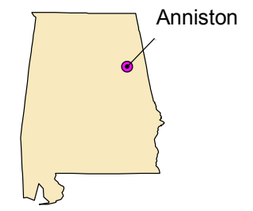
SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

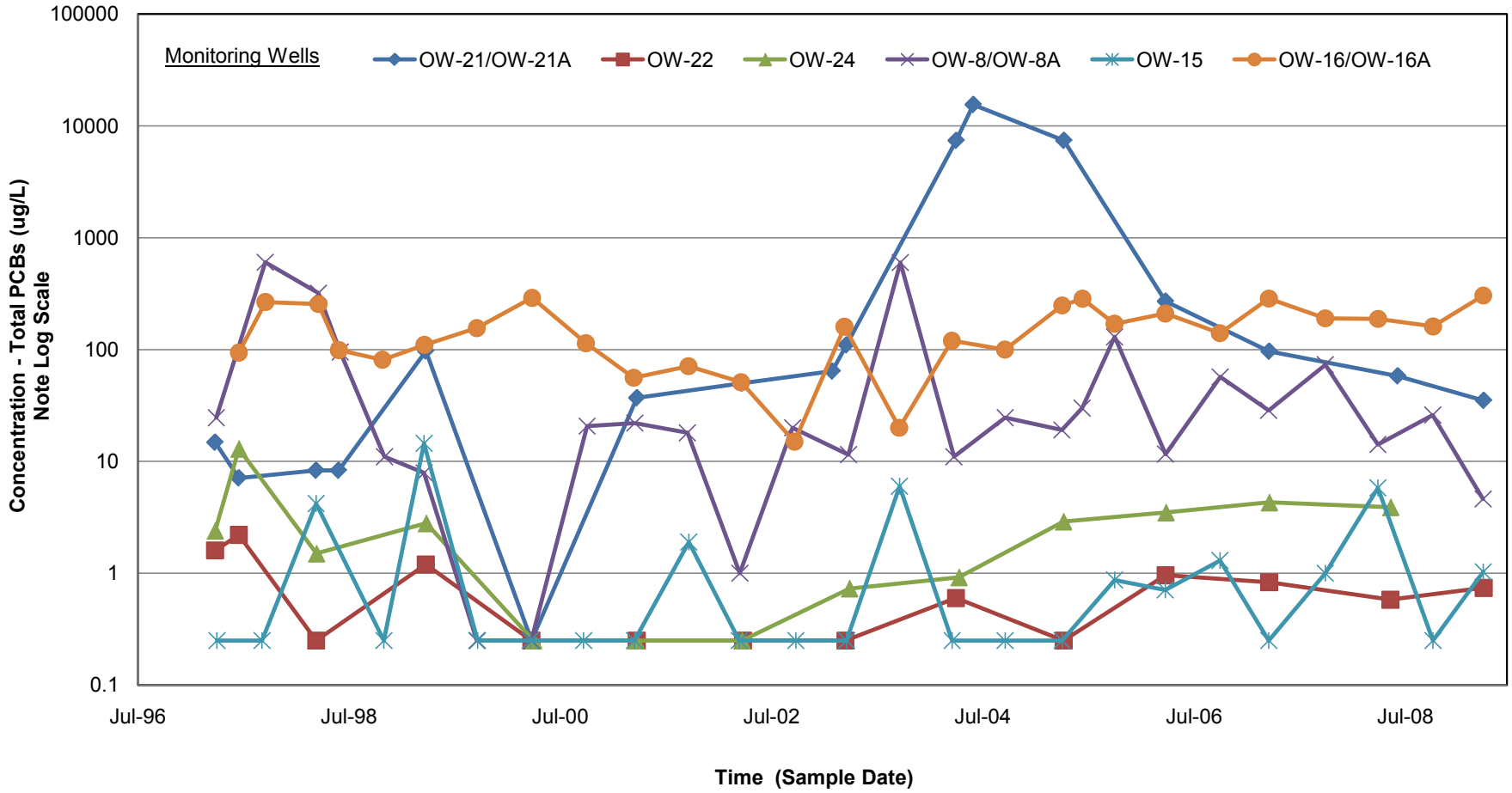


SCALE

150 75 0 150 300 450 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 4-4

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments_FS_Figure_4-4_Soil_GW_PCB3.mxd



Notes: Non-detect measurements shown at 0.25 ug/L (1/2 of the Maximum Contaminant Level (MCL)).

Golder Associates Inc.	SCALE: AS SHOWN	PROJECT: **Solutia / OU-3 Feasibility Study / AL**	
	DATE: Jun 2010	TITLE: **Monitoring Well Total PCB (Unfiltered) Concentration vs. Time**	
	MADE BY: TIR		
	CAD: -		
FILE: OU-3 Feasibility Study Report	CHECK: GLH	CLIENT: SOLUTIA	FIGURE: **4-5**
PROJECT No.: 043-3746OU3 / REV.: 1	REVIEW: SJM		

SOIL AND GROUNDWATER IMPACT AREAS

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Buildings
- Existing Monitoring Well
- Existing Interceptor Well
- Potential Groundwater Impact Areas
- Soil Impact Areas (based on potential human contact)
- Soil Impact Areas (based on potential human contact and potential leaching to groundwater)
- Soil Impact Areas (based on potential leaching to groundwater)
- Approximate Cell Boundary

NOTES

1 - See Sections 5 and 6 of the main text for a description of these soil and groundwater impact areas.

SOURCE	ZONE
USGS 1:2,400 Quad Maps Golder Associates (on-site base map)	Alabama East 101
MAP PROJECTION	**DATUM**
US State Plane	NAD83

LOCATION MAP

N W E S

Anniston

SOLUTIA

Golder Associates

SCALE

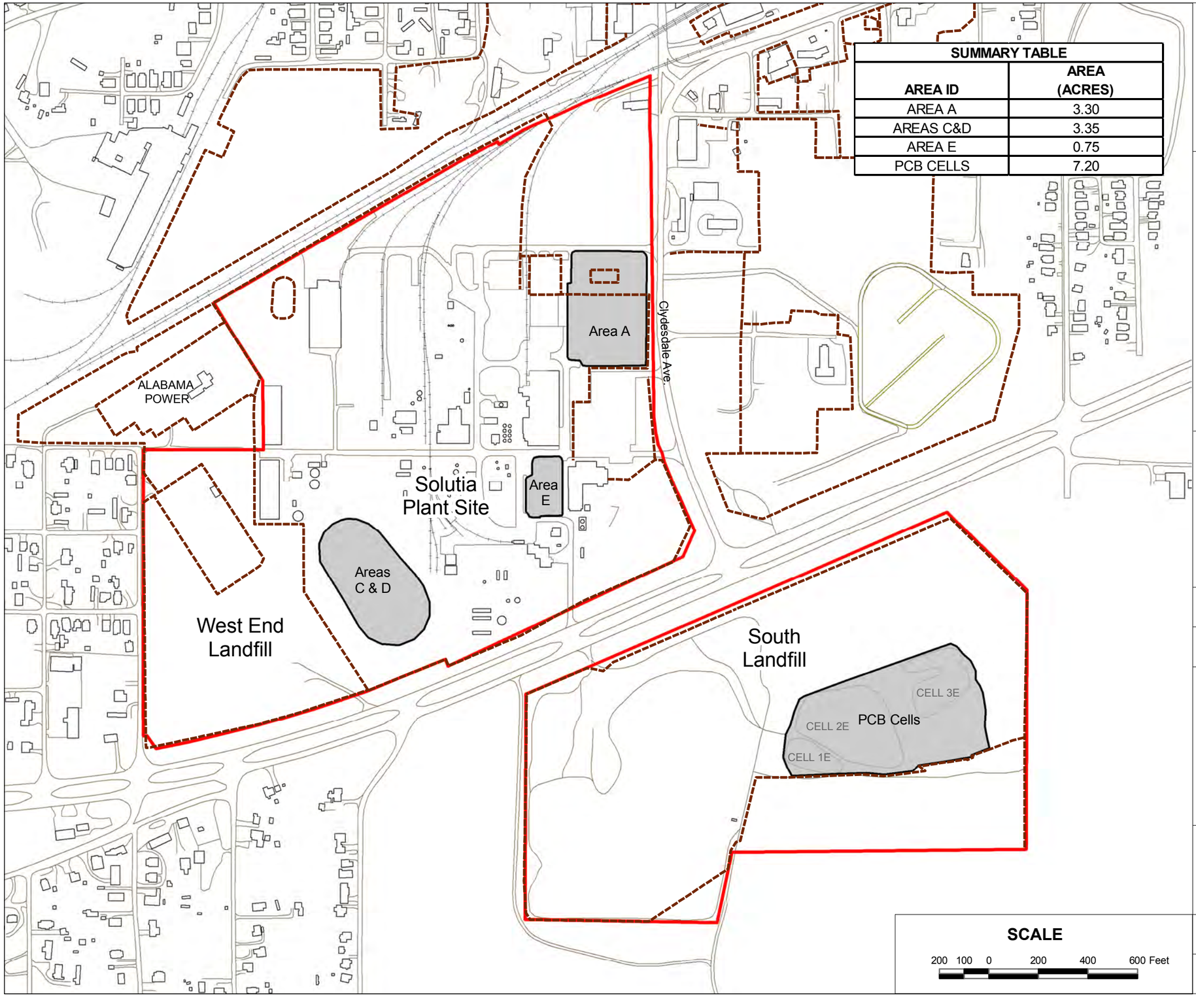
220 110 0 220 440 660 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE:	**PROJECT NO:**	**FIGURE NO.**
June 2010	0433746OU3	5-1

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_5-1_Impacts.mxd

LIMITS OF EXCAVATION/CAPPING

SUMMARY TABLE	
AREA ID	AREA (ACRES)
AREA A	3.30
AREAS C&D	3.35
AREA E	0.75
PCB CELLS	7.20



LEGEND

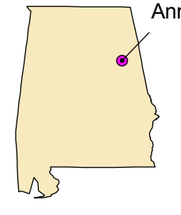
- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Proposed Limits of Excavation/Capping (Areal Limits)
- Approximate Cell Boundary

NOTES

1 - See Figures 7-1 and 7-2 for excavation schedule and excavation/backfill details.
2 - See Figure 7-4 for proposed cap types for soil impact areas.
3 - See Figure 7-5 for capping details.
4 - Limits of capping shown for the PCB Cells only apply to Soil Alternative S-C Option 2.

SOURCE USGS 1:2,400 Quad Maps Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP



SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 5-2

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_5-2_ExcCap.mxd

EXISTING GROUNDWATER CORRECTIVE ACTION SYSTEM

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Existing Monitoring Well
- Existing Interceptor Well
- Existing Surface Conveyance Piping
- Existing Underground Conveyance Piping
- Groundwater Components

NOTES

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

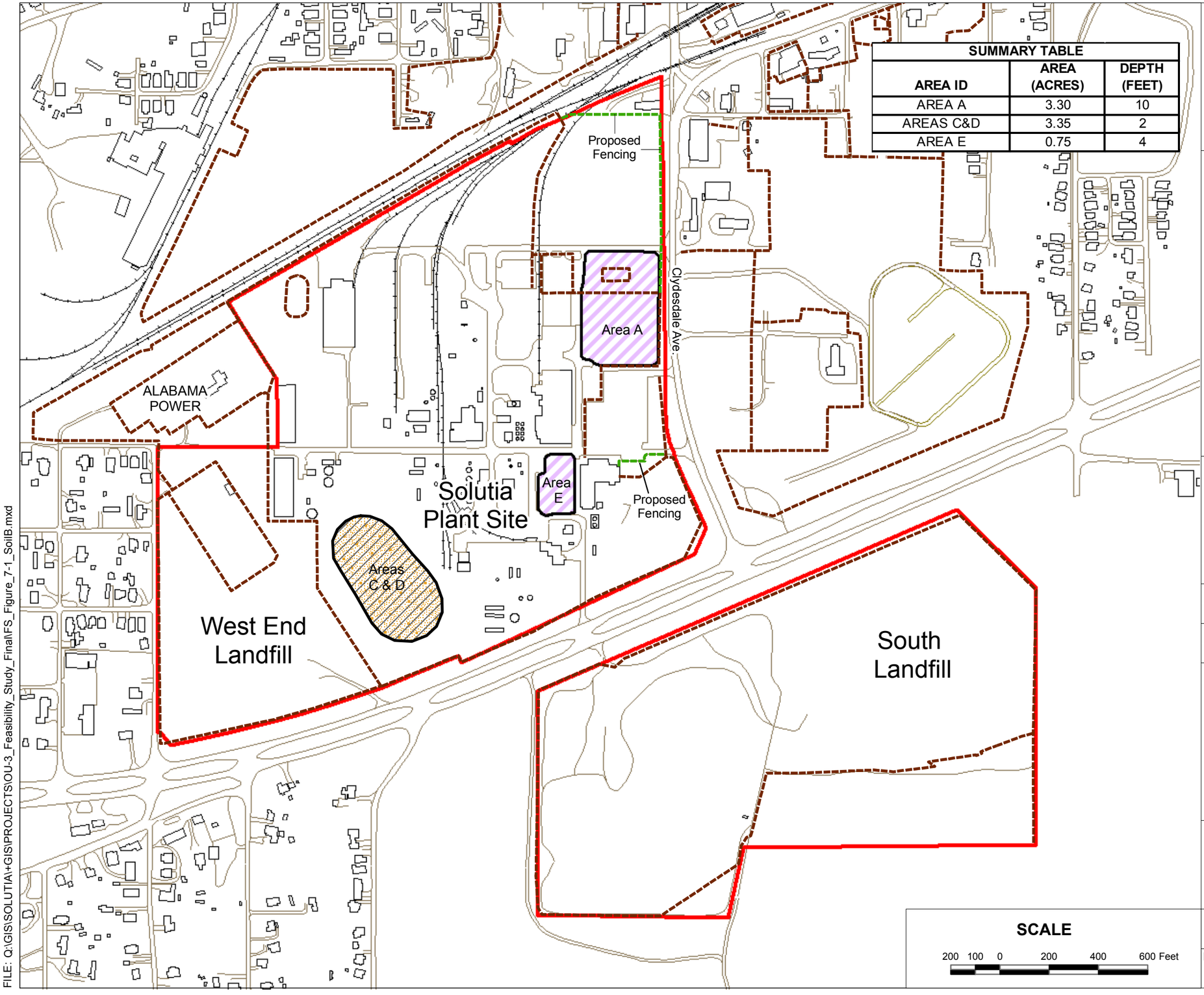
Anniston

SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
JLP	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 5-3

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_FinalFS_Figure_5-3_ExistGW.mxd



SUMMARY TABLE		
AREA ID	AREA (ACRES)	DEPTH (FEET)
AREA A	3.30	10
AREAS C&D	3.35	2
AREA E	0.75	4

SOIL ALTERNATIVE S-B REMEDIAL COMPONENTS

Excavation and Off-Site Disposal

LEGEND

- OU-3 Area
- Existing Fence
- Proposed Fence
- Roads
- Railroads
- Proposed Limits of Excavation
- Proposed Gravel and Soil Backfill Option
- Proposed Grass and Soil Backfill Option

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - See Figure 7-2 for excavation and backfill details.
3 - See Figure 7-3 for fence details.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

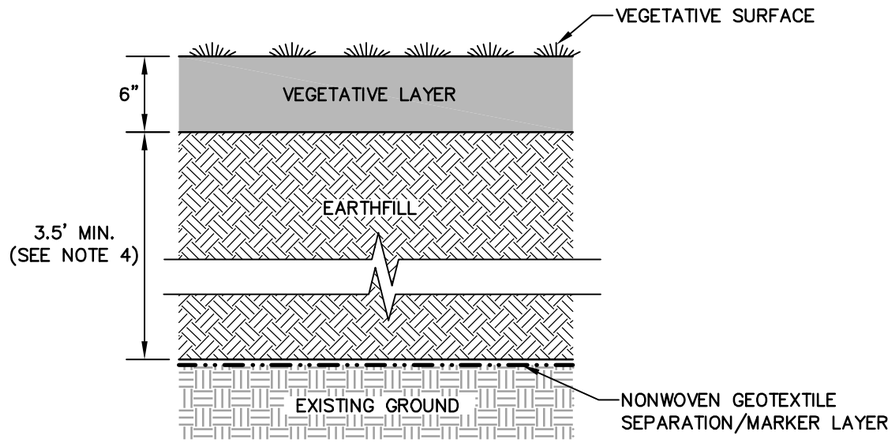
LOCATION MAP

SCALE

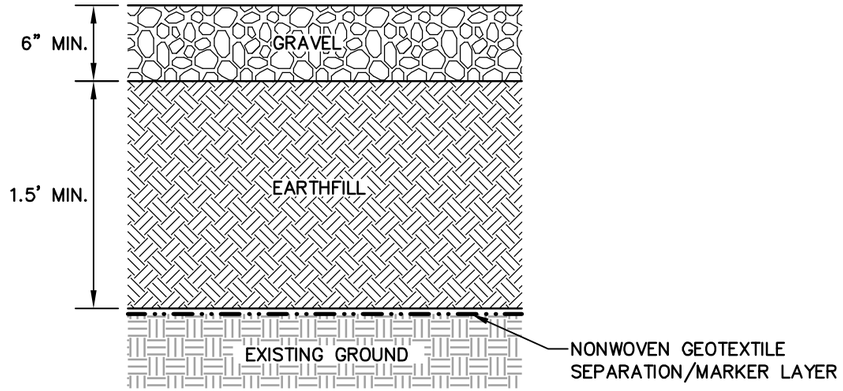
200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-1

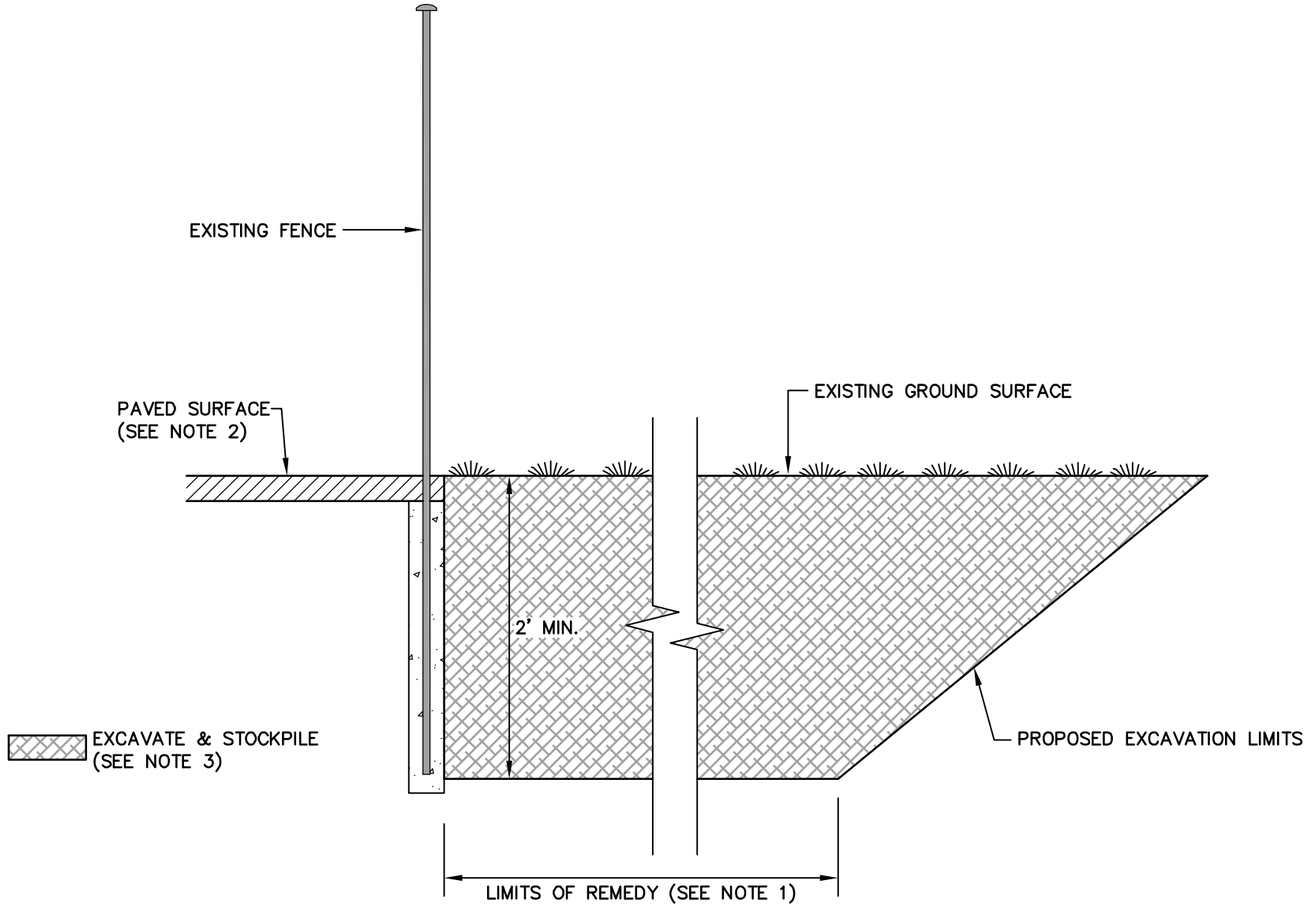
FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Final\FS_Figure_7-1_SoilB.mxd



SOIL AND GRASS BACKFILL OPTION
PROPOSED FOR AREAS A&E



SOIL AND GRAVEL BACKFILL OPTION
PROPOSED FOR AREAS C&D



EXCAVATION DETAIL

NOTES:
1. EXCAVATION AND REPLACEMENT OF MATERIAL TO EXTEND TO FULL TREATMENT DEPTH OVER LIMITS SHOWN ON PLANS. SLOPE AND EXCAVATE ADDITIONAL MATERIAL OUTSIDE TREATMENT AREA AS NECESSARY.

2. IF LIMITS OF REMEDY EXTEND TO PAVED SURFACE, FENCING, OR OTHER OBSTRUCTION, LOCALLY CUT SLOPES VERTICALLY IN THESE AREAS TO PROVIDE MINIMUM EXCAVATION REQUIREMENTS.

3. USE SPECIFIED BACKFILL (OPTIONS SHOWN ABOVE) TO RETURN EXCAVATED AREA TO PRE-CONSTRUCTION GRADES, OR THOSE OTHERWISE INDICATED ON THE PLANS.

4. EXTEND EARTHFILL BACKFILL TO THE BOTTOM OF THE EXCAVATION. SOME AREAS (AREAS A & E) REQUIRE EXCAVATION AND REMOVAL OF MORE THAN 2 FEET OF MATERIAL.

SOLUTIA

Golder Associates

TITLE
TYPICAL BACKFILL SECTIONS AND EXCAVATION DETAIL

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-2

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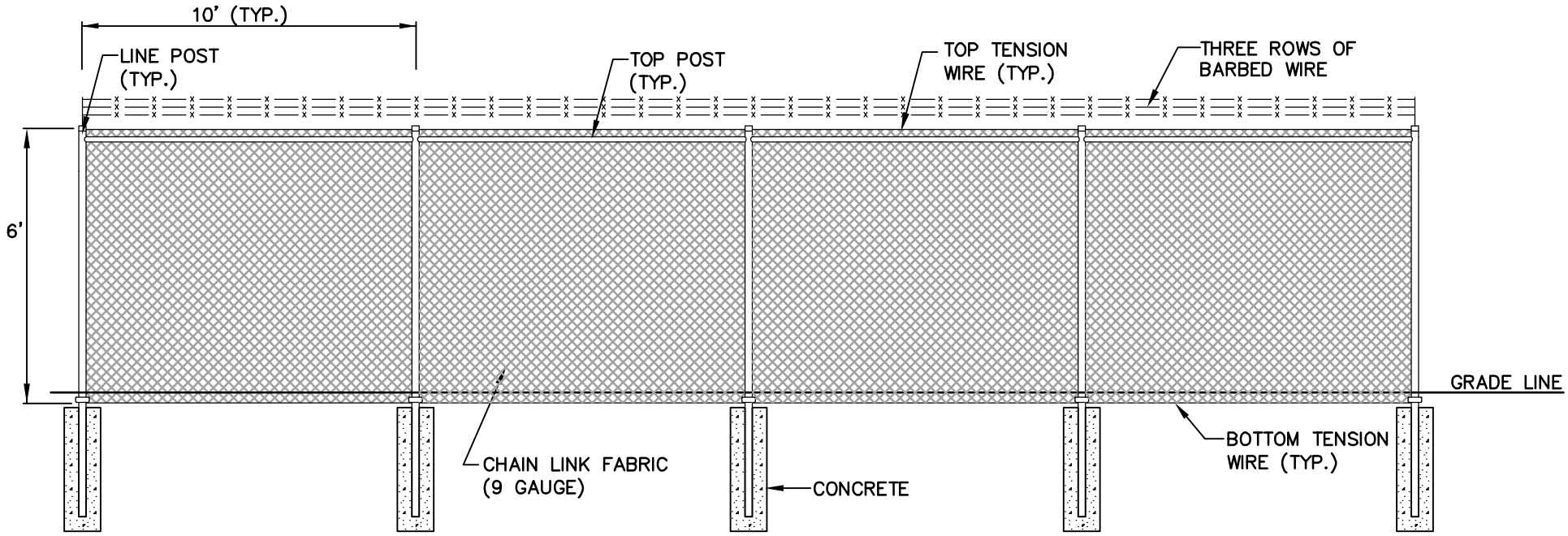


TYPICAL GALVANIZED CHAIN LINK FENCE DETAIL

SOLUTIA

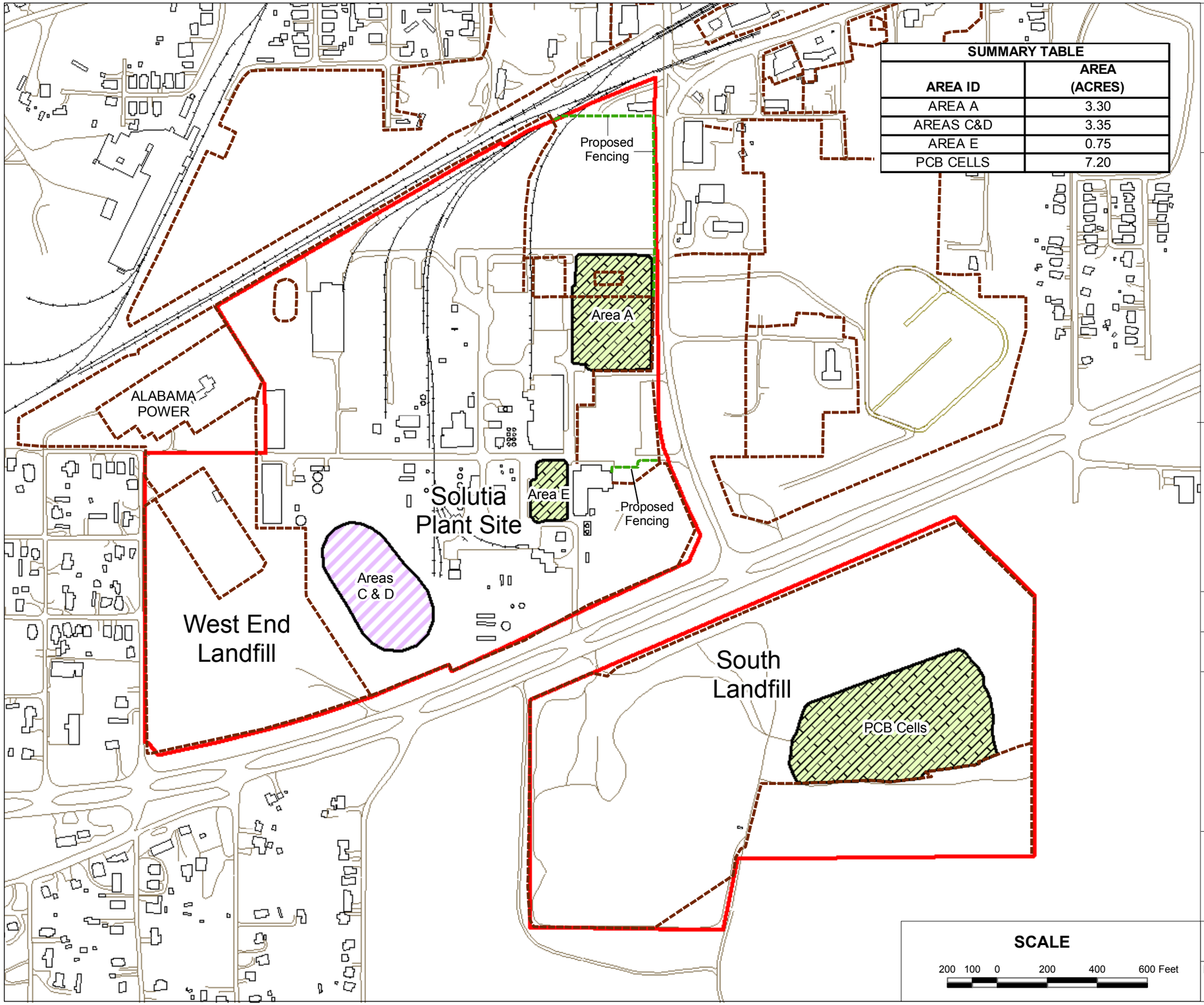
Golder Associates

TITLE

TYPICAL FENCE DETAIL

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-3



SUMMARY TABLE	
AREA ID	AREA (ACRES)
AREA A	3.30
AREAS C&D	3.35
AREA E	0.75
PCB CELLS	7.20

SOIL ALTERNATIVE S-C REMEDIAL COMPONENTS

Capping

LEGEND

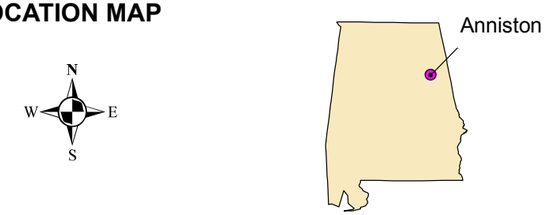
- OU-3 Area
- Existing Fence
- Proposed Fence
- Roads
- Railroads
- Proposed Limits of Capping
- Proposed Impermeable Cover (Geomembrane or Paved)
- Proposed Grass and Soil Cover

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - See Figure 7-3 for fence details.
3 - See Figure 7-5 for capping details.
4 - Limits of capping shown for the PCB Cells only apply to Soil Alternative S-C Option 2.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP



SOLUTIA

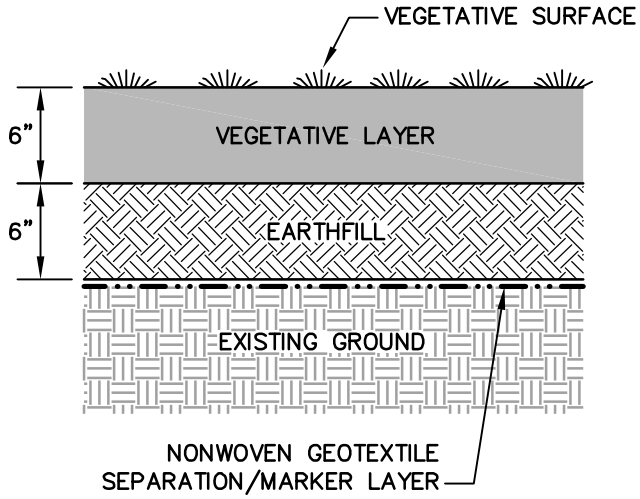
Golder Associates

SCALE

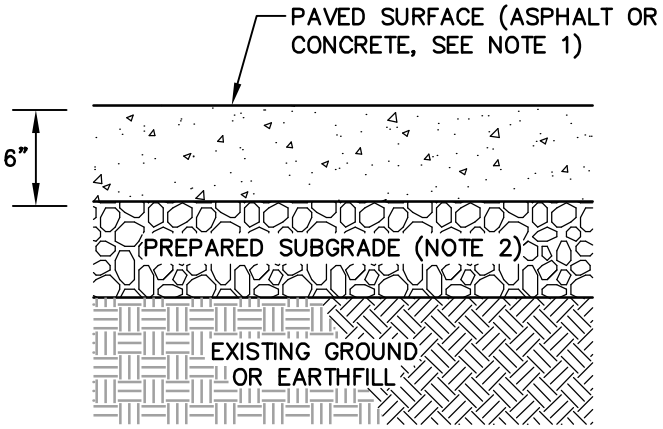
200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	TIR	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-4

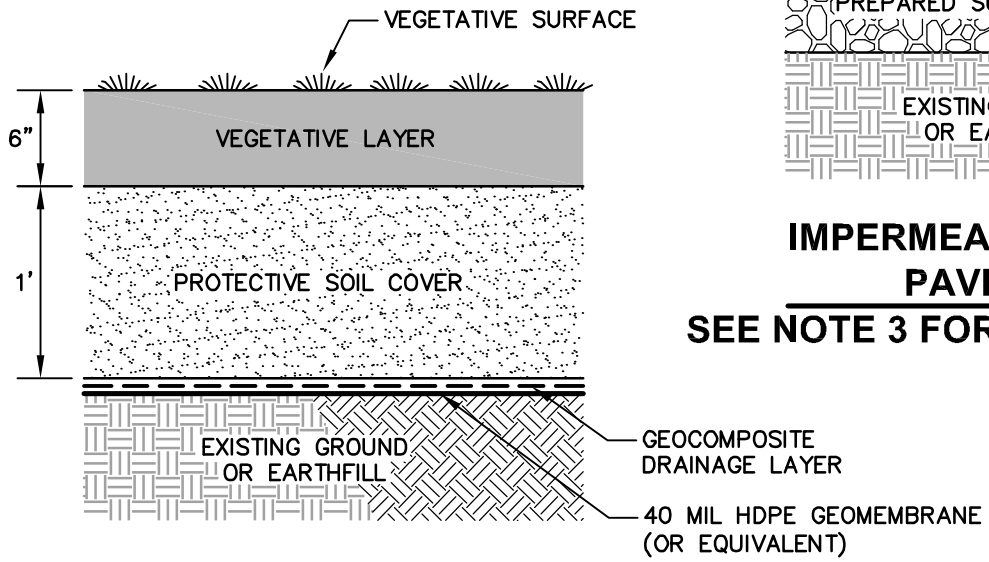
FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_7-4_SoilC.mxd



SOIL AND GRASS COVER SECTION
PROPOSED FOR AREAS C&D



IMPERMEABLE SECTION #2
PAVED COVER
SEE NOTE 3 FOR PROPOSED AREAS



IMPERMEABLE SECTION #1
GEOMEMBRANE COVER
SEE NOTE 3 FOR PROPOSED AREAS

NOTES

1. THICKNESS OF PAVEMENT SURFACE TO BE 6" MIN. AS PER 40 CFR 761.61 AND 40 CFR 761.75 GUIDANCE.

2. SUBGRADE PREPARATION TO BE DESIGNED BASED ON EXISTING CONDITIONS AND INTENDED SERVICE USE OF PAVEMENT.

3. SELECTION OF IMPERMEABLE COVER OPTION FOR AREAS A&E WILL BE MADE DURING A PRE-DESIGN INVESTIGATION. FOR ALTERNATIVE S-C OPTION 2, A GEOMEMBRANE COVER WILL BE USED OVER THE PCB CELLS.

SOLUTIA

Golder Associates

TITLE

TYPICAL COVER SECTIONS

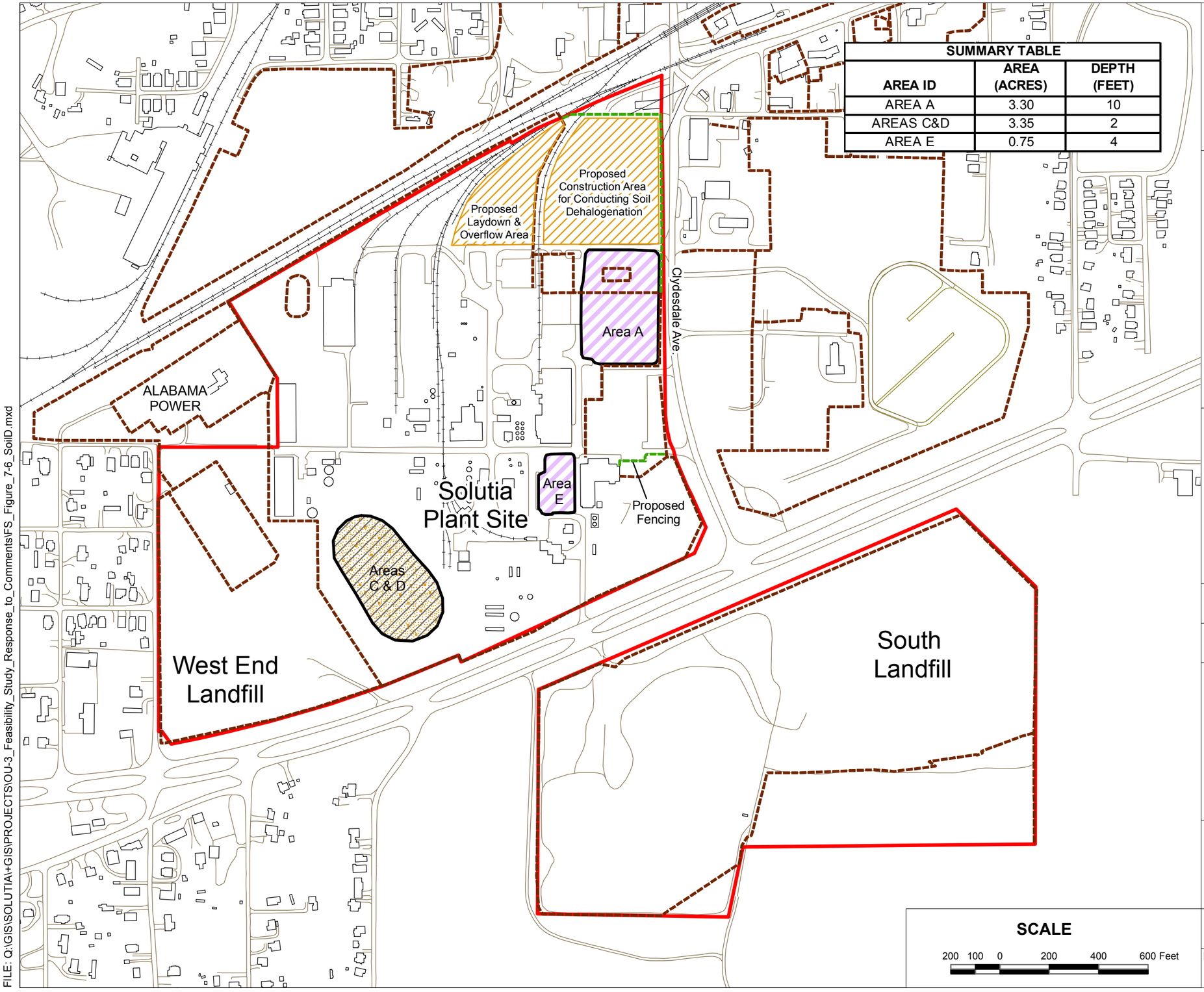
PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-5

SOIL ALTERNATIVE S-D
REMEDIAL COMPONENTS

On-Site Ex-Situ Dehalogenation

SUMMARY TABLE		
AREA ID	AREA (ACRES)	DEPTH (FEET)
AREA A	3.30	10
AREAS C&D	3.35	2
AREA E	0.75	4



LEGEND

- OU-3 Area
- Existing Fence
- Proposed Fence
- Roads
- Railroads
- Proposed Limits of Excavation
- Proposed Gravel and Soil Cover
- Proposed Grass and Soil Cover
- Proposed Construction Area for Conducting Ex-Situ Soil Treatment

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - See Figure 7-2 for excavation and backfill details. Treated soils will be used to backfill excavation areas with the exception of the proposed gravel or vegetative surface layer.
3 - See Figure 7-3 for fence details.
4 - See Figure 7-7 for dehalogenation process details.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

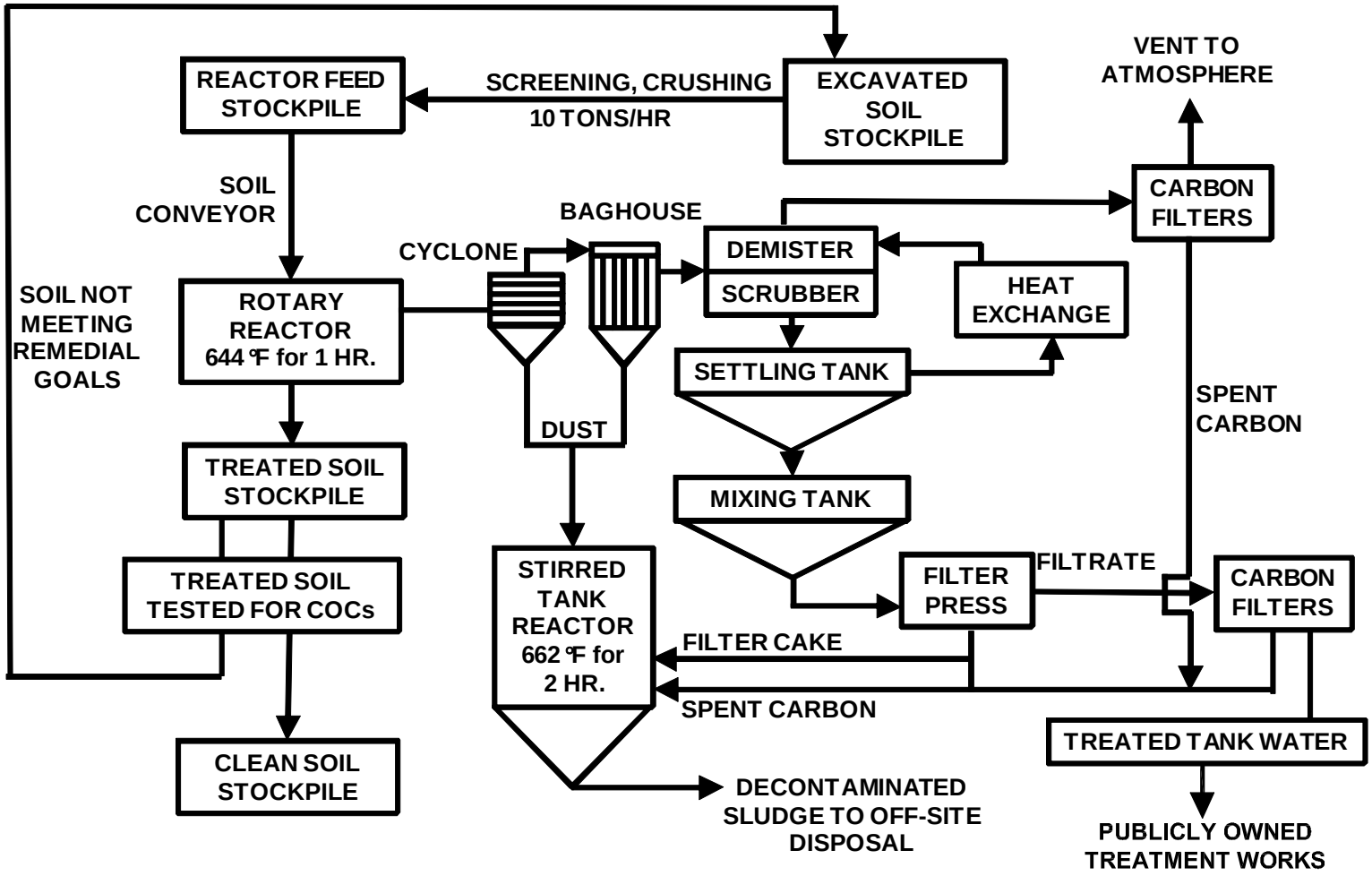
LOCATION MAP

SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
AMA	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-6

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_7-6_SoilD.mxd



REFERENCE:
SCHEMATIC ADAPTED FROM THE USEPA FEDERAL REMEDIATION TECHNOLOGY ROUNDTABLE SECTION 4–17, AT WEB ADDRESS:
http://www.frtr.gov/matrix2/section4/D01-4-17a.html

SOLUTIA

Golder Associates

TITLE

SCHEMATIC OF DEHALOGENATION PROCESS

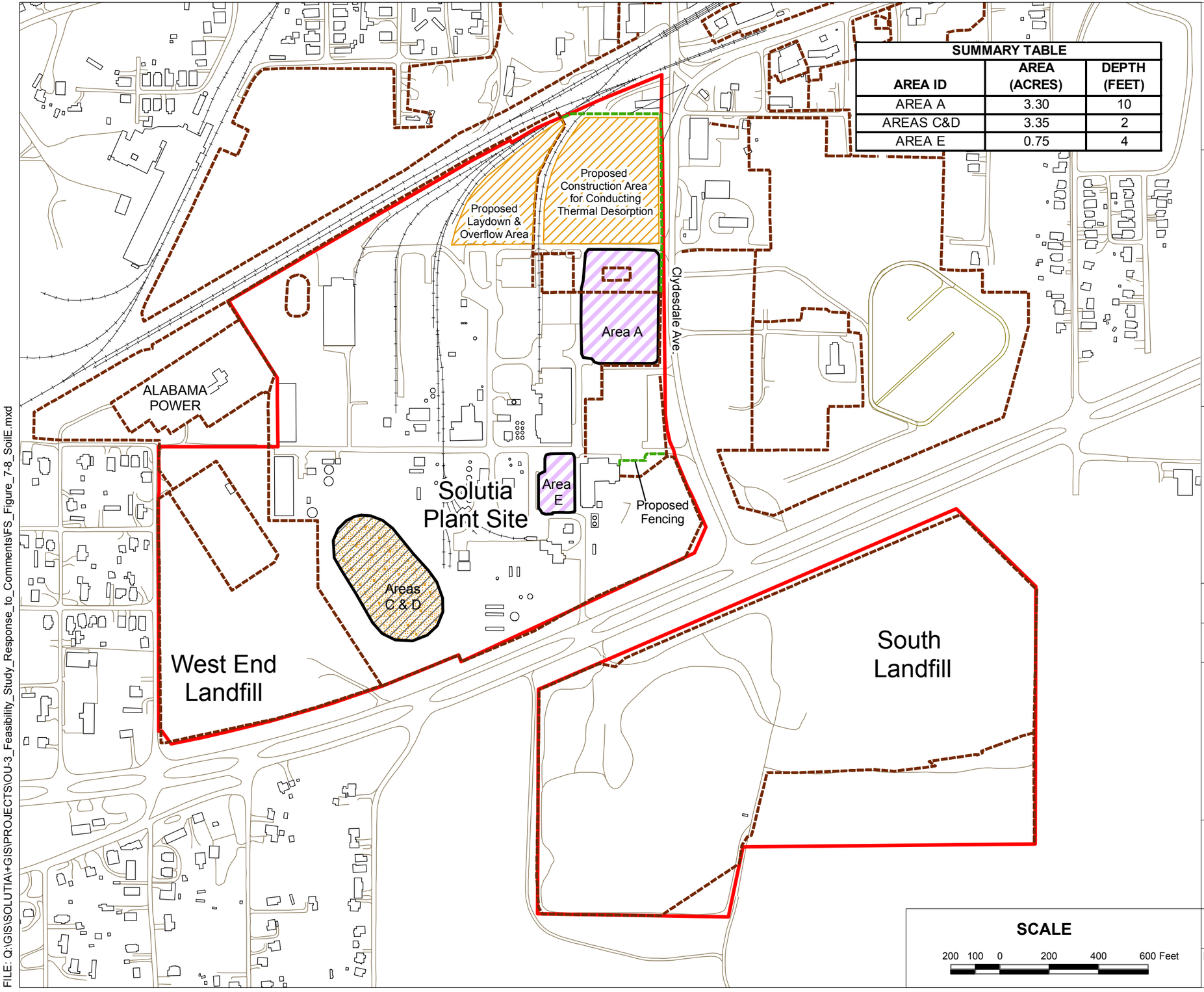
PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-7

SOIL ALTERNATIVE S-E
REMEDIAL COMPONENTS

On-Site Ex-Situ Thermal Desorption

SUMMARY TABLE		
AREA ID	AREA (ACRES)	DEPTH (FEET)
AREA A	3.30	10
AREAS C&D	3.35	2
AREA E	0.75	4



LEGEND

- OU-3 Area
- Existing Fence
- Proposed Fence
- Roads
- Railroads
- Proposed Limits of Excavation
- Proposed Gravel and Soil Cover
- Proposed Grass and Soil Cover
- Proposed Construction Area for Conducting Ex-Situ Soil Treatment

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - See Figure 7-2 for excavation and backfill details. Treated soils will be used to backfill excavation areas with the exception of the proposed gravel or vegetative surface layer.
3 - See Figure 7-3 for fence details.
4 - See Figure 7-9 for thermal desorption process details.

