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Alternatives Evaluation Report, Wadesboro VCC Site, Wadesboro, NC

Exxon Mobil Corporation
Houston, Texas

April 2002

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

3700 Regency Parkway, Suite 140
Cary, NC 27511
919-469-1952

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APPENDIX

Appendix A Analytical Data Summary Tables

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirements
BBL	Blasland, Bouck & Lee, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cy	cubic yards
DOT	Department of Transportation
ExxonMobil	Exxon Mobil Corporation
mg/kg	milligrams per kilogram
OSHA	Occupations Safety and Health Act
PRG	USEPA Region 9 Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VCC	Virginia-Carolina Chemical Company

1. Introduction

1.1 Introduction

This report presents the results of an evaluation of several alternatives for the Phase II Action at the former Virginia-Carolina Chemical Company (VCC) phosphate/fertilizer plant located in Wadesboro, North Carolina (the Site). Figure 1-1 identifies the Site location on the U.S. Geological Survey (USGS) 7.5-minute quadrangle for Wadesboro, North Carolina.

The evaluation was completed in accordance with, and subject to, the terms, conditions, reservations of rights, denial of any admission of liability, and all other provisions of the Administrative Order on Consent (AOC) for Actions for the Site entered into voluntarily by Exxon Mobil Corporation (ExxonMobil), the successor in interest to the former VCC plant listed above and the United States Environmental Protection Agency (USEPA) pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The Docket Number for the AOC is 01-06-C. The effective date of the AOC is December 29, 2000.

1.2 Site History

The Wadesboro VCC facility operated as a fertilizer manufacturing facility from 1908 to 1945. During that time, VCC burned pyrite ore for the production of the sulfuric acid used in the production of super-phosphate fertilizers. The generated acid was stored in lead-lined acid chambers. While details of the exact operational history of this Site are unknown, it is believed that during periodic cleaning of the acid chambers washdown water containing acid and soluble lead was likely flushed onto the ground surface or into nearby drainage ditches. In addition, at similar sites pyrite cinders that did not burn completely in the combustion chambers were frequently used as on-site fill material. This slag material has a reddish/magenta appearance and has been found to contain elevated levels of inorganic constituents, primarily arsenic.

The operational history of the Site is unknown from 1945 to 1961. The Site was sold to Anson County in 1961 and was not in use from 1961 to 1975. The Site was purchased at auction from Anson County by Mr. Carl Weston (the current owner) in 1975, who used a portion of the Site for industrial operations. The Site has been abandoned for approximately 10 years.

Prior to the Phase I Removal Action performed by ExxonMobil in early 2001 (see below), structures at the Site were located in two principal processing areas in the central and southern portions of the Site (Figure 1-2). The Central Processing Area consisted of a brick building, two tanks, a fire reservoir, and a concrete pad that was once apparently the foundation slab for a packaging and distribution warehouse. Two utility buildings and the former acid chambers comprised the Southern Processing Area. Buildings in both areas were in various stages of collapse. Mr. Weston apparently used the Central Processing Area as a small metal reclamation and parts fabrication plant. These structures were demolished in early 2001 as part of the Phase I Removal Action (see below).

Abandoned railroad spurs define the northeastern and southwestern borders of the Site (Figure 1-2). The northeastern railroad spur is a prominent site feature. Elevated approximately 20 feet above the surrounding area, the northeastern spur's height was consistent with the height of on-site buildings. The southwestern spur initially slopes off site to the northeast and then gradually changes to a southerly direction toward the spur's northeastern margin. Concrete drainage channels are present perpendicular to the northeastern railroad spur. The drainage paths were apparently gutters used to channel water away from the roof of the distribution warehouse on the central portion of the Site.

The Site tract is located in a mixed residential and industrial area. Two residences border the Site to the east, and one borders the Site to the south (Figure 1-2). The property to the west is undeveloped. An active railroad track is located along the northern boundary of the Site. The Site itself is zoned HI (Heavy Industrial) and all adjacent properties (including those with residences) are zoned LI (Light Industrial).

ExxonMobil implemented a Phase I Removal Action at the Site in January and February 2001. Phase I Removal Action activities were initiated in January 2001 and completed in February 2001 and included:

- Survey of the property line;
- Installation of a chain-link fence on the Site near the property line to restrict unauthorized access to the Site;
- Demolition of potentially unsafe structures such as buildings, the former acid chambers, and a trailer; and
- Backfill of the reservoir with clean brick.

Blasland, Bouck, & Lee, Inc. (BBL), on behalf of ExxonMobil, performed a site characterization in 2001 (BBL, 2001). Site investigation activities included the collection and analysis of groundwater, surface water, sediment, and soil samples. The absence of elevated concentrations of Site-related metals, specifically arsenic and lead, in the groundwater, surface water, and stream sediments indicates that these media have not been adversely impacted by the activities of the former phosphate/fertilizer plant. Therefore, no further action is necessary for these media. Refer to Section 2 for a discussion of the available groundwater, surface water, and sediment data.

The soil data, which are described in detail in Section 2, indicated that shallow soil (less than four feet below ground surface [bgs]) in and around the Southern Processing Area contained elevated concentrations of arsenic and/or lead. Therefore, the alternatives identified and evaluated in this report will address the soils in and around the Southern Processing Area.

1.3 Phase II Objectives

The overall objective of Phase II, as described in the AOC, was to "conduct the removal action..... to abate an imminent and substantial endangerment to the public health, welfare or the environment that may be presented by the actual or threatened release of hazardous substances, at or from the Site." Specific objectives have been developed that meet the requirements of the overall objective for use in developing and evaluating alternatives. The specific objectives are:

- Minimize the potential for exposure to on-site soil containing arsenic and/or lead at concentrations above Site-Specific Action Levels;
- Minimize the potential for off-site migration of on-site soils containing arsenic and/or lead at concentrations above Site-Specific Action Levels; and
- Minimize the potential for exposure to, and continued migration of, off-site soil containing arsenic and/or lead at concentrations above Site-Specific Action Levels.

1.4 Report Organization

This report contains six sections and one appendix. This introduction is followed in Section 2 by a description of relevant Site data used to characterize the magnitude and extent of arsenic and/or lead concentrations across the Site. Section 3 develops Site-Specific Action Levels and identifies and evaluates several alternatives that meet the Phase II objectives identified in Section 1.3. Section 4 presents a detailed analysis of the six identified alternatives, while Section 5 identifies the recommended Phase II alternative. Section 6 lists the references cited in this report. Appendix A contains a tabular summary of the validated data for the soil, sediment, and groundwater samples collected during the site investigation.

2. Summary of Site Characterization Data

2.1 Introduction

This section summarizes existing data that were used when determining which media needed to be addressed and when developing and evaluating alternatives for the identified media.

2.2 Surface Water

Surface water samples were collected from two locations (WB-SW01 and WB-SW02) in the unnamed stream to the west of the Site. These locations correspond with the two sediment samples collected from the same locations; WB-SW01 and WB-SD01, and WB-SW02 and WB-SD02 were collected from the same location. Samples were analyzed for TAL metals.

2.2.1 Surface Water Sample Analytical Results

As expected, several metals were detected in the two surface water samples. Neither arsenic nor lead were detected in the samples and none of the detected metals were present at concentrations exceeding the USEPA Region 9 Preliminary Remediation Goals (PRGs) for tap water. Table 2-1 presents the concentrations of analytes detected in the samples. Appendix A contains the complete set of validated data, along with a description of the data qualifiers, for the surface water samples collected.

2.2.2 Conclusions

The absence of elevated concentrations of Site-related metals, specifically arsenic and lead, in the surface water samples indicates that surface water has not been adversely impacted by the activities of the former phosphate/fertilizer plant. Therefore, no further action is necessary at the Site for surface water.

2.3 Sediment

Sediment samples were collected from the stream to the west of the Site (WB-SD1 and WB-SD2) and from the dry drainage pathway to the southeast of the acid chambers (WB-SD3 and WB-SD4). The drainage pathway to the southeast of the acid chambers is dry and, therefore, the "sediment" samples collected from this pathway are considered soil samples (discussed in Section 2.5).

2.3.1 Summary of Sediment Sample Analytical Results

As expected, numerous metals were detected in the sediment samples. None of the detected metals were present at concentrations exceeding USEPA Region 9 residential or industrial soil PRGs (comparable standards do not exist for sediment). Arsenic and lead concentrations for the two sediment samples collected at the Site are shown on Figure 2-1. Table 2-2 presents the concentrations of analytes detected in the sediment samples. Appendix A contains the complete set of validated data, along with a description of the data qualifiers, for the sediment samples collected.

2.3.2 Conclusions

The two sediment samples collected from the unnamed stream west of the Site did not contain elevated concentrations of any metal, including arsenic and lead. This includes the sample (WB-SD1) that was collected just downstream of the outfall from the drainage ditch located along the western boundary of the Site, where sediment contamination would be anticipated to be present. The lack of elevated metals concentrations in the two sediment samples indicates that the Site has not acted as a source of metals to the stream from either surface water runoff or discharge of groundwater from the Site. This demonstrates that these media have not been adversely impacted by the activities of the former phosphate/fertilizer plant. Therefore, no further action is necessary at the Site for sediment.

2.4 Groundwater

Groundwater samples were collected from shallow monitoring wells WB-MW1, WB-MW2, and WB-MW3 and analyzed for TAL metals.

2.4.1 Summary of Groundwater Sample Analytical Results

Arsenic was not detected in any groundwater sample and lead was detected in one sample at the low concentration of 2.6 μg/L. Several metals (aluminum, cadmium, iron, and/or manganese) were present in the groundwater samples at concentrations exceeding tap water PRGs; however, these metals are not known to be typically associated with releases from former phosphate/fertilizer facilities. Analytes exceeding PRGs in groundwater samples collected at the Site are shown on Figure 2-2. Groundwater pH is moderately acidic (pH = 4.6) in wells WB-MW1 and WB-MW2. Table 2-3 presents the concentrations of analytes detected in the groundwater samples. Appendix A contains the complete set of validated data, along with a description of the data qualifiers, for the groundwater samples collected.

2.4.2 Conclusions

During sampling, the groundwater monitoring wells only produced small amounts of groundwater at very low flows. This indicates that the water table aquifer, which is the aquifer that could potentially be impacted by the activities of the former phosphate/fertilizer plant, could not be used as a water source for nearby residents. Groundwater appears to discharge to the unnamed stream west of the Site, away from the nearby residences, to contribute to the base flow of the stream. The absence of elevated metals concentrations, and more importantly the absence of arsenic and lead, in the surface water samples (see Section 2.4.1) indicate that groundwater discharging to the stream from the Site is not contributing significant amounts of Site-related metals to the surface water. The absence of elevated metals concentrations, particularly arsenic and lead, from the sediments (see Section 2.2.1) also indicates that the Site has not contributed metals to surface water in the past.

The absence of elevated concentrations of Site-related metals, specifically arsenic and lead, in the groundwater samples indicates that groundwater has not been adversely impacted by the activities of the former phosphate/fertilizer plant. Therefore, no further action is necessary at the Site for groundwater.

2.5 Soil

Soil samples were collected in each of the 20 soil borings (Figure 2-3) and analyzed for TAL metals and pH. In the central processing area, soil samples were collected at the ground surface (0-foot to 0.5-foot bgs interval) and from the 2-foot to 4-foot bgs interval. In the southern processing area, soil samples were collected at the ground surface (0-foot to 0.5-foot bgs interval) and from the 2-foot to 4-foot, 4-foot to 6-foot, 6-foot to 8-foot, and 8-foot to 10-foot bgs intervals. All samples collected at the ground surface and from the 2-foot to 4-foot bgs interval were analyzed and the data evaluated. Samples from the deeper intervals were only analyzed where the 2-foot to 4-foot bgs interval contained lead and/or arsenic in concentrations exceeding the corresponding industrial PRGs. Thus, soil samples from the 4-foot to 6-foot bgs interval in soil boring locations WB-SB15, WB-SB19, and WB-SB20 were analyzed and the data evaluated.

2.5.1 Summary of Soil Sample Analytical Results

Elevated concentrations of arsenic and lead were detected in the soil samples collected from the Site (Tables 2-4 and 2-5). In the Central Processing Area, lead was detected at concentrations in excess of PRGs (USEPA, 2000) for both residential and industrial soils in the surficial samples from boring WB-SB09 (1,370 milligrams per kilogram [mg/kg]) and in excess of the industrial soil PRG in the surficial sample from boring WB-SB10 (643 mg/kg). Neither of the 2 – 4 foot bgs samples these borings contained lead at concentrations greater than the PRGs. Arsenic was not present at concentrations exceeding PRGs in any soil sample collected from the Central Processing Area.

In the Southern Processing Area, lead and/or arsenic concentrations exceeding the residential and/or industrial soil PRGs were detected in the soil samples collected from the ground surface (0-foot to 0.5-foot bgs interval) in a majority of the borings advanced there. A lead concentration exceeding the PRGs was detected in the soil sample collected from the 2-foot to 4-foot bgs interval in boring WB-SB20 (Table 2-5) and in sample VC-03-SB (2.5 feet bgs) (Table 2-4). Lead was present at concentrations exceeding the PRG in both of the surficial soil samples collected from the southeastern drainage ditch. Detected lead concentrations above the PRGs varied from 408 to 32,100 mg/kg.

Concentrations of arsenic exceeding the PRG were also detected in the soil samples collected from the 2-foot to 4-foot bgs interval in borings WB-SB15, WB-SB19, and WB-SB20. Concentrations exceeding PRGs were not detected in the 2-foot to 4-foot bgs interval for the other borings or in the 4-foot to 6-foot bgs interval in borings WB-SB15, WB-SB19, and WB-SB20. Finally, arsenic was present at a concentration exceeding the PRG in one of the two surficial soil samples (WB-SD04) collected from the southeastern drainage ditch. Arsenic and lead concentrations in soil samples collected from the entire Site are presented in Figure 2-3.

In addition to arsenic and lead, antimony was present at a concentration above the residential (but not industrial) PRG in the soil sample collected from the ground surface (0-foot to 0.5-foot bgs interval) at boring WB-SB19. This boring also had arsenic and lead concentrations greater than the residential PRGs. Iron, not typically associated with historical activities at former phosphate/fertilizer plants, was present in some soil samples at concentrations exceeding PRGs. Iron was present at concentrations above residential or industrial soil PRGs in samples from 5 of 11 borings advanced in the Central Processing Area and in samples from all of the borings advanced in the Southern Processing Area. (Tables 2-4 and 2-5).

Thallium was detected in two soil samples collected during a USEPA soil investigation. Thallium was present in soil samples VC-04-SS and VC-05-SS at levels slightly above the residential PRG of 5.2 mg/kg but well below the industrial PRG of 130 mg/kg. Both of these samples are located on-site where the industrial PRG is applicable.

Appendix A contains the complete set of validated data, along with a description of the data qualifiers, for the soil samples collected.

2.5.2 Conclusions

Lead was present at concentrations exceeding the PRG in samples from just 1 of 10 borings advanced in the Central Processing Area. The elevated lead concentration was present in the 0-foot to 0.5-foot bgs interval in this boring (WB-SB09), which indicates that the lead is limited to the near-surface soils at that location.

Arsenic and/or lead were present at concentrations exceeding PRGs in samples collected from 9 of the 10 borings advanced in the Southern Processing Area. Elevated arsenic and/or lead concentrations were limited to the 0-foot to 0.5-foot sample interval in six of those borings. In the remaining three borings, elevated arsenic and/or lead concentrations were limited to the top 4 feet of the boring.

One soil sample collected from the drainage ditch southeast of the Site had an elevated arsenic concentration, which indicates that the drainage ditch has likely transported impacted soil approximately 300 feet away from (southeast) of the Site.

Shallow (less than 4 feet bgs) soil has been impacted with arsenic and lead by activities of the former phosphate/fertilizer plant, primarily in the Southern Processing Area. Therefore, impacted soil will be addressed in the alternatives.

2.6 Conclusions

The absence of elevated concentrations of Site-related metals, specifically arsenic and lead, in the groundwater, surface water, and stream sediments indicates that these matrices have not been adversely impacted by the activities of the former phosphate/fertilizer plant. Therefore, no further action is recommended for these matrices.

Shallow (less than 4 feet bgs) soil has been impacted with arsenic and lead by activities of the former phosphate/fertilizer plant, primarily in the Southern Processing Area. Therefore, Site-Specific Action Levels and alternatives that meet the Phase II objectives identified in Section 1.3 will be developed for shallow soil.

3. Identification of Phase II Alternatives

3.1 Introduction

This section presents Site-Specific Action Levels developed for on- and off-site shallow soils. It also identifies and describes alternatives developed to address soils with metals concentrations exceeding the Site-Specific Action Levels. As discussed in Section 2, no action is necessary for surface water, sediment or groundwater at the Site.

3.2 Site-Specific Action Levels

Site-Specific Action Levels are necessary to determine which areas of the Site should be included in the alternatives and the extent to which those areas should be remediated. This section uses the existing Site data to identify the metals for which action levels should be developed and then uses published USEPA standards as a basis for the Site-Specific Action Level for each identified metal.

3.2.1 Selection of Metals for Site-Specific Action Level Development

Five metals (antimony, arsenic, iron, lead, and thallium) are present in samples of Site soils at concentrations exceeding residential and/or industrial PRGs. As discussed in Section 1.2, past industrial practices at former phosphate fertilizer plants such as this one have typically resulted in the release of arsenic and lead to the environment. Arsenic and lead are present at concentrations exceeding both residential and industrial PRGs in Site soils as discussed in Section 2. Therefore, Site-Specific Action Levels will be developed for these two metals.

Antimony was present in just two on-site soil samples (VC-02-SB [1.5 bgs] and WB-SB19 [0-0.5 bgs]) (Tables 2-4 and 2-5) at concentrations exceeding the residential, but not the industrial, PRGs. Thallium was also present in just two on-site soil samples (VC-04-SS and VC-05-SS [both surficial samples]) (Table 2-4) at concentrations exceeding the residential, but not the industrial, PRGs. Since the Site is zoned industrial, the on-site soil antimony and thallium concentrations are below the industrial PRG, and because antimony and thallium are not elements typically associated with former phosphate fertilizer plant activities, no action should be taken at the Site based on these antimony and thallium concentrations. Therefore, a Site-Specific Action Level will not be developed for antimony or thallium.

Finally, iron was present in numerous soil samples at concentrations exceeding residential, and in some cases industrial, PRGs. However, due to the low toxicity of this metal (according to USEPA [2000] the industrial PRG is not based on toxicological data but is instead a maximum default concentration of 100,000 mg/kg) and its ubiquitous presence at the Site, no further action is warranted for iron. Therefore, a Site-Specific Action Level will not be developed for iron.

3.2.2 Selection of Site-Specific Action Levels

Due to the past industrial use of the Site, the current zoning of the Site for heavy industrial use, and the restricted access to the Site resulting from the installation of a fence during the Phase I Removal Action, Site-Specific Action Levels should be developed for the on-site soils that reflect the industrial nature of the Site. On-Site soils are those soils located on the former VCC property currently owned by Mr. Weston. However, the close proximity of residences to the Site and the current unrestricted access to off-site soils that have been impacted by Site activities warrant the development of Site-Specific Action Levels for off-site soils that reflect the potential for exposure to local residents. Off-site soils refer to soil not located on Mr. Weston's property

3.2.2.1 Off-Site Soil

For arsenic, which has both cancer and non-cancer endpoint PRGs, the cancer endpoint PRG for residential soils (0.39 mg/kg) is lower than the regional soil arsenic background concentration of 4.1 mg/kg reported by Shacklette and Boerngen (1984). Therefore, the residential non-cancer PRG of 22 mg/kg, which is the next highest PRG for arsenic, will be used as the Site-Specific Action Level for off-site soils. The use of this PRG is appropriate because it still falls within the range of soil concentrations (0.39 mg/kg [the published residential cancer endpoint PRG based on a 10^{-6} cancer risk] to 39 mg/kg [the calculated residential cancer endpoint PRG based on a 10^{-4} cancer risk]) that equates to USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

USEPA (2001) has recently published a new rule setting standards for abatement of lead in soil contaminated with lead-based paint. This rule sets a standard of 1,200 mg/kg of lead in soil, a concentration that USEPA considers to be protective for children playing in bare soil in a residential yard. Therefore, this standard will be used as the Site-Specific Action Level for lead in off-site soil.

3.2.2.2 On-Site Soil

As with the residential PRG, arsenic has both cancer and non-cancer endpoint industrial PRGs. The cancer endpoint PRG for industrial soil of 2.7 mg/kg, which is based on a carcinogenic risk of 10^{-6}, is lower than the regional soil arsenic background concentration of 4.1 mg/kg reported by Shacklette and Boerngen (1984). Therefore, to ensure that the Site-Specific Action Level is above regional background while at the same time remaining protective of human health, the industrial cancer endpoint PRG has been increased to 27 mg/kg to reflect a carcinogenic risk of 10^{-5}. The use of this adjusted industrial PRG is appropriate because it still falls within the range of USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}. Therefore, 27 mg/kg will be used as the Site-Specific Action Level for arsenic on-site soil.

The industrial PRG for lead is 750 mg/kg (USEPA, 2000); however, this is well below the 1,200 mg/kg that USEPA (2001) has found to be protective for lead in bare soil in a residential yard that is being used as the Site-Specific Action Level for the off-site soil and is therefore overly conservative. Therefore, 1,200 mg/kg will also be used as the Site-Specific Action Level for on-site soil.

3.3 Identification of Soils to be Addressed in the Alternatives

Theissen polygon maps were developed for the surface and subsurface soils at the Site (Figures 3-1 and 3-2, respectively) to calculate the surface area represented by each sample. Theissen polygon mapping involves the use of computer software to draw perpendicular bisector lines between adjacent sample locations, thus creating two-dimensional, sample-specific polygon areas. In this manner, any location within a given polygon is represented by the corresponding soil sample location and data. The Site property line was used as a boundary in developing the polygons. Therefore, on-site samples correspond to on-site polygons and off-site samples correspond to polygons located off-site.

Polygons shaded on Figures 3-1 and 3-2 indicate those polygons that exceed the Site-Specific Action Levels. Tables 3-1 and 3-2 present the surface areas of each of the polygons developed for Site surface and subsurface soil, respectively.

Tables 3-1, 3-2, and 3-3 also list the arsenic and lead concentrations in each polygon sample and compare these data to the Site-Specific Action Levels. The on-site, off-site, and total surface areas and in-place soil volumes are also listed for the polygons where Site-Specific Action Levels were exceeded. Only data representing the 0 – 2 foot (Table 3-1), 2 – 4 foot (Table 3-2), and 4 – 6 foot (Table 3-3) depth intervals were presented in these tables. None of the samples collected from below a depth of 4 feet contained arsenic or lead at concentrations exceeding Site-Specific Action Levels; therefore, the estimated maximum depth of soil that may be need to be addressed at the Site is 4 feet bgs.

3.4 Phase II Alternatives

Six alternatives were identified and evaluated. These alternatives are:

- Alternative 1 – No Action;
- Alternative 2 – Excavation of Select Off-Site Soil with Consolidation Under Topsoil Layer and Institutional Controls;
- Alternative 3 – Excavation of Off-Site Soil with Consolidation Under On-Site Soil Cover and Institutional Controls;
- Alternative 4 – Excavation of Off-Site Soil with Consolidation Under On-Site Asphalt Cap and Institutional Controls;
- Alternative 5 – Excavation of Off-Site Soil with Off-Site Disposal, Soil Cover Over On-Site Soil and Institutional Controls; and
- Alternative 6 – Excavation of On- and Off-Site Soil with Off-Site Disposal.

A description of each alternative and an evaluation of the ability of each to achieve the objectives are provided below.

3.4.1 Alternative 1 – No Action

The no-action alternative is required under the National Contingency Plan (NCP) [40 CFR 300.430(e) (6)] and serves as a baseline to evaluate action-related remedial alternatives. This alternative would result in continued potential for off-site migration of arsenic and lead over time. In addition, the no action alternative would not decrease the potential of exposure to the arsenic and lead-containing soils.

