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December 23, 2005

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

Re: Anniston PCB Site
Revision 1 of the *Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3*

Dear Ms. Langston-Scully:

On behalf of Solutia Inc. and Pharmacia Corporation, as parties to the Partial Consent Decree (CD) for the Anniston PCB Site, enclosed please find eight hard copies and ten electronic copies of the revised *Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3 of the Anniston PCB Site*. The revisions have been made to reflect approval of the revised procedures for the biological surveys provided by Marc Greenberg on June 8, 2005 in response to comments previously provided by the United States Environmental Protection Agency (USEPA) on March 7, 2005, the use of biological indices to evaluate the biological survey data as discussed during our August 30, 2005 meeting and subsequent telephone communications between Messrs. Greenberg and Ludwig, and clarifications to the Data Quality Objectives and Preliminary Remedial Action Objectives for the Site as described in a letter from the USEPA dated August 19, 2005.

This revised report is submitted in accordance with the CD, including Section IX of the Agreement for the Remedial Investigation/Feasibility Study (Appendix A to the CD) and the Statement of Work (Appendix B to the CD).

Should you have any questions regarding this matter, please contact me at (256) 231-8404.

Sincerely,

Craig R. Branchfield
Manager, Remedial Projects

CRB/mfe
Enclosures

cc: Mr. Phillip Davis (ADEM)
Mr. G. Douglas Jones, Esq.
Mr. Thomas Dahl

REPORT

Screening Level Ecological Risk Assessment (SLERA) for Operable Units 1, 2, and 3 of the Anniston PCB Site

Anniston PCB Site
Anniston, Alabama

Revision 1
December 2005

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

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1. Introduction

This report presents the Screening Level Ecological Risk Assessment (SLERA) for Operable Units (OUs) 1, 2, and 3 of the Anniston Polychlorinated Biphenyl (PCB) Site (Site). This SLERA is a deliverable under the August 4, 2003 Partial Consent Decree (CD) for the Site (United States Environmental Protection Agency [USEPA], 2002) and was prepared on behalf of Pharmacia Corporation and Solutia Inc. as signatory parties to the CD. Together, Pharmacia and Solutia are referred to as P/S. As described in the December 2004 *Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan; Blasland, Bouck & Lee, Inc. [BBL], 2004), the SLERA comprises Steps 1 and 2 of the ecological risk assessment process, in which exposure and toxicity parameters for ecological receptors that may be present in OUs 1, 2, and 3 are biased toward conservatism (e.g., maximum concentrations in exposure media, most sensitive toxicity benchmarks) as per the USEPA guidance (USEPA, 1997a).

1.1 Purpose and Objective

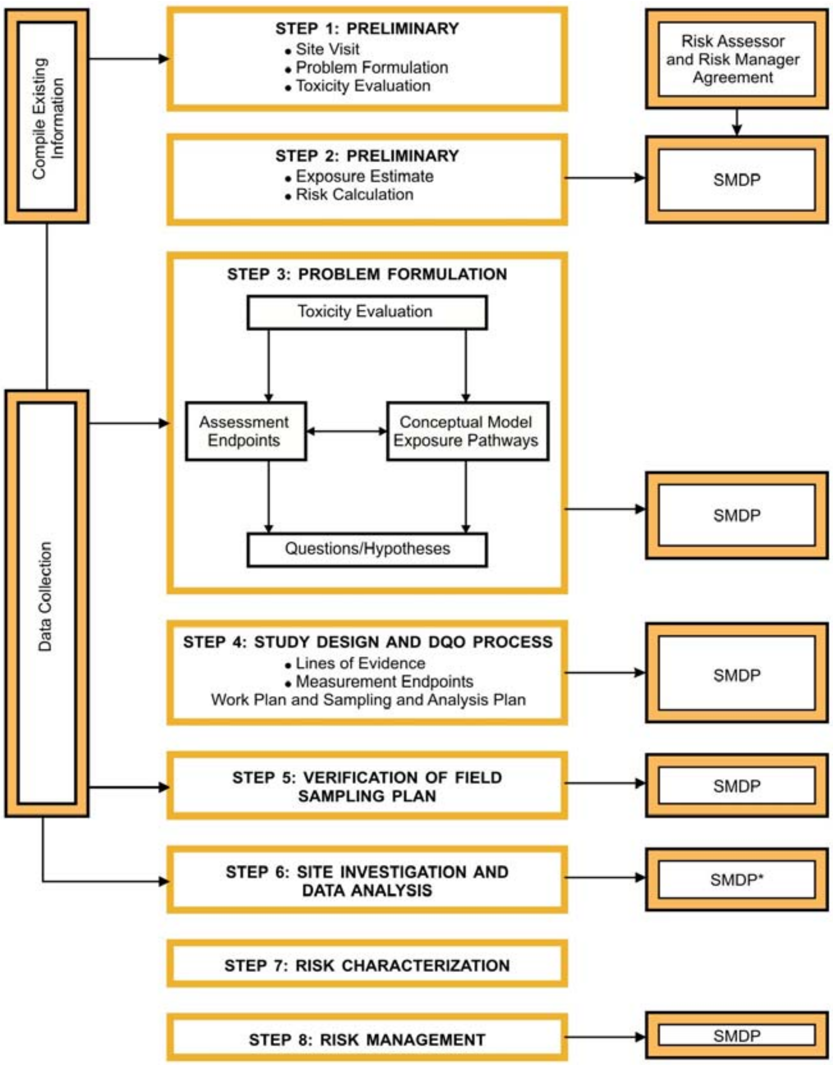
The objective of this SLERA is to determine which constituents of potential concern (COPCs) and ecological exposure pathways associated with OUs 1, 2, and 3 represent a negligible risk and which represent a potential for adverse effects and require a more thorough assessment in a baseline ecological risk assessment (BERA). Screening of the COPCs is conducted using available data, with the understanding that the COPC list may be modified under an Adaptive Site Management (ASM) Process as additional chemical characterization data are collected. The screening level exposure pathways analysis is an evaluation of receptors and habitats, and is used to identify and document the presence of active and complete exposure pathways in OUs 1, 2 and 3 as an added component of the screening assessment process. Habitat areas within OUs 1, 2 and 3 that do not have active and complete pathways will be eliminated from further risk analysis, while habitat areas with active and complete pathways and where COPCs are either present above threshold concentrations or cannot be excluded due to lack of information will be passed to a BERA. The BERAs for OUs 1, 2, and 3 will be coordinated with the ecological risk assessment presently being planned for OU-4 of the Site.