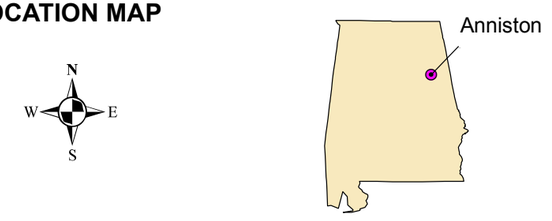
SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

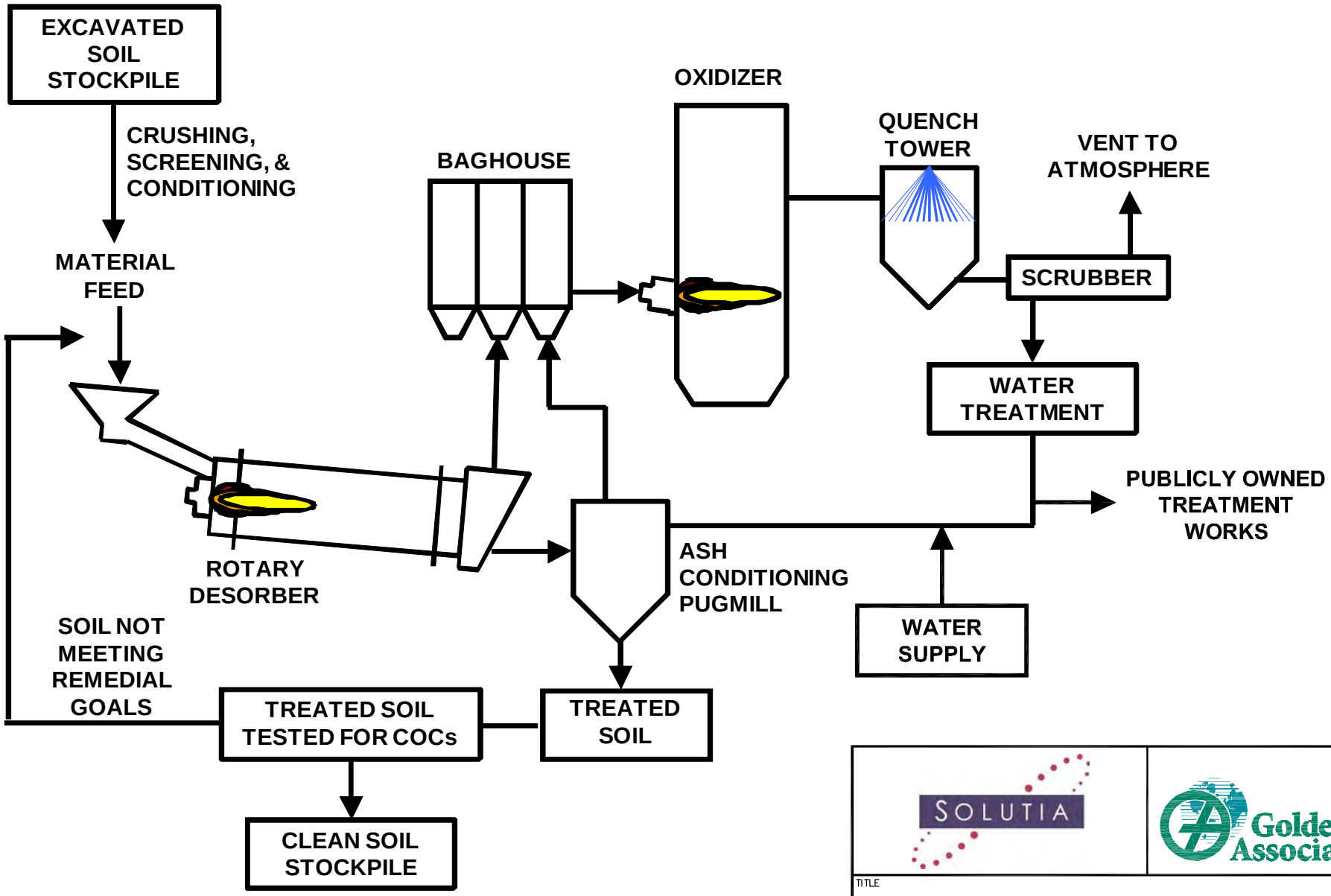


SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
JLP	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-8

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_Response_to_Comments\FS_Figure_7-8_SoilE.mxd



SOLUTIA

Golder Associates

TITLE

SCHEMATIC OF DIRECT FIRED THERMAL DESORPTION WITH OXIDATION

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-9

GROUNDWATER ALTERNATIVE GW-B REMEDIAL COMPONENTS

Expanded Groundwater Extraction

Proposed Interceptor Wells
T-9
T-10
OW-21A
OW-22
MW-08
MW-09A
OW-24
OW-19
IW-16
IW-22
IW-17
IW-23
IW-18
IW-24
IW-21
IW-19
MW-16
IW-20
MW-20A
SBP-15
IW-25
MW-15
Storage Tank & Electronic Controls
Proposed Carbon Treatment
Proposed Interceptor Wells
OW-10
Proposed Monitoring Well
Clydesdale Ave.
ALABAMA POWER
OW-08A
IW-14A
Lift Station
Solutia Plant Site
OW-07
OW-06A
OW-15
OW-16A
MW-11A
MW-12A
MW-13A
IW-07
IW-08
IW-09
IW-10
IW-06
IW-11
IW-05
IW-12
IW-13
Existing Carbon Treatment
South Landfill
West End Landfill
OW-04
OW-02
IW-02
MW-01B

LEGEND

- Existing Monitoring Well
- Existing Interceptor Well
- Proposed Interceptor Well
- Proposed Monitoring Well
- Groundwater Components
- Existing Surface Conveyance Piping
- Existing Underground Conveyance Piping
- Proposed Underground Conveyance Piping
- OU-3 Area
- Existing Fence
- Roads
- Railroads

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - The numbers and locations of proposed interceptor and monitoring wells and carbon treatment units will be refined by a pre-design investigation.
3 - See Figures 7-11, 7-12, and 7-13 for proposed interceptor well details, monitoring well details, and carbon treatment details.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP

N W E S

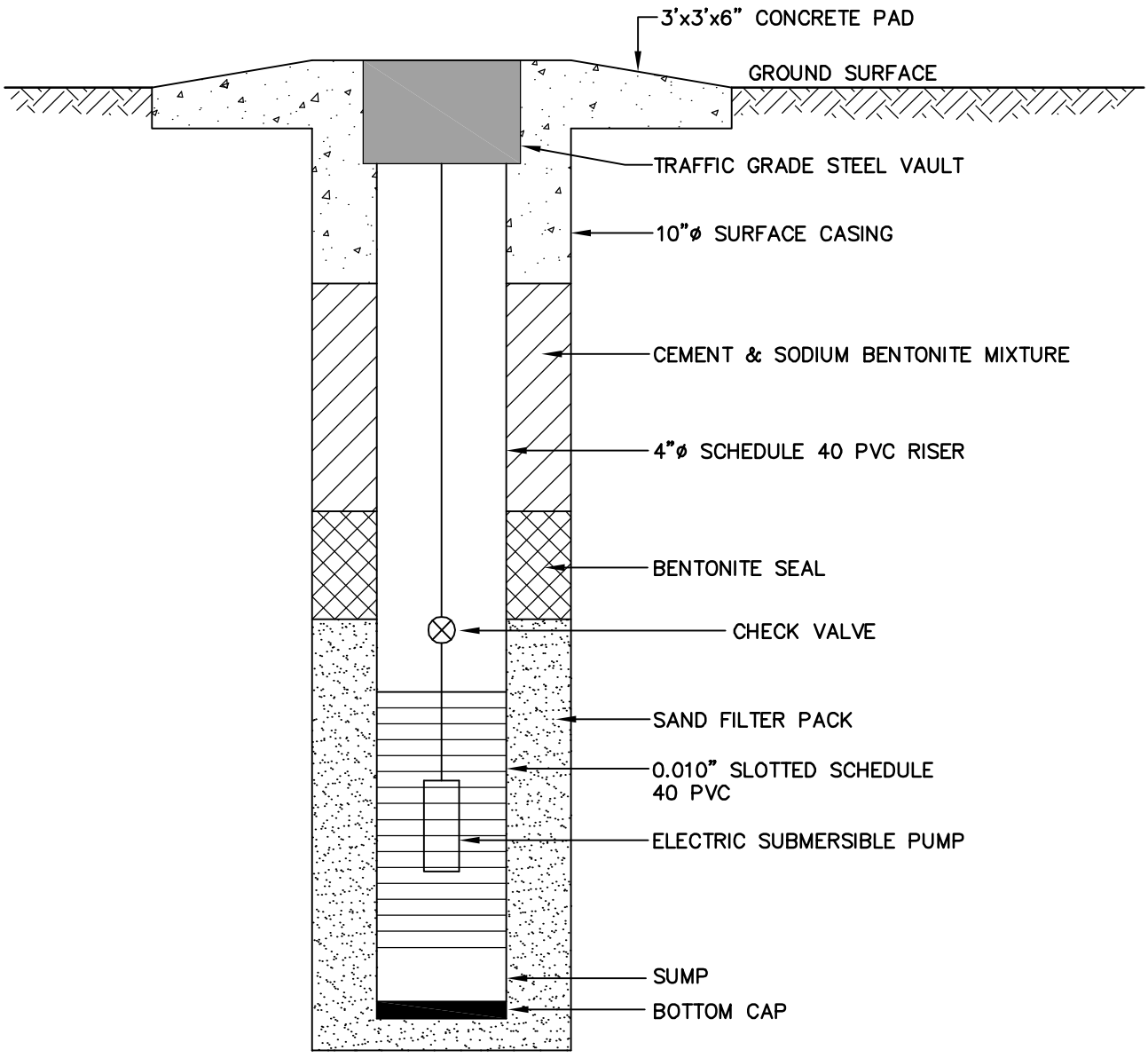
Anniston

SCALE

200 100 0 200 400 600 Feet

PRODUCED BY: JLP	CHECKED BY: GLH	REVIEWED BY: SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-10

FILE: Q:\GIS\SOLUTIA\+GIS\PROJECTS\OU-3_Feasibility_Study_FinalFS_Figure_7-10_GWB.mxd



SOLUTIA

Golder Associates

TITLE

TYPICAL INTERCEPTOR WELL

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-11

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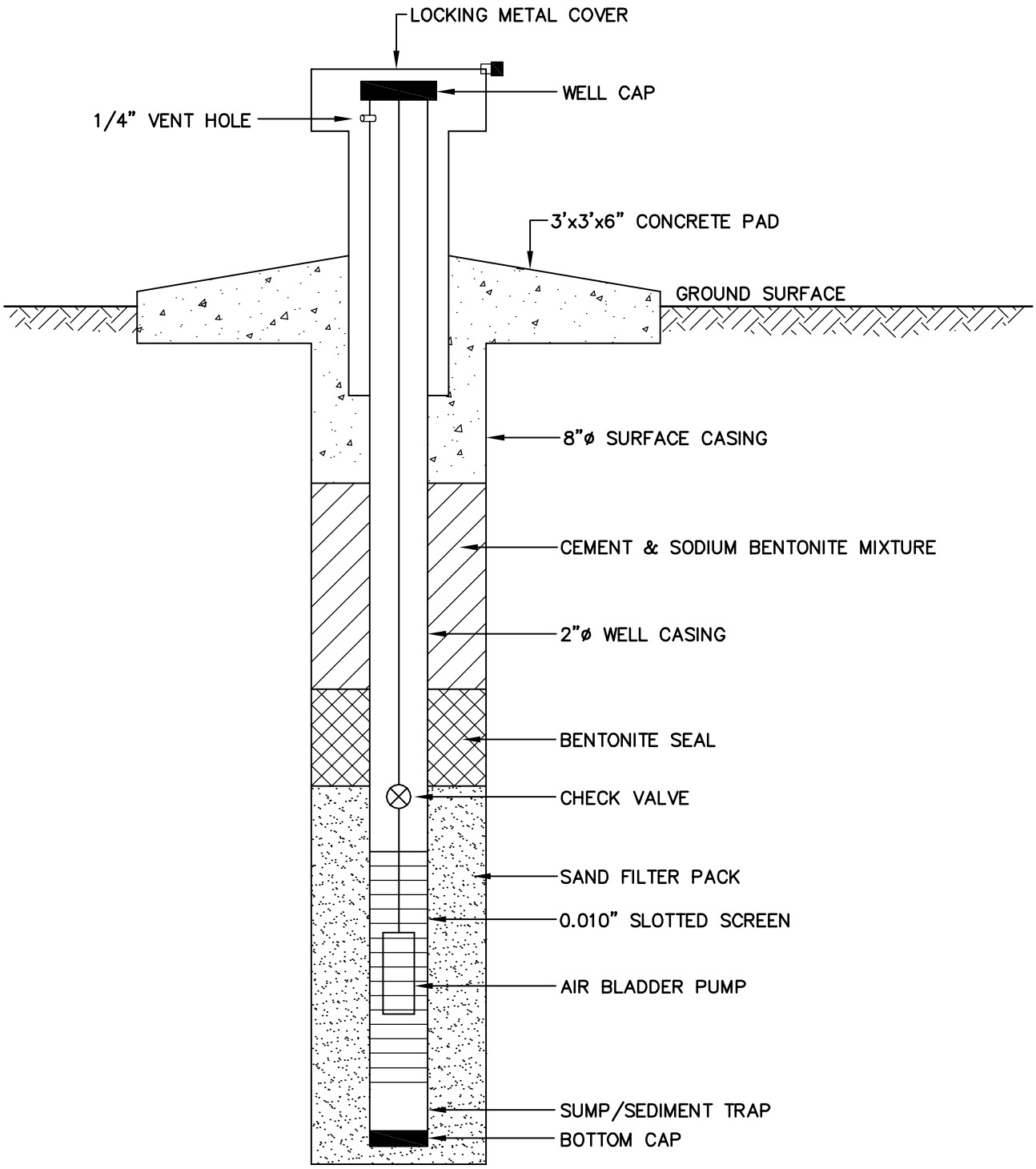

SOLUTIA

Golder Associates

TITLE

TYPICAL MONITORING WELL

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-12

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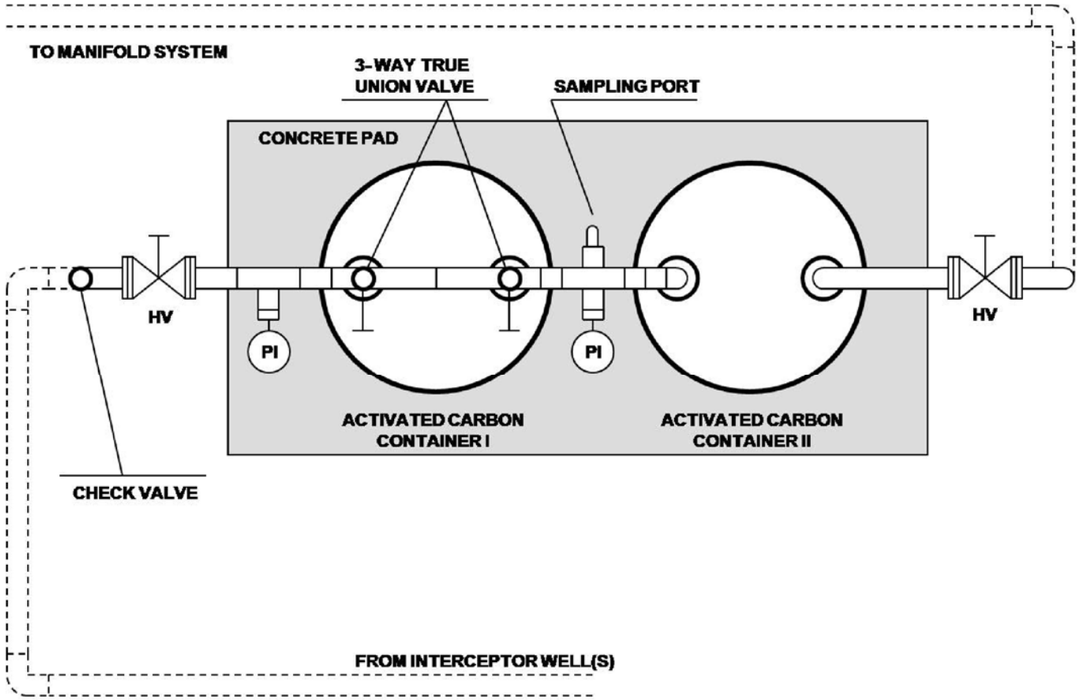

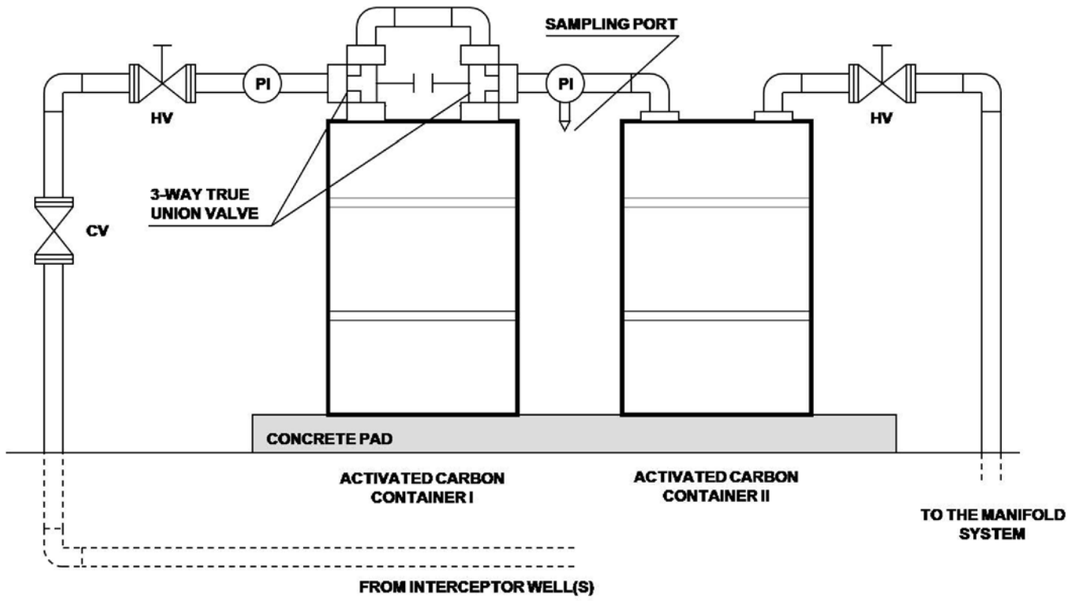

LEGEND

(PI)	PRESSURE GAUGE
HV	HAND–OPERATED VALVE
CV	CHECK VALVE

NOTES:
1. ALL FITTINGS SHALL HAVE TRUE UNION CONNECTIONS OR FLANGES.

2. PIPING SHALL BE PVC SCHEDULE 40 OF APPROPRIATE DIMENSIONS.

SOLUTIA

Golder Associates

TITLE

SCHEMATIC OF CARBON TREATMENT

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-13

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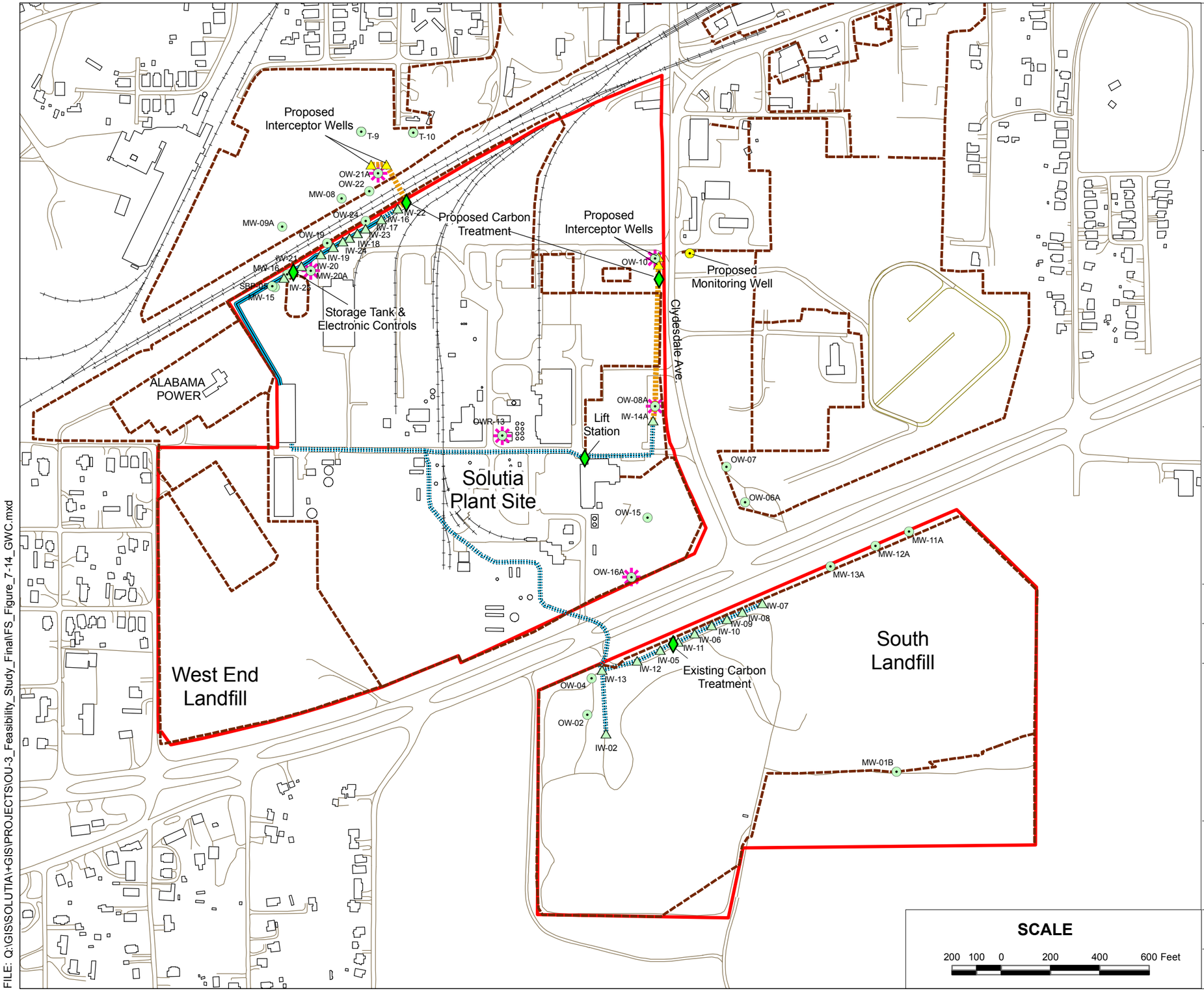
GROUNDWATER ALTERNATIVE GW-C REMEDIAL COMPONENTS

Expanded Groundwater Extraction with MNA



LEGEND

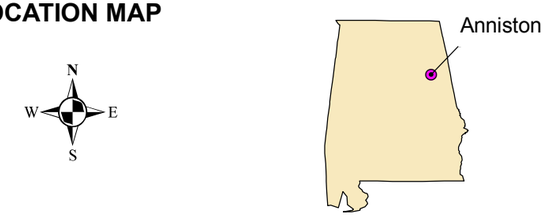
- Proposed MNA Well
- Existing Monitoring Well
- Existing Interceptor Well
- Proposed Interceptor Well
- Proposed Monitoring Well
- Groundwater Components
- Existing Surface Conveyance Piping
- Existing Underground Conveyance Piping
- Proposed Underground Conveyance Piping
- OU-3 Area
- Existing Fence
- Roads
- Railroads

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - The numbers and locations of proposed interceptor and monitoring wells and carbon treatment units will be refined by a pre-design investigation.
3 - See Figures 7-11, 7-12, and 7-13 for proposed interceptor well details, monitoring well details, and carbon treatment details.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)	**ZONE** Alabama East 101
MAP PROJECTION US State Plane	**DATUM** NAD83

LOCATION MAP



SCALE

200 100 0 200 400 600 Feet

PRODUCED BY: JLP	CHECKED BY: GLH	REVIEWED BY: SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-14

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GROUNDWATER ALTERNATIVE GW-D REMEDIAL COMPONENTS

ZVI Funnel and Gate Groundwater Treatment

Proposed Funnel & Gate System
T-9
T-10
OW-21A
OW-22
MW-08
MW-09A
OW-24
IW-22
IW-16
IW-17
IW-23
OW-19
IW-18
IW-24
IW-19
IW-21
IW-20
MW-16
MW-20A
SB-15
IW-25
MW-15
Storage Tank & Electronic Controls
ALABAMA POWER
OW-10
Proposed Monitoring Well
Proposed Funnel & Gate System
OW-08A
Lift Station
IW-14A
Solutia Plant Site
Clydesdale Ave.
OW-07
OW-06A
OW-15
OW-16A
MW-11A
MW-12A
MW-13A
IW-07
IW-08
IW-09
IW-10
IW-06
IW-11
IW-05
IW-12
Existing Carbon Treatment
IW-13
OW-04
OW-02
IW-02
West End Landfill
South Landfill
MW-01B

LEGEND

- OU-3 Area
- Existing Fence
- Roads
- Railroads
- Existing Monitoring Well
- Existing Interceptor Well
- Proposed Monitoring Well
- Groundwater Components
- Existing Surface Conveyance Piping
- Existing Underground Conveyance Piping
- Proposed Funnel and Gate System

NOTES

1 - O&M of existing interim corrective measures shown on Figure 3-1 and detailed in Section 3 are also part of this remedial alternative but are not shown here for clarity.
2 - See Figures 7-12 and 7-16 for proposed monitoring well details and funnel and gate system details.
3 - Type and scale of contingent secondary groundwater treatment will be evaluated during a pre-design investigation.

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

N W E S

Anniston

SCALE

200 100 0 200 400 600 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
JLP	GLH	SJM
DATE: June 2010	PROJECT NO: 0433746OU3	FIGURE NO. 7-15

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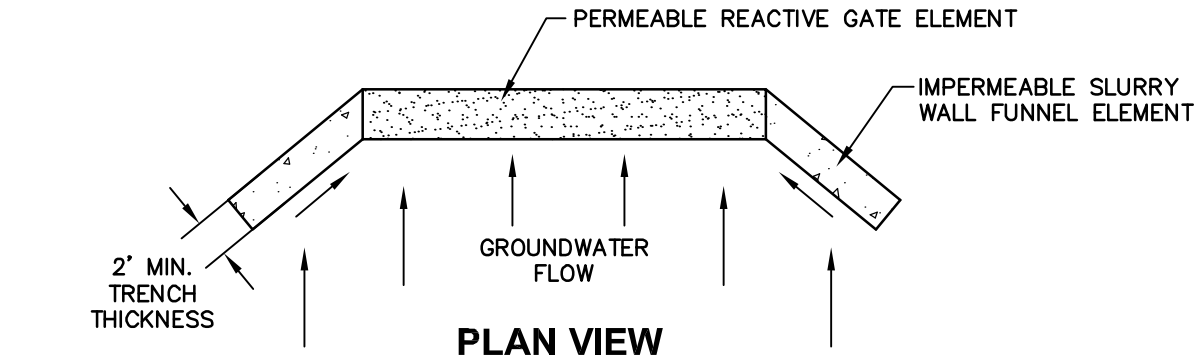
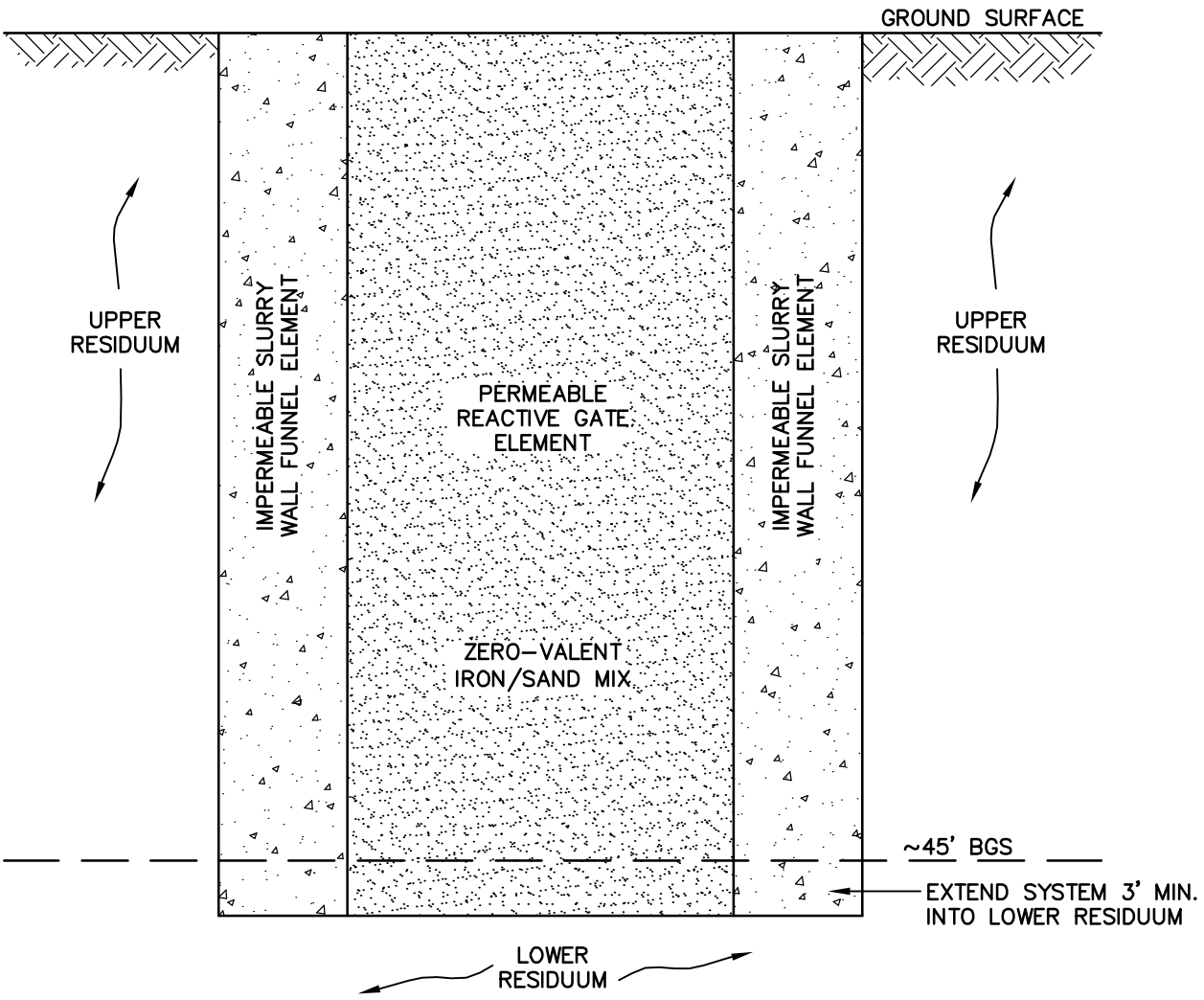


PLAN VIEW



SECTION VIEW

SOLUTIA

Golder Associates

TITLE

SCHEMATIC OF ZVI FUNNEL AND GATE SYSTEM

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
RJC	GLH	SJM

DATE:	PROJECT No:	FILE No.	FIGURE No:
JUNE 2010	0433746OU3	0433746-001	7-16

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APPENDIX A

Select Tables and Figures from the Remedial Investigation Report

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
PCBs, Aroclor Specific										
Aroclor 1016	U	NA	NA	NA	NA	NA	U	U	U	U
Aroclor 1221	U	NA	NA	NA	NA	NA	U	U	U	U
Aroclor 1232	U	NA	NA	NA	NA	NA	U	U	U	U
Aroclor 1242	U	NA	NA	NA	NA	NA	U	U	U	U
Aroclor 1248	420	NA	NA	NA	NA	NA	U	U	U	U
Aroclor 1254	1400 J	NA	NA	NA	NA	NA	U	U	4500	U
Aroclor 1260	2200 J	NA	NA	NA	NA	NA	80	U	1300	U
Aroclor 1268	1700 J	NA	NA	NA	NA	NA	88	70	490	U
PCBs, Totals	5720 J	10000	4100	1300	6700	U	168	70	6290	U
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	AOC-A 0-0.5	LFSL89	LFSL93	LFSL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	3900	7600	3100	4200	11000	7900
Barium	NA	NA	NA	NA	18000	150000	22000	43000	51000	38000
Beryllium	NA	NA	NA	NA	U	1000	U	U	U	U
Cadmium	NA	NA	NA	NA	U	U	U	U	U	U
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	18000	20000	7400	19000	38000	23000
Cobalt	NA	NA	NA	NA	2000	9100	2200	5000	6100	8900
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	8700	88000	25000	41000	52000	48000
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	70000	590000	220000	120000	610000	690000
Mercury	NA	NA	NA	NA	U	210	52	1100	1800	330
Nickel	NA	NA	NA	NA	U	18000	5700	7500	15000	39000
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	31000	39000	10000	33000	42000	50000
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	9.4	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	1600000	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	4500000	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	70000	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U	35000	U
Aroclor 1254	U	U	61 J	U	23	4000	770	24000	44000	5200
Aroclor 1260	U	U	66 J	U	U	7200	1400	10000	27000	4100
Aroclor 1268	U	71 J	100 J	73 J	NA	NA	NA	NA	NA	NA
PCBs, Totals	U	71 J	227 J	73 J	23	11200	2170	104000	106000	9300
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	U	U	U	U	U	U
Parathion	NA	NA	NA	NA	U	U	U	U	U	U
Sulfotepp	NA	NA	NA	NA	U	U	U	U	U	U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	U	U	U	U	U	U
2,4,6-Trichlorophenol	NA	NA	NA	NA	U	U	U	U	U	U
2,4-Dichlorophenol	NA	NA	NA	NA	U	U	U	U	U	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	U	U	U	U	U	U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	U	U	U	U	U	U
Pentachlorophenol	NA	NA	NA	NA	U	U	U	U	U	U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	U	U	U	U	U	U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	U	U	U	U	U	U
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	U	U	U	U	U	U
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	U	U	U	U	U	UJ
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	U	U	U	U	U	U
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	U	U	U	U	U	U

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TABLE 4-1
Soil Sample Results

Parameter	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	U	U	U	U	U	U
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	U	U	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	12000	10000	14000	6800 J	9000 J	13000	6900	5200	4700	7200
Barium	62000	52000	780000	25000	21000	23000	85000	110000	48000	36000 J
Beryllium	U	U	780	1500 J	1900 J	690	750	1000	U	620
Cadmium	U	U	920	U	U	U	U	730	U	U
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	48000	18000	14000	17000 J	21000 J	16000	23000	110000	16000	40000
Cobalt	17000	9800	12000	22000 J	45000 J	6900	3200	7500	6000	4300
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	220000	41000	150000	39000 J	20000 J	18000	23000	36000	250000	42000
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	620000	520000	12000000	680000 J	1100000 J	250000	100000	360000	68000	100000
Mercury	1400	93	460	76 J	11 J	32	50	46	79	3300 J
Nickel	2400000	12000	120000	17000 J	26000 J	11000	9000	33000	8400	8600 J
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	51000	45000	26000	55000	67000	25000	41000	36000	30000	52000
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	15	17	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	130000	140000	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	U	200000	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	67000	U	U	U	U	U	U	UJ
Aroclor 1242	U	U	U	59 J	45 J	U	U	U	U	46000 J
Aroclor 1248	U	U	U	U	U	150	200	6000	2900	U
Aroclor 1254	170000	U	120000	28 J	20 J	54	320	10000	2400	12000 J
Aroclor 1260	59000	34	95000	U	U	U	150	U	1100	7000 J
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Totals	229000	34	282000	87 J	65 J	204	670	16000	6400	65000 J
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	U	U	U	U	U	U	U	U	U	U
Parathion	U	U	U	U	U	U	U	U	U	U
Sulfotepp	U	U	U	U	U	U	U	U	U	U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	U	U	U	U	U	U	U	U	U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	U	U	U	U	U	U	17	U	U	8.8
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	U	U	U	U	U	U	U	U	U

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TABLE 4-1
Soil Sample Results

Parameter	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	U	U	U	U	U	33	U	U	U	U
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	U	NA	U	12000
Inorganics										
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	8200	13000	12000	33000 J	19000 J	U	NA	5700	NA	NA
Barium	28000 J	38000	350000	55000 J	30000 J	65000	NA	49000	NA	NA
Beryllium	U	830	U	U	U	U	NA	U	NA	NA
Cadmium	U	U	U	U	U	U	NA	U	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	37000	25000	12000	10000 J	19000 J	U	NA	16000	NA	NA
Cobalt	4000	7400	74000	4300 J	3300 J	47000	NA	9100	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	40000	15000	35000	110000 J	85000 J	52000	NA	28000	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	120000	310000	5500000	370000 J	270000 J	2600000	NA	670000	NA	NA
Mercury	1100 J	56	49	420 J	280 J	55	NA	300	NA	NA
Nickel	6700 J	18000	98000	11000	13000	69000	NA	8600	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	47000	41000	67000	15000 J	9700 J	93000	NA	40000	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	U	U	U	NA	U	NA	NA
Aroclor 1221	U	U	U	U	U	U	NA	U	NA	NA
Aroclor 1232	720000	U	U	U	U	U	NA	U	NA	NA
Aroclor 1242	U	U	U	U	U	U	NA	U	NA	NA
Aroclor 1248	U	U	U	16000000 J	9800000 J	480 J	NA	59 J	NA	NA
Aroclor 1254	97000	U	140	U	U	U	NA	120	NA	NA
Aroclor 1260	44000	U	65	620000 J	UJ	27	NA	380	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Totals	861000	U	205	16620000 J	9800000 J	507 J	NA	559 J	NA	NA
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	U	U	U	100 J	100 J	U	NA	49 J	NA	NA
Parathion	U	U	U	U	U	U	NA	56 J	NA	NA
Sulfotepp	U	U	U	U	U	U	NA	U	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	U	U	U	U	U	NA	U	NA	NA
2,4,6-Trichlorophenol	U	U	U	U	U	U	NA	U	NA	NA
2,4-Dichlorophenol	U	U	U	U	U	U	NA	U	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	U	U	U	U	U	NA	U	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	U	U	U	U	U	U	NA	U	NA	NA
Pentachlorophenol	U	U	U	U	U	U	NA	U	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	U	U	U	U	U	NA	U	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	NA	U	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	U	U	U	U	U	U	NA	U	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	U	U	U	U	U	NA	U	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	17	U	U	U	U	U	NA	U	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	U	U	U	U	U	NA	U	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSR-15-Q 6-10	SSR-16 0.83-3	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	U	U	U	U	U	U	NA	U	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	11000000	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	3800	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	41000	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	470 J	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	520 J	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	59000000	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	14000	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	2500	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	13000	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	19000000	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	11000	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	34000000	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	160000	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	170	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	33000	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	1800000	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	150000	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	25000	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	25000	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	27000	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	340	U	570	U
Aroclor 1248	U	150 J	U	U	U	U	520 J	1700 J	1000 J	U
Aroclor 1254	U	3300 J	96 J	10000	400 J	210 J	5200 J	4700	2400 J	24000
Aroclor 1260	U	2500 J	79	2400	470 J	190 J	3200 J	4000	1800 J	8800
Aroclor 1268	U	910 J	U	1000	300 J	190 J	1600 J	1800	830 J	4800
PCBs, Totals	U	6860 J	175 J	40400	1170 J	590 J	10860 J	12200 J	6600 J	37600
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	140 J	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	46 J	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	24 J	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	50 J	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	40 J	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	110 J	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	1900 J	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	42 J	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	74 J	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	UJ	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	820 J	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	2.3 J	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA

Notes:
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2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5	SSRI-04 3-4	SSRI-05 0-0.5
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	U	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	U	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	13000000	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	7000	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	170000	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	820	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	640	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	24000000	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	13000	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	11000	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	19000	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	21000000	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	41000	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	12000000	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	830000	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	2600	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	15000	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	1000000	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	360000	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	23000	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	62000	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
PCBs, Aroclor Specific										
Aroclor 1016	U	U	UJ	U	U	U	U	U	U	U
Aroclor 1221	U	U	UJ	U	U	U	U	U	U	U
Aroclor 1232	U	U	UJ	U	U	U	U	U	U	U
Aroclor 1242	U	U	UJ	U	U	U	10000 J	U	U	U
Aroclor 1248	U	U	UJ	U	38000 J	15000	U	U	U	U
Aroclor 1254	56000	4800	95 J	U	140000	48000	U	U	U	3400 J
Aroclor 1260	29000	5200	180 J	94 J	53000	45000	35000	U	U	15000 J
Aroclor 1268	U	21000	590 J	650 J	19000	18000	11000	U	U	20000 J
PCBs, Totals	85000	31000	865 J	744 J	250000 J	126000	56000 J	U	U	38400 J
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA

Notes:
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3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	45 J	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	41 J	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	180 J	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	180 J	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	210 J	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	130 J	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	88 J	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	200 J	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	290 J	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	41 J	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	49 J	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	410	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	28 J	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	59 J	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	230 J	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	340 J	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	UR	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	25 J	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	NA	UJ	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	U	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	U	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
Hydrocarbons										
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics										
Cyanide	NA	NA	NA	NA	650	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	19000000	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	8700	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	390000	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	230000	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	800	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	4700	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	24000000	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	23000	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	5000	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	280000	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	26000000	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	4700000	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	850000	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	670000	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	1100	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	26000	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	1500000	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	4500	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	12000	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	400000	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	31000	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	610000	NA	NA	NA	NA	NA
Other										
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
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TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	0	U	U	U	U	U	U
Aroclor 1221	U	U	U	0	U	U	U	U	U	U
Aroclor 1232	U	U	U	0	U	U	U	U	U	U
Aroclor 1242	U	U	U	0	U	U	U	U	U	U
Aroclor 1248	U	U	U	0	U	U	U	U	U	63 J
Aroclor 1254	2200 J	800 J	U	440000 J	52000	840 J	U	U	U	U
Aroclor 1260	5300 J	1100 J	U	390000 J	66000	780 J	U	U	U	850 J
Aroclor 1268	5600 J	9900 J	220 J	100000 J	36000	270 J	U	U	U	1100 J
PCBs, Totals	13100 J	11800 J	220 J	930000 J	154000	1890 J	U	U	U	2013 J
Pesticides										
4,4'-DDD	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	380	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	61 J	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	32 J	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	120 J	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	830	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	1900	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	2100	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	2100	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	1500	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
SVOCs (continued)										
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	57 JN	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	62 J	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	1400	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	620	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	31 J	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	940	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	1300	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	37 J	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	470	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	1200	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	UR	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	35 J	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5
VOCs (continued)										
Methyl acetate	NA	NA	NA	NA	UJ	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
Hydrocarbons								
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics								
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA
Metals								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA
Other								
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
PCBs, Aroclor Specific								
Aroclor 1016	U	U	UJ	U	U	U	U	U
Aroclor 1221	U	U	UJ	U	U	U	U	U
Aroclor 1232	U	U	UJ	U	U	U	U	U
Aroclor 1242	U	U	UJ	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U
Aroclor 1254	U	140 J	U	U	U	U	11000	11000
Aroclor 1260	U	230 J	U	U	U	U	10000	9800
Aroclor 1268	U	260 J	U	U	U	U	5200	5500
PCBs, Totals	U	630 J	UJ	U	U	U	26200	26300
Pesticides								
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
SVOCs								
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
SVOCs (continued)								
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
VOCs								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2
VOCs (continued)								
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
Hydrocarbons							
Petroleum hydrocarbons	NA	NA	NA	NA	NA	NA	NA
Inorganics							
Cyanide	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA
Metals							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	91	NA	NA	NA	NA	940	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA
Other							
Cation Exchange Capacity	NA	NA	NA	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
PCBs, Aroclor Specific							
Aroclor 1016	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U
Aroclor 1248	U	13000	910	34000	U	5700	540
Aroclor 1254	100 J	30000	2100 J	56000	6600	17000	1100 J
Aroclor 1260	300 J	30000	3900 J	59000	7500	14000	1500 J
Aroclor 1268	140 J	11000	2200 J	20000	14000	4500	1300 J
PCBs, Totals	540 J	84000	9110 J	169000	28100	41200	4440 J
Pesticides							
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
SVOCs							
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
SVOCs (continued)							
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
VOCs							
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24B 0-2	SWMU-12-24C 0-2	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2
VOCs (continued)							
Methyl acetate	NA	NA	NA	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
Hydrocarbons				
Petroleum hydrocarbons	NA	NA	NA	NA
Inorganics				
Cyanide	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA
Metals				
Aluminum	NA	NA	NA	NA
Antimony	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Mercury	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Potassium	NA	NA	NA	NA
Selenium	NA	NA	NA	NA
Silver	NA	NA	NA	NA
Sodium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
Other				
Cation Exchange Capacity	NA	NA	NA	NA
Organic Carbon (Walkley-Black)	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA

Notes:
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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
PCBs, Aroclor Specific				
Aroclor 1016	U	U	U	U
Aroclor 1221	U	U	U	U
Aroclor 1232	U	U	U	U
Aroclor 1242	U	U	U	U
Aroclor 1248	1200	U	U	670
Aroclor 1254	4800	780 J	6600	4200
Aroclor 1260	9000	2400 J	14000	5700
Aroclor 1268	3000	940 J	18000	3100
PCBs, Totals	18000	4120 J	38600	13670
Pesticides				
4,4'-DDD	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA
Endrin	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA
Parathion	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA

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TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
SVOCs				
1,1'-Biphenyl	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-C	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
SVOCs (continued)				
bis(2-Chloroethoxy) methane	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA
Phenol	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
VOCs				
1,1,1-Trichloroethane	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromid	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA
Acetone	NA	NA	NA	NA
Benzene	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-1
Soil Sample Results

Parameter	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5
VOCs (continued)				
Methyl acetate	NA	NA	NA	NA
Methyl bromide	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA
Methylene chloride (Dichloromethane)	NA	NA	NA	NA
Styrene	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA
Toluene	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA

Notes:
1) Values are reported in ppb.
2) Depth listed for samples in sample name are in feet.
3) NA = Not Analyzed; U = Non-detect; J = Estimated; Q = Duplicate

TABLE 4-3
Occurrence and Distribution of Facility Constituents in Soil
Anniston PCB Site, Operable Unit 3

Parameter Group	Constituent	CAS-ID	Unit	Minimum Concentration [2]	Maximum Concentration [6]	Mean Concentration	Location of Maximum Concentration	Most Recent Measurements	Detection Frequency	Percentage of Detections	Range of Reporting Limits	Prevalent Constituents Based on Detections
PCBs, Pesticides and Dioxin	PCBs, Total [1]	1336-36-3	µg/kg	23	16,620,000	266,473	SSR-18	ND - 930,000	63 / 76	83%	39 - 930,000	Yes
	Heptachlor epoxide	1024-57-3	µg/kg	380	380	126.6	SSRI-11	ND - 380	1 / 3	33%	31 - 380	
	Methyl parathion	298-00-0	µg/kg	49 J	100 J	6.5	SSR-18	ND	2 / 23	9%	18 - 22	
	Parathion	56-38-2	µg/kg	56 J	56 J	2.4	SSR-21	ND	1 / 23	4%	37 - 42	
	Dioxin, TEQ[4]	NA	µg/kg	0.191	0.756	0.453	SSRI-07	.191-.756	3/3	100%	0.00197-0.0194	
VOCs	Acetone	67-64-1	µg/kg	25 J	35 J	20	SSRI-11	ND - 35	2 / 3	67%	49 - 83	
	Carbon disulfide	75-15-0	µg/kg	2.3 J	2.3 J	0.77	SSRI-04	ND - 2.3 J	1 / 3	33%	4.9 - 8.3	
	Chlorobenzene	108-90-7	µg/kg	17	17	1.48	SSR-12, SSR-15	ND	2 / 23	9%	4.2 - 8.3	
	Methylene chloride	75-09-2	µg/kg	33	33	1.43	SSR-11	ND	1 / 23	4%	4.2 - 8.3	
SVOCs	1,1'-Biphenyl	92-52-4	µg/kg	45 J	140 J	82	SSRI-04	45 J - 140 J	3 / 3	100%	390 -420	
	2-Methylnaphthalene	91-57-6	µg/kg	32 J	32 J	10.7	SSRI-11	ND - 32 J	1 / 3	33%	390 -420	
	Anthracene	120-12-7	µg/kg	41 J	120 J	53.7	SSRI-11	ND - 120 J	2 / 3	67%	390 -420	
	Benzo(a)anthracene	56-55-3	µg/kg	46 J	830	352	SSRI-11	46 J - 830	3 / 3	100%	390 -420	
	Benzo(a)pyrene	50-32-8	µg/kg	24 J	1,900	701.3	SSRI-11	24 J - 1,900	3 / 3	100%	390 -420	Yes
	Benzo(b)fluoranthene	205-99-2	µg/kg	50 J	2,100	786.7	SSRI-11	50 J - 2,100	3 / 3	100%	390 -420	
	Benzo(g,h,i)perylene	191-24-2	µg/kg	40 J	2,100	756.7	SSRI-11	40 J - 2,100	3 / 3	100%	390 -420	
	Benzo(k)fluoranthene	207-08-9	µg/kg	88 J	1,500	529.3	SSRI-11	ND - 1,500 J	2 / 3	67%	390 -420	
	bis(2-Ethylhexyl)phthalate	117-81-7	µg/kg	57 JN	200 J	122.3	SSRI-07	57 JN - 200 J	3 / 3	100%	390 -420	
	Carbazole	86-74-8	µg/kg	62 J	62 J	20.7	SSRI-11	ND - 62 J	1 / 3	33%	390 -420	
	Chrysene	218-01-9	µg/kg	290 J	1900 J	1,196.7	SSRI-04	290 J - 1,900 J	3 / 3	100%	390 -420	
	Dibenz(a,h)anthracene	53-70-3	µg/kg	41 J	620	220.3	SSRI-11	ND - 620	2 / 3	67%	390 -420	
	Dibenzofuran	132-64-9	µg/kg	31 J	31 J	10.3	SSRI-11	ND - 31 J	1 / 3	33%	390 -420	
	Di-n-butylphthalate	84-74-2	µg/kg	49 J	49 J	16.3	SSRI-07	ND - 49 J	1 / 3	33%	390 -420	
	Fluoranthene	206-44-0	µg/kg	42 J	940	464	SSRI-11	42 J - 940	3 / 3	100%	390 -420	
	Fluorene	86-73-7	µg/kg	28 J	28 J	9.3	SSRI-07	ND - 28 J	1 / 3	33%	390 -420	
	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	59 J	1,300	453	SSRI-11	ND - 1,300	2 / 3	67%	390 -420	
	Naphthalene	91-20-3	µg/kg	37 J	37 J	12.3	SSRI-11	ND - 37 J	1 / 3	33%	390 -420	
	Phenanthrene	85-01-8	µg/kg	74 J	470	258	SSRI-11	74 J - 470	3 / 3	100%	390 -420	
	Pyrene	129-00-0	µg/kg	340 J	1,200	786.7	SSRI-11	340 J - 1,200	3 / 3	100%	390 -420	
Metals	Aluminum	7429-90-5	mg/kg	11,000	19,000	14,333	SSRI-11	11,000 - 19,000	3 / 3	100%	23 - 25	
	Antimony	7440-36-0	mg/kg	8.7	8.7	2.9	SSRI-11	ND - 8.7	1 / 3	33%	2.3 - 2.5	
	Arsenic	7440-38-2	mg/kg	3.1	390	25.44	SSRI-11	3.8 - 390	22 / 23	96%	1.1 - 12	Yes
	Barium	7440-39-3	mg/kg	18	780	110.48	SSR-09	41 - 230	23 /23	100%	1.1 - 13	
	Beryllium	7440-41-7	mg/kg	0.47	1.9	0.42	SSR-10	0.47 - 0.8	11 / 23	48%	0.45 - 6	
	Cadmium	7440-43-9	mg/kg	0.52	4.7	0.3265	SSRI-11	0.52 - 4.7	5 / 23	22%	0.49 - 6	
	Calcium	7440-70-2	mg/kg	24,000	59,000	35,667	SSRI-04	24,000 - 59,000	3 / 3	100%	56 - 62	
	Chromium	7440-47-3	mg/kg	7.4	110	24.06	SSR-13	13 - 23	22 / 23	96%	1.1 - 12	

TABLE 4-3
Occurrence and Distribution of Facility Constituents in Soil
Anniston PCB Site, Operable Unit 3

Parameter Group	Constituent	CAS-ID	Unit	Minimum Concentration (2)	Maximum Concentration (6)	Mean Concentration	Location of Maximum Concentration	Most Recent Measurements	Detection Frequency	Percentage of Detections	Range of Reporting Limits	Prevalent Constituents Based on Detections
	Cobalt	7440-48-4	mg/kg	2	74	13.27	SSR-17	2.5 - 11	23 / 23	100%	1.1 - 13	Yes
	Copper	7440-50-8	mg/kg	13	280	104	SSRI-11	13 - 280	3 / 3	100%	2.3 - 2.5	
	Iron	7439-89-6	mg/kg	19,000	26,000	22,000	SSRI-11	19,000 - 26,000	3 / 3	100%	5.6 - 6.2	
	Lead	7439-92-1	mg/kg	8.7	4,700	264.07	SSRI-11	11 - 4,700	23/23	100%	0.56 - 29	Yes
	Magnesium	7439-95-4	mg/kg	850	34,000	15,616	SSRI-04	850- 34,000	3 / 3	100%	56 - 62	
	Manganese	7439-96-5	mg/kg	68	12,000	1,241	SSR-09	160 - 830	23/23	100%	1.1 - 13	Yes
	Mercury	7439-97-6	mg/kg	0.032	3.3	0.592	SSR-15	0.17 - 2.6	24 / 25	96%	0.024 - 0.71	Yes
	Nickel	7440-02-0	mg/kg	5.7	2,400	130.17	SSR-07	15 - 33	22 / 23	96%	4.4 - 53	Yes
	Potassium	7440-09-7	mg/kg	1,000	1,800	1,433	SSRI-04	1,000 - 1,800	3 / 3	100%	110 - 120	
	Selenium	7782-49-2	mg/kg	4.5	4.5	2	SSRI-11	ND - 4.5	1 / 3	33%	2.8 -3.1	
	Silver	7440-22-4	mg/kg	12	12	4	SSRI-11	ND - 12	1 / 3	33%	1.1 -1.2	
	Sodium	7440-23-5	mg/kg	150	400	303	SSRI-11	150 - 400	3 / 3	100%	110 - 120	
	Vanadium	7440-62-2	mg/kg	10	93	39.69	SSR-19	23 - 31	23/23	100%	1.1 - 13	
	Zinc	7440-66-6	mg/kg	25	610	232.3	SSRI-11	25 - 610	3 / 3	100%	2.3 - 2.5	