3.4.2 Alternative 2 - Excavation of Select Off-Site Soil with Consolidation Under Topsoil Layer and Institutional Controls

This alternative involves the excavation of approximately 240 cubic yards (cy) of off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Polygon SD4) with consolidation of the excavated material under a topsoil layer constructed on Site, and institutional controls restricting future property uses. A topsoil layer, consisting of 0.5 foot of topsoil, would be installed over 14 on-site polygons (SB9, SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) and one off-site polygon (SB20) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the topsoil layer would be approximately 2.4 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Approximately 240 cy of off-site soil from Polygon SD4 would be excavated to a depth of 4 feet bgs and consolidated under the on-site topsoil layer. Additional sampling would be conducted (e.g., in polygons such as SB9, SB12, and SB20) prior to placement of the topsoil layer to further delineate/refine the area over which the topsoil would be installed. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 2 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the topsoil layer would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

3.4.3 Alternative 3 - Excavation of Off-Site Soil with Consolidation Under On-Site Soil Cover and Institutional Controls

This alternative involves the excavation of approximately 1,950 cy of off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Polygons SD4 and SB20), consolidation of the excavated

material under a soil cover constructed on Site, and institutional controls restricting future property uses. A soil cover consisting of 1 foot of clean fill and 0.5 foot of topsoil would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the soil cover would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and consolidated under the on-site soil cover. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be covered, up to approximately 1,600 cy of surface soil from Polygon SB9 (which contained 14.8 mg/kg arsenic and 1,370 mg/kg lead) would also be excavated and consolidated under the on-site soil cover. In total, approximately 3,600 cy of soil would be excavated and consolidated under the soil cover. Additional sampling would be conducted (e.g., in polygons such as SB9, SB12, and SB20) prior to excavation or placement of the soil cover to further delineate/refine the extent of soil to be excavated/covered. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 3 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the soil cover would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

3.4.4 Alternative 4 – Excavation of Off-Site Soil with Consolidation Under On-Site Asphalt Cap and Institutional Controls

This alternative involves the excavation of approximately 1,950 cy of off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Polygons SD4 and SB20), consolidation of the excavated material under an asphalt cap constructed on Site, and institutional controls restricting future property uses. An asphalt cap consisting of 8-inches of crushed stone, 6-inches of subbase, and 1 1/2–inches of top course would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). In addition, for aesthetic purposes, VC-07-SS will also be capped with asphalt. The size of the asphalt cap would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and consolidated under the on-site asphalt cap. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be capped, up to approximately 1,600 cy of surface soil from Polygon SB9 (which contained 14.8 mg/kg arsenic and 1,370 mg/kg lead) would also be excavated and consolidated under the on-site asphalt cap. In total, approximately 3,600 cy of soil would be excavated and consolidated under the asphalt cap. Additional sampling would be conducted (e.g., in polygons such as SB9, SB12, and SB20) prior to excavation or placement of the asphalt cap to further delineate/refine the extent of soil to be excavated/capped. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 4 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the asphalt cap would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

3.4.5 Alternative 5 - Excavation of Off-Site Soil with Off-Site Disposal, Soil Cover Over On-Site Soils, and Institutional Controls

This alternative combines the excavation and off-site disposal of approximately 1,950 cy of off-site soil exceeding Site-Specific Action Levels (Polygons SD4 and SB20) with the installation of a soil cover over on-site soils exceeding Site-Specific Action Levels, and institutional controls restricting future property uses. A soil cover, consisting of 1 foot of clean fill 0.5 foot of topsoil, would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the soil cover would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized. Excavated off-site soil would be disposed of at permitted RCRA Subtitle D and/or C landfills.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and disposed of off site. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be covered, up to approximately 1,600 cy of surface soil from Polygon SB9 (which contained 14.8 mg/kg arsenic and 1,370 mg/kg lead) would also be excavated and disposed of off site. In total, up to approximately 3,000 cy of soil would be excavated and disposed of off site at permitted RCRA Subtitle D or C facilities. Additional sampling would be conducted (e.g., in polygons such as SB9, SB12, and SB20) prior to excavation or placement of a soil cover to further delineate/refine the extent of soil to be excavated/covered. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 5 may be modified based on those results. If results indicated a significantly greater volume of material needs to be excavated and disposed than originally estimated, Alternative 3 would be considered. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Excavated soil would be sampled in place prior to excavation and analyzed to determine if it was hazardous or non-hazardous to determine disposal requirements. It has been assumed during preparation of the planning level cost estimate that 75% of the excavated soil would be non-hazardous and could be disposed of at a RCRA Subtitle D landfill while the remaining 25% of the excavated soil would be hazardous and would require disposal at a RCRA Subtitle C landfill. It has also been assumed that hazardous soil would not require treatment prior to disposal to meet land ban limitations.

3.4.6 Alternative 6 - Excavation of On- and Off-Site Soil with Off-Site Disposal

This alternative involves the excavation of all on- and off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels with off-site disposal of the soil at permitted Resource Conservation and Recovery Act (RCRA) Subtitle D and/or C landfills. Approximately 9,600 in-place cy of soil would be excavated from 14 on-site polygons (SB9, SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) and 2 off-site polygons (SD4 and SB20) to depths of two to four feet, as appropriate. Tables 3-1 and 3-2 list the polygons that would be excavated, the depth of excavation, and the total volume excavated. Additional sampling would be conducted (e.g., in polygons such as SB9, SB12, and SB20) prior to excavation to further delineate/refine the extent of soil to be excavated. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 6 may be modified based on those results. If results indicated a significantly greater volume of material than estimated needs to be excavated, then Alternatives 3, 4, or 5 would be considered. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Excavated soil would be sampled in place prior to excavation and analyzed to determine if it was hazardous or non-hazardous to determine disposal requirements. It has been assumed during preparation of the planning level cost estimate that 75% of the excavated soil would be non-hazardous and could be disposed of at a RCRA Subtitle D landfill while the remaining 25% of the excavated soil would be hazardous and would require

disposal at a RCRA Subtitle C landfill. It has also been assumed that hazardous soil would not require treatment prior to disposal to meet land ban limitations.

4. Detailed Analysis of Alternatives

4.1 Introduction

The detailed and comparative analyses of the six alternatives described in Section 3.4 consist of the analysis and presentation of the relevant information needed to allow decision-makers to select a remedial alternative. The primary objectives of the detailed analysis are: 1) to further define alternatives described in Section 3.4; 2) to evaluate each of the six alternatives against the evaluation criteria as specified in *Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA* (USEPA, 1988); and 3) to compare alternatives against each other to assess the relative performance of each alternative with respect to each evaluation criterion.

There are nine evaluation criteria contained in the USEPA guidance documents to address the CERCLA requirements as stated in the NCP. Assessments against two of the criteria relate directly to evaluation against regulatory requirements and are categorized as threshold criteria. Each alternative must meet these criteria, unless an "Applicable" or "Relevant and Appropriate" requirement (ARAR) waiver is invoked. These two criteria are:

- **Overall Protection of Human Health and the Environment** - This criterion considers the overall benefits to human health and the environment as a result of implementation. These benefits include an alternative's protectiveness and ability to reduce potential for exposure and risk.

- **Compliance with ARARs** - The extent to which ARARs would be achieved by an alternative is considered.

The following five criteria categorized as balancing criteria represent the primary technical criteria upon which the detailed analysis is based:

- **Long-Term Effectiveness and Permanence** - This criterion considers the alternative in terms of risk remaining after its implementation and its ability to maintain reliable protection over time.

- **Reduction in Mobility, Toxicity, or Volume Through Treatment** - This criterion considers the ability of an alternative to reduce the mobility, toxicity, or volume through treatment of on-site soils containing arsenic and lead.

- **Short-Term Effectiveness** - An alternative's short-term adverse impacts on human health or the environment due to construction and implementation are considered.

- **Implementability** - The technical and administrative feasibility of implementing an alternative, including the availability of services and materials required for implementation is considered.

- **Cost** - This criterion considers short-term capital and operating costs. Short-term capital and operating costs consist of direct and indirect costs. Direct costs include construction, equipment, transportation, disposal, analysis, treatment, and contingency costs, as appropriate. Indirect costs include engineering, legal, and permitting fees.

The final two criteria are evaluated by USEPA based on anticipated public and agency comments. These criteria categorized as modifying criteria are described below.

- **Community Acceptance** - Issues and concerns the public may have are evaluated.

- **Support Agency Acceptance** - This criterion considers issues and concerns the USEPA may have regarding an alternative, based on its review of the report.

4.2 Analysis of Individual Alternatives

This subsection presents a detailed analysis of each potential remedial alternative based on effectiveness, implementability, and cost as defined by the nine criteria cited above.

4.2.1 Alternative 1 - No Action

The no-action alternative provides a comparative baseline against which other alternatives can be evaluated. Under this alternative, no remedial action will be taken, and the soils containing arsenic and lead are considered to be left in place, without the implementation of any containment, removal, treatment, or other mitigating actions. This alternative does not provide for the monitoring of soil and does not provide for any active or passive institutional controls to reduce the potential for exposure (e.g., physical barriers). Since no remedial action will be taken, the potential for off-site migration of arsenic and lead soils would tend to continue over time. With the no-action alternative, the potential for exposure to soils containing arsenic and lead would remain.

Detailed analysis of the alternative follows.

Overall Protection of Human Health and the Environment - Under Alternative 1, the potential for off-site migration of soils containing arsenic and lead would remain. In addition, the no action alternative would not decrease the potential for exposure to the arsenic and/or lead-containing soils. Alternative 1 provides no increased protection over the current Site conditions and would not be protective of human health and the environment.

Compliance with ARARs/TBCs - Alternative 1 would not be in compliance with state and federal ARARs because the potential for exposure to soil containing arsenic and lead at concentrations above Site-Specific Action Levels would remain.

Long-Term Effectiveness and Permanence - Alternative 1 would not be protective or reliable over time because of the potential for off-site migration of, and continues exposure to, arsenic- and lead-containing soils.

Reduction in Mobility, Toxicity, or Volume Through Treatment - Alternative 1 provides no active remediation of soils that would reduce the mobility, toxicity, or volume of soils contain arsenic and lead through treatment.

Short-Term Effectiveness - Alternative 1 would maintain current conditions and, as such, no short-term increase in exposure and associated potential risks would occur.

Implementability - Alternative 1 would not involve the implementation of any active remedial responses.

Cost - No cost would be associated with Alternative 1.

4.2.2 Alternative 2 - Excavation of Select Off-Site Soil with Consolidation Under On-Site Topsoil Layer and Institutional Controls

This alternative involves the excavation of approximately 240 cy of select off-site soils with arsenic and/or lead concentrations exceeding Site-Specific Action Levels with consolidation of the excavated material under a topsoil layer constructed on Site. A topsoil layer, consisting of 0.5 foot of topsoil, would be installed over 14 on-site polygons and one off-site polygon with surface soil arsenic and/or lead concentrations exceeding Site-

Specific Action Levels (Table 3-1). The size of the topsoil layer would be approximately 2.4 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Approximately 240 cy of off-site soil from Polygon SD4 would be excavated to a depth of 4 feet bgs and consolidated under the on-site topsoil layer. Additional sampling would be conducted (e.g., in polygons SB9, SB12, and SB20) prior to placement of the topsoil layer to further delineate/refine the area over which the topsoil would be installed. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 2 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the topsoil layer would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Detailed analysis of the alternative follows.

Overall Protection of Human Health and the Environment - Alternative 2 would be protective of human health and the environment by removing and/or covering select arsenic and lead-containing soils off-site and consolidating at the Site under a topsoil layer. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. This alternative will eliminate the potential for human exposure with soils and off-site migration by construction of erosion control measures by removal and consolidation, covering with a topsoil layer, erosion control, implementation of institutional controls, and periodic monitoring and repair. A degree of short-term risk to workers is involved with implementing this alternative because the associated work involves handling and moving materials containing arsenic and lead. These risks can be reduced by using engineering controls, safety procedures, and equipment, but can not be eliminated. Nevertheless, this alternative would achieve the objectives through the removal and containment of arsenic and lead-containing soils.

Compliance with ARARs - Applicable ARARs/TBCs for this alternative are summarized in Table 4-1. Specific ARARs that directly influence implementing this alternative are listed below.

- **Federal Clean Air Act (40 CFR 50) and North Carolina Air Pollution Control Requirements (15A NCAC 2D).** These ARARs establish regulations regarding air emissions. Current emissions are assumed to be within acceptable limits. Since excavation of select soils and disturbance during construction could result in increased air emissions, the final design would be structured to assure that construction methods do not result in unacceptable emissions.

- **Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste (40 CFR 264).** This ARAR regulates the storage, transportation and operation of hazardous waste generators. This ARAR is applicable to Site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

- **North Carolina Sedimentation Control Rules (15A NCAC 4).** This ARAR establishes requirements for prevention of sedimentation pollution and is applicable to any land disturbing activities.

- **Occupations Safety and Health Act (OSHA) (29 CFR 1910 Part 120).** This ARAR provides safety rules for Site workers handling specific chemicals during activities. This regulation would be applicable for any action taken at the Site which involves handling of excavated materials.

Long-Term Effectiveness and Permanence - Alternative 2 would provide long-term protectiveness by reducing human exposure. It would reduce the health risks to workers, trespassers, and residents, and would minimize the potential for uncontrolled on- and/or off-site migration of those soils because the topsoil layer can be designed to minimize topsoil loss. Removal of off-site soil with consolidation under the on-site topsoil layer would also minimize the potential for future migration of the off-site soil. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. In the long term, the reliability of this alternative would be managed through periodic inspection, maintenance, and repair activities as necessary to ensure that the topsoil layer continues to isolate the covered soil from the ground surface.

Reduction in Mobility, Toxicity, or Volume Through Treatment - This alternative would not result in reductions in mobility, toxicity, or volume of arsenic and lead through treatment. However, the volume of off-site arsenic- and lead-containing soils would be reduced through the excavation and consolidation of select off-site soils. The mobility of the material would be reduced through containment on-site under a topsoil layer. The toxicity of the material would not be changed.

Short-Term Effectiveness - In the short term, excavation of arsenic- and/or lead-containing soils will increase the potential risk of exposure and releases to nearby receptors (primarily workers). Soil consolidation and placement of a topsoil layer would result in an increased potential during implementation for worker exposure to the arsenic- and/or lead-containing soils. Short-term protectiveness is also limited by the potential for arsenic and lead to migrate via airborne dust, and surface water runoff, despite the containment measures that will be in place. However, compliance with proper health and safety procedures and erosion and sedimentation control provisions developed as part of the remedial design would reduce the potential for worker and community exposure and the uncontrolled release of arsenic and/or lead-containing soils exceeding the Site-Specific Action Levels. The potential for off-site migration via surface water runoff and dustborne releases would be increased during the excavation.

Other aspects of this remedial alternative that constrain its short-term effectiveness are the potential for increased air emissions and increased risk of accidental release during soils handling.

Implementability - Implementing Alternative 2 would involve excavation, consolidation of soils on-site, placement of a topsoil layer, and institutional controls (i.e., maintenance of access restrictions, implementation of restrictions on future use). This alternative is easily and safely implementable using standard earthmoving technology. Administratively, the consolidation of soils on-site is possible. The services and materials necessary to implement this alternative are available locally or nationally. Qualified commercial contractors would be available to perform the work, and construction equipment could be obtained and transported to the Site.

Cost - The costs associated with Alternative 2 include the following construction activities: mobilizing/ demobilizing, work area preparation, excavating soils, transport and consolidation of soils, placement of an on-site topsoil layer, and Site restoration. Estimated capital costs associated with Alternative 2 is approximately $90,000, while the O&M cost is approximately $3,500 per year including costs associated with maintenance and repair of the topsoil layer, for a total O&M cost of approximately $43,000 (based on a 30-year present worth analysis). The total project present worth cost for Alternative 2 is approximately $193,000, including contingency and engineering. Cost assumptions and unit prices used when developing the planning level cost estimates are presented on Table 4-2. Details of the cost estimate for Alternative 2 are summarized on Table 4-3.

4.2.3 Alternative 3 - Excavation of Off-Site Soil and Consolidation Under On-Site Soil Cover and Institutional Controls

This alternative involves the excavation of approximately 1,950 cy of off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Polygons SD4 and SB20), consolidation of the excavated material under a soil cover constructed on site, and institutional controls restricting future property uses. A soil cover consisting of 1 foot of clean fill and 0.5 foot of topsoil would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the soil cover would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and consolidated under the on-site soil cover. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be covered, up to approximately 1,600 cy of surface soil from Polygon SB9 (which contained 14.8 mg/kg arsenic and 1,370 mg/kg lead) would also be excavated and consolidated under the on-site soil cover. In total, approximately 3,600 cy of soil would be excavated and consolidated under the soil cover. Additional sampling would be conducted (e.g., in polygons SB9, SB12, and SB20) prior to excavation or placement of a soil cover to further delineate/refine the extent of soil to be excavated/covered. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 3 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the soil cover would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Detailed analysis of the alternative follows.

<u>Overall Protection of Human Health and the Environment</u> - Alternative 3 would be protective of human health and the environment by consolidating off-site arsenic- and lead-containing soil on site with similar on-site soil under a soil cover. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. This alternative will minimize the potential for human exposure with soils and off-site migration by removal and consolidation of impacted soil, placement of a soil cover, erosion control, implementation of institutional controls, and periodic monitoring and repair. A degree of short-term risk to workers is involved with implementing this alternative because the associated work involves handling and moving materials containing arsenic and lead. These risks can be reduced by using engineering controls, safety procedures, and equipment, but can not be eliminated. Nevertheless, this alternative would achieve the objectives through the removal and containment of arsenic and lead-containing soils.

<u>Compliance with ARARs</u> - Applicable ARARs/TBCs for this alternative are summarized in Table 4-1. Specific ARARs that directly influence implementing this alternative are listed below.

- **Federal Clean Air Act (40 CFR 50) and North Carolina Air Pollution Control Requirements (15A NCAC 2D).** These ARARs establish regulations regarding air emissions. Current emissions are assumed to be within acceptable limits. Since excavation of select soils and disturbance during construction could result in increased air emissions, the final design would be structured to assure that construction methods do not result in unacceptable emissions.

- **Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste (40 CFR 264).** This ARAR regulates the storage, transportation and operation of hazardous waste generators. This ARAR is applicable to Site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

- **North Carolina Sedimentation Control Rules (15A NCAC 4).** This ARAR establishes requirements for prevention of sedimentation pollution and is applicable to any land disturbing activities.

- **OSHA (29 CFR 1910 Part 120).** This ARAR provides safety rules for Site workers handling specific chemicals during activities. This regulation would be applicable for any action taken at the Site which involves handling of excavated materials.

Long-Term Effectiveness and Permanence - Alternative 3 would provide long-term protectiveness by reducing human exposure. It would reduce the health risks to workers, trespassers, and residents, and would minimize the potential for uncontrolled on- and/or off-site migration of those soils because the soil cover can be designed to minimize soil loss. Removal of off-site soil with consolidation under the on-site soil cover would also minimize the potential for future migration of the off-site soil. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. In the long term, the reliability of this alternative would be managed through periodic cover inspection, maintenance, and repair activities as necessary to ensure that the soil cover continues to isolate the covered soil from the ground surface.

Reduction in Mobility, Toxicity, or Volume Through Treatment - This alternative would not result in reductions in mobility, toxicity, or volume of arsenic and lead through treatment.. However, the volume of off-site arsenic and lead-containing soils exceeding the Site-Specific Action Levels would be reduced through the excavation and consolidation on site. The mobility of the material would be reduced through containment on-site under a soil cover. The toxicity of the material would not be changed.

Short-Term Effectiveness - In the short term, excavation of soils will increase the potential risk of exposure and releases to nearby receptors (primarily workers). Soil consolidation and cover construction activities would result in an increased potential during implementation for worker exposure to the arsenic and lead-containing soils. Short-term protectiveness is also limited by the potential for arsenic and lead to migrate via airborne dust, and surface water runoff, despite the containment measures that will be in place. However, compliance with proper health and safety procedures and erosion and sedimentation control provisions developed as part of the remedial design would reduce the potential for worker and community exposure and the uncontrolled release of arsenic and lead-containing soils exceeding the Site-Specific Action Levels. The potential for off-site migration via surface water runoff and dustborne releases would be increased during the excavation.

Other aspects of this remedial alternative that constrain its short-term effectiveness are the potential for increased air emissions and increased risk of accidental release during soils handling.

Implementability - Implementing Alternative 3 would involve excavation, consolidation of soils on-site, installation of a soil cover, and institutional controls (i.e., maintenance of access restrictions, implementation of restrictions on future use). This alternative is easily and safely implementable using standard earthmoving technology. Administratively, the consolidation of soils on-site is possible. The services and materials necessary to implement this alternative are available locally or nationally. Qualified commercial contractors would be available to perform the work, and construction equipment could be obtained and transported to the Site.

Cost - The costs associated with Alternative 3 include the following construction activities: mobilizing/ demobilizing, work area preparation, excavating soils, transport and consolidation of soils, covering on-site soils, and Site restoration. Estimated capital costs associated with Alternative 3 is approximately $267,000, while the O&M cost is approximately $3,500 per year including costs associated with maintenance and repair of the soil cover, for a total O&M cost of approximately $43,000 (based on a 30-year present worth analysis). The total project present worth cost for Alternative 3 is approximately $450,000, including contingency and engineering. Cost assumptions and unit prices used when developing the planning level cost estimates are presented on Table 4-2. Details of the cost estimate for Alternative 3 are summarized on Table 4-4.

4.2.4 Alternative 4 - Excavation of Off-Site Soil and Consolidation Under On-Site Asphalt Cap and Institutional Controls

This alternative involves the excavation of approximately 1,950 cy of off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Polygons SD4 and SB20), consolidation of the excavated material under an asphalt cap constructed on Site, and institutional controls. An asphalt cap, consisting of 8-inches of crushed stone, 6-inches of subbase, and 1 1/2–inches of top course, would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the asphalt cap would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and consolidated under the on-site asphalt cap. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be capped, up to approximately 1,600 cy of surface soil from Polygon SB9 (which contained 14.8 mg/kg arsenic and 1,370 mg/kg lead) would also be excavated and consolidated under the on-site asphalt cap. In total, approximately 3,600 cy of soil would be excavated and consolidated under the asphalt cap. Additional sampling would be conducted (e.g., in polygons SB9, SB12, and SB20) prior to excavation or placement of an asphalt cap to further delineate/refine the extent of soil to be excavated/capped. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 4 may be modified based on those results. For example, the results of additional delineation sampling may indicate that only portions of some polygons contain surficial soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels. The dimensions of the asphalt cap would then be adjusted accordingly. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Detailed analysis of the alternative follows.

Overall Protection of Human Health and the Environment - Alternative 4 would be protective of human health and the environment by removing and/or capping arsenic and lead-containing soils exceeding the Site-Specific Action Levels from off-site locations and consolidating at the Site under an asphalt cap. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. This alternative will eliminate the potential for human exposure with soils and off-site migration by consolidation of off-site soils on site, isolation of soil under an asphalt cap, erosion control, implementation of institutional controls, and periodic monitoring and repair. A degree of short-term risk to workers is involved with implementing this alternative because the associated work involves handling and moving materials containing arsenic and lead. These risks can be reduced by using engineering controls, safety procedures, and equipment, but can not be eliminated. Nevertheless, this alternative would achieve the objectives through the removal and containment of arsenic and lead-containing soils.

Compliance with ARARs - Applicable ARARs/TBCs for this alternative are summarized in Table 4-1. Specific ARARs that directly influence implementing this alternative are listed below.

- **Federal Clean Air Act (40 CFR 50) and North Carolina Air Pollution Control Requirements (15A NCAC 2D).** These ARARs establish regulations regarding air emissions. Current emissions are assumed to be within acceptable limits. Since excavation of select soils and disturbance during construction could result in increased air emissions, the final design would be structured to assure that construction methods do not result in unacceptable emissions.

- **Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste (40 CFR 264).** This ARAR regulates the storage, transportation and operation of hazardous waste generators. This ARAR is applicable to Site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

- **North Carolina Sedimentation Control Rules (15A NCAC 4).** This ARAR establishes requirements for prevention of sedimentation pollution and is applicable to any land disturbing activities.

- **OSHA (29 CFR 1910 Part 120).** This ARAR provides safety rules for Site workers handling specific chemicals during activities. This regulation would be applicable for any action taken at the Site which involves handling of excavated materials.

Long-Term Effectiveness and Permanence - Alternative 4 would provide long-term protectiveness by reducing human exposure. It would reduce the health risks to workers, trespassers, and residents, and would minimize the potential for uncontrolled on- and/or off-site migration of those soils because those soils would be consolidated beneath an asphalt cap. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. In the long term, the reliability of this alternative would be managed through periodic cap inspection, maintenance, and repair activities as necessary to ensure that the asphalt cap continues to isolate the capped soil from the ground surface.

Reduction in Mobility, Toxicity, or Volume Through Treatment - This alternative would not result in reductions in mobility, toxicity, or volume of arsenic and lead through treatment. However, the volume of off-site arsenic and lead-containing soils exceeding the Site-Specific Action Levels at the Site would be reduced through the excavation and consolidation on site. The mobility of the material would be reduced through containment on-site under an asphalt cap. The toxicity of the material would not be changed.

Short-Term Effectiveness - In the short term, excavation of soils will increase the potential risk of exposure and releases to nearby receptors (primarily workers). Soils consolidation and asphalt cap construction activities would result in an increased potential during implementation for worker exposure to the arsenic and lead-containing soils. Short-term protectiveness is also limited by the potential for arsenic and lead to migrate via airborne dust, and surface water runoff, despite the containment measures that will be in place. However, compliance with proper health and safety procedures and erosion and sedimentation control provisions developed as part of the remedial design would reduce the potential for worker and community exposure and the uncontrolled release of arsenic and lead-containing soils exceeding the Site-Specific Action Levels. The potential for off-site migration via surface water runoff and dustborne releases would be increased during the excavation.

Other aspects of this remedial alternative that constrain its short-term effectiveness are the potential for increased air emissions and increased risk of accidental release during soils handling.

Implementability - Implementing Alternative 4 would involve excavation, consolidation of soils on-site, and capping, and institutional controls (i.e., maintenance of access restrictions, implementation of restrictions on future use). This alternative is easily and safely implementable using standard earthmoving technology. Administratively, the consolidation of soils on-site is possible. The services and materials necessary to implement this alternative are available locally or nationally. Qualified commercial contractors would be available to perform the work, and construction equipment could be obtained and transported to the Site.

Cost - The costs associated with Alternative 4 include the following construction activities: mobilizing/ demobilizing, work area preparation, excavating soils, transport and consolidation of soils, construction of an asphalt cap, and Site restoration. Estimated capital costs associated with Alternative 4 is approximately $418,000, while the O&M cost is approximately $3,400 per year including costs associated with maintenance and repair of the soil cover, for a total O&M cost of approximately $43,000 (based on a 30-year present worth analysis). The total project present worth cost for Alternative 4 is approximately $668,000, including contingency and engineering. Cost assumptions and unit prices used when developing the planning level cost estimates are presented on Table 4-2. Details of the cost estimate for Alternative 4 are summarized on Table 4-5.

4.2.5 Alternative 5 – Excavation of Off-Site Soil with Off-Site Disposal, Soil Cover Over On-Site Soil, and Institutional Controls

This alternative combines the excavation and off-site disposal of approximately 1,950 cy of off-site soil exceeding Site-Specific Action Levels (Polygons SD4 and SB20) with the installation of a soil cover over on-site soils exceeding Site-Specific Action Levels. A soil cover consisting of 1 foot of clean fill and 0.5 foot of topsoil would be installed over 13 on-site polygons (SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) with surface soil arsenic and/or lead concentrations exceeding Site-Specific Action Levels (Table 3-1). The size of the soil cover would be approximately 1.7 acres and would be designed such that erosion resulting from storm water runoff is minimized. Excavated off-site soil would be disposed of at permitted RCRA Subtitle D and/or C landfills.