1.2 Technical Approach

Data collected during investigations conducted under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program were used to develop this SLERA. These data are presented and described in the *Phase I – Conceptual Site Model Report for the Anniston PCB Site* (Phase I CSM Report) (BBL, 2003) and the *Off-Site RCRA Facility Investigation (RFI) Report* (Off-Site Report; BBL, 2000b). These reports are the primary sources of information on exposure media concentrations as well as potential sources of chemicals, release mechanisms, exposure pathways and routes, and receptors applicable to the current assessment.

This report was developed in accordance with the CD and the eight-step process described by the USEPA in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment* (see figure on next page, adapted from USEPA, 1997a) and follows the recommendations of the USEPA's supplemental guidance document, *Amended Guidance on Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities, and Inclusion of Stakeholders* (USEPA, 2000). The methodology developed by the USEPA provides a rational, science-based approach for evaluating ecological risks for remedial decision making and the Site administrative record. This report describes the completion of the screening level portion of the ecological risk assessment process using readily available exposure media data (Steps 1 and 2 of the ecological risk assessment process).

The initial screening for COPCs presented in this report follows a systematic process. The basic COPC identification process includes a comparison of PCBs and other constituent concentrations measured in environmental media to conservative screening thresholds. COPCs include substances in Table 1 of Exhibit F of the CD for the Site (USEPA, 2002) and the broader list of constituents identified by the USEPA in a letter to P/S dated March 13, 2003 (USEPA, 2003) and clarified in a letter dated August 19, 2005 (USEPA, 2005). The process for refining the list of COPCs will follow an ASM approach that incorporates the data and associated findings from OUs 1, 2 and 3 into the planning process. The ASM approach will also be used to refine and revise the receptors and exposure pathways evaluated in subsequent phases of the risk assessment. Incorporating ASM into the process to scope the supplemental investigations, if any, at OUs 1, 2, and 3 is a scientifically valid approach that is often used by the USEPA for planning and managing watershed issues (USEPA, 2004) and by governmental agencies for federal site restoration, as outlined in the recent publication from the National Research Council (NRC), *Environmental Cleanup at Navy Facilities: Adaptive Site Management* (NRC, 2003). The NRC has also recommended the use of ASM for sites with PCB-contaminated sediment (NRC, 2001). Much of the framework for the ASM process stems from recommendations by the Presidential/Congressional Commission of Risk Assessment and Risk Management that include multiple steps for problem formulation, process design, option identification, information gathering, synthesis, decision, implementation, and evaluation (Presidential/Congressional Commission, 1997). The ASM approach is also supported by recent draft guidance from the USEPA for contaminated sediment remediation.



USEPA's Eight-Step Process for Conducting Ecological Risk Assessments

Notes:
SMDP – Scientific/Management Decision Point
* - Step 6 is only a SMDP if changes to the sampling and analysis plan are necessary.

As a component of the overall systematic process, compounds for which environmental media data and/or ecological screening values (ESVs) are lacking and for which there are active or complete exposure pathways will be carried through to the BERA. Screening for active and complete exposure pathways is conducted using USEPA rapid bioassessment protocols (for aquatic habitats) and a site-specific modification of the terrestrial wildlife habitat evaluation procedures developed by the Kansas Department of Wildlife and Parks (KDWP, 2004).