Notes:
(1) Total PCBs were calculated based on using ND = 0 for individual Aroclors with no detections.
(2) Note that some analytes were detected below the laboratory reporting limits but above the method detection limits and have been qualified as estimated values.
(3) The table includes all parameters that had detections reported in the RI Report, dated July 2008.
(4) Dioxin TEQ: ITEF TEQ calculated with ND=0 and EMPC=EMPC.
(5) ND = Non-detect. J = Estimated Value.
(6) The maximum result from the original / duplicate pair was used in the analysis.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
Field Parameters												
Field turbidity (NTU)	5.4	N/A	15.79	N/A	5	7.85	N/A	2.24	12.6	> 1000	3	N/A
Inorganics												
Alkalinity	U	NA	4200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	1200 J	NA	150 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	360	NA	660	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	U	NA	5900	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Barium	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	U	U	U	U	U	U	U	U	U	34	U	U
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	U	11 J	U	UJ	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	25	17 J	U	25 J	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	U	U	U	U	U	NA	NA	U	U	NA	NA	NA
Nickel	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
Other												
Phenolics	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	33 J	NA	440 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	33000 J	NA	16000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	UJ	NA	20000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	UJ	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	UJ	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	UJ	U	U	U	U	U	U
Aroclor 1268	NA	NA	NA	NA	NA	UJ	U	NA	NA	NA	NA	NA
PCBs, Totals	U	U	U	U	U	UJ	U	U	U	U	U	U
Pesticides												
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
Pesticides (continued)												
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	U	NA	U	NA	U	U	NA	1.9	U	U	U	U
Sulfotepp	U	NA	U	NA	U	NA	NA	U	U	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	NA	U	NA	U	NA	NA	U	U	U	U	U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
SVOCs (continued)												
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	U	NA	U	NA	U	NA	NA	U	U	1.6 J	9.7 J	9.2 J
Pentachlorophenol	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
VOCs												
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	U	NA	U	NA	U	NA	NA	U	U	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	NA	U	NA	U	NA	NA	U	U	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	U	NA	U	NA	U	NA	NA	U	U	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CB-85 1998-Jul	CB-85-F 1998-Jul	MW-01B 1998-Jul	MW-01B-F 1998-Jul	MW-01B 2007-Apr	MW-07 2005-Jun	MW-07-F 2005-Jun	MW-08 2007-Apr	MW-09A 2007-Apr	MW-11A 2007-Apr	MW-12A 2007-Apr	MW-12A-Q 2007-Apr
VOCs (continued)												
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
Field Parameters												
Field turbidity (NTU)	11	6.3	N/A	0.89	N/A	0.12	2.19	N/A	13.4	N/A	0.55	N/A
Inorganics												
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	NA	210	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	51	52	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	0.13 J	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	5900	6000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	U	U	U	U	NA	1.1 J	6.8 J	7.2 J	18	21	240	250
Copper	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	78	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	1300	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	36	32	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	U	U	3.3	U	0.75	U	U	U	U	U	U
Nickel	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	1500	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	6500	6800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
Other												
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	NA	U	UJ	UJ	U	UJ	U	UJ
Aroclor 1254	U	U	U	U	NA	U	UJ	UJ	U	UJ	U	UJ
Aroclor 1260	U	U	U	U	NA	U	UJ	UJ	U	UJ	U	UJ
Aroclor 1268	NA	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Totals	U	U	U	U	NA	U	UJ	UJ	U	UJ	U	UJ
Pesticides												
4,4'-DDD	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
Pesticides (continued)												
Methoxychlor	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	U	UJ	NA	U	NA	0.19 J	U	U	U	NA	U	NA
Sulfotepp	NA	UJ	NA	U	NA	U	U	U	U	NA	U	NA
Toxaphene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs												
1,1'-Biphenyl	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	U	NA	NA	NA	NA	6.7 J	5 J	NA	NA	NA	NA
2,4-Dichlorophenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	U	NA	U	NA	U	U	U	U	NA	U	NA
Acenaphthene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
SVOCs (continued)												
Benzo(a)pyrene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	0.73 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	3.5 J	U	NA	U	NA	U	33	31	8.6 J	NA	3.7 J	NA
Pentachlorophenol	NA	U	NA	NA	NA	NA	8.8	6.7 J	NA	NA	NA	NA
Phenanthrene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
VOCs												
1,1,1-Trichloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	U	NA	U	NA	U	5.2 J	4.9 J	U	NA	U	NA
1,2-Dichloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	U	NA	U	NA	U	2.1 J	2.1 J	U	NA	U	NA
2-Butanone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	U	NA	U	NA	U	3.3	3.4	U	NA	U	NA
Chloroethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	MW-13A 2007-Apr	MW-14 2005-Jun	MW-14-F 2005-Jun	MW-15 2007-Apr	MW-15-F 2007-Apr	MW-16 2007-Apr	MW-20A 2007-Apr	MW-20A-Q 2007-Apr	OW-02 2007-Apr	OW-02-F 2007-Apr	OW-04 2007-Apr	OW-04-F 2007-Apr
VOCs (continued)												
Methyl bromide	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
Field Parameters												
Field turbidity (NTU)	N/A	1000	27	N/A	18.8	N/A	0.64	N/A	2.19	N/A	0.61	N/A
Inorganics												
Alkalinity	NA	14000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Nitrate-N	NA	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	U	6.9 J	NA	NA	U	U
Barium	NA	NA	NA	NA	NA	NA	28	28	NA	NA	190	190
Beryllium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	U	U
Cadmium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	U	U
Calcium	NA	NA	NA	NA	NA	NA	30000	29000	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	U	U
Cobalt	240	NA	0.8 J	NA	16	16	U	U	U	NA	U	10
Copper	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Ferrous Iron	NA	U	NA	U	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	U	U	NA	NA	U	18
Magnesium	NA	NA	NA	NA	NA	NA	9800	9600	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	20	21	NA	NA	310	330 J
Mercury	U	NA	U	NA	0.82	U	U	U	U	NA	0.68	0.93
Nickel	NA	NA	NA	NA	NA	NA	2.5 J	U	NA	NA	8.7	9.2
Phosphorus	NA	6800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	2600	2500	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	7700	8100	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	U	U	NA	NA	U	U
Zinc	NA	NA	NA	NA	NA	NA	U	U	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
Other												
Phenolics	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	45000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	140000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	NA	U	NA	U	U	U	U	U	U	U	U
Aroclor 1221	U	NA	U	NA	U	U	30	2.1 J	25	U	U	U
Aroclor 1232	U	NA	U	NA	U	U	U	U	U	U	U	U
Aroclor 1242	U	NA	U	NA	U	U	U	U	U	U	U	U
Aroclor 1248	U	NA	U	NA	U	UJ	UJ	UJ	U	UJ	U	U
Aroclor 1254	U	NA	U	NA	U	UJ	UJ	UJ	3.6	UJ	U	U
Aroclor 1260	U	NA	U	NA	U	UJ	UJ	UJ	U	UJ	U	U
Aroclor 1268	NA	NA	NA	NA	NA	NA	UJ	UJ	NA	NA	NA	NA
PCBs, Totals	U	NA	U	NA	U	UJ	30 J	2.1 J	28.6	UJ	U	U
Pesticides												
4,4'-DDD	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	0.14 JN	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	0.075 JN	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	0.56 JN	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
Pesticides (continued)												
Methoxychlor	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	UJ	NA	NA	NA	U	NA
Parathion	NA	NA	U	NA	U	NA	0.25 J	NA	0.5 J	NA	U	NA
Sulfotepp	NA	NA	U	NA	U	NA	UJ	NA	U	NA	U	NA
Toxaphene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
SVOCs												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	U	NA	U	NA	U	NA	U	NA	U	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
SVOCs (continued)												
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	2.5 J	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	2.1 J	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	2.1 J	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	2.6 J	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	2.4 J	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	1.9 J	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	U	NA	U	NA	U	NA	U	NA	U	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
Pyrene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
VOCs												
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	0.67 J	NA	NA	NA	U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	U	NA	U	NA	U	NA	U	NA	U	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	U	NA	U	NA	U	NA	U	NA	U	NA
2-Butanone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	U	NA	U	NA	U	NA	U	NA	U	NA
Chloroethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-04-F-Q 2007-Apr	OW-06A 1998-Oct	OW-06A 2007-Apr	OW-06A-Q 1998-Oct	OW-07 2007-Apr	OW-07-F 2007-Apr	OW-08A 2005-Jun	OW-08A-F 2005-Jun	OW-08A 2007-Apr	OW-08A-F 2007-Apr	OW-09 1998-Jul	OW-09-F 1998-Jul
VOCs (continued)												
Methyl bromide	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	U	NA
Styrene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	U	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
Field Parameters												
Field turbidity (NTU)	1.41	N/A	3.35	N/A	6.69	7.4	N/A	1.43	N/A	3.51	N/A	1.43
Inorganics												
Alkalinity	NA	NA	20000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Nitrate-N	NA	NA	1400 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	3100000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	230	170 J	NA	NA	NA	1500	480	NA	NA	80 J	36 JN	NA
Antimony	U	U	NA	NA	NA	U	U	NA	NA	U	U	NA
Arsenic	U	U	U	U	NA	U	U	NA	NA	U	U	NA
Barium	200	160	1000	1000	NA	920	930	NA	NA	92 J	90	NA
Beryllium	0.52 J	0.64 J	6.8	4.3	NA	5	4.9	NA	NA	0.27 J	0.27 J	NA
Cadmium	U	U	U	U	NA	1.6 J	1.7 J	NA	NA	U	U	NA
Calcium	28000	15000	NA	NA	NA	91000	77000	NA	NA	3000	2800	NA
Chromium	U	U	U	U	NA	2 J	0.87 J	NA	NA	U	U	NA
Cobalt	7.2 J	8 J	52	49	NA	56	38	7.2 J	NA	25	27	29
Copper	U	1.7 J	NA	NA	NA	14 J	5 J	NA	NA	2.1 J	2.6 J	NA
Ferrous Iron	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	U	U	NA	NA	NA	230	U	NA	NA	96	120	NA
Lead	U	U	U	14 J	NA	U	U	NA	NA	U	U	NA
Magnesium	5500	6100	NA	NA	NA	34000	36000	NA	NA	1600	1700	NA
Manganese	180	270	1500	1400 J	NA	1500	1200	NA	NA	580 J	610	NA
Mercury	0.086 J	0.27	50	U	NA	16	23	U	NA	U	U	U
Nickel	4.7 J	5.1 J	63	61	NA	69	63	NA	NA	11 J	9.1 J	NA
Phosphorus	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	4000	4200	NA	NA	NA	5500	5900	NA	NA	7300	7000	NA
Selenium	U	U	NA	NA	NA	U	U	NA	NA	U	U	NA
Silver	U	U	NA	NA	NA	U	U	NA	NA	U	U	NA
Sodium	6900	7700	NA	NA	NA	58000	59000	NA	NA	25000	24000	NA
Thallium	U	U	NA	NA	NA	U	U	NA	NA	U	U	NA
Vanadium	U	U	U	U	NA	U	U	NA	NA	U	U	NA
Zinc	9.9 J	9.5 J	NA	NA	NA	600	2200	NA	NA	16 J	16 J	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
Other												
Phenolics	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	730 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	1300000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	130 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	10000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	NA	U	U	U	U	170	16 JN	100 J
Aroclor 1232	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	NA	6.2 J	U	U	UJ	U	U	90
Aroclor 1254	U	U	U	U	NA	UJ	U	U	UJ	U	U	U
Aroclor 1260	U	U	U	U	NA	UJ	U	U	UJ	U	U	U
Aroclor 1268	U	U	NA	NA	NA	UJ	U	NA	NA	U	U	NA
PCBs, Totals	U	U	U	U	NA	6.2 J	U	U	UJ	170	16 JN	190 J
Pesticides												
4,4'-DDD	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4,4'-DDE	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4,4'-DDT	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Aldrin	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
alpha-BHC	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
alpha-Chlordane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
beta-BHC	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
delta-BHC	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Dieldrin	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endosulfan I	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endosulfan II	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endosulfan sulfate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endrin	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endrin aldehyde	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Endrin ketone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
gamma-BHC	U	NA	NA	NA	NA	0.1 J	NA	NA	NA	U	NA	NA
gamma-Chlordane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Heptachlor	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Heptachlor epoxide	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
Pesticides (continued)												
Methoxychlor	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Methyl parathion	UJ	NA	U	NA	NA	UJ	NA	NA	NA	1.4 J	NA	NA
Parathion	UJ	NA	U	NA	NA	UJ	NA	U	NA	28 J	NA	57
Sulfotepp	UJ	NA	U	NA	NA	U	NA	U	NA	UJ	NA	U
Toxaphene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
SVOCs												
1,1'-Biphenyl	U	NA	NA	NA	NA	U	NA	NA	NA	170	NA	NA
2,4,5-Trichlorophenol	U	NA	U	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2,4,6-Trichlorophenol	U	NA	U	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2,4-Dichlorophenol	U	NA	U	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2,4-Dimethylphenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2,4-Dinitrophenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2,4-Dinitrotoluene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2,6-Dinitrotoluene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2-Chloronaphthalene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2-Chlorophenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2-Methylnaphthalene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2-Methylphenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
2-Nitroaniline	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2-Nitrophenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
3,3'-Dichlorobenzidine	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
3-Nitroaniline	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4,6-Dinitro-2-methylphenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
4-Bromophenylphenyl ether	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4-Chloro-3-methylphenol	U	NA	NA	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
4-Chloroaniline	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4-Chlorophenylphenyl ether	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4-Nitroaniline	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4-Nitrophenol	U	NA	U	NA	NA	UJ	NA	U	NA	24 J	NA	25
Acenaphthene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Acenaphthylene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Acetophenone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Anthracene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Atrazine	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Benzaldehyde	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Benzo(a)anthracene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
SVOCs (continued)												
Benzo(a)pyrene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Benzo(b)fluoranthene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Benzo(g,h,i)perylene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Benzo(k)fluoranthene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
bis(2-Chloroethoxy) methane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
bis(2-Chloroethyl) ether	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
bis(2-Chloroisopropyl) ether	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
bis(2-Ethylhexyl)phthalate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Butyl benzyl phthalate	U	NA	NA	NA	NA	U	NA	NA	NA	1.2	NA	NA
Caprolactam	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Carbazole	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Chrysene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Dibenz(a,h)anthracene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Dibenzofuran	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Diethyl phthalate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Dimethyl phthalate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Di-n-butylphthalate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Di-n-octylphthalate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Fluoranthene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Fluorene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Hexachlorobenzene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Hexachlorobutadiene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Hexachlorocyclopentadiene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Hexachloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Indeno(1,2,3-cd)pyrene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Isophorone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Naphthalene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Nitrobenzene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
N-Nitroso-di-n-propylamine	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
N-Nitrosodiphenylamine	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
O,O,O-Triethylphosphorothioate	U	NA	U	NA	NA	U	NA	U	NA	U	NA	2 J
Pentachlorophenol	U	NA	U	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
Phenanthrene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Phenol	U	NA	U	NA	NA	UJ	NA	NA	NA	UJ	NA	NA
Pyrene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA

Notes:
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TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
VOCs												
1,1,1-Trichloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	U	NA	NA	U	NA	NA	NA	U	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,1,2-Trichloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,1-Dichloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,1-Dichloroethene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,2,4-Trichlorobenzene	U	NA	NA	NA	NA	0.8 J	NA	NA	NA	1200	NA	NA
1,2-Dibromo-3-chloropropane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,2-Dibromoethane (Ethylene dibromi	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,2-Dichlorobenzene	U	NA	U	NA	NA	U	NA	U	NA	12	NA	5 J
1,2-Dichloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,2-Dichloropropane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,3-Dichlorobenzene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
1,4-Dichlorobenzene	U	NA	U	NA	NA	U	NA	U	NA	5	NA	2 J
2-Butanone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
2-Hexanone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
4-Methyl-2-pentanone	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Acetone	U	NA	NA	NA	NA	U	NA	NA	NA	UJ	NA	NA
Benzene	U	NA	NA	NA	NA	U	NA	NA	NA	0.77 J	NA	NA
Bromochloromethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Bromodichloromethane	U	NA	NA	NA	NA	2	NA	NA	NA	U	NA	NA
Bromoform	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Carbon disulfide	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Carbon tetrachloride	U	NA	NA	NA	NA	2.5	NA	NA	NA	U	NA	NA
Chlorobenzene	U	NA	U	NA	NA	U	NA	U	NA	U	NA	1.3
Chloroethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Chloroform	U	NA	NA	NA	NA	27	NA	NA	NA	U	NA	NA
cis-1,2-Dichloroethene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
cis-1,3-Dichloropropene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Cyclohexane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Dibromochloromethane	U	NA	NA	NA	NA	0.77 J	NA	NA	NA	U	NA	NA
Dichlorodifluoromethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Ethylbenzene	U	NA	NA	NA	NA	U	NA	NA	NA	2.1	NA	NA
Fluorotrichloromethane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Isopropylbenzene	U	NA	U	NA	NA	U	NA	NA	NA	U	NA	NA
Methyl acetate	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-09 2005-Jun	OW-09-F 2005-Jun	OW-10 1998-Jul	OW-10-F 1998-Jul	OW-10 1998-Aug	OW-10 2005-Jul	OW-10-F 2005-Jul	OW-15 2007-Apr	OW-15-F 2007-Apr	OW-16A 2005-Jun	OW-16A-F 2005-Jun	OW-16A 2007-Apr
VOCs (continued)												
Methyl bromide	U	NA	NA	NA	NA	U	NA	NA	NA	UJ	NA	NA
Methyl chloride	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Methyl tert-butyl ether	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Methylcyclohexane	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Methylene chloride (Dichloromethane	U	NA	U	NA	NA	U	NA	NA	NA	U	NA	NA
Styrene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Tetrachloroethylene	U	NA	NA	NA	NA	3.1	NA	NA	NA	U	NA	NA
Toluene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
trans-1,2-Dichloroethene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
trans-1,3-Dichloropropene	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Trichloroethylene	U	NA	NA	NA	NA	10	NA	NA	NA	U	NA	NA
Vinyl chloride	U	NA	NA	NA	NA	U	NA	NA	NA	U	NA	NA
Xylenes (total)	U	NA	NA	NA	NA	U	NA	NA	NA	6	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
Field Parameters												
Field turbidity (NTU)	N/A	0.89	34.3	N/A	5.91	N/A	6.28	N/A	14.1	8.27	0.85	N/A
Inorganics												
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	210000	NA	9800	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	1600 J	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA	U	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	35000	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Metals												
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Barium	NA	NA	NA	NA	NA	NA	NA	NA	210	130	40	41
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Cobalt	NA	25	38	NA	2.6 J	NA	2.3 J	NA	U	U	U	U
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	U	6.8	U	UJ
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	2300	830	250	250 J
Mercury	NA	U	U	U	0.11 J	U	U	U	U	U	U	U
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
Other												
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	5000 J	NA	1000 J	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	300000 J	NA	100000 J	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	8200	NA	U	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	110000	NA	U	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	7000 J	NA	UJ	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	UJ	U	88	U	0.83	UJ	4.3	U	U	U	U	U
Aroclor 1254	UJ	U	U	U	U	UJ	U	U	U	U	U	U
Aroclor 1260	UJ	U	8.3	U	U	UJ	U	U	U	U	U	U
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Totals	UJ	U	96.3	U	0.83	UJ	4.3	U	U	U	U	U
Pesticides												
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
Pesticides (continued)												
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Parathion	NA	U	7600	NA	U	NA	U	NA	U	NA	U	NA
Sulfotepp	NA	U	12	NA	U	NA	U	NA	U	NA	U	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	U	9500	NA	U	NA	U	NA	U	NA	U	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
SVOCs (continued)												
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	1.4 J	530	NA	U	NA	1.3 J	NA	U	NA	U	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
VOCs												
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	U	39 J	NA	U	NA	1.2 J	NA	U	NA	U	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	U	7.5 J	NA	U	NA	U	NA	U	NA	U	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	U	U	NA	U	NA	U	NA	U	NA	U	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OW-16A-F 2007-Apr	OW-19 2007-Apr	OW-21A 2007-Apr	OW-21A-F 2007-Apr	OW-22 2007-Apr	OW-22-F 2007-Apr	OW-24 2007-Apr	OW-24-F 2007-Apr	OWR-01D 1998-Aug	OWR-01D-F 1998-Aug	OWR-01S 1998-Aug	OWR-01S-F 1998-Aug
VOCs (continued)												
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	U	NA	U	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
Field Parameters											
Field turbidity (NTU)	0.84	N/A	1.58	N/A	N/A	N/A	2.2	N/A	0.59	N/A	1.6
Inorganics											
Alkalinity	NA	NA	120000	120000	NA	NA	23000	NA	NA	NA	NA
Cyanide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	1700 J	1800 J	NA	NA	2200 J	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	710 J	540 J	NA	NA	U	NA	NA	NA	NA
Sulfate	NA	NA	U	U	NA	NA	U	NA	NA	NA	NA
Sulfide	NA	NA	U	U	NA	NA	U	NA	NA	NA	NA
Metals											
Aluminum	150 J	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	U	U	U	U	U	U	U	U	U	U	U
Barium	43	40	29	34	17	16	93	92	38	43	22
Beryllium	0.19 J	0.18 J	U	U	U	U	U	U	U	U	U
Cadmium	U	U	U	U	U	U	U	U	U	U	U
Calcium	13000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	U	U	U	U	U	U	U	U	U	U	U
Cobalt	U	U	U	U	U	U	29	33	U	U	U
Copper	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	U	U	NA	NA	U	NA	NA	NA	NA
Iron	160	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	U	U	U	U	U	U	U	UJ	U	15 J	U
Magnesium	3000	2800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	28	23	130	140	13	12 J	4500	4500 J	270	270 J	U
Mercury	U	0.08 J	U	U	U	U	U	U	0.25	0.23	U
Nickel	2.3 J	2.7 J	U	U	U	U	U	U	U	4.6	U
Phosphorus	NA	NA	U	U	NA	NA	U	NA	NA	NA	NA
Potassium	3100	3200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	8500	8300	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	U	U	U	U	U	U	U	U	U	U	U
Zinc	660	810	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
Other											
Phenolics	NA	NA	U	U	NA	NA	U	NA	NA	NA	NA
Standard Plate Count	NA	NA	720 J	520 J	NA	NA	740 J	NA	NA	NA	NA
Total dissolved solids	NA	NA	180000 J	170000 J	NA	NA	240000 J	NA	NA	NA	NA
Total organic carbon	NA	NA	U	U	NA	NA	3000	NA	NA	NA	NA
Total organic halides	NA	NA	32	28 J	NA	NA	40	NA	NA	NA	NA
Total suspended solids	NA	NA	6000 J	9000 J	NA	NA	UJ	NA	NA	NA	NA
PCBs, Aroclor Specific											
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	UJ	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	UJ	U	U	U	U	U	U	U	U	U
Aroclor 1260	U	UJ	U	U	U	U	U	U	U	U	U
Aroclor 1268	U	UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Totals	U	UJ	U	U	U	U	U	U	U	U	U
Pesticides											
4,4'-DDD	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
Pesticides (continued)											
Methoxychlor	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	UJ	NA	U	U	NA	NA	U	NA	U	NA	U
Parathion	UJ	NA	U	U	NA	NA	U	NA	U	NA	U
Sulfotepp	U	NA	U	U	NA	NA	U	NA	U	NA	U
Toxaphene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
1,1'-Biphenyl	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	NA	U	U	NA	NA	U	NA	U	NA	U
2,4,6-Trichlorophenol	U	NA	U	U	NA	NA	U	NA	U	NA	U
2,4-Dichlorophenol	U	NA	U	U	NA	NA	U	NA	U	NA	U
2,4-Dimethylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	NA	U	U	NA	NA	U	NA	U	NA	U
Acenaphthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
SVOCs (continued)											
Benzo(a)pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	U	NA	U	U	NA	NA	U	NA	U	NA	U
Pentachlorophenol	U	NA	U	U	NA	NA	1.2	NA	U	NA	U
Phenanthrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	NA	U	U	NA	NA	U	NA	U	NA	U
Pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
VOCs											
1,1,1-Trichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	U	U	NA	NA	U	NA	U	NA	U
1,1,2-Trichloro-1,2,2-trifluoroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	U	NA	U	U	NA	NA	U	NA	U	NA	U
1,2-Dichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	NA	U	U	NA	NA	U	NA	U	NA	U
2-Butanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	U	NA	U	U	NA	NA	U	NA	U	NA	U
Chloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	NA	U	U	NA	NA	U	NA	U	NA	U
Methyl acetate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	OWR-01S 2005-Jul	OWR-01S-F 2005-Jul	OWR-02D 1998-Jul	OWR-02D-Q 1998-Jul	OWR-02D-F 1998-Jul	OWR-02D-F-Q 1998-Jul	OWR-02S 1998-Aug	OWR-02S-F 1998-Aug	OWR-03S 1998-Jul	OWR-03S-F 1998-Jul	OWR-04D 1998-Jul
VOCs (continued)											
Methyl bromide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	U	NA	U	U	NA	NA	U	NA	U	NA	U
Styrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
Field Parameters											
Field turbidity (NTU)	N/A	0.86	N/A	400	2.2	N/A	1.65	N/A	4.72	N/A	1.8
Inorganics											
Alkalinity	NA	NA	NA	11000	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	U	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	2300	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	5000	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	U	NA	NA	NA	NA	NA	NA	NA
Metals											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	U	U	U	NA	U	U	U	U	U	U	U
Barium	25	1200	1300	NA	150	180	U	17	120	130	240
Beryllium	U	U	U	NA	U	U	U	U	U	U	U
Cadmium	U	U	U	NA	U	U	U	U	U	U	U
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	U	U	U	NA	U	U	31	39	U	U	U
Cobalt	U	79	81	NA	U	U	U	U	U	U	29
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	140	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	UJ	U	21	NA	U	U	U	13	U	U	U
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	U	1300	1300	NA	470	660	U	U	33	10	1400
Mercury	U	0.57	U	NA	1.3	0.27	U	UJ	U	U	U
Nickel	U	55	56	NA	9.5	11	U	U	U	U	10
Phosphorus	NA	NA	NA	39	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	U	U	U	NA	U	U	10	U	4 J	2.9 J	U
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
Other											
Phenolics	NA	NA	NA	U	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	960	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	970000	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	23000	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	1600	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	5400000	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific											
Aroclor 1016	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1221	U	210	U	NA	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	NA	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	NA	U	U	2.2	U	U	UJ	U
Aroclor 1254	U	U	U	NA	U	U	U	U	0.72	UJ	U
Aroclor 1260	U	U	U	NA	U	U	U	U	U	UJ	U
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	U	UJ	NA
PCBs, Totals	U	210	U	NA	U	U	2.2	U	0.72	UJ	U
Pesticides											
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
Pesticides (continued)											
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	5.5	NA	NA	U	NA	U	NA	UJ	NA	9.6
Parathion	NA	28	NA	NA	U	NA	U	NA	UJ	NA	560
Sulfotepp	NA	U	NA	NA	U	NA	U	NA	UJ	NA	1.8
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	U	NA	NA	U	NA	U	NA	U	NA	U
2,4,6-Trichlorophenol	NA	U	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dichlorophenol	NA	U	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	2300	NA	NA	U	NA	U	NA	U	NA	390
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
SVOCs (continued)											
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	U	NA	NA	U	NA	U	NA	U	NA	330
Pentachlorophenol	NA	1.2	NA	NA	U	NA	U	NA	U	NA	1.2
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	U	NA	NA	U	NA	U	NA	U	NA	U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
VOCs											
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	U	NA	NA	U	NA	U	NA	U	NA	U
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	U	NA	NA	U	NA	U	NA	U	NA	U
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	U	NA	NA	U	NA	U	NA	U	NA	U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	46	NA	NA	U	NA	U	NA	U	NA	U
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	U	NA	NA	U	NA	U	NA	U	NA	U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-04D-F 1998-Jul	OWR-05D 1998-Aug	OWR-05D-F 1998-Aug	OWR-05D 1998-Oct	OWR-06D 1998-Jul	OWR-06D-F 1998-Jul	OWR-07D 1998-Aug	OWR-07D-F 1998-Aug	OWR-07D 2005-Jun	OWR-07D-F 2005-Jun	OWR-08S 1998-Aug
VOCs (continued)											
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	NA	U	NA	NA	U	NA	U	NA	U	NA	36
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
Field Parameters											
Field turbidity (NTU)	N/A	2.2	N/A	10.12	N/A	0.17	N/A	N/A	N/A	351	N/A
Inorganics											
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	U	U	U	U	U	U	U	U	U	NA	NA
Barium	240	190	230	44	15	35	35	35	34	NA	NA
Beryllium	U	U	U	U	U	1.2 J	1.2 J	1 J	1.1 J	NA	NA
Cadmium	U	U	U	U	U	U	U	U	U	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	U	U	U	U	U	U	U	U	U	NA	NA
Cobalt	30	24	28	U	U	1.1 J	U	U	U	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	6	27 J	45 J	9.1	UJ	U	U	U	2.6	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1500	1100 J	1400 J	510	82 J	120	130	120 J	120 J	NA	NA
Mercury	0.33 J	U	U	U	U	U	U	U	U	NA	NA
Nickel	11	9.1	10	16	U	7.4 J	6.1 J	5.9 J	5.9 J	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	U	U	U	18	U	U	U	U	U	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
Other											
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific											
Aroclor 1016	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1221	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1232	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1242	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1248	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1254	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1260	U	U	U	U	U	NA	NA	NA	NA	U	U
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U
PCBs, Totals	U	U	U	U	U	NA	NA	NA	NA	U	U
Pesticides											
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
Pesticides (continued)											
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	9.7	NA	NA	U	NA	NA	NA	NA	NA	UJ	UJ
Parathion	730	NA	NA	U	NA	NA	NA	NA	NA	UJ	UJ
Sulfotepp	1.9	NA	NA	U	NA	NA	NA	NA	NA	UJ	U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	NA	NA	U	NA	NA	NA	NA	NA	U	U
2,4,6-Trichlorophenol	U	NA	NA	U	NA	NA	NA	NA	NA	U	U
2,4-Dichlorophenol	U	NA	NA	U	NA	NA	NA	NA	NA	U	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	340	NA	NA	U	NA	NA	NA	NA	NA	U	U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
SVOCs (continued)											
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	330	NA	NA	U	NA	NA	NA	NA	NA	U	U
Pentachlorophenol	U	NA	NA	U	NA	NA	NA	NA	NA	U	U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	NA	NA	U	NA	NA	NA	NA	NA	U	U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
VOCs											
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	NA	U	NA	U	U	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	U	NA	NA	U	NA	U	U	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	NA	NA	U	NA	U	U	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	U	NA	NA	U	NA	U	U	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	NA	NA	U	NA	U	U	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-08S-Q 1998-Aug	OWR-08S-F 1998-Aug	OWR-08S-F-Q 1998-Aug	OWR-09S 1998-Aug	OWR-09S-F 1998-Aug	OWR-10 2005-Jun	OWR-10-Q 2005-Jun	OWR-10-F 2005-Jun	OWR-10-F-Q 2005-Jun	OWR-10 2005-Jul	OWR-10-Q 2005-Jul
VOCs (continued)											
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	36	NA	NA	U	NA	U	U	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
Field Parameters										
Field turbidity (NTU)	N/A	N/A	5.1	N/A	3.8	N/A	2.6	N/A	N/A	N/A
Inorganics										
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	U	U	U	U	U	U	U	U
Barium	NA	NA	630	640	U	U	U	U	U	U
Beryllium	NA	NA	6.8 J	7.1 J	U	U	U	U	U	U
Cadmium	NA	NA	U	U	U	U	U	U	U	U
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	U	U	U	U	U	U	U	U
Cobalt	NA	NA	300	300	260 J	250 J	U	U	U	U
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	U	U	U	U	UJ	UJ	UJ	UJ
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	6500	6600	12000	12000	140	140	140	140
Mercury	NA	NA	3.3	0.65	0.71	0.52	2.3	2.2	2.1	2.4
Nickel	NA	NA	82 J	85 J	U	U	U	U	U	U
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	U	U	U	U	U	U	U	U
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
Other										
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific										
Aroclor 1016	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	170	20	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	4.4	U	250	68	72	240
Aroclor 1242	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	U	U	U	U	U
Aroclor 1268	U	U	U	U	U	U	U	U	U	U
PCBs, Totals	U	U	170	20	4.4	U	250	68	72	240
Pesticides										
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
Pesticides (continued)										
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	NA	NA	U	NA	U	NA	U	NA	NA	U
Parathion	NA	NA	U	NA	10	NA	U	NA	NA	U
Sulfotepp	NA	NA	U	NA	U	NA	U	NA	NA	U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	U	NA	U	NA	U	NA	NA	U
2,4,6-Trichlorophenol	NA	NA	U	NA	U	NA	U	NA	NA	U
2,4-Dichlorophenol	NA	NA	U	NA	U	NA	U	NA	NA	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	U	NA	8000	NA	U	NA	NA	U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
SVOCs (continued)										
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	NA	NA	U	NA	U	NA	U	NA	NA	U
Pentachlorophenol	NA	NA	U	NA	U	NA	U	NA	NA	U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	U	NA	U	NA	U	NA	NA	U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
VOCs										
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	U	NA	U	NA	U	NA	NA	U
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	20	NA	U	NA	U	NA	NA	U
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	21	NA	U	NA	U	NA	NA	U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	29	NA	5.2	NA	U	NA	NA	U
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NA	NA	U	NA	U	NA	U	NA	NA	U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-10-F 2005-Jul	OWR-10-F-Q 2005-Jul	OWR-11 2003-Feb	OWR-11-F 2003-Feb	OWR-12 2003-Feb	OWR-12-F 2003-Feb	OWR-13 2003-Feb	OWR-13-F 2003-Feb	OWR-13-F-Q 2003-Feb	OWR-13-Q 2003-Feb
VOCs (continued)										
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	NA	NA	U	NA	U	NA	U	NA	NA	U
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
Field Parameters												
Field turbidity (NTU)	57.3	N/A	7.66	N/A	0.42	9.47	N/A	9	N/A	2.3	N/A	2.95
Inorganics												
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	NA	NA	NA	NA	NA	760	U	350	230	110 J	U	56 J
Antimony	NA	NA	NA	NA	NA	U	U	U	U	U	U	U
Arsenic	4.4 J	U	U	U	NA	U	U	U	U	U	U	6.1 J
Barium	63	25	150	130	NA	20	14	77	72	120	120	13 J
Beryllium	1.3 J	U	0.18 J	U	NA	0.61 J	0.24 J	0.51 J	0.49 J	0.4 J	0.41 J	U
Cadmium	U	U	U	U	NA	U	U	U	U	U	U	U
Calcium	NA	NA	NA	NA	NA	3100	3300	6100	5800	2500	2500	39000
Chromium	8.9 J	0.91 J	4.1 J	1.3 J	NA	2.4 J	U	1.2 J	1.4 J	U	U	U
Cobalt	12 J	U	2.1 J	1.9 J	U	U	1.1 J	13	13	5 J	6.5 J	1.9 J
Copper	NA	NA	NA	NA	NA	U	U	3.5 J	3.4 J	3.4 J	4.1 J	U
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	1700	U	210	U	30 J	U	U
Lead	9.2	U	U	U	NA	3.3 J	U	U	U	U	U	U
Magnesium	NA	NA	NA	NA	NA	1500	1500	4000	3800	3100	3100	6400
Manganese	530	9 J	96	74 J	NA	510	370	390	360	140	150	540 J
Mercury	0.43	0.15 J	U	U	U	U	U	0.1 J	U	0.1 J	0.14 J	UJ
Nickel	15 J	U	22 J	16 J	NA	8.2 J	U	11 J	11 J	14 J	13 J	U
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	1200	920 J	3400	3100	10000	10000	5100
Selenium	NA	NA	NA	NA	NA	U	U	U	U	U	U	U
Silver	NA	NA	NA	NA	NA	U	U	U	U	U	U	U
Sodium	NA	NA	NA	NA	NA	6900	5700	38000	36000	8400	8800	28000
Thallium	NA	NA	NA	NA	NA	U	U	U	U	U	U	U
Vanadium	18	1.8 J	1.9 J	2 J	NA	2.5 J	U	U	U	U	U	U
Zinc	NA	NA	NA	NA	NA	370	310	1700	1100	610	410	200

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
Other												
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	110	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	18 J	U	U	U	U	U	U	U	U	120 J
Aroclor 1242	5	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	UJ	UJ	U	U	U	U	UJ	U	UJ	U
Aroclor 1254	U	U	UJ	UJ	U	U	U	U	UJ	U	UJ	U
Aroclor 1260	U	U	UJ	UJ	U	U	U	U	UJ	U	UJ	U
Aroclor 1268	U	U	UJ	UJ	NA	U	U	U	UJ	U	UJ	U
PCBs, Totals	5	U	128 J	UJ	U	U	U	U	UJ	U	UJ	120 J
Pesticides												
4,4'-DDD	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4,4'-DDE	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4,4'-DDT	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Aldrin	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
alpha-BHC	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
alpha-Chlordane	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
beta-BHC	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
delta-BHC	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Dieldrin	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endosulfan I	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endosulfan II	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endosulfan sulfate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endrin	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endrin aldehyde	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Endrin ketone	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
gamma-BHC	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
gamma-Chlordane	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Heptachlor	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Heptachlor epoxide	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
Pesticides (continued)												
Methoxychlor	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Methyl parathion	U	NA	UJ	NA	NA	U	NA	UJ	NA	UJ	NA	UJ
Parathion	U	NA	0.32 J	NA	U	U	NA	UJ	NA	UJ	NA	33 J
Sulfotepp	U	NA	UJ	NA	U	U	NA	U	NA	U	NA	UJ
Toxaphene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
SVOCs												
1,1'-Biphenyl	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2,4,5-Trichlorophenol	U	NA	UJ	NA	NA	U	NA	U	NA	U	NA	U
2,4,6-Trichlorophenol	U	NA	UJ	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dichlorophenol	U	NA	U	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dinitrophenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2-Chloronaphthalene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2-Chlorophenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2-Methylnaphthalene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2-Methylphenol	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
2-Nitroaniline	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
2-Nitrophenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	UR	NA	U	NA	U	NA	U
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
3-Nitroaniline	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4-Chloroaniline	NA	NA	NA	NA	NA	UR	NA	U	NA	U	NA	U
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
4-Nitroaniline	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
4-Nitrophenol	U	NA	120 J	NA	U	UJ	NA	U	NA	U	NA	U
Acenaphthene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	2 J
Acenaphthylene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Acetophenone	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Anthracene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Atrazine	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Benzaldehyde	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	UJ
Benzo(a)anthracene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U

Notes:
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2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
SVOCs (continued)												
Benzo(a)pyrene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Butyl benzyl phthalate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Caprolactam	NA	NA	NA	NA	NA	U	NA	3.1 J	NA	U	NA	U
Carbazole	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Chrysene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Dibenzofuran	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Diethyl phthalate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Dimethyl phthalate	NA	NA	NA	NA	NA	U	NA	1.4 J	NA	U	NA	U
Di-n-butylphthalate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Di-n-octylphthalate	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Fluoranthene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Fluorene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Hexachlorobenzene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Hexachlorobutadiene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Hexachloroethane	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Isophorone	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Naphthalene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Nitrobenzene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
O,O,O-Triethylphosphorothioate	U	NA	3.4 J	NA	3.9 J	U	NA	U	NA	U	NA	U
Pentachlorophenol	1.4	NA	U	NA	NA	U	NA	U	NA	U	NA	U
Phenanthrene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U
Phenol	U	NA	U	NA	NA	UJ	NA	U	NA	U	NA	U
Pyrene	NA	NA	NA	NA	NA	U	NA	U	NA	U	NA	U

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
VOCs												
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,1,2,2-Tetrachloroethane	UJ	NA	U	NA	NA	UJ	NA	U	NA	U	NA	U
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,1-Dichloroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,1-Dichloroethene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	11
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,2-Dichlorobenzene	1.4 J	NA	31	NA	U	UJ	NA	U	NA	U	NA	1.7
1,2-Dichloroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,2-Dichloropropane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
1,4-Dichlorobenzene	UJ	NA	7.5	NA	U	UJ	NA	U	NA	U	NA	U
2-Butanone	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
2-Hexanone	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Acetone	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	UJ
Benzene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Bromochloromethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Bromodichloromethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Bromoform	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Carbon disulfide	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Carbon tetrachloride	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Chlorobenzene	UJ	NA	2.5	NA	U	UJ	NA	U	NA	U	NA	U
Chloroethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Chloroform	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	10
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Cyclohexane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Dibromochloromethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Dichlorodifluoromethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Ethylbenzene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Fluorotrichloromethane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Isopropylbenzene	UJ	NA	U	NA	NA	UJ	NA	U	NA	U	NA	U
Methyl acetate	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	OWR-14D 2005-Jul	OWR-14D-F 2005-Jul	OWR-15D 2005-Jul	OWR-15D-F 2005-Jul	SBP-05 2007-Apr	T-1 2005-Jul	T-1-F 2005-Jul	T-2 2005-Jul	T-2-F 2005-Jul	T-3 2005-Jul	T-3-F 2005-Jul	T-4 2005-Jun
VOCs (continued)												
Methyl bromide	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	UJ
Methyl chloride	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Methyl tert-butyl ether	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Methylcyclohexane	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Methylene chloride (Dichloromethane	UJ	NA	U	NA	NA	UJ	NA	U	NA	U	NA	U
Styrene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Tetrachloroethylene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Toluene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	8.2
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Trichloroethylene	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	3.4
Vinyl chloride	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U
Xylenes (total)	NA	NA	NA	NA	NA	UJ	NA	U	NA	U	NA	U

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
Field Parameters												
Field turbidity (NTU)	N/A	N/A	N/A	260	2.6	N/A	N/A	856	6.7	N/A	N/A	83
Inorganics												
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals												
Aluminum	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	5.1 J	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	U	U	4.6 J	U	U	U	U	U	U	U	U	U
Barium	13	12	13	160 J	34	29	36	150 J	52	68	50	48 J
Beryllium	U	U	U	U	U	U	U	U	0.23 J	U	0.17 J	U
Cadmium	U	U	U	U	U	U	U	U	U	U	U	U
Calcium	41000	39000	39000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	U	U	U	57	U	U	U	14	U	U	U	U
Cobalt	1.4 J	1.7 J	1.1 J	36	U	U	U	19	U	U	U	U
Copper	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	40 J	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2.2 J	3.3 J	U	33	U	U	U	18	U	U	U	U
Magnesium	6500	6500	6500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	550	530	520	2000	37	130	32	1700	94	190	83	250
Mercury	U	UJ	U	U	U	U	U	U	U	U	U	U
Nickel	U	U	U	63	6.8 J	U	6.7 J	35	3.5 J	5.7	3.9 J	U
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	4900	4900	5100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	28000	26000	28000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	2.3 J	1.9 J	U	81	U	U	U	33	U	U	U	U
Zinc	210	140	140	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
Other												
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific												
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	110 J	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	0.66	U	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1268	U	U	U	NA	U	NA	U	NA	U	NA	U	NA
PCBs, Totals	110 J	U	U	U	0.66	U	U	U	U	U	U	U
Pesticides												
4,4'-DDD	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC	0.55 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
Pesticides (continued)												
Methoxychlor	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl parathion	UJ	NA	NA	U	UJ	NA	NA	U	UJ	NA	NA	U
Parathion	51 J	NA	NA	U	UJ	NA	NA	U	UJ	NA	NA	U
Sulfotepp	0.33 J	NA	NA	U	UJ	NA	NA	U	UJ	NA	NA	U
Toxaphene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs												
1,1'-Biphenyl	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
2,4,6-Trichlorophenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
2,4-Dichlorophenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
2,4-Dimethylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenylphenyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenylphenyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Acenaphthene	0.73 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
SVOCs (continued)												
Benzo(a)pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy) methane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
O,O,O-Triethylphosphorothioate	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Pentachlorophenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Phenanthrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Pyrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
VOCs												
1,1,1-Trichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
1,1,2-Trichloro-1,2,2-trifluoroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene dibromi	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	UJ	NA	NA	U	U	NA	NA	U	U	NA	NA	U
1,2-Dichloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
2-Butanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Chloroethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorotrichloromethane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Methyl acetate	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	T-4-Q 2005-Jun	T-4-F 2005-Jun	T-4-F-Q 2005-Jun	WEL-01 1998-Oct	WEL-01 2005-Jun	WEL-01-F 1998-Oct	WEL-01-F 2005-Jun	WEL-02 1998-Oct	WEL-02 2005-Jun	WEL-02-F 1998-Oct	WEL-02-F 2005-Jun	WEL-03 1998-Oct
VOCs (continued)												
Methyl bromide	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl chloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride (Dichloromethane	U	NA	NA	U	U	NA	NA	U	U	NA	NA	U
Styrene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
Field Parameters											
Field turbidity (NTU)	N/A	9	N/A	14.9	N/A	96	N/A	N/A	N/A	9	N/A
Inorganics											
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Nitrate-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	390	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Arsenic	U	U	U	NA	NA	U	U	U	U	U	NA
Barium	47	52	51	NA	NA	74 J	10	12	11	26	NA
Beryllium	U	0.19 J	0.17 J	NA	NA	U	U	U	U	U	NA
Cadmium	U	U	U	NA	NA	U	U	U	U	U	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	13000	NA
Chromium	U	U	U	NA	NA	12	U	U	U	1.6 J	NA
Cobalt	U	2.4 J	1.1 J	NA	NA	12	U	U	U	6.4 J	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8 J	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	320	NA
Lead	U	U	U	NA	NA	16	U	U	U	U	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	2400	NA
Manganese	250	150	140 J	NA	NA	1100	53	58	55	350	NA
Mercury	U	0.11 J	U	NA	NA	U	U	U	U	U	NA
Nickel	U	3.7 J	2.4 J	NA	NA	25	U	U	U	4.7 J	NA
Phosphorus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	1800	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	9500	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Vanadium	U	U	U	NA	NA	27	U	U	U	U	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.7 J	NA

Notes:
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
Other											
Phenolics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific											
Aroclor 1016	U	NA	NA	U	U	U	U	U	U	U	U
Aroclor 1221	U	NA	NA	U	U	U	U	U	U	U	U
Aroclor 1232	U	NA	NA	U	U	U	U	U	U	U	U
Aroclor 1242	U	NA	NA	U	U	U	U	U	U	U	U
Aroclor 1248	U	NA	NA	U	UJ	U	U	U	U	U	U
Aroclor 1254	U	NA	NA	0.36 J	UJ	U	U	U	U	U	U
Aroclor 1260	U	NA	NA	U	UJ	U	U	U	U	U	U
Aroclor 1268	NA	NA	NA	U	UJ	NA	NA	NA	NA	U	U
PCBs, Totals	U	NA	NA	0.36 J	UJ	U	U	U	U	U	U
Pesticides											
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
gamma-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA

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TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
Pesticides (continued)											
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Methyl parathion	NA	NA	NA	UJ	NA	U	U	NA	NA		NA
Parathion	NA	NA	NA	UJ	NA	U	U	NA	NA		NA
Sulfotepp	NA	NA	NA	U	NA	U	U	NA	NA		NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
SVOCs											
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2,4,5-Trichlorophenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
2,4,6-Trichlorophenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
2,4-Dichlorophenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
3-Methylphenol/4-Methyphenol (m&p-	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Bromophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Chlorophenylphenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
4-Nitrophenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
SVOCs (continued)											
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
bis(2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
O,O,O-Triethylphosphorothioate	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
Pentachlorophenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Phenol	NA	NA	NA	U	NA	U	U	NA	NA	U	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
VOCs										NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,1,2,2-Tetrachloroethane	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,2-Dibromoethane (Ethylene dibromi	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,2-Dichlorobenzene	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
1,4-Dichlorobenzene	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Chlorobenzene	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.67 J	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Dichlorodifluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Fluorotrichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Isopropylbenzene	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	WEL-03-F 1998-Oct	WEL-03 2005-Jun	WEL-03-F 2005-Jun	WEL-03 2005-Jul	WEL-03-F 2005-Jul	WEL-04 1998-Oct	WEL-04-Q 1998-Oct	WEL-04-F 1998-Oct	WEL-04-F-Q 1998-Oct	CMW-1 2004-Aug	CMW-1-F 2004-Aug
VOCs (continued)											
Methyl bromide	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Methyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Methyl tert-butyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Methylene chloride (Dichloromethane	NA	U	NA	NA	NA	U	U	NA	NA	U	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	UJ	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Trichloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
Field Parameters						
Field turbidity (NTU)	-10	N/A	-9	N/A	N/A	N/A
Inorganics						
Alkalinity	NA	NA	NA	NA	NA	NA
Cyanide	U	NA	U	U	NA	NA
Nitrate-N	NA	NA	NA	NA	NA	NA
Nitrogen, Kjeldahl	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA
Metals						
Aluminum	65 J	NA	240	210	NA	NA
Antimony	U	NA	U	U	NA	NA
Arsenic	U	NA	U	U	NA	NA
Barium	20	NA	42	41	NA	NA
Beryllium	U	NA	U	U	NA	NA
Cadmium	U	NA	U	U	NA	NA
Calcium	24000	NA	29000	29000	NA	NA
Chromium	U	NA	U	U	NA	NA
Cobalt	5.5 J	NA	3.2 J	3.1 J	NA	NA
Copper	0.31 J	NA	2.4 J	2.5 J	NA	NA
Ferrous Iron	NA	NA	NA	NA	NA	NA
Iron	58	NA	190	150	NA	NA
Lead	U	NA	3.1 J	U	NA	NA
Magnesium	4500	NA	11000	11000	NA	NA
Manganese	250	NA	330	330	NA	NA
Mercury	U	NA	U	U	NA	NA
Nickel	2.1 J	NA	3.5 J	4.7 J	NA	NA
Phosphorus	NA	NA	NA	NA	NA	NA
Potassium	2600	NA	16000	16000	NA	NA
Selenium	U	NA	U	U	NA	NA
Silver	U	NA	U	U	NA	NA
Sodium	6800	NA	19000	19000	NA	NA
Thallium	U	NA	5 J	U	NA	NA
Vanadium	U	NA	U	U	NA	NA
Zinc	3.5 J	NA	22	23	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
Other						
Phenolics	NA	NA	NA	NA	NA	NA
Standard Plate Count	NA	NA	NA	NA	NA	NA
Total dissolved solids	NA	NA	NA	NA	NA	NA
Total organic carbon	NA	NA	NA	NA	NA	NA
Total organic halides	NA	NA	NA	NA	NA	NA
Total suspended solids	NA	NA	NA	NA	NA	NA
PCBs, Aroclor Specific						
Aroclor 1016	U	UJ	U	U	U	U
Aroclor 1221	U	UJ	U	U	U	U
Aroclor 1232	U	UJ	U	U	U	U
Aroclor 1242	U	UJ	U	U	U	U
Aroclor 1248	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	U
Aroclor 1268	U	U	U	U	U	U
PCBs, Totals	U	UJ	U	U	U	U
Pesticides						
4,4'-DDD	U	NA	U	U	NA	NA
4,4'-DDE	U	NA	U	U	NA	NA
4,4'-DDT	U	NA	U	U	NA	NA
Aldrin	U	NA	U	U	NA	NA
alpha-BHC	U	NA	U	U	NA	NA
alpha-Chlordane	U	NA	U	U	NA	NA
beta-BHC	U	NA	U	U	NA	NA
delta-BHC	U	NA	U	U	NA	NA
Dieldrin	U	NA	U	U	NA	NA
Endosulfan I	U	NA	U	U	NA	NA
Endosulfan II	U	NA	U	U	NA	NA
Endosulfan sulfate	U	NA	U	U	NA	NA
Endrin	U	NA	U	U	NA	NA
Endrin aldehyde	U	NA	U	U	NA	NA
Endrin ketone	U	NA	U	U	NA	NA
gamma-BHC	U	NA	U	U	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA
Heptachlor	U	NA	U	U	NA	NA
Heptachlor epoxide	U	NA	U	U	NA	NA

Notes:
1) Values are in ppb.
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3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
Pesticides (continued)						
Methoxychlor	U	NA	U	U	NA	NA
Methyl parathion	U	NA	U	U	NA	NA
Parathion	U	NA	U	U	NA	NA
Sulfotepp	U	NA	U	U	NA	NA
Toxaphene	U	NA	U	U	NA	NA
SVOCs						
1,1'-Biphenyl	U	NA	U	U	NA	NA
2,4,5-Trichlorophenol	U	NA	U	U	NA	NA
2,4,6-Trichlorophenol	U	NA	U	U	NA	NA
2,4-Dichlorophenol	U	NA	U	U	NA	NA
2,4-Dimethylphenol	U	NA	U	U	NA	NA
2,4-Dinitrophenol	U	NA	U	U	NA	NA
2,4-Dinitrotoluene	U	NA	U	U	NA	NA
2,6-Dinitrotoluene	U	NA	U	U	NA	NA
2-Chloronaphthalene	U	NA	U	U	NA	NA
2-Chlorophenol	U	NA	U	U	NA	NA
2-Methylnaphthalene	U	NA	U	U	NA	NA
2-Methylphenol	U	NA	U	U	NA	NA
2-Nitroaniline	U	NA	U	U	NA	NA
2-Nitrophenol	U	NA	U	U	NA	NA
3,3'-Dichlorobenzidine	U	NA	UJ	U	NA	NA
3-Methylphenol/4-Methyphenol (m&p-	U	NA	U	U	NA	NA
3-Nitroaniline	U	NA	U	U	NA	NA
4,6-Dinitro-2-methylphenol	U	NA	U	U	NA	NA
4-Bromophenylphenyl ether	U	NA	U	U	NA	NA
4-Chloro-3-methylphenol	U	NA	U	U	NA	NA
4-Chloroaniline	U	NA	U	U	NA	NA
4-Chlorophenylphenyl ether	U	NA	U	U	NA	NA
4-Nitroaniline	U	NA	U	U	NA	NA
4-Nitrophenol	U	NA	U	U	NA	NA
Acenaphthene	U	NA	U	U	NA	NA
Acenaphthylene	U	NA	U	U	NA	NA
Acetophenone	U	NA	UJ	U	NA	NA
Anthracene	U	NA	U	U	NA	NA
Atrazine	U	NA	U	U	NA	NA
Benzaldehyde	U	NA	UJ	U	NA	NA
Benzo(a)anthracene	U	NA	U	U	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
SVOCs (continued)						
Benzo(a)pyrene	U	NA	U	U	NA	NA
Benzo(b)fluoranthene	U	NA	U	U	NA	NA
Benzo(g,h,i)perylene	U	NA	U	U	NA	NA
Benzo(k)fluoranthene	U	NA	U	U	NA	NA
bis(2-Chloroethoxy) methane	U	NA	U	U	NA	NA
bis(2-Chloroethyl) ether	U	NA	U	U	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	U	NA	U	U	NA	NA
Butyl benzyl phthalate	U	NA	U	U	NA	NA
Caprolactam	U	NA	UJ	U	NA	NA
Carbazole	U	NA	U	U	NA	NA
Chrysene	U	NA	U	U	NA	NA
Dibenz(a,h)anthracene	U	NA	U	U	NA	NA
Dibenzofuran	U	NA	U	U	NA	NA
Diethyl phthalate	U	NA	U	U	NA	NA
Dimethyl phthalate	U	NA	U	U	NA	NA
Di-n-butylphthalate	U	NA	U	U	NA	NA
Di-n-octylphthalate	U	NA	U	U	NA	NA
Fluoranthene	U	NA	U	U	NA	NA
Fluorene	U	NA	U	U	NA	NA
Hexachlorobenzene	U	NA	U	U	NA	NA
Hexachlorobutadiene	U	NA	U	U	NA	NA
Hexachlorocyclopentadiene	U	NA	U	U	NA	NA
Hexachloroethane	U	NA	U	U	NA	NA
Indeno(1,2,3-cd)pyrene	U	NA	U	U	NA	NA
Isophorone	U	NA	U	U	NA	NA
Naphthalene	U	NA	U	U	NA	NA
Nitrobenzene	U	NA	U	U	NA	NA
N-Nitroso-di-n-propylamine	U	NA	U	U	NA	NA
N-Nitrosodiphenylamine	U	NA	U	U	NA	NA
O,O,O-Triethylphosphorothioate	U	NA	U	U	NA	NA
Pentachlorophenol	U	NA	U	U	NA	NA
Phenanthrene	U	NA	U	U	NA	NA
Phenol	U	NA	U	U	NA	NA
Pyrene	U	NA	U	U	NA	NA

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4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
VOCs	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	U	NA	U	U	NA	NA
1,1,2,2-Tetrachloroethane	U	NA	U	U	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	U	NA	U	U	NA	NA
1,1,2-Trichloroethane	U	NA	U	U	NA	NA
1,1-Dichloroethane	U	NA	U	U	NA	NA
1,1-Dichloroethene	U	NA	U	U	NA	NA
1,2,4-Trichlorobenzene	UJ	NA	UJ	UJ	NA	NA
1,2-Dibromo-3-chloropropane	U	NA	U	U	NA	NA
1,2-Dibromoethane (Ethylene dibromi	U	NA	U	U	NA	NA
1,2-Dichlorobenzene	U	NA	U	U	NA	NA
1,2-Dichloroethane	U	NA	U	U	NA	NA
1,2-Dichloropropane	U	NA	U	U	NA	NA
1,3-Dichlorobenzene	U	NA	U	U	NA	NA
1,4-Dichlorobenzene	U	NA	U	U	NA	NA
2-Butanone	U	NA	U	U	NA	NA
2-Hexanone	U	NA	U	U	NA	NA
4-Methyl-2-pentanone	U	NA	U	U	NA	NA
Acetone	U	NA	U	U	NA	NA
Benzene	U	NA	U	U	NA	NA
Bromochloromethane	U	NA	U	U	NA	NA
Bromodichloromethane	U	NA	U	U	NA	NA
Bromoform	U	NA	U	U	NA	NA
Carbon disulfide	U	NA	U	U	NA	NA
Carbon tetrachloride	U	NA	U	U	NA	NA
Chlorobenzene	U	NA	U	U	NA	NA
Chloroethane	U	NA	U	U	NA	NA
Chloroform	U	NA	U	U	NA	NA
cis-1,2-Dichloroethene	U	NA	U	U	NA	NA
cis-1,3-Dichloropropene	U	NA	U	U	NA	NA
Cyclohexane	U	NA	U	U	NA	NA
Dibromochloromethane	U	NA	U	U	NA	NA
Dichlorodifluoromethane	U	NA	U	U	NA	NA
Ethylbenzene	U	NA	U	U	NA	NA
Fluorotrichloromethane	U	NA	U	U	NA	NA
Isopropylbenzene	U	NA	U	U	NA	NA
Methyl acetate	U	NA	U	U	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-4
Groundwater Sample Results

Parameter	CMW-2 2004-Aug	CMW-2-F 2004-Aug	CMW-3 2004-Aug	CMW-3-Q 2004-Aug	CMW-3-F 2004-Aug	CMW-3-F-Q 2004-Aug
VOCs (continued)						
Methyl bromide	UJ	NA	UJ	UJ	NA	NA
Methyl chloride	U	NA	U	U	NA	NA
Methyl tert-butyl ether	U	NA	0.35 J	0.4 J	NA	NA
Methylcyclohexane	UJ	NA	UJ	UJ	NA	NA
Methylene chloride (Dichloromethane	U	NA	U	U	NA	NA
Styrene	U	NA	U	U	NA	NA
Tetrachloroethylene	4.9 J	NA	UJ	UJ	NA	NA
Toluene	U	NA	U	U	NA	NA
trans-1,2-Dichloroethene	U	NA	U	U	NA	NA
trans-1,3-Dichloropropene	U	NA	U	U	NA	NA
Trichloroethylene	U	NA	U	U	NA	NA
Vinyl chloride	U	NA	U	U	NA	NA
Xylenes (total)	U	NA	U	U	NA	NA

Notes:
1) Values are in ppb.
2) Results presented are the most recent sampling data for each well.
3) NA=Not Analyzed; U=Non-detect; J=Estimated; F=Filtered; Q=Duplicate; N/A=Not Applicable
4) Filtered samples collected using 0.1 micrometer filter.