Up to approximately 1,950 cy of off-site soil from Polygons SD4 and SB20 would be excavated to a depth of 4 feet bgs and disposed of off site. In addition, due to its presence on an upper level of the Site physically separate from the other polygons that would be covered, up to approximately 1,600 cy of surface soil from Polygon SB9 would also be excavated and disposed of off site. In total, approximately 3,000 cy of soil would be excavated and disposed of off site at permitted RCRA Subtitle D or C facilities. Additional sampling would be conducted (e.g., in polygons SB9, SB12, and SB20) prior to excavation or placement of a soil cover to further delineate/refine the extent of soil to be excavated/covered. If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 5 may be modified based on those results. If results indicated a significantly greater volume of material needs to be excavated and disposed than originally estimated, Alternative 3 would be considered. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Detailed analysis of the alternative follows.

Overall Protection of Human Health and the Environment - Alternative 5 would be protective of human health and the environment by excavating select off-site and on-site soils with arsenic and lead concentrations exceeding the Site-Specific Action Levels with off-site disposal and covering the remaining on-site soils with arsenic and lead exceeding the Site-Specific Action Levels with a soil cover. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. This alternative will eliminate the potential for human exposure with soils and off-site migration by disposal off-site of select soils, isolation of remaining soils under a soil cover, erosion control,

implementation of institutional controls, and periodic monitoring and repair. A degree of short-term risk to workers is involved with implementing this alternative because the associated work involves handling and moving materials containing arsenic and lead. These risks can be reduced by using engineering controls, safety procedures, and equipment, but can not be eliminated. Nevertheless, this alternative would achieve the objectives through the removal and containment of arsenic and lead-containing soils.

Compliance with ARARs - Applicable ARARs/TBCs for this alternative are summarized in Table 4-1. Specific ARARs that directly influence implementing this alternative are listed below.

- **Federal Clean Air Act (40 CFR 50) and North Carolina Air Pollution Control Requirements (15A NCAC 2D).** These ARARs establish regulations regarding air emissions. Current emissions are assumed to be within acceptable limits. Since excavation of select soils and disturbance during construction could result in increased air emissions, the final design would be structured to assure that construction methods do not result in unacceptable emissions.

- **Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste (40 CFR 264).** This ARAR regulates the storage, transportation and operation of hazardous waste generators. This ARAR is applicable to site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

- **Department of Transportation (DOT) Hazardous Materials Transportation Act (49 USC 1801).** This ARAR outlines the procedures for packaging, labeling, manifesting, and transporting hazardous waste materials for off-site disposal. This ARAR is applicable in transporting hazardous wastes to off site to appropriate TSD facilities.

- **North Carolina Sedimentation Control Rules (15A NCAC 4).** This ARAR establishes requirements for prevention of sedimentation pollution and is applicable to any land disturbing activities.

- **OSHA (29 CFR 1910 Part 120).** This ARAR provides safety rules for Site workers handling specific chemicals during activities. This regulation would be applicable for any action taken at the Site which involves handling of excavated materials.

Long-Term Effectiveness and Permanence - Alternative 5 would provide long-term protectiveness by reducing human exposure. It would reduce the health risks to workers, trespassers, and residents, and would minimize the potential for uncontrolled on- and/or off-site migration of those soils. Institutional controls would be necessary under this alternative because soil containing arsenic and/or lead above Site-Specific Action Levels would remain at the Site. In the long term, the reliability of this alternative would be managed through periodic cover inspection, maintenance, and repair activities as necessary to ensure that the soil cover continues to isolate the covered soil from the ground surface.

Reduction in Mobility, Toxicity, or Volume Through Treatment - This alternative would not result in reductions in mobility, toxicity, or volume of arsenic and lead through treatment. However, the volume of arsenic and lead-containing soils exceeding the Site-Specific Action Levels at the Site would be reduced through the excavation and off-site disposal of select soils. The mobility of select material would be reduced through containment in a RCRA landfill while the mobility of the remaining soils would be reduced through containment on site under a soil cover. The toxicity of the material would not be changed.

Short-Term Effectiveness - In the short term, excavation of soils will increase the potential risk of exposure and releases to nearby receptors (primarily workers). Because of excavation and cover construction activities,

there would be an increased potential during implementation for worker exposure to the arsenic and lead-containing soils. Short-term protectiveness is also limited by the potential for arsenic and lead to migrate via airborne dust, and surface water runoff, despite the containment measures that will be in place. However, compliance with proper health and safety procedures and erosion and sedimentation control provisions developed as part of the remedial design would reduce the potential for worker and community exposure and the uncontrolled release of arsenic and lead-containing soils exceeding the Site-Specific Action Levels. The potential for off-site migration via surface water runoff and dustborne releases would be increased during the excavation.

Alternative 5 would increase the potential for worker exposure to arsenic and lead-containing soils due to the excavation and transport of the targeted soil. Approximately 320, 17-ton trucks traveling from the Site to the appropriate disposal facilities would result in an increase potential to exposure for workers, residents, travelers, and passers-by as well as disruption to the community. Potential exposure to nonworkers would increase through the potential for accidents during transportation to the RCRA landfill.

Transporting residuals to the nearest RCRA Subtitle C landfill would pose perhaps the greatest short-term risk. The nearest RCRA Subtitle C landfill is located approximately 575 miles from the Site in Emelle, Alabama. With approximately 80, 17-ton trucks traveling a combined total of approximately 46,000 miles to this facility, transporting material over this distance would increase the area and number of people that could potentially be exposed to arsenic and lead-containing soils.

Other aspects of this remedial alternative that constrain its short-term effectiveness are the potential for increased air emissions and increased risk of accidental release during soils handling.

Implementability - Implementing Alternative 5 would involve excavation, off-site disposal of select soils, consolidation of other soils on-site, covering, and institutional controls (i.e., maintenance of access restrictions, implementation of restrictions on future use). This alternative is easily and safely implementable using standard earthmoving technology. Administratively, both the consolidation of soils on site and disposal of soils off site are possible. The services and materials necessary to implement this alternative are available locally or nationally. Qualified commercial contractors would be available to perform the work, and construction equipment could be obtained and transported to the Site.

Cost - The costs associated with Alternative 5 include the following construction activities: mobilizing/ demobilizing, work area preparation, excavating soils, off-site disposal of select soils, transport and on-site consolidation of other soils, covering select on-site polygons, and Site restoration. Estimated capital costs associated with Alternative 5 is approximately $637,000, while the O&M cost is approximately $3,500 per year including costs associated with maintenance and repair of the soil cover, for a total O&M cost of approximately $43,000 (based on a 30-year present worth analysis). The total project present worth cost for Alternative 5 is approximately $986,000, including contingency and engineering. Cost assumptions and unit prices used when developing the planning level cost estimates are presented on Table 4-2. Details of the cost estimate for Alternative 5 are summarized on Table 4-6.

4.2.6 Alternative 6 – Excavation of On- and Off-Site Soil with Off-Site Disposal

This alternative involves the excavation of all on- and off-site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels with off-site disposal of the soil at permitted RCRA Subtitle D and/or C landfills. Approximately 9,600 in-place cubic yards (cy) of soil would be excavated from 14 on-site polygons (SB9, SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS) and 2 off-site polygons (SD4 and SB20) to depths of two to four feet, as appropriate. Additional sampling would be conducted (e.g., in polygons SB9, SB12, and SB20) prior to excavation to further delineate/refine the extent of soil to be excavated.

If additional sample(s) indicate significant differences from the previous sampling investigations, Alternative 6 may be modified based on those results. If results indicated a significantly greater volume of material than estimated needs to be excavated, then Alternatives 3, 4, or 5 would be considered. Excavated areas would be backfilled with clean soil fill and topsoil, the areas graded to ensure proper drainage, and grass grown to control erosion.

Excavated soil would be sampled in place prior to excavation and analyzed to determine if it was hazardous or non-hazardous to determine disposal requirements. It has been assumed during preparation of the planning level cost estimate that 75% of the excavated soil would be non-hazardous and could be disposed of at a RCRA Subtitle D landfill while the remaining 25% of the excavated soil would be hazardous and would require disposal at a RCRA Subtitle C landfill. It has also been assumed that hazardous soil would not require treatment prior to disposal to meet land ban limitations.

Detailed analysis of the alternative follows.

Overall Protection of Human Health and the Environment - Alternative 6 would be protective of human health and the environment by removing from the Site soil with arsenic and/or lead concentrations exceeding Site-Specific Action Levels and permanently disposing of in RCRA Subtitle D and/or C landfills. However, overall protection of human health and the environment could be compromised due to potential repeated exposures from possible accidental or incidental releases, as described below in the evaluation of short-term effectiveness. Certain risks may be reduced by the use of engineering controls, safety procedures, and equipment; however, they can not be eliminated. Nevertheless, this alternative would achieve the objectives through the removal and disposal of soils containing arsenic and lead despite the significant potential short-term risks to human health and the environment cited above as related to constructability issues.

Compliance with ARARs - Applicable ARARs/TBCs for this alternative are summarized in Table 4-1. Specific ARARs that directly influence implementing this alternative are discussed below.

- **Federal Clean Air Act (40 CFR 50) and North Carolina Air Pollution Control Requirements (15A NCAC 2D).** These ARARs establish regulations regarding air emissions. Current emissions are assumed to be within acceptable limits. Since excavation of select soils and disturbance during construction could result in increased air emissions, the final design would be structured to assure that construction methods do not result in unacceptable emissions.

- **Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste (40 CFR 264).** This ARAR regulates the storage, transportation and operation of hazardous waste generators. This ARAR is applicable to Site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

- **DOT Hazardous Materials Transportation Act (49 USC 1801).** This ARAR outlines the procedures for packaging, labeling, manifesting, and transporting hazardous waste materials for off-site disposal. This ARAR is applicable in transporting hazardous wastes to off site to appropriate TSD facilities.

- **North Carolina Sedimentation Control Rules (15A NCAC 4).** This ARAR establishes requirements for prevention of sedimentation pollution and is applicable to any land disturbing activities.

- **OSHA (29 CFR 1910 Part 120).** This ARAR provides safety rules for Site workers handling specific chemicals during activities. This regulation would be applicable for any action taken at the Site which involves handling of excavated materials.

Long-Term Effectiveness and Permanence - Alternative 6 would provide long-term protectiveness of human health and the environment. It would reduce the risks to workers, trespassers, and residents. Additionally, the potential off-site migration of soil containing arsenic and lead via erosion would be eliminated as well. Through the removal of arsenic and lead-containing soils, Alternative 6 would permanently reduce the potential for long-term effects such as human exposure or off-site migration.

Reduction in Mobility, Toxicity, or Volume Through Treatment - Alternative 6 would not result in reductions in mobility, toxicity, and volume of arsenic and lead through treatment. However, the volume of arsenic and lead -containing material at the Site would be reduced through the excavation and off-site disposal of materials. The mobility of the material would be reduced through containment in a RCRA landfill. The toxicity of the material would not be changed.

Short-Term Effectiveness - The excavation of soils would increase the potential for arsenic and lead migration via airborne dust, surface water runoff, and soils transport, despite the containment measures that will be in place. Construction activities would result in the increased potential for short-term exposures to both workers and nearby residents to dust-borne releases of arsenic and lead-containing soils. In addition, residuals transport to disposal sites would pose the same short-term risks.

Although compliance with proper health and safety procedures and erosion and sedimentation control provisions developed as part of the remedial design would minimize the potential for worker exposure and the uncontrolled release of arsenic and lead-containing materials, the potential for off-site migration via surface water runoff and dust-borne releases would be increased during the excavation.

Alternative 6 would significantly increase the potential for worker exposure to arsenic and lead-containing soils due to the excavation and transport of the large volume of targeted soil. Approximately 850, 17-ton trucks traveling from the Site to the appropriate disposal facilities would result in an increase potential to exposure for workers, residents, travelers, and passers-by as well as disruption to the community. Potential exposure to nonworkers would increase through the potential for accidents during transportation to the RCRA landfill.

Transporting residuals to the nearest RCRA Subtitle C landfill would pose perhaps the greatest short-term risk. The nearest RCRA Subtitle C landfill is located approximately 575 miles from the Site in Emelle, Alabama. With approximately 210, 17-ton trucks traveling more than 120,000 miles to the facility, transporting material over this distance would increase the area and number of people that could potentially be exposed to arsenic and lead-containing soils.

Implementability - Implementing Alternative 6 would involve excavating and transporting soils to a RCRA-permitted landfill. These technologies have been applied successfully to other sites and are considered technically feasible. The materials and qualified commercial contractors are available nationally or locally to implement this alternative. Administratively, the disposal of residuals in a RCRA facility is possible.

Cost - Alternative 6 costs are associated with the following construction activities: mobilizing/demobilizing, work area preparation, excavating soils, transport and disposal of materials, Site restoration, and health and safety. The estimated capital cost associated with Alternative 6 is approximately $2.0 million, including contingency and engineering. The transport and disposal of the excavated residuals accounts for approximately 72 percent of the total capital cost. Cost assumptions and unit prices used when developing the planning level cost estimates are presented on Table 4-2. Details of the cost estimate for Alternative 6 are summarized on Table 4-7.

4.3 Comparative Analysis of Alternatives

The purpose of this subsection is to evaluate the relative performance of each alternative in relation to the nine criteria. The comparative analysis generally will focus on the differences between alternatives with respect to the primary balancing criteria since these factors play the major role in determining which options are cost-effective and which remedy utilizes permanent solutions and treatment to the maximum extent practicable. A discussion of the performance of the alternatives relative to each other according to the criteria is provided below.

Overall Protection of Human Health and the Environment

Alternative 1 is the least protective of human health and the environment of all six alternatives. Alternative 1 provides no increased protection over the current conditions and would not be protective of human health and the environment over the long-term for foreseeable land uses. Removing select soils and consolidating under a topsoil layer, soil cover, or asphalt cap (Alternatives 2, 3, 4, and 5) would be protective of human health and the environment by minimizing the potential for human exposure with soils and uncontrolled off-site migration by implementing erosion control measures, a cover system, institutional controls, and maintenance. Alternative 6, in the long term, would be the most protective of human health and the environment by removal and disposal of arsenic and lead-containing materials above the Site-Specific Action Levels. Because of its scale, Alternative 6 (and to a lesser extent Alternative 5) poses the greatest short-term risks arising from accidental or incidental exposure associated with excavation of the greatest amount of soil, increasing chances of accidental releases, and potential exposure arising out of more than 800 trucks traveling to dispose of soil. Overall, Alternatives 3 and 4 would offer the greatest protection of human health and the environment, considering both long- and short-term effects.

Compliance with ARARs

Alternative 1 would not minimize the potential for exposure to soil containing arsenic and lead at concentrations exceeding Site-Specific Action Levels. Alternatives 2 through 6 would be in compliance with all ARARs.

Long-Term Effectiveness and Permanence

A primary measure of the long-term effectiveness of an alternative is the magnitude of risk to human health after remediation. With proper and effective operation and maintenance, Alternatives 2 through 5 would provide long-term effectiveness by isolating or removing arsenic and lead-containing soils in exceedences of the action levels from the Site; however, Alternative 2 would be the least effective of those alternatives because the isolating soil layer is the thinnest of the three alternatives. Alternative 6 has a high degree of long-term effectiveness and permanence because all materials containing arsenic and lead above the Site-Specific Action Levels are excavated and removed from the Site and disposed of in a RCRA-permitted landfill. Alternatives 2 through 5, excavation, consolidation and containment, also have a high degree of effectiveness, but rely on periodic monitoring and repair to ensure that the covers integrities and institutional controls are maintained. Alternative 1 would not be an effective or permanent alternative.

Reduction in Mobility, Toxicity, or Volume Through Treatment

None of the alternatives would reduce mobility, toxicity, or volume through treatment. Alternative 6 would reduce the volume of arsenic and lead-containing material above the action levels at the Site to zero through excavation and off-site disposal of materials. Alternative 5 would reduce the volume of arsenic and lead-containing material above the action levels off-site through excavation and off-site disposal (at a permitted disposal facility) of some materials. Alternatives 3 and 4 would remove the arsenic and lead-containing off-site

soils exceeding the Site-Specific Action Levels by excavating and consolidating materials on site. Alternative 2 would reduce a portion of the volume of arsenic and lead-containing soils off-site exceeding the Site-Specific Action Levels by excavating and consolidating materials on-site.

Short-Term Effectiveness

Alternative 1 would be effective in the short term since no construction activities would be implemented. Alternative 2 would have a higher short-term effectiveness because it involves excavating and moving the smallest amount of soil. Alternatives 3 and 4 would have a lower short-term effectiveness because it involves excavating and moving of a larger volume of soil. Although the use of Site controls and monitoring reduce the potential for short-term impacts, risks increase proportionally with increased handling of materials. Alternative 5 would have an even lower short-term effectiveness because it involves the both the excavating and moving of soil, along with the off-site disposal of soil. Alternative 6 would be the least effective in the short term because it would require excavating approximately 2.5 times the volume of material of Alternative 5, increasing the likelihood of accidental releases higher. Additionally, transporting approximately 850 truck loads of materials over public roads during the excavation period greatly increases the potential exposure of to the general public. These factors make Alternative 6 the least effective in the short term.

Implementability

Alternative 1 cannot be evaluated by this criterion; however, the remaining 5 Alternatives are based upon proven technologies and are considered technically feasible. The services and material necessary to implement Alternatives 2 though 6 would be available through local vendors or could be readily transported to the Site.

The engineering, design, and administrative requirements increase with the complexity of the alternatives in numerical order; Alternative 2 being the least difficult with Alternative 6 being the most difficult and complex. The degree of difficulty in implementing these alternatives increases with the amount of material to be excavated, and the distance to the selected disposal area.

Due to the magnitude of work required for Alternative 3 through 6, Alternative 2 is considered more implementable.

Cost

Alternative 1 has no associated capital or O&M costs. The estimated total project present worth costs for each alternative are as follows: Alternative 2 is $193,000; Alternative 3 is $450,000; Alternative 4 is $668,000; Alternative 5 is $986,000; and is $2.0 million. A summary of costs is provided in Tables 4-3 through 4-7.

Community Acceptance

Community acceptance is not anticipated for Alternative 1 for no active remediation is proposed. Acceptance is anticipated for the other Alternatives.

Support Agency Acceptance

USEPA acceptance is not anticipated for Alternative 1 for no active remediation is proposed. Acceptance is anticipated for the other Alternatives.

5. Preferred Remedy

This section identifies the preferred remedy for the Wadesboro VCC Site. The selection of the preferred remedy is based on an individual and comparative evaluation of the six alternatives with respect to the nine criteria required by the NCP, as presented in this report.

Given these considerations, Alternative 3 - Excavation of Off-Site Soil with Consolidation Under On-Site Soil Cover and Institutional Controls, is recommended because:

- Alternative 3 would be protective of human health and the environment and achieve the objectives established for the Site. Specifically, it will: minimize the potential for exposure to on-site soils above Site-Specific Action Levels; minimize the potential for off-site migration of on-site soils above the Site-Specific Action Levels; and minimize the potential for direct contact and continued migration of arsenic and lead-containing soils above the action levels.

- Alternative 3 would remove off-site soil with arsenic and lead concentrations that are above the Site-Specific Action Levels, thereby preventing exposure by nearby residents.

- Alternative 3 would restrict future exposure with the implementation of institutional controls.

- Alternative 3 achieves the objectives without the off-site transport and disposal of soil.

- Alternative 3 is not as permanent a solution as Alternative 6; however, with implementation of institutional controls, it is as protective as Alternative 6.

- Alternative 3 would be far more cost-effective than Alternatives 5 and 6. A planning level cost of approximately $450,000 for Alternative 3 is approximately 20% of the cost of Alternative 6 and approximately 45% of the cost of Alternative 5. Neither cost, short-term risk, nor ease of implementation, can be justified by the increased degree of protectiveness offered by Alternative 6. Consequently, Alternative 3 offers a balance of effectiveness and cost.

Based on these findings, Alternative 3, that includes relocating off-site soils containing arsenic and lead above the Site-Specific Action Levels and consolidation under an on-site soil cover, is the preferred remedy for the Wadesboro VCC Site. This alternative meets all of the objectives, is as equally or more protective as the other five alternatives, and is the most cost-effective.

6. References

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Tables

BLASLAND, BOUCK & LEE, INC.

engineers & scientists

Table 2-1
Summary of Detected Analytes in Surface Water Samples
Wadesboro VCC - Alternatives Evaluation Report

			Concentration[1] in Sample:		
Analyte	**PRG**	**Units**	**WB-SW01**	**WB-SW02**	**WB-SW99[2]**
Metals					
Aluminum	36,000	µg/L	265	344	353
Barium	2,600	µg/L	80.2 B	80.3 B	79.3 B
Calcium	NP	µg/L	18500	20500	21200
Cobalt	2,200	µg/L	0.70 U	0.90 B	0.89 B
Iron	11,000	µg/L	1250	1150	1200
Magnesium	NP	µg/L	5360	5580	5790
Manganese	880	µg/L	76.4	111	116
Nickel	730	µg/L	1.6 U	2.5 B	2.5 B
Potassium	NP	µg/L	1500 B	1560 B	1610 B
Sodium	NP	µg/L	12300	12700	13200
Zinc	11,000	µg/L	12.4 B	21.7	23.5
Water Quality Parameters					
pH	--	S.U.	8.27	7.90	NM
Temperature	--	°C	22.95	22.46	NM
Specific Conductance	--	mS/cm	0.184	0.189	NM
Dissolved Oxygen	--	mg/L	6.34	6.51	NM
Oxidation/Reduction Potential	--	mV	280	375	NM

Notes:
\1 See Appendix B for a description of data qualifiers
\2 Blind field duplicate of sample WB-SW02
PRG = USEPA Region 9 Preliminary Remediation Goal for tap water
NM = not measured
Boxed results exceed tap water PRG

Table 2-2
Summary of Detected Analytes in Sediment Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SD01	WB-SD02	WB-SD99[2]
Aluminum	76,000	100,000	mg/kg	1740	7130	7370
Arsenic	22[3]	22[3]	mg/kg	1.5 B	5.5	4.8
Barium	5,400	100,000	mg/kg	21.2 B	75.0	76.0
Beryllium	150	2,200	mg/kg	0.15 B	0.29 B	0.32 B
Calcium	NP	NP	mg/kg	330 B	1240 B	1300 B
Chromium	210	450	mg/kg	4.4	13.0	14.7
Cobalt	4,700	100,000	mg/kg	1.9 B	6.6 B	6.9 B
Copper	2,900	76,000	mg/kg	2.8 B	14.3	14.0
Iron	23,000	100,000	mg/kg	6570	16300	17700
Lead	400	750	mg/kg	4.2	11.9	13.0
Magnesium	NP	NP	mg/kg	391 B	1190 B	1340 B
Manganese	1,800	32,000	mg/kg	66.4	247	258
Mercury	6	88	mg/kg	0.03 U	0.06 B	0.05 B
Nickel	1,600	41,000	mg/kg	2.7 B	8.9 B	9.0 B
Potassium	NP	NP	mg/kg	180 B	571 B	573 B
Thallium	5	130	mg/kg	1.2 U	1.8 B	1.9 U
Vanadium	550	14,000	mg/kg	8.7 B	21.1	23.4
pH	--	--	S.U.	6.81	6.60	6.43

Notes:
\1 See Appendix B for a description of data qualifiers
\2 Blind field duplicate of sample WB-SD02
\3 Residential non-cancer endpoint
PRG = USEPA Region 9 Preliminary Remediation Goal
Boxed results exceed industrial soil PRG

Table 2-3
Summary of Detected Analytes in Groundwater Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	PRG	Units	Concentration[1] in Sample: WB-MW1	WB-MW2	WB-MW3	WB-MW90[2]
Aluminum	36,000	µg/L	52600 J	84600 J	400 J	377 J
Barium	2,600	µg/L	31.0 B	37.7 B	198 B	199 B
Beryllium	73	µg/L	10.8 B	11.5 B	0.10 U	0.10 U
Cadmium	18	µg/L	10.1 BJ	27.8 J	0.60 U	0.60 U
Calcium	NP	µg/L	565000	415000	260000	261000
Cobalt	2,200	µg/L	631	996	2.2 B	2.0 B
Copper	1,400	µg/L	54.5 B	998	2.5 U	1.8 B
Iron	11,000	µg/L	575	60700	469	403
Lead	NP	µg/L	11.5 U	10.3 U	2.6 B	1.9 U
Magnesium	NP	µg/L	277000	214000	48000	48100
Manganese	880	µg/L	28700	53900	1740	1760
Nickel	730	µg/L	498	505	5.1 B	4.2 B
Potassium	NP	µg/L	6320 B	7500 B	6290	6120
Selenium	180	µg/L	R	R	R	R
Sodium	NP	µg/L	57400	1350000	36400	36200
Thallium	NP	µg/L	24.5 UJ	24.5 UJ	6.0 BJ	4.9 UJ
Vanadium	260	µg/L	4.0 U	12.3 B	1.1 U	1.2 U
Zinc	11,000	µg/L	1480	4630	1.8 B	1.8 B
Field Measurements						
pH	--	S.U.	4.59	4.62	6.88	6.88
Temperature	--	°C	14.23	15.37	15.51	15.51
Conductivity	--	mS/cm	3.95	4.62	1.53	1.53
Dissolved Oxygen	--	mg/L	2.83	1.42	2.34	2.34
ORP	--	mV	520	353	305	305
Flow	--	mL/min	350	200	200	200
Turbidity	--	--	clear	v. slight	clear	clear