1.3 Report Organization

In addition to this introduction, this report is organized into the following sections: Section 2 contains background information, including descriptions of the OUs, and pertinent historical details. Section 3 presents Steps 1 and 2 of the risk assessment process along with an exposure pathways analysis. A discussion of uncertainty is included in Section 4, and overall conclusions are presented in Section 5. References cited in the report are listed in Section 6.

2. Background Information

2.1 Site Description

The Site is located in the north-central part of Alabama and has been evaluated extensively over the past 20 years. Work in OUs 1, 2, and 3 has included a combination of investigative and remedial efforts conducted under the guidance of the Alabama Department of Environmental Management (ADEM) and the USEPA. Historically, the efforts under RCRA have included the general areas of the Anniston Facility, which were called the "On-Site" areas, and areas downstream of the Facility, called the "Off-Site" areas. These historical terms have been replaced by "On-Facility" and "Off-Facility," since the entire Facility property is part of the Anniston PCB Site. On-Site and Off-Site are now only maintained to reflect the actual titles of documents or specific studies.

2.1.1 Operable Units 1 and 2 (OU-1/OU-2)

OU-1/OU-2 consists of both residential and non-residential properties located upstream of Highway 78 (Figure 1) up to and surrounding the Facility area (OU-3). The geography of this area includes properties that are immediately north and east of the Facility that were historically part of the "On-Site" area, and non-residential areas that have historically been addressed under the Administrative Order on Consent (e.g., the 11th Street Ditch and West 9th Street Creek). The Administrative Order on Consent (AOC) was executed between Solutia and the USEPA (USEPA, 2001).

The lateral bounds of the non-residential properties potentially include both floodplain and non-floodplain properties. Given the immediate focus on the residential portions of the Site, the lateral extent of the non-residential portions of OU-1/OU-2 will be established once the sampling of residential areas has been sufficiently implemented. Residential properties located in the Oxford Lakes Neighborhood Zone (Zone OLN) are also included in OU-1/OU-2. The residential properties included in this OU were selected based on the specific land use classification addressed by the Non-Time Critical (NTC) Removal Agreement (Appendix G to the CD), and the unique and specific requirements identified under the NTC Removal Agreement.

Although there are both residential and non-residential land uses in OU-1/OU-2, the OU as a whole is contiguous and ecological receptor populations potentially inhabiting the area do not distinguish between human constructed land-use restrictions or artificial boundaries (i.e., dividing lines between residential and non-residential properties). Rather, the entire Snow Creek floodplain and stream channel could be contacted with equal probability, and the primary factor dictating ecological use of this area is habitat quality. The various land uses within OU-1/OU-2 are described in Section 3.1.1.

2.1.2 Operable Unit 3 (OU-3)

OU-3 consists of the Facility itself including the plant site, the South Landfill and the West End Landfill. This OU is bordered to the north by the railway, by Coldwater Mountain to the south, by Clydesdale Avenue to the east, and by First Avenue to the west (Figure 2). Investigative and remedial efforts in OU-3 have included surface and subsurface soils, groundwater, and air media. Major remedial efforts have been undertaken to control stormwater flow around the Facility and to contain Facility-related source areas. In addition, the consistent industrial character of this area and associated deed restrictions differentiate it from other areas of the Site.

2.2 Manufacturing History

Manufacturing operations at the Facility began in 1917. A variety of organic and inorganic chemicals have been produced at the Facility during its history, including PCBs, ethyl parathion (parathion), paranitrophenol (PNP), and phosphorus pentasulfide. The Facility currently manufactures polyphenyl compounds (non-halogenated) that are used in a variety of heat-transfer fluid, plasticizer, and lubricant applications. PCBs were produced at the Facility from the late 1920s to 1971. Chlorine was also produced at the Facility between the 1950s and 1969 for the sole purpose of supporting PCB manufacturing (Golder Associates, Inc. [Golder], 2002).

2.3 Regulatory Context

Completion of ecological risk assessments was identified as Task 5 for both OU-1/OU-2 and OU-3 in the RI/FS Work Plan (BBL, 2004). Initially, the SLERAs for the two OUs were developed separately, and the results were provided as Appendices E (OU-1/OU-2) and F (OU-3) of the RI/FS Work Plan. At the time the RI/FS Work Plan was submitted, plans were underway to conduct semi-quantitative surveys of resident biota in both OUs. The surveys were designed to provide additional empirical evidence to reduce uncertainty associated with the risk assessment process. After the semi-quantitative surveys were completed and P/S received USEPA's comments on the initial SLERAs, it became clear that there was no longer any compelling reason to maintain the two SLERAs as separate documents. As a result, this revision presents a combined SLERA for OUs 1, 2, and 3 and fulfills the commitments made in the RI/FS Work Plan and obligations outlined the CD.