TABLE 4-9
Constituent Concentration Limits

Constituent	Concentration Limits		
	USEPA MCLs (µg/L)	USEPA PRGs (µg/L)	Calculated PRG (µg/L)
Chlorobenzene	100	--	--
Methylene Chloride	5	--	--
Isopropyl Benzene (Cumene)	--	660	--
1,1,2,2-Tetrachloroethane	--	0.055	--
Cobalt	--	730	--
Mercury	2	--	--
1,2-Dichlorobenzene	600	--	--
1,4-Dichlorobenzene	75	--	--
2,4-Dichlorophenol	--	110	--
Phenol	--	11,000	--
Parathion	--	220	--
Methyl Parathion	--	9.1	--
Pentachlorophenol	1	--	--
4-Nitrophenol	--	--	1,095
PCBs (Polychlorinated biphenyls)	0.5	--	--
Tetraethyldithiopyrophosphate (Sulfotepp)	--	18	--
o,o,o-Triethylphosphorothioate	--	--	730
2,4,5-Trichlorophenol	--	3,600	--
2,4,6-Trichlorophenol	--	3.6	--
Arsenic	10	--	--
Barium	2,000	--	--
Beryllium	4	--	--
Cadmium	5	--	--
Chromium	100	--	--
Lead	15	--	--
Manganese	--	880	--
Nickel	--	730	--
Vanadium	--	36	--

Notes:
List includes the 28 Constituents of Interest (COIs) as discussed in Section 4.0 of accompanying report.
USEPA Maximum Contamination Limits (MCLs) are used where available. If MCLs are not available, then USEPA Region IX Preliminary Remediation Goals (PRGs) are used.
Where neither MCLs or Region IX PRGs were available, PRGs were developed using methods consistent with the Region IX PRGs User's Guide. See Appendix E for further details.

TABLE 4-10
Occurrence and Distribution for Facility Constituents in Groundwater

Parameter Group	Constituent	CAS-ID	Unit	Minimum Concentration [7]	Maximum Concentration [5]	Mean Concentration	Location of Maximum Concentration	Most Recent Measurement from all Site Wells	Detection Frequency	Percentage of Detections	Range of Reporting Limits	Prevalent Constituents Based on Detections
PCBs, Pesticides and Dioxin	PCBs. Total [3]	1336-36-3	µg/L	0.32 J	15,500	97.7	OW-21A	ND - 190 J	90 / 368	24%	0.47 - 1,000	Yes
	4,4'-DDE	72-55-9	µg/L	0.14 JN	0.14 JN	0.014	OW-08A	ND - 0.14 JN	1 / 10	10%	0.094 - 9.5	
	Dieldrin	60-57-1	µg/L	0.075 JN	0.075 JN	0.0075	OW-08A	ND - 0.075 JN	1 / 10	10%	0.094 - 95	
	gamma-BHC	58-89-9	µg/L	0.1 J	0.56 JN	0.12	OW-08A	ND - 0.56 JN	3 / 10	30%	0.047 - 4.8	
	Methyl parathion	298-00-0	µg/L	1.4 J	74 J	2.21	OW-21A	ND - 1.4 J	4 / 41	10%	0.5 - 500	
	Parathion	56-38-2	µg/L	0.17 J	23,000	151.1	OW-21A	ND - 7,600	62 / 363	17%	0.94 - 1,100	Yes
	Tetraethyldithiopyrophosphate (Sulfotepp)	3689-24-5	µg/L	0.19 J	150	0.84	OW-21A	ND - 12	18 / 317	6%	0.47 - 500	
	Dioxin TEQ [2]	NA	µg/L	5.6×10^{-8}	3.01×10^{-6} J	7.33×10^{-7}	OW-16A	5.6×10^{-8} - 3.01×10^{-6} J	4 / 10	40%	4.56×10^{-7} - 5.6×10^{-5}	
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	µg/L	0.67 J	0.67 J	0.016	OW-08A	ND - 0.67 J	1 / 41	2%	1 - 50	
	1,2,4-Trichlorobenzene	120-82-1	µg/L	0.8 J	1,200	121	OW-16A	ND - 1,200	3 / 10	30%	1 - 1	
	1,4-Dichlorobenzene	106-46-7	µg/L	0.53 J	21	0.31	OWR-11	ND - 7.5 J	13 / 205	6%	1 - 2,000	Yes
	1,2-Dichlorobenzene	95-50-1	µg/L	1.2 J	39 J	1.70	OW-21A	ND - 39 J	30 / 205	15%	0 - 2,000	Yes
	Benzene	71-43-2	µg/L	0.77 J	0.77 J	0.08	OW-16A	ND - 0.77 J	1 / 10	10%	1 - 1	
	Bromodichloromethane	75-27-4	µg/L	2	2	0.20	OW-10	ND - 2	1 / 10	10%	1 - 1	
	Carbon tetrachloride	56-23-5	µg/L	2.5	2.5	0.25	OW-10	ND - 2.5	1 / 10	10%	1 - 1	
	Chlorobenzene	108-90-7	µg/L	0.51 J	46	0.88	OWR-05D	ND - 3.4	42 / 306	14%	0 - 100	Yes
	Chloroform	67-66-3	µg/L	27	27	2.70	OW-10	ND - 27	1 / 10	10%	1 - 1	
	cis-1,2-Dichloroethene	156-59-2	µg/L	10	10	1	T-4	ND - 10	1 / 10	10%	1 - 1	
	Dibromochloromethane	124-48-1	µg/L	0.77 J	0.77 J	0.08	OW-10	ND - 0.77 J	1 / 10	10%	1 - 1	
	Ethylbenzene	100-41-4	µg/L	2.1	2.1	0.21	OW-16A	ND - 2.1	1 / 10	10%	1 - 1	
	Methylene chloride	75-09-2	µg/L	0.46 J	36	0.30	OWR-08S	ND	7 / 277	3%	5 - 500	
	trans-1,2-Dichloroethene	156-60-5	µg/L	8.2	8.2	0.82	T-4	ND - 8.2	1 / 10	10%	1 - 1	
	Tetrachloroethylene	127-18-4	µg/L	3.1	3.1	0.31	OW-10	ND - 3.1	1 / 10	10%	1 - 1	
	Trichloroethylene	79-01-6	µg/L	3.4	10	1.3	OW-10	ND - 10	2 / 10	20%	1 - 1	
	Xylenes (total)	1330-20-7	µg/L	6	6	0.6	OW-16A	ND - 6	1 / 10	10%	2 - 2	
SVOCs	1,1'-Biphenyl	92-52-4	µg/L	170	170	17	OW-16A	ND - 17	1 / 10	10%	9.4 - 10	
	2,4,5-Trichlorophenol	95-95-4	µg/L	1.5 J	18.2	0.378	MW-20A	ND - 4 J	11 / 288	4%	9.4 - 2,000	
	2,4,6-Trichlorophenol	88-06-2	µg/L	3.4 J	25.1	1.04	MW-20A	6.7 J	19 / 290	7%	9.4 - 2,000	
	2,4-Dichlorophenol	120-83-2	µg/L	.78 J	1.4 J	0.015	MW-20A	ND - 1.1 J	4 / 288	1%	9.4 - 2000	
	4-Nitrophenol	100-02-7	µg/L	3.6 J	31,000	364	OW-21A	ND - 9,500	31 / 363	9%	24 - 19,000	Yes
	Acenaphthene	83-32-9	µg/L	0.73 J	0.73 J	0.073	T-4	ND - 0.73 J	1 / 10	10%	9.4 - 10	
	Benzo(a)pyrene	50-32-8	µg/L	2.5 J	2.5 J	0.25	OW-08A	ND - 2.5 J	1 / 10	10%	9.4 - 10	
	Benzo(b)fluoranthene	205-99-2	µg/L	2.1 J	2.1 J	0.21	OW-08A	ND - 2.1 J	1 / 10	10%	9.4 - 10	
	Benzo(g,h,i)perylene	191-24-2	µg/L	2.1 J	2.1 J	0.21	OW-08A	ND - 2.1 J	1 / 10	10%	9.4 - 10	
	Benzo(k)fluoranthene	207-08-9	µg/L	2.6 J	2.6 J	0.26	OW-08A	ND - 2.6 J	1 / 10	10%	9.4 - 10	
	Butyl benzyl phthalate	85-68-7	µg/L	1.2 J	1.2 J	0.12	OW-16A	ND - 1.2 J	1 / 10	10%	9.4 - 10	
	Caprolactam	105-60-2	µg/L	3.1 J	3.1 J	0.310	T-2	ND - 3.1 J	1 / 10	10%	9.4 - 10	
	Dibenz(a,h)anthracene	53-70-3	µg/L	2.4 J	2.4 J	0.24	OW-08A	ND - 2.4 J	1 / 10	10%	9.4 - 10	
	Dimethyl phthalate	131-11-3	µg/L	1.4 J	1.4 J	0.14	T-2	ND - 1.4 J	1 / 10	10%	9.4 - 10	
	Indeno(1,2,3-cd)pyrene	193-39-5	µg/L	0.73 J	1.9 J	0.26	OW-08A	ND - 1.9 J	2 / 10	20%	9.4 - 10	
	O,O,O-Triethylphosphorothioate	126-68-1	µg/L	1.3 J	530	7.780	OW-21A	ND - 530	81 / 363	22%	0- 2,000	Yes
	Pentachlorophenol	87-86-5	µg/L	1.2	95.4	1.9	MW-20A	8.8 J	20 / 290	7%	0.94 - 5,000	Yes

TABLE 4-10
Occurrence and Distribution for Facility Constituents in Groundwater

Parameter Group	Constituent	CAS-ID	Unit	Minimum Concentration (7)	Maximum Concentration (5)	Mean Concentration	Location of Maximum Concentration	Most Recent Measurement from all Site Wells	Detection Frequency	Percentage of Detections	Range of Reporting Limits	Prevalent Constituents Based on Detections
Metals	Aluminum	7429-90-5	mg/L	0.056 J	1.5	0.3446	OW-10	ND - 1.5	9 / 10	90%	0.20	
	Antimony	7440-36-0	mg/L	0.0051 J	0.00051 J	0.0051 J	T-4	ND-0.0051 J	1 / 10	10%	0.02	
	Arsenic	7440-38-2	mg/L	0.0044 J	0.0061 J	0.00026	T-4	ND - 0.0061 J	2 / 41	5%	0.01 - 0.1	
	Barium	7440-39-3	mg/L	0.013 J	1.2	0.1578	OWR-05D	0.013 J - 0.092	36 / 41	88%	0.01 - 0.1	
	Beryllium	7440-41-7	mg/L	0.00013 J	0.0068 J	0.00059	OWR-11/OW-10	ND - 0.005	15 / 41	37%	.004 - .04	
	Cadmium	7440-43-9	mg/L	0.0016 J	0.0016 J	3.9E-05	OW-10	ND- 0.0016 J	1 / 41	2%	0.005 - 0.05	
	Calcium	7440-70-2	mg/L	2.5	91	22.36	OW-10	2.5 - 91	10 / 10	100%	0.05	
	Chromium	7440-47-3	mg/L	0.0012 J	0.057	0.00323	WEL-01	ND - 0.0089	9 / 41	22%	0.01 - 0.1	
	Cobalt	7440-48-4	mg/L	0.00078 J	0.3	0.0191	OWR-11	ND - 0.24	119 / 313	38%	0.00071 - 0.01	Yes
	Copper	7440-50-8	mg/L	0.0021 J	0.014 J	0.0023	OW-10	ND - 0.014	4 / 10	40%	0.02	
	Ferrous Iron	NA	mg/L	0.14	0.14	0.14	OWR-05D	ND - 0.14	1 / 9	11%	0.05 - 0.25	
	Iron	7439-89-6	mg/L	0.03 J	1.7	0.2544	T-1	ND - 1.7	8 / 10	80%	0.05	
	Lead	7439-92-1	mg/L	0.0022 J	0.033	0.00236	WEL-01	ND - 0.0092	8 / 41	20%	0.005 - 0.05	
	Magnesium	7439-95-4	mg/L	1.3	34	7.03	OW-10	1.3 - 34	10 / 10	100%	0.5	
	Manganese	7439-96-5	mg/L	0.02	12	1.053	OWR-12	0.02 - 1.5	38 / 41	93%	0.01 - 0.01	Yes
	Mercury	7439-97-6	mg/L	0.000081 J	0.05	0.00049	OW-10	ND - 0.0033	48 / 219	22%	0.0002 - 0.002	Yes
	Nickel	7440-02-0	mg/L	0.0023 J	0.082 J	0.0134	OWR-11	ND - 0.069	24 / 41	59%	0.004 - 0.4	
	Phosphorus	7723-14-0	mg/L	0.039	6.8	0.76	OW-06A	ND - 6.8	2 / 9	22%	0.01 - 0.2	
	Potassium	7440-09-7	mg/L	1.2	10	4.37	T-3	1.2 - 10	10 / 10	100%	1 - 1	
	Sodium	7440-23-5	mg/L	6.5	58	19.39	OW-10	6.5 - 58	10 / 10	100%	1 - 1	
	Vanadium	7440-62-2	mg/L	0.0019 J	0.081	0.0048	WEL-01	ND - 0.018	10/41	24%	0.01 - 0.1	
	Zinc	7440-66-6	mg/L	0.0099 J	1.7	0.418	T-2	ND - 1.7	8 / 10	80%	0.02	

Notes:
(1) Table defines ranges of detections for groundwater concentrations from 1998 to April 2007.
(2) Dioxin TEQ: ITEF TEQ calculated with ND=0 and EMPC=EMPC.
(3) Total PCBs were calculated based on using ND = 0 for individual Aroclors with no detections.
(4) Results from filtered samples were not used in the analysis.
(5) The maximum result from the original / duplicate pair was used in the analysis.
(6) ND = Non-detect. J = Estimated Value. JN = Tentatively Identified.
(7) Note that some analytes were detected below the laboratory reporting limits but above the method detection limits and have been qualified as estimated values.

TABLE 5-1
Soil Sampling Results Preliminary Screening

	Maximum Detected Soil Concentration (mg/kg)[1]	Freq. of Detections[1]	Background Concentration (mg/kg)[3]	MCL-based SSL (mg/kg) [2]	Risk-based SSL (mg/kg) [2]	Number of SSL Exceedances	Location of Exceedances	MCL (ug/L) [2]	Tap Water (ug/L) [2]	Maximum Detected Groundwater Concentration (ug/L)[1]	Detected in Groundwater Above MCL/Tapwater?	Retained for Detailed Screen?[4]	Rationale for Elimination
Inorganics													
Cyanide	0.65	1 of 3	--	2	7.4	--	--	200	730	ND	Below MCL	No	Below Screening Value, Not Detected in GW Above MCL
Aluminum	19,000	3 of 3	15,000	--	55000	--	--	--	37000	1500	Below Tap Water	No	Below Screening Value, Not Detected in GW Above Tap Water Concentration
Antimony	8.7	1 of 3	1.7	0.27	0.66	1	SSRI-11-Q	6	15	5.1	Below MCL	No	Not Detected in GW Above MCL
Arsenic	390	22 of 23	16	0.29	0.0013	22	Multiple locations	10	0.05	6.1	Below MCL	No	Not Detected in GW Above MCL
Barium	780	23 of 23	180	82	300	7	Multiple locations	2000	7300	1200	Below MCL	No	Not Detected in GW Above MCL
Beryllium	1.9	11 of 23	0.83	3.2	58	0	--	4	73	6.8	Yes	No	Below Screening Value
Cadmium	4.7	5 of 23	0.25	0.38	1.4	5	Multiple locations	5	18	1.6	Below MCL	No	Not Detected in GW Above MCL
Calcium	59,000	3 of 3	1,200	--	--	--	--	--	--	--	No MCL	No	Essential Nutrient
Chromium	110	22 of 23	38	--	--	--	--	100	--	57	Below MCL	No	Not Detected in GW Above MCL
Cobalt	74	23 of 23	16	--	0.49	23	Multiple locations	--	11	300	Yes	Yes	
Copper	280	3 of 3	16	46	51	1	SSRI-11-Q	1300	1500	14	Below MCL	No	Not Detected in GW Above MCL
Iron	26,000	3 of 3	39,000	--	640	3	Multiple locations	--	26000	1700	Below Tap Water	No	Below Background, Essential Nutrient, Not Detected in GW Above Tap Water Concentration
Lead	4,700	23 of 23	39	14	--	21	Multiple locations	15	--	33	Yes	Yes	
Magnesium	34,000	3 of 3	910	--	--	--	--	--	--	34000	No MCL	No	Essential Nutrient
Manganese	12,000	23 of 23	1,500	--	57	23	Multiple locations	--	880	12000	Yes	Yes	
Mercury	3.3	24 of 25	0.07	0.10	0.033	13	Multiple locations	2	0.63	50	Yes	Yes	
Nickel	2,400	22 of 23	12	--	48	4	Multiple locations	--	730	82	Below Tap Water	No	Not Detected in GW Above Tap Water Concentration
Potassium	1,800	3 of 3	760	--	--	--	--	--	26	10000	Yes	No	Essential Nutrient
Selenium	4.5	1 of 3	0.48	0.26	0.95	1	SSRI-11-Q	50	180	ND	Below MCL	No	Not Detected in GW Above MCL
Silver	12	1 of 3	0.30	--	1.6	1	SSRI-11-Q	--	180	ND	Below Tap Water	No	Not Detected in GW Above Tap Water Concentration

TABLE 5-1
Soil Sampling Results Preliminary Screening

	Maximum Detected Soil Concentration (mg/kg)[1]	Freq. of Detections[1]	Background Concentration (mg/kg)[3]	MCL-based SSL (mg/kg) [2]	Risk-based SSL (mg/kg) [2]	Number of SSL Exceedances	Location of Exceedances	MCL (ug/L) [2]	Tap Water (ug/L) [2]	Maximum Detected Groundwater Concentration (ug/L)[1]	Detected in Groundwater Above MCL/Tapwater?	Retained for Detailed Screen?[4]	Rationale for Elimination
Sodium	400	3 of 3	670	--	--	--	--	--	--	58000	No MCL	No	Essential Nutrient
Vanadium	93	23 of 23	62	--	260	0	--	--	260	81	Below Tap Water	No	Below Screening Value, Not Detected in GW Above Tap Water Concentration
Zinc	610	3 of 3	38	--	680	0	--	--	11000	1700	Below Tap Water	No	Below Screening Value, Essential Nutrient, Not Detected in GW Above Tap Water Concentration
PCBs, Aroclor Specific													
Aroclor 1016	-	0 of 76	--	--	0.052	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1221	-	0 of 76	--	--	0.00014	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1232	720	4 of 76	--	--	0.00014	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1242	46	5 of 76	--	--	0.003	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1248	16,000	24 of 76	--	--	0.003	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1254	440	53 of 76	--	--	0.0051	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1260	620	55 of 76	--	--	0.014	--	--	--	--	--	--	--	Retained as part of PCBs, Total
Aroclor 1268	100	42 of 57	--	--	--	--	--	--	--	--	--	--	Retained as part of PCBs, Total
PCBs, Totals [5]	16,620	63 of 76	--	0.045	0.015	61	Multiple locations	0.50	0.17	7400	Yes	Yes	
Pesticides	-												
Heptachlor epoxide	0.38	1 of 3	--	0.0021	0.00008	1	SSRI-11-Q	0.20	0.01	ND	Below MCL	No	Not Detected in GW Above MCL
SVOCs													
Benz(a)anthracene	0.83	3 of 3	--	--	0.014	3	Multiple locations	--	0.029	ND	Below Tap Water	No	Not Detected in GW Above Tap Water Concentration
Benzo(a)pyrene [6]	1.9	3 of 3	--	0.31	0.0046	1	SSRI-11-Q	0.20	0.0029	2.5	Yes	Yes	
Benzo(b)fluoranthene	2.1	3 of 3	--	--	0.047	3	Multiple locations	--	0.029	2.1	Yes	Yes	
Benzo(g,h,i)perylene	2.1	3 of 3	--	--	--	--	--	--	--	2.1	Yes	Yes	
Benzo(k)fluoranthene	1.5	2 of 3	--	--	0.46	1	SSRI-11-Q	--	0.29	2.6	Yes	Yes	
Chrysene	1.9	3 of 3	--	--	1.40	1	SSRI-04-Q	--	2.90	ND	Below Tap Water	No	Not Detected in GW Above Tap Water Concentration

TABLE 5-1
Soil Sampling Results Preliminary Screening

	Maximum Detected Soil Concentration (mg/kg)[1]	Freq. of Detections[1]	Background Concentration (mg/kg)[3]	MCL-based SSL (mg/kg) [2]	Risk-based SSL (mg/kg) [2]	Number of SSL Exceedances	Location of Exceedances	MCL (ug/L) [2]	Tap Water (ug/L) [2]	Maximum Detected Groundwater Concentration (ug/L)[1]	Detected in Groundwater Above MCL/Tapwater?	Retained for Detailed Screen?[4]	Rationale for Elimination
Dibenz(a,h)anthracene	0.62	2 of 3	--	--	0.02	2	SSRI-07-Q, SSRI-11-Q	--	0.0029	2.4	Yes	Yes	
Fluoranthene	0.94	3 of 3	--	--	210	0	--	--	1500	ND	Below Tap Water	No	Below Screening Value, Not Detected in GW Above Tap Water Concentration
Indeno(1,2,3-cd)pyrene	1.30	2 of 3	--	--	0.16	1	SSRI-11-Q	--	0.03	1.9	Yes	Yes	
Phenanthrene	0.47	3 of 3	--	--	--	--	--	--	--	ND	No MCL	No	Not Detected in GW
Pyrene	1.2	3 of 3	--	--	150	0	--	--	1100	ND	Below Tap Water	No	Below Screening Value, Not Detected in GW Above Tap Water Concentration
VOCs													
Chlorobenzene	0.017	2 of 23	--	0.075	0.068	0	--	100	91	46	Below MCL	No	Below Screening Value, Not Detected in GW Above MCL
Methylene chloride (Dichloromethane)	0.033	1 of 23	--	0.0013	0.0012	1	SSR-11	5	4.8	36	Yes	No	Less than 5% Frequency of Detection

Shaded chemicals were retained for detailed screening.

Notes:
1. The data is presented in Tables 4-1 and 4-4.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. The MCL for Benzo(a)Pyrene was used as a surrogate for other PAHs that did not have a MCL.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

PARAMETER [1,4,6,7,8,9]	AOC-A 0-0.5	LFSL89	LFSL93	LSFL94	LFSL99	LFSL103	SL-3A 0-0.25	SL-3B 0-0.25	SL-3C 0-0.25	SL-3D 0-0.25	SLGM-3A 0-0.25	SLGM-3B 0-0.25	SLGM-3C 0-0.25	SLGM-3D 0-0.25	SSR-01 0-2	SSR-02 0-2
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8700	88000
Exceeds Background [3]															0	1
Exceeds MCL Based SSL [2]															0	1
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	70000	590000
Exceeds Background [3]															0	0
Exceeds Risk Based SSL [2]															1	1
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	210
Exceeds Background [3]															0	1
Exceeds MCL Based SSL [2]															0	1
Exceeds Risk Based SSL [2]															0	1
PCBs, Totals [5]	5720	10	4.1	1.3	6.7	U	168	70	6290	U	U	71	227	73	23	11200
Exceeds MCL Based SSL [2]	1	0	0	0	0	0	1	1	1	0	0	1	1	1	0	1
Exceeds Risk Based SSL [2]	1	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentration
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

PARAMETER [1,4,6,7,8,9]	SSR-03 0.5-2.5	SSR-04 6-10	SSR-05 2.5-4.5	SSR-06 0.67-2	SSR-07 2-3	SSR-08 1-3	SSR-09 0.58-2.58	SSR-10 19-21	SSR-10-Q 19-21	SSR-11 6-10	SSR-12 6-8	SSR-13 6-8	SSR-14 10-12	SSR-15 6-10	SSR-15-Q 6-10	SSR-16 0.83-3
Lead	25000	41000	52000	48000	220000	41000	150000	39000	20000	18000	23000	36000	250000	42000	40000	15000
Exceeds Background [3]	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0
Exceeds MCL Based SSL [2]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manganese	220000	120000	610000	690000	620000	520000	12000000	680000	1100000	250000	100000	360000	68000	100000	120000	310000
Exceeds Background [3]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Exceeds Risk Based SSL [2]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mercury	52	1100	1800	330	1400	93	460	76	11	32	50	46	79	3300	1100	56
Exceeds Background [3]	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0
Exceeds MCL Based SSL [2]	0	1	1	1	1	0	1	0	0	0	0	0	0	1	1	0
Exceeds Risk Based SSL [2]	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1
PCBs, Totals [5]	2170	104000	106000	9300	229000	34	282000	87	65	204	670	16000	6400	65000	861000	U
Exceeds MCL Based SSL [2]	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0
Exceeds Risk Based SSL [2]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentrati on
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

PARAMETER [1,4,6,7,8,9]	SSR-17 1.25-3.5	SSR-18 0.25-0.5	SSR-18-Q 0.25-0.5	SSR-19 0.67-3	SSR-20 0.25-0.5	SSR-21 0.33-2.5	SSR-22 0.33-0.5	SSR-22-Q 0.33-0.5	SSRI-01 0-0.5	SSRI-01 3-4	SSRI-02 0-0.5	SSRI-02 3-4	SSRI-03 0-0.5	SSRI-03 3-4	SSRI-04 0-0.5	SSRI-04-Q 0-0.5
Lead	35000	110000	85000	52000	NA	28000	NA	NA	NA	NA	NA	NA	NA	NA	NA	11000
Exceeds Background [3]	0	1	1	1		0										0
Exceeds MCL Based SSL [2]	1	1	1	1		1										0
Manganese	5500000	370000	270000	2600000	NA	670000	NA	NA	NA	NA	NA	NA	NA	NA	NA	160000
Exceeds Background [3]	1	0	0	1		0										0
Exceeds Risk Based SSL [2]	1	1	1	1		1										1
Mercury	49	420	280	55	NA	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	170
Exceeds Background [3]	0	1	1	0		1										1
Exceeds MCL Based SSL [2]	0	1	1	0		1										1
Exceeds Risk Based SSL [2]	1	1	1	1		1										1
PCBs, Totals [5]	205	16620000	9800000	507	NA	559	NA	NA	U	6860	175	40400	1170	590	10860	12200
Exceeds MCL Based SSL [2]	1	1	1	1		1			0	1	1	1	1	1	1	1
Exceeds Risk Based SSL [2]	1	1	1	1		1			0	1	1	1	1	1	1	1

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentration
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

PARAMETER [1,4,6,7,8,9]	SSRI-04 3-4	SSRI-05 0-0.5	SSRI-05 3-4	SSRI-06 0-0.5	SSRI-06 3-4	SSRI-06-Q 3-4	SSRI-07 0-0.5	SSRI-07-Q 0-0.5	SSRI-07 3.5-3.5	SSRI-08 0-0.5	SSRI-08 3-4	SSRI-09 0-0.5	SSRI-09 3-4	SSRI-10 0-0.5	SSRI-10 3-4	SSRI-11 0-0.5
Lead	NA	NA	NA	NA	NA	NA	NA	41000	NA	NA	NA	NA	NA	NA	NA	NA
Exceeds Background [3]								1								
Exceeds MCL Based SSL [2]								1								
Manganese	NA	NA	NA	NA	NA	NA	NA	830000	NA	NA	NA	NA	NA	NA	NA	NA
Exceeds Background [3]								0								
Exceeds Risk Based SSL [2]								1								
Mercury	NA	NA	NA	NA	NA	NA	NA	2600	NA	NA	NA	NA	NA	NA	NA	NA
Exceeds Background [3]								1								
Exceeds MCL Based SSL [2]								1								
Exceeds Risk Based SSL [2]								1								
PCBs, Totals [5]	6600	37600	85000	31000	865	744	250000	126000	56000	U	U	38400	13100	11800	220	930000
Exceeds MCL Based SSL [2]	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1
Exceeds Risk Based SSL [2]	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentration
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

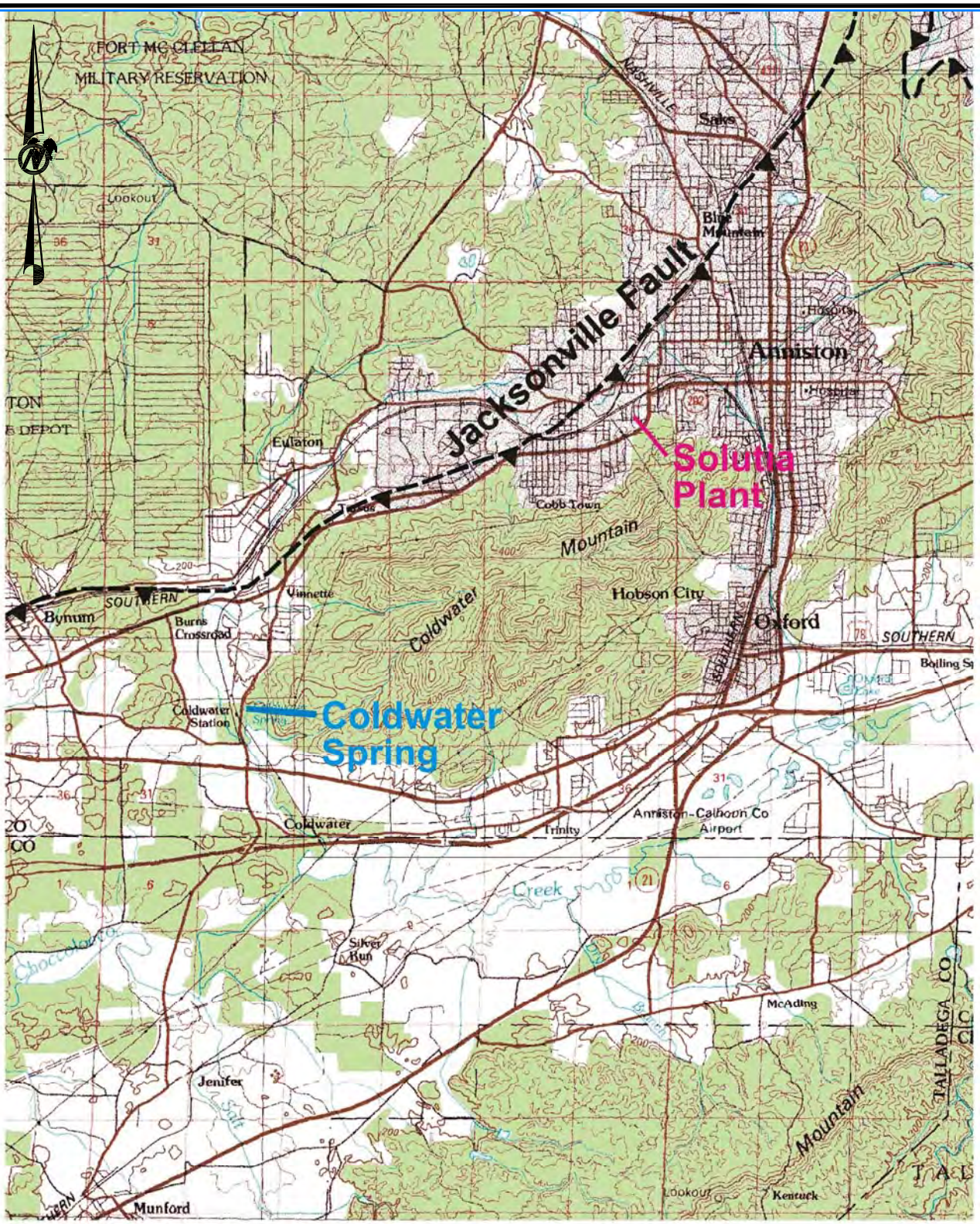
PARAMETER [1,4,6,7,8,9]	SSRI-11-Q 0-0.5	SSRI-11 3-4	SSRI-12 0-0.5	SSRI-12 3-4	SSRI-12-Q 3-4	SSRI-13 0-0.5	SSRI-13 3-4	SSRI-14 0-0.5	SSRI-14 3-4	SSRI-15 0-0.5	SSRI-15-Q 0-0.5	SSRI-16 0-0.5	SWMU-12-24A 0-2	SWMU-12-24A-Q 0-2	SWMU-12-24B 0-2	SWMU-12-24C 0-2
Lead	4700000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Exceeds Background [3]	1															
Exceeds MCL Based SSL [2]	1															
Manganese	670000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Exceeds Background [3]	0															
Exceeds Risk Based SSL [2]	1															
Mercury	1100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	91	NA
Exceeds Background [3]	1														1	
Exceeds MCL Based SSL [2]	1														0	
Exceeds Risk Based SSL [2]	1														1	
PCBs, Totals [5]	154000	1890	U	U	U	2013	U	630	U	U	U	U	26200	26300	540	84000
Exceeds MCL Based SSL [2]	1	1	0	0	0	1	0	1	0	0	0	0	1	1	1	1
Exceeds Risk Based SSL [2]	1	1	0	0	0	1	0	1	0	0	0	0	1	1	1	1

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentration
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.

TABLE 5-2
Evaluation of Background/SSL
Exceedances in Soil

PARAMETER [1,4,6,7,8,9]	SWMU-12-24D 0-2	SWMU-12-24E 0-2	SWMU-12-24F 0-2	SWMU-12-24G 0-2	SWMU-12-24H 0-2	SWMU-12-24I 0-2	SWMU-17 0-0.5	SWMU-25 0-0.5	SWMU-31 0-0.5	# of Sampled Locations	Exceedance Count	% of Exceedances	Screening Concentration (mg/kg)[2,3]
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Exceeds Background [3]										26	15	58%	39000
Exceeds MCL Based SSL [2]										26	24	92%	14000
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Exceeds Background [3]										26	3	12%	1500000
Exceeds Risk Based SSL [2]										26	26	100%	57000
Mercury	NA	NA	NA	940	NA	NA	NA	NA	NA				
Exceeds Background [3]				1						28	19	68%	70
Exceeds MCL Based SSL [2]				1						28	15	54%	100
Exceeds Risk Based SSL [2]				1						28	25	89%	33
PCBs, Totals [5]	9110	169000	28100	41200	4440	18000	4120	38600	13670				
Exceeds MCL Based SSL [2]	1	1	1	1	1	1	1	1	1	86	65	76%	45
Exceeds Risk Based SSL [2]	1	1	1	1	1	1	1	1	1	86	67	78%	15

Notes:
1. The data is presented in Tables 4-1 and 4-4 of the Report on Remedial Investigation for Operable Unit 3 dated July 2008.
2. Information obtained from EPA's agreed upon Regional Screening Levels for Regions 3, 6 and 9, dated September 2008.
3. Background concentrations for metals were compiled by the Army Corps of Engineers for the Fort McClellan Site located in Anniston, Alabama (SAIC, 1998). Two times the arithmetic mean of the combined surface and subsurface soil datasets was used in the evaluation.
4. See Section 5.1.1.2 of the text for a description of screening criteria.
5. Maximum detected concentration of PCBs was detected at a location currently under a substantial concrete cap.
6. 1 = sample concentration exceeds screening concentration; 0 = sample concentration does not exceed screening concentration
7. Concentration values are reported in ppb.
8. NA = Not Analyzed; U = Non-detect; Q = Duplicate
9. Refer to Table 4-1 in the Report on Remedial Investigation for Operable Unit 3 dated July 2008 for qualifiers.
10. Depth listed for samples in sample name are in feet.



Source: USGS 1:100,000 DRG, Anniston, Calhoun County, Alabama

REFERENCES

1.) USGS TOPOGRAPHIC MAP, 7.5 MIN. QUADRANGLE MAP SERIES: ANNISTON QUADRANGLE, CALHOUN COUNTY, AL

Golder Associates
Jacksonville, Florida

FILE No.	9433680J007
PROJECT No.	943-3680
REV.	0

SCALE	N.T.S.
DATE	03/20/09
DESIGN	RWP
CADD	MRM
CHECK	RWP
REVIEW	SJM

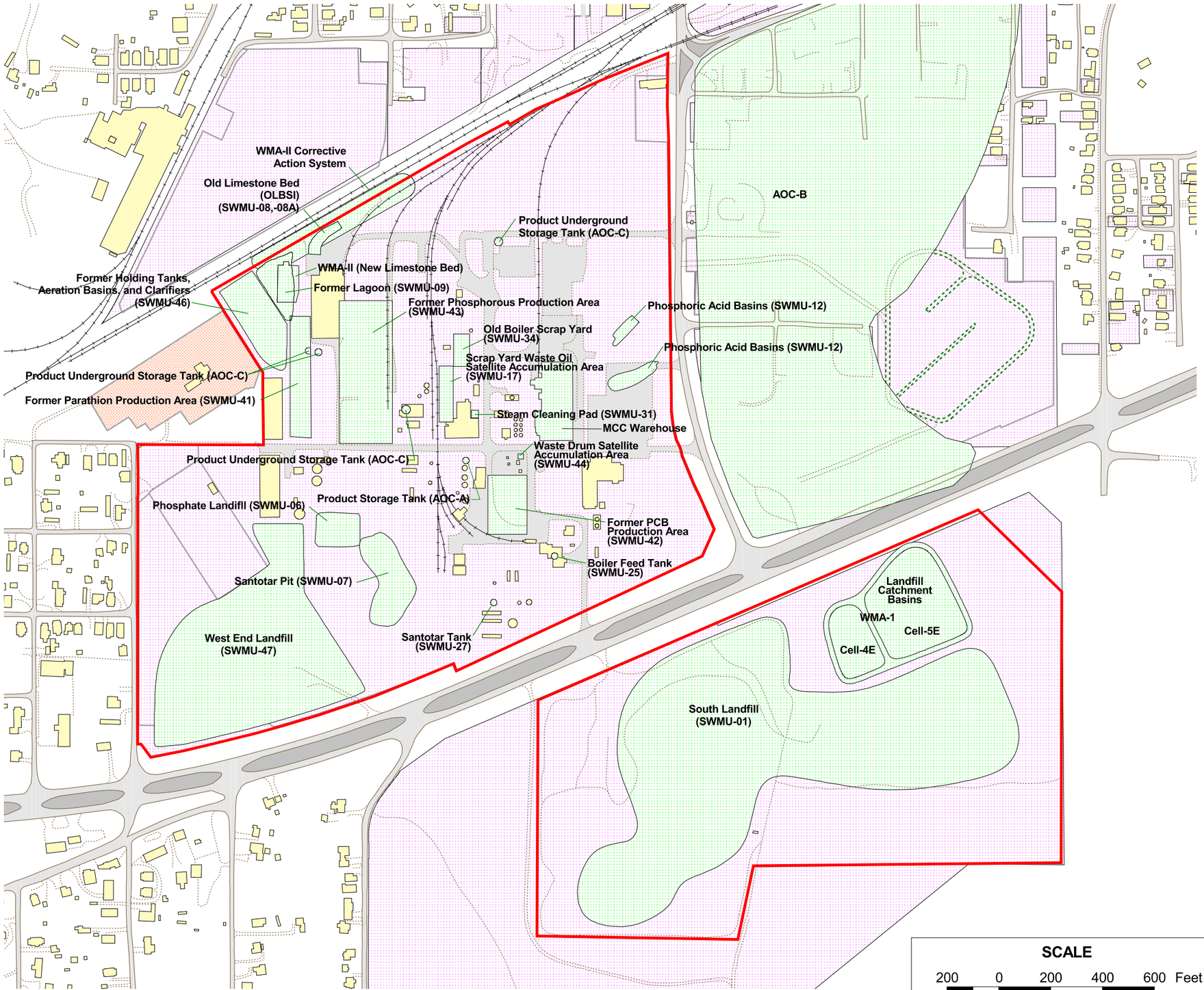
TITLE

LOCATION OF JACKSONVILLE FAULT LINE

RI REPORT / SOLUTIA INC.

FIGURE 1-4

Drawing file: 9433680J007.dwg Mar 20, 2009 - 3:11pm



Former OU-3 Source Areas

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- Property Line
- OU-3 Area
- Buildings
- Paved
- Solutia Inc.
- Alabama Power
- Source Areas

NOTES

ZONE
Alabama East 101

SOURCE
Golder Associates (on-site base map)
USGS 1:2400 Quad Maps

MAP PROJECTION
US State Plane

DATUM
NAD83

LOCATION MAP

N

SCALE

200 0 200 400 600 Feet

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J002C Rev. 2	2-1

Monitoring Well Locations

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Recovery Well
- Deep Residuum Monitoring/ Observation Well
- Shallow Residuum Monitoring/ Observation Well
- Piezometer
- Bedrock Monitoring Well
- OU-2 Temporary Monitoring Well

NOTES

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

Anniston

400 0 400 Feet

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J005B Rev. 1	2-2

Soil Sample Locations

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Railroads
- Major Roads
- Minor Roads
- Drainage Basin
- Property Line
- OU-3 Area
- Paved
- Buildings
- Landfill Area
- Pre-RFI/CS Surface Samples (Prior to 1998 Cover Upgrades)
- RFI/CS Subsurface soil sample
- RFI/CS Surface (or near surface) soil sample
- Supplemental RFI/CS Soil Sample
- Supplemental RFI/CS Composite Soil Sample
- OU-3 RI Soil Sample Location
- Screening sample locations where PCBs were below 5 ppm (Prior to 1998 Cover Upgrades)
- Screening sample locations where PCBs were above 5 ppm (Prior to 1998 Cover Upgrades)

NOTES

1) Screening samples were collected and analyzed prior to upgraded covers being put in place.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps
MAP PROJECTION	**DATUM**
US State Plane	NAD83

LOCATION MAP

SCALE

400 0 400 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J006 Rev. 2	2-5

One Mile Radius Potable Well Survey

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Roads
- Railroads
- OU-3 Area
- One Mile Perimeter
- Parcels with Potable Wells

NOTES

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

600 0 600 1200 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J011A	2-7

Discontinuity Location

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Shallow Residuum Monitoring/ Observation Well
- Deep Residuum Monitoring/ Observation Well
- Bedrock Monitoring Well
- Interceptor Well
- Approximate Discontinuity Location
- Angled Boring Location

NOTES

1.) Geologic discontinuity location obtained from Geraghty and Miller, Inc. Bedrock Investigation, 1992

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

Anniston

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J011B Rev. 12	3-4

SCALE
100 0 100 200 Feet

Shallow Residuum
Potentiometric Surface for October 2007

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Recovery Well
- Shallow Residuum Monitoring/ Observation Well
- Deep Residuum Monitoring/ Observation Well
- Piezometer
- Equipotential Contour (feet above mean sea level)
- (792.22) Groundwater Elevation Data

NOTES

1) Cone of depression around recovery well systems not shown in detail due to map scale.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

Anniston

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J012A Rev. 3	3-5

400 0 400 Feet

PCB Soil Sample Results

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Railroads
- Major Roads
- Minor Roads
- Drainage Basin
- Property Line
- OU-3 Area
- Paved
- Buildings
- Landfill Area

- Pre-RFI/CS Surface Samples (Prior to 1998 Cover Upgrades)
- RFI/CS Subsurface soil sample
- RFI/CS Surface (or near surface) soil sample
- Supplemental RFI/CS Soil Sample collected within 24 inches of surface
- Supplemental RFI/CS Composite Soil Sample
- OU-3 RI Soil Sample Location

1.17 / NR — PCB Results in mg/kg
Top result is surface or near surface
Bottom result is subsurface

NOTES

1) At each location, if only one result is shown, there is only a surface sample at that point.
2) Only primary sample results shown, see Table 4-1 for duplicate results.
3) BDL = Below Detection Limit.
4) J = Estimated value.
5) mg/kg = milligrams per kilogram.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

Anniston

SCALE

400 0 400 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/23/09	943-3680	9433680J026	4-1

Metal Soil Sample Results

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Railroads
- Major Roads
- Minor Roads
- Drainage Basin
- Property Line
- OU-3 Area
- Paved
- Buildings
- Landfill Area
- RFI/CS Subsurface soil sample
- RFI/CS Surface (or near surface) soil sample
- Supplemental RFI/CS Soil Sample collected within 24 inches of surface
- Supplemental RFI/CS Composite Soil Sample
- OU-3 RI Soil Sample Location

NOTES

1) Only detections are shown. See Table 4-1 for complete results.
2) J = Estimated value
3) NA = Not Analyzed
4) Soil samples collected from both surface and subsurface.
5) Concentrations in milligrams per kilogram.

11000 - Aluminum
ND - Antimony
3.8 - Arsenic
41 - Barium
0.47 J - Beryllium
0.52 J - Cadmium
59000 - Calcium
14 - Chromium
2.5 - Cobalt
13 - Copper
19000 - Iron
11 - Lead
34000 - Magnesium
160 - Manganese
0.17 - Mercury
33 - Nickel
1800 - Potassium
ND - Selenium
ND - Silver
150 - Sodium
ND - Thallium
25 - Vanadium
25 - Zinc

6.8 J - Arsenic
25 - Barium
1.5 J - Beryllium
ND - Cadmium
17 J - Chromium
22 J - Cobalt
39 J - Lead
680 J - Manganese
0.076 J - Mercury
17 J - Nickel
55 - Vanadium

13 - Arsenic
23 - Barium
0.69 - Beryllium
ND - Cadmium
16 - Chromium
6.9 - Cobalt
18 - Lead
250 - Manganese
0.032 - Mercury
11 - Nickel
25 - Vanadium

12 - Arsenic
62 - Barium
ND - Beryllium
ND - Cadmium
48 - Chromium
17 - Cobalt
220 - Lead
620 - Manganese
1.4 - Mercury
2400 - Nickel
51 - Vanadium

1 - Arsenic
52 - Barium
ND - Beryllium
ND - Cadmium
18 - Chromium
9.8 - Cobalt
41 - Lead
520 - Manganese
0.093 - Mercury
12 - Nickel
45 - Vanadium

7.9 - Arsenic
38 - Barium
ND - Beryllium
ND - Cadmium
23 - Chromium
8.9 - Cobalt
48 - Lead
690 - Manganese
0.33 - Mercury
39 - Nickel
50 - Vanadium

12 - Arsenic
350 - Barium
ND - Beryllium
ND - Cadmium
12 - Chromium
74 - Cobalt
35 - Lead
5500 - Manganese
0.049 - Mercury
98 - Nickel
67 - Vanadium

ND - Arsenic
65 - Barium
ND - Beryllium
ND - Cadmium
ND - Chromium
47 - Cobalt
52 - Lead
2600 - Manganese
0.055 - Mercury
69 - Nickel
93 - Vanadium

13 - Arsenic
38 - Barium
0.83 - Beryllium
ND - Cadmium
25 - Chromium
7.4 - Cobalt
15 - Lead
310 - Manganese
0.056 - Mercury
18 - Nickel
41 - Vanadium

5.7 - Arsenic
49 - Barium
ND - Beryllium
ND - Cadmium
16 - Chromium
9.1 - Cobalt
28 - Lead
670 - Manganese
0.3 - Mercury
8.6 - Nickel
40 - Vanadium

7.6 - Arsenic
150 - Barium
1 - Beryllium
ND - Cadmium
20 - Chromium
9.1 - Cobalt
88 - Lead
590 - Manganese
0.21 - Mercury
18 - Nickel
39 - Vanadium

4.7 - Arsenic
48 - Barium
ND - Beryllium
ND - Cadmium
16 - Chromium
6 - Cobalt
250 - Lead
68 - Manganese
0.79 - Mercury
84 - Nickel
30 - Vanadium

14 - Arsenic
780 - Barium
0.78 - Beryllium
0.92 - Cadmium
14 - Chromium
12 - Cobalt
150 - Lead
12000 - Manganese
0.46 - Mercury
120 - Nickel
26 - Vanadium

33 J - Arsenic
55 J - Barium
ND - Beryllium
ND - Cadmium
10 J - Chromium
4.3 J - Cobalt
110 J - Lead
370 J - Manganese
0.42 J - Mercury
11 - Nickel
15 J - Vanadium

6.9 - Arsenic
85 - Barium
0.75 - Beryllium
ND - Cadmium
23 - Chromium
3.2 - Cobalt
23 - Lead
100 - Manganese
0.05 - Mercury
9 - Nickel
41 - Vanadium

5.2 - Arsenic
110 - Barium
1 - Beryllium
0.73 - Cadmium
110 - Chromium
7.5 - Cobalt
36 - Lead
360 - Manganese
0.046 - Mercury
33 - Nickel
36 - Vanadium

3.9 - Arsenic
18 - Barium
ND - Beryllium
ND - Cadmium
18 - Chromium
2 - Cobalt
8.7 - Lead
70 - Manganese
ND - Mercury
ND - Nickel
31 - Vanadium

3.1 - Arsenic
22 - Barium
ND - Beryllium
ND - Cadmium
7.4 - Chromium
2.2 - Cobalt
25 - Lead
220 - Manganese
0.052 - Mercury
5.7 - Nickel
10 - Vanadium

0.94 - Mercury

0.091 - Mercury

7.2 - Arsenic
36 J - Barium
0.62 - Beryllium
ND - Cadmium
40 - Chromium
4.3 - Cobalt
42 - Lead
100 - Manganese
3.3 J - Mercury
8.6 J - Nickel
52 - Vanadium

19000 - Aluminum
8.7 - Antimony
390 - Arsenic
230 - Barium
0.8 - Beryllium
4.7 - Cadmium
24000 - Calcium
23 - Chromium
5 - Cobalt
280 - Copper
26000 - Iron
4700 - Lead
850 - Magnesium
670 - Manganese
1.1 - Mercury
26 - Nickel
1500 - Potassium
4.5 - Selenium
12 - Silver
400 - Sodium
ND - Thallium
31 - Vanadium
610 - Zinc

4.2 - Arsenic
43 - Barium
ND - Beryllium
ND - Cadmium
19 - Chromium
5 - Cobalt
41 - Lead
120 - Manganese
1.1 - Mercury
7.5 - Nickel
33 - Vanadium

11 - Arsenic
51 - Barium
ND - Beryllium
ND - Cadmium
38 - Chromium
6.1 - Cobalt
52 - Lead
610 - Manganese
1.8 - Mercury
15 - Nickel
42 - Vanadium

13000 - Aluminum
ND - Antimony
7 - Arsenic
170 - Barium
0.82 - Beryllium
0.64 - Cadmium
24000 - Calcium
13 - Chromium
11 - Cobalt
19 - Copper
21000 - Iron
41 - Lead
12000 - Magnesium
830 - Manganese
2.6 - Mercury
15 - Nickel
1000 - Potassium
ND - Selenium
ND - Silver
360 - Sodium
ND - Thallium
23 - Vanadium
62 - Zinc

SSRI-01 NA
SSRI-02 NA
SSRI-03 NA
SSRI-04
SSRI-05 NA
SSRI-06 NA
SSRI-07
SSRI-08 NA
SSRI-09 NA
SSRI-10 NA
SSRI-11
SSRI-12 NA
SSRI-13
SSRI-14 NA
SSRI-15 NA
SSRI-16 NA

SSR-01
SSR-02
SSR-03
SSR-04
SSR-05
SSR-06
SSR-07
SSR-08
SSR-09
SSR-10
SSR-11
SSR-12
SSR-13
SSR-14
SSR-15
SSR-16
SSR-17
SSR-18
SSR-19
SSR-20
SSR-21
SSR-22

SWMU-12-24A NA
SWMU-12-24B
SWMU-12-24C NA
SWMU-12-24D NA
SWMU-12-24E NA
SWMU-12-24F NA
SWMU-12-24G
SWMU-12-24H NA
SWMU-12-24I NA
SWMU-17-6A NA
SWMU-25-6A NA
SWMU-31-6A NA
SWMU-42-6A NA
AOC-A-6A NA

SL-3A NA
SL-3B NA
SL-3C NA
SL-3D NA
SLGM-3A NA
SLGM-3B NA
SLGM-3C NA
SLGM-3D NA

South Landfill
6th St.
Calhoun St.
Jefferson St.
Banor

SCALE
400 0 400 Feet

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps
MAP PROJECTION	**DATUM**
US State Plane	NAD83

LOCATION MAP

N

Anniston

SOLUTIA

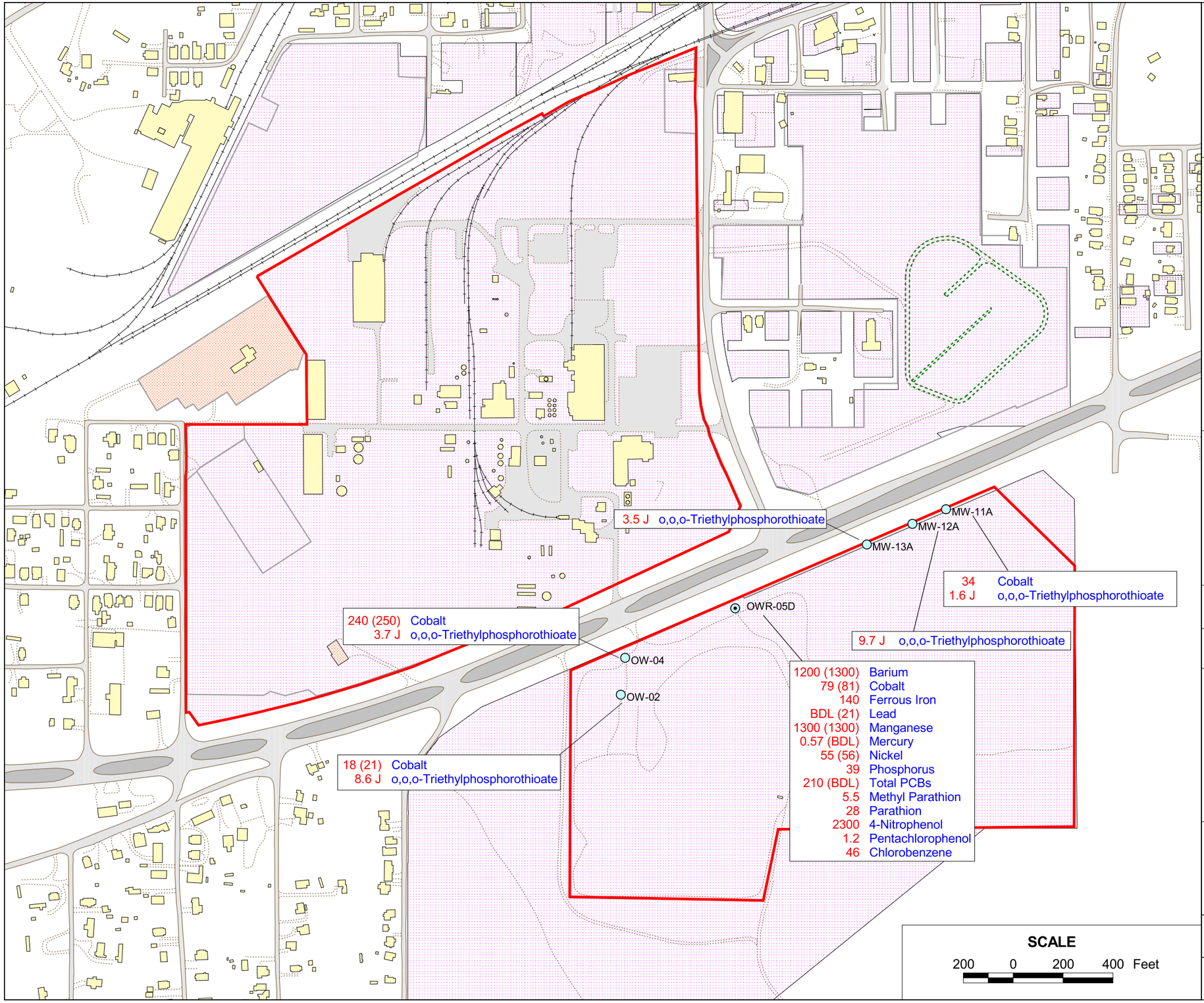
Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J014B Rev. 1	4-2

WMA I and South Landfill Groundwater Chemistry

Remedial Investigation Report
Solutia Inc., Anniston, Alabama



LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Shallow Residuum Monitoring/ Observation Well
- Deep Residuum Monitoring/ Observation Well
- 52 Sample Result
- (54) Filtered Sample Result

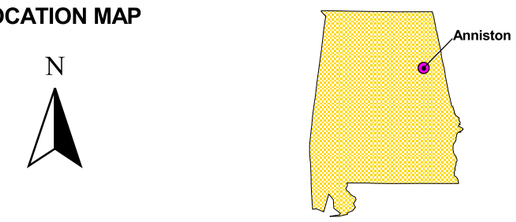
NOTES

1) BDL = Concentration below detection limit.
2) J = Estimated.
3) All concentration results are in µg/l.
4) Only detections are shown. Results are from 2005 RI Program for OWR-05D, but from 2007 RCRA Program for all others.
5) For duplicate sample pairs, only results from the primary sample are shown.