Notes:
\1 See Appendix B for a description of data qualifiers
\2 Blind field duplicate of sample WB-MW3
PRG = USEPA Region 9 Preliminary Remediation Goal for tap water
Boxed results exceed tap water PRG

Table 2-4
Analytes Detected in Soil During USEPA Investigation, December 1999
Wadesboro VCC - Alternatives Evaluation Report

Analyte	USEPA Reg. IX Residential Preliminary Remediation Goals (mg/kg)	USEPA Reg. IX Industrial Preliminary Remediation Goals (mg/kg)	Sample Name, Description, and Depth (all results reported in mg/kg)							
			VC-01-SS discolored area; center (0.5 feet bgs)	VC-02-SB discolored area; center (1.5 feet bgs)	VC-03-SB discolored area; center (2.5 feet bgs)	VC-04-SS discolored area; NW corner (surficial)	VC-05-SS drainage ditch; pump house (surficial)	VC-06-SS concrete drainage path; NE RR spur (surficial)	VC-07-SS former acid chambers; SE corner (surficial)	VC-08-SS drainage ditch; 24" pipe (surficial)
Pesticides / Polychlorinated Biphenyls										
4,4'-DDT (p,p'-DDT)	1.7	12	ND	ND	ND	ND	ND	0.033	0.013	ND
alpha-BHC (HCH-alpha)	0.09	0.59	ND	ND	0.0046	ND	ND	ND	ND	ND
Dieldrin	0.03	0.15	ND	ND	ND	ND	ND	ND	0.0029	ND
Endosulfan I (alpha)	370	5,300	ND	ND	ND	ND	ND	ND	0.0029	ND
Endosulfan II (beta)	NP	NP	ND	ND	ND	ND	ND	ND	0.014	ND
Endosulfan Sulfate	NP	NP	ND	ND	ND	ND	ND	0.012	0.054	ND
Endrin	18	260	ND	ND	ND	ND	ND	ND	0.017	ND
Endrin Ketone	NP	NP	ND	ND	ND	ND	ND	ND	0.023	ND
Semivolatile Organic Compounds										
Fluoranthene	2,300	30,000	ND	ND	ND	ND	ND	0.5	ND	ND
Pyrene	2,300	54,000	ND	ND	ND	ND	ND	0.69	ND	ND
Bis (2-ethylhexyl) phthalate	35	180	0.82	ND	ND	ND	ND	ND	ND	ND
Chrysene	62	290	ND	ND	ND	ND	ND	0.53	ND	ND
Di-n-octylphthalate	1,200	10,000	ND	ND	ND	ND	ND	0.6	ND	ND
Benzo (b) fluoranthene	0.62	2.9	ND	ND	ND	ND	ND	0.48	ND	ND
Volatile Organic Compounds										
2-Butanone (MEK)	7,300	28,000	ND	0.12	0.026	ND	ND	ND	ND	ND
Carbon Disulfide	360	720	ND	0.034	ND	ND	ND	ND	ND	ND
Metals										
Aluminum	76,000	100,000	1,050	4,100	1,830	810	4,620	17,800	14,600	5,640
Antimony	31	820	11.1	139	11.3	22	8.4	ND	ND	2.7
Arsenic	22[1]	22[1]	19.9	4	11.5	43.4	965	10.3	23.8	42.6
Barium	5,400	100,000	599	374	1,060	659	359	86.4	110	229
Calcium	NP	NP	323	6,170	1,650	196	494	65,700	975	459
Chromium	210	450	1.9	6.8	5.5	0.98	7.7	34	37.1	9.7
Cobalt	4700	100,000	4.1	4.6	4.2	4.5	9.8	3.2	1.6	2
Copper	2,900	76,000	63.2	1,520	585	99.3	599	39.5	139	105
Iron	23,000	100,000	43,700	14,600	60,600	89,800	45,300	11,900	45,200	26,900
Lead	400	750	1,560	1,080	1,790	29,700	8,490	230	1,150	1,940
Magnesium	NP	NP	ND	ND	ND	ND	933	1,110	944	482
Manganese	1,800	32,000	12.6	26.4	8.9	22.3	65	169	85.2	33.3
Mercury	6.1	88	2.1	1.3	1.2	0.28	0.12	0.28	0.35	ND
Nickel	1600	41000	1.6	4.1	1.6	1.8	4	6.2	6	2.4
Potassium	NP	NP	491	ND	360	336	599	1,710	1,780	581
Selenium	390	10,000	3.9	20.6	17.8	8.1	3.4	ND	2.4	4.4
Silver	390	10,000	6.8	45.5	12.9	20.7	6.2	ND	ND	3

Table 2-4
Analytes Detected in Soil During USEPA Investigation, December 1999
Wadesboro VCC - Alternatives Evaluation Report

Analyte	USEPA Reg. IX Residential Preliminary Remediation Goals (mg/kg)	USEPA Reg. IX Industrial Preliminary Remediation Goals (mg/kg)	Sample Name, Description, and Depth (all results reported in mg/kg)							
			VC-01-SS discolored area; center (0.5 feet bgs)	VC-02-SB discolored area; center (1.5 feet bgs)	VC-03-SB discolored area; center (2.5 feet bgs)	VC-04-SS discolored area; NW corner (surficial)	VC-05-SS drainage ditch; pump house (surficial)	VC-06-SS concrete drainage path; NE RR spur (surficial)	VC-07-SS former acid chambers; SE corner (surficial)	VC-08-SS drainage ditch; 24" pipe (surficial)
Metals (continued)										
Sodium	NP	NP	1,040	ND	2,710	5,510	615	691	ND	582
Thallium	5.2	130	3.3	ND	3.7	5.6	6.8	ND	2	1.7
Vanadium	550	14,000	5.1	ND	4.7	5.9	21.9	34.2	58.3	15
Zinc	23,000	100,000	352	2,630	839	134	308	75.7	86.9	77.1

Notes:

1. Compounds listed in Table 2-1 represent values that were not designated by the laboratory with the following qualifiers: J (estimated), U (not detected above specified value), B (blank contamination or between reported detection limit and instrument detection limit), and NJ (tentatively identified compound and estimated value).
2. ND = Not detected above reporting limit
3. NP = Not promulgated
4. bgs = below ground surface

/1 = Residential non-cancer endpoint (see Section 4.3)

Boxed values exceed residential soil PRG only

Double-boxed values exceed residential and industrial soil PRG

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB01 0-0.5 ft bgs	WB-SB01 2-3.5 ft bgs	WB-SB02 0-0.5 ft bgs	WB-SB02 2-4 ft bgs	WB-SB03 0-0.5 ft bgs	WB-SB03 2-4 ft bgs	WB-SB04 0-0.5 ft bgs	WB-SB04 2-4 ft bgs
Aluminum	76,000	100,000	mg/kg	7370	9070	5930	3090	2930	14700	15300	15300
Antimony	31	820	mg/kg	1.0 UJ	0.96 U	0.90 U	1.0 U	0.96 U	1.1 U	1.0 UJ	1.0 UJ
Arsenic	22[6]	22[6]	mg/kg	6.5	3.5	7.4	2.1 B	1.9 B	5.7	8.3	4.4
Barium	5,400	100,000	mg/kg	38.5 B	29.0 B	37.2 B	28.0 B	16.2 B	49.6	107	62.6
Beryllium	150	2,200	mg/kg	0.17 U	0.13 B	0.19 U	0.11 U	0.06 U	0.39 B	0.70 B	0.42 B
Cadmium	37	810	mg/kg	0.13 U	0.13 U	0.25 B	0.14 U	0.13 U	0.15 U	1.4	0.13 U
Calcium	NP	NP	mg/kg	1280	91.0 B	2470	399 B	2780	1950	67100	2450
Chromium	210	450	mg/kg	30.1 J	15.3	30.2	5.8	9.2	26.6	26.6 J	18.9 J
Cobalt	4,700	100,000	mg/kg	2.3 B	2.1 B	5.8 B	3.0 B	2.0 B	7.0 B	6.1 B	8.0 B
Copper	2,900	76,000	mg/kg	11.4	10.0 J	18.5	5.1 U	8.3	22.0	62.0	18.5
Iron	23,000	100,000	mg/kg	21400	21900	16300	11400	5430	28300	19800	24400
Lead	400	750	mg/kg	119 J	11.0 J	52.3	7.9	13.3	19.4	116 J	20.4 J
Magnesium	NP	NP	mg/kg	774 B	1040 B	996 B	373 B	774 B	3520	2020	4100
Manganese	1,800	32,000	mg/kg	138	94.2	208	319	263	265	287	277
Mercury	6.1	88	mg/kg	0.05 B	0.03 U	0.04 B	0.03 U	0.04 B	0.03 U	0.08	0.03 U
Nickel	1,600	41,000	mg/kg	10.6	5.3 B	19.6	3.5 B	7.2 B	16.8	12.6	18.4
Potassium	NP	NP	mg/kg	456 B	480 B	529 B	282 B	348 B	1020 B	1450	816 B
Selenium	390	10,000	mg/kg	0.96 U	0.92 U	0.86 U	0.99 U	0.92 U	1.1 U	0.99 U	0.95 U
Silver	390	10,000	mg/kg	0.18 U	0.17 U	0.16 U	0.18 U	0.17 U	0.20 U	0.18 U	0.18 U
Sodium	NP	NP	mg/kg	49.4 U	47.6 U	44.7 U	51.1 U	47.6 U	116 B	485 B	49.3 U
Thallium	5.2	130	mg/kg	1.1 U	1.1 B	0.98 U	1.1 U	1.0 U	1.2 U	1.1 U	1.1 U
Vanadium	550	14,000	mg/kg	22.4	23.1	15.0	10.9 B	6.0 B	26.2	30.1	25.3
Zinc	23,000	100,000	mg/kg	33.6 J	13.3 J	58.6 J	6.9	27.4 J	47.4 J	88.5 J	38.7 J
pH	--	--	S.U.	5.00	4.07	4.77	4.76	5.96	3.95	5.48	4.21

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB05 0-0.5 ft bgs	WB-SB05 2-4 ft bgs	WB-SB06 0-0.5 ft bgs	WB-SB06 2-4 ft bgs	WB-SB07 0-0.5 ft bgs	WB-SB07 2-3.5 ft bgs	WB-SB08 0-0.5 ft bgs	WB-SB08 2-4 ft bgs
Aluminum	76,000	100,000	mg/kg	13100	12600	21600	12500	5150	4810	5470	9170
Antimony	31	820	mg/kg	1.1 UJ	1.0 UJ	1.2 UJ	1.1 UJ	1.0 U	0.94 U	1.1 U	0.95 U
Arsenic	22[6]	22[6]	mg/kg	4.4	4.0	9.6	4.0	5.5	3.9	5.0	3.0
Barium	5,400	100,000	mg/kg	71.5	54.0	65.5	48.9 B	36.6 B	11.5 B	139	22.9 B
Beryllium	150	2,200	mg/kg	0.48 B	0.61 B	0.37 B	0.24 B	0.12 B	0.07 B	0.28 B	0.11 B
Cadmium	37	810	mg/kg	0.14 U	0.14 U	0.16 U	0.15 U	0.14 U	0.13 U	0.31 B	0.13 U
Calcium	NP	NP	mg/kg	11200	665 B	15600	378 B	1310	65.6 B	2410	124 B
Chromium	210	450	mg/kg	16.5 J	14.3 J	29.0 J	15.7 J	9.8	11.0	8.6	12.2
Cobalt	4,700	100,000	mg/kg	10.6 B	16.5	4.3 B	4.4 B	1.3 B	0.41 B	3.3 B	1.6 B
Copper	2,900	76,000	mg/kg	14.8	15.9	16.0	7.6	14.7 J	4.6 BJ	19.6	5.5
Iron	23,000	100,000	mg/kg	16300	20500	34000	20200	9520	18400	9000	13300
Lead	400	750	mg/kg	15.7 J	21.7 J	18.7 J	12.5 J	33.5 J	8.0 J	121	5.0
Magnesium	NP	NP	mg/kg	4410	5280	2590	1270	356 B	195 B	469 B	484 B
Manganese	1,800	32,000	mg/kg	394	598	144	136	48.3	56.3	142	17.2
Mercury	6.1	88	mg/kg	0.03 U	0.03 U	0.05 B	0.04 B	0.09	0.03 U	0.08	0.03 U
Nickel	1,600	41,000	mg/kg	19.7	24.4	10.5 B	5.8 B	4.0 B	1.7 B	4.9 B	2.5 B
Potassium	NP	NP	mg/kg	1230	1250	1850	786 B	308 B	176 B	318 B	248 B
Selenium	390	10,000	mg/kg	1.0 U	0.99 U	1.1 U	1.1 U	1.0 U	0.90 U	1.2 B	0.91 U
Silver	390	10,000	mg/kg	0.19 U	0.18 U	0.21 U	0.20 U	0.19 U	0.17 U	0.19 U	0.17 U
Sodium	NP	NP	mg/kg	53.0 U	51.1 U	63.7 B	54.9 U	51.7 U	46.5 U	61.4 B	47.0 U
Thallium	5.2	130	mg/kg	1.2 U	1.1 U	1.3 U	1.2 U	1.1 U	1.0 U	1.2 U	1.0 U
Vanadium	550	14,000	mg/kg	17.8	19.7	43.4	25.5	14.0	25.7	11.6 B	22.6
Zinc	23,000	100,000	mg/kg	48.2 J	49.8 J	33.5 J	12.4 J	24.6 J	3.6 B	87.4 J	8.8
pH	--	--	S.U.	7.85	4.57	6.65	4.37	4.60	3.37	4.95	4.81

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB09 0-0.5 ft bgs	WB-SB09 2-4 ft bgs	WB-SB10 0-0.5 ft bgs	WB-SB10 2-4 ft bgs	WB-SB11 0-0.5 ft bgs	WB-SB11 2-4 ft bgs	WB-SB12 0-0.5 ft bgs	WB-SB12 2-4 ft bgs
Aluminum	76,000	100,000	mg/kg	9270 J	15900	11400	14400	15000	14400 J	12500	3740
Antimony	31	820	mg/kg	3.5 BJ	1.0 U	5.8 BJ	1.0 UJ	10.4 BJ	1.0 UJ	1.1 BJ	1.2 UJ
Arsenic	22[6]	22[6]	mg/kg	14.8 J	7.3	10.9	7.8	33.7	8.6 J	8.5	14.9
Barium	5,400	100,000	mg/kg	87.4	51.6	126	32.7 B	185	54.7	109	131
Beryllium	150	2,200	mg/kg	0.39 B	0.26 B	0.99 B	0.16 B	0.69 B	0.30 B	0.38 B	0.08 BU
Cadmium	37	810	mg/kg	1.2 J	0.14 U	4.3	0.13 U	1.5	R	0.74 B	0.23 B
Calcium	NP	NP	mg/kg	81700 J	1320	139000	5140	112000	1010 BJ	17700	2900
Chromium	210	450	mg/kg	27.7 J	21.3	76.9 J	29.0 J	34.8 J	20.3 J	16.0 J	3.6 J
Cobalt	4,700	100,000	mg/kg	8.2 B	4.4 B	4.1 B	2.6 B	4.8 B	6.3 B	6.8 B	0.59 B
Copper	2,900	76,000	mg/kg	22.7	22.8	349	30.7	80.6	24.6	106	8.5
Iron	23,000	100,000	mg/kg	10700 J	31600	24100	36600	30000	30300 J	23700	6710
Lead	400	750	mg/kg	1370 J	35.2	643 J	23.1 J	8520 J	15.3 J	32100 J	105 J
Magnesium	NP	NP	mg/kg	787 B	2120	1120	1040 B	2090	3470	2030	377 B
Manganese	1,800	32,000	mg/kg	279	236	620	65.2	168	303	149	57.0
Mercury	6.1	88	mg/kg	1.1 J	0.04 B	0.27	0.05 B	2.6	0.03 U	0.17	0.16
Nickel	1,600	41,000	mg/kg	40.6 J	9.6	18.3	4.6 B	15.3	14.0 J	11.7	1.1 B
Potassium	NP	NP	mg/kg	903 B	602 B	1410	626 B	1730	1210	834 B	804 B
Selenium	390	10,000	mg/kg	9.3 J	0.98 U	0.93 U	0.95 U	6.8	0.97 UJ	0.93 U	6.5
Silver	390	10,000	mg/kg	0.17 U	0.18 U	0.28 B	0.18 U	0.84 B	0.18 U	2.1 B	0.21 U
Sodium	NP	NP	mg/kg	189 B	50.5 U	826 B	49.3 U	1590	49.9 U	48.1 U	58.5 U
Thallium	5.2	130	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.3 U
Vanadium	550	14,000	mg/kg	30.2 J	38.7	34.4	47.7	56.9	33.1 J	20.5	5.3 B
Zinc	23,000	100,000	mg/kg	88.8 J	27.7 J	276 J	56.3 J	366 J	40.9 J	134 J	67.2 J
pH	--	--	S.U.	4.90	4.12	4.62	4.17	4.50	3.23	4.41	3.75

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB13 0-0.5 ft bgs	WB-SB13 2-4 ft bgs	WB-SB14 0-0.5 ft bgs	WB-SB14 2-4 ft bgs	WB-SB15 0-0.5 ft bgs	WB-SB91[2] 0-0.5 ft bgs	WB-SB15 2-4 ft bgs	WB-SB90[3] 2-4 ft bgs
Aluminum	76,000	100,000	mg/kg	5880	13000	10000	14600	4180	3940	3630	2600
Antimony	31	820	mg/kg	1.9 BJ	1.0 UJ	10.8 BJ	0.99 UJ	2.6 B	2.4 BJ	1.3 U	1.2 U
Arsenic	22[6]	22[6]	mg/kg	54.8	4.1	84.1	8.3	25.6	21.2	91.2	55.1
Barium	5,400	100,000	mg/kg	73.3	50.9	672	44.1	303	285	67.9	213
Beryllium	150	2,200	mg/kg	0.07 BU	0.32 B	0.70 B	0.28 B	0.03 U	0.06 B	0.03 B	0.03 U
Cadmium	37	810	mg/kg	0.16 U	0.14 U	5.0	0.33 B	0.29 B	0.15 U	0.17 U	0.24 B
Calcium	NP	NP	mg/kg	19200	907 B	84500	900 B	525 B	1240 B	509 B	390 B
Chromium	210	450	mg/kg	14.2 J	17.8 J	23.3 J	29.6 J	5.7	5.9 J	6.4	4.2
Cobalt	4,700	100,000	mg/kg	5.9 B	4.3 B	12.0	4.8 B	3.8 B	3.7 B	1.1 B	2.0 B
Copper	2,900	76,000	mg/kg	78.7	58.3	480	74.9	81.3	86.4	12.8 J	28.8 J
Iron	23,000	100,000	mg/kg	136000	23100	54200	35800	33600	32100	54400	59200
Lead	400	750	mg/kg	453 J	7.7 J	1720 J	17.6 J	1410	1490 J	54.7 J	550 J
Magnesium	NP	NP	mg/kg	794 B	1370	1400	1810	296 B	264 B	446 B	254 B
Manganese	1,800	32,000	mg/kg	627	87.6	159	122	27.5	23.1	113	81.0
Mercury	6.1	88	mg/kg	0.11	0.03 B	0.34	0.03 B	0.18	0.13	0.03 U	0.04 U
Nickel	1,600	41,000	mg/kg	7.4 B	7.3 B	8.3	7.7 B	1.5 B	1.7 B	1.9 B	0.99 B
Potassium	NP	NP	mg/kg	518 B	600 B	1150	682 B	498 B	418 B	2730	1740
Selenium	390	10,000	mg/kg	1.2 U	0.98 U	2.0	0.94 U	1.9	1.1 U	1.2 U	2.5
Silver	390	10,000	mg/kg	0.43 B	0.18 U	2.5	0.18 U	1.5 B	1.8 B	0.23 U	0.90 B
Sodium	NP	NP	mg/kg	203 B	50.5 U	813 B	48.7 U	501 B	427 B	4310	4110
Thallium	5.2	130	mg/kg	1.3 U	1.1 U	1.0 U	1.1 U	1.3 B	1.2 U	1.4 U	1.3 U
Vanadium	550	14,000	mg/kg	15.2	30.8	34.8	45.5	9.5 B	8.6 B	10.0 B	6.4 B
Zinc	23,000	100,000	mg/kg	111 J	61.7 J	638 J	309 J	105 J	49.7 J	38.3 J	108 J
pH	--	--	S.U.	7.01	3.99	5.31	3.50	3.33	3.62	3.27	2.81

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB15 4-6 ft bgs	WB-SB16 0-0.5 ft bgs	WB-SB16 2-4 ft bgs	WB-SB17 0-0.5 ft bgs	WB-SB17 2-4 ft bgs	WB-SB18 0-0.5 ft bgs	WB-SB18 2-4 ft bgs	WB-SB19 0-0.5 ft bgs
Aluminum	76,000	100,000	mg/kg	14500	14100	9840	10900	11100	8110 J	8770	782 J
Antimony	31	820	mg/kg	1.1 UJ	4.9 B	0.97 U	1.8 BJ	1.0 UJ	1.1 BJ	1.0 UJ	32.3 J
Arsenic	22[6]	22[6]	mg/kg	6.4	44.6	4.7	34.2 J	6.4	20.3 J	3.5	112 J
Barium	5,400	100,000	mg/kg	42.2 B	280	32.8 B	114	65.4	138	19.1 B	450
Beryllium	150	2,200	mg/kg	0.27 B	0.50 B	0.17 B	0.22 B	0.30 B	0.43 B	0.17 B	0.02 U
Cadmium	37	810	mg/kg	0.44 B	2.8	0.20 B	0.16 U	0.14 U	0.41 BJ	0.13 U	0.97 BJ
Calcium	NP	NP	mg/kg	267 B	47600	265 B	620 B	193 B	3220 J	375 B	218 BJ
Chromium	210	450	mg/kg	23.9	30.1	17.8	18.0	21.5 J	13.1 J	16.2 J	2.2 BJ
Cobalt	4,700	100,000	mg/kg	6.3 B	8.0 B	3.3 B	7.1 B	4.5 B	15.5	3.5 B	15.6
Copper	2,900	76,000	mg/kg	56.0	241	114 J	180	24.1	229	8.5	221
Iron	23,000	100,000	mg/kg	27300	43900	20700	40200	30400	31800 J	33800	162000 J
Lead	400	750	mg/kg	15.1 J	664	8.4 J	658 J	20.7 J	174 J	8.5 J	19800 J
Magnesium	NP	NP	mg/kg	3930	1690	1290	1110 B	1830	1000 B	1030 B	94.5 B
Manganese	1,800	32,000	mg/kg	237	268	93.6	132	182	263	81.7	29.5
Mercury	6.1	88	mg/kg	0.03 UJ	0.08	0.06	0.07	0.03 U	0.04 BJ	0.03 U	0.78 J
Nickel	1,600	41,000	mg/kg	14.5	10.8	5.7 B	6.3 B	8.2 B	9.8 J	3.9 B	1.3 BJ
Potassium	NP	NP	mg/kg	645 B	1400	481 B	680 B	686 B	441 B	310 B	593 B
Selenium	390	10,000	mg/kg	1.1 U	2.2	0.93 U	1.1 U	1.0 U	1.0 BJ	0.97 U	4.9 J
Silver	390	10,000	mg/kg	0.20 U	0.65 B	0.17 U	0.41 U	0.19 U	0.46 B	0.18 U	12.1
Sodium	NP	NP	mg/kg	1200 B	324 B	48.1 U	86.7 B	51.7 U	153 B	50.6 B	3920
Thallium	5.2	130	mg/kg	1.2 U	1.1 U	1.1 U	2.0 B	1.1 U	1.1 U	1.1 U	3.9
Vanadium	550	14,000	mg/kg	38.3	40.9	28.0	32.8	37.5	18.4 J	22.7	4.3 BJ
Zinc	23,000	100,000	mg/kg	46.0 J	355 J	95.2 J	184 J	28.5 J	362 J	43.6 J	624 J
pH	--	--	S.U.	4.69	5.37	3.89	3.81	3.11	3.65	3.48	3.33

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Residential PRG	Industrial PRG	Units	Concentration[1] in Sample: WB-SB92[4] 0-0.5 ft bgs	WB-SB19 2-4 ft bgs	WB-SB19 4-6 ft bgs	WB-SB20 0-0.5 ft bgs	WB-SB20 2-4 ft bgs	WB-SB20 4-6 ft bgs	WB-SD03[5]	WB-SD04[5]
Aluminum	76,000	100,000	mg/kg	844 J	11000 J	12700	11100	8220	9210	13100	17000 J
Antimony	31	820	mg/kg	35.4 J	1.0 UJ	1.0 UJ	4.4 B	6.8 BJ	4.0 BJ	2.1 B	2.5 UJ
Arsenic	22[6]	22[6]	mg/kg	122 J	38.9 J	6.2	14.2	72.4	21.6	17.7	51 J
Barium	5,400	100,000	mg/kg	340	61.4	51.4	139	403	159	47.6 B	40.0 B
Beryllium	150	2,200	mg/kg	0.02 U	0.23 B	0.29 B	0.61 B	0.55 B	0.61 B	0.23 B	0.26 B
Cadmium	37	810	mg/kg	1.7 J	R	0.94 B	2.7	3.6	3.2	0.18 U	R
Calcium	NP	NP	mg/kg	284 BJ	283 BJ	281 B	68600	50500	55000	1100 B	1870 BJ
Chromium	210	450	mg/kg	3.1 J	22.9 J	19.1	32.4	17.0 J	24.4	11.4	25.1 J
Cobalt	4,700	100,000	mg/kg	17.4	4.3 B	5.6 B	5.4 B	19.8	8.9 B	1.9 B	3.7 B
Copper	2,900	76,000	mg/kg	258	933	229	104	650	243	263	316
Iron	23,000	100,000	mg/kg	158000 J	21100 J	20300	25400	71300	30600	12200	101000 J
Lead	400	750	mg/kg	80300 J	19.1 J	194	162	478 J	147	408	611 J
Magnesium	NP	NP	mg/kg	84.5 B	1430	1160	2590	1920	1140	614 B	757 B
Manganese	1,800	32,000	mg/kg	28.1	135	97.3	148	123	124	39.7	89.8
Mercury	6.1	88	mg/kg	0.90 J	0.03 U	0.03 UJ	0.05 B	0.10	0.04 BJ	0.09	0.13 J
Nickel	1,600	41,000	mg/kg	1.9 BJ	6.7 BJ	6.3 B	16.1	10.0	9.3	4 B	8.1 BJ
Potassium	NP	NP	mg/kg	735 B	1210	535 B	805 B	871 B	681 B	588 B	606 B
Selenium	390	10,000	mg/kg	5.9 J	0.95 UJ	0.99 U	1.1 B	2.1	1.5	1.3 U	2.4 UJ
Silver	390	10,000	mg/kg	12.7	0.18 U	0.21 B	0.18 U	2.5	0.49 B	0.25 B	0.70 B
Sodium	NP	NP	mg/kg	3730	1580	2620	504 B	410 B	486 B	65.2 U	124 U
Thallium	5.2	130	mg/kg	3.8	1.1 U	1.1 U	1.1 U	1.2 B	1.0 U	1.4 U	2.7 U
Vanadium	550	14,000	mg/kg	4.7 BJ	32.5 J	30.2	31.9	24.3	26.3	17.7	29.4 J
Zinc	23,000	100,000	mg/kg	686 J	58.6 J	103 J	242 J	652 J	300 J	88.2 J	157 J
pH	--	--	S.U.	3.00	2.91	3.86	6.80	4.85	5.80	4.58	4.11