3. Ecological Evaluation

This SLERA closely follows the USEPA guidance for performing ecological risk assessments (USEPA, 1997a and 2000). SLERAs are conducted using assumptions that maximize the exposure and risk estimates so that only those chemicals that represent a *de minimis* risk are eliminated from further consideration. Those that potentially pose an unacceptable risk – based either on exceedance of screening thresholds or a lack of concentration or toxicological threshold data – are retained for consideration in subsequent steps of the assessment. The applicable risk assessment guidance documents have been considered in this analysis to identify chemical constituents detected in OUs 1, 2, and 3 that potentially pose a risk to resident ecological receptor populations. The three main components of this assessment include the problem formulation phase, ecological effects evaluation phase, and the exposure/risk calculation phase. Each phase/step is discussed below in context of the SLERA for OUs 1, 2, and 3.

The SLERA for OUs 1, 2, and 3 is associated with explicit boundaries, assumptions, and extrapolations that have a direct influence on how the results are interpreted and used. The limits are as follows:

- This assessment is limited to ecological receptor populations in OUs 1, 2, and 3.
- Data for exposure media were extracted from multiple sources available as of April 2004.
- A conservative approach was used in exposure and risk modeling where the highest validated media concentrations and lowest toxicity thresholds were combined to yield a high-end risk estimate.
- Existing media-specific benchmarks from the published literature were used (e.g., soil screening concentrations from USEPA Region 4).
- This assessment is deterministic in nature as it uses a single point estimate rather than distributions of input variables. As such, it does not include quantification of uncertainty in model input variables.
- A maximal exposure scenario is assumed, where ecological receptors live and forage in the area of concern 100% of their time (assuming an Area Use Factor of 1).
- The exposure pathways assessment step is enhanced to ensure that the only constituents forwarded to the BERA are those for which active or complete exposure pathways are present.

3.1 Step 1: Screening Level Problem Formulation and Ecological Effects Evaluation

The purpose of the screening level problem formulation step is to develop a CSM that illustrates the flux of chemicals (considering fate and transport) relative to physical characteristics, potential exposure pathways of biota, specific ecological endpoints, and mechanisms of toxicity in OUs 1, 2, and 3 (USEPA, 1997a). As part of this step, Figures 3 through 7 were developed to illustrate the exposure pathways associated with OUs 1, 2, and 3, where ecological receptors may be exposed to PCBs and other COPCs via contact with sediment, surface water, floodplain soil, air, and food. These figures depict simplified ecosystems present in OUs 1, 2, and 3 and show the fate and transport and potential exposure pathways for the main COPC groups (PCBs and methyl mercury – Figure 3, metals – Figure 4, other semivolatile organic compounds [SVOCs] – Figure 5, volatile organic compounds [VOCs] – Figure 6, and organophosphorous pesticides [OPs] – Figure 7).

The ecological setting, potential former sources, and the COPCs are identified in Step 1. Fate and transport mechanisms at the Site (primarily for PCBs and methyl mercury), pathways and routes of exposure, potential receptors, and assessment and measurement endpoints are also discussed below with an ecological effects evaluation for screening purposes.

3.1.1 Ecological Setting

In a screening level risk assessment, an understanding of the ecological setting (habitat characteristics) is a critical component of the overall investigation (USEPA, 2000). Given its importance, the ecological setting of non-residential, residential, and industrial properties in OUs 1, 2, and 3 have been investigated by risk assessors and ecologists on three occasions: October of 2001; May of 2002; and October of 2003. Results from the October 2001 and May 2002 investigations were originally reported in the Phase I CSM Report (BBL, 2003), and the results from all three investigations with respect to the ecological setting are described below in terms of dominant features provided by Snow Creek, land use along the Creek, and land use at the Facility. Vegetation and wildlife species that were observed during Site visits are identified in Tables 1 and 2.

3.1.1.1 Snow Creek

Snow Creek is a small urban drainage way that flows through the City of Anniston into the Town of Oxford, Alabama, before its confluence with Choccolocco Creek just south of Interstate 20 near the Choccolocco Creek Water Treatment Facility. Aquatic habitat in the upstream reaches of Snow Creek (north of U.S. Highway 78) is limited; there are drainage ditches along residential roads that flow into the Creek, and as it moves south it is heavily channelized through dense areas of residential, commercial, and industrial land use. In areas where concrete sluiceways channelize the Creek (Figures 8 and 9), substrate, aquatic vegetation, and bank features are lacking or are insufficient as habitat for aquatic organisms or wildlife. Previous studies have found that these areas, which are most prevalent above Noble Street, score low in habitat quality (BBL, 2000b). However, other areas of the Creek have not been altered to the same degree, specifically the portion of Snow Creek below Noble Street and above U.S. Highway 78. These areas have banks with riparian vegetation, a sandy-silt mix of substrate and depositional bars, and occasional riffle-run-pools (Figure 10). During heavy rains the surface water levels rise considerably in the Creek, and turbidity is visibly evident. At the southern limit of Snow Creek in OU-1/OU-2, surface waters flow into a long underground culvert beneath the Quintard Mall (Figure 11), which is an area devoid of any quality ecological habitat.