SCALE
200 0 200 400 Feet

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps
MAP PROJECTION	**DATUM**
US State Plane	NAD83

LOCATION MAP

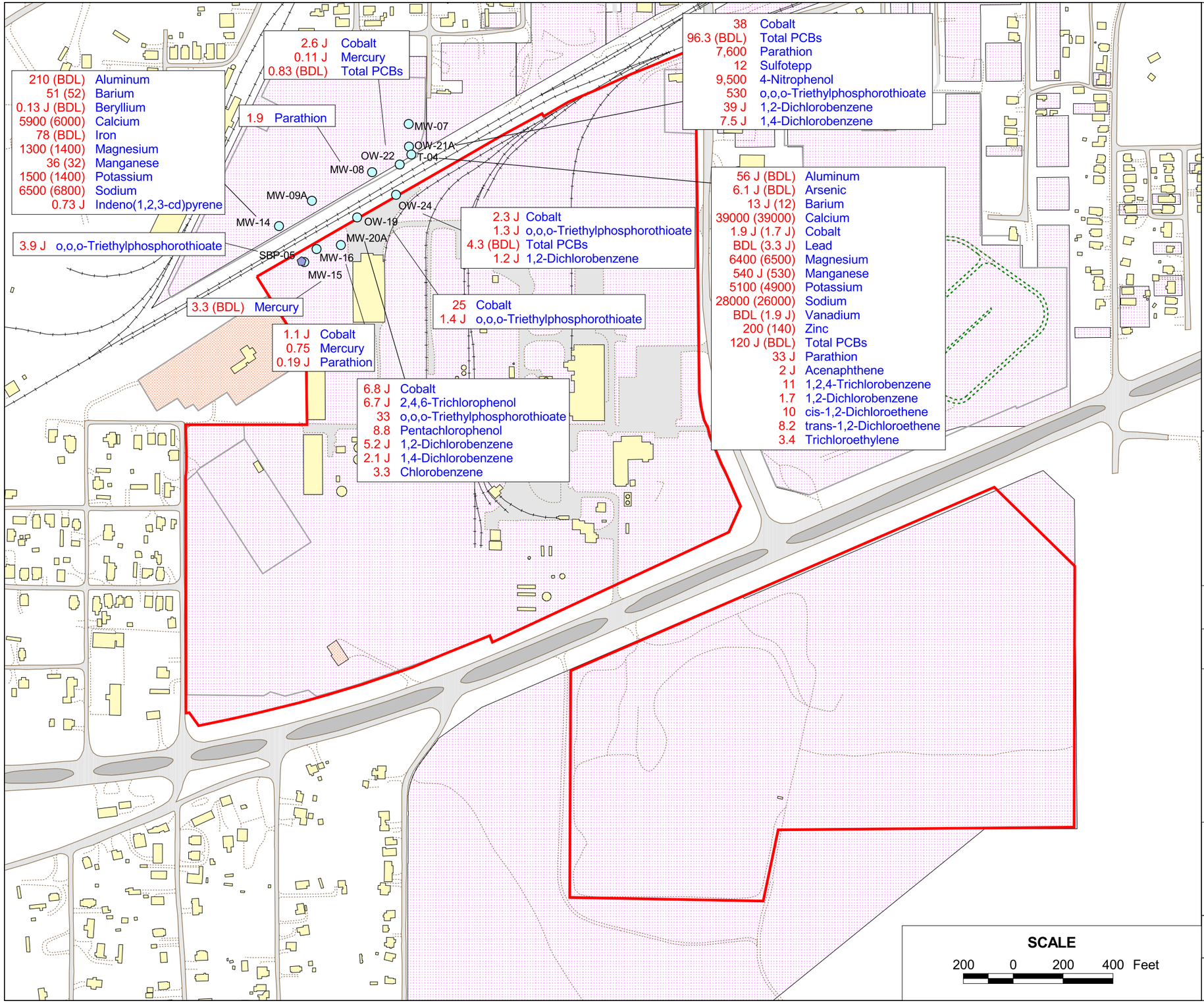


SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J005C Rev. 2	4-3



WMA II & OLBSI Groundwater Chemistry

Remedial Investigation Report
Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Shallow Residuum Monitoring/ Observation Well
- Bedrock Monitoring Well
- 52 Sample Result
- (54) Filtered Sample Result

NOTES

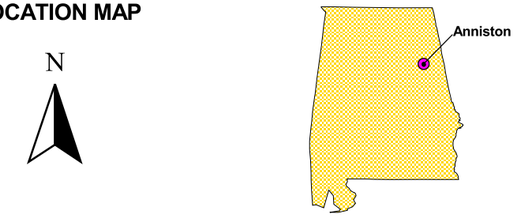
1) BDL = Concentration below detection limit.
2) J = Estimated.
3) All concentration results are in µg/l.
4) Only detections are shown. Results are from 2005 RI or 2007 RCRA Program.
5) For duplicate sample pairs, only results from the primary sample are shown.

SCALE
200 0 200 400 Feet

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP



SOLUTIA

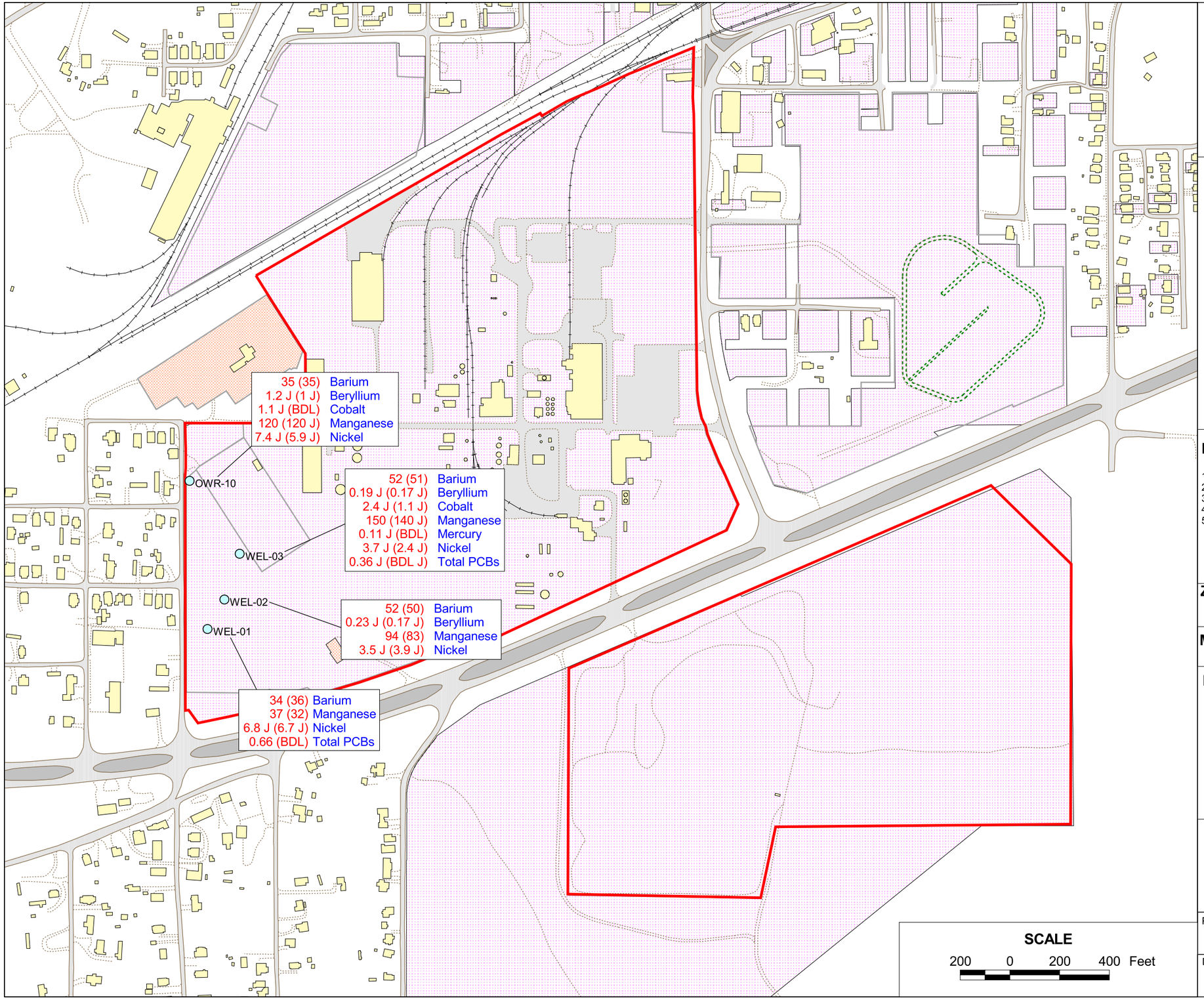
Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J005D Rev. 2	4-4

West End Landfill Groundwater Chemistry

Remedial Investigation Report
Solutia Inc., Anniston, Alabama



LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Shallow Residuum Monitoring/ Observation Well
- 52 Sample Result
- (54) Filtered Sample Result

NOTES

1) BDL = Concentration below detection limit.
2) J = Estimated.
3) All concentration results are in µg/l.
4) Only detections are shown. Results are from 2005 RI or 2007 RCRA Program.
5) For duplicate sample pairs, only results from the primary sample are shown.

SCALE
200 0 200 400 Feet

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

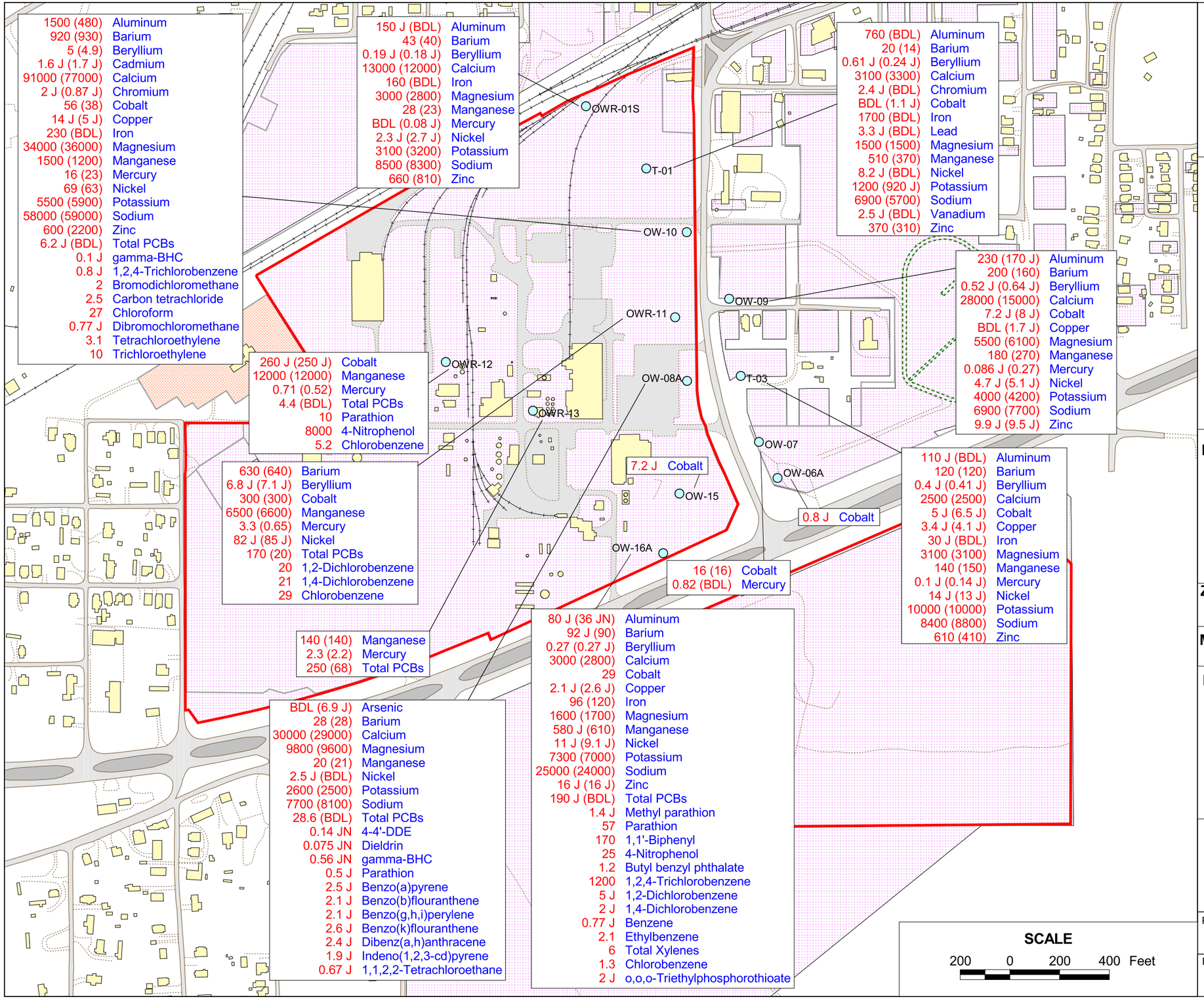
N

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J005E Rev. 2	4-5



Interior & Northeast Perimeter Groundwater Chemistry

Remedial Investigation Report

Solutia Inc., Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Shallow Residuum Monitoring/ Observation Well
- 52 Sample Result
- (54) Filtered Sample Result

NOTES

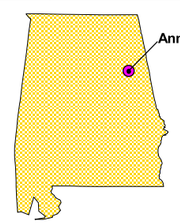
1) BDL = Concentration below detection limit.
2) J = Estimated.
3) All concentration results are in µg/l.
4) Only detections are shown. Results from 2005 RI or 2007 RCRA Program.
5) For duplicate sample pairs, only results from the primary sample are shown.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N



SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J005F Rev. 2	4-6

PCB Concentrations in Groundwater

Remedial Investigation Report

Anniston PCB Site, Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- OU-2 Temporary Monitoring Well
- Bedrock Monitoring Well
- Deep Residuum Monitoring/ Observation Well
- Shallow Residuum Monitoring/ Observation Well

6.2 Aroclor Concentration (ug/L)
Filtered Results Shown
in Parenthesis
NA = Not Analyzed
ND = Not Detected
(As defined in Note 1)

3.5 Aroclor Concentration (ug/L)
Filtered Results Shown
in Parenthesis
NA = Not Analyzed
ND = Not Detected
(2007 RCRA Program)

2.2 Homolog Concentration (ug/L)
Filtered Results Shown
in Parenthesis
NA = Not Analyzed
ND = Not Detected
(As defined in Note 3)

NOTES

1) Sample data collected during the April to July 2005 period, except as follows:

- 1998 RFI - OWR-1D, OWR-2S, OWR-2D, OWR-3S, OWR-4D, OWR-5D, OWR-6D, OWR-8S, OWR-9S, CB-85, and WEL-04
- 2003 Supplemental RFI - OWR-11, OWR-12, and OWR-13.
- 2007 Preliminary SCSR Addendum - T-05 and T-06
- 2008 OU-2 Groundwater Investigation - T-08, T-09, T-10 and T-12

2) Validation codes have not been shown for clarity. Please refer to Table 4-4.

3) Sample data collected as follows:

- 2005 Preliminay SCSR - OW-10, OWR-1S, T-01, T-02, T-03, T-04, MW-14, OW-9, OW-8A and OW-10A
- 2006 Site Characterization Summary Adendum Report - T-05 and T-06
- 2008 OU-1/OU-2 Field Sampling Addendum No. 3 - T-08, T-09, T-10 and T-12

4) If Homologs were detected less than 0.01 ug/kg, then the results was reported as <0.01 mg/kg.

400 0 400 Feet

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps
MAP PROJECTION	**DATUM**
US State Plane	NAD83

LOCATION MAP

N

Anniston

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
02/18/10	943-3680	9433680J017 Rev. 2	4-9

Prevalent Volatile Organic Compounds in Groundwater

Remedial Investigation Report

Anniston PCB Site, Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Deep Residuum Monitoring/ Observation Well
- Shallow Residuum Monitoring/ Observation Well
- NA = Not Analyzed
- ND = Not Detected
- 3.3 / 5.2 / 2.1 — Chlorobenzene / 1,2-Dichlorobenzene / 1,4-Dichlorobenzene

NOTES

1.) The sample data presented represents the most recent data collected and included in the RI Report.

2.) All concentration results are in ug/l.

3.) Validation codes have not been shown for clarity. Please refer to Table 4-4.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J025A	4-14

400 0 400 Feet

Other Prevalent Semi-Volatile Organic Compounds in Groundwater

Remedial Investigation Report

Anniston PCB Site, Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface
- Deep Residuum Monitoring/ Observation Well
- Shallow Residuum Monitoring/ Observation Well
- NA = Not Analyzed
- ND = Not Detected
- 8.8 / 33 / NA — Pentachlorophenol / o,o,o-Triethylphosphorothioate / Benzo(a)pyrene

NOTES

1.) The sample data presented represents the most recent data collected and included in the RI Report.

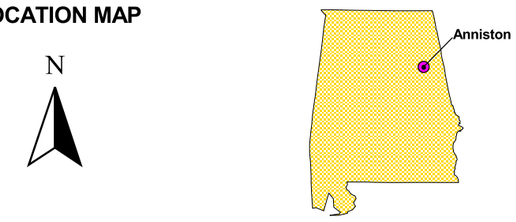
2.) All concentration results are in ug/l.

3.) Validation codes have not been shown for clarity. Please refer to Table 4-4.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP



PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J025B	4-15

400 0 400 Feet

Prevalent Metal Concentrations in Groundwater

Remedial Investigation Report

Anniston PCB Site, Anniston, Alabama

LEGEND

- Major Roads
- Minor Roads
- Drainage Basin
- Railroads
- OU-3 Area
- Buildings
- Alabama Power
- Solutia Inc.
- Paved Surface

- Deep Residuum Monitoring/ Observation Well
- Shallow Residuum Monitoring/ Observation Well

Metal Concentration (ug/L)
Filtered Results Shown
in Parenthesis
NA = Not Analyzed
ND = Not Detected

ND (6.9)	Arsenic
ND (ND)	Cobalt
ND (ND)	Lead
20 (21)	Manganese
ND (ND)	Mercury
2.5 J (ND)	Nickel

NOTES

1.) The sample data presented represents the most recent data collected and included in the RI Report.

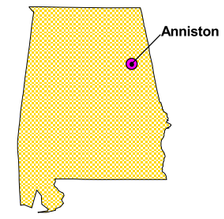
2.) Validation codes have not been shown for clarity. Please refer to Table 4-4.

ZONE	SOURCE
Alabama East 101	Golder Associates (on-site base map) USGS 1:2400 Quad Maps

MAP PROJECTION	DATUM
US State Plane	NAD83

LOCATION MAP

N



400 0 400 Feet

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
MRM	RWP	SJM

DATE:	PROJECT No:	FILE No:	FIGURE NO.
03/20/09	943-3680	9433680J024 Rev 1	4-16

APPENDIX B

Development of Remedial Goal Options

March 2008 RGO Calcs CDM

Parametrix CDM
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES
1218 3RD AVENUE, SUITE 380
SEATTLE, WASHINGTON 98101
T. 206.903.0231 F. 206.382.6989
www.parametrix.com

March 25, 2008

Ms. Pamela J. Langston Scully
Remedial Project Manager
U.S. Environmental Protection Agency
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Project: Contract No. : 68-57-03-04
Task Order No. : 0023

Subject: Development of Remedial Goal Options- Anniston PCB Site, OU 3

Dear Ms. Scully:

CDM FEDERAL PROGRAMS CORPORATION (CDM) is pleased submit the above referenced document for your review. The remedial goal options (RGOs) were calculated based on the results of the Revised Final Human Health Risk Assessment completed for OU3 in January 2008.

CDM is pleased to assist EPA with this assignment, and we look forward to providing further technical assistance on this project. If you have anyquestions concerning the attached, please call me at (404) 720-1324.

Sincerely yours,

CDM Federal Programs Corporation

Tony Isolda
Project Manager

Attachment

cc: Meredith Clark, EPA Project Officer (letter only)
Jim LaVelle, CDM (1 copy)
Project File (Atlanta) (1 copy)

Development of Remedial Goal Options for Anniston PCB Site, Operable Unit 3

A Human Health Risk Assessment was completed for Operable Unit 3 (Facility Area) of the Anniston PCB Site (CDM 2008). Estimates of possible exposure were combined with toxicity criteria to provide estimates on cancer risk and noncancer hazards for various human populations. Estimates for cancer risks and non-cancer hazards for future operations area workers exceed EPA's thresholds, often by orders of magnitude, based on default EPA exposure assumptions. Even with the use of site-specific information based on current site conditions and use, risks and hazards remain elevated in the Facility Area for current/future trespassers, operations area workers, operations and maintenance (O&M) workers and construction workers.

Remedial goal options (RGOs) provide remedial design staff with long-term targets to use during analysis and selection of remedial alternatives. Ideally, such goals, if achieved, should both comply with applicable or relevant and appropriate requirements (ARARs) and result in residual risks that fully satisfy the NCP (EPA 1990) requirements for the protection of human health and the environment. RGOs are guidelines and do not establish that cleanup to meet these goals is warranted.

RGOs were calculated for COCs only. COCs are defined as those contaminants that (1) have individual excess lifetime cancer risk levels of 1×10^{-6} (or greater) or an HQ of 0.1 (or greater) in an exposure scenario that exceeds an excess cancer risk level of 1×10^{-4} or an HI of 1; and/or (2) exceed a state or federal ARAR.

USEPA Region 4 provides two methods to calculate RGOs. The first method is to combine the intake levels of each COC and rearrange the risk equations to solve for the concentration term (RGO). The second method is a simplified method based on site specific exposure data and was employed for this site. For each selected COC, a ratio is calculated between the target risk and the calculated risk. This ratio provides the multiplier for the Exposure Point Concentration (EPC), and the product is the RGO.

Hence, the proportion is:

EPC[chemical i]/Calculated Risk[chemical i] = RGO[chemical i]/Target Risk

RGO's can be interpreted as exposure point concentrations that would be protective for a given exposure scenario (e.g. future operations area worker). Exposure point concentrations are calculated for exposure units - areas within which receptors may

contact contaminated media more or less randomly. The size of exposure units varies based on how people use the site and are exposed to COCs in soil and other media. Thus, RGO's are appropriately used in conjunction with considerations of current and/or future land use and receptor behavior. RGOs, calculated separately for cancer and non-cancer effects, correspond to incremental cancer risk levels of 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} and HQs of 0.1, 1, and 3.

Tables 1 through 7present the RGOs for surface soil based on current/future operations workers, current/future O&M workers, current/future trespassers and current/future construction workers. Tables 8 through 11 present RGOs and potential ARARs for groundwater based on future use as tap water for residents, operations workers and O&M workers. ARARs for groundwater are the Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards.

Table 1
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Current Operations Area Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
SVOCs							
Benzo(a)pyrene	1.9	0.4	4	36	NA	NA	NA
Dibenzo(a,h)anthracene	0.62	0.4	4	36	NA	NA	NA
P/PCBs							
PCBs, Total	370	3	26	264	5	47	142
Dioxin							
Dioxin TEQ	8.E-04	3.E-05	3.E-04	3.E-03	NA	NA	NA
Inorganics							
Arsenic	390	7	66	661	105	1054	3162

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using current operations worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using current operations worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 2
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Future Operations Area Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
SVOCs							
Benzo(a)pyrene	1.9	0.2	2	21	NA	NA	NA
Dibenzo(a,h)anthracene	0.62	0.2	2	21	NA	NA	NA
P/PCBs							
PCBs, Total	6100	1	10	103	1	15	45
Dioxin							
Dioxin TEQ	8.E-04	2.E-05	2.E-04	2.E-03	NA	NA	NA
Inorganics							
Arsenic	390	2	16	163	26	260	780

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using future operations worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using future operations worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 3
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Current O&M Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
SVOCs							
Benzo(a)pyrene	1.9	0.8	8	83	NA	NA	NA
P/PCBs							
PCBs, Total	370	5	53	529	8	76	227
Dioxin							
Dioxin TEQ	8.E-04	1.E-04	1.E-03	1.E-02	NA	NA	NA
Inorganics							
Arsenic	390	11	105	1054	170	1696	5087

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using current O&M worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using current O&M worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 4
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Future O&M Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
SVOCs							
Benzo(a)pyrene	1.9	0.8	8	83	NA	NA	NA
P/PCBs							
PCBs, Total	6100	6	55	555	77	772	2316
Dioxin							
Dioxin TEQ	8.E-04	1.E-04	1.E-03	1.E-02	NA	NA	NA
Inorganics							
Arsenic	390	11	105	1054	170	1696	5087

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using future O&M worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using future O&M worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 5
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Current Trespasser - Adolescent (7-16 years)
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
P/PCBs							
PCBs, Total	370	NA	NA	NA	5	49	146
Inorganics							
Arsenic	390	NA	NA	NA	85	848	2543

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal was not calculated as cumulative excess lifetime cancer risk for current trespasser was less than 1E-4.
4. Remediation goal based on contact with soil using current adolescent trespasser exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the cumulative ELCR for exposure to surface soil was less than 1E-04, RGOs are not required.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 6
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Future Trespasser - Adolescent (7-16 years)
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
P/PCBs							
PCBs, Total	6100	9	87	871	5	51	153
Dioxin							
Dioxin TEQ	8.E-04	1.E-04	1.E-03	1.E-02	NA	NA	NA
Inorganics							
Arsenic	390	13	130	1300	85	848	2543

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using future adolescent trespasser exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using future adolescent trespasser exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 7
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Current/Future Construction Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level [3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
P/PCBs							
PCBs, Total	3300	24	236	2357	1	13	40
Dioxin							
Dioxin TEQ	8.E-04	3.E-04	3.E-03	3.E-02	NA	NA	NA
Inorganics							
Arsenic	150	33	333	3333	22	217	652

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using adult construction worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using adult construction worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemical was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

Table 8
Risk-Based Remedial Goal Options and ARARs for Groundwater [1]
Future Offsite Resident - Child to Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (ug/L)	Cancer Risk Level [3] (ug/L)			Hazard Quotient Level[4] (ug/L)			ARAR[5]	(ug/L)
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3		
VOCs									
1,4-Dichlorobenzene	2.4	1.3	13	126	NA_c	NA_c	NA_c	75	MCL
Pentachlorophenol	20	0.1	1	14	15	154	462	1	MCL
Trichloroethylene	3.4	0.1	1	8	0.4	4	13	5	MCL
SVOCs									
2,4,6-Trichlorophenol	15	3.0	30	300	0.1	1	3	- - -	
Indeno(1,2,3-cd)pyrene	0.73	0.01	0.1	1	NA_c	NA_c	NA_c	- - -	
P/PCBs									
PCBs, Total	2400	0.01	0.06	0.6	8.E-03	8.E-02	2.E-01	0.5	MCL
Methyl parathion	74	NA_{nc}	NA_{nc}	NA_{nc}	0.4	4	12	- - -	
Parathion	9400	NA_{nc}	NA_{nc}	NA_{nc}	9	94	282	- - -	
Dioxin									
Dioxin TEQ	4.E-06	4.E-07	4.E-06	4.E-05	NA_c	NA_c	NA_c	0.00003	MCL
Inorganics									
Arsenic	6.1	0.04	0.4	4	0.5	5	14	10	MCL

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in groundwater.
3. Remediation goal based on ingestion of groundwater using future child to adult residential exposure assumptions and cancer slope factors.
4. Remediation goal based on ingestion of groundwater using future child to adult residential exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards, ADEM Admin. Code r. 335-7-2 available at: http://www.adem.state.al.us/regulations/div7/div712208.pdf

Acronyms:

HQ: Hazard quotient

NA_c: Not applicable - the chemical was evaluated as a carcinogen only.

NA_{nc}: Not applicable - the chemical was evaluated as a noncarcinogen only.

MCL: Maximum Contaminant Level

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

- - - : Drinking Water standard not available

Table 9
Risk-Based Remedial Goal Options and ARARs for Groundwater [1]
Future Offsite Resident - Child (0-6 Years)
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (ug/L)	Cancer Risk Level [3] (ug/L)			Hazard Quotient Level[4] (ug/L)			ARAR[5]	(ug/L)
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3		
VOCs									
1,2,4-Trichlorbenzene	11	NA_{nc}	NA_{nc}	NA_{nc}	0.2	2	5	70	MCL
1,4-Dichlorobenzene	2.4	0.7	7	73	NA_c	NA_c	NA_c	75	MCL
Pentachlorophenol	20	0.1	1	13	4	41	122	1	MCL
Trichloroethylene	3.4	0.04	0.4	4	0.3	3	10	5	MCL
SVOCs									
2,4,6-Trichlorophenol	15	1.8	18	176	0.02	0.2	0.5	- - -	
Indeno(1,2,3-cd)pyrene	0.73	0.02	0.2	2	NA_c	NA_c	NA_c	- - -	
P/PCBs									
PCBs, Total	2400	0.02	0.2	2	0.01	0.05	0.2	0.5	MCL
gamma-BHC	0.55	0.01	0.1	1	0.05	0.5	1	0.2	MCL
Methyl parathion	74	NA_{nc}	NA_{nc}	NA_{nc}	0.4	4	12	- - -	
Parathion	9400	NA_{nc}	NA_{nc}	NA_{nc}	9	85	256	- - -	
Dioxin									
Dioxin TEQ	4.E-06	1.E-06	1.E-05	1.E-04	NA_c	NA_c	NA_c	0.00003	MCL
Inorganics									
Arsenic	6.1	0.1	1	12	0.5	5	14	10	MCL
Mercury	1.8	NA_{nc}	NA_{nc}	NA_{nc}	0.02	0.2	0.5	2	MCL

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in groundwater.
3. Remediation goal based on ingestion of groundwater using future child resident exposure assumptions and cancer slope factors.
4. Remediation goal based on ingestion of groundwater using future child resident exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards, ADEM Admin. Code r. 335-7-2 available at: http://www.adem.state.al.us/regulations/div7/div712208.pdf

Acronyms:

HQ: Hazard quotient

NA_c: Not applicable - the chemical was evaluated as a carcinogen only.

NA_{nc}: Not applicable - the chemical was evaluated as a noncarcinogen only.

MCL: Maximum Contaminant Level

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

- - - : Drinking Water standard not available

Table 10
Risk-Based Remedial Goal Options and ARARs for Groundwater [1]
Future Operations Area Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (ug/L)	Cancer Risk Level [3] (ug/L)			Hazard Quotient Level[4] (ug/L)			ARAR[5]	(ug/L)
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3		
VOCs									
Pentachlorophenol	20	2.4	24	241	NA_c	NA_c	NA_c	1	MCL
Trichloroethylene	3.4	0.7	7	71	NA_c	NA_c	NA_c	5	MCL
SVOCs									
2,4,6-Trichlorophenol	15	NA_{nc}	NA_{nc}	NA_{nc}	1	10	30	- - -	
Indeno(1,2,3-cd)pyrene	0.73	0.4	4	38	NA_c	NA_c	NA_c	- - -	
P/PCBs									
PCBs, Total	2400	0.1	1	14	0.2	2	6	0.5	MCL
Methyl parathion	74	NA_{nc}	NA_{nc}	NA_{nc}	3	26	77	- - -	
Parathion	9400	NA_{nc}	NA_{nc}	NA_{nc}	63	627	1880	- - -	
Dioxin									
Dioxin TEQ	4.E-06	2.E-06	2.E-05	2.E-04	NA_c	NA_c	NA_c	0.00003	MCL
Inorganics									
Arsenic	6.1	0.2	2	19	3	31	92	10	MCL

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in groundwater.
3. Remediation goal based on ingestion of groundwater using future adult operations worker exposure assumptions and cancer slope factors.
4. Remediation goal based on ingestion of groundwater using future adult operations worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards, ADEM Admin. Code r. 335-7-2 available at: http://www.adem.state.al.us/regulations/div7/div712208.pdf

Acronyms:

HQ: Hazard quotient

NA_c: Not applicable - the chemical was evaluated as a carcinogen only.

NA_{nc}: Not applicable - the chemical was evaluated as a noncarcinogen only.

MCL: Maximum Contaminant Level

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

- - - : Drinking Water standard not available

Table 11
Risk-Based Remedial Goal Options and ARARs for Groundwater [1]
Future O&M Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (ug/L)	Cancer Risk Level [3] (ug/L)			Hazard Quotient Level[4] (ug/L)			ARAR[5] (ug/L)	
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3		
P/PCBs									
PCBs, Total	2400	2	15	150	2	22	65	0.5	MCL
Parathion	9400	NA_{nc}	NA_{nc}	NA_{nc}	627	6267	18800	- - -	
Inorganics									
Arsenic	6.1	2	20	197	NA_c	NA_c	NA_c	10	MCL

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in groundwater.
3. Remediation goal based on ingestion of groundwater using future adult O&M worker exposure assumptions and cancer slope factors.
4. Remediation goal based on ingestion of groundwater using future adult O&M worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards, ADEM Admin. Code r. 335-7-2 available at: http://www.adem.state.al.us/regulations/div7/div712208.pdf

Acronyms:

HQ: Hazard quotient

NA_c: Not applicable - the chemical was evaluated as a carcinogen only.

NA_{nc}: Not applicable - the chemical was evaluated as a noncarcinogen only.

MCL: Maximum Contaminant Level

- - - : Drinking Water standard not available

September 2009 RGO Addendum Memo

A-4 Addendum to RGOs

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September 3, 2009

Ms. Pamela J. Langston Scully
Remedial Project Manager
U.S. Environmental Protection Agency
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Project: Contract No. : 68-57-03-04
Task Order No. : 0023

Subject: Addendum to Remedial Goal Options for Anniston PCB Site, OU 3

Dear Ms. Scully:

CDM FEDERAL PROGRAMS CORPORATION (CDM) is pleased submit the above referenced document for your review. Per your request on August 21, 2009, remedial goal options (RGOs) have been calculated for 4-Nitrophneol and Sulfotepp. In addition, the RGO has been re-calculated for 2,4,6-trichlorophenol based on a new RfD recommended for 2,4,6-trichlorophenol.

CDM is pleased to assist EPA with this assignment, and we look forward to providing further technical assistance on this project. If you have any questions concerning the attached, please call me at (678) 852-6174 or (404)720-1400.

Sincerely yours,

CDM Federal Programs Corporation

Tony Isolda
Project Manager

Attachment

cc: Jim LaVelle, CDM (1 copy)
Project File (Atlanta) (1 copy)

Technical Memorandum
Remedial Goal Option Addendum
For the Anniston OU-3 Human Health Risk Assessment
September 3, 2009

This Remedial Goal Option (RGO) addendum memorandum for the Anniston OU-3 Human Health Risk Assessment (HHRA) presents groundwater RGOs for three chemicals: 2,4,6-trichlorophenol, 4-nitrophenol, and sulfotepp (tetraethyldithiopyrophosphate). The RGOs are presented in the revised Table 9 included in Attachment 1. Calculations that support the new RGOs are provided in spreadsheets in Attachment 1. The RGOs for 2,4,6-trichlorophenol are revised values based on an updated oral reference dose (RfD) toxicity value. The RGOs for 4-nitrophenol and sulfotepp are new values since these chemicals are listed in the RCRA permit and are detected in relatively high concentrations in OU-3 groundwater.

RGOs were calculated following guidance provided by USEPA Region 4 in the 2000 *Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins*. For each chemical, RGOs were developed by deriving a ratio between the target risk and the calculated risk. This ratio provided the multiplier for the exposure point concentration (EPC) in groundwater and the product is the RGO. The proportion is as follows:

EPC[chemical i]/Calculated Risk[chemical i] = RGO [chemical i]/Target Risk

In general, RGOs are calculated separately for cancer and noncancer effects, corresponding to incremental cancer risk levels of $1x10^{-4}$, $1x10^{-5}$, and $1x10^{-6}$ and hazard quotients (HIs) of 0.1, 1 and 3. For this assessment, each RGO was based on noncancer effects based on available toxicity information. The oral RfD employed in this assessment for 2,4,6-trichlorophenol is the value currently recommended by Provisional Peer Reviewed Toxicity Value (PPRTV) derived by EPA's Superfund Health Risk Technical Support Center (STSC) and replaces the old Health Effects Assessment Summary Table (HEAST) value used in the original risk assessment. Oral RfDs for 4-nitrophenol and sulfotepp are values currently available through National Center for Environmental Assessment (NCEA) and Integrated Risk Information System ((IRIS), respectively. Support documentation for PPRTVs for 2,4,6-trichlorophenol and 4-nitrophenol are provided in Attachment 2.

Calculated risks used to derive each RGO were based on a young child (0-6 years) under the residential exposure scenario that was used in the original HHRA. This exposure scenario assumed that children could be exposed to chemicals detected in groundwater through ingestion of tapwater and dermal contact while bathing. Non-cancer hazards are higher for young children because these hazards are estimated based on dose rate expressed as mg/kg-d.

Lower body weights for young children result in higher estimates for dose rate. Thus, protection of young children in a residential setting will also protect other age groups.

For the ingestion and dermal pathways, exposure is assumed to occur for 350 days per year for six years. The ingestion rate for tapwater was assumed to be 1 liter/day, and the exposed skin surface area was assumed to be 6,600 cm2 for total immersion during bathing. Child body weight was assumed to be 15 kg. It should be noted that exposure resulting from inhalation of chemicals while bathing was not evaluated for these compounds because noncancer inhalation reference concentration (RfC) toxicity values are not available. None of the above chemicals are highly volatile however and lack of consideration of inhalation exposure is not expected to result in significant underestimation of exposure and HI. Henry's law constants for 2,4,6-trichlorophenol, 4-nitrophenol and sulfotepp are 2.6E-06, 4,15E-10, and 4.45E-06 atm-m^3/mole at 25°C, respectively (ChemID 2009). Typically, chemicals are classified as volatile only if Henry's law constants are above 1E-05 atm-m^3/mole (EPA 2004).

Groundwater exposure point concentrations were calculated using data from seven well locations (MW-09A, MW-14, MW-15, MW-16, MW-20A, OW-21A, and T4) that were analyzed for 2,4,6-trichlorophenol, 4-nitrophenol, and sulfotepp at least once. ProUCL (EPA 2007) was used to calculate these EPCs. Table A-3 in the OU-3 HHRA lists well locations and specific samples used in these calculation. Note that the groundwater sample from MW-07 was not analyzed for the three compounds of interest. Data collected from sampling rounds in 2003 through 2005 were employed in the evaluation.

REFERENCES:

ChemID (2009) Physical Properties.
http://chem.sis.nlm.nih.gov/chemidplus/jsp/common/PhysicalProperties.jsp?calledFrom=lite
http://chem.sis.nlm.nih.gov/chemidplus/jsp/common/PhysicalProperties.jsp?calledFrom=lite
http://chem.sis.nlm.nih.gov/chemidplus/jsp/common/PhysicalProperties.jsp?calledFrom=lite

EPA (2004) User'a Guide for Evaluating Subsurface Vapor Intrustion into Buildings.
http://www.epa.gov/oswer/riskassessment/airmodel/pdf/2004_0222_3phase_users_guide.pdf

EPA (2007) ProUCL Version 4.00.04. http://www.epa.gov/nerlesd1/tsc/TSC_form.htm

EPA (2009) Intergrated Risk Information System. http://www.epa.gov/ncea/iris/index.html

Attachment 1

ProUCL output

Cancer Risk and HI calculations for child resident exposure to groundwater

Updated RGO Table

	General UCL Statistics for Data Sets with Non-Detects	
User Selected Options		
From File	C:\Documents and Settings\lamiepo\My Documents\My Documents\Anniston Ala\OU_3\OU3_GW_proucl.wst	
Full Precision	OFF	
Confidence Coefficient	95%	
Number of Bootstrap Operations	2000	

2,4,6-Trichlorophenol

General Statistics

Number of Valid Data	25	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	20
		Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	9.4	Minimum Detected	2.241
Maximum Detected	17	Maximum Detected	2.833
Mean of Detected	13.68	Mean of Detected	2.597
SD of Detected	2.813	SD of Detected	0.222
Minimum Non-Detect	9.7	Minimum Non-Detect	2.272
Maximum Non-Detect	5000	Maximum Non-Detect	8.517
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	25
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

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 to draw conclusions

It is recommended to have 10-15 or mora 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	0.968	Shapiro Wilk Test Statistic	0.927
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	188	Mean	2.646
SD	537	SD	1.917
95% DL/2 (t) UCL	371.7	95% H-Stat (DL/2) UCL	385.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.304
		SD in Log Scale	0.223
		Mean in Original Scale	10.27
		SD in Original Scale	2.428
		95% Percentile Bootstrap UCL	11.96

	A	B	C	D	E	F	G	H	I	J	K	L
105	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.											
106												
107												
108	UCL Statistics											
109	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
110	Shapiro Wilk Test Statistic				0.982		Shapiro Wilk Test Statistic					0.688
111	5% Shapiro Wilk Critical Value				0.762		5% Shapiro Wilk Critical Value					0.762
112	Data appear Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
113												
114	Assuming Normal Distribution						Assuming Lognormal Distribution					
115	DL/2 Substitution Method						DL/2 Substitution Method					
116	Mean				3186		Mean					4.349
117	SD				7830		SD					2.474
118	95% DL/2 (t) UCL				5865		95% H-Stat (DL/2) UCL					9940
119												
120	Maximum Likelihood Estimate(MLE) Method				N/A		Log ROS Method					
121	MLE yields a negative mean						Mean in Log Scale					2.745
122							SD in Log Scale					4.136
123							Mean in Original Scale					3196
124							SD in Original Scale					7826
125							95% Percentile Bootstrap UCL					5946
126							95% BCA Bootstrap UCL					6896
127												
128	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
129	k star (bias corrected)				0.43		Data appear Normal at 5% Significance Level					
130	Theta Star				36802							
131	nu star				4.301							
132												
133	A-D Test Statistic				0.741		Nonparametric Statistics					
134	5% A-D Critical Value				0.699		Kaplan-Meier (KM) Method					
135	K-S Test Statistic				0.699		Mean					3278
136	5% K-S Critical Value				0.367		SD					7634
137	Data not Gamma Distributed at 5% Significance Level						SE of Mean					1707
138							95% KM (t) UCL					6198
139	Assuming Gamma Distribution						95% KM (z) UCL					6085
140	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL					11012
141	Minimum				1E-09		95% KM (bootstrap t) UCL					5408
142	Maximum				30000		95% KM (BCA) UCL					20000
143	Mean				10164		95% KM (Percentile Bootstrap) UCL					17440
144	Median				8954		95% KM (Chebyshev) UCL					10718
145	SD				9448		97.5% KM (Chebyshev) UCL					13938
146	k star				0.103		99% KM (Chebyshev) UCL					20262
147	Theta star				98763							
148	Nu star				5.146		Potential UCLs to Use					
149	AppChi2				1.22		95% KM (t) UCL					6198
150	95% Gamma Approximate UCL				42867		95% KM (Percentile Bootstrap) UCL					17440
151	95% Adjusted Gamma UCL				47690							
152	Note: DL/2 is not a recommended method.											
153												
154												
155	Chlorobenzene											
156												

209				5% K-S Critical Value	0.333					SD	1.833
210	Data not Gamma Distributed at 5% Significance Level									SE of Mean	0.438
211										95% KM (t) UCL	4.735
212	Assuming Gamma Distribution									95% KM (z) UCL	4.706
213	Gamma ROS Statistics using Extrapolated Data									95% KM (jackknife) UCL	4.61
214				Minimum	2.083					95% KM (bootstrap t) UCL	6.569
215				Maximum	13.59					95% KM (BCA) UCL	5.486
216				Mean	8.536					95% KM (Percentile Bootstrap) UCL	5.068
217				Median	9.174					95% KM (Chebyshev) UCL	5.895
218				SD	3.694					97.5% KM (Chebyshev) UCL	6.721
219				k star	3.937					99% KM (Chebyshev) UCL	8.344
220				Theta star	2.168						
221				Nu star	196.8					Potential UCLs to Use	
222				AppChi2	165.4					95% KM (t) UCL	4.735
223				95% Gamma Approximate UCL	10.16					95% KM (% Bootstrap) UCL	5.068
224				95% Adjusted Gamma UCL	10.28						
225	Note: DL/2 is not a recommended method.										
226											
227											
228	Sulfotepp										
229											
230	General Statistics										
231				Number of Valid Data	25					Number of Detected Data	4
232				Number of Distinct Detected Data	4					Number of Non-Detect Data	21
233										Percent Non-Detects	84.00%
234											
235	Raw Statistics									Log-transformed Statistics	
236				Minimum Detected	9.3					Minimum Detected	2.23
237				Maximum Detected	150					Maximum Detected	5.011
238				Mean of Detected	60.58					Mean of Detected	3.624
239				SD of Detected	63.16					SD of Detected	1.193
240				Minimum Non-Detect	0.33					Minimum Non-Detect	-1.109
241				Maximum Non-Detect	500					Maximum Non-Detect	6.215
242											
243	Note: Data have multiple DLs - Use of KM Method is recommended										
244	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Non-Detect	25
245	Observations < Largest ND are treated as NDs									Number treated as Detected	0
246										Single DL Non-Detect Percentage	100.00%
247	Warning: There are only 4 Distinct Detected Values in this data										
248	Note: It should be noted that even though bootstrap may be performed on this data set										
249	the resulting calculations may not be reliable enough to draw conclusions										
250											
251	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.										
252											
253											
254	UCL Statistics										
255	Normal Distribution Test with Detected Values Only									Lognormal Distribution Test with Detected Values Only	
256				Shapiro Wilk Test Statistic	0.879					Shapiro Wilk Test Statistic	0.995
257				5% Shapiro Wilk Critical Value	0.748					5% Shapiro Wilk Critical Value	0.748
258	Data appear Normal at 5% Significance Level									Data appear Lognormal at 5% Significance Level	
259											
260	Assuming Normal Distribution									Assuming Lognormal Distribution	

TABLE B-7.15
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe:	Future
Receptor Population:	Off-site Residents
Receptor Age	Child (0-6 yrs)

Cancer Intake Factors

GROUNDWATER

Ingestion:	5.5E-06
Dermal:	3.6E-05
Inhalation Vapor in Bath:	5.5E-06
Inhalation Ambient Air:	4.1E-06

Noncancer Intake Factors

GROUNDWATER

Ingestion:	6.4E-05
Dermal:	4.2E-04
Inhalation Vapor in Bath:	6.4E-05
Inhalation Ambient Air:	4.8E-07

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	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Ingestion	**SVOCs**												
				2,4,6-Trichlorophenol	14.32	ug/L	7.8E-05	mg/kg/day	1.10E-02	$(mg/kg/day)^{-1}$	8.6E-07	9.2E-04	mg/kg/day	1.0E-03	mg/kg/day	9.2E-01
				4-Nitrophenol	17,440	ug/L	9.6E-02	mg/kg/day	NA	NA	NA	1.1E+00	mg/kg/day	8.0E-03	mg/kg/day	1.4E+02
				P/PCBS												
				Sulfotepp	67.27	ug/L	3.7E-04	mg/kg/day	NA	NA	NA	4.3E-03	mg/kg/day	5.0E-04	mg/kg/day	8.6E+00
			Exp. Route Total								8.6E-07					1.5E+02
Groundwater	Groundwater	Tap Water	Dermal Contact	**SVOCs**												
				2,4,6-Trichlorophenol	14.32	ug/L	1.8E-05	mg/kg/day	1.10E-02	$(mg/kg/day)^{-1}$	2.0E-07	2.1E-04	mg/kg/day	1.0E-03	mg/kg/day	2.1E-01
				4-Nitrophenol	17,440	ug/L	3.0E-03	mg/kg/day	NA	NA	NA	3.5E-02	mg/kg/day	8.0E-03	mg/kg/day	4.4E+00
				P/PCBS												
				Sulfotepp	67.27	ug/L	3.4E-05	mg/kg/day	NA	NA	NA	4.0E-04	mg/kg/day	5.0E-04	mg/kg/day	7.9E-01
			Exp. Route Total								2.0E-07					5.4E+00
Groundwater	Air	Vapors in Bath	Inhalation	**SVOCs**												
				2,4,6-Trichlorophenol	119	ug/m^3	6.5E-04	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	7.1E-06	7.6E-03	mg/kg/day	NA	NA	NA
				4-Nitrophenol	144,452	ug/m^3	7.9E-01	mg/kg/day	NA	NA	NA	9.2E+00	mg/kg/day	NA	NA	NA
				P/PCBS												
				Sulfotepp	557	ug/m^3	3.1E-03	mg/kg/day	NA	NA	NA	3.6E-02	mg/kg/day	NA	mg/kg/day	NA
			Exp. Route Total								7.1E-06					0.0E+00
		Exposure Point Total									8.2E-06					1.5E+02

Table 9
Risk-Based Remedial Goal Options and ARARs for Groundwater [1]
Future Offsite Resident - Child (0-6 Years)
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (ug/L)	Cancer Risk Level[3] (ug/L)			Hazard Quotient Level[4] (ug/L)			ARAR[5]	(ug/L)
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3		
VOCs									
1,2,4-Trichlorbenzene	11	NA_{nc}	NA_{nc}	NA_{nc}	0.2	2	5	70	MCL
1,4-Dichlorobenzene	2.4	0.7	7	73	NA_c	NA_c	NA_c	75	MCL
Pentachlorophenol	20	0.1	1	13	4	41	122	1	MCL
Trichloroethylene	3.4	0.04	0.4	4	0.3	3	10	5	MCL
SVOCs									
2,4,6-Trichlorophenol	14	1.8	18	176	1.3	13	39	- - -	
4-Nitrophenol	17,440	NA_{nc}	NA_{nc}	NA_{nc}	12	125	374	- - -	
Indeno(1,2,3-cd)pyrene	0.73	0.02	0.2	2	NA_c	NA_c	NA_c	- - -	
P/PCBs									
PCBs, Total	2,400	0.02	0.2	2	0.01	0.05	0.2	0.5	MCL
gamma-BHC	0.55	0.01	0.1	1	0.05	0.5	1	0.2	MCL
Methyl parathion	74	NA_{nc}	NA_{nc}	NA_{nc}	0.4	4	12	- - -	
Parathion	9,400	NA_{nc}	NA_{nc}	NA_{nc}	9	85	256	- - -	
Sulfotepp	67	NA_{nc}	NA_{nc}	NA_{nc}	0.7	7	21	- - -	
Dioxin									
Dioxin TEQ	4.E-06	1.E-06	1.E-05	1.E-04	NA_c	NA_c	NA_c	0.00003	MCL
Inorganics									
Arsenic	6.1	0.1	1	12	0.5	5	14	10	MCL
Mercury	1.6	NA_{nc}	NA_{nc}	NA_{nc}	0.02	0.2	0.5	2	MCL

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in groundwater.
3. Remediation goal based on ingestion of groundwater using future child resident exposure assumptions and cancer slope factors.
4. Remediation goal based on ingestion of groundwater using future child resident exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. Alabama Department of Environmental Management (ADEM) Primary Drinking Water Standards, ADEM Admin. Code r. 335-7-2 available at: http://www.adem.state.al.us/regulations/div7/div712206.pdf

Acronyms:

HQ: Hazard quotient

NA_c: Not applicable - the chemical was evaluated as a carcinogen only.