Table 2-5
Summary of Detected Analytes in Site Characterization Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

Notes:
\1 See Appendix B for a description of data qualifiers
\2 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs
\3 Blind field duplicate of sample WB-SB15 2-4 ft bgs
\4 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs
\5 Although these samples are numbered with a sediment sample convention, these samples were collected in a dry drainage ditch and are actually soil samples due to the absence of flow
\6 Residential non-cancer endpoint
PRG = USEPA Region 9 Preliminary Remediation Goal
Boxed results exceed residential soil PRG
Double-boxed results exceed residential & industrial soil PRGs

Table 3-1
Soil Surface Area and Volume Above Site-Specific Action Levels: 0 - 2 Foot Depth Increment
Wadesboro VCC - Alternatives Evaluation Report

Polygon/ Sample Location	Polygon/ Sample ID	Polygon Area (sq. ft.)	Sample Depth (ft.)	Arsenic Conc. (mg/kg)	As Conc. > Action Level?	Lead Conc. (mg/kg)	Pb Conc. > Action Level?	Surface Area Above Action Level (sq. ft.)			In-Place Volume Above Action Level (cy)		
								Total	On Site	Off Site	Total	On Site	Off Site
On Site	WB-SB01	17,707	0 - 2	6.5	No	119 J	No	0	0	NA	0	0	NA
	WB-SB02	71,502	0 - 2	7.4	No	52.3	No	0	0	NA	0	0	NA
	WB-SB03	59,908	0 - 2	1.9 B	No	13.3	No	0	0	NA	0	0	NA
	WB-SB04	46,401	0 - 2	8.3	No	116 J	No	0	0	NA	0	0	NA
	WB-SB05	33,112	0 - 2	4.4	No	15.7 J	No	0	0	NA	0	0	NA
	WB-SB06	25,878	0 - 2	9.6	No	18.7 J	No	0	0	NA	0	0	NA
	WB-SB07	28,835	0 - 2	5.5	No	33.5 J	No	0	0	NA	0	0	NA
	WB-SB08	36,570	0 - 2	5	No	121	No	0	0	NA	0	0	NA
	WB-SB09	22,087	0 - 2	14.8 J	No	1,370 J	YES	22,087	22,087	NA	1,636	1,636	NA
	WB-SB10	14,322	0 - 2	10.9	No	643 J	No	0	0	NA	0	0	NA
	WB-SB11	14,357	0 - 2	33.7	YES	8,520 J	YES	14,357	14,357	NA	1,063	1,063	NA
	WB-SB12	20,150	0 - 2	8.5	No	32,100 J	YES	20,150	20,150	NA	1,493	1,493	NA
	WB-SB13	7,272	0 - 2	54.8	YES	453 J	No	7,272	7,272	NA	539	539	NA
	WB-SB14	5,046	0 - 2	84.1	YES	1,720 J	YES	5,046	5,046	NA	374	374	NA
	WB-SB15	1,704	0 - 2	23.4	YES	1,450 J	YES	1,704	1,704	NA	126	126	NA
	WB-SB16	2,407	0 - 2	44.6	YES	664	No	2,407	2,407	NA	178	178	NA
	WB-SB17	2,361	0 - 2	34.2 J	YES	658 J	No	2,361	2,361	NA	175	175	NA
	WB-SB19	1,330	0 - 2	117 J	YES	50,050 J	YES	1,330	1,330	NA	99	99	NA
	VC-01-SS	1,504	0 - 2	19.9	No	1,560	YES	1,504	1,504	NA	111	111	NA
	VC-04-SS	2,669	0 - 2	43.4	YES	29,700	YES	2,669	2,669	NA	198	198	NA
	VC-05-SS	3,318	0 - 2	965	YES	8,490	YES	3,318	3,318	NA	246	246	NA
	VC-06-SS	24,884	0 - 2	10.3	No	230	No	0	0	NA	0	0	NA
	VC-07-SS	9,494	0 - 2	23.8	YES	1,150	No	9,494	9,494	NA	703	703	NA
	VC-08-SS	1,181	0 - 2	42.6	YES	1,940	YES	1,181	1,181	NA	87	87	NA
Off Site	WB-SB18	11,856	0 - 2	20.3 J	No	174 J	No	0	NA	0	0	NA	0
	WB-SB20	11,577	0 - 2	14.2	No	162	No	0	NA	0	0	NA	0
	WB-SD03	1,600	0 - 2	17.7	No	408	No	0	NA	0	0	NA	0
	WB-SD04	1,600	0 - 2	51 J	YES	611 J	No	1,600	NA	1,600	119	NA	119
Totals:	**Totals:**	480,632	--	--		--		96,480	94,880	1,600	7,147	7,028	119

Table 3-1
Soil Surface Area and Volume Above Site-Specific Action Levels: 0 - 2 Foot Depth Increment
Wadesboro VCC - Alternatives Evaluation Report

Notes:
1. Polygon ID and area based on information shown on Figure 3-1.
2. For instances where a duplicate sample was available, the average of the samples was included in the table.
3. All calculations and rounding are performed by the computer software. Therefore, certain quantities in the above table are displayed as rounded numbers for table clarity.
4. Site-Specific Action Levels are:

	Off-Site Soil	On-Site Soil
Arsenic	22 mg/kg	27 mg/kg
Lead	1,200 mg/kg	1,200 mg/kg

NA = not applicable

Table 3-2
Soil Surface Area and Volume Above Site-Specific Action Levels: 2 - 4 Foot Depth Increment
Wadesboro VCC - Alternatives Evaluation Report

Polygon/ Sample Location	Polygon/ Sample ID	Polygon Area (sq. ft.)	Sample Depth (ft.)	Arsenic Conc. (mg/kg)	As Conc. > Action Level?	Lead Conc. (mg/kg)	Pb Conc. > Action Level?	Surface Area Above Action Level (sq. ft.)			In-Place Volume Above Action Level (cy)		
								Total	On Site	Off Site	Total	On Site	Off Site
On Site	WB-SB01	17,707	2 - 4	3.5	No	11.0 J	No	0	0	NA	0	0	NA
	WB-SB02	71,502	2 - 4	2.1 B	No	7.9	No	0	0	NA	0	0	NA
	WB-SB03	59,908	2 - 4	5.7	No	19.4	No	0	0	NA	0	0	NA
	WB-SB04	46,401	2 - 4	4.4	No	20.4 J	No	0	0	NA	0	0	NA
	WB-SB05	33,112	2 - 4	4.0	No	21.7 J	No	0	0	NA	0	0	NA
	WB-SB06	30,388	2 - 4	4.0	No	12.5 J	No	0	0	NA	0	0	NA
	WB-SB07	28,835	2 - 4	3.9	No	8.0 J	No	0	0	NA	0	0	NA
	WB-SB08	37,970	2 - 4	3.0	No	5.0	No	0	0	NA	0	0	NA
	WB-SB09	39,913	2 - 4	7.3	No	35.2	No	0	0	NA	0	0	NA
	WB-SB10	15,683	2 - 4	7.8	No	23.1 J	No	0	0	NA	0	0	NA
	WB-SB11	16,229	2 - 4	8.6 J	No	15.3 J	No	0	0	NA	0	0	NA
	WB-SB12	20,150	2 - 4	14.9	No	105 J	No	0	0	NA	0	0	NA
	WB-SB13	9,687	2 - 4	4.1	No	7.7 J	No	0	0	NA	0	0	NA
	WB-SB14	5,046	2 - 4	8.3	No	17.6 J	No	0	0	NA	0	0	NA
	WB-SB15	3,461	2 - 4	73.2	YES	302.4 J	No	3,461	3,461	NA	256	256	NA
	WB-SB16	3,433	2 - 4	4.7	No	8.4 J	No	0	0	NA	0	0	NA
	WB-SB17	9,398	2 - 4	6.4	No	20.7 J	No	0	0	NA	0	0	NA
	WB-SB19	5,179	2 - 4	38.9 J	YES	19.1 J	No	5,179	5,179	NA	384	384	NA
Off Site	WB-SB18	11,856	2 - 4	3.5	No	8.5 J	No	0	NA	0	0	NA	0
	WB-SB20	11,577	2 - 4	72.4	YES	478 J	No	11,577	NA	11,577	858	NA	858
Totals:		477,435	--	--		--		20,217	8,640	11,577	1,498	640	858

Notes:
1. Polygon ID and area based on information shown on Figure 3-2.
2. For instances where a duplicate sample was available, the average of the samples was included in the table.
3. All calculations and rounding are performed by the computer software. Therefore, certain quantities in the above table are displayed as rounded numbers for table clarity.
4. Site-Specific Action Levels are:

	Off-Site Soil	On-Site Soil
Arsenic	22 mg/kg	27 mg/kg
Lead	1,200 mg/kg	1,200 mg/kg

NA = not applicable

Table 3-3
Soil Surface Area and Volume Site-Specific Action Levels: 4 - 6 Foot Depth Increment
Wadesboro VCC - Alternatives Evaluation Report

Polygon/ Sample Location	Polygon/ Sample ID	Polygon Area (sq. ft.)	Sample Depth (ft.)	Arsenic Conc. (mg/kg)	As Conc. > Action Level?	Lead Conc. (mg/kg)	Pb Conc. > Action Level?	Surface Area Above Action Level (sq. ft.)			In-Place Volume Above Action Level (cy)		
								Total	On Site	Off Site	Total	On Site	Off Site
On Site	WB-SB15	3,461	4 - 6	6.4	No	15.1 J	No	0	0	NA	0	0	NA
	WB-SB19	5,179	4 - 6	6.2	No	194.0	No	0	0	NA	0	0	NA
Off Site	WB-SB20	11,577	4 - 6	21.6	No	147	No	0	NA	0	0	NA	0
Totals:		20,217	--	--		--		0	0	0	0	0	0

Notes:
1. Polygon ID and area based on information shown on Figure 3-2.
2. All calculations and rounding are performed by the computer software. Therefore, certain quantities in the above table are displayed as rounded numbers for table clarity.
3. Site-Specific Action Levels are:

	Off-Site Soil	On-Site Soil
Arsenic	22 mg/kg	27 mg/kg
Lead	1,200 mg/kg	1,200 mg/kg

NA = not applicable

Table 4-1
Compliance with Federal and State ARARs and TBCs
Wadesboro VCC – Alternatives Evaluation Report

Regulation	Citation	Description	ARAR/TBC	Rationale
FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs				
Water Quality Criteria	40 CFR Part 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	Relevant and Appropriate	Although removal is not proposed for the unnamed stream, criteria may be considered when assessing impacts of surface water runoff and excavation.
Solid Waste Disposal Act / Land Disposal	42 USC 6901 *et.seq.* 40 CFR Part 268	Establishes a timetable for restriction of land disposal of hazardous materials.	Applicable	Identifies hazardous wastes restricted from land disposal.
Clean Air Act	40 CFR Part 50 40 CFR 61 40 USC 1857	Sets chemical and particulate air quality criteria.	Applicable	Provides appropriate action levels of chemical/particulate constituents during site work.
Occupational Safety and Health Act (OSHA)	29 CFR 1910 Part 120	Provides safety rules for site workers handling specific chemicals during activities.	Applicable	This regulation would be applicable for any actions taken at the site which involve handling of excavated materials.
FEDERAL LOCATION-SPECIFIC ARARs AND TBCs				
Endangered Species Act	16 USC 1531 et seq. 50 CFR Part 200 50 CFR Part 402	Requires federal agencies to ensure that the continued existence of any endangered or threatened species and their habitat will not be jeopardized by a site action.	Relevant and Appropriate	Need to determine if endangered or threatened species are present.
National Environmental Policy Act	40 CFR 6.302 40 CFR 6, Appendix A Exec. Ord. 11990/11988	Requires federal agencies, where possible, to avoid or minimize adverse impacts of federal actions upon wetlands/floodplains and enhance natural values of such.	Applicable	Applicable if work will be conducted within wetland areas.
RCRA Location Standards	40 CFR 264.18	A treatment, storage and disposal (TSD) facility must be designed, constructed, operated and maintained to avoid washout on a 100-year flood plain.	Relevant and Appropriate	Applicable for alternatives that require staging materials on site prior to off-site disposal or those requiring on-site containment of materials.
STATE LOCATION-SPECIFIC ARARs AND TBCs				
North Carolina Sedimentation Pollution Control Act	General Statistics of NC, Chapter 113A, Article 4	Establishes mandatory standards for control of sedimentation and erosion in streams and lakes.	Applicable	Applicable for all phases of work involving excavation and material staging near the unnamed stream.

Table 4-1
Compliance with Federal and State ARARs and TBCs
Wadesboro VCC – Alternatives Evaluation Report

Regulation	Citation	Description	ARAR/TBC	Rationale
FEDERAL ACTION-SPECIFIC ARARs AND TBCs				
Clean Water Act: Discharge to Waters of the United States (NPDES)	40 CFR 122 40 CFR 125 40 CFR 230 40 CFR 402 40 CFR 403 CWA Section 404	Established site-specific limitations and performance standards which are designed to protect surface water quality. Types of discharges regulated under the CWA include: discharge of dredged or fill materials into United States waters.	Relevant and Appropriate	May be considered as guidance for the removal of materials from the unnamed stream.
Classification of Hazardous Waste	40 CFR 261	Federal requirements for classification and identification of hazardous wastes.	Applicable	Applicable to materials not yet characterized for off-site disposal.
Land Disposal Restrictions	40 CFR Part 268 OSWER Dir. 9834.11	Disposal of hazardous materials from CERCLA response actions are subject to federal disposal prohibitions.	Applicable	Applicable to the disposal of CERCLA waste materials.
Department of Transportation (DOT) Hazardous Materials Transportation Act	49 USC 1801 40 CFR 107, 171, 172	Outlines procedures for packaging, labeling, manifesting, and transporting hazardous waste materials for off-site disposal.	Applicable	Applicable to transporting hazardous wastes off site to appropriate treatment, storage and disposal facilities.
Clean Air Act	40 CFR 50,60	Regulations define monitoring requirements and emission standards.	Applicable	Applicable; air monitoring will be implemented throughout the process.
Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste	40 CFR 264	Regulates storage, transportation and operation of hazardous waste generators.	Applicable	Applicable to site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.
FEDERAL AND ACTION-SPECIFIC ARARs AND TBCs				
Occupational Safety and Health Act (OSHA)	29 CFR Part 1910 29 CFR Part 1926 29 CFR Part 1904	Established requirements for worker safety and health.	Applicable	This regulation is applicable for any site-related action.
STATE ACTION-SPECIFIC ARARs AND TBCs				
North Carolina Air Pollution Control Requirements	15A NCAC 2D	Air pollution control, air quality, and emissions control standards.	Applicable	Applicable; air monitoring will be implemented throughout the process.
North Carolina Sedimentation Control Rules	15A NCAC 4	Requirements for prevention of sedimentation pollution.	Applicable	Applicable to any land disturbing activities.
North Carolina Hazardous Waste Management Regulations	13A NCAC	Incorporates federal RCRA regulations by reference.	Applicable	Applicable to site-related activities involving the excavation, staging, transportation, and disposal of hazardous waste materials.

Table 4-2
Cost Assumptions and Unit Prices
Wadesboro VCC - Alternatives Evaluation Report

UNIT COSTS

Item	Description	Unit	Unit Price Material & Labor
1	Clearing/Grubbing	AC	4,240
2	Transport/Disposal of Grubbed Vegetation		
2a	Hazardous Material	TON	176
2b	Non-hazardous Material	TON	35
3	Soil Excavation/Loading	CY	15
4	Transport/Consolidation Onsite (General Hauling)	CY	2.4
5	Transport/Disposal Off-Site		
5a	Hazardous Material	TON	176
5b	Non-hazardous Material	TON	35
6	Site Restoration		
6a	Clean Fill, Installed, Including Backfill and Compaction	CY	20
6b	Top Soil, Installed	CY	25
6c	Hydroseeding	AC	2,500
7	Asphalt Cap	CY	30
8	Mowing Installed Cover	Event	1,500

ASSUMPTIONS

Item	Description	Assumed Value	Units
1	Estimated percentage of total area requiring clearing/grubbing	50%	%
2	Estimated distribution of hazardous/non-hazardous soils		
2a	Hazardous materials	25%	%
2b	Non-hazardous materials	75%	%
3	Desired thickness of clean backfill and topsoil		
3a	Clean backfill thickness for soil cover	1.0	FT
3b	Topsoil thickness for site restoration/soil cover	0.5	FT
4	Estimated unit density of cleared vegetation	240	tons/acre
5	Estimated soil density of excavated soils	1.5	tons/cy
6	30-Year Present Worth interest rate	7	%

Table 4-3
Planning Level Cost Estimate
Alternative 2: Excavation of Select Off-Site Soil with Consolidation
Under On-Site Topsoil Layer and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

Item No.	Description	Estimated Quantity	Unit	Unit Price Material & Labor	Estimated Amount
Excavation and Off-Site Disposal Cost Estimate					
1	Mobilization/Site Preparation/Demobilization	1	LS	10,000	$10,000
2	Clearing/Grubbing	1.24	AC	4,240	$5,259
3	Transport and Disposal of Cleared Vegetation	298	TON	35	$10,419
4	Soil Excavation and Loading (based on investigation results)				
	Off-Site Areas	238	CY	15	$3,570
5	Site Restoration of Excavated Area				
	Install Clean Fill Including Backfill and Compaction	208	CY	20	$4,168
	Install Topsoil	30	CY	25	$741
	Hydroseeding	0.04	AC	2,500	$92
6	Topsoil Layer Over On-Site and Off-Site Areas				
	Install Topsoil	1,971	CY	25	$49,276
	Hydroseeding	2.44	AC	2,500	$6,100
				SUBTOTAL CAPITAL COSTS:	**$89,624**
Item No.	**Description**	**Estimated Quantity**	**Unit**	**Unit Cost ($)**	**Item Cost($)**
Annual (Post-Remedial Site Control)					
7	Topsoil Layer Inspection / Maintenance	2	Event	1,500	$3,000
8	Topsoil Layer Repairs	20	CY	25	$500
				SUBTOTAL ANNUAL COSTS	**$3,500**
				30-YEAR PRESENT WORTH COST:	**$43,434**
				PROJECT PRESENT WORTH COST:	**$133,058**
			Contingency	30%	$39,917
			Engineering	15%	$19,959
				TOTAL:	**$192,933**
				TOTAL PROJECT PRESENT WORTH COST:	**$193,000**

Item No.	Assumption
1	Includes costs associated with contractor mobilization/demobilization of equipment and personnel.
2	Assumes approximately 50% of excavation area requires clearing/grubbing of surface vegetation.
3	Assumes all cleared vegetation may be disposed as non-hazardous waste.
	Assumes a unit density of 240 tons/acre for cleared vegetation.
4	Excavation areas calculated using Thiessen Polygon Method.
	Excavation volumes obtained by multiplying polygon areas by the required depth of excavation.
	Polygon WB-SD04 would be excavated to a depth of 4 feet bgs and consolidated on site.
5	Assumes that excavated volume will be backfilled with clean fill material and 0.5 foot of topsoil.
	Assumes entire area of excavation will be hydroseeded.
6	Assumes that a topsoil cover will be installed over on-site and off-site areas exceeding arsenic and lead action levels.
	Polygons to be covered are: SB9, SB11-SB17, SB19, SB20, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS
	Assumes topsoil layer will consist of 0.5 foot of topsoil.
	Assumes that entire topsoil cover will be hydroseeded.
7	Includes mowing, inspection, and maintenance of the topsoil layer.
8	Assumes a replacement of 1% of the topsoil layer annually.

Table 4-4
Planning Level Cost Estimate
Alternative 3: Excavation of Off-Site Soil with Consolidation
Under On-Site Soil Cover and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

Item No.	Description	Estimated Quantity	Unit	Unit Price Material & Labor	Estimated Amount
Excavation and Off-Site Disposal Cost Estimate					
1	Mobilization/Site Preparation/Demobilization	1	LS	20,000	$20,000
2	Clearing/Grubbing	1.24	AC	4,240	$5,259
3	Transport and Disposal of Cleared Vegetation	298	TON	35	$10,419
4	Soil Excavation and Loading (based on investigation results)				
	Onsite Areas	1,636	CY	15	$24,540
	Offsite Areas	1,954	CY	15	$29,310
5	Transport and Consolidation of Excavated Soil On-Site	3,590	CY	2.40	$8,616
6	Site Restoration - Excavated Areas				
	Install Clean Fill Including Backfill and Compaction	2,937	CY	20	$58,742
	Install Topsoil	653	CY	25	$16,323
	Hydroseeding	0.81	AC	2,500	$2,024
7	Soil Cover Over Onsite Areas				
	Install Clean Fill Including Backfill and Compaction	2,696	CY	20	$53,910
	Install Topsoil	1,348	CY	25	$33,694
	Hydroseeding	1.67	AC	2,500	$4,178
				SUBTOTAL CAPITAL COSTS:	**$267,014**
Item No.	**Description**	**Estimated Quantity**	**Unit**	**Unit Cost ($)**	**Item Cost($)**
Annual (Post-Remedial Site Control)					
8	Soil Cover Inspection / Maintenance	2	Event	1,500	$3,000
9	Soil Cover Repairs	20	CY	25	$500
				SUBTOTAL ANNUAL COSTS	**$3,500**
				30-YEAR PRESENT WORTH COST:	**$43,434**
				PROJECT PRESENT WORTH COST:	**$310,448**
			Contingency	30%	$93,134
			Engineering	15%	$46,567
				TOTAL:	**$450,150**
				TOTAL PROJECT PRESENT WORTH COST:	**$450,000**

Item No.	Assumption
1	Includes costs associated with contractor mobilization/demobilization of equipment and personnel.
2	Assumes approximately 50% of excavation/capping area requires clearing/grubbing of surface vegetation.
3	Assumes all cleared vegetation may be disposed as non-hazardous waste. Assumes a unit density of 240 tons/acre for cleared vegetation.
4	Excavation areas calculated using Thiessen Polygon Method. Excavation volumes obtained by multiplying polygon areas by the required depth of excavation. The following polygons would be excavated and consolidated on site: On Site: SB9 to a depth of 2 feet bgs Off Site: WB-SD04 and SB20 to a depth of 4 feet bgs
5	Transport and disposal fee hauling cost of excavated soil to onsite areas using a 5 CY dumptruck (Get-A-Quote.net, 2002).
6	Assumes that excavated volume will be backfilled with clean fill material and 0.5 foot of topsoil. Assumes entire area of excavation will be hydroseeded.
7	Assumes that a soil cover will be installed over on site areas exceeding arsenic and lead action levels. Polygons to be covered are: SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS Assumes soil cover will consist of 1 foot of clean fill material and 0.5 foot of topsoil. Assumes that entire soil cover will be hydroseeded.

Table 4-4
Planning Level Cost Estimate
Alternative 3: Excavation of Off-Site Soil with Consolidation
Under On-Site Soil Cover and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

8 Includes mowing, inspection, and maintenance of the soil cover.
9 Assumes a replacement of 1% of the soil cover anually.