Because of the notable change in the portion of the Creek below U.S. Highway 78 and its similarities in important habitat characteristics to Choccolocco Creek, the lower portion of Snow Creek was included in OU-4. Thus, the southern border of OU-1/OU-2 is U.S. Highway 78.

Signs of habitat limitations include the dominance of organisms such as midges (*Chironomidae*) (Barbour et al., 1999) that occur in relatively high abundance (BBL, 2000a). Another indication of poor habitat quality is the presence of Alligator weed (*Alternathera philoeroides*), an exotic aquatic plant that is so dense in the Creek during warmer months that at periods of low flow it severely blocks the Creek channel. In other areas of the Creek where there are faster-flowing riffles over cobbled substrate (predominantly below South Noble Street), other species, including two families of mayflies (*Baetidae* and *Heptageniidae*), dragonflies (*Coenagrionidae*), dobsonflies (*Corydalidae*), riffle beetles (*Elmidae*), water scavenger beetles (*Hydrophilidae*), stoneflies (mostly *Hydroptilidae*), and several families of freshwater snails have been observed. In addition, sunfish have been observed using small pools of the Creek where there is adequate bank cover. Banks, riparian corridors, and floodplains of Snow Creek above Highway 78 are all modified by human development.

Land Use Bordering Snow Creek

Several classifications of land use in OU-1/OU-2 were surveyed as potential habitat for wildlife. The findings are described below.

Residential. Most of the habitat available to ecological species in these areas is limited to maintained lawns with sparse and arranged ornamental (and often exotic/“non-native”) trees and shrubs (Figures 12 and 13). Impervious layers, as represented by paved driveways, rooftops, streets, or large parking areas, are present throughout the residential communities and provide little, if any, significant habitat (Figure 14). Mowed lawns of some residential properties are maintained right up to the edge of Snow Creek (Figure 15). In these cases, there is little habitat in the form of cover or forage for terrestrial wildlife. In other locations where residential properties do not border the Creek, riparian habitat along the top of the creek bank (although typically narrow) provides some habitat for species of songbirds and “urban” wildlife (e.g., skunks, raccoons, squirrels, etc.). However, these areas are somewhat isolated by surrounding dense, residential communities (and other land uses), and therefore access is likely constrained.

Habitats associated with residential communities are most dominant in sections of OU-1/OU-2 immediately north and south of Route 202 and to the west of Route 21 in Anniston (Figure 1). Several other residential communities are present along the west side of Noble Street and on Main Street in Oxford.

Industrial. Land use in industrial areas is dominated by the presence of commercial buildings, manufacturing facilities, junkyards, parking areas, railroad tracks, and areas with impervious cover (usually greater than 80%), or if not impervious, groundcover disturbed by maintenance, excavation, or debris (Figures 16 and 17). Potential habitats are primarily disturbed or abandoned fields, patches of urban scrub/shrub forest, or maintained lawns with sparse ornamental trees and shrubs. Little or no wildlife were observed at locations throughout industrial areas.

Commercial. Land use in commercial areas is dominated by retail structures, single stores, strip malls, associated parking areas, landscaping, stormwater facilities, and areas with an impervious cover (usually greater than 80%) (Figures 18 and 19). Potential habitats consist of maintained lawns, and sparse ornamental trees and shrubs. Little or no wildlife were observed in these areas.

Recreational/School. Land use in these areas is dominated by playgrounds, ball fields, and large areas of maintained and manicured lawns (nearly 100% cover) (Figures 20 and 21). Functional ecological habitats are confined to less regularly maintained fields where songbirds typical of urban environments were observed foraging.

Stormwater Retention Structure. Located just east of the Facility (OU-3), the retention structure is used to control the flow of surface water runoff directed from the South Landfill. The retention structure does not support either fully functional terrestrial habitat (because of frequent inundation) or fully functional aquatic habitat (because of concomitant drying). The habitat here is disturbed by the wetting and drying cycles, and it is mainly opportunistic – only rapid-colonizing aquatic and terrestrial species were observed in or around the retention structure.

Non-residential areas (primarily associated with transportation infrastructure, including roadways and railroad beds) are found throughout OU-1/OU-2. There is moderate density of transportation infrastructure in the residential communities within the City of Anniston. The proportion of such land uses is greater as one proceeds south along Snow Creek, Southern Railroad, Quintard Drive, and Noble Street towards Oxford. These main roads and the active railway through Anniston are used heavily by motorists and trains, respectively. In fact, it is this high density transportation infrastructure that limits the abundance and quality of terrestrial habitat by creating small, isolated patches of field or forested habitat.