NA_{nc}: Not applicable - the chemical was evaluated as a noncarcinogen only.

MCL: Maximum Contaminant Level

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

- - - : Drinking Water standard not available

Attachment 2

Support documents for PPRTVs
for 2,4,6-trichlorophenol and 4-nitrophenol

Superfund Technical Support Center

National Center for Environmental Assessment
U.S. Environmental Protection Agency
26 West Martin Luther King Drive, MS-AG41
Cincinnati, Ohio 45268

Jon Reid/Director, Teresa Shannon/Administrator
Hotline 513-569-7300, FAX 513-569-7159, E-Mail: Superfund_STSC@epa.gov

August 25, 2009

Christine Julias
CDM
Accepted Requestor

ASSISTANCE REQUESTED: PPRTVs for p-Nitrophenol and 2,4,6-Trichlorophenol

ENCLOSED INFORMATION:

Attachment 1: **Provisional Peer Reviewed Toxicity Values for p-Nitrophenol (CASRN 100-02-7) Derivation of a Chronic Oral RfD**

Attachment 2: **Provisional Peer Reviewed Toxicity Values for p-Nitrophenol (CASRN 100-02-7) Derivation of a Chronic Inhalation RfC**

Attachment 3: **Provisional Peer Reviewed Toxicity Values for p-Nitrophenol (CASRN 100-02-7) Derivation of a Carcinogenicity Assessment**

Attachment 4: **Provisional Peer Reviewed Toxicity Values for 2,4,6-Trichlorophenol (CASRN 88-06-2)**

BE ADVISED: *Unless specifically indicated to have been peer reviewed, it is to be noted that the attached Provisional Toxicity Value Paper(s) have not been through the U.S. EPA's formal review process; therefore, they do not represent a U.S. EPA verified assessment.*

If you have any questions regarding this transmission, please contact the STSC at (513) 569-7300.

Attachments (1)

cc: STSC files

Supported by ECFlex, Incorporated, under
U.S. Environmental Protection Agency Contract No. EP-C-06-088.

09-25-02

Provisional Peer Reviewed Toxicity Values for

p- Nitrophenol
(CASRN 100-02-7)

Derivation of a Chronic Oral RfD

Superfund Health Risk Technical Support Center
National Center for Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

MTD	maximum tolerated dose
MTL	median threshold limit
NAAQS	National Ambient Air Quality Standards
NOAEL	no-observed-adverse-effect level
NOAEL(ADJ)	NOAEL adjusted to continuous exposure duration
NOAEL(HEC)	NOAEL adjusted for dosimetric differences across species to a human
NOEL	no-observed-effect level
OSF	oral slope factor
p-IUR	**provisional inhalation unit risk**
p-OSF	**provisional oral slope factor**
p-RfC	**provisional inhalation reference concentration**
p-RfD	**provisional oral reference dose**
PBPK	physiologically based pharmacokinetic
ppb	parts per billion
ppm	parts per million
PPRTV	**Provisional Peer Reviewed Toxicity Value**
RBC	red blood cell(s)
RCRA	Resource Conservation and Recovery Act
RDDR	Regional deposited dose ratio (for the indicated lung region)
REL	relative exposure level
RfC	inhalation reference concentration
RfD	oral reference dose
RGDR	Regional gas dose ratio (for the indicated lung region)
s.c.	subcutaneous
SCE	sister chromatid exchange
SDWA	Safe Drinking Water Act
sq.cm.	square centimeters
TSCA	Toxic Substances Control Act
UF	uncertainty factor
μg	microgram
μmol	micromoles
VOC	volatile organic compound

Disclaimers

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Questions Regarding PPRTVs

Questions regarding the contents of the PPRTVs and their appropriate use (e.g., on chemicals not covered, or whether chemicals have pending IRIS toxicity values) may be directed to the EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center (513-569-7300), or OSRTI.

INTRODUCTION

An RfD for *p*-nitrophenol is not available on IRIS (U.S. EPA, 2002) or in the HEAST (U.S. EPA, 1997). The Drinking Water Standards and Health Advisory list reports an RfD of 8E-3 mg/kg-day (U.S. EPA, 2000), referenced to a Health Advisory (U.S. EPA, 1991a). The RfD was derived from a NOAEL of 25 mg/kg-day and LOAEL of 70 mg/kg-day for mortality and associated clinical signs and pathological changes in rats treated with *p*-nitrophenol by gavage for 13 weeks (Hazelton Laboratories, 1989). An uncertainty factor of 3000 (10 for intraspecies extrapolation, 10 for interspecies extrapolation, 10 to extrapolate from a subchronic study, and 3 for the lack of reproductive/developmental and chronic toxicity data) was applied to the NOAEL to calculate the RfD. Older U.S. EPA documents in the CARA list (U.S. EPA, 1991c, 1994), including a Health and Environmental Effects Profile (U.S. EPA, 1985) and a Health Effects Assessment (U.S. EPA, 1987), did not find relevant data on which to base an RfD.

Developmental toxicity studies of *p*-nitrophenol were also located. In a study reported by Kavlock (1990), groups of pregnant rats received a single gavage dose of *p*-nitrophenol on gestational day 11. Increased mortality (3/13) was observed in the dams dosed with 667 mg/kg; no deaths were observed in the dams exposed to 333 mg/kg. No significant alterations in litter size, perinatal loss, pup weight, or litter biomass, and no external malformations, were observed in the offspring of rats dosed with up to 1000 mg/kg (Kavlock, 1990). In another developmental toxicity study (Hardin et al., 1987; Plasterer et al., 1985), groups of 50 pregnant CD-1 mice were dosed via gavage with 400 mg/kg-day of *p*-nitrophenol on gestational days 6-13. Increased mortality (9/50 versus 0/50 for controls) was observed in the dams, and no effects on maternal weight gain were observed. No effects on the number of viable litters, number of live births per litter, percent survival of pups, pup birth weights, or pup weight gain were observed. Abu-Qare et al. (1999, 2000) indicate that a single oral dose of 100 mg/kg given to pregnant Sprague-Dawley rats did not alter maternal or fetal methemoglobin content, plasma buyrylcholinesterase, or brain acetylcholinesterase; other endpoints were not reported.

FEASIBILITY OF DERIVING A PROVISIONAL RfD FOR p-NITROPHENOL

The Hazelton Laboratories (1989) study is not suitable for derivation of a p-RfD. No statistically significant effects, including mortality, were observed in rats treated with either 25 or 70 mg/kg-day of *p*-nitrophenol compared to control-treated animals. Moreover, the incidences of *p*-nitrophenol-induced mortality are confounded by experimental error during blood collection: *p*-nitrophenol treatment may be related to as few as 1/20, 1/20, 3/30, and 13/20 mortalities in females dosed with 25, 70 or 140 mg/kg and males dosed with 140 mg/kg-day, respectively. On this basis, clear evidence of a statistically significant elevation in mortality is seen only in males treated with 140 mg/kg-day of *p*-nitrophenol. The non-mortality endpoints found to be elevated in animals treated with 70 or 140 mg/kg, clinical signs and organ congestion, were only seen in a subset of animals dying prematurely, and therefore cannot be considered independent indicators of toxicity. The authors report that animals were observed twice daily for mortality and moribundity; therefore, it is unclear the degree to which organ congestion represents post-mortem rather than *p*-nitrophenol-induced changes. Methemoglobin formation is a relatively sensitive marker of acute mononitrophenol toxicity (reviewed in ATSDR, 1992; U.S. EPA, 1980, 1985, 1987) and this endpoint was not evaluated due to analytical problems. Because mortality is the only independent measure of toxicity found to be related to *p*-nitrophenol exposure by Hazelton Laboratories (1989), use of this study to calculate a p-RfD might tend to underestimate risk to human health caused by oral exposure to *p*-nitrophenol.

U.S. EPA. 1985. Health and Environmental Effects Profile (HEEP) for Nitrophenols. Prepared by the Office Health and Environmental Assessment, Environmental Criteria and Assessment Office for the Office of Solid Waste and Emergency Response, Washington DC.

U.S. EPA. 1987. Health Effects Assessment (HEA) for Nitrophenols. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1991a. Drinking Water Health Advisory for *p*-nitrophenol. Office of Science and Technology, Office of Water. NTIS PB92-135490.

U.S. EPA. 1991b. RfD/RfC Work Group Meeting Notes (with attachments) for the February 20, 1991 meeting. Office of Research and Development, National Center for Environmental Assessment, Washington, DC.

U.S. EPA. 1991c. Chemical Assessments and Related Activities (CARA). Office of Health and Environmental Assessment, Washington, DC. April.

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U.S. EPA. 1997. Health Effects Assessment Summary Tables (HEAST). FY-1997 Update. Prepared by the Office of Research and Development, National Center for Environmental Assessment, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. July. EPA/540/R/97/036. NTIS PB 97-921199.

U.S. EPA. 2000. Drinking Water Standards and Health Advisories. Summer 2000. Office of Water, Washington, DC. Examined September 2001. Online. www.epa.gov/ost/drinking/standards/

U.S. EPA. 2002. Integrated Risk Information System (IRIS). Office of Research and Development, National Center for Environmental Assessment, Washington, DC. Examined September 2001. Online. www.epa.gov/iris

Weisburger, E.K. and V.W. Hudson. 2001. Aromatic nitro and amino compounds. In: Patty's Toxicology, Vol 4, 5th ed., Bingham, E., B. Cohrssen, and C.H. Powell, Ed. John Wiley and Sons Inc., p. 650-651.

WHO (World Health Organization). 2001. Environmental Health Criteria (EHC) Monographs International Programme on Chemical Safety, Geneva, Switzerland. Examined September 2001. Online. www.inchem.org/ehc.html

09-25-02

Provisional Peer Reviewed Toxicity Values for

p-Nitrophenol
(CASRN 100-02-7)

Derivation of a Chronic Inhalation RfC

Superfund Health Risk Technical Support Center
National Center for Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

MTD	maximum tolerated dose
MTL	median threshold limit
NAAQS	National Ambient Air Quality Standards
NOAEL	no-observed-adverse-effect level
NOAEL(ADJ)	NOAEL adjusted to continuous exposure duration
NOAEL(HEC)	NOAEL adjusted for dosimetric differences across species to a human
NOEL	no-observed-effect level
OSF	oral slope factor
p-IUR	**provisional inhalation unit risk**
p-OSF	**provisional oral slope factor**
p-RfC	**provisional inhalation reference concentration**
p-RfD	**provisional oral reference dose**
PBPK	physiologically based pharmacokinetic
ppb	parts per billion
ppm	parts per million
PPRTV	**Provisional Peer Reviewed Toxicity Value**
RBC	red blood cell(s)
RCRA	Resource Conservation and Recovery Act
RDDR	Regional deposited dose ratio (for the indicated lung region)
REL	relative exposure level
RfC	inhalation reference concentration
RfD	oral reference dose
RGDR	Regional gas dose ratio (for the indicated lung region)
s.c.	subcutaneous
SCE	sister chromatid exchange
SDWA	Safe Drinking Water Act
sq.cm.	square centimeters
TSCA	Toxic Substances Control Act
UF	uncertainty factor
μg	microgram
μmol	micromoles
VOC	volatile organic compound

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INTRODUCTION

IRIS (U.S. EPA, 2002) lists the RfC for *p*-nitrophenol as not verifiable. The HEAST (U.S. EPA, 1997) includes a notation that data for nitrophenols are inadequate for quantitative risk assessment, referenced to a Health Effects Assessment (HEA) for nitrophenols (U.S. EPA, 1987). A Health and Environmental Effects Profile (HEEP) for nitrophenols (U.S. EPA, 1985), located in the CARA list (U.S. EPA, 1991a, 1994), also found an absence of relevant inhalation data. ATSDR (1992) published a Toxicological Profile on 2- and 4-nitrophenol that did not derive inhalation MRLs due to lack of adequate data. No occupational exposure limits for *p*-nitrophenol have been assigned by ACGIH (2001), OSHA (2001a,b) or NIOSH (2001). WHO (2001) and IARC (2001) have not produced documents on *p*-nitrophenol. The NTP (2001) status report and a review on aromatic nitro and amino compounds (Weisburger and Hudson, 2001) were consulted for relevant studies. In 1995, TOXLINE, DART, and ETIC had been searched

not cause mortalities. Subscquently, male rats were exposed for 6 hours per day for 10 days to 0, 0.03, 0.13, 0.34, or 2.47 g/m^3 of *p*-nitrophenol sodium salt aerosol, followed by a 14 day observation period. Urinalysis, hematology, and serum clinical chemistry were performed. No adverse effects were seen at 0.03 g/m^3. Transient methemoglobinemia was observed at 0.13 g/m^3 and higher. At 0.34 and 2.47 g/m^3, transient weight loss, dark urine, proteinuria, increased creatine and serum glutamie-oxaloacetic-transaminase activity were observed. Exposure to 2.47 g/m^3 also induced increased hematocrit, hemoglobin, and erythrocyte number. This study finds an acute inhalation LC_{50} greater than 4.7 g/m^3, a NOAEL of 0.03 g/m^3 and a LOAEL of 0.13 g/m^3. ATSDR (1992) chose not to derive an acute inhalation MRL from these data due to reporting inconsistencies, a lack of clearly toxie effects, and "the preliminary nature of the report."

FEASIBILITY OF DERIVING A PROVISIONAL RfC FOR p-NITROPHENOL

A provisional RfC for *p*-nitrophenol cannot be derived because of a lack of human inhalation data and the inadequacy of the animal inhalation data. The RfD/RfC Work Group (U.S. EPA, 1991b) indicated that "an RfC for 4-nitrophenol is non-verifiable based on the lack of adequate subchronic or chronic inhalation toxicity data, a lack of data on portal-of-entry effects, and the fact that a route-to-route extrapolation cannot be performed due to the lack of pharmacokinetic data." The Work Group also noted that because *p*-nitrophenol is a solid at room temperature, its aerosol nature and regional respiratory deposition are important considerations. It is not recommended to derive a provisional RfC for *p*-nitrophenol based on the provisional RfD, because sufficient information is not available regarding absorption of this chemical following oral or inhalation exposure and because it is not known whether this chemical will produce irritative respiratory effects when inhaled following subchronic or chronic exposure.

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09-25-02

Provisional Peer Reviewed Toxicity Values for

p-Nitrophenol
(CASRN 100-02-7)

Derivation of a Carcinogenicity Assessment

Superfund Health Risk Technical Support Center
National Center for Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

MTD	maximum tolerated dose
MTL	median threshold limit
NAAQS	National Ambient Air Quality Standards
NOAEL	no-observed-adverse-effect level
NOAEL(ADJ)	NOAEL adjusted to continuous exposure duration
NOAEL(HEC)	NOAEL adjusted for dosimetric differences across species to a human
NOEL	no-observed-effect level
OSF	oral slope factor
p-IUR	**provisional inhalation unit risk**
p-OSF	**provisional oral slope factor**
p-RfC	**provisional inhalation reference concentration**
p-RfD	**provisional oral reference dose**
PBPK	physiologically based pharmacokinetic
ppb	parts per billion
ppm	parts per million
PPRTV	**Provisional Peer Reviewed Toxicity Value**
RBC	red blood cell(s)
RCRA	Resource Conservation and Recovery Act
RDDR	Regional deposited dose ratio (for the indicated lung region)
REL	relative exposure level
RfC	inhalation reference concentration
RfD	oral reference dose
RGDR	Regional gas dose ratio (for the indicated lung region)
s.c.	subcutaneous
SCE	sister chromatid exchange
SDWA	Safe Drinking Water Act
sq.cm.	square centimeters
TSCA	Toxic Substances Control Act
UF	uncertainty factor
µg	microgram
µmol	micromoles
VOC	volatile organic compound

Disclaimers

Users of this document should first check to see if any IRIS values exist for the chemical of concern before proceeding to use a PPRTV. If no IRIS value is available, staff in the regional Superfund and RCRA program offices are advised to carefully review the information provided in this document to ensure that the PPRTVs used are appropriate for the types of exposures and circumstances at the Superfund site or RCRA facility in question. PPRTVs are periodically updated; therefore, users should ensure that the values contained in the PPRTV are current at the time of use.

It is important to remember that a provisional value alone tells very little about the adverse effects of a chemical or the quality of evidence on which the value is based. Therefore, users are strongly encouraged to read the entire PPRTV manuscript and understand the strengths and limitations of the derived provisional values. PPRTVs are developed by the EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center for OSRTI. Other EPA programs or external parties who may choose of their own initiative to use these PPRTVs are advised that Superfund resources will not generally be used to respond to challenges of PPRTVs used in a context outside of the Superfund Program.

Questions Regarding PPRTVs

Questions regarding the contents of the PPRTVs and their appropriate use (e.g., on chemicals not covered, or whether chemicals have pending IRIS toxicity values) may be directed to the EPA Office of Research and Development's National Center for Environmental Assessment, Superfund Health Risk Technical Support Center (513-569-7300), or OSRTI.

INTRODUCTION

A carcinogenicity assessment for *p*-nitrophenol is not available on IRIS (U.S. EPA, 2002) or in the HEAST (U.S. EPA, 1997). The Drinking Water Standards and Health Advisory list (U.S. EPA, 2000) assigned *p*-nitrophenol to cancer group D, not classifiable as to human carcinogenicity. The source document for this assessment was a Health Advisory (U.S. EPA, 1991a). The CARA list (U.S. EPA, 1991b, 1994) includes a Health and Environmental Effects Profile (U.S. EPA, 1985) and Health Effects Assessment (U.S. EPA, 1987), both of which also assigned *p*-nitrophenol to cancer weight-of-evidence Group D. IARC (2001) has not assessed the carcinogenicity of *p*-nitrophenol. The NTP (2001) status report, the WHO Environmental Health Criteria series (2001), an ATSDR Toxicological Profile (ATSDR, 1992), and a review on aromatic nitro and amino compounds (Weisburger and Hudson, 2001) were consulted, and literature searches were conducted, to identify relevant studies. In 1995, TOXLINE, DART, and

Other Studies

Testing of *p*-nitrophenol for genotoxicity has produced primarily negative results, although there is some evidence that this chemical can produce clastogenic effects. *p*-Nitrophenol did not produce mutations in the *Salmonella typhimurium* plate incorporation assay with or without metabolic activation (ATSDR, 1992; NTP, 1991). No DNA damage was observed in *Escherichia coli*, *Proteus mirabilis*, and *S. typhimurium* without metabolic activation (ATSDR, 1992). DNA damage was observed in *Bacillus subtilis* without metabolic activation (ATSDR, 1992). A review of unpublished experiments (Hoechst Celanese Corporation, 1989) reported negative results for genotoxicity in *Salmonella*. Negative results were seen in a HGPRT assay in Chinese hamster ovary cells (Oberly et al., 1990) and forward mutation assays in mouse lymphoma cells with and without metabolic activation (ATSDR, 1992; Oberly et al., 1996), and in a DNA repair assay in rat hepatocytes without metabolic activation (ATSDR, 1992). A weakly positive result was observed for inhibition of DNA synthesis in Chinese hamster ovary cells without metabolic activation (ATSDR, 1992). At cytotoxic doses, *p*-nitrophenol induced DNA double strand breaks in primary rat hepatocytes (Elia et al., 1994; Storer et al., 1996), but not in V79 Chinese hamster cells or human white blood cells (Hartmann and Speit, 1997). Negative results were seen in a sister chromatid exchange assay in Chinese hamster ovary cells with or without metabolic activation (NTP, 1991); however, a positive result for chromosomal aberrations was observed in Chinese hamster ovary cells in the presence of metabolic activation at concentrations that delayed cell cycle (NTP, 1991). In cultured human peripheral lymphocytes, *p*-nitrophenol caused a dose-dependent and statistically significant increase in the incidence of chromosomal abnormalities (Huang et al., 1995, 1996). Negative results were observed in three *in vivo* assays: a dominant lethal assay and a host-mediated assay in mice (ATSDR, 1992), and germ cell assays in *Drosophila melanogaster* (NTP, 1991; Fourcman et al., 1994).

PROVISIONAL WEIGHT-OF-EVIDENCE CLASSIFICATION

Based on the lack of information regarding the carcinogenicity of *p*-nitrophenol in humans or animals after oral or inhalation exposure, and no evidence of carcinogenicity in animals after dermal exposure, *p*-nitrophenol can be given a weight-of-evidence classification of Group D, *not classifiable as to human carcinogenicity*, according to U.S. EPA (1986) guidelines. Under the proposed guidelines (U.S. EPA,1999) the *data are inadequate for an assessment of human carcinogenic potential.*

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3-21-2007

Provisional Peer Reviewed Toxicity Values for

2,4,6-Trichlorophenol
(CASRN 88-06-2)

Superfund Health Risk Technical Support Center
National Center for Environmental Assessment
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

NAAQS	National Ambient Air Quality Standards
NOAEL	no-observed-adverse-effect level
NOAEL(ADJ)	NOAEL adjusted to continuous exposure duration
NOAEL(HEC)	NOAEL adjusted for dosimetric differences across species to a human
NOEL	no-observed-effect level
OSF	oral slope factor
p-IUR	provisional inhalation unit risk
p-OSF	provisional oral slope factor
p-RfC	provisional inhalation reference concentration
p-RfD	provisional oral reference dose
PBPK	physiologically based pharmacokinetic
ppb	parts per billion
ppm	parts per million
PPRTV	Provisional Peer Reviewed Toxicity Value
RBC	red blood cell(s)
RCRA	Resource Conservation and Recovery Act
RDDR	Regional deposited dose ratio (for the indicated lung region)
REL	relative exposure level
RfC	inhalation reference concentration
RfD	oral reference dose
RGDR	Regional gas dose ratio (for the indicated lung region)
s.c.	subcutaneous
SCE	sister chromatid exchange
SDWA	Safe Drinking Water Act
sq.cm.	square centimeters
TSCA	Toxic Substances Control Act
UF	uncertainty factor
µg	microgram
µmol	micromoles
VOC	volatile organic compound

Disclaimers

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INTRODUCTION

Neither an RfD or RfC for 2,4,6-trichlorophenol (2,4,6-TCP) is available on IRIS (U.S. EPA, 2007) or in the HEAST (U.S. EPA, 1997). IRIS (U.S. EPA, 2007) provides an OSF and IUR. The Drinking Water and Health Advisories list (U.S. EPA, 2000) does not include an oral RfD for 2,4,6-TCP. ATSDR published a Toxicological Profile for 2,4,6-Trichlorophenol (ATSDR, 1990) in which an intermediate-duration oral MRL of 0.042 mg/kg-day was derived, based on a NOAEL of 4.2 mg/kg-day and a LOAEL of 42 mg/kg-day for reduced litter size in female Sprague-Dawley rats exposed to 2,4,6-trichlorophenol in the drinking water from 3 weeks of age through breeding and parturition (Exon and Koller, 1985). ATSDR subsequently published an updated Toxicological Profile for Chlorophenols (ATSDR, 1997), providing an intermediate-duration oral MRL of 0.003 mg/kg-day for chlorophenols as a class, based on decreased delayed type hypersensitivity response to bovine serum albumin in rats exposed to 2,4-dichlorophenol in drinking water (Exon and Koller, 1985). ATSDR (1997) did not provide an intermediate-duration oral MRL for 2,4,6-TCP per se. The CARA database (U.S. EPA, 1991,

leukemias. Leukocytosis, monocytosis, and bone marrow hyperplasia were noted in some treated male and female rats not having lymphoma or leukemia, but not in the 20 control rats. In mice, a significantly increased incidence of hepatocyte hyperplasia was observed for mid-dose males. Other hepatotoxic effects (inflammation, necrosis) were commonly seen in the livers of dosed mice. Hepatocellular carcinomas or adenomas occurred in mice at incidences that were dose-related. For the purpose of deriving an RfD, all noncancer effects reported for both rats and mice in NCI (1979) are considered to be related to the carcinogenic process and are not relevant for deriving an RfD.

In preliminary range-finding studies by NCI (1979), groups of rats and mice (5/sex/species) were exposed to 10,000-46,000 ppm (rats) or 6800-31,500 ppm (mice) of 2,4,6-TCP in the diet for 7 weeks. Assuming a food factor of 0.1 for a subchronic oral study in rats and a food factor of 0.15 for a subchronic oral study in mice (U.S. EPA, 2007), estimated dose ranges were 1000-4600 mg/kg-day in rats and 1020-4725 mg/kg-day in mice. Relative to controls, dose-dependent lower mean body weights were reported in all exposed groups of rats, and in groups of mice at doses $\geq$735 mg/kg-day (males) or $\geq$1075 mg/kg-day (females). Survival was 100% for rats and mice (of both sexes) consuming doses $\leq$1470 mg/kg-day and $\leq$3225 mg/kg-day, respectively. The highest dose in rats (4600 mg/kg-day) resulted in the death of 2/5 males and 3/5 females. At the highest dose in mice (4725 mg/kg-day), mortality was observed in two mice of each sex. In rats, histopathologic signs of toxicity were seen only at the highest dose (4600 mg/kg-day) and consisted of moderate to marked increased splenic hematopoiesis in males and females and midzonal vacuolation of hepatocytes in males. Histological examination gave no indication of treatment-related toxicity in male and female mice of the 1075 mg/kg-day dose groups. The authors did not indicate whether or not histopathologic effects were seen at lower doses or the highest dose (4725 mg/kg-day) in mice. No other relevant data were provided. The lowest treatment level (735 mg/kg-day) is considered to be a LOAEL, but the dose levels in this study are too high to be useful for RfD derivation.

In a subchronic gavage study (Bercz et al., 1990), groups of 10 male and 10 female Sprague-Dawley rats, 49 days of age, were administered 2,4,6-TCP in oral doses of 0, 80, 240, or 720 mg/kg-day by gavage (in corn oil) for 90 days. Clinical observations were made daily; mortality and morbidity checks were performed twice daily. Body weights were recorded weekly, at which time animals were examined for obvious signs of abnormalities. Food consumption was measured weekly, ophthalomoscopic examinations were performed prior to treatment and during the final week of the study. Extensive analyses of hematology, blood chemistry, and urine profiles were performed at sacrifice. Comprehensive gross and microscopic examinations were performed on major tissues and organs, as well as all gross lesions. There were no significant treatment-related effects regarding mortality, body weight, food consumption, ophthalmology, or hematology. Significant dose-related effects consisted of increased absolute or relative liver weight in mid- and high-dose males and females and increased absolute and relative kidney weight in high-dose males. Other significant effects occurred primarily in the high-dose group, and included clinical signs (urine staining and salivation); increased relative testes weight (males), absolute lung, and relative adrenal weight (females); increased serum

0.93 g in controls). Significantly increased mean liver weight was observed in both 30- and 300-ppm exposure groups (12.5 and 14.1 g, respectively, vs 10.9 g in controls). Significantly increased mean spleen and liver weights were also seen in rats similarly exposed to 300-ppm of 2,4-DCP. The effects related to immune response and increased liver weight (at 30 mg-kg-day) were not considered to be adverse by Exon and Koller (1985).

Blackburn et al. (1986) administered 2,4,6-TCP (99% pure) to groups of 30 (low- and mid-dose) or 40 (controls and high-dose) adult female Long-Evans hooded rats in oral doses (gavage, in corn oil) of 0, 100, 500, or 1000 mg/kg-day, 5 days per week for 2 weeks, followed by dosing 7 days per week during mating with unexposed males of the same strain and throughout 21 days of gestation. Body weights were recorded daily from the beginning of treatment until delivery. Females that had not delivered by gestation day 24 were sacrificed, and ovaries and uteri examined for signs of post implantation loss. For those females delivering pups, date of delivery, sex ratio of the litter, and male and female pup body weights were recorded. Litters were culled to 8 pups (approximately equal numbers of males and females) on postpartum day 4. Body weights were recorded weekly thereafter and litters were culled to 2 males and 2 females each at weaning. Female pups were monitored for time of vaginal opening. On postpartum day 42, all remaining pups were sacrificed. Necropsy was limited to establishing whether or not intubation was the cause of death in treated dams that succumbed prior to the termination of treatment. Survival was 38/39, 29/29, 25/30, and 24/40 in 0-, 100-, 500-, and 1000-mg/kg-day groups of treated dams, respectively. The majority of deaths, particularly in the high-dose dams, were due to intubation errors. However, 3/16 high-dose deaths were attributed to 2,4,6-TCP exposure. Urogenital staining was noted in the high-dose group. Dose-related significantly lower mean body weights (relative to controls) were observed in dams at the end of the first and second weeks of pre-mating treatment, as well as throughout the first 14 days of gestation (the actual body weight values could not be determined from the graphically-presented body weight data). No significant treatment-related maternal body weight effects were apparent on gestation day 21. There were no statistically significant dose-related differences in breeding success, although breeding success was low in all study groups (63, 72, 60, and 50% for 0-, 100-, 500-, and 1000-mg/kg groups, respectively). No significant treatment-related differences were seen in mean litter sizes or pup survival. Mean litter body weights were significantly depressed in pups of the 500- and 1000-mg/kg groups initially, but from postpartum day 4 onward, there were no significant differences in mean litter body weights of any exposure group, relative to controls. The study authors indicated that the initial depressed pup body weights were most likely a reflection of maternal toxicity, as evidenced by increased mortality, clinical signs (urogenital staining), and decreased body weights in mid- and high-dose dams. A maternal FEL of 500 mg/kg-day is identified in this study based on decreased survival.

In a second experiment reported in Blackburn et al. (1986), male Long-Evans hooded rats (25 high-dose rats, 15 per group at other dose levels) were administered 2,4,6-TCP (99% pure) in oral doses (gavage, in corn oil) of 0, 100, 500, or 1000 mg/kg-day, 5 days per week for 11 weeks (Blackburn et al., 1986). Males used in this study had initial baseline sperm counts of 20 million or more and ejaculation latencies of 30 minutes or less. After 10 weeks of treatment, copulatory

than controls) reported for the 30 ppm group in the Exon and Koller (1985) continuation study is not considered to be an adverse effect. Also, the effects related to immune response reported by Exon and Koller (1985) are not considered for defining the LOAEL, as there is no dose-response relationship established.

The provisional RfD is derived by dividing the subchronic NOAEL of 3.0 mg/kg-day by an uncertainty factor of 3000 (10 for extrapolation from subchronic to chronic exposure duration, 10 for extrapolation from rodents to humans, 10 for protecting sensitive individuals, and 3 for deficiencies in the database, particularly the lack of a multigeneration reproduction study and supporting long-term toxicity studies in other species). The **provisional RfD** derived in this way **is 3.0 mg/kg-day ÷ 3000 = $1x10^{-3}$ or 1E-3 mg/kg-day.**[1]

STATEMENT OF CONFIDENCE

Confidence in the key studies is low. Although the critical animal study (Exon and Koller, 1985) examined reproductive endpoints, study details were limited, a single generation was produced, and only females were exposed. The study did, however, identify both a NOAEL and a LOAEL for reproductive effects. Confidence in the database is low due to the lack of a multigeneration reproduction study and supporting long-term toxicity studies. Consequently, there is low confidence in the provisional RfD.

DERIVATION OF A PROVISIONAL RfC FOR 2,4,6-TRICHLOROPHENOL

No values are developed due to lack of relevant information.

DERIVATION OF A PROVISIONAL CARCINOGENICITY ASSESSMENT FOR 2,4,6-TRICHLOROPHENOL

Cancer values are provided on IRIS (U.S. EPA, 2007).

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[1] The RfD differs from the ATSDR intermediate-duration MRL of 4E-2 mg/kg-day. ATSDR never applies a database uncertainty factor and did not apply a derivation UF. When these UFs are applied the value would be divided by an additional 30 or 1E-3 which is identical to the RfD.

U.S. EPA. 1991. Chemical Assessments and Related Activities (CARA). Office of Health and Environmental Assessment, Washington, DC. April 1991.

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RG Addendum Triethylphosphorothioate

A-2 Memorandum: Review of proposed remedial level for Triethylphosphorothioate

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

61 Forsyth Street, S.W.
Atlanta, Georgia 30303

MEMORANDUM

September 25, 2009

SUBJECT: Review of proposed remedial level for Triethylphosphorothioate
Anniston PCB Site

FROM: Kevin Koporec, Toxicologist
Technical Support Section
Superfund Support Branch

THROUGH: Glenn Adams, Chief
Technical Support Section
Superfund Support Branch

TO: Pam Scully, RPM
Superfund Remedial Branch

Per your request (Email 09/03/2009), I have reviewed the **proposed remedial level for o,o,o-Triethylphosphorothioate in groundwater** for the **Anniston PCB Superfund Site, Anniston, Alabama** of Site. A value needs to be derived due to the detection of o,o,o-Triethylphosphorothioate in the groundwater and the lack of an EPA verified toxicity value for this compound.

The proposal from Solutia is to use Dimethoate as a surrogate for o,o,o-Triethylphosphorothioate; this value and resultant groundwater concentration was included as Attachment E-1 in the July 2008 RCRA Permit Application. TSS concurs with this proposal and recommends approval of the value. We note, however, that TSS reserves the right to change this recommendation in the event that EPA were to recommended a different toxicity value for o,o,o-Triethylphosphorothioate in the future.

Feel free to contact me if you need further help at 2-8644.

Replacement RGO Table 1 Current Worker

A-3 Replacement Table for RGO analysis Current Operations Worker

Table 1
Risk-Based Remedial Goal Options and ARARs for Surface Soil [1]
Current Operations Area Worker - Adult
Anniston PCB Site, Operable Unit 3

Chemical of Concern	EPC[2] (mg/kg)	Cancer Risk Level[3] (mg/kg)			Hazard Quotient Level[4] (mg/kg)		
		1E-6	1E-5	1E-4	HQ=0.1	HQ=1	HQ=3
SVOCs							
Benzo(a)pyrene	1.9	0.4	4	36	NA	NA	NA
Dibenzo(a,h)anthracene	0.62	0.4	4	36	NA	NA	NA
P/PCBs							
PCBs, Total	370	3	34	336	5	47	142
Dioxin							
Dioxin TEQ	8.E-04	3.E-05	3.E-04	3.E-03	NA	NA	NA
Inorganics							
Arsenic	390	7	66	661	105	1054	3162

Notes:

1. RGO = EPC * target risk / calculated risk (Human Health Risk Assessment Bulletins -- Supplement to RAGS (USEPA Region 4, 2000).
2. EPC: Exposure point concentration in surface soil.
3. Remediation goal based on contact with soil using current operations worker exposure assumptions and cancer slope factors.
4. Remediation goal based on contact with soil using current operations worker exposure assumptions and reference doses.
5. ARAR: Applicable or Relevant and Appropriate Requirement. There are no available ARARs for soil.

Acronyms:

HQ: Hazard quotient

NA: Not applicable - the chemicel was evaluated as a carcinogen only.

TEQ: Dioxin toxic equivalents - dioxin and dioxin-like compounds are summed as a weighted value that considers each chemical's toxicity relative to the most toxic compound in the category: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (WHO, 1997).

APPENDIX C

HELP Model Evaluation of South Landfill Cover – Cells 1E, 2E, and 3E

Golder Associates	Subject : South Landfill Cover Evaluation					
	Job#:	043 3746OU3	Made by:	CMM	Date:	6/6/2010
	Ref:	Solutia - South LF	Checked by:	SJA	Sheet:	1
			Reviewed by:	SJM	of:	1

Objective :

Use the HELP (Hydrologic Evaluation of Landfill Performance) to compare different types of cover systems. The three systems evaluated will be as follows:

1) Cover System per CERCLA Guidelines - See Attachment A to this calculation package.
2) Cover System per TSCA Guidelines - See Attachment B
3) Existing Soil Cover for Cells 1E, 2E, and 3E of the South Landfill - See Attachment C.

Method :

Use the USEPA Hydrologic Evaluation of Landfill Performance (HELP) model version 3.07 (November 1997)) to estimate infiltration through the selected cover systems. The estimated rates are per plan acre approximations. Rainfall, % Area allowing Runoff, Weather Parameters, Max. Leaf Area Index, and Quality of Sur face Vegetation will be the same for all cases. HELP generated values for Initial moisture and Curve Number based on the first layer modeled. 6 inches of topsoil were added to the soil cover cases to meet HELP modeling requirements for soil barriers.

Cover System	Layer 1	Layer 2	Layer 3	Layer 4
CERCLA Guidelines	24" (60 cm) Vegetative layer	12' (30 cm) Drainage	.04" (.10 cm) FML	24" (60 cm) $1x10^{-7}$ c/s soil layer
TSCA Guidelines	6" (15 cm) Vegetative layer	10" (25 cm) $1x10^{-7}$ c/s soil layer		
South Landfill	6" (15 cm) Vegetative layer	19" (48 cm) 4.14E-06 c/s soil layer		

Note: Average thickness measured - see Attachment C = 19 inches.

Note: Used geometric average of laboratory permeability tests results. See Attachment C.

Assumptions :

- % of Area allowing Runoff = 100%
- The SCS Run-off curve number was calculated by HELP using slope and soil texture information and a fair stand of grass.
- Climatological data for Birmingham, Alabama was used to generate synthetic weather data for Anniston, AL.
- The final cover scenario was run with a 100 year simulation period.
- Assumed good installation with the geomembrane having 3 holes / ac manufacturing defects and 3 holes / ac installation defects.
- Evaporative Zone Depth set by Model (based on soil texture and function of lower layer).
- Max. Leaf Index = 5

Model Results :

The following cover percolation rates were estimated with the HELP model.

Percolation through Cover (See attached HELP Model runs)

Cover System	Peak Daily (cf/day/ac.)	Avg. Daily (cf/day/ac.)	Peak Daily (gal/day/ac.)	Avg. Daily (gal/day/ac)
CERCLA Guidelines	0.20	0.02	1.49	0.14
TSCA Guidelines	19.76	11.63	147.76	86.97
South Landfill	672.60	172.22	5030.68	1288.13

HELP Runs

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 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
 **                HELP MODEL VERSION 3.07 (1 November 1997)                  **
 **                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
 **                     USAE WATERWAYS EXPERIMENT STATION                     **
 **              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
 **                                                                           **
 **                                                                           **
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 PRECIPITATION DATA FILE:    C:\WHI\UNSAT22\data\P424.VHP\_weather1.dat
 TEMPERATURE DATA FILE:      C:\WHI\UNSAT22\data\P424.VHP\_weather2.dat
 SOLAR RADIATION DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\_weather3.dat
 EVAPOTRANSPIRATION DATA:    C:\WHI\UNSAT22\data\P424.VHP\_weather4.dat
 SOIL AND DESIGN DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\I_385737.inp
 OUTPUT DATA FILE:           C:\WHI\UNSAT22\data\P424.VHP\O_385737.prt


 TIME:  16:32     DATE:   6/ 7/2010


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      TITLE:  Composite Cap per Subtitle C - CERCLA Guidelines

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      NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
               COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   9
           THICKNESS                    =     60.96   CM
           POROSITY                     =      0.5010 VOL/VOL
           FIELD CAPACITY               =      0.2840 VOL/VOL
           WILTING POINT                =      0.1350 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.2930 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.190000000000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	30.48	CM
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2701	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000000000E-01	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	30.5	METERS

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.10	CM
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.400000000000E-12	CM/SEC
FML PINHOLE DENSITY	=	7.41	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	7.41	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	60.96	CM
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000000000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 30. METERS.

SCS RUNOFF CURVE NUMBER	=	83.21	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	0.4047	HECTARES
EVAPORATIVE ZONE DEPTH	=	25.4	CM

INITIAL WATER IN EVAPORATIVE ZONE	=	6.159	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.725	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	3.429	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	52.123	CM
TOTAL INITIAL WATER	=	52.123	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Anniston AL

STATION LATITUDE	=	33.39 DEGREES
MAXIMUM LEAF AREA INDEX	=	5.00
START OF GROWING SEASON (JULIAN DATE)	=	72
END OF GROWING SEASON (JULIAN DATE)	=	316
EVAPORATIVE ZONE DEPTH	=	10.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	7.00 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.75	4.89	4.43	5.12	3.85
4.44	3.36	3.34	2.71	4.81	4.62

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.50	45.90	54.40	61.70	69.80	76.90
80.40	80.00	74.00	62.90	54.50	45.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL
AND STATION LATITUDE = 33.66 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.99	4.77	5.13	4.30	5.18	3.56
	4.44	3.57	3.43	2.96	4.48	4.42
STD. DEVIATIONS	2.14	2.64	2.73	2.06	2.54	2.01
	2.00	1.72	2.03	1.78	2.15	2.22
RUNOFF						
TOTALS	0.222	0.409	0.282	0.146	0.210	0.065
	0.108	0.058	0.115	0.048	0.226	0.196
STD. DEVIATIONS	0.366	0.806	0.402	0.280	0.340	0.139
	0.169	0.143	0.193	0.113	0.337	0.351
EVAPOTRANSPIRATION						
TOTALS	1.455	1.965	3.031	3.446	3.972	3.408
	3.748	3.303	2.599	1.493	1.153	1.200
STD. DEVIATIONS	0.247	0.260	0.691	0.996	1.236	1.456
	1.427	1.205	1.092	0.548	0.175	0.165
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	3.0133	2.9972	2.8188	1.4982	1.0731	0.7086
	0.3983	0.3805	0.3488	0.6368	1.6768	2.8445
STD. DEVIATIONS	1.4829	1.6413	1.7535	1.1545	0.9574	0.7009
	0.4673	0.4733	0.4217	0.7590	1.1556	1.5238
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0003	0.0003	0.0003	0.0002	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003
STD. DEVIATIONS	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3						
AVERAGES	3.4380	3.7970	3.2213	1.7663	1.2257	0.8354
	0.4544	0.4341	0.4113	0.7265	1.9768	3.2483
STD. DEVIATIONS	1.6918	2.1759	2.0109	1.3611	1.0993	0.8263
	0.5331	0.5400	0.4972	0.8660	1.3624	1.7444

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.23 (7.782)	185952.9	100.00
RUNOFF	2.083 (1.2562)	7561.65	4.066
EVAPOTRANSPIRATION	30.773 (3.2239)	111702.33	60.070
LATERAL DRAINAGE COLLECTED FROM LAYER 2	18.39480 (5.13082)	66771.651	35.90784
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00186 (0.00049)	6.745	0.00363
AVERAGE HEAD ON TOP OF LAYER 3	1.795 (0.507)		
CHANGE IN WATER STORAGE	-0.025 (1.7588)	-89.51	-0.048

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 100 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.86	17641.41548	3060087
RUNOFF	2.695	9782.00910	370059
DRAINAGE COLLECTED FROM LAYER 2	0.36256	1316.05647	400061
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000055	0.19970	400061
AVERAGE HEAD ON TOP OF LAYER 3	21.839		
MAXIMUM HEAD ON TOP OF LAYER 3	26.894		
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	41.3 FEET		
SNOW WATER	4.80	17437.0317	280082

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4615

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1350

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(INCHES)	(VOL/VOL)
1	6.7412	0.2809
2	1.0656	0.0888
3	0.0000	0.0000
4	10.2480	0.4270
SNOW WATER	0.000	

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 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
 **                HELP MODEL VERSION 3.07 (1 November 1997)                  **
 **                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
 **                     USAE WATERWAYS EXPERIMENT STATION                     **
 **              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
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 PRECIPITATION DATA FILE:    C:\WHI\UNSAT22\data\P424.VHP\_weather1.dat
 TEMPERATURE DATA FILE:      C:\WHI\UNSAT22\data\P424.VHP\_weather2.dat
 SOLAR RADIATION DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\_weather3.dat
 EVAPOTRANSPIRATION DATA:    C:\WHI\UNSAT22\data\P424.VHP\_weather4.dat
 SOIL AND DESIGN DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\I_385756.inp
 OUTPUT DATA FILE:           C:\WHI\UNSAT22\data\P424.VHP\O_385756.prt


 TIME:  13:54     DATE:   6/ 7/2010


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      TITLE:  Soil Only Cap - TSCA Guidelines

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      NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
               COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   9
           THICKNESS                    =     15.24   CM
           POROSITY                     =      0.5010 VOL/VOL
           FIELD CAPACITY               =      0.2840 VOL/VOL
           WILTING POINT                =      0.1350 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.4247 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.190000000000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	25.40	CM
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000000000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 30.% AND A SLOPE LENGTH OF 30. METERS.

SCS RUNOFF CURVE NUMBER	=	84.04	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	0.4047	HECTARES
EVAPORATIVE ZONE DEPTH	=	15.2	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	6.473	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.635	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.057	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	17.319	CM
TOTAL INITIAL WATER	=	17.319	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Anniston AL

STATION LATITUDE	=	33.39	DEGREES
MAXIMUM LEAF AREA INDEX	=	5.00	
START OF GROWING SEASON (JULIAN DATE)	=	72	
END OF GROWING SEASON (JULIAN DATE)	=	316	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.00	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
4.58	4.75	4.89	4.43	5.12	3.85
4.44	3.36	3.34	2.71	4.81	4.62

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.50	45.90	54.40	61.70	69.80	76.90
80.40	80.00	74.00	62.90	54.50	45.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL
AND STATION LATITUDE = 33.66 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.99	4.77	5.13	4.30	5.18	3.56
	4.44	3.57	3.43	2.96	4.48	4.42
STD. DEVIATIONS	2.14	2.64	2.73	2.06	2.54	2.01
	2.00	1.72	2.03	1.78	2.15	2.22
RUNOFF						
TOTALS	3.271	3.218	2.226	0.917	0.866	0.214
	0.284	0.133	0.409	0.639	2.671	2.950
STD. DEVIATIONS	2.067	2.637	2.335	1.283	1.436	0.515
	0.520	0.364	0.850	1.019	2.065	2.110
EVAPOTRANSPIRATION						
TOTALS	1.429	1.957	3.130	3.838	4.345	3.614
	3.928	3.479	2.715	1.530	1.129	1.165
STD. DEVIATIONS	0.237	0.251	0.575	0.883	1.315	1.551
	1.575	1.327	1.176	0.544	0.170	0.153
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.1599	0.1412	0.1419	0.1020	0.0701	0.0354
	0.0403	0.0374	0.0495	0.0908	0.1414	0.1592
STD. DEVIATIONS	0.0059	0.0071	0.0174	0.0360	0.0399	0.0315

	0.0365	0.0360	0.0388	0.0529	0.0315	0.0093

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	5.1686	4.6943	3.5908	2.1940	1.4625	0.6180
	0.7333	0.6303	0.9044	2.1286	4.5412	5.1561
STD. DEVIATIONS	0.5614	0.7092	1.2447	1.2955	1.0519	0.7294
	0.8028	0.7528	0.8923	1.6012	1.4342	0.5794

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	INCHES		CU. FEET	PERCENT
PRECIPITATION	51.23	(7.782)	185952.9	100.00
RUNOFF	17.798	(5.7792)	64604.94	34.743
EVAPOTRANSPIRATION	32.258	(3.4921)	117093.40	62.969
PERCOLATION/LEAKAGE THROUGH LAYER 2	1.16924	(0.13914)	4244.251	2.28243
AVERAGE HEAD ON TOP OF LAYER 2	2.652	(0.382)		
CHANGE IN WATER STORAGE	0.003	(0.6752)	10.27	0.006

PEAK DAILY VALUES FOR YEARS 1 THROUGH 100 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.86	17641.41548	3060087
RUNOFF	5.497	19951.99699	370059
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.005442	19.75575	2890001
AVERAGE HEAD ON TOP OF LAYER 2	6.000		
SNOW WATER	4.80	17437.0317	280082
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.5010		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1350		

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FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(INCHES)	(VOL/VOL)
1	2.8314	0.4719
2	4.2700	0.4270
SNOW WATER	0.000	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                HELP MODEL VERSION 3.07 (1 November 1997)                  **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                     USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
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PRECIPITATION DATA FILE:    C:\WHI\UNSAT22\data\P424.VHP\_weather1.dat
TEMPERATURE DATA FILE:      C:\WHI\UNSAT22\data\P424.VHP\_weather2.dat
SOLAR RADIATION DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\_weather3.dat
EVAPOTRANSPIRATION DATA:    C:\WHI\UNSAT22\data\P424.VHP\_weather4.dat
SOIL AND DESIGN DATA FILE:  C:\WHI\UNSAT22\data\P424.VHP\I_0.inp
OUTPUT DATA FILE:           C:\WHI\UNSAT22\data\P424.VHP\O_0.prt


TIME:  14: 0     DATE:   6/ 7/2010


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     TITLE:  Existing Soil Only Cap - South Landfill

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
               COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                LAYER  1
                                --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   9
          THICKNESS                     =     15.24   CM
          POROSITY                      =      0.5010 VOL/VOL
          FIELD CAPACITY                =      0.2840 VOL/VOL
          WILTING POINT                 =      0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.2342 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.190000000000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	= 48.26	CM
POROSITY	= 0.4270	VOL/VOL
FIELD CAPACITY	= 0.4180	VOL/VOL
WILTING POINT	= 0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.414000000000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 30.% AND A SLOPE LENGTH OF 30. METERS.