Table 4-5
Planning Level Cost Estimate
Alternative 4: Excavation of Off-Site Soil with Consolidation
Under On-Site Asphalt Cap and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

Item No.	Description	Estimated Quantity	Unit	Unit Price Material & Labor	Estimated Amount
Excavation and Off-Site Disposal Cost Estimate					
1	Mobilization/Site Preparation/Demobilization	1	LS	20,000	$20,000
2	Clearing/Grubbing	1.24	AC	4,240	$5,259
3	Transport and Disposal of Cleared Vegetation	298	TON	35	$10,419
4	Soil Excavation and Loading (based on investigation results)				
	On-site Areas	1,636	CY	15	$24,540
	Off-site Areas	1,954	CY	15	$29,310
5	Transport and Consolidation of Excavated Soil On-Site	3,590	CY	2.40	$8,616
6	Site Restoration - Excavated Areas				
	Install Clean Fill Including Backfill and Compaction	2,937	CY	20	$58,742
	Install Topsoil	653	CY	25	$16,323
	Hydroseeding	0.81	AC	2,500	$2,024
7	Asphalt Cap Over Onsite Areas	8,088	SY	30	$242,643
				SUBTOTAL CAPITAL COSTS	**$417,875**
Item No.	**Description**	**Estimated Quantity**	**Unit**	**Unit Cost ($)**	**Item Cost($)**
Annual (Post-Remedial Site Control)					
8	Asphalt Cap Inspection	1	Year	1,000	$1,000
9	Asphalt Cap Repairs	81	SY	30	$2,426
				SUBTOTAL ANNUAL COSTS	**$3,426**
				30-YEAR PRESENT WORTH COST:	**$42,519**
				PROJECT PRESENT WORTH COST:	**$460,394**
			Contingency	30%	$138,118
			Engineering	15%	$69,059
				TOTAL:	**$667,571**
				TOTAL PROJECT PRESENT WORTH COST:	**$668,000**

Item No.	Assumption
1	Includes costs associated with contractor mobilization/demobilization of equipment and personnel.
2	Assumes approximately 50% of excavation/capping area requires clearing/grubbing of surface vegetation.
3	Assumes all cleared vegetation may be disposed as non-hazardous waste. Assumes a unit density of 240 tons/acre for cleared vegetation.
4	Excavation areas calculated using Thiessen Polygon Method. Excavation volumes obtained by multiplying polygon areas by the required depth of excavation. The following polygons would be excavated and consolidated on site: Off Site: WB-SD04 and SB20 to a depth of 4 feet bgs On Site: WB-SD09 to a depth of 2 feet bgs
5	Transport and disposal fee hauling cost of excavated soil to onsite areas using a 5 CY dumptruck (Get-A-Quote.net, 2002).
6	Assumes that excavated volume will be backfilled with clean fill material and 0.5 foot of topsoil. Assumes entire area of excavation will be hydroseeded.
7	Assumes that an asphalt cap will be installed over onsite areas exceeding arsenic and lead action levels . Polygons to be capped are: SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS Assumes asphalt cap will consist of 8-inches of crushed stone, 6-inches of subbase, and 1 1/2-inches of top course.
8	Includes inspection and maintenance of the asphalt cap.
9	Assumes a replacement of 1% of the asphalt cap annually.

Table 4-6
Planning Level Cost Estimate
Alternative 5: Excavation of Off-Site Soil with Off-Site Disposal,
Soil Cover Over On-site Soil, and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

Item No.	Description	Estimated Quantity	Unit	Unit Price Material & Labor	Estimated Amount
Excavation and Off-Site Disposal Cost Estimate					
1	Mobilization/Site Preparation/Demobilization	1	LS	20,000	$20,000
2	Clearing/Grubbing	1.24	AC	4,240	$5,259
3	Transport and Disposal of Cleared Vegetation	298	TON	35	$10,419
4	Soil Excavation and Loading (based on investigation results)				
	Onsite Areas	1,636	CY	15	$24,540
	Offsite Areas	1,954	CY	15	$29,310
5	Transport and Disposal of Excavated Soil Off-Site				
	Hazardous Materials	1,346	TON	176	$236,940
	Non-hazardous Materials	4,039	TON	35	$141,356
6	Site Restoration - Excavated Areas				
	Install Clean Fill Including Backfill and Compaction	2,937	CY	20	$58,742
	Install Topsoil	653	CY	25	$16,323
	Hydroseeding	0.81	AC	2,500	$2,024
7	Soil Cover Over Onsite Areas				
	Install Clean Fill Including Backfill and Compaction	2,696	CY	20	$53,913
	Install Topsoil	1,348	CY	25	$33,694
	Hydroseeding	1.67	AC	2,500	$4,178
				SUBTOTAL CAPITAL COSTS	**$636,697**
Item No.	**Description**	**Estimated Quantity**	**Unit**	**Unit Cost ($)**	**Item Cost($)**
Annual (Post-Remedial Site Control)					
8	Soil Cover Inspection / Maintenance	2	Event	1,500	$3,000
9	Soil Cover Repairs	20	CY	25	$500
				SUBTOTAL ANNUAL COSTS	**$3,500**
				30-YEAR PRESENT WORTH COST:	**$43,434**
				PROJECT PRESENT WORTH COST:	**$680,130**
				Contingency 30%	$204,039
				Engineering 15%	$102,020
				TOTAL:	**$986,189**
				TOTAL PROJECT PRESENT WORTH COST:	**$986,000**

Item No.	Assumption
1	Includes costs associated with contractor mobilization/demobilization of equipment and personnel.
2	Assumes approximately 50% of excavation/capping area requires clearing/grubbing of surface vegetation.
3	Assumes all cleared vegetation may be disposed as non-hazardous waste. Assumes a unit density of 240 tons/acre for cleared vegetation.
4	Excavation areas calculated using Thiessen Polygon Method. Excavation volumes obtained by multiplying polygon areas by the required depth of excavation. The following polygons would be excavated and disposed of off-site: On Site: SB9 to a depth of 2 feet bgs Off Site: WB-SD04 and SB20 to a depth of 4 feet bgs
5	Assumes that 25% of excavated materials will be disposed as hazardous waste.
6	Assumes that excavated volume will be backfilled with clean fill material and 0.5 foot of topsoil. Assumes entire area of excavation will be hydroseeded.

Table 4-6
Planning Level Cost Estimate
Alternative 5: Excavation of Off-Site Soil with Off-Site Disposal,
Soil Cover Over On-site Soil, and Institutional Controls
Wadesboro VCC - Alternatives Evaluation Report

7 Assumes that a soil cover will be installed over onsite areas exceeding arsenic and lead action levels.
Polygons to be covered are: SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, and VC-08-SS
Assumes soil cap will consist of 1 foot of clean fill material and 0.5 foot of topsoil.
Assumes that entire soil cap will be hydroseeded.

8 Includes mowing, inspection, and maintenance of the soil cover.

9 Assumes a replacement of 1% of the soil cover anually.

Table 4-7
Planning Level Cost Estimate
Alternative 6: Excavation of On- and Off-Site Soil with Off-Site Disposal
Wadesboro VCC - Alternatives Evaluation Report

Item No.	Description	Estimated Quantity	Unit	Unit Price Material & Labor	Estimated Amount
Excavation and Off-Site Disposal Cost Estimate					
1	Mobilization/Site Preparation/Demobilization	1	LS	20,000	$20,000
2	Clearing/Grubbing	1.24	AC	4,240	$5,259
3	Transport and Disposal of Cleared Vegetation	298	TON	35	$10,419
4	Soil Excavation and Loading (based on investigation results)				
	Onsite Areas	7,668	CY	15	$115,020
	Offsite Areas	1,954	CY	15	$29,310
5	Transport and Disposal of Excavated Soil Off-Site				
	Hazardous Materials	3,608	TON	176	$635,052
	Non-hazardous Materials	10,825	TON	35	$378,866
6	Site Restoration				
	Install Clean Fill Including Backfill and Compaction	7,621	CY	20	$152,426
	Install Topsoil	2,001	CY	25	$50,017
	Hydroseeding	2.48	AC	2,500	$6,201
				SUBTOTAL CAPITAL COSTS	**$1,402,571**
				Contingency 30%	$420,771
				Engineering 15%	$210,386
				TOTAL CAPITAL COST	**$2,033,728**
				ROUNDED TO	**$2,030,000**

Item No.	Assumption
1	Includes costs associated with contractor mobilization/demobilization of equipment and personnel.
2	Assumes approximately 50% of excavation area requires clearing/grubbing of surface vegetation.
3	Assumes all cleared vegetation may be disposed as non-hazardous waste.
	Assumes a unit density of 240 tons/acre for cleared vegetation.
4	Excavation areas calculated using Thiessen Polygon Method.
	Excavation volumes obtained by multiplying polygon areas by the required depth of excavation.
	The following polygons would be excavated and disposed of off-site: SB9, SB11-SB17, SB19, VC-01-SS, VC-04-SS, VC-05-SS, VC-07-SS, VC-08-SS, WB-SD04, and SB20
5	Assumes that 25% of excavated materials will be disposed as hazardous waste.
6	Assumes that excavated volume will be backfilled with clean fill material and 0.5 foot of topsoil.
	Assumes entire area of excavation will be hydroseeded.

Figures

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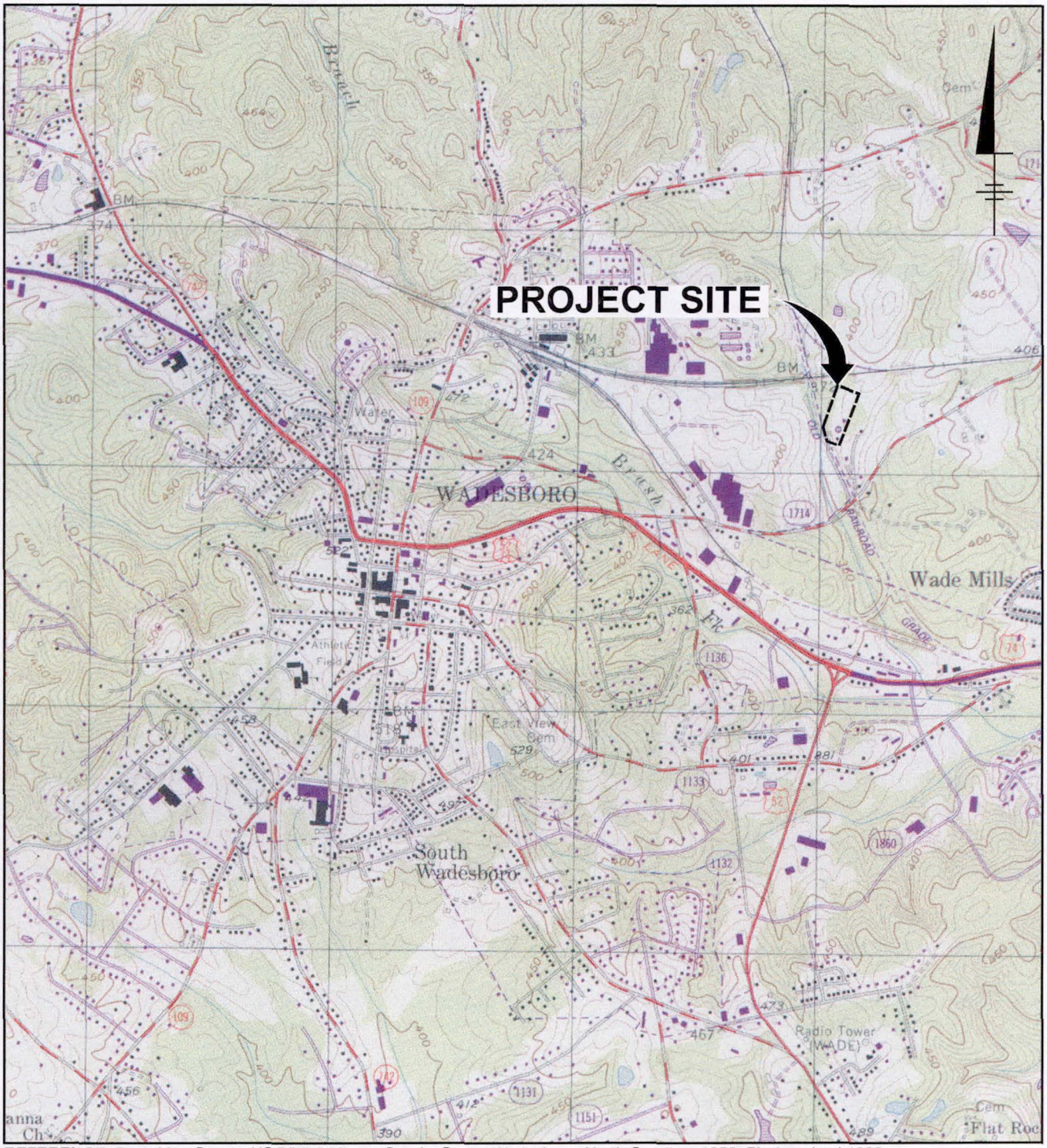
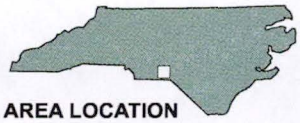


REFERENCE: Base Map Source USGS 7.5 Minute Quads. Series Wadesboro, North Carolina, 1956, Photorevised 1988.

2000' 0 2000'

Approximate Scale: 1" = 2000'



AREA LOCATION

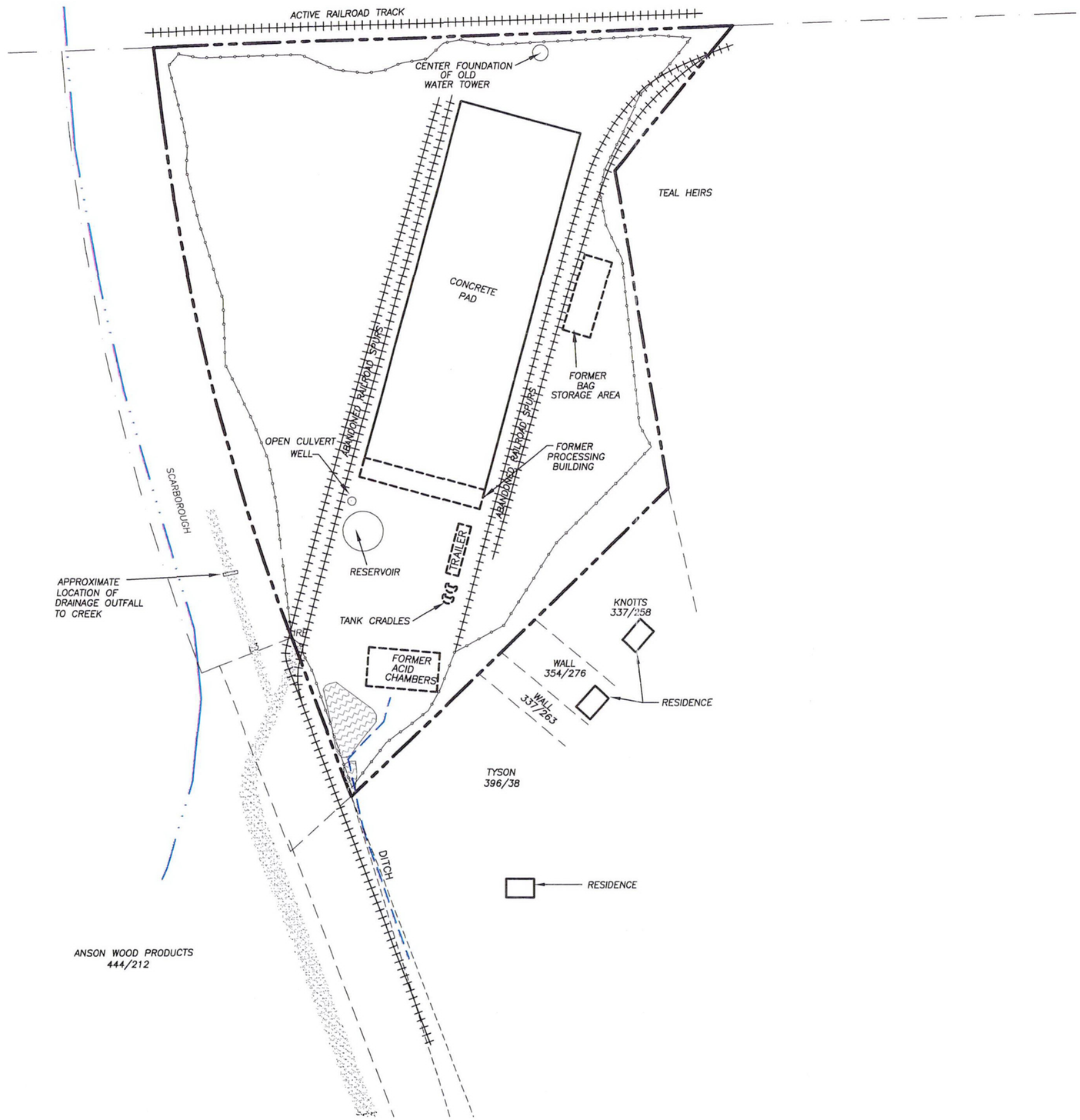
VIRGINIA-CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA
ALTERNATIVES EVALUATION REPORT

SITE LOCATION MAP

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1-1

04/01/02 SYR-D54-LBR
54626003/54626n01.cdr



LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
- PROPERTY LINE
- APPROXIMATE LOCATION OF FORMER STRUCTURE
- CHAIN LINK FENCE
- ACCESS ROAD
- DISCOLORED SOIL

NOTE:

1. BASE MAP BY JAMES R. HARRINGTON AND ASSOCIATES AT A SCALE OF 1" = 100' SUPPLEMENTED BY BBL WITH FEATURES DIGITIZED FROM A DRAWING ENTITLED "FIGURE 3 – SAMPLING LOCATION MAP" BY TETRA TECH EMI (2000).

0 150' 300'

GRAPHIC SCALE

VIRGINIA–CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

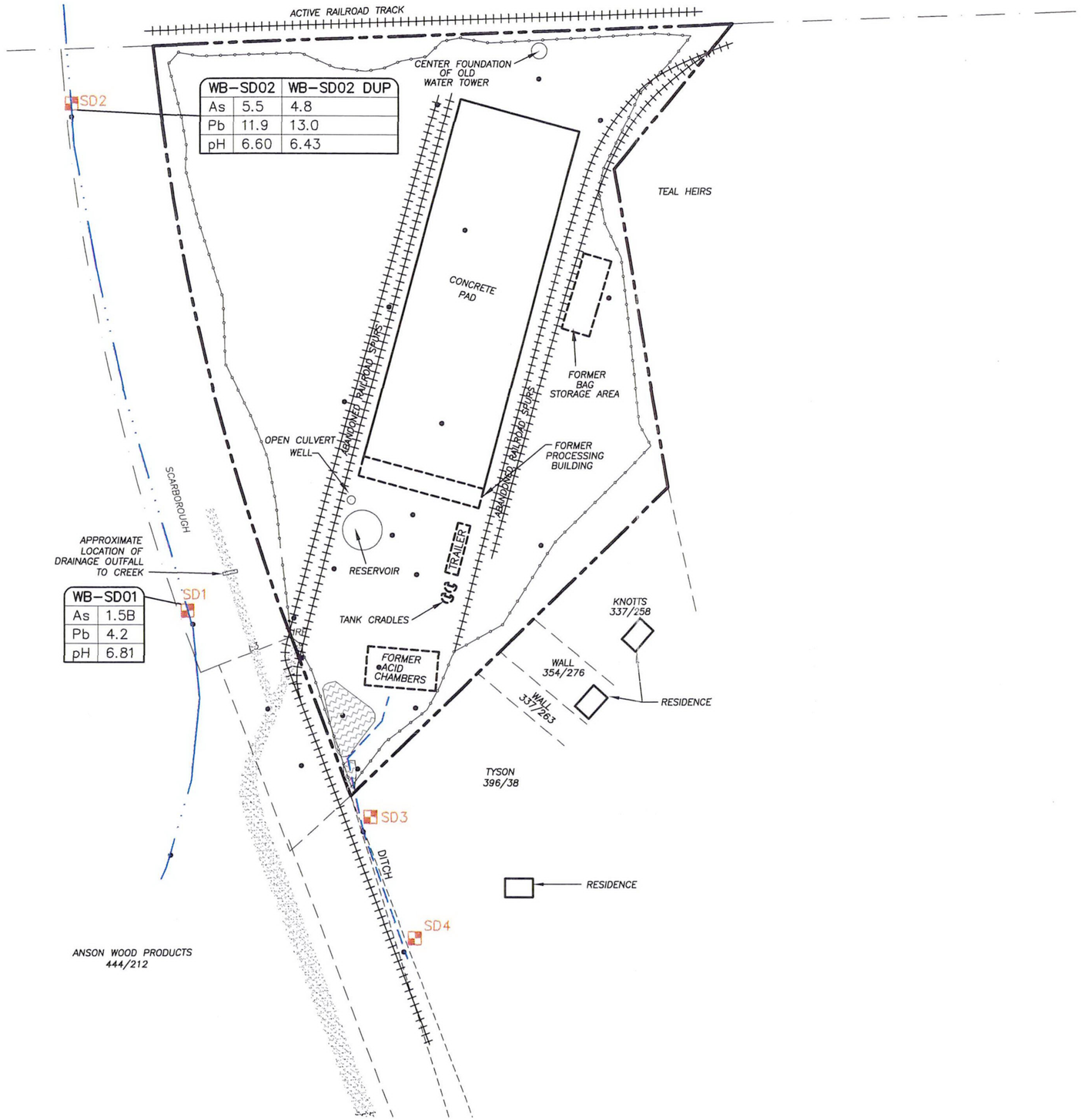
ALTERNATIVES EVALUATION REPORT

SITE MAP

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **1-2**

L: ON=*, OFF=REF, SP*
P: STD-PCP/BL LEXMARK
3/22/02 SYR-54-PGL DMW PGL
54626006/54626B07.DWG



WB-SD02		WB-SD02 DUP
As	5.5	4.8
Pb	11.9	13.0
pH	6.60	6.43

WB-SD01	
As	1.5B
Pb	4.2
pH	6.81

LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
- PROPERTY LINE
- APPROXIMATE LOCATION OF FORMER STRUCTURE
- CHAIN LINK FENCE
- ACCESS ROAD
- DISCOLORED SOIL
- SD1 SEDIMENT SAMPLE LOCATION

NOTES:

1. BASE MAP BY JAMES R. HARRINGTON AND ASSOCIATES AT A SCALE OF 1" = 100' SUPPLEMENTED BY BBL WITH FEATURES DIGITIZED FROM A DRAWING ENTITLED "FIGURE 3 – SAMPLING LOCATION MAP" BY TETRA TECH EMI (2000).
2. SD03 AND SD04 WERE TAKEN IN DRY DRAINAGE DITCH AND ARE CONSIDERED SOIL SAMPLES.
3. ALL CONCENTRATIONS IN mg/kg.

0 150' 300'

GRAPHIC SCALE

VIRGINIA-CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

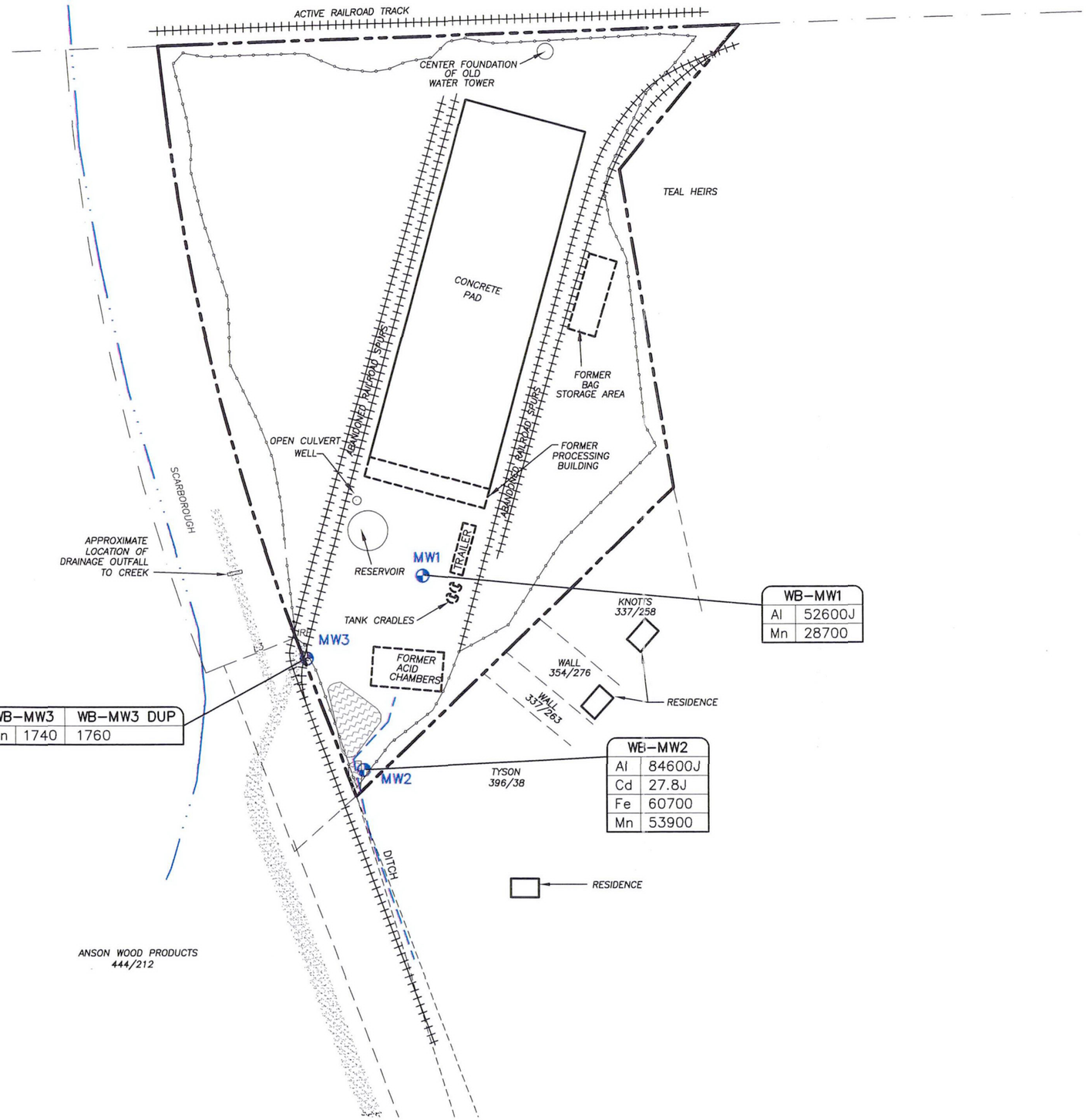
ALTERNATIVES EVALUATION REPORT

ARSENIC AND LEAD CONCENTRATIONS AND pH IN SEDIMENT

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-1**

L: ON=*, OFF=REF, SP*
P: STD-PCP/BL @LEXMARK
3/22/02 SYR-54-PGL RCA PGL
54626007/54626B04.DWG



WB-MW1	
Al	52600J
Mn	28700

WB-MW3	WB-MW3 DUP
Mn 1740	1760

WB-MW2	
Al	84600J
Cd	27.8J
Fe	60700
Mn	53900

LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
- PROPERTY LINE
- APPROXIMATE LOCATION OF FORMER STRUCTURE
- CHAIN LINK FENCE
- ACCESS ROAD
- DISCOLORED SOIL
- MW1 MONITORING WELL LOCATION

NOTES:

1. BASE MAP BY JAMES R. HARRINGTON AND ASSOCIATES AT A SCALE OF 1" = 100' SUPPLEMENTED BY BBL WITH FEATURES DIGITIZED FROM A DRAWING ENTITLED "FIGURE 3 – SAMPLING LOCATION MAP" BY TETRA TECH EMI (2000).
2. ALL CONCENTRATIONS IN ug/L.
3. PRGs ARE USEPA REGION IX PRELIMINARY REMEDIATION GOALS FOR TAP WATER.