Many of the terrestrial habitats that are provided by trees and shrubs (including a high proportion of non-native species) are confined to the steep altered edge of Snow Creek. Here, habitats are provided by mimosa (*Albizia julibrissin*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), slippery elm (*Ulmus fulva*), privet (*Ligustrum vulgare*), white aster (*Aster vimineus*), and evening primrose (*Oenothera biennis*). These habitats are disturbed by pruning. Other locations where trees and shrubs are present are in small, undeveloped areas that border residential, commercial, or industrial properties near the Southern Railroad tracks. Major species in these habitats include mimosa (*Albizia julibrissin*), multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and kudzu (*Pueraria montana*). These are invasive forms that have colonized the disturbed habitats in this area.

Both residential and non-residential land uses have altered the floodplain of Snow Creek. Over time, there have been many alterations to the Creek itself, and significant development of residential and non-residential properties within the floodplain have altered topography and floodplain boundaries. For example, the extensive concrete sluiceways in upstream reaches of Snow Creek eliminated bank habitat, substrate, and a functional floodplain. Land is developed immediately along the Creek in these areas. In addition, the development of the Quintard Mall directly on top of Snow Creek and the floodplain completely eliminates any habitat for aquatic or terrestrial organisms. There are some areas of Snow Creek where small pools, riffles, and runs may provide limited habitat for aquatic organisms; however, these areas are limited in size relative to the overall length of the creek. For terrestrial habitats, the extensive developed land areas have consumed much of the contiguous habitat that was in place before the development of Anniston and Oxford. What are left are only small, isolated patches of disturbed land that have limited capacity to support wildlife communities.

3.1.1.2 The Facility

The Facility area (OU-3) is largely occupied by buildings, parking lots, other areas actively used for industrial purposes, and impervious surfaces. As a result, “habitat” in this area is primarily characterized by impervious surfaces (e.g., pavement, structures), with small strips and medians of mowed and maintained lawns and decorative plantings. Based on direct observation of habitat characteristics, there does not appear to be a functional ecosystem within OU-3. Furthermore, the Facility is fenced off, potentially restricting terrestrial wildlife access to the area.

Land Use at the Facility

Several distinct areas within the Facility were surveyed to assess the presence or absence of potential ecological habitat. The results are described below.

West End Landfill. The West End Landfill is a mowed and maintained capped landfill surrounded by residential properties and parking lots (Figure 22). The landfill surface itself is open space, but there is little habitat structure and no surface water. The intensely built environment of the surrounding parcels, including the presence of an APCO substation, appears to render this area unattractive to ecological receptors.

Maintained Grounds (Northeast). Maintained parcels in the northeastern portion of the Facility are routinely mowed, and surrounding areas are disturbed and managed. The area appears to have little or no ecological value (Figure 23).

Open Area. A small open area, containing picnic tables, trash cans, and walking paths is located in the southeastern portion of the Facility. This small area of open space has compacted soils, ornamental plantings, is limited in size, and is surrounded by larger areas that have little ecological value.

South Landfill. The South Landfill is routinely mowed and maintained in conjunction with the Facility's RCRA Permit requirements. Open space is limited to disturbed vegetation growing no more than 20 centimeters high. No surface water is present, and an interceptor dike/berm was installed to divert clean water away from the landfill area. There is no habitat structure (beyond the mowed vegetation), and no cover for wildlife (Figure 24). While rodents (voles and/or mice) or other small mammals like chipmunks might inhabit the mowed landfill surface, the open and exposed conditions do not favor larger, higher trophic level organisms. Surrounding parcels do support some habitat and edge environments, but these cut-over woodlots and second growth weedy parcels are small and subject to frequent disturbance. Because the surrounding parcels support some cover habitat, there is likely to be an incidental wildlife presence on the South Landfill. However, the South Landfill habitat itself appears to be poor and likely provides little or no ecological foundation for birds and mammals to feed or breed.

3.1.2 Exposure Pathways Analysis: Habitat and Biological Assessment

USEPA guidelines for ecological risk assessments (USEPA, 1998) emphasize the importance of ecosystem and receptor characteristics in defining exposure pathways. In an expanded depiction of the ecological risk assessment framework (Figure 1-2 in USEPA, 1998), "measures of ecosystem and receptor characteristics" is given a central place in the analysis phase of the risk assessment. Together, characteristics of the ecosystems and receptors potentially subject to releases are used to define completed exposure pathways (USEPA, 1997a).

In June of 2005, a detailed biological survey and habitat assessment were performed to supplement the information provided above on the ecological settings within OUs 1, 2, and 3. The procedures followed in the biological surveys were approved by USEPA on June 8, 2005, and the use of biological indices to evaluate the biological survey data was discussed during an August 30, 2005 meeting and subsequent telephone conversations between USEPA and P/S. The approach is described in detail in the following sections of this report. This field work documented key ecosystem and receptor characteristics for defining screening level exposure pathways and determining pathways that must be forwarded to the BERA for further assessment. Field work for habitat and biological assessment elements was conducted by a team that included a participant from USEPA, who observed operations for quality assurance purposes, participated in field assessment decisions, and confirmed field observations.