SCS RUNOFF CURVE NUMBER	= 84.04	
FRACTION OF AREA ALLOWING RUNOFF	= 100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	= 0.4047	HECTARES
EVAPORATIVE ZONE DEPTH	= 15.2	CM
INITIAL WATER IN EVAPORATIVE ZONE	= 3.570	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	= 7.635	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	= 2.057	CM
INITIAL SNOW WATER	= 0.000	CM
INITIAL WATER IN LAYER MATERIALS	= 18.754	CM
TOTAL INITIAL WATER	= 18.754	CM
TOTAL SUBSURFACE INFLOW	= 0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Anniston AL

STATION LATITUDE	= 33.39	DEGREES
MAXIMUM LEAF AREA INDEX	= 5.00	
START OF GROWING SEASON (JULIAN DATE)	= 72	
END OF GROWING SEASON (JULIAN DATE)	= 316	
EVAPORATIVE ZONE DEPTH	= 6.0	INCHES
AVERAGE ANNUAL WIND SPEED	= 7.00	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 70.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 75.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

4.58	4.75	4.89	4.43	5.12	3.85
4.44	3.36	3.34	2.71	4.81	4.62

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.50	45.90	54.40	61.70	69.80	76.90
80.40	80.00	74.00	62.90	54.50	45.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Anniston AL
AND STATION LATITUDE = 33.66 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.99	4.77	5.13	4.30	5.18	3.56
	4.44	3.57	3.43	2.96	4.48	4.42
STD. DEVIATIONS	2.14	2.64	2.73	2.06	2.54	2.01
	2.00	1.72	2.03	1.78	2.15	2.22
RUNOFF						
TOTALS	0.733	1.183	0.805	0.326	0.467	0.110
	0.179	0.094	0.258	0.147	0.690	0.721
STD. DEVIATIONS	1.063	1.790	1.202	0.682	0.921	0.276
	0.324	0.273	0.562	0.354	0.991	1.157
EVAPOTRANSPIRATION						
TOTALS	1.444	1.845	2.726	2.952	3.519	3.074
	3.461	2.997	2.296	1.442	1.211	1.227
STD. DEVIATIONS	0.249	0.330	0.755	0.961	1.090	1.319
	1.249	1.062	0.962	0.559	0.202	0.159
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	2.5675	2.2370	1.8357	1.1586	1.1879	0.5546
	0.7228	0.5192	0.7158	1.1065	2.2801	2.4321
STD. DEVIATIONS	1.2232	1.2038	1.3555	0.9248	0.8850	0.6587
	0.7016	0.5762	0.6434	0.9075	1.2110	1.2076

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	1.2936	1.3319	0.9386	0.5204	0.5382	0.2163
	0.2977	0.1749	0.3157	0.4878	1.1964	1.2332
STD. DEVIATIONS	0.8617	0.9547	0.8573	0.5367	0.5340	0.3374
	0.3568	0.2626	0.3832	0.5433	0.8463	0.8427

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	INCHES		CU. FEET	PERCENT
PRECIPITATION	51.23	(7.782)	185952.9	100.00
RUNOFF	5.714	(3.2303)	20743.13	11.155
EVAPOTRANSPIRATION	28.194	(3.0141)	102342.57	55.037
PERCOLATION/LEAKAGE THROUGH LAYER 2	17.31760	(3.52783)	62861.503	33.80507
AVERAGE HEAD ON TOP OF LAYER 2	0.712	(0.195)		
CHANGE IN WATER STORAGE	0.002	(0.9308)	5.66	0.003

PEAK DAILY VALUES FOR YEARS 1 THROUGH 100 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.86	17641.41548	3060087
RUNOFF	4.303	15619.72405	370059
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.185294	672.60184	1360002
AVERAGE HEAD ON TOP OF LAYER 2	6.000		
SNOW WATER	4.80	17437.0317	280082
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.5010		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1350		

****

FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(INCHES)	(VOL/VOL)
1	1.5844	0.2641
2	8.1130	0.4270
SNOW WATER	0.000	

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****

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FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(INCHES)	(VOL/VOL)
1	2.8314	0.4719
2	4.2700	0.4270
SNOW WATER	0.000	

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Attachment A

Attachment A-1

CERCLA Landfills Caps RI/FS
Data Collection Guidelines

http://www.epa.gov/superfund/policy/remedy/presump/caps.htm
Last updated on Monday, May 10, 2010

Superfund

Presumptive Remedies: CERCLA Landfill Caps RI/FS Data Collection Guide

Municipal landfills constitute approximately 20 percent of all sites on the Superfund National Priorities List. Approximately 75 percent of all CERCLA Municipal Solid Waste Landfill (MSWLF) Remedial Actions call for installation of a landfill cap. The remedy selection process for MSWLFs is the basis of a U.S. Environmental Protection Agency (EPA) guidance, *Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites* (U.S. EPA, 1991), which establishes the framework for containment (including landfill cap construction, leachate collection and treatment, ground water treatment, and landfill gas collection and treatment) as the presumptive remedy for MSWLFs.

In 1992, EPA introduced the *Superfund Accelerated Cleanup Model (SACM)* to accelerate all phases of the remedial process. The presumptive remedy initiative is one tool for speeding up cleanups within SACM. One way that presumptive remedies can streamline the remedial process is through early identification of data collection needs for the remedial design. By collecting design data prior to issuance of the Record of Decision (ROD), the need for additional field investigations during the remedial design (RD) will be reduced, thereby accelerating the overall remedial process for these sites. Data needed for design also can be useful in better defining the scope of the remedy and in improving the accuracy of the cost estimate in the ROD. Since containment is the presumptive remedy for MSWLFs, the Remedial Project Manager (RPM) can begin making arrangements to collect landfill cap design data as soon as a basis for remedial action is established (e.g., ground water contaminant concentrations exceeding maximum contaminant levels [MCLs]).

This fact sheet identifies the data pertinent to landfill cap design that will be required for most sites. These data are organized within six categories: (1) waste area delineation; (2) slope stability and settlement; (3) gas generation/migration; (4) existing cover assessment; (5) surface water run-on/run-off management; and (6) clay sources. For reference, all data requirements and data collection methods discussed in this document are summarized in a table at the end of this document (Table 2). In addition to the following guidance provided in this fact sheet, RPMs should enlist the aid of technical experts familiar with landfill cap design in establishing data collection needs for specific sites.

TECHNICAL AREA 1: WASTE AREA DELINEATION

The area of a landfill cap is determined by the horizontal extent of previous waste disposal. One of the major causes of cost escalation for MSWLF sites has been the failure to establish the actual boundaries of the waste. Costly construction change orders have been required to increase the area of the cap because wastes have been found to extend well beyond the edges of the intended cap. Waste boundaries should be identified as accurately as practicable prior to initiation of the design.

Aerial photographs, maps, and a local newspaper subject search may provide a historical record of the extent and type of disposal activities conducted at the site. If appropriate, residents could be interviewed to confirm or supplement available information.

Field investigation should be used to confirm records and to collect data to delineate the outer boundaries of the waste. Field investigations normally include surface, subsurface, and noninvasive

geophysical explorations. Field investigation methods that provide information on the surface and shallow subsurface extent of waste include excavating shallow test pits, using direct-push exploration techniques, and drilling boreholes. Additional subsurface investigation methods are used to provide information on the vertical extent of waste.

Borings can be used to estimate waste thickness and condition of existing cover soils adjacent to or underlying the waste. However, drilling into or through the waste and into the underlying soils and/or bedrock should be performed only if necessary, and only if the driller is experienced in the methods used to prevent cross-contamination. Additional health and safety concerns (especially exposure to methane gas) must be addressed in the health and safety plan when borings are located in the waste.

Visual evidence of the waste boundary or subsurface contamination from these field investigation activities should be recorded and, if necessary, verification samples should be collected and shipped for laboratory analyses.

Surface geophysical methods also may be useful in delineating the waste boundary. Each method has limitations, and the selection of an appropriate method should be based on landfill characteristics and data needs. The most commonly employed geophysical methods include:

- Magnetometry (measures minor changes in earth's magnetic field)--location of waste boundary and distribution of metallic waste
- Electromagnetic Conductivity (response to artificially induced magnetic field)--location of areas of contrasting conductivity, such as a landfill or natural deposits
- Ground-Penetrating Radar (reflection of electromagnetic waves)--determination of horizontal extent and depth of disturbed soils and buried objects (often used to confirm magnetometry)
- Electrical Resistivity (measures earth's response to electrical current)--determination of edge of landfill by subsurface resistivity difference
- Seismic Refraction (natural or induced compression waves)--estimation of depth to geologic strata and bedrock adjacent to the landfill.

These noninvasive surface geophysical methods should be performed prior to invasive explorations (e.g., borings or test pits). This will allow for the more limited intrusion activities to verify the findings of the noninvasive exploration methods.

TECHNICAL AREA 2: SLOPE STABILITY AND SETTLEMENT

Waste settlement and/or slope failure of the waste and existing cover soils can occur during construction of, or after completion of, the cap. Waste settlement or slope failure (see Figure 1) may expose waste and require costly repairs. Data are needed on degree of slope, existing cover materials, and existing cover soils to create cross-sectional diagrams for use in evaluating landfill slope stability and the potential for settlement damage.

Figure 1. Typical slope failure at MSWLF site.

Settlement in a landfill can be caused by factors such as: biodegradation of wastes, consolidation of waste under the weight of waste material and cap, deterioration of partially filled containers (e.g., drums), or compaction of material during landfill operation or cap installations. Possible consequences of settlement include instability in the waste or cover soil, which can damage the cap. In fact, a recent article on cap design reports that "The center of a 20-foot diameter section of a landfill cover, for instance, could settle only 0.5 to 1.5 feet before significant cracking [of the composite clay liner] could be expected." (Koerner and Daniel, 1992) For this reason, settlement potential and stability of the landfill system should be evaluated concurrently.

The weight of the new cap can be significant enough to cause additional waste settlement and compaction. The effect of this additional weight may initiate differential settlement across the cap, thus compromising the integrity of the cap, or create stability problems such as slippage failures in

the waste and/or existing cover soil. Differential settlement occurs when one area of waste settles more readily than another because of differences in moisture content, waste compaction, or waste composition. Settlement (magnitudes typically range from 5 to 25 percent of the initial waste thickness), and especially differential settlement, may create cracks in the cap and allow rainwater to reach the waste. Changes in the topography of the landfill because of settlement may also create areas on the cap surface where rainwater can pond.

In creating the conceptual landfill cap design, three separate calculations are conducted

- Stability of waste--largely depends on how well the waste was compacted when placed, waste layer thicknesses, and waste composition
- Stability of the cap (existing and proposed)
- Settlement of waste--largely depends on how well the waste was compacted when placed, waste layer thicknesses, age, rate of waste degradation, and waste composition.

Because of their heterogeneous nature, the settlement and stability of municipal wastes are difficult to predict. Settlement rates of selected areas of the waste can be measured by placing survey monuments on top of the waste and taking periodic measurements to determine the change in elevation of the monuments. Because settlement generally occurs slowly, it is important to begin measurement early, preferably during the remedial investigation.

The settlement of the waste depends on thickness and general composition of the waste and existing topography. Compressibility characteristics are derived from preload tests and empirical correlations to data in the published literature. Data from surveying monuments, settlement plates, and topographic surveys can be used to determine surface settlement rates across the landfill.

The stability of waste can be determined by evaluating the following:

- Potentiometric surface and perched water table information--can be determined using water level measurements from piezometers and monitoring wells
- Thickness of waste
- Existing topography--can be determined from site reconnaissance and topographic surveys.

Ground motions induced by earthquakes (seismic events) can also affect cap performance through a decrease in slope stability. This fact sheet does not address the additional data required for cap designs for landfills located in seismic impact zones.

The waste thickness and composition can be determined by observing and sampling (during completion of test pits, borings, and hand-augered holes with an experienced driller) and by searching through historical records.

The existing cover soil should also be evaluated to determine its stability and potential for settlement. Studies for the stability of the existing cover soil could include:

- Maximum slope
- Soil classification
- Potentiometric surface
- Shear strength
- Thickness
- Density

Slope measurements and potentiometric surface derivations can be obtained using the same procedures used to determine waste characteristics. The remaining data can be obtained by boring, piezocone penetrometer (PCPT), geophysical techniques, and test pits. Existing cover soils should be classified by grain size and hydrometer analysis, as well as by Atterberg limits performed on borings and test pit samples. See the summary table at the end of this fact sheet (Table 2) for recommended tests to determine the shear strength for fine- and coarse-grained soils.

The stability and settlement estimates for existing cover soil depend largely on the complexity of the landfill site. Investigations necessary to evaluate physical properties of the existing cover soils will depend on the type(s) of soils encountered. If the existing cover soils are soft silts and clays, the settlement and stability evaluations will be more complex than for sands and gravels. These soil samples should be collected during drilling of monitoring wells to save time and money, usually during the remedial investigation (RI).

Additional slope stability evaluations will be performed during landfill cap design. Slopes greater than 3:1 (3 horizontal/1 vertical) and landfills that have been constructed within or adjacent to wetlands or low-strength soils are of particular concern. These areas of concern should be identified during RI/FS data collection to the extent possible.

TECHNICAL AREA 3: GAS GENERATION/MIGRATION

Assessment of the rate and composition of gas generated in the landfill will determine whether or not a gas collection layer should be included as a component of the cap. Dangers of gas generation and uncontrolled migration include vegetative kill, health risks from exposure, and explosive or lethal gas buildup within and outside of the landfill (see Figure 2). Field monitoring for the presence of landfill gases is also important in developing safety parameters and reducing health risks to personnel working on site.

Figure 2. Vertical and lateral migration of generated gas from MSWLF site.

Volatile Generation of gas typically results from the biological decomposition of organic material in the wastes. The rate and process of gas generation are dependent on the availability of moisture, temperature, organic content of the waste, waste particle size, and waste compaction.

Data immediately available in the field for assessing gas generation are landfill gas composition and gas pressure. Gas composition in soils usually is evaluated in the field by monitoring or sampling through gas probes using a methane meter, explosimeter, or organic vapor analyzer. Air samples should be analyzed for the presence of volatile organic compounds (VOCs) or semivolatile organic compounds (SVOCs). Moisture and heat content also can be determined by the laboratory or in the field with hand-held instruments. This information may be necessary to assess possible treatment alternatives for collected gas.

Gas migration is a function of site geology, chemical concentration, and pressure and density gradients. Gases migrate through the path of least resistance (e.g., coarse and porous soils, bedding stone along nearby water and sewer lines). Data for evaluating gas migration control and treatment methods include the composition of any existing landfill liners, soil stratigraphy, depth to water table, proximity of human/ecological receptors, and the locations of buried utilities and other backfilled excavations and structures.

Gas migration pathways may be identified based on knowledge of the site geology, hydrogeology, and surrounding soil characteristics and by review of water and sewer maps. Some of these data may be obtained by collecting and evaluating samples from test pits, borings, or hand-augered holes. Piezocone data also may be cost-effective for characterizing the surrounding subsurface soils at larger MSWLF sites.

Potential receptors of landfill gas emissions may be identified through site reconnaissance, and receptor locations should be monitored to assess possible accumulation of migrant landfill gases. Atmospheric monitoring at receptor locations may be done using a flame ionization detector (FID), a photoionization detector (PID), or a gas monitoring station; however, a PID will not detect methane and thus cannot be used to assess explosion risk. An oxygen meter using the Lower Explosive Limit (LEL) indicator may be used to detect explosive levels of gas.

Gas control is accomplished through either passive or active gas collection. Treatment of collected gas may be required depending on the concentration of hazardous constituents. The gas control system required will depend on the proximity of receptors, permeability of migration pathways, State and Federal regulations and guidelines, and level and rate of gas generation. Effective gas disposal methods include flaring, processing and sale, and/or sorption.

Active gas collection may be necessary to control gas migration when receptors are, or are expected to be, at risk. Active gas collection generally is required when measurements exceed either

- 5% methane at the property line or cap edge, or
- 25% methane LEL in/at on-site structures. (This subject is further addressed in the U.S. EPA Technology Brief *Data Requirements for Selecting Remedial Action Technology* [U.S. EPA, 1987].)

A gas pumping test can be used to improve the estimate of the gas permeability of the waste materials and unsaturated soils, number of collection wells required, piping size and configuration, and blower requirements. However, gas pumping tests should not be relied on without further adjustment during construction.

TECHNICAL AREA 4: EXISTING COVER ASSESSMENT

Existing landfill caps should be evaluated to determine whether or not any components can be reused in the construction of a new cap. Use of existing components could save both time and money.

Data on existing components can be readily collected because only materials above the waste need be sampled. Sampling locations and procedures that will minimize damage to geosynthetic materials should be used. Sampling holes should, at a minimum, be refilled with bentonite if the existing cap is composed of clay. Geosynthetics should be patched with materials of equal properties following manufacturer's guidelines.

Additionally, the site reconnaissance should be used to evaluate, in general, the need for regrading the landfill surface to achieve proper side slopes. Appropriate limits to the steepness of slopes can be determined from preliminary slope stability calculations. Excavation into landfill waste materials may be required to reduce slope steepness to acceptable limits.

Table 1 provides recommended guidelines for final cover designs. The assessment of the existing cover should include an evaluation of the potential for any components to meet final cover guidelines.

Table 1. Existing Cover Assessment Data Requirements and Recommended Guidelines

Data Requirements	Recommended Guidelines[a] (for Final Cover)
Slope (top)	3% to 5% minimum for drainage
Cap Area	Covers horizontal waste limits
Vegetative/Soil Layer	Vegetative soil supporting healthy low shrubs or grass, no erosion, gullies or deep rooted plants, no unacceptable frost heaves or settlement
Drainage Layer	Permeability > $1x10^{-2}$ cm/s (sand, gravel, or geosynthetic)
Barrier Layer	Two-component (geomembrane atop compacted clay[b]) composite liner below the frost zone

Gas Venting System	Either passive vents located at high points (not clogged, no settlement) or extraction and treatment system working properly

[a] Refer to EPA's Technical Guidance Document: *Final Covers on Hazardous Waste Landfills and Surface Impoundments* (U.S. EPA, 1989).
[b] Clay compacted to a permeability less than or equal to 1×10^{-7} cm/s, geomembrane thickness greater than or equal to 20 mil.

TECHNICAL AREA 5: SURFACE RUN-ON/RUN-OFF MANAGEMENT

The surface area and gradient of landfill slopes will affect surface water control measures. For the protection of both the landfill cap and adjacent areas (see Figure 3), the design of the final remedy should ensure that the site layout will provide adequate space for surface water diversion and containment/retention impoundments.

Figure 3. Storm run-off impact from an MSWLF site.

RCRA Subtitle D minimum requirements for MSWLFs (40 CFR Section 258.26) include providing a run-on control system capable of preventing flow onto the active portion of a landfill during the peak discharge from a 25-year rain storm. The regulation also requires providing run-off control systems to collect, at a minimum, the water volume resulting from a 24-hour, 25-year rainstorm. RCRA Subtitle D regulations apply to the closure of active MSWLFs and may be Applicable or Relevant and Appropriate Requirements (ARARs) for certain landfills at CERCLA sites as well.

The method for estimating run-on and run-off design discharges should be based on engineering judgment and on-site conditions (e.g., the Rational Method used by hydrologists to determine overland flow). Detailed storm flow calculations usually are done during the design phase. However, data for preliminary calculations should be collected early enough to prepare an estimate of the cost of run-on/run-off control measures as part of the remedy estimate for the ROD.

Because run-on and run-off control is required for operating landfills, some landfills may already have surface water diversion or containment impoundments that allow sediment to settle out of the run-off and that control discharge for a 25-year storm. Depending on when the landfill was designed (with respect to applicable Federal and State regulations), existing control structures may not have adequate capacity. In addition, the RI/FS should identify areas for temporary surface water controls for use during cap construction activities.

A review of the original design or site records available for a landfill may provide information on design criteria for the surface water control structures. Site reconnaissance should be conducted to evaluate the physical condition of the system. If there are no existing diversion or containment impoundments, adequate space should be located on or off site to accommodate them. Property acquisition may be necessary if on-site space is not available.

Prior to cap installation, collected or diverted run-on surface waters often can be discharged to a nearby surface waterbody or to a recharge basin. Discharge to surface water is considered a point source discharge and must comply with the National Pollution Discharge Elimination System (NPDES) requirements of the Clean Water Act. Because many States have jurisdiction for the discharge of pollutants to surface waters, permit requirements may vary depending on location, although an NPDES permit is always needed. Other factors to consider are the water quality and soil type, which can be determined by analysis of surface water samples, visual and sieve analyses of the soil, and review of NPDES compliance data (if applicable).

After the cover is installed, the collected or diverted surface water is not contaminated; therefore,

diversion or containment impoundment maintenance usually is limited to control of vegetation and debris and sediment removal. Discharge to a recharge basin is not considered a point source discharge and, generally, regulators evaluate these basins for permit compliance on a case-by-case basis.

TECHNICAL AREA 6: CLAY SOURCES

A compacted clay layer is normally one of the primary components of an effective cap, provided that sources of clay (low-permeability soil) are available at or near the landfill. Data-gathering activities should include looking for potential on-site/local clay deposits for the cap construction. Manufactured geosynthetic clay liners should be considered if the required volume or physical properties are not available in nearby soils. A comparison of geosynthetic clay liner material cost versus clay excavation and transport cost should be completed before design commences.

Investigation of potential sources for clay should be initiated prior to the preliminary conceptual cap design (which defines the components of the cover). For information on clay deposits, the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) publishes soil maps and classifications by county. Additional information on the availability of clay soils may be obtained from State natural resource inventory programs; local contractors or engineering firms practicing in the area; State and local highway officials, shallow borings, test pits, and hand-augered holes; and geotechnical laboratory testing.

After potential sources of clay are identified, a site reconnaissance may be conducted. The site reconnaissance should include sample collection via hand-augered holes or shovels to verify the availability of clay over the site.

Subsurface soil samples of the source area should be collected later to determine resource quality (shear testing of layer interfaces) and quantity. Procedures used to characterize clay sources generally include:

- Excavation of at least one test pit for every 25,000 to 50,000 cubic yards
- Collection of soil samples from test pits for laboratory characterization
- Shallow borings to confirm soil type, volume, and, in certain instances, depth to ground water
- Laboratory testing of samples collected including: grain size analysis, Atterberg limits, permeability testing, moisture content, and compaction testing. Detailed compaction requirements to meet construction quality assurance objectives are provided in *Quality Assurance and Quality Control for Waste Containment Facilities* (U.S. EPA, 1993 b).

If sufficient quantities of soil cover materials with appropriate engineering properties are not available within an economically practicable distance from the project site, geosynthetics or processed natural materials should be considered. Geosynthetic clay liners are generally manufactured by either sandwiching bentonitic clays between geotextiles or affixing the bentonitic clay to the bottom surface of a membrane. Thus, if clay is not readily available, low-permeability layers of the cap may be comprised of either available soil that is processed by adding bentonite to reduce the permeability or geosynthetic clay liners. For cap drainage layers, geosynthetic drainage nets may also be used, in lieu of coarse sand and gravel, to meet performance requirements. Information on geosynthetic clay liners and drainage nets can be obtained from manufacturer catalogues.

CONCLUSION

For each MSWLF site where capping is clearly a preferred remedy, the RPM should assemble a technical review team to determine the design data to be collected. This team should include experienced RPMs and technical experts familiar with data collection needs for cap design. The team can help the RPM in defining the field work required and its timing and in reviewing the design data submitted by the contractor. In the event that the contractor is changed (i.e., the RI/FS is Fund-led

and the design is switched to Potentially Responsible Party [PRP-led), the technical review team can assist the RPM in transferring the pertinent collected design data to the new contractor.

Table 2 summarizes the data needs and collection methods presented in this fact sheet. This table should be used as a reference when determining necessary design data collection activities.

Table 2. Data Requirements and Collection Methods

Data Requirements	Data Collection Methods
Waste Area Delineation	
Design/historical information	Historical records, personal interviews
Horizontal extent of waste	Test pits, probes, hand-augered holes, magnetometry, electromagnetic conductivity, ground-penetrating radar, electrical resistivity, seismic refraction
Depth and thickness of waste	Borings, geophysical surveys
Slope Stability and Settlement[a]	
Waste Evaluation	
Slope measurement (A)	Slope inclinometers, topographic survey
Potentiometric surface (A)	Piezometers/monitoring wells
Compressibility characteristics (C)	Preload testing, empirical correlations to published literature
Settlement rate (C)	Survey monuments, settlement plates, topographic survey
Thickness of waste (A,C)	Observation and sampling during test pits, borings, hand-augered holes, historical records, geophysical surveys

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(800) 424-9346

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Attachment A-2

Sections from the EPA Technical Guidance on Final Covers on Hazardous Waste Landfills

United States
Environmental Protection
Agency

Office of Solid Waste and
Emergency Response
Washington DC 20460

EPA 530-SW-89-047
July 1989

PB89-233480

EPA

Technical Guidance Document:

Final Covers on Hazardous Waste Landfills and Surface Impoundments

Landfill closure requirements are based on a two-part liquids management strategy of (1) minimizing the leachate generation by keeping liquids out of the unit, and (2) detecting, collecting, and removing leachate within the unit. Closure requirements are specified in 40 CFR 264.310 and 40 CFR 265.310 and include a final cover and post-closure care.

The Agency considers keeping water out of the unit to be the prime element of the strategy. Thus, the Agency believes that a properly designed and constructed cover becomes, after closure, the most important feature of the landfill structure. The Agency requires that the cover be designed and constructed to provide long-term minimization of the movement of water from the surface into the closed unit. Where the waste mass lies entirely above the zone of ground-water saturation, a properly designed and maintained cover can prevent, for all practical purposes, the entry of water into the closed unit, and thus minimize the formation and migration of leachate. In the absence of damage, the cover design recommended here, including the FML/soil low-permeability layer, should restrict infiltration, to the extent of the design, for the long term.

1.4 GENERAL COVER SYSTEM RECOMMENDATIONS

The cover system should be a major consideration during site selection, planning, and initial design of the landfill containment structure. Factors for consideration include location and availability of low-permeability soil, stockpiling of topsoil, restricting height to provide stable slopes, and site use beyond the post-closure care period.

1.4.1 Design Recommendations

The final cover recommended in this guidance document is a multilayer design (Figure 1) comprised as follows, from top to bottom:

- a top layer consisting of two components: (1) either a vegetated or armored surface component, selected to minimize erosion and, to the extent possible, promote drainage off the cover, and (2) a soil component with a minimum thickness of 60 cm [24 in.], comprised of topsoil and/or fill soil as appropriate, the surface of which slopes uniformly at least 3 percent but not more than 5 percent; a soil component of greater thickness may be required to assure that the underlying low-permeability layer is below the frost zone;

- either a soil drainage (and FML-protective bedding) layer with minimum thickness of 30 cm (12 in.) and a minimum hydraulic conductivity of 1×10^{-2} cm/sec that

will effectively minimize water infiltration into the low-permeability layer, and will have a final slope of at least 3 percent after settlement and subsidence; or a drainage layer consisting of geosynthetic materials with equivalent performance characteristics; and

- a two-component low-permeability layer, lying wholly below the frost zone, that provides long-term minimization of water infiltration into the underlying wastes, consisting of (1) a 20-mil [0.5 mm] minimum thickness flexible membrane liner [FML] component and (2) a compacted soil component with a minimum thickness of at least 60 cm [24 in.] and a maximum in-place saturated hydraulic conductivity of 1×10^{-7} cm/sec.

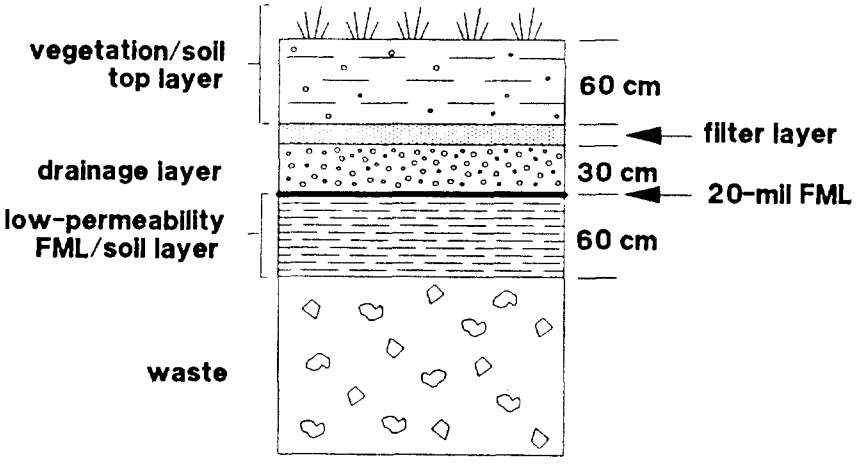

Figure 1. EPA-recommended cover design.

Optional layers may be used on a site-specific basis. Figure 2 depicts a cover design that includes optional layers. Two such layers include (1) a gas vent layer to remove gases that are produced within the wastes, and/or (2) a biotic barrier layer to protect the cover from animal or plant intrusion. Geosynthetic filter materials may also be used to prevent migration of fine materials from one layer into another or to prevent clogging of the drainage layer.

The Agency recognizes, for specific cases, that alternative designs (e.g., fewer layers or optional layers) may be applicable. For instance, in extremely arid regions, a gravel-armored top surface component might serve to compensate for a naturally reduced vegetation coverage and the erosion control that it provides. Also, in arid regions the drainage layer might not be required. In areas where burrowing animals may damage the

low-permeability layer, the damage may be prevented by use of an overlying "biotic barrier" layer of large-size material, such as cobbles. A gas vent layer between the waste and the low-permeability layer may be installed, as shown in Figure 2, at units that produce gases.

Alternative designs must provide long-term performance at least equivalent to the recommended design outlined in this guidance. All alternative designs must be approved by the appropriate Regional Administrator of the Agency.

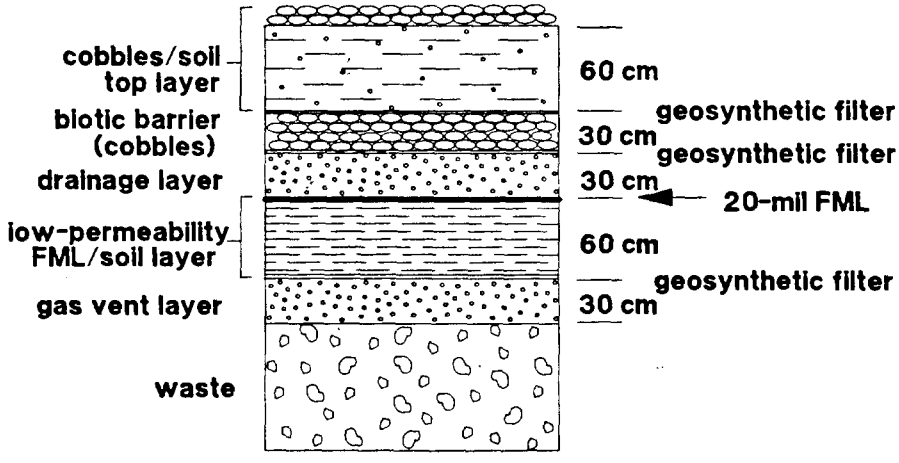

Figure 2. EPA-recommended cover design with optional layers.

In some cases, where the waste is of such character that vertical migration of gases is impeded, full-depth vent structures to the bottom of the waste mass may be needed. These structures would be designed to prevent the horizontal migration of gases out of the landfill into the surrounding soil. Active rather than passive systems may be required in some cases to adequately remove accumulated gases.

Filter layers are likely to be needed above the drainage layer and between layers that are comprised of soils of greatly different particle sizes, to prevent one from migrating into the other. The filters may be constructed of soils of intermediate grain size, or they may be geosynthetic materials. Three between-layer locations where geosynthetic filters may be appropriate are shown in Figure 2.

Table 2 presents a synopsis of the Agency-recommended components of a landfill and their principal design parameters.

1.4.2 Construction Quality Assurance (CQA)

The Agency believes that the landfill owner or operator should implement a detailed construction quality assurance (CQA) program for the final cover system based on written plans for inspecting the quality of construction materials and the construction practices employed in their placement. The Agency believes that use of a CQA program is essential for determining, with a reasonable degree of certainty, whether a completed final cover system meets or exceeds all design criteria, plans, and specifications. The Agency has issued technical guidance that includes final cover CQA (EPA, 1987i).

The Agency has proposed CQA rules for both permitted and interim status units (EPA, 1987b). These proposed rules would require a CQA program for installing the following components of landfills, surface impoundments and waste piles: foundations; low-permeability soils; FMLs; dikes; leachate detection, collection, and removal systems; and final covers. The CQA plan would be site-specific. It should address activities such as inspecting, monitoring, and sampling of the individual components. For the cover, the CQA plan should provide assurance that: 1) all layers of the final cover are uniform and damage-free; 2) the materials for each layer are as specified in the design specifications; and 3) each layer is constructed as specified in the design.

1.4.3 Settlement and Subsidence

Settlement within a closed hazardous waste landfill can disrupt the integrity and function of the final cover system. Settlement of the waste may be uniformly distributed and may occur primarily before placement of the final cover. Subsidence, however, is considered to be an unevenly distributed settlement (i.e., differential settlement) after closure that can disrupt the integrity of the final cover by creating depressions and cracks. In addition, subsidence due to the collapse of drums (this will occur mainly in older units), the leaching of soluble waste constituents, or biodegradation of organic matter in the waste, may not begin until several years after closure or it may occur gradually over decades.

To reduce the potential for damage from settlement and subsidence, the final cover should be designed and constructed to allow for the total estimated settlement. The final grade after subsidence of the cover should be at the actual desired design elevation. The cover design process used to establish the final grade elevation should include consideration of the following:

- consolidation of all waste layers (the primary consideration) and daily and intermediate soil covers;

Attachment B

activities will be conducted, the quantity of PCBs to be treated, the type of R&D technology to be used, the general physical and chemical properties of material being treated, and an estimate of the duration of the PCB activity. The EPA Regional Administrator, the State environmental protection agency, and the local environmental protection agency may waive notification in writing prior to commencement of the research.

(iii) The amount of material containing PCBs treated annually by the facility during R&D for PCB disposal activities does not exceed 500 gallons or 70 cubic feet of liquid or non-liquid PCBs and does not exceed a maximum concentration of 10,000 ppm PCBs.

(iv) No more than 1 kilogram total of pure PCBs per year is disposed of in all R&D for PCB disposal activities at a facility.

(v) Each R&D for PCB disposal activity under this section lasts no more than 1 calendar year.

(vi) Store all PCB wastes (treated and untreated PCB materials, testing samples, spent laboratory samples, residuals, untreated samples, contaminated media or instrumentation, clothing, etc.) in compliance with §761.65(b) and dispose of them according to the undiluted PCB concentration prior to treatment. However, PCB materials not treated in the R&D for PCB disposal activity may be returned either to the physical location where the samples were collected or a location where other regulated PCBs from the physical location where the samples were collected are being stored for disposal.

(vii) Use manifests pursuant to subpart K of this part for all R&D PCB wastes being transported from the R&D facility to an approved PCB storage or disposal facility. However, §§761.207 through 761.218 do not apply if the residuals or treated samples are returned either to the physical location where the samples were collected or a location where other regulated PCBs from the physical location where the samples were collected are being stored for disposal.

(viii) Package and ship all PCB wastes pursuant to DOT requirements under 49 CFR parts 171 through 180.

(ix) Comply with the recordkeeping requirements of §761.180.

(2) Do not exceed material limitations set out in paragraphs (j)(1) (iii) and (iv) of this section and the time limitation set out in paragraph (j)(1)(v) of this section without prior written approval from EPA. Requests for approval to exceed the material limitations for PCBs in R&D for PCB disposal activities as specified in this section must be submitted in writing to the EPA Regional Administrator for the Region in which the facility conducting R&D for PCB disposal activities is located. Each request shall specify the quantity or concentration requested or additional time needed for disposal and include a justification for each increase. For extensions to the duration of the R&D for PCB disposal activity, the request shall also include a report on the accomplishments and progress of the previously authorized R&D for PCB disposal activity for which the extension is sought. The EPA Regional Administrator may grant a waiver in writing for an increase in the volume of PCB material, the maximum concentration of PCBs, the total amount of pure PCBs, or the duration of the R&D activity. Approvals will state all requirements applicable to the R&D for PCB disposal activity.

(3) The EPA Regional Administrator for the Region in which an R&D for PCB disposal activity is conducted may determine, at any time, that an R&D PCB disposal approval is required under paragraphs (e) and (i)(2) of this section or §761.70(d) to ensure that any R&D for PCB disposal activity does not present an unreasonable risk of injury to health or the environment.

(Sec. 6, Pub. L. 94–469, 90 Stat. 2020 (15 U.S.C. 2605)

[44 FR 31542, May 31, 1979]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §761.60, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and on GPO Access.

§ 761.61 PCB remediation waste.

This section provides cleanup and disposal options for PCB remediation

waste. Any person cleaning up and disposing of PCBs managed under this section shall do so based on the concentration at which the PCBs are found. This section does not prohibit any person from implementing temporary emergency measures to prevent, treat, or contain further releases or mitigate migration to the environment of PCBs or PCB remediation waste.

(a) *Self-implementing on-site cleanup and disposal of PCB remediation waste.* EPA designed the self-implementing procedure for a general, moderately-sized site where there should be low residual environmental impact from remedial activities. The procedure may be less practical for larger or environmentally diverse sites. For these other sites, the self-implementing procedure still applies, but an EPA Regional Administrator may authorize more practical procedures through paragraph (c) of this section. Any person may conduct self-implementing cleanup and disposal of PCB remediation waste in accordance with the following requirements without prior written approval from EPA.

(1) *Applicability.* (i) The self-implementing procedures may not be used to clean up:

(A) Surface or ground waters.

(B) Sediments in marine and freshwater ecosystems.

(C) Sewers or sewage treatment systems.

(D) Any private or public drinking water sources or distribution systems.

(E) Grazing lands.

(F) Vegetable gardens.

(ii) The self-implementing cleanup provisions shall not be binding upon cleanups conducted under other authorities, including but not limited to, actions conducted under section 104 or section 106 of CERCLA, or section 3004(u) and (v) or section 3008(h) of RCRA.

(2) *Site characterization.* Any person conducting self-implementing cleanup of PCB remediation waste must characterize the site adequately to be able to provide the information required by paragraph (a)(3) of this section. Subpart N of this part provides a method for collecting new site characterization data or for assessing the sufficiency of existing site characterization data.

(3) *Notification and certification.* (i) At least 30 days prior to the date that the cleanup of a site begins, the person in charge of the cleanup or the owner of the property where the PCB remediation waste is located shall notify, in writing, the EPA Regional Administrator, the Director of the State or Tribal environmental protection agency, and the Director of the county or local environmental protection agency where the cleanup will be conducted. The notice shall include:

(A) The nature of the contamination, including kinds of materials contaminated.

(B) A summary of the procedures used to sample contaminated and adjacent areas and a table or cleanup site map showing PCB concentrations measured in all pre-cleanup characterization samples. The summary must include sample collection and analysis dates. The EPA Regional Administrator may require more detailed information including, but not limited to, additional characterization sampling or all sample identification numbers from all previous characterization activities at the cleanup site.

(C) The location and extent of the identified contaminated area, including topographic maps with sample collection sites cross referenced to the sample identification numbers in the data summary from paragraph (a)(3)(i)(B) of this section.

(D) A cleanup plan for the site, including schedule, disposal technology, and approach. This plan should contain options and contingencies to be used if unanticipated higher concentrations or wider distributions of PCB remediation waste are found or other obstacles force changes in the cleanup approach.

(E) A written certification, signed by the owner of the property where the cleanup site is located and the party conducting the cleanup, that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to assess or characterize the PCB contamination at the cleanup site, are on file at the location designated in the certificate, and are available for EPA inspection. Persons using alternate methods for chemical extraction and

chemical analysis for site characterization must include in the certificate a statement that such a method will be used and that a comparison study which meets or exceeds the requirements of subpart Q of this part, and for which records are on file, has been completed prior to verification sampling.

(ii) Within 30 calendar days of receiving the notification, the EPA Regional Administrator will respond in writing approving of the self-implementing cleanup, disapproving of the self-implementing cleanup, or requiring additional information. If the EPA Regional Administrator does not respond within 30 calendar days of receiving the notice, the person submitting the notification may assume that it is complete and acceptable and proceed with the cleanup according to the information the person provided to the EPA Regional Administrator. Once cleanup is underway, the person conducting the cleanup must provide any proposed changes from the notification to the EPA Regional Administrator in writing no less than 14 calendar days prior to the proposed implementation of the change. The EPA Regional Administrator will determine in his or her discretion whether to accept the change, and will respond to the change notification verbally within 7 calendar days and in writing within 14 calendar days of receiving it. If the EPA Regional Administrator does not respond verbally within 7 calendar days and in writing within 14 calendar days of receiving the change notice, the person who submitted it may deem it complete and acceptable and proceed with the cleanup according to the information in the change notice provided to the EPA Regional Administrator.

(iii) Any person conducting a cleanup activity may obtain a waiver of the 30-day notification requirement, if they receive a separate waiver, in writing, from each of the agencies they are required to notify under this section. The person must retain the original written waiver as required in paragraph (a)(9) of this section.

(4) *Cleanup levels.* For purposes of cleaning, decontaminating, or removing PCB remediation waste under this section, there are four general waste categories: bulk PCB remediation waste, non-porous surfaces, porous surfaces, and liquids. Cleanup levels are based on the kind of material and the potential exposure to PCBs left after cleanup is completed.

(i) *Bulk PCB remediation waste.* Bulk PCB remediation waste includes, but is not limited to, the following non-liquid PCB remediation waste: soil, sediments, dredged materials, muds, PCB sewage sludge, and industrial sludge.

(A) *High occupancy areas.* The cleanup level for bulk PCB remediation waste in high occupancy areas is ≤1 ppm without further conditions. High occupancy areas where bulk PCB remediation waste remains at concentrations >1 ppm and ≤10 ppm shall be covered with a cap meeting the requirements of paragraphs (a)(7) and (a)(8) of this section.

(B) *Low occupancy areas.* (*1*) The cleanup level for bulk PCB remediation waste in low occupancy areas is ≤25 ppm unless otherwise specified in this paragraph.

(*2*) Bulk PCB remediation wastes may remain at a cleanup site at concentrations >25 ppm and ≤50 ppm if the site is secured by a fence and marked with a sign including the M_L mark.

(*3*) Bulk PCB remediation wastes may remain at a cleanup site at concentrations >25 ppm and ≤100 ppm if the site is covered with a cap meeting the requirements of paragraphs (a)(7) and (a)(8) of this section.

(ii) *Non-porous surfaces.* In high occupancy areas, the surface PCB cleanup standard is ≤ 10 µg/100 cm^2 of surface area. In low occupancy areas, the surface cleanup standard is <100 µg/100 cm^2 of surface area. Select sampling locations in accordance with subpart P of this part or a sampling plan approved under paragraph (c) of this section.

(iii) *Porous surfaces.* In both high and low occupancy areas, any person disposing of porous surfaces must do so based on the levels in paragraph (a)(4)(i) of this section. Porous surfaces may be cleaned up for use in accordance with § 761.79(b)(4) or § 761.30(p).

(iv) *Liquids.* In both high and low occupancy areas, cleanup levels are the concentrations specified in § 761.79(b)(1) and (b)(2).

(v) *Change in the land use for a cleanup site.* Where there is an actual or proposed change in use of an area cleaned up to the levels of a low occupancy area, and the exposure of people or animal life in or at that area could reasonably be expected to increase, resulting in a change in status from a low occupancy area to a high occupancy area, the owner of the area shall clean up the area in accordance with the high occupancy area cleanup levels in paragraphs (a)(4)(i) through (a)(4)(iv) of this section.

(vi) The EPA Regional Administrator, as part of his or her response to a notification submitted in accordance with §761.61(a)(3) of this part, may require cleanup of the site, or portions of it, to more stringent cleanup levels than are otherwise required in this section, based on the proximity to areas such as residential dwellings, hospitals, schools, nursing homes, playgrounds, parks, day care centers, endangered species habitats, estuaries, wetlands, national parks, national wildlife refuges, commercial fisheries, and sport fisheries.

(5) *Site cleanup.* In addition to the options set out in this paragraph, PCB disposal technologies approved under §§761.60 and 761.70 are acceptable for on-site self-implementing PCB remediation waste disposal within the confines of the operating conditions of the respective approvals.

(i) *Bulk PCB remediation waste.* Any person cleaning up bulk PCB remediation waste shall do so to the levels in paragraph (a)(4)(i) of this section.

(A) Any person cleaning up bulk PCB remediation waste on-site using a soil washing process may do so without EPA approval, subject to all of the following:

(*1*) A non-chlorinated solvent is used.

(*2*) The process occurs at ambient temperature.

(*3*) The process is not exothermic.

(*4*) The process uses no external heat.

(*5*) The process has secondary containment to prevent any solvent from being released to the underlying or surrounding soils or surface waters.

(*6*) Solvent disposal, recovery, and/or reuse is in accordance with relevant provisions of approvals issued according to paragraphs (b)(1) or (c) of this section or applicable paragraphs of §761.79.

(B) Bulk PCB remediation waste may be sent off-site for decontamination or disposal in accordance with this paragraph, provided the waste is either dewatered on-site or transported off-site in containers meeting the requirements of the DOT Hazardous Materials Regulations (HMR) at 49 CFR parts 171 through 180.

(*1*) Removed water shall be disposed of according to paragraph (b)(1) of this section.

(*2*) Any person disposing off-site of dewatered bulk PCB remediation waste shall do so as follows:

(*i*) Unless sampled and analyzed for disposal according to the procedures set out in §§761.283, 761.286, and 761.292, the bulk PCB remediation waste shall be assumed to contain ≥50 ppm PCBs.

(*ii*) Bulk PCB remediation wastes with a PCB concentration of <50 ppm shall be disposed of in accordance with paragraph (a)(5)(v)(A) of this section.

(*iii*) Bulk PCB remediation wastes with a PCB concentration ≥50 ppm shall be disposed of in a hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA, or a PCB disposal facility approved under this part.

(*iv*) The generator must provide written notice, including the quantity to be shipped and highest concentration of PCBs (using extraction EPA Method 3500B/3540C or Method 3500B/3550B followed by chemical analysis using EPA Method 8082 in SW-846 or methods validated under subpart Q of this part) at least 15 days before the first shipment of bulk PCB remediation waste from each cleanup site by the generator, to each off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval.

(*3*) Any person may decontaminate bulk PCB remediation waste in accordance with §761.79 and return the waste to the cleanup site for disposal as long as the cleanup standards of paragraph (a)(4) of this section are met.

(ii) *Non-porous surfaces.* PCB remediation waste non-porous surfaces shall be cleaned on-site or off-site for disposal on-site, disposal off-site, or use, as follows:

(A) For on-site disposal, non-porous surfaces shall be cleaned on-site or off-site to the levels in paragraph (a)(4)(ii) of this section using:

(*1*) Procedures approved under §761.79.

(*2*) Technologies approved under §761.60(e).

(*3*) Procedures or technologies approved under paragraph (c) of this section.

(B) For off-site disposal, non-porous surfaces:

(*1*) Having surface concentrations <100 μg/100 cm^2 shall be disposed of in accordance with paragraph (a)(5)(i)(B)(*2*)(*ii*) of this section. Metal surfaces may be thermally decontaminated in accordance with §761.79(c)(6)(i).

(*2*) Having surface concentrations ≥100 μg/100 cm^2 shall be disposed of in accordance with paragraph (a)(5)(i)(B)(*2*)(*iii*) of this section. Metal surfaces may be thermally decontaminated in accordance with §761.79(c)(6)(ii).

(C) For use, non-porous surfaces shall be decontaminated on-site or off-site to the standards specified in §761.79(b)(3) or in accordance with §761.79(c).

(iii) *Porous surfaces.* Porous surfaces shall be disposed on-site or off-site as bulk PCB remediation waste according to paragraph (a)(5)(i) of this section or decontaminated for use according to §761.79(b)(4), as applicable.

(iv) *Liquids.* Any person disposing of liquid PCB remediation waste shall either:

(A) Decontaminate the waste to the levels specified in §761.79(b)(1) or (b)(2).

(B) Dispose of the waste in accordance with paragraph (b) of this section or an approval issued under paragraph (c) of this section.

(v) *Cleanup wastes.* Any person generating the following wastes during and from the cleanup of PCB remediation waste shall dispose of or reuse them using one of the following methods:

(A) Non-liquid cleaning materials and personal protective equipment waste at any concentration, including non-porous surfaces and other non-liquid materials such as rags, gloves, booties, other disposable personal protective equipment, and similar materials resulting from cleanup activities shall be either decontaminated in accordance with §761.79(b) or (c), or disposed of in one of the following facilities, without regard to the requirements of subparts J and K of this part:

(*1*) A facility permitted, licensed, or registered by a State to manage municipal solid waste subject to part 258 of this chapter.

(*2*) A facility permitted, licensed, or registered by a State to manage non-municipal non-hazardous waste subject to §§257.5 through 257.30 of this chapter, as applicable.

(*3*) A hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA.

(*4*) A PCB disposal facility approved under this part.

(B) Cleaning solvents, abrasives, and equipment may be reused after decontamination in accordance with §761.79.

(6) *Cleanup verification*—(i) *Sampling and analysis.* Any person collecting and analyzing samples to verify the cleanup and on-site disposal of bulk PCB remediation wastes and porous surfaces must do so in accordance with subpart O of this part. Any person collecting and analyzing samples from non-porous surfaces must do so in accordance with subpart P of this part. Any person collecting and analyzing samples from liquids must do so in accordance with §761.269. Any person conducting interim sampling during PCB remediation waste cleanup to determine when to sample to verify that cleanup is complete, may use PCB field screening tests.

(ii) *Verification.* (A) Where sample analysis results in a measurement of PCBs less than or equal to the levels specified in paragraph (a)(4) of this section, self-implementing cleanup is complete.

(B) Where sample analysis results in a measurement of PCBs greater than the levels specified in paragraph (a)(4) of this section, self-implementing cleanup of the sampled PCB remediation waste is not complete. The owner or operator of the site must either dispose of the sampled PCB remediation waste, or reclean the waste represented by the sample and reinitiate sampling and analysis in accordance with paragraph (a)(6)(i) of this section.

(7) *Cap requirements.* A cap means, when referring to on-site cleanup and disposal of PCB remediation waste, a uniform placement of concrete, asphalt, or similar material of minimum thickness spread over the area where remediation waste was removed or left in place in order to prevent or minimize human exposure, infiltration of water, and erosion. Any person designing and constructing a cap must do so in accordance with §264.310(a) of this chapter, and ensure that it complies with the permeability, sieve, liquid limit, and plasticity index parameters in §761.75(b)(1)(ii) through (b)(1)(v). A cap of compacted soil shall have a minimum thickness of 25 cm (10 inches). A concrete or asphalt cap shall have a minimum thickness of 15 cm (6 inches). A cap must be of sufficient strength to maintain its effectiveness and integrity during the use of the cap surface which is exposed to the environment. A cap shall not be contaminated at a level ≥1 ppm PCB per Aroclor™ (or equivalent) or per congener. Repairs shall begin within 72 hours of discovery for any breaches which would impair the integrity of the cap.

(8) *Deed restrictions for caps, fences and low occupancy areas.* When a cleanup activity conducted under this section includes the use of a fence or a cap, the owner of the site must maintain the fence or cap, in perpetuity. In addition, whenever a cap, or the procedures and requirements for a low occupancy area, is used, the owner of the site must meet the following conditions:

(i) Within 60 days of completion of a cleanup activity under this section, the owner of the property shall:

(A) Record, in accordance with State law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will in perpetuity notify any potential purchaser of the property:

(*1*) That the land has been used for PCB remediation waste disposal and is restricted to use as a low occupancy area as defined in §761.3.

(*2*) Of the existence of the fence or cap and the requirement to maintain the fence or cap.

(*3*) The applicable cleanup levels left at the site, inside the fence, and/or under the cap.

(B) Submit a certification, signed by the owner, that he/she has recorded the notation specified in paragraph (a)(8)(i)(A) of this section to the EPA Regional Administrator.

(ii) The owner of a site being cleaned up under this section may remove a fence or cap after conducting additional cleanup activities and achieving cleanup levels, specified in paragraph (a)(4) of this section, which do not require a cap or fence. The owner may remove the notice on the deed no earlier than 30 days after achieving the cleanup levels specified in this section which do not require a fence or cap.

(9) *Recordkeeping.* For paragraphs (a)(3), (a)(4), and (a)(5) of this section, recordkeeping is required in accordance with §761.125(c)(5).

(b) *Performance-based disposal.* (1) Any person disposing of liquid PCB remediation waste shall do so according to §761.60(a) or (e), or decontaminate it in accordance with §761.79.

(2) Any person disposing of non-liquid PCB remediation waste shall do so by one of the following methods:

(i) Dispose of it in a high temperature incinerator approved under §761.70(b), an alternate disposal method approved under §761.60(e), a chemical waste landfill approved under §761.75, or in a facility with a coordinated approval issued under §761.77.

(ii) Decontaminate it in accordance with §761.79.

(3) Any person may manage or dispose of material containing <50 ppm PCBs that has been dredged or excavated from waters of the United States:

(i) In accordance with a permit that has been issued under section 404 of the Clean Water Act, or the equivalent of such a permit as provided for in regulations of the U.S. Army Corps of Engineers at 33 CFR part 320.

(ii) In accordance with a permit issued by the U.S. Army Corps of Engineers under section 103 of the Marine Protection, Research, and Sanctuaries Act, or the equivalent of such a permit as provided for in regulations of the U.S. Army Corps of Engineers at 33 CFR part 320.

(c) *Risk-based disposal approval.* (1) Any person wishing to sample, cleanup, or dispose of PCB remediation waste in a manner other than prescribed in paragraphs (a) or (b) of this section, or store PCB remediation waste in a manner other than prescribed in § 761.65, must apply in writing to the EPA Regional Administrator in the Region where the sampling, cleanup, disposal or storage site is located, for sampling, cleanup, disposal or storage occurring in a single EPA Region; or to the Director of the National Program Chemicals Division, for sampling, cleanup, disposal or storage occurring in more than one EPA Region. Each application must contain information described in the notification required by § 761.61(a)(3). EPA may request other information that it believes necessary to evaluate the application. No person may conduct cleanup activities under this paragraph prior to obtaining written approval by EPA.

(2) EPA will issue a written decision on each application for a risk-based method for PCB remediation wastes. EPA will approve such an application if it finds that the method will not pose an unreasonable risk of injury to health or the environment.

[63 FR 35448, June 29, 1998, as amended at 64 FR 33761, June 24, 1999]

§ 761.62 Disposal of PCB bulk product waste.

PCB bulk product waste shall be disposed of in accordance with paragraph (a), (b), or (c) of this section. Under some of these provisions, it may not be necessary to determine the PCB concentration or leaching characteristics of the PCB bulk product waste. When it is necessary to analyze the waste to make either of these determinations, use the applicable procedures in subpart R of this part to sample the waste for analysis, unless EPA approves another sampling plan under paragraph (c) of this section.

(a) *Performance-based disposal.* Any person disposing of PCB bulk product waste may do so as follows:

(1) In an incinerator approved under § 761.70.

(2) In a chemical waste landfill approved under § 761.75.

(3) In a hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA.