0 150' 300'

GRAPHIC SCALE

VIRGINIA–CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

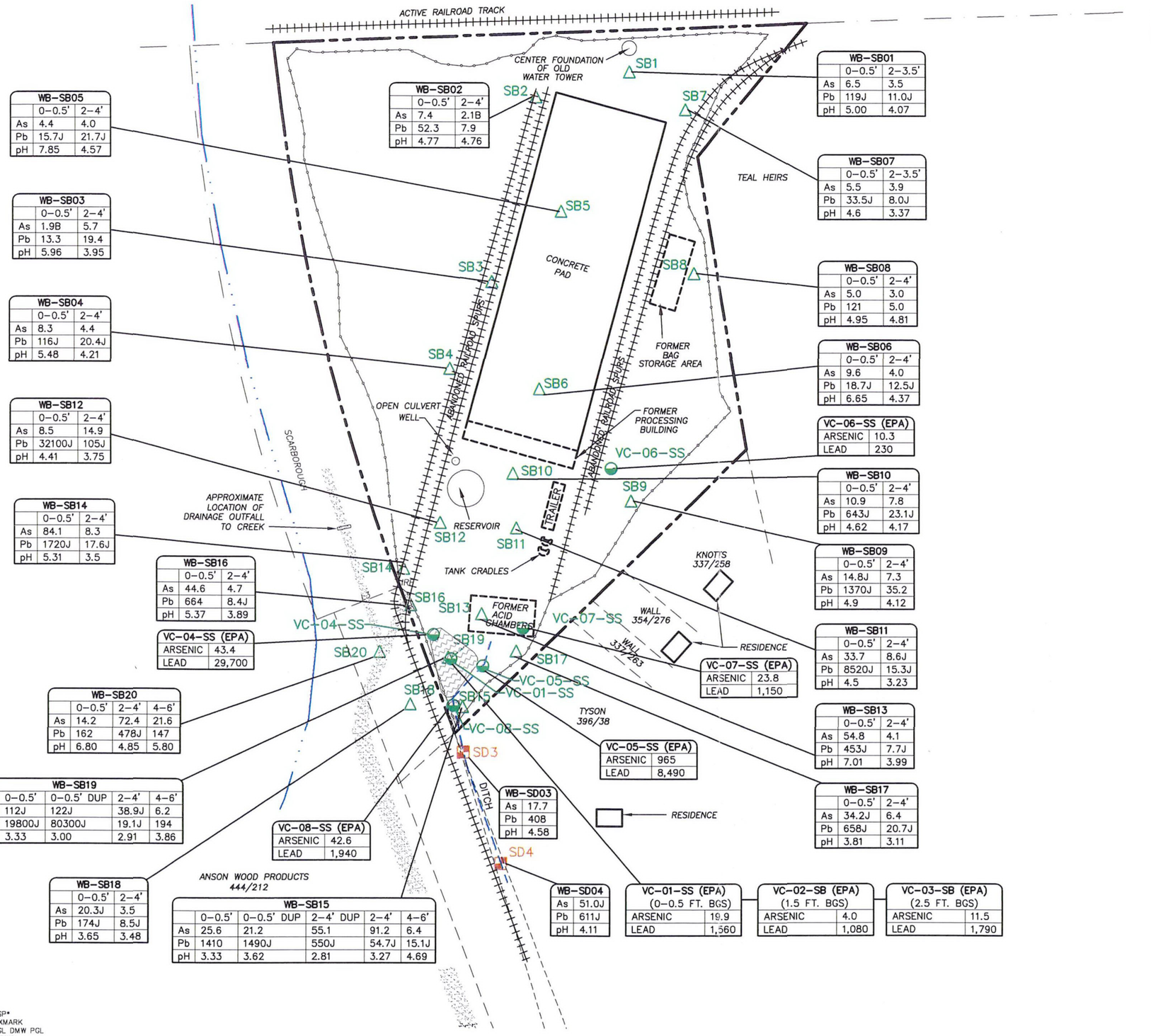
ALTERNATIVES EVALUATION REPORT

ANALYTES EXCEEDING PRGs IN GROUNDWATER

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-2**

L: ON=*, OFF=REF, SP*
P: STD-PCP/BL EXMARK
3/22/02 SYR-54-PGL RCA PGL
54626007/54626B06.DWG



WB-SB01	0–0.5'	2–3.5'
As	6.5	3.5
Pb	119J	11.0J
pH	5.00	4.07

WB-SB02	0–0.5'	2–4'
As	7.4	2.1B
Pb	52.3	7.9
pH	4.77	4.76

WB-SB03	0–0.5'	2–4'
As	1.9B	5.7
Pb	13.3	19.4
pH	5.96	3.95

WB-SB04	0–0.5'	2–4'
As	8.3	4.4
Pb	116J	20.4J
pH	5.48	4.21

WB-SB05	0–0.5'	2–4'
As	4.4	4.0
Pb	15.7J	21.7J
pH	7.85	4.57

WB-SB06	0–0.5'	2–4'
As	9.6	4.0
Pb	18.7J	12.5J
pH	6.65	4.37

WB-SB07	0–0.5'	2–3.5'
As	5.5	3.9
Pb	33.5J	8.0J
pH	4.6	3.37

WB-SB08	0–0.5'	2–4'
As	5.0	3.0
Pb	121	5.0
pH	4.95	4.81

WB-SB09	0–0.5'	2–4'
As	14.8J	7.3
Pb	1370J	35.2
pH	4.9	4.12

WB-SB10	0–0.5'	2–4'
As	10.9	7.8
Pb	643J	23.1J
pH	4.62	4.17

WB-SB11	0–0.5'	2–4'
As	33.7	8.6J
Pb	8520J	15.3J
pH	4.5	3.23

WB-SB12	0–0.5'	2–4'
As	8.5	14.9
Pb	32100J	105J
pH	4.41	3.75

WB-SB13	0–0.5'	2–4'
As	54.8	4.1
Pb	453J	7.7J
pH	7.01	3.99

WB-SB14	0–0.5'	2–4'
As	84.1	8.3
Pb	1720J	17.6J
pH	5.31	3.5

WB-SB16	0–0.5'	2–4'
As	44.6	4.7
Pb	664	8.4J
pH	5.37	3.89

WB-SB17	0–0.5'	2–4'
As	34.2J	6.4
Pb	658J	20.7J
pH	3.81	3.11

WB-SB18	0–0.5'	2–4'
As	20.3J	3.5
Pb	174J	8.5J
pH	3.65	3.48

WB-SB19	0–0.5'	0–0.5' DUP	2–4'	4–6'
As	112J	122J	38.9J	6.2
Pb	19800J	80300J	19.1J	194
pH	3.33	3.00	2.91	3.86

WB-SB20	0–0.5'	2–4'	4–6'
As	14.2	72.4	21.6
Pb	162	478J	147
pH	6.80	4.85	5.80

WB-SB15	0–0.5'	0–0.5' DUP	2–4' DUP	2–4'	4–6'
As	25.6	21.2	55.1	91.2	6.4
Pb	1410	1490J	550J	54.7J	15.1J
pH	3.33	3.62	2.81	3.27	4.69

VC-04-SS (EPA)	
ARSENIC	43.4
LEAD	29,700

VC-05-SS (EPA)	
ARSENIC	965
LEAD	8,490

VC-06-SS (EPA)	
ARSENIC	10.3
LEAD	230

VC-07-SS (EPA)	
ARSENIC	23.8
LEAD	1,150

VC-08-SS (EPA)	
ARSENIC	42.6
LEAD	1,940

WB-SD03	
As	17.7
Pb	408
pH	4.58

WB-SD04	
As	51.0J
Pb	611J
pH	4.11

VC-01-SS (EPA) (0–0.5 FT. BGS)	
ARSENIC	19.9
LEAD	1,560

VC-02-SB (EPA) (1.5 FT. BGS)	
ARSENIC	4.0
LEAD	1,080

VC-03-SB (EPA) (2.5 FT. BGS)	
ARSENIC	11.5
LEAD	1,790

LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
- PROPERTY LINE
- APPROXIMATE LOCATION OF FORMER STRUCTURE
- CHAIN LINK FENCE
- ACCESS ROAD
- DISCOLORED SOIL
- SB1 SOIL BORING LOCATION
- SD3 SEDIMENT SAMPLE LOCATION
- VC-07-SS USEPA SURFACE (0–0.5 FT.) SOIL SAMPLE (12/99)

NOTES:

1. BASE MAP BY JAMES R. HARRINGTON AND ASSOCIATES AT A SCALE OF 1" = 100' SUPPLEMENTED BY BBL WITH FEATURES DIGITIZED FROM A DRAWING ENTITLED "FIGURE 3 – SAMPLING LOCATION MAP" BY TETRA TECH EMI (2000).
2. ALL SAMPLING DEPTHS ARE IN FEET BELOW GROUND SURFACE.
3. SD03 AND SD04 WERE TAKEN IN DRY DRAINAGE DITCH AND ARE ACTUALLY SOIL SAMPLES.
4. USEPA SAMPLE LOCATIONS ARE APPROXIMATE.
5. CONCENTRATIONS IN mg/kg.

0 150' 300'
GRAPHIC SCALE

VIRGINIA–CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

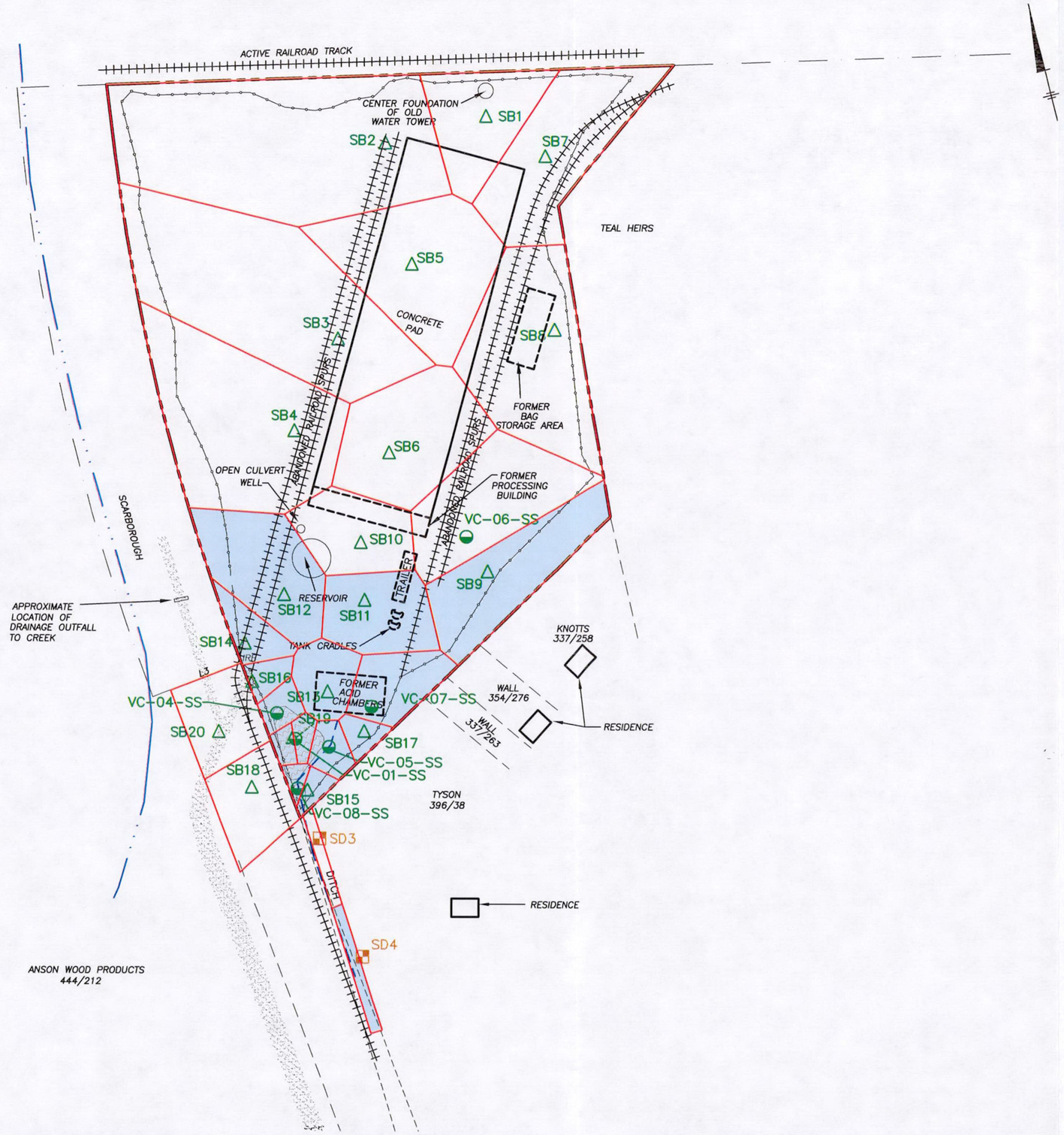
ALTERNATIVES EVALUATION REPORT

ARSENIC AND LEAD CONCENTRATIONS AND pH IN SOIL

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-3

L: ON=*, OFF=REF, SP*
P: STD-PCP/BL @LEXMARK
3/22/02 SYR-54-PGL DWW PGL
54626006/54626C01.DWG



LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
- PROPERTY LINE
- APPROXIMATE LOCATION OF FORMER STRUCTURE
- CHAIN LINK FENCE
- ACCESS ROAD
- DISCOLORED SOIL
- SB1 SOIL BORING LOCATION
- SD1 SEDIMENT SAMPLE LOCATION
- SW1 SURFACE WATER SAMPLE LOCATION
- SG1 STREAM GAUGE LOCATION
- VC-07-SS USEPA SURFACE (0-0.5 FT.) SOIL SAMPLE (12/99)
- HORIZONTAL LIMITS OF AREA ASSOCIATE WITH GIVEN SAMPLE, DEVELOPED USING THE THEISSEN POLYGON APPROACH.
- POLYGONS THAT EXCEED SITE-SPECIFIC ACTION LEVELS

NOTE:

1. BASE MAP BY JAMES R. HARRINGTON AND ASSOCIATES AT A SCALE OF 1" = 100' SUPPLEMENTED BY BBL WITH FEATURES DIGITIZED FROM A DRAWING ENTITLED "FIGURE 3 - SAMPLING LOCATION MAP" BY TETRA TECH EMI (2000).

0 150' 300'

GRAPHIC SCALE

VIRGINIA-CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

ALTERNATIVES EVALUATION REPORT

SURFACE SOIL POLYGONS

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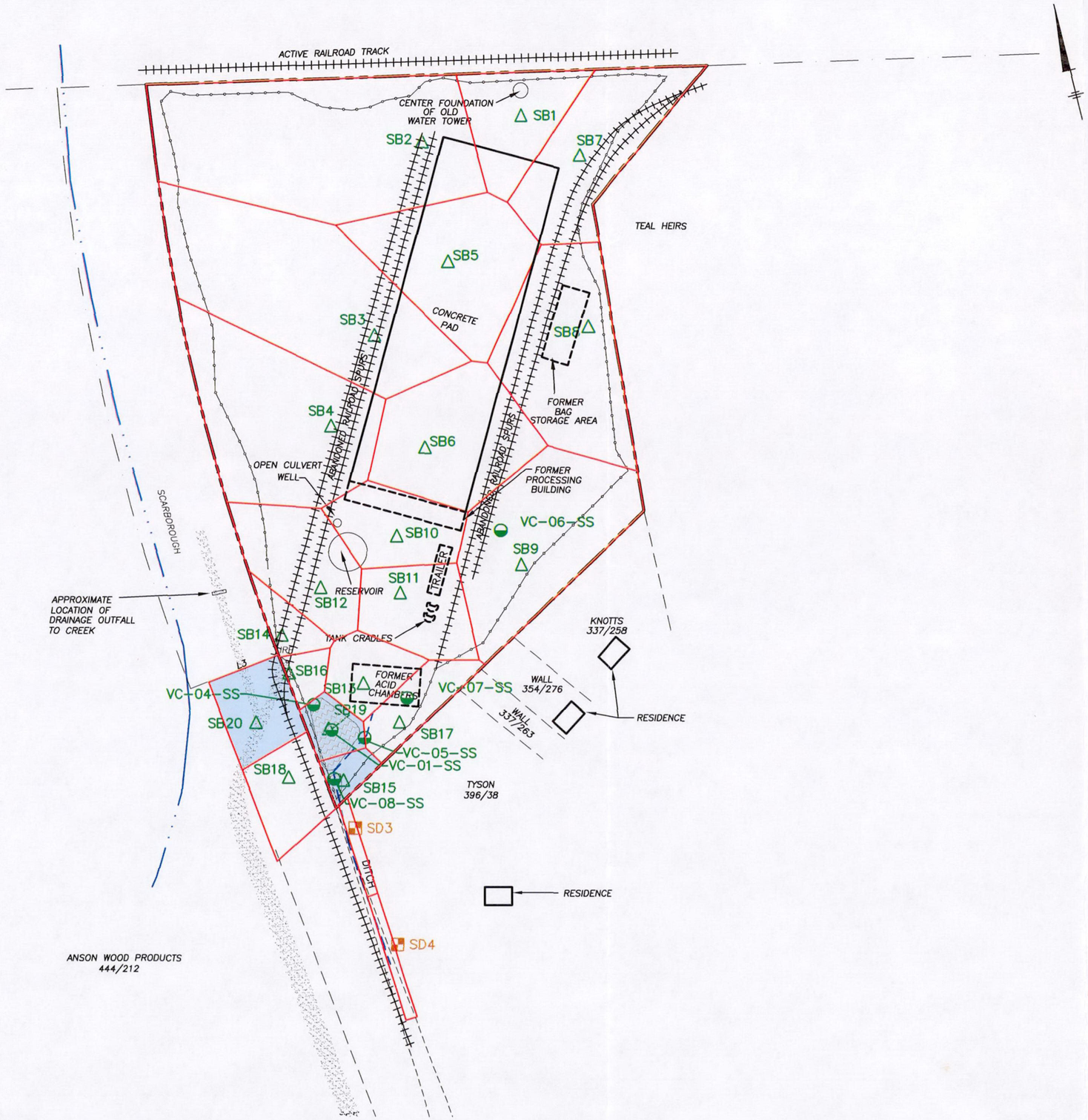
engineers & scientists

FIGURE
3-1

X: NONE
L: ON=*, OFF=REF, SP*
P: PAGESET/BL
4/3/02 SYR-54-PGL DMW PGL
54626006/54626B12.DWG



LEGEND:

- BUILDING
- TANK
- ROAD
- RAILROAD
- DITCH
- STREAM
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- APPROXIMATE LOCATION OF FORMER STRUCTURE
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0 150' 300'

GRAPHIC SCALE

VIRGINIA-CAROLINA CHEMICAL CO. SITE
WADESBORO, NORTH CAROLINA

ALTERNATIVES EVALUATION REPORT

SUBSURFACE SOIL POLYGONS

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
3-2

X: NONE
L: ON=*, OFF=REF, SP*
P: PAGESET/BL
4/3/02 SYR-54-PGL DMW PGL
54626006/54626B13.DWG

Appendix A

Analytical Data Summary Tables

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB01 0-0.5 ft bgs	WB-SB01 2-3.5 ft bgs	WB-SB02 0-0.5 ft bgs	WB-SB02 2-4 ft bgs
Aluminum	mg/kg	7370	9070	5930	3090
Antimony	mg/kg	1.0 UJ	0.96 U	0.90 U	1.0 U
Arsenic	mg/kg	6.5	3.5	7.4	2.1 B
Barium	mg/kg	38.5 B	29.0 B	37.2 B	28.0 B
Beryllium	mg/kg	0.17 U	0.13 B	0.19 U	0.11 U
Cadmium	mg/kg	0.13 U	0.13 U	0.25 B	0.14 U
Calcium	mg/kg	1280	91.0 B	2470	399 B
Chromium	mg/kg	30.1 J	15.3	30.2	5.8
Cobalt	mg/kg	2.3 B	2.1 B	5.8 B	3.0 B
Copper	mg/kg	11.4	10.0 J	18.5	5.1 U
Iron	mg/kg	21400	21900	16300	11400
Lead	mg/kg	119 J	11.0 J	52.3	7.9
Magnesium	mg/kg	774 B	1040 B	996 B	373 B
Manganese	mg/kg	138	94.2	208	319
Mercury	mg/kg	0.05 B	0.03 U	0.04 B	0.03 U
Nickel	mg/kg	10.6	5.3 B	19.6	3.5 B
Potassium	mg/kg	456 B	480 B	529 B	282 B
Selenium	mg/kg	0.96 U	0.92 U	0.86 U	0.99 U
Silver	mg/kg	0.18 U	0.17 U	0.16 U	0.18 U
Sodium	mg/kg	49.4 U	47.6 U	44.7 U	51.1 U
Thallium	mg/kg	1.1 U	1.1 B	0.98 U	1.1 U
Vanadium	mg/kg	22.4	23.1	15.0	10.9 B
Zinc	mg/kg	33.6 J	13.3 J	58.6 J	6.9
Field Measurements					
pH	S.U.	5.00	4.07	4.77	4.76

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB03 0-0.5 ft bgs	WB-SB03 2-4 ft bgs	WB-SB04 0-0.5 ft bgs	WB-SB04 2-4 ft bgs
Aluminum	mg/kg	2930	14700	15300	15300
Antimony	mg/kg	0.96 U	1.1 U	1.0 UJ	1.0 UJ
Arsenic	mg/kg	1.9 B	5.7	8.3	4.4
Barium	mg/kg	16.2 B	49.6	107	62.6
Beryllium	mg/kg	0.06 U	0.39 B	0.70 B	0.42 B
Cadmium	mg/kg	0.13 U	0.15 U	1.4	0.13 U
Calcium	mg/kg	2780	1950	67100	2450
Chromium	mg/kg	9.2	26.6	26.6 J	18.9 J
Cobalt	mg/kg	2.0 B	7.0 B	6.1 B	8.0 B
Copper	mg/kg	8.3	22.0	62.0	18.5
Iron	mg/kg	5430	28300	19800	24400
Lead	mg/kg	13.3	19.4	116 J	20.4 J
Magnesium	mg/kg	774 B	3520	2020	4100
Manganese	mg/kg	263	265	287	277
Mercury	mg/kg	0.04 B	0.03 U	0.08	0.03 U
Nickel	mg/kg	7.2 B	16.8	12.6	18.4
Potassium	mg/kg	348 B	1020 B	1450	816 B
Selenium	mg/kg	0.92 U	1.1 U	0.99 U	0.95 U
Silver	mg/kg	0.17 U	0.20 U	0.18 U	0.18 U
Sodium	mg/kg	47.6 U	116 B	485 B	49.3 U
Thallium	mg/kg	1.0 U	1.2 U	1.1 U	1.1 U
Vanadium	mg/kg	6.0 B	26.2	30.1	25.3
Zinc	mg/kg	27.4 J	47.4 J	88.5 J	38.7 J
Field Measurements					
pH	S.U.	5.96	3.95	5.48	4.21

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

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Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB05 0-0.5 ft bgs	WB-SB05 2-4 ft bgs	WB-SB06 0-0.5 ft bgs	WB-SB06 2-4 ft bgs
Aluminum	mg/kg	13100	12600	21600	12500
Antimony	mg/kg	1.1 UJ	1.0 UJ	1.2 UJ	1.1 UJ
Arsenic	mg/kg	4.4	4.0	9.6	4.0
Barium	mg/kg	71.5	54.0	65.5	48.9 B
Beryllium	mg/kg	0.48 B	0.61 B	0.37 B	0.24 B
Cadmium	mg/kg	0.14 U	0.14 U	0.16 U	0.15 U
Calcium	mg/kg	11200	665 B	15600	378 B
Chromium	mg/kg	16.5 J	14.3 J	29.0 J	15.7 J
Cobalt	mg/kg	10.6 B	16.5	4.3 B	4.4 B
Copper	mg/kg	14.8	15.9	16.0	7.6
Iron	mg/kg	16300	20500	34000	20200
Lead	mg/kg	15.7 J	21.7 J	18.7 J	12.5 J
Magnesium	mg/kg	4410	5280	2590	1270
Manganese	mg/kg	394	598	144	136
Mercury	mg/kg	0.03 U	0.03 U	0.05 B	0.04 B
Nickel	mg/kg	19.7	24.4	10.5 B	5.8 B
Potassium	mg/kg	1230	1250	1850	786 B
Selenium	mg/kg	1.0 U	0.99 U	1.1 U	1.1 U
Silver	mg/kg	0.19 U	0.18 U	0.21 U	0.20 U
Sodium	mg/kg	53.0 U	51.1 U	63.7 B	54.9 U
Thallium	mg/kg	1.2 U	1.1 U	1.3 U	1.2 U
Vanadium	mg/kg	17.8	19.7	43.4	25.5
Zinc	mg/kg	48.2 J	49.8 J	33.5 J	12.4 J
Field Measurements					
pH	S.U.	7.85	4.57	6.65	4.37