The goal of the habitat and biological assessments conducted in OUs 1, 2, and 3 between June 9 and 14, 2005 was to reduce uncertainties associated with exposure pathways and potential ecological receptors. The methods and results of the habitat and biological assessments are presented here, and these findings are used to support a more detailed analysis of the relationship between ecological receptors and exposure at each OU.

Specific objectives of the habitat and biological assessments described in this section of the SLERA are as follows:

- Assess the type and quality of habitat provided by aquatic and riparian habitats in OU-1/OU-2 and terrestrial habitat in OU-3;
- Assess the presence and composition of the benthic macroinvertebrate (BMI) community in Snow Creek and a stormwater retention structure (OU-1/OU-2);
- Assess the presence and composition of fish communities in Snow Creek and a stormwater retention structure (OU-1/OU-2);
- Assess the use of the OUs by avian and terrestrial wildlife; and
- Assess the presence and composition of invertebrate, avian, and mammalian communities in OU-3.

3.1.2.1 General Approach

Aquatic and riparian (creek bank) habitats are the primary habitat types associated with OU-1/OU-2, and terrestrial habitats are the primary habitat type associated with OU-3. The habitat assessment for pathways analysis is based on two different protocols, one for aquatic habitats and one for terrestrial. Each is described below.

1. **USEPA Rapid Bioassessment Protocols**. In 1999, the USEPA released a revised version of *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (RBP) (Barbour et al., 1999). This document lists protocols that are a synthesis of existing methods used by numerous federal and state agencies. Observations of aquatic habitat and biological organisms are collected and scored for each

location where the protocols are applied. These protocols can be applied to a wide range of programs, including support of ecological risk assessments for aquatic environments. The methods described in the RBP document were used in the assessment activities performed in OU-1/OU-2 (Snow Creek) and the stormwater retention structure. These protocols cannot be used for terrestrial habitat evaluations.

2. **Kansas Department of Wildlife and Parks Method**. The KDWP has published a method for the quantitative evaluation of terrestrial wildlife habitat quality (KDWP, 2004). The Kansas Parks Method (KPM) is a terrestrial analog of that used in the RBP, and represents a consolidation of methods used by Kansas State agencies and the U.S. Soil Conservation Service. The method is used to assign a value from 0.0 to 10.0 (a KP Value Score) to represent the quality of an evaluated habitat compared to an optimum habitat, which is represented by a score of 10. The method focuses on terrestrial habitats of woodlands, rangeland, pastureland, cropland, wetlands, and odd areas. The KPM was applied to terrestrial habitat quality assessment activities performed in each of the OUs by comparing Site habitat quality values to the conditions expected in a fully developed regional "climax" community of forest and woodland. As published, the KPM is designed for applications in natural and/or agricultural landscapes, and the method incorporates a habitat interspersion score to account for the quality of habitats adjacent to the assessment location. The KPM interspersion parameter is evaluated by categorizing adjacent habitats as woodland, rangeland, pasture, wetlands, cropland, odd areas, or streams and impoundments. As described in Section 3.1.1, habitat components of OU-1/OU-2 and OU-3 are isolated patches in intensely developed, urbanized, and managed landscapes. To apply the KPM at the Anniston PCB Site, a Site-specific interspersion factor was incorporated to account for the developed, urban nature of the watershed. This interspersion factor of -1.0 was applied to the KP Value Score resulting from the characteristics of the highest quality habitat in each evaluation area. This modification extends the KPM and makes it applicable in the land use matrix along Snow Creek and in OU-3.

The technical basis for using the KPM at the Site was to provide, in addition to the RBP developed by USEPA for aquatic habitats, a semi-quantitative means for scoring terrestrial wildlife habitats. Much of the terrestrial habitat that exists at the Site is confined to narrow (and sometimes fragmented) bands of habitat along Snow Creek that are surrounded by a well-established urban setting of commercial, industrial, and residential land uses. In addition, terrestrial habitats at the Facility are primarily those that result from successional changes that arise from frequent land management practice (i.e., mowing, bush-hogging, capping, etc.). The KPM is a useful tool for picking up where the RBP leaves off – at assessing the value of terrestrial habitats above the river bank and in OU-3.

However, it is important to point out that by design the KPM can only be applied to those areas where wildlife habitat is actually present. The method highlights woodland, rangeland, pasture, cropland, wetland, and odd areas for evaluation, and scores (called component points in the method) are presented on a positive scale. For example, in odd areas, the method seeks to score (at a minimum) the positive attributes of cover provided by woody or herbaceous vegetation, even if this vegetation is non-native. Negative scores are possible, but usually only when adjacent habitat is absent.