(4) Under an alternate disposal approval under § 761.60(e).

(5) In accordance with the decontamination provisions of § 761.79.

(6) For metal surfaces in contact with PCBs, in accordance with the thermal decontamination provisions of § 761.79(c)(6).

(7) In accordance with a TSCA PCB Coordinated Approval issued under § 761.77.

(b) *Disposal in solid waste landfills.* (1) Any person may dispose of the following PCB bulk product waste in a facility permitted, licensed, or registered by a State as a municipal or non-municipal non-hazardous waste landfill:

(i) Plastics (such as plastic insulation from wire or cable; radio, television and computer casings; vehicle parts; or furniture laminates); preformed or molded rubber parts and components; applied dried paints, varnishes, waxes or other similar coatings or sealants; caulking; Galbestos; non-liquid building demolition debris; or non-liquid PCB bulk product waste from the shredding of automobiles or household appliances from which PCB small capacitors have been removed (shredder fluff).

(ii) Other PCB bulk product waste, sampled in accordance with the protocols set out in subpart R of this part, that leaches PCBs at <10 µg/L of water measured using a procedure used to simulate leachate generation.

(2) Any person may dispose of PCB bulk product waste other than those materials meeting the conditions of paragraph (b)(1) of this section, (e.g., paper or felt gaskets contaminated by liquid PCBs in a facility that is permitted, licensed, or registered by a State to manage municipal solid waste subject to part 258 of this chapter or non-municipal non-hazardous waste subject to §§ 257.5 through 257.30 of this chapter, as applicable, if:

(i) The PCB bulk product waste is segregated from organic liquids disposed of in the landfill unit.

(ii) Leachate is collected from the landfill unit and monitored for PCBs.

otherwise allowed under subpart D of this part.

[63 FR 35455, June 29, 1998, as amended at 64 FR 33761, June 24, 1999]

§ 761.75 Chemical waste landfills.

This section applies to facilities used to dispose of PCBs in accordance with the part.

(a) *General.* A chemical waste landfill used for the disposal of PCBs and PCB Items shall be approved by the Agency Regional Administrator pursuant to paragraph (c) of this section. The landfill shall meet all of the requirements specified in paragraph (b) of this section, unless a waiver from these requirements is obtained pursuant to paragraph (c)(4) of this section. In addition, the landfill shall meet any other requirements that may be prescribed pursuant to paragraph (c)(3) of this section.

(b) *Technical requirements.* Requirements for chemical waste landfills used for the disposal of PCBs and PCB Items are as follows:

(1) *Soils.* The landfill site shall be located in thick, relatively impermeable formations such as large-area clay pans. Where this is not possible, the soil shall have a high clay and silt content with the following parameters:

(i) In-place soil thickness, 4 feet or compacted soil liner thickness, 3 feet;

(ii) Permeability (cm/sec), equal to or less than 1×10^{-7};

(iii) Percent soil passing No. 200 Sieve, >30;

(iv) Liquid Limit, >30; and

(v) Plasticity Index >15.

(2) *Synthetic membrane liners.* Synthetic membrane liners shall be used when, in the judgment of the Regional Administrator, the hydrologic or geologic conditions at the landfill require such a liner in order to provide at least a permeability equivalent to the soils in paragraph (b)(1) of this section. Whenever a synthetic liner is used at a landfill site, special precautions shall be taken to insure that its integrity is maintained and that it is chemically compatible with PCBs. Adequate soil underlining and soil cover shall be provided to prevent excessive stress on the liner and to prevent rupture of the liner. The liner must have a minimum thickness of 30 mils.

(3) *Hydrologic conditions.* The bottom of the landfill shall be above the historical high groundwater table as provided below. Floodplains, shorelands, and groundwater recharge areas shall be avoided. There shall be no hydraulic connection between the site and standing or flowing surface water. The site shall have monitoring wells and leachate collection. The bottom of the landfill liner system or natural in-place soil barrier shall be at least fifty feet from the historical high water table.

(4) *Flood protection.* (i) If the landfill site is below the 100-year floodwater elevation, the operator shall provide surface water diversion dikes around the perimeter of the landfill site with a minimum height equal to two feet above the 100-year floodwater elevation.

(ii) If the landfill site is above the 100-year floodwater elevation, the operators shall provide diversion structures capable of diverting all of the surface water runoff from a 24-hour, 25-year storm.

(5) *Topography.* The landfill site shall be located in an area of low to moderate relief to minimize erosion and to help prevent landslides or slumping.

(6) *Monitoring systems*—(i) *Water sampling.* (A) For all sites receiving PCBs, the ground and surface water from the disposal site area shall be sampled prior to commencing operations under an approval provided in paragraph (c) of this section for use as baseline data.

(B) Any surface watercourse designated by the Regional Administrator using the authority provided in paragraph (c)(3)(ii) of this section shall be sampled at least monthly when the landfill is being used for disposal operations.

(C) Any surface watercourse designated by the Regional Administrator using the authority provided in paragraph (c)(3)(ii) of this section shall be sampled for a time period specified by the Regional Administrator on a frequency of no less than once every six months after final closure of the disposal area.

(ii) *Groundwater monitor wells.* (A) If underlying earth materials are homogenous, impermeable, and uniformly sloping in one direction, only three sampling points shall be necessary.

These three points shall be equally spaced on a line through the center of the disposal area and extending from the area of highest water table elevation to the area of the lowest water table elevation on the property.

(B) All monitor wells shall be cased and the annular space between the monitor zone (zone of saturation) and the surface shall be completely backfilled with Portland cement or an equivalent material and plugged with Portland cement to effectively prevent percolation of surface water into the well bore. The well opening at the surface shall have a removable cap to provide access and to prevent entrance of rainfall or stormwater runoff. The well shall be pumped to remove the volume of liquid initially contained in the well before obtaining a sample for analysis. The discharge shall be treated to meet applicable State or Federal discharge standards or recycled to the chemical waste landfill.

(iii) *Water analysis.* As a minimum, all samples shall be analyzed for the following parameters, and all data and records of the sampling and analysis shall be maintained as required in §761.180(d)(1). Sampling methods and analytical procedures for these parameters shall comply with those specified in 40 CFR part 136 as amended in 41 FR 52779 on December 1, 1976.

(A) PCBs.

(B) pH.

(C) Specific conductance.

(D) Chlorinated organics.

(7) *Leachate collection.* A leachate collection monitoring system shall be installed above the chemical waste landfill. Leachate collection systems shall be monitored monthly for quantity and physicochemical characteristics of leachate produced. The leachate should be either treated to acceptable limits for discharge in accordance with a State or Federal permit or disposed of by another State or Federally approved method. Water analysis shall be conducted as provided in paragraph (b)(6)(iii) of this section. Acceptable leachate monitoring/collection systems shall be any of the following designs, unless a waiver is obtained pursuant to paragraph (c)(4) of this section.

(i) *Simple leachate collection.* This system consists of a gravity flow drainfield installed above the waste disposal unit liner. This design is recommended for use when semi-solid or leachable solid wastes are placed in a lined pit excavated into a relatively thick, unsaturated, homogenous layer of low permeability soil.

(ii) *Compound leachate collection.* This system consists of a gravity flow drainfield installed above the waste disposal unit liner and above a secondary installed liner. This design is recommended for use when semi-liquid or leachable solid wastes are placed in a lined pit excavated into relatively permeable soil.

(iii) *Suction lysimeters.* This system consists of a network of porous ceramic cups connected by hoses/tubing to a vacuum pump. The porous ceramic cups or suction lysimeters are installed along the sides and under the bottom of the waste disposal unit liner. This type of system works best when installed in a relatively permeable unsaturated soil immediately adjacent to the bottom and/or sides of the disposal facility.

(8) *Chemical waste landfill operations.* (i) PCBs and PCB Items shall be placed in a landfill in a manner that will prevent damage to containers or articles. Other wastes placed in the landfill that are not chemically compatible with PCBs and PCB Items including organic solvents shall be segregated from the PCBs throughout the waste handling and disposal process.

(ii) An operation plan shall be developed and submitted to the Regional Administrator for approval as required in paragraph (c) of this section. This plan shall include detailed explanations of the procedures to be used for recordkeeping, surface water handling procedures, excavation and backfilling, waste segregation burial coordinates, vehicle and equipment movement, use of roadways, leachate collection systems, sampling and monitoring procedures, monitoring wells, environmental emergency contingency plans, and security measures to protect against vandalism and unauthorized waste placements. EPA guidelines entitled ''Thermal Processing and Land Disposal of Solid Waste'' (39 FR 29337, Aug. 14, 1974) are a useful reference in preparation of this plan. If the facility is to

be used to dispose of liquid wastes containing between 50 ppm and 500 ppm PCB, the operations plan must include procedures to determine that liquid PCBs to be disposed of at the landfill do not exceed 500 ppm PCB and measures to prevent the migration of PCBs from the landfill. Bulk liquids not exceeding 500 ppm PCBs may be disposed of provided such waste is pretreated and/or stabilized (e.g., chemically fixed, evaporated, mixed with dry inert absorbant) to reduce its liquid content or increase its solid content so that a non-flowing consistency is achieved to eliminate the presence of free liquids prior to final disposal in a landfill. PCB Container of liquid PCBs with a concentration between 50 and 500 ppm PCB may be disposed of if each container is surrounded by an amount of inert sorbant material capable of absorbing all of the liquid contents of the container.

(iii) Ignitable wastes shall not be disposed of in chemical waste landfills. Liquid ignitable wastes are wastes that have a flash point less than 60 degrees C (140 degrees F) as determined by the following method or an equivalent method: Flash point of liquids shall be determined by a Pensky-Martens Closed Cup Tester, using the protocol specified in ASTM D 93–90, or the Setaflash Closed Tester using the protocol specified in ASTM Standard D–3278–89.

(iv) Records shall be maintained for all PCB disposal operations and shall include information on the PCB concentration in liquid wastes and the three dimensional burial coordinates for PCBs and PCB Items. Additional records shall be developed and maintained as required in §761.180.

(9) *Supporting facilities.* (i) A six foot woven mesh fence, wall, or similar device shall be placed around the site to prevent unauthorized persons and animals from entering.

(ii) Roads shall be maintained to and within the site which are adequate to support the operation and maintenance of the site without causing safety or nuisance problems or hazardous conditions.

(iii) The site shall be operated and maintained in a manner to prevent safety problems or hazardous conditions resulting from spilled liquids and windblown materials.

(c) *Approval of chemical waste landfills.* Prior to the disposal of any PCBs and PCB Items in a chemical waste landfill, the owner or operator of the landfill shall receive written approval of the Agency Regional Administrator for the Region in which the landfill is located. The approval shall be obtained in the following manner:

(1) *Initial report.* The owner or operator shall submit to the Regional Administrator an initial report which contains:

(i) The location of the landfill;

(ii) A detailed description of the landfill including general site plans and design drawings;

(iii) An engineering report describing the manner is which the landfill complies with the requirements for chemical waste landfills specified in paragraph (b) of this section;

(iv) Sampling and monitoring equipment and facilities available;

(v) Expected waste volumes of PCBs;

(vi) General description of waste materials other than PCBs that are expected to be disposed of in the landfill;

(vii) Landfill operations plan as required in paragraph (b) of this section;

(viii) Any local, State, or Federal permits or approvals; and

(ix) Any schedules or plans for complying with the approval requirements of these regulations.

(2) *Other information.* In addition to the information contained in the report described in paragraph (c)(1) of this section, the Regional Administrator may require the owner or operator to submit any other information that the Regional Administrator finds to be reasonably necessary to determine whether a chemical waste landfill should be approved. Such other information shall be restricted to the types of information required in paragraphs (c)(1) (i) through (ix) of this section.

(3) *Contents of approval.* (i) Except as provided in paragraph (c)(4) of this section the Regional Administrator may not approve a chemical waste landfill for the disposal of PCBs and PCB Items, unless he finds that the landfill meets all of the requirements of paragraph (b) of this section.

(ii) In addition to the requirements of paragraph (b) of this section, the Regional Administrator may include in an approval any other requirements or provisions that the Regional Administrator finds are necessary to ensure that operation of the chemical waste landfill does not present an unreasonable risk of injury to health or the environment from PCBs. Such provisions may include a fixed period of time for which the approval is valid.

The approval may also include a stipulation that the operator of the chemical waste landfill report to the Regional Administrator any instance when PCBs are detectable during monitoring activities conducted pursuant to paragraph (b)(6) of this section.

(4) *Waivers.* An owner or operator of a chemical waste landfill may submit evidence to the Regional Administrator that operation of the landfill will not present an unreasonable risk of injury to health or the environment from PCBs when one or more of the requirements of paragraph (b) of this section are not met. On the basis of such evidence and any other available information, the Regional Administrator may in his discretion find that one or more of the requirements of paragraph (b) of this section is not necessary to protect against such a risk and may waive the requirements in any approval for that landfill. Any finding and waiver under this paragraph will be stated in writing and included as part of the approval.

(5) *Persons approved.* Any approval will designate the persons who own and who are authorized to operate the chemical waste landfill, and will apply only to such persons, except as provided by paragraph (c)(7) of this section.

(6) *Final approval.* Approval of a chemical waste landfill will be in writing and will be signed by the Regional Administrator. The approval will state all requirements applicable to the approved landfill.

(7) *Transfer of property.* Any person who owns or operates an approved chemical waste landfill must notify EPA at least 30 days before transferring ownership in the property or transferring the right to conduct the chemical waste landfill operation. The transferor must also submit to EPA, at least 30 days before such transfer, a notarized affidavit signed by the transferee which states that the transferee will abide by the transferor's EPA chemical waste landfill approval. Within 30 days of receiving such notification and affidavit, EPA will issue an amended approval substituting the transferee's name for the transferor's name, or EPA may require the transferee to apply for a new chemical waste landfill approval. In the latter case, the transferee must abide by the transferor's EPA approval until EPA issues the new approval to the transferee.

(Sec. 6, Pub. L. 94–469, 90 Stat. 2020 (15 U.S.C. 2605)

[44 FR 31542, May 31, 1979. Redesignated at 47 FR 19527, May 6, 1982, and amended at 48 FR 5730, Feb. 8, 1983; 49 FR 28191, July 10, 1984; 53 FR 12524, Apr. 15, 1988; 53 FR 21641, June 9, 1988; 57 FR 13323, Apr. 16, 1992; 63 FR 35456, June 29, 1998]

§ 761.77 Coordinated approval.

(a) *General requirements.* Notwithstanding any other provision of this part, the EPA Regional Administrator for the Region in which a PCB disposal or PCB commercial storage facility described in paragraphs (b) and (c) of this section is located may issue a TSCA PCB Coordinated Approval to the persons described in those paragraphs if the conditions listed in this section are met. A TSCA PCB Coordinated Approval will designate the persons who own and who are authorized to operate the facilities described in paragraphs (b) and (c) of this section and will apply only to such persons. All requirements, conditions, and limitations of any other permit or waste management document cited or described in paragraphs (b) and (c) of this section, as the technical or legal basis on which the TSCA PCB Coordinated Approval is issued, are conditions of the TSCA PCB Coordinated Approval.

(1) Persons seeking a TSCA PCB Coordinated Approval shall submit a request for approval by certified mail, to the EPA Regional Administrator for the Region in which the activity will take place. Persons seeking a TSCA PCB Coordinated Approval for a new PCB activity shall submit the request for approval at the same time they

(b)(3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

[57 FR 3491, Jan. 29, 1992, as amended at 71 FR 40273, July 14, 2006]

§§ 264.305–264.308 [Reserved]

§ 264.309 Surveying and recordkeeping.

The owner or operator of a landfill must maintain the following items in the operating record required under § 264.73:

(a) On a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks; and

(b) The contents of each cell and the approximate location of each hazardous waste type within each cell.

[47 FR 32365, July 26, 1982, as amended at 50 FR 4514, Jan. 31, 1985]

§ 264.310 Closure and post-closure care.

(a) At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:

(1) Provide long-term minimization of migration of liquids through the closed landfill;

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

(b) After final closure, the owner or operator must comply with all post-closure requirements contained in §§ 264.117 through 264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under § 264.117). The owner or operator must:

(1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

(2) Continue to operate the leachate collection and removal system until leachate is no longer detected;

(3) Maintain and monitor the leak detection system in accordance with §§ 264.301(c)(3)(iv) and (4) and 264.303(c), and comply with all other applicable leak detection system requirements of this part;

(4) Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of subpart F of this part;

(5) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and

(6) Protect and maintain surveyed benchmarks used in complying with § 264.309.

[47 FR 32365, July 26, 1982, as amended at 50 FR 28748, July 15, 1985; 57 FR 3491, Jan. 29, 1992]

§ 264.311 [Reserved]

§ 264.312 Special requirements for ignitable or reactive waste.

(a) Except as provided in paragraph (b) of this section, and in § 264.316, ignitable or reactive waste must not be placed in a landfill, unless the waste and landfill meet all applicable requirements of part 268, and:

(1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under § 261.21 or § 261.23 of this chapter; and

(2) Section 264.17(b) is complied with.

(b) Except for prohibited wastes which remain subject to treatment standards in subpart D of part 268, ignitable wastes in containers may be landfilled without meeting the requirements of paragraph (a) of this section, provided that the wastes are disposed of in such a way that they are protected from any material or conditions

Attachment C

SOUTH LANDFILL
CAP CHARACTERIZATION
INVESTIGATION

CELL	THICKNESS VERIFICATION POINT	NORTHING	EASTING	DEPTH (IN.)	PERMEABILITY
CELL 1E	1E1	1145191.752	650976.4288	24	1.8 E -05
CELL 1E	1E2	1145138.251	651074.671	20	
CELL 1E	1E3	1145212.077	651025.596	6	
CELL 1E	1E4	1145242.886	650895.446	24	
CELL 1E	1E5	1145179.068	650899.829	24	
CELL 2E	2E1	1145317.927	651139.2465	24	
CELL 2E	2E2	1145241.012	651280.888	14	
CELL 2E	2E3	1145429.817	651137.219	24	8.4 E -07
CELL 2E	2E4	1145403.863	650998.371	24	
CELL 2E	2E5	1145308.804	650935.354	24	
CELL 3E	3E1	1145500.962	651488.4782	24	
CELL 3E	3E2	1145468.394	651549.506	24	4.7 E -06
CELL 3E	3E3	1145574.588	651499.189	13	
CELL 3E	3E4	1145518.499	651372.656	9	
CELL 3E	3E5	1145395.531	651431.163	19	

OWR-05D

CELL 1W

CELL 2W

CELL 2WA

CELL 3W

CELL 4E

CELL 2E

CELL 3E

CELL 1E

3E3

3E4

3E1

3E2

3E5

2E3

2E4

2E1

2E5

2E2

1E4

1E3

1E1

1E5

1E2

LEGEND

- Trees
- Grass and Clay Cover
- Grass and HDPE Liner
- Grass and Soil Cover
- Trees and Soil Cover
- Approximate Location of Observed Seep Area
- GPS Locations of Thickness Verification
- Shelby Tube Location for Permeability Testing
- Monitoring Well

NOTES

SOURCE USGS 1:2,400 Quad Maps; Golder Associates (on-site base map)

ZONE Alabama East 101

MAP PROJECTION US State Plane

DATUM NAD83

LOCATION MAP

N W E S

Anniston

SCALE

50 25 0 50 100 Feet

SOLUTIA

Golder Associates

PRODUCED BY:	CHECKED BY:	REVIEWED BY:
BDJ	TIR	SJM
DATE: 05/05/10	PROJECT NO: 0433746OU3	FIGURE NO. 1

Map Document: Q:\GIS\SOLUTIA\+GIS\PROJECTS\EPA_Dispute\South\LF_Sample_Pts.mxd 4/29/2010 11:00:43 AM

TABLE 1
SOUTH LANDFILL CAP MATERIAL OBSERVATIONS
ANNISTON PCB SITE - OPERABLE UNIT 3

Sample Identification	Total Boring Depth (inches)	Soil Type (USCS)	Permeability (cm/sec)	Sample Description
1E-1	24	(CL)	1.8E-05	0-24" - Red/Brown Silty CLAY
1E-2	20	--	--	0-20" - Brown SAND/CLAY, Gravel at 20"
1E-3	6	--	--	0-6" - Gravel
1E-4	24	--	--	0-3" - Brown Sandy CLAY, 4-24" - Red/Brown CLAY
1E-5	24	--	--	0-24" - Red/Brown CLAY
2E-1	24	--	--	0-6" - Brown SAND/CLAY, 7-24" - Red/Brown SILT/CLAY
2E-2	14	--	--	0-6" - Brown SAND/CLAY, 7-14" - Red/Brown SILT/CLAY, Gravel at 14"
2E-3	24	(ML)	8.4E-07	0-5" - Brown SAND/CLAY, 6-24" - Red/Brown CLAY
2E-4	24	--	--	0-3" - Brown SAND/CLAY, 4-24" - Red/Brown CLAY
2E-5	24	--	--	0-3" - Brown SAND/CLAY, 4-24" - Red/Brown CLAY
3E-1	24	--	--	0-21" - Brown CLAY/SAND, 21-24" - Light Red/Brown Silty CLAY
3E-2	24	(ML)	4.7E-06	0-24" - Light Red Silty CLAY
3E-3	13	--	--	0-13" - Brown CLAY/SAND, Gravel at 13"
3E-4	9	--	--	0-9" - Brown CLAY/SAND, Gravel at 9"
3E-5	19	--	--	0-6" - Brown CLAY/SAND, 7-19" - Red/Brown Silty CLAY, Gravel at 19"

Notes:
-- Samples were not collected for analysis
Refer to Figure 1 for sample locations
CL - Low Plasticity Clay
ML - Low Plasticity Silt
Sample Descriptions based on field observations

APPENDIX D

Exposure Point Concentration Analyses

Golder Associates	**SUBJ:**	Appendix D - FS Report - Exposure Point Concentration Analyses	
	Job No.:	043-3746OU3	**Prepared:** GLH
	Ref.:	Anniston PCB Site - OU-3 Feasibility Study	**Checked:** SJM
	Date:	Jun-03-2010	**Reviewed:** SJM

Objective:

Calculate the Exposure Point Concentrations (EPCs) for OU-3 of the Anniston PCB Site for total PCBs and arsenic in surface soil. This analysis provides EPCs calculations for two scenarios. The first scenario provides calculations to match the results presented in the site-specific Human Health Risk Assessment (HHRA) prepared by CDM Federal Programs Corporation (CDM) for the United States Environmental Protection Agency (EPA) as submitted on 14 January 2008. The second scenario provides EPC calculations representative of post-remedial conditions following implementation of the proposed remedial alternatives for soil.

Method:

An EPC is an estimate of the concentration of a constituent of concern (COC) at points of exposure for different groups of receptors (CDM, 2008). This concentration term is calculated as the lower of the maximum detected concentration or the upper one-sided 95 percent confidence limit of the arithmetic mean concentration (95% UCL). The 95% UCL is used to help ensure that the average concentration is not underestimated. As done in the CDM HHRA analyses for OU-3 (as detailed in Section 3.4 of the HHRA), EPCs for OU-3 were calculated in 1 of 2 ways. For datasets (samples for a specific chemical and media) with less than 10 samples, the maximum measured concentration is used to represent the EPC. For datasets with greater than 10 samples, the lower value of the UCL and the maximum detected value were selected as the EPC. To calculate the appropriate 95% UCL, CDM and the current analyses utilize the EPA recommended computer statistical software program ProUCL Version 4 (ProUCL).

As summarized in the HHRA: "The ProUCL program contains rigorous parametric and nonparametric (including bootstrapping methods) statistical methods ... and ProUCL also provides goodness-of-fit tests for normal, lognormal, and gamma distributions where the non-detect values can be extrapolated (estimated) based upon normal regression on statistics (ROS), gamma ROS, and lognormal ROS (robust ROS) methods."

Environmental Data (Surface Soil):

The samples identified as surface soil samples in the HHRA (CDM 2008) were used in the current analyses, and consist of samples where the beginning depth of sampling was less than 0.5 feet (6 inches) below ground surface. Samples collected from deeper sampling depths (i.e. sampling depths starting at 6 inches or greater) were considered subsurface soil samples. As discussed in the HHRA (Section 3.2.1), the dataset for current land-use scenarios does not include sample SSR-18, as the location is currently under a concrete cap, precluding exposure. Additionally, subsurface soil samples below 12 feet below ground surface (ft-bgs) were not included in the current construction worker scenario, for which the excavation depth was limited to this depth (12 ft-bgs).

EPCs are evaluated for the existing conditions scenario presented in the HHRA and the post-remediation scenario for total PCBs and arsenic only, as these two chemicals were the only identified COCs to have Remedial Goals as discussed in Section 4.4 of the FS Report.

The following table provides the surface soil PCB and arsenic concentrations used to calculate the EPCs for OU-3. The data is provided in parts per billion, ppb. The table includes the sample results, a designation of whether the constituent measured was non detect or detected, the reporting limits, and the validation qualifiers. The last column on the table indicates whether or not the area where the sample is located will be treated (excavated/capped/treated, etc.) as indicated in Section 5.3 of the FS Report. The first set of calculations provided use the entire data set and calculate EPCs that match the values presented in the HHRA from CDM/EPA. The second set of calculations show the EPCs for OU-3 assuming remedial efforts are complete. The samples designated below as treated were removed from the data set, as these samples would no longer pose a risk to receptors from surface soil.

Golder Associates	**SUBJ:**	Appendix D - FS Report - Exposure Point Concentration Analyses	
	Job No.:	043-3746OU3	**Prepared:** GLH
	Ref.:	Anniston PCB Site - OU-3 Feasibility Study	**Checked:** SJM
	Date:	Jun-03-2010	**Reviewed:** SJM

OU-3 Surface Soil Samples as per HHRA (CDM, 2008) with Total PCBs and Arsenic Data

Sample Location	Total PCBs ppb	1=D,0=ND D_PCB	RL ppb	Qualifier see notes	Arsenic (ppb)	1=D,0=ND D_As	RL ppb	Qualifier see notes	Treated (Y / N)
SSRI-11 0-0.5	930000	1	88000	J	390000	1	1200		Y
SSRI-07 0-0.5	250000	1	8500	J	7000	1	1100		Y
SWMU-12-24E 0-2	169000	1	8000						Y
SWMU-12-24C 0-2	84000	1	3900						Y
SWMU-12-24G 0-2	41200	1	1900						Y
SWMU-25 0-0.5	38600	1	1900						N
SSRI-09 0-0.5	38400	1	810	J					N
SSRI-05 0-0.5	37600	1	810						N
SSRI-06 0-0.5	31000	1	4000						Y
SWMU-12-24F 0-2	28100	1	4000						Y
SWMU-12-24A-Q 0-2	26300	1	4000						Y
SWMU-12-24I 0-2	18000	1	1500						Y
SWMU-31 0-0.5	13670	1	770						N
SSRI-04-Q 0-0.5	12200	1	830	J	3800	1	1200		N
SSRI-10 0-0.5	11800	1	400	J					N
SSR-02 0-2	11200	1	2000		7600	1	1200		N
SWMU-12-24D 0-2	9110	1	390	J					Y
AOC-A 0-0.5	5720	1	330	J					N
SWMU-12-24H 0-2	4440	1	380	J					Y
SWMU-17 0-0.5	4120	1	330	J					N
SSRI-13 0-0.5	2013	1	180	J					N
SSRI-03 0-0.5	1170	1	82	J					N
SSRI-14 0-0.5	630	1	82	J					N
SSR-21 0.33-2.5	559	1	39	J	5700	1	1200		N
SWMU-12-24B 0-2	540	1	79	J					Y
SSRI-02 0-0.5	175	1	78	J					N
SSRI-12-0-6	0	0	88						N
SSRI-08-6	0	0	78						N
SSRI-01-6	0	0	76						N
SSR-01 0-2	23	1	40		3900	1	1200		N

Notes: RL = laboratory reporting limit, J = estimated value, ppb = parts per billion = μg/kg

Highlighting Indicates non-detect samples

EPC Calculations

For Arsenic, since there are less than 10 samples in the surface soil dataset, the EPC is taken as the maximum value in the applicable dataset, as detailed in the table below.

Arsenic Surface Soil Pre-Remediation EPC =	390,000 ppb	Based on sample SSRI-11
Arsenic Surface Soil Post-Remediation EPC =	7600 ppb	Based on Sample SSR-02

For total PCBs it is appropriate to statistically calculate the EPC value for the pre- and post-remediation conditions based on the 95% UCL of the dataset since the number of samples in the surface soil dataset is greater than 10.

ProUCL Analyses for Total PCBs

UCL Calculations were completed using ProUCL Version 4, and by using the built in algorithms to denote non detects using the "UCL --> NDs --> All" option as done in the HHRA.

In order to match the mean value reported in CDM's HHRA Table B-3.1 (58,994) of Appendix B, it was necessary to use the reporting limit (RL) for the three non-detect samples in the surface soil PCB dataset. However, the ProUCL backup sheet from the HHRA for the current land use scenario for surface soil presented in Appendix C of the HHRA shows the minimum and maximum non-detect values as 44 and 38, respectively, which correspond to one-half of the minimum and maximum reporting limit for the three non-detect samples in the dataset. Changing the dataset from utilizing the full reporting limit values to the one-half of the values does not change the calculated EPC when using the "UCL --> NDs --> All" Option in ProUCL.

ProUCL Results for Total PCBs

A total of three ProUCL analyses were completed in the current analyses. The first two cases were completed to match the analyses / data presented in the HHRA as described in the table below. The third case represents the case where the proposed remediation has been completed at the Site. These calculations were performed by removing the samples indicated above from the data set and re-calculating the EPC value.

Description of Data Set	EPC from ProUCL (ppb)	Type of EPC Recommended by ProUCL
Matching HHRA Surface Soil Data - Table B-3.1 (ND = DL)	373914	99% KM (Chebyshev) UCL
Matching HHRA Surface Soil Data - Appendix C (ND = 1/2 DL)	373914	99% KM (Chebyshev) UCL
As above without Samples from Areas to be Covered (as indicated in the above table and the main text)	24231	95% KM (Chebyshev) UCL

Notes:
EPC = exposure point concentration, UCL = Upper Confidence Limit, ND = non-detect, DL = detection limit, KM = Kaplan-Meier, ppb = parts per billion = mg/kg
The ProUCL output sheets for each of the above analyses are included at the end of this calculation package.

Summary of Results

Based on the results presented above it was determined that the proposed remedial actions result in post-remediation EPC values for soil that are below the Remedial Goals, as presented below for both PCBs and arsenic. As such, the application of any of the remedial alternatives for soil (except for the "No Action" alternative) will provide adequate protection of human health and the environment.

Based on the results of the site-specific HHRA and EPA Superfund Guidance, the following Remedial Goals for soil were selected by EPA.

OU-3 Remedial Goals for Soil

Constituent	Surface Soil Remedial Goal	Subsurface Soil Remedial Goal
PCBs	25	45
Arsenic	66	217
benzo(a)pyrene	None	N/A
dibenzo(a,h)anthracene	None	N/A
dioxin TEQs	None	None

N/A = not applicable; i.e., not a COC for listed medium

None = exposure point concentration below acceptable risk level

Basis for Remedial Goals:

Surface PCBs RG = 25 mg/kg based on EPA's Superfund PCB Guidance

Subsurface PCBs RG = 45 mg/kg based on site specific risk for a future operations worker at an HQ=3

Surface Arsenic RG = 66 mg/kg based on site specific risk for a current operations worker of 10^{-5}

Subsurface Arsenic RG = 217 mg/kg based on site specific risk for construction worker at an HQ=1

References:

CDM (2008) "Revised Final Human Health Baseline Risk Assessment for Anniston PCB Site Operable Unit 3 Anniston, AL", January.

Golder Associates Inc., (2009). "Feasibility Study Report for Operable Unit 3 of the Anniston PCB Site", May.

USEPA (2010) "USEPA comments from Review of May 2009 Feasibility Study Report for Operable Unit 3 of the Anniston PCB Site", 19 April.

Attachments:

Current Analysis (Golder 2009) ProUCL output sheets

HHRA Tables A-1 and B-3 (CDM, 2008)

HHRA UCL Calculations CDM (2008)

Current Analysis (Golder 2009)
ProUCL output sheets

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	X:\Clients\Solutia\13 OU-3 Feasibility Study\EPC Calculations - March 2009\HHRA Data Set to match Table B-3.1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB

General Statistics

Number of Valid Data	30	Number of Detected Data	27
Number of Distinct Detected Data	27	Number of Non-Detect Data	3
		Percent Non-Detects	10.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	23	Minimum Detected	3.135
Maximum Detected	930000	Maximum Detected	13.74
Mean of Detected	65540	Mean of Detected	9.131
SD of Detected	181515	SD of Detected	2.33
Minimum Non-Detect	76	Minimum Non-Detect	4.331
Maximum Non-Detect	88	Maximum Non-Detect	4.477

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	26
Single DL Non-Detect Percentage	13.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.378	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.923	5% Shapiro Wilk Critical Value	0.923
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	58990	Mean	8.588
SD	173028	SD	2.76
95% DL/2 (t) UCL	112666	95% H-Stat (DL/2) UCL	1318785
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	41064	Mean in Log Scale	8.666
SD	186041	SD in Log Scale	2.623
95% MLE (t) UCL	98777	Mean in Original Scale	58994
95% MLE (Tiku) UCL	95149	SD in Original Scale	173027
		95% Percentile Bootstrap UCL	118107
		95% BCA Bootstrap UCL	156279

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.331	Data appear Lognormal at 5% Significance Level	
Theta Star	198229		
nu star	17.85		
A-D Test Statistic	0.98		
5% A-D Critical Value	0.843		
K-S Test Statistic	0.843		
5% K-S Critical Value	0.182		
Data not Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.000000001	Mean	58988
Maximum	930000	SD	170121
Mean	58986	SE of Mean	31651
Median	11500	95% KM (t) UCL	112768
SD	173030	95% KM (z) UCL	111050
k star	0.164	95% KM (jackknife) UCL	112651
Theta star	359396	95% KM (bootstrap t) UCL	285659
Nu star	9.847	95% KM (BCA) UCL	119536
AppChi2	3.847	95% KM (Percentile Bootstrap) UCL	115310
95% Gamma Approximate UCL	151004	95% KM (Chebyshev) UCL	196953
95% Adjusted Gamma UCL	159918	97.5% KM (Chebyshev) UCL	256650
		99% KM (Chebyshev) UCL	373914
		Potential UCLs to Use	
		99% KM (Chebyshev) UCL	373914

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet_a.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB

General Statistics

Number of Valid Data	30	Number of Detected Data	27
Number of Distinct Detected Data	27	Number of Non-Detect Data	3
		Percent Non-Detects	10.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	23	Minimum Detected	3.135
Maximum Detected	930000	Maximum Detected	13.74
Mean of Detected	65540	Mean of Detected	9.131
SD of Detected	181515	SD of Detected	2.33
Minimum Non-Detect	38	Minimum Non-Detect	3.638
Maximum Non-Detect	44	Maximum Non-Detect	3.784

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	26
Single DL Non-Detect Percentage	13.33%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.378
5% Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	58988
SD	173029
95% DL/2 (t) UCL	112664
Maximum Likelihood Estimate(MLE) Method	
Mean	41059
SD	186045
95% MLE (t) UCL	98774
95% MLE (Tiku) UCL	95147

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	8.518
SD	2.892
95% H-Stat (DL/2) UCL	2090483
Log ROS Method	
Mean in Log Scale	8.666
SD in Log Scale	2.623
Mean in Original Scale	58994
SD in Original Scale	173027
95% Percentile Bootstrap UCL	114908
95% BCA Bootstrap UCL	159856

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.331
Theta Star	198229
nu star	17.85
A-D Test Statistic	0.98
5% A-D Critical Value	0.843
K-S Test Statistic	0.843
5% K-S Critical Value	0.182

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000000001
Maximum	930000
Mean	58986
Median	11500
SD	173030
k star	0.164
Theta star	359396
Nu star	9.847
AppChi2	3.847
95% Gamma Approximate UCL	151004
95% Adjusted Gamma UCL	159918

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	58988
SD	170121
SE of Mean	31651
95% KM (t) UCL	112768
95% KM (z) UCL	111050
95% KM (jackknife) UCL	112651
95% KM (bootstrap t) UCL	287080
95% KM (BCA) UCL	116097
95% KM (Percentile Bootstrap) UCL	118680
95% KM (Chebyshev) UCL	196953
97.5% KM (Chebyshev) UCL	256650
99% KM (Chebyshev) UCL	373914

Potential UCLs to Use

99% KM (Chebyshev) UCL	373914

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	X:\Clients\Solutia\13 OU-3 Feasibility Study\EPC Calculations - March 2009\HHRA Data Set without Proposed covered areas.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB

General Statistics

Number of Valid Data	18	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	3
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	23	Minimum Detected	3.135
Maximum Detected	38600	Maximum Detected	10.56
Mean of Detected	11859	Mean of Detected	8.134
SD of Detected	14455	SD of Detected	2.166
Minimum Non-Detect	76	Minimum Non-Detect	4.331
Maximum Non-Detect	88	Maximum Non-Detect	4.477

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	14
Single DL Non-Detect Percentage	22.22%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.751	Shapiro Wilk Test Statistic	0.915
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	9889	Mean	7.394
SD	13878	SD	2.6
95% DL/2 (t) UCL	15579	95% H-Stat (DL/2) UCL	361709
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	7550	Mean in Log Scale	7.465
SD	16225	SD in Log Scale	2.496
95% MLE (t) UCL	14202	Mean in Original Scale	9892
95% MLE (Tiku) UCL	14243	SD in Original Scale	13876
		95% Percentile Bootstrap UCL	15069
		95% BCA Bootstrap UCL	16561

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.451	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	26303		
nu star	13.53		
A-D Test Statistic	0.303	Nonparametric Statistics	
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.792	Mean	9886
5% K-S Critical Value	0.234	SD	13489
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	3291
		95% KM (t) UCL	15611
Assuming Gamma Distribution		95% KM (z) UCL	15299
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	15560
Minimum	0.000000001	95% KM (bootstrap t) UCL	17575
Maximum	38600	95% KM (BCA) UCL	15698
Mean	9882	95% KM (Percentile Bootstrap) UCL	15667
Median	3067	95% KM (Chebyshev) UCL	24231
SD	13883	97.5% KM (Chebyshev) UCL	30439
k star	0.148	99% KM (Chebyshev) UCL	42632
Theta star	66797		
Nu star	5.326	Potential UCLs to Use	
AppChi2	1.306	95% KM (Chebyshev) UCL	24231
95% Gamma Approximate UCL	40310		
95% Adjusted Gamma UCL	46720		

Note: DL/2 is not a recommended method.

HHRA Tables A-1 and B-3 (CDM, 2008)

TABLE A-1
SURFACE SOIL SAMPLE INFORMATION
Anniston PCB Site, Operable Unit 3
Anniston, Alabama

Exposure Area	Location	Sample ID	Sample Depth (feet)	Date	Comment	Use in Risk Assessment-Current Scenarios	Use in Risk Assessment-Future Scenarios
Operations Area	AOC-A	AOC-A-6A	0-0.5	1/28/03		Y	Y
	SSR-01	SSR-01	0-2	8/19/98		Y	Y
	SSR-02	SSR-02	0-2	8/19/98		Y	Y
	SSR-03	SSR-03	0.5-2.5	8/18/98		N (1)	N (1)
	SSR-18	SSR-18	0.25-0.5	8/20/98		N (3)	Y
		SSR-18	0.25-0.5	8/20/98	Duplicate	N (3)	Y (2)
	SSR-21	SSR-21	0.33-2.5	8/20/98		Y	Y
	SSRI-01	SSRI-01-6	0-0.5	6/2/05		Y	Y
	SSRI-02	SSRI-02-6	0-0.5	6/1/05		Y	Y
	SSRI-03	SSRI-03-6	0-0.5	6/1/05		Y	Y
	SSRI-04	SSRI-04-6	0-0.5	6/1/05		Y	Y
		SSRI-04-06	0-0.5	7/6/05	Duplicate	Y (2)	Y (2)
	SSRI-05	SSRI-05-6	0-0.5	6/1/05		Y	Y
	SSRI-06	SSRI-06-6	0-0.5	6/2/05		Y	Y
	SSRI-07	SSRI-07-6	0-0.5	6/6/05		Y	Y
		SSRI-07-06	0-0.5	7/6/05	Duplicate	Y (2)	Y (2)
	SSRI-08	SSRI-08-6	0-0.5	6/2/05		Y	Y
	SSRI-09	SSRI-09-6	0-0.5	6/3/05		Y	Y
	SSRI-10	SSRI-10-6	0-0.5	6/3/05		Y	Y
	SSRI-11	SSRI-11-6	0-0.5	6/6/05		Y	Y
		SSRI-11-06	0-0.5	7/6/05	Duplicate	Y (5)	Y (2)
	SSRI-12	SSRI-12-6	0-0.5	6/6/05		Y	Y
	SSRI-13	SSRI-13-6	0-0.5	6/6/05		Y	Y
	SSRI-14	SSRI-14-6	0-0.5	6/6/05		Y	Y
	SWMU-17	SWMU-17-6A	0-0.5	1/28/03		Y	Y
	SWMU-25	SWMU-25-6A	0-0.5	1/28/03		Y	Y
	SWMU-31	SWMU-31-6A	0-0.5	1/28/03		Y	Y
	SWMU-42	SWMU-42-6A	0-0.5	2/20/03		Y	Y
		SWMU-42-6B	0-0.5	2/20/03	Duplicate	Y (2)	Y (2)
	SWMU-12-24A	SWMU-12-24A	0-2	1/29/03		Y	Y
		SWMU-12-24A-X	0-2	1/29/03	Duplicate	Y (2)	Y (2)
	SWMU-12-24B	SWMU-12-24B	0-2	1/29/03		Y	Y
	SWMU-12-24C	SWMU-12-24C	0-2	1/29/03		Y	Y
	SWMU-12-24D	SWMU-12-24D	0-2	1/29/03		Y	Y
	SWMU-12-24E	SWMU-12-24E	0-2	1/29/03		Y	Y
	SWMU-12-24F	SWMU-12-24F	0-2	1/29/03		Y	Y
	SWMU-12-24G	SWMU-12-24G	0-2	1/29/03		Y	Y
	SWMU-12-24H	SWMU-12-24H	0-2	1/29/03		Y	Y
	SWMU-12-24I	SWMU-12-24I	0-2	1/29/03		Y	Y
South Landfill	LFSL89	NA	NA	NA	May 23. 2006 letter from Solutia to US EPA (4)	Y	Y
	LFSL93	NA	NA	NA	May 23. 2006 letter from Solutia to US EPA (4)	Y	Y
	LFSL94	NA	NA	NA	May 23. 2006 letter from Solutia to US EPA (4)	Y	Y
	LFSL99	NA	NA	NA	May 23. 2006 letter from Solutia to US EPA (4)	Y	Y
	LFSL103	NA	NA	NA	May 23. 2006 letter from Solutia to US EPA (4)	Y	Y
	SL-3A	SL-3A	0-0.25	1/29/03		Y	Y
	SL-3B	SL-3B	0-0.25	1/29/03		Y	Y
	SL-3C	SL-3C	0-0.25	1/29/03		Y	Y
	SL-3D	SL-3D	0-0.25	1/29/03		Y	Y
	SLGM-3A	SLGM-3A	0-0.25	2/20/03		Y	Y
	SLGM-3B	SLGM-3B	0-0.25	2/20/03		Y	Y
	SLGM-3C	SLGM-3C	0-0.25	2/20/03		Y	Y
	SLGM-3D	SLGM-3D	0-0.25	2/20/03		Y	Y
West Landfill	SSRI-15	SSRI-15-6	0-0.5	6/6/05		Y	Y
		Dup-3	0-0.5	6/6/05	Duplicate	Y (2)	Y (2)
	SSRI-16	SSRI-16-6	0-0.5	6/6/05		Y	Y

N = No. Not used in risk assessment.
Y = Yes. Used in risk assessment.
NA = Sample information is not available.
(1) Samples are not included in the risk calculation since the location where they were sampled has been excavated.
(2) Maximum values of duplicate sample results and their original samples are used in risk calculations.
(3) Samples are not included in the risk calculation since the location where they were sampled is currently inaccessible due to a concrete cap.
(4) Data obtained from the figure attached to the May 23, 2006 letter from Solutia to Ms. Langston Scully at US EPA.
(5) Average of the duplicate sample results and the original sample results is used in risk calculations under central tendency exposure scenario.

TABLE B-3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Anniston PCB Site, Operable Unit 3

Scenario Timeframe:	Current
Medium:	Surface Soil
Exposure Medium:	Surface Soil

Exposure Point	Chemical of Potential Concern	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Detection Frequency	Range of Detection Limit	Arithmetic Mean	95% UCL of Distribution	Exposure Point Concentration (1)			
									Value	Unit	Statistic	Rationale (2)
Facility Area	**SVOCs**											
	Benzo(a)anthracene	46 J	830	µg/kg	3 / 3	390 - 420	352	NA	830	µg/kg	Max	<ten samples
	Benzo(a)pyrene	24 J	1,900	µg/kg	3 / 3	390 - 420	701	NA	1,900	µg/kg	Max	<ten samples
	Benzo(b)fluoranthene	50 J	2,100	µg/kg	3 / 3	390 - 420	787	NA	2,100	µg/kg	Max	<ten samples
	Dibenz(a,h)anthracene	41 J	620	µg/kg	2 / 3	390 - 420	289	NA	620	µg/kg	Max	<ten samples
	Indeno(1,2,3-cd)pyrene	59 J	1,300	µg/kg	2 / 3	390 - 420	521	NA	1,300	µg/kg	Max	<ten samples
	P/PCBs											
	PCBs, Total (3,4)	23	930,000	µg/kg	27 / 30	37 - 88,000	58,994	373,914	373,914	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Heptachlor epoxide	380	380	µg/kg	1 / 3	31 - 380	182	NA	380	µg/kg	Max	<ten samples
	Dioxin											
	Dioxin TEQ	0.191	0.756	µg/kg	1 / 4	NA - NA	NA	NA	0.756	µg/kg	Max	<ten samples
	Inorganics											
	Aluminum	11,000	19,000	mg/kg	3 / 3	23 - 25	14,333	NA	19,000	mg/kg	Max	<ten samples
	Antimony	8.7	8.7	mg/kg	1 / 3	2.3 - 2.5	4	NA	9	mg/kg	Max	<ten samples
	Arsenic	3.8	390	mg/kg	6 / 6	1.1 - 1.2	70	NA	390	mg/kg	Max	<ten samples
	Cadmium	0.52 J	4.7	mg/kg	3 / 6	0.54 - 0.62	1	NA	5	mg/kg	Max	<ten samples
	Chromium	13	23	mg/kg	5 / 6	1.1 - 1.2	17	NA	23	mg/kg	Max	<ten samples
	Iron	19,000	26,000	mg/kg	3 / 3	5.6 - 6.2	22,000	NA	26,000	mg/kg	Max	<ten samples
	Lead	8.7	4,700	mg/kg	5 / 6	0.56 - 6.1	813	NA	4,700	mg/kg	Max	<ten samples
	Manganese	70	830	mg/kg	5 / 6	1.1 - 1.2	498	NA	830	mg/kg	Max	<ten samples
	Mercury	0.091	2.6	mg/kg	7 / 8	0.024 - 0.42	0.7	NA	3	mg/kg	Max	<ten samples
	Vanadium	23	40	mg/kg	5 / 6	1.1 - 1.2	32	NA	40	mg/kg	Max	<ten samples

Statistics: Maximum Detected Value (Max); 95 th Percentile (Perc); Normal Distribution (UCL-N); Lognormal Distribution (UCL-T); Gamma Distribution (UCL-G); Non-parametric UCL (UCL-NP).

(1) Exposure point concentration (EPC) is the lower of the maximum concentration and the 95% Upper Confidence Limit (UCL) or 95 th Percentile.

(2) The UCL listed were calculated using ProUCL 4.0 program.

(3) Total PCBs calculated using sum of the detected Aroclors when at least one Aroclor detected or maximum practical quantitation limit for non-detected Aroclors when none of the Aroclors are detected. EPC was calculated using one-half the practical quantitation limit for non-detected Aroclors.

(4) Under Central Tendency Exposure (CTE) scenario, duplicate sample at SSRI-11 were average to calculate EPC. The mean value was selected as EPC.

HHRA UCL Calculations CDM (2008)

List of ProUCL Output Included in Appendix C
Anniston PCB Site, Operable Unit 3

Surface Soil (Current Land-use Scenario)
- PCBs (Facility Area)

Surface Soil (Future Land-use Scenario)
- PCBs (Facility Area)

Subsurface Soil (Current and Future Land-use Scenario)
- PCBs (Facility Area)
- Arsenic (Facility Area)
- Barium (Facility Area)
- Cadmium (Facility Area)
- Chromium (Facility Area)
- Lead (Facility Area)
- Manganese (Facility Area)
- Mercury (Facility Area)
- Nickel (Facility Area)
- Vanadium (Facility Area)

Surface Soil (Current and Future Land-use Scenario)
- PCBs (South Landfill)

Groundwater
- Chlorobenzene
- PCBs
- Mercury

Ambient Air
- PCBs (South Landfill)
- PCBs (West End Landfill)
- PCBs (All Locations)

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	F:\All Works\Anniston\Final Report\Data\Input\ProUCL input files\SS_OA_current.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCBmax

General Statistics

Number of Valid Samples	30	Number of Detected Data	27
Number of Unique Samples	27	Number of Non-Detect Data	3
		Percent Non-Detects	10.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	23	Minimum Detected	3.135
Maximum Detected	930000	Maximum Detected	13.74
Mean of Detected	65540	Mean of Detected	9.131
SD of Detected	181515	SD of Detected	2.33
Minimum Non-Detect	38	Minimum Non-Detect	3.638
Maximum Non-Detect	44	Maximum Non-Detect	3.784

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	26
Single DL Non-Detect Percentage	13.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.378	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.923	5% Shapiro Wilk Critical Value	0.923
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	58988	Mean	8.518
SD	173029	SD	2.892
95% DL/2 (t) UCL	112664	95% H-Stat (DL/2) UCL	3482286
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	41059	Mean in Log Scale	8.666
SD	186045	SD in Log Scale	2.623
95% MLE (t) UCL	98774	Mean in Original Scale	58994
95% MLE (Tiku) UCL	95147	SD in Original Scale	173027
		95% Percentile Bootstrap UCL	116820
		95% BCA Bootstrap UCL	159248

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**
k star (bias corrected)	0.331	**Data appear Lognormal at 5% Significance Level**
Theta Star	198229	
nu star	17.85	
A-D Test Statistic	0.98	**Nonparametric Statistics**

5% A-D Critical Value	0.843
K-S Test Statistic	0.843
5% K-S Critical Value	0.182
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0
Maximum	930000
Mean	58986
Median	11500
SD	173030
k star	0.164
Theta star	359396
Nu star	9.847
AppChi2	3.847
95% Gamma Approximate UCL	151004
95% Adjusted Gamma UCL	159918

Note: DL/2 is not a recommended method.

Kaplan-Meier (KM) Method	
Mean	58988
SD	170121
SE of Mean	31651
95% KM (t) UCL	112768
95% KM (z) UCL	111050
95% KM (jackknife) UCL	112651
95% KM (bootstrap t) UCL	280091
95% KM (BCA) UCL	124303
95% KM (Percentile Bootstrap) UCL	116432
95% KM (Chebyshev) UCL	196953
97.5% KM (Chebyshev) UCL	256650
99% KM (Chebyshev) UCL	373914
Potential UCLs to Use	
99% KM (Chebyshev) UCL	373914

PCBavg

General Statistics

Number of Valid Samples	30	Number of Detected Data	27
Number of Unique Samples	27	Number of Non-Detect Data	3
		Percent Non-Detects	10.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	23	Minimum Detected	3.135
Maximum Detected	542000	Maximum Detected	13.2
Mean of Detected	51169	Mean of Detected	9.111
SD of Detected	112795	SD of Detected	2.291
Minimum Non-Detect	38	Minimum Non-Detect	3.638
Maximum Non-Detect	44	Maximum Non-Detect	3.784

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	26
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	13.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.483	Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.923	5% Shapiro Wilk Critical Value	0.923
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	46054	Mean	8.5
SD	107936	SD	2.86
95% DL/2 (t) UCL	79538	95% H-Stat (DL/2) UCL	2939060
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	

Mean	35223
SD	116487
95% MLE (t) UCL	71359
95% MLE (Tiku) UCL	69240

Mean in Log Scale	8.655
SD in Log Scale	2.578
Mean in Original Scale	46062
SD in Original Scale	107932
95% Percentile Bootstrap UCL	81240
95% BCA Bootstrap UCL	97821

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.365
Theta Star	140227
nu star	19.7
A-D Test Statistic	0.632
5% A-D Critical Value	0.834
K-S Test Statistic	0.834
5% K-S Critical Value	0.181

Data follow Appr. Gamma Distribution at 5% Significance Level

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0
Maximum	542000
Mean	46052
Median	11500
SD	107936
k star	0.17
Theta star	270486
Nu star	10.22
AppChi2	4.077
95% Gamma Approximate UCL	115394
95% Adjusted Gamma UCL	122037

Note: DL/2 is not a recommended method.

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	46055
SD	106121
SE of Mean	19744
95% KM (t) UCL	79602
95% KM (z) UCL	78531
95% KM (jackknife) UCL	79525
95% KM (bootstrap t) UCL	142445
95% KM (BCA) UCL	87207
95% KM (Percentile Bootstrap) UCL	81925
95% KM (Chebyshev) UCL	132117
97.5% KM (Chebyshev) UCL	169356
99% KM (Chebyshev) UCL	242506

Potential UCLs to Use

95% KM (Chebyshev) UCL	132117