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB07 0-0.5 ft bgs	WB-SB07 2-3.5 ft bgs	WB-SB08 0-0.5 ft bgs	WB-SB08 2-4 ft bgs
Aluminum	mg/kg	5150	4810	5470	9170
Antimony	mg/kg	1.0 U	0.94 U	1.1 U	0.95 U
Arsenic	mg/kg	5.5	3.9	5.0	3.0
Barium	mg/kg	36.6 B	11.5 B	139	22.9 B
Beryllium	mg/kg	0.12 B	0.07 B	0.28 B	0.11 B
Cadmium	mg/kg	0.14 U	0.13 U	0.31 B	0.13 U
Calcium	mg/kg	1310	65.6 B	2410	124 B
Chromium	mg/kg	9.8	11.0	8.6	12.2
Cobalt	mg/kg	1.3 B	0.41 B	3.3 B	1.6 B
Copper	mg/kg	14.7 J	4.6 BJ	19.6	5.5
Iron	mg/kg	9520	18400	9000	13300
Lead	mg/kg	33.5 J	8.0 J	121	5.0
Magnesium	mg/kg	356 B	195 B	469 B	484 B
Manganese	mg/kg	48.3	56.3	142	17.2
Mercury	mg/kg	0.09	0.03 U	0.08	0.03 U
Nickel	mg/kg	4.0 B	1.7 B	4.9 B	2.5 B
Potassium	mg/kg	308 B	176 B	318 B	248 B
Selenium	mg/kg	1.0 U	0.90 U	1.2 B	0.91 U
Silver	mg/kg	0.19 U	0.17 U	0.19 U	0.17 U
Sodium	mg/kg	51.7 U	46.5 U	61.4 B	47.0 U
Thallium	mg/kg	1.1 U	1.0 U	1.2 U	1.0 U
Vanadium	mg/kg	14.0	25.7	11.6 B	22.6
Zinc	mg/kg	24.6 J	3.6 B	87.4 J	8.8
Field Measurements					
pH	S.U.	4.60	3.37	4.95	4.81

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB09 0-0.5 ft bgs	WB-SB09 2-4 ft bgs	WB-SB10 0-0.5 ft bgs	WB-SB10 2-4 ft bgs
Aluminum	mg/kg	9270 J	15900	11400	14400
Antimony	mg/kg	3.5 BJ	1.0 U	5.8 BJ	1.0 UJ
Arsenic	mg/kg	14.8 J	7.3	10.9	7.8
Barium	mg/kg	87.4	51.6	126	32.7 B
Beryllium	mg/kg	0.39 B	0.26 B	0.99 B	0.16 B
Cadmium	mg/kg	1.2 J	0.14 U	4.3	0.13 U
Calcium	mg/kg	81700 J	1320	139000	5140
Chromium	mg/kg	27.7 J	21.3	76.9 J	29.0 J
Cobalt	mg/kg	8.2 B	4.4 B	4.1 B	2.6 B
Copper	mg/kg	22.7	22.8	349	30.7
Iron	mg/kg	10700 J	31600	24100	36600
Lead	mg/kg	1370 J	35.2	643 J	23.1 J
Magnesium	mg/kg	787 B	2120	1120	1040 B
Manganese	mg/kg	279	236	620	65.2
Mercury	mg/kg	1.1 J	0.04 B	0.27	0.05 B
Nickel	mg/kg	40.6 J	9.6	18.3	4.6 B
Potassium	mg/kg	903 B	602 B	1410	626 B
Selenium	mg/kg	9.3 J	0.98 U	0.93 U	0.95 U
Silver	mg/kg	0.17 U	0.18 U	0.28 B	0.18 U
Sodium	mg/kg	189 B	50.5 U	826 B	49.3 U
Thallium	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U
Vanadium	mg/kg	30.2 J	38.7	34.4	47.7
Zinc	mg/kg	88.8 J	27.7 J	276 J	56.3 J
Field Measurements					
pH	S.U.	4.90	4.12	4.62	4.17

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

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Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB11 0-0.5 ft bgs	WB-SB11 2-4 ft bgs	WB-SB12 0-0.5 ft bgs	WB-SB12 2-4 ft bgs
Aluminum	mg/kg	15000	14400 J	12500	3740
Antimony	mg/kg	10.4 BJ	1.0 UJ	1.1 BJ	1.2 UJ
Arsenic	mg/kg	33.7	8.6 J	8.5	14.9
Barium	mg/kg	185	54.7	109	131
Beryllium	mg/kg	0.69 B	0.30 B	0.38 B	0.08 BU
Cadmium	mg/kg	1.5	R	0.74 B	0.23 B
Calcium	mg/kg	112000	1010 BJ	17700	2900
Chromium	mg/kg	34.8 J	20.3 J	16.0 J	3.6 J
Cobalt	mg/kg	4.8 B	6.3 B	6.8 B	0.59 B
Copper	mg/kg	80.6	24.6	106	8.5
Iron	mg/kg	30000	30300 J	23700	6710
Lead	mg/kg	8520 J	15.3 J	32100 J	105 J
Magnesium	mg/kg	2090	3470	2030	377 B
Manganese	mg/kg	168	303	149	57.0
Mercury	mg/kg	2.6	0.03 U	0.17	0.16
Nickel	mg/kg	15.3	14.0 J	11.7	1.1 B
Potassium	mg/kg	1730	1210	834 B	804 B
Selenium	mg/kg	6.8	0.97 UJ	0.93 U	6.5
Silver	mg/kg	0.84 B	0.18 U	2.1 B	0.21 U
Sodium	mg/kg	1590	49.9 U	48.1 U	58.5 U
Thallium	mg/kg	1.1 U	1.1 UJ	1.1 U	1.3 U
Vanadium	mg/kg	56.9	33.1 J	20.5	5.3 B
Zinc	mg/kg	366 J	40.9 J	134 J	67.2 J
Field Measurements					
pH	S.U.	4.50	3.23	4.41	3.75

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

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Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB13 0-0.5 ft bgs	WB-SB13 2-4 ft bgs	WB-SB14 0-0.5 ft bgs	WB-SB14 2-4 ft bgs
Aluminum	mg/kg	5880	13000	10000	14600
Antimony	mg/kg	1.9 BJ	1.0 UJ	10.8 BJ	0.99 UJ
Arsenic	mg/kg	54.8	4.1	84.1	8.3
Barium	mg/kg	73.3	50.9	672	44.1
Beryllium	mg/kg	0.07 BU	0.32 B	0.70 B	0.28 B
Cadmium	mg/kg	0.16 U	0.14 U	5.0	0.33 B
Calcium	mg/kg	19200	907 B	84500	900 B
Chromium	mg/kg	14.2 J	17.8 J	23.3 J	29.6 J
Cobalt	mg/kg	5.9 B	4.3 B	12.0	4.8 B
Copper	mg/kg	78.7	58.3	480	74.9
Iron	mg/kg	136000	23100	54200	35800
Lead	mg/kg	453 J	7.7 J	1720 J	17.6 J
Magnesium	mg/kg	794 B	1370	1400	1810
Manganese	mg/kg	627	87.6	159	122
Mercury	mg/kg	0.11	0.03 B	0.34	0.03 B
Nickel	mg/kg	7.4 B	7.3 B	8.3	7.7 B
Potassium	mg/kg	518 B	600 B	1150	682 B
Selenium	mg/kg	1.2 U	0.98 U	2.0	0.94 U
Silver	mg/kg	0.43 B	0.18 U	2.5	0.18 U
Sodium	mg/kg	203 B	50.5 U	813 B	48.7 U
Thallium	mg/kg	1.3 U	1.1 U	1.0 U	1.1 U
Vanadium	mg/kg	15.2	30.8	34.8	45.5
Zinc	mg/kg	111 J	61.7 J	638 J	309 J
Field Measurements					
pH	S.U.	7.01	3.99	5.31	3.50

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

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Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB15 0-0.5 ft bgs	WB-SB91[1] 0-0.5 ft bgs	WB-SB15 2-4 ft bgs	WB-SB90[2] 2-4 ft bgs
Aluminum	mg/kg	4180	3940	3630	2600
Antimony	mg/kg	2.6 B	2.4 BJ	1.3 U	1.2 U
Arsenic	mg/kg	25.6	21.2	91.2	55.1
Barium	mg/kg	303	285	67.9	213
Beryllium	mg/kg	0.03 U	0.06 B	0.03 B	0.03 U
Cadmium	mg/kg	0.29 B	0.15 U	0.17 U	0.24 B
Calcium	mg/kg	525 B	1240 B	509 B	390 B
Chromium	mg/kg	5.7	5.9 J	6.4	4.2
Cobalt	mg/kg	3.8 B	3.7 B	1.1 B	2.0 B
Copper	mg/kg	81.3	86.4	12.8 J	28.8 J
Iron	mg/kg	33600	32100	54400	59200
Lead	mg/kg	1410	1490 J	54.7 J	550 J
Magnesium	mg/kg	296 B	264 B	446 B	254 B
Manganese	mg/kg	27.5	23.1	113	81.0
Mercury	mg/kg	0.18	0.13	0.03 U	0.04 U
Nickel	mg/kg	1.5 B	1.7 B	1.9 B	0.99 B
Potassium	mg/kg	498 B	418 B	2730	1740
Selenium	mg/kg	1.9	1.1 U	1.2 U	2.5
Silver	mg/kg	1.5 B	1.8 B	0.23 U	0.90 B
Sodium	mg/kg	501 B	427 B	4310	4110
Thallium	mg/kg	1.3 B	1.2 U	1.4 U	1.3 U
Vanadium	mg/kg	9.5 B	8.6 B	10.0 B	6.4 B
Zinc	mg/kg	105 J	49.7 J	38.3 J	108 J
Field Measurements					
pH	S.U.	3.33	3.62	3.27	2.81

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB15 4-6 ft bgs	WB-SB16 0-0.5 ft bgs	WB-SB16 2-4 ft bgs	WB-SB17 0-0.5 ft bgs
Aluminum	mg/kg	14500	14100	9840	10900
Antimony	mg/kg	1.1 UJ	4.9 B	0.97 U	1.8 BJ
Arsenic	mg/kg	6.4	44.6	4.7	34.2 J
Barium	mg/kg	42.2 B	280	32.8 B	114
Beryllium	mg/kg	0.27 B	0.50 B	0.17 B	0.22 B
Cadmium	mg/kg	0.44 B	2.8	0.20 B	0.16 U
Calcium	mg/kg	267 B	47600	265 B	620 B
Chromium	mg/kg	23.9	30.1	17.8	18.0
Cobalt	mg/kg	6.3 B	8.0 B	3.3 B	7.1 B
Copper	mg/kg	56.0	241	114 J	180
Iron	mg/kg	27300	43900	20700	40200
Lead	mg/kg	15.1 J	664	8.4 J	658 J
Magnesium	mg/kg	3930	1690	1290	1110 B
Manganese	mg/kg	237	268	93.6	132
Mercury	mg/kg	0.03 UJ	0.08	0.06	0.07
Nickel	mg/kg	14.5	10.8	5.7 B	6.3 B
Potassium	mg/kg	645 B	1400	481 B	680 B
Selenium	mg/kg	1.1 U	2.2	0.93 U	1.1 U
Silver	mg/kg	0.20 U	0.65 B	0.17 U	0.41 U
Sodium	mg/kg	1200 B	324 B	48.1 U	86.7 B
Thallium	mg/kg	1.2 U	1.1 U	1.1 U	2.0 B
Vanadium	mg/kg	38.3	40.9	28.0	32.8
Zinc	mg/kg	46.0 J	355 J	95.2 J	184 J
Field Measurements					
pH	S.U.	4.69	5.37	3.89	3.81

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB17 2-4 ft bgs	WB-SB18 0-0.5 ft bgs	WB-SB18 2-4 ft bgs	WB-SB19 0-0.5 ft bgs
Aluminum	mg/kg	11100	8110 J	8770	782 J
Antimony	mg/kg	1.0 UJ	1.1 BJ	1.0 UJ	32.3 J
Arsenic	mg/kg	6.4	20.3 J	3.5	112 J
Barium	mg/kg	65.4	138	19.1 B	450
Beryllium	mg/kg	0.30 B	0.43 B	0.17 B	0.02 U
Cadmium	mg/kg	0.14 U	0.41 BJ	0.13 U	0.97 BJ
Calcium	mg/kg	193 B	3220 J	375 B	218 BJ
Chromium	mg/kg	21.5 J	13.1 J	16.2 J	2.2 BJ
Cobalt	mg/kg	4.5 B	15.5	3.5 B	15.6
Copper	mg/kg	24.1	229	8.5	221
Iron	mg/kg	30400	31800 J	33800	162000 J
Lead	mg/kg	20.7 J	174 J	8.5 J	19800 J
Magnesium	mg/kg	1830	1000 B	1030 B	94.5 B
Manganese	mg/kg	182	263	81.7	29.5
Mercury	mg/kg	0.03 U	0.04 BJ	0.03 U	0.78 J
Nickel	mg/kg	8.2 B	9.8 J	3.9 B	1.3 BJ
Potassium	mg/kg	686 B	441 B	310 B	593 B
Selenium	mg/kg	1.0 U	1.0 BJ	0.97 U	4.9 J
Silver	mg/kg	0.19 U	0.46 B	0.18 U	12.1
Sodium	mg/kg	51.7 U	153 B	50.6 B	3920
Thallium	mg/kg	1.1 U	1.1 U	1.1 U	3.9
Vanadium	mg/kg	37.5	18.4 J	22.7	4.3 BJ
Zinc	mg/kg	28.5 J	362 J	43.6 J	624 J
Field Measurements					
pH	S.U.	3.11	3.65	3.48	3.33

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB92\3 0-0.5 ft bgs	WB-SB19 2-4 ft bgs	WB-SB19 4-6 ft bgs	WB-SB20 0-0.5 ft bgs
Aluminum	mg/kg	844 J	11000 J	12700	11100
Antimony	mg/kg	35.4 J	1.0 UJ	1.0 UJ	4.4 B
Arsenic	mg/kg	122 J	38.9 J	6.2	14.2
Barium	mg/kg	340	61.4	51.4	139
Beryllium	mg/kg	0.02 U	0.23 B	0.29 B	0.61 B
Cadmium	mg/kg	1.7 J	R	0.94 B	2.7
Calcium	mg/kg	284 BJ	283 BJ	281 B	68600
Chromium	mg/kg	3.1 J	22.9 J	19.1	32.4
Cobalt	mg/kg	17.4	4.3 B	5.6 B	5.4 B
Copper	mg/kg	258	933	229	104
Iron	mg/kg	158000 J	21100 J	20300	25400
Lead	mg/kg	80300 J	19.1 J	194	162
Magnesium	mg/kg	84.5 B	1430	1160	2590
Manganese	mg/kg	28.1	135	97.3	148
Mercury	mg/kg	0.90 J	0.03 U	0.03 UJ	0.05 B
Nickel	mg/kg	1.9 BJ	6.7 BJ	6.3 B	16.1
Potassium	mg/kg	735 B	1210	535 B	805 B
Selenium	mg/kg	5.9 J	0.95 UJ	0.99 U	1.1 B
Silver	mg/kg	12.7	0.18 U	0.21 B	0.18 U
Sodium	mg/kg	3730	1580	2620	504 B
Thallium	mg/kg	3.8	1.1 U	1.1 U	1.1 U
Vanadium	mg/kg	4.7 BJ	32.5 J	30.2	31.9
Zinc	mg/kg	686 J	58.6 J	103 J	242 J
Field Measurements					
pH	S.U.	3.00	2.91	3.86	6.80

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-1
Summary of Analytical Results for Soil Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:			
Analyte	Units	WB-SB20 2-4 ft bgs	WB-SB20 4-6 ft bgs	WB-SD03\4	WB-SD04\4
Aluminum	mg/kg	8220	9210	13100	17000 J
Antimony	mg/kg	6.8 BJ	4.0 BJ	2.1 B	2.5 UJ
Arsenic	mg/kg	72.4	21.6	17.7	51.0 J
Barium	mg/kg	403	159	47.6 B	40.0 B
Beryllium	mg/kg	0.55 B	0.61 B	0.23 B	0.26 B
Cadmium	mg/kg	3.6	3.2	0.18 U	R
Calcium	mg/kg	50500	55000	1100 B	1870 BJ
Chromium	mg/kg	17.0 J	24.4	11.4	25.1 J
Cobalt	mg/kg	19.8	8.9 B	1.9 B	3.7 B
Copper	mg/kg	650	243	263	316
Iron	mg/kg	71300	30600	12200	101000 J
Lead	mg/kg	478 J	147	408	611 J
Magnesium	mg/kg	1920	1140	614 B	757 B
Manganese	mg/kg	123	124	39.7	89.8
Mercury	mg/kg	0.10	0.04 BJ	0.09	0.13 J
Nickel	mg/kg	10.0	9.3	4 B	8.1 BJ
Potassium	mg/kg	871 B	681 B	588 B	606 B
Selenium	mg/kg	2.1	1.5	1.3 U	2.4 UJ
Silver	mg/kg	2.5	0.49 B	0.25 B	0.70 B
Sodium	mg/kg	410 B	486 B	65.2 U	124 U
Thallium	mg/kg	1.2 B	1.0 U	1.4 U	2.7 U
Vanadium	mg/kg	24.3	26.3	17.7	29.4 J
Zinc	mg/kg	652 J	300 J	88.2 J	157 J
Field Measurements					
pH	S.U.	4.85	5.80	4.58	4.11

Notes:

\1 Blind field duplicate of sample WB-SB15 0-0.5 ft bgs

\2 Blind field duplicate of sample WB-SB15 2-4 ft bgs

\3 Blind field duplicate of sample WB-SB19 0-0.5 ft bgs

\4 Although these samples are labelled with a sediment sample labelling convention, these samples were collected in a dry drainage ditch and are actually soil samples and not sediment samples

Table A-2
Summary of Analytical Results for Sediment Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Units	Concentration in Sample: WB-SD01	WB-SD02	WB-SD99\1
Aluminum	mg/kg	1740	7130	7370
Antimony	mg/kg	1.1 U	1.5 U	1.7 U
Arsenic	mg/kg	1.5 B	5.5	4.8
Barium	mg/kg	21.2 B	75.0	76.0
Beryllium	mg/kg	0.15 B	0.29 B	0.32 B
Cadmium	mg/kg	0.15 U	0.21 U	0.23 U
Calcium	mg/kg	330 B	1240 B	1300 B
Chromium	mg/kg	4.4	13.0	14.7
Cobalt	mg/kg	1.9 B	6.6 B	6.9 B
Copper	mg/kg	2.8 B	14.3	14.0
Iron	mg/kg	6570	16300	17700
Lead	mg/kg	4.2	11.9	13.0
Magnesium	mg/kg	391 B	1190 B	1340 B
Manganese	mg/kg	66.4	247	258
Mercury	mg/kg	0.03 U	0.06 B	0.05 B
Nickel	mg/kg	2.7 B	8.9 B	9.0 B
Potassium	mg/kg	180 B	571 B	573 B
Selenium	mg/kg	1.0 U	1.5 U	1.6 U
Silver	mg/kg	0.20 U	0.27 U	0.30 U
Sodium	mg/kg	54.2 U	76.3 U	84.2 U
Thallium	mg/kg	1.2 U	1.8 B	1.9 U
Vanadium	mg/kg	8.7 B	21.1	23.4
Zinc	mg/kg	37.2 J	189 J	173 J
Field Measurements				
pH	S.U.	6.81	6.60	6.43

Notes:

\1 Blind field duplicate of sample WB-SD02

Table A-3
Summary of Analytical Results for Groundwater Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Units	Concentration in Sample: WB-MW1	WB-MW2	WB-MW3	WB-MW90[\1]
Aluminum	µg/L	52600 J	84600 J	400 J	377 J
Antimony	µg/L	22.5 U	22.5 U	4.5 U	4.5 U
Arsenic	µg/L	15.0 U	15.0 U	3.0 U	3.0 U
Barium	µg/L	31.0 B	37.7 B	198 B	199 B
Beryllium	µg/L	10.8 B	11.5 B	0.10 U	0.10 U
Cadmium	µg/L	10.1 BJ	27.8 J	0.60 U	0.60 U
Calcium	µg/L	565000	415000	260000	261000
Chromium	µg/L	2.5 U	9.0 U	0.79 U	0.50 U
Cobalt	µg/L	631	996	2.2 B	2.0 B
Copper	µg/L	54.5 B	998	2.5 U	1.8 B
Iron	µg/L	575	60700	469	403
Lead	µg/L	11.5 U	10.3 U	2.6 B	1.9 U
Magnesium	µg/L	277000	214000	48000	48100
Manganese	µg/L	28700	53900	1740	1760
Mercury	µg/L	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	µg/L	498	505	5.1 B	4.2 B
Potassium	µg/L	6320 B	7500 B	6290	6120
Selenium	µg/L	R	R	R	R
Silver	µg/L	4.0 U	4.0 U	0.80 U	0.80 U
Sodium	µg/L	57400	1350000	36400	36200
Thallium	µg/L	24.5 UJ	24.5 UJ	6.0 BJ	4.9 UJ
Vanadium	µg/L	4.0 U	12.3 B	1.1 U	1.2 U
Zinc	µg/L	1480	4630	1.8 B	1.8 B
Field Measurements					
pH	S.U.	4.59	4.62	6.88	6.88
Temperature	°C	14.23	15.37	15.51	15.51
Conductivity	mS/cm	3.95	4.62	1.53	1.53
Dissolved Oxygen	mg/L	2.83	1.42	2.34	2.34
ORP	mV	520	353	305	305
Flow	mL/min	350	200	200	200
Turbidity	--	clear	v. slight	clear	clear

Notes:

\1 Blind field duplicate of sample WB-MW3

Table A-4
Summary of Analytical Results for Surface Water Samples
Wadesboro VCC - Alternatives Evaluation Report

Analyte	Units	Concentration in Sample: WB-SW01	WB-SW02	WB-SW99[1]
TAL Metals				
Aluminum	µg/L	265	344	353
Antimony	µg/L	4.5 U	4.5 U	4.5 U
Arsenic	µg/L	3.0 U	3.0 U	3.0 U
Barium	µg/L	80.2 B	80.3 B	79.3 B
Beryllium	µg/L	0.10 U	0.10 U	0.10 U
Cadmium	µg/L	0.60 U	0.60 U	0.60 U
Calcium	µg/L	18500	20500	21200
Chromium	µg/L	0.80 U	0.50 U	0.51 U
Cobalt	µg/L	0.70 U	0.90 B	0.89 B
Copper	µg/L	1.0 U	1.9 U	1.5 U
Iron	µg/L	1250	1150	1200
Lead	µg/L	1.9 U	1.9 U	1.9 U
Magnesium	µg/L	5360	5580	5790
Manganese	µg/L	76.4	111	116
Mercury	µg/L	0.10 U	0.10 U	0.10 U
Nickel	µg/L	1.6 U	2.5 B	2.5 B
Potassium	µg/L	1500 B	1560 B	1610 B
Selenium	µg/L	4.3 U	4.3 U	4.3 U
Silver	µg/L	0.80 U	0.80 U	0.80 U
Sodium	µg/L	12300	12700	13200
Thallium	µg/L	4.9 U	4.9 U	4.9 U
Vanadium	µg/L	0.97 U	1.2 U	1.2 U
Zinc	µg/L	12.4 B	21.7	23.5
Water Quality Parameters				
pH	S.U.	8.27	7.90	NM
Temperature	°C	22.95	22.46	NM
Specific Conductance	mS/cm	0.184	0.189	NM
Dissolved Oxygen	mg/L	6.34	6.51	NM
Oxidation/Reduction Potential	mV	280	375	NM

Notes:

\1 Blind field duplicate of sample WB-SW02

NM = not measured

Table A-5
Summary of Analytical Results for Field QC Samples
Wadesboro VCC - Alternatives Evaluation Report

		Concentration in Sample:					
Analyte	Units	WB-EBSD 041601	WB-EBSB 041601	WB-EBSB 041701	WB-EBSB 041801	WB-EBSD 041801	WB-EBGW 042601
Aluminum	µg/L	38.8 U	215	387	292	209	25.1 BU
Antimony	µg/L	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U
Arsenic	µg/L	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Barium	µg/L	0.74 U	0.50 U	4.5 U	0.50 U	1.5 U	0.50 U
Beryllium	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Cadmium	µg/L	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Calcium	µg/L	170 B	243 B	1040 B	151 B	273 B	212 B
Chromium	µg/L	0.50 U	8.7 B	17.0	2.2 U	45.9	0.50 U
Cobalt	µg/L	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U
Copper	µg/L	1.0 U	22.3 B	3.7 U	1.3 U	1.8 U	1.0 U
Iron	µg/L	22.4 U	392	777	223	796	10.8 U
Lead	µg/L	1.9 U	1.9 U	269	4.2 J	8.1	1.9 U
Magnesium	µg/L	18.8 B	19.1 U	87.0 B	12.0 U	33.0 U	34.0 U
Manganese	µg/L	8.9 B	40.6	28.9	11.2 B	89.6	0.88 U
Mercury	µg/L	0.10 U	0.10 U	0.20 B	0.10 U	0.10 U	0.10 U
Nickel	µg/L	1.6 U	11.0 B	16.1 B	4.4 B	6.1 B	1.6 U
Potassium	µg/L	17.1 U	27.2 B	77.9 B	17.4 B	40.0 B	17.1 U
Selenium	µg/L	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	R
Silver	µg/L	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U
Sodium	µg/L	296 B	507 B	485 B	281 B	456 B	428 B
Thallium	µg/L	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 UJ
Vanadium	µg/L	0.80 U	0.80 U	0.86 U	0.80 U	0.80 U	0.80 U
Zinc	µg/L	2.2 B	128	267	3.9 B	8.6 B	1.1 U