For this Site, the data that were evaluated in the KPM were collected from wildlife habitat transects specifically established in fragmented and/or narrow areas where habitat is present. Areas adjacent to these habitats were almost always larger, primarily occupied by active human uses or actively managed, and completely devoid of habitat features (i.e., parking lots, railroad tracks, abandoned construction equipment, etc.). It is this aspect of habitat quality that is reflected in the Site-specific interspersion score for the Anniston application of the KPM method. To apply the KPM, we scored each location on the KPM field key following assessment guidance in the methods description. Locations were scored from field notes, field photographs, and aerial photographs following completion of the field surveys. The initial scores were then adjusted by applying the Site-specific interspersion factor of -1.0 to account for the developed, urban nature of the area.

Results (summarized in Table 6) are described in more detail below. Field notes, field data sheets, and copies of pages from the field book are provided in Appendix A[1], and photographs of OU-1/OU-2 and OU-3 are included as Figures 8 through 24. The photographs of OU-1/OU-2 show the wide variety of land use in the area. Since the majority of OU-1/OU-2 does not contain "surveyable" wildlife habitat due to the dominance of residential, commercial, and industrial land uses and the KPM cannot be applied where there is no habitat, much of the OU was not included in the habitat and biological assessment. The survey locations were therefore purposefully biased toward the highest quality habitat present in OU-1/OU-2.

[1] There are some entries in the field data sheets that refer to the field book for more information. Pages from the field book are also included in Appendix A.

3.1.2.2 OU-1/OU-2

Station reconnaissance, habitat, and biological surveys for OU-1/OU-2 were conducted between June 9 and 16, 2005. The overall approach used by the field ecologist team was to preliminarily identify station locations, confirm tasks, and initiate data collection in support of the RBP and KPM. Detailed methods for data collections are described below. Results are described in Sections 3.3.1 and 3.3.3.

3.1.2.2.1 Station Siting

A preliminary reconnaissance was conducted by field ecologists before implementing the RBP methodology for Snow Creek to identify sample locations. Five sampling reaches for OU-1/OU-2, each approximately 100 meters in length, were distributed along Snow Creek (Figure 25). These reaches were selected to reflect conditions that adequately represent the natural heterogeneity of habitats that exist in Snow Creek. Data collected during previous investigations and reconnaissance activities indicate that significant portions of Snow Creek have been stabilized, channelized, and/or hardscaped to the point that natural conditions no longer exist in these areas. The channelized areas fragment the natural order of Snow Creek such that the continuity of hydrogeomorphic processes is disturbed. These areas were not surveyed as habitat. The five sample reaches that were assessed are indicative of the range of remnant natural conditions (pools, riffles, runs with natural substrate) that currently exist in Snow Creek.

In addition to Snow Creek, previous reconnaissance efforts identified the stormwater retention structure east of the Facility as a feature that may provide aquatic habitat. As such, the retention structure was selected as a sixth biological assessment sampling location. Figure 36 presents the stormwater retention structure biological assessment sample locations.

3.1.2.2.2 Biological Reconnaissance (BioRecon)

Following a confirmation of sample locations in Snow Creek, a modified version of the BioRecon evaluation technique, outlined in the RBP Guidance, was used at each sample reach to confirm that the reach was suitable for further assessment. Multiple habitat types were consistently present in each reach, and RPB protocols for further sampling within a multiple-habitat reach were used. Kicks and/or jabs with a standard D-ring net [0.3

meter opening with 500 micrometer (μm) mesh] were used to sample the substrate for BMI in subhabitats. A jab consisted of sweeping the D-ring net through aquatic vegetation or against a vegetated rock for a distance of 0.5 meters. A kick consisted of placing the head of the net against the substrate, so that the net opening was facing upstream, then disturbing the sediment in front of the net for a distance of 0.5 meters and allowing the substrate temporarily suspended in the water column to drift with the current into the net. In pooled water without current, the net was gently moved through the water above the disturbed area to collect the kick sample. In accordance with the BioRecon protocol, four kicks or jabs were distributed among the different habitat types. If fewer than four habitat types were identified, one jab/kick was performed in each habitat and the remaining jabs/kicks targeted the most productive habitat type. After collection of the 4-kick/jab sample, the contents of the net were emptied into a shallow pan. Invertebrates were separated from the litter, and the specimens were identified and enumerated in the field by an aquatic ecologist. BMI tallies were evaluated to characterize the suitability, productivity, and habitability of the assessed stream reach. Each reach assessed during BioRecon activities was evaluated based on these characteristics and then evaluated as part of a detailed BMI community assessment. Distribution of the sampling effort in each reach is presented in Table 7.

3.1.2.2.3 Habitat Assessment

Aquatic and Creek Bank

Aquatic and creek bank habitats in Snow Creek along each sampling reach were evaluated using RPB methods. Assessment activities were conducted by a team of three ecologists. Initially, the field team walked the length of the reach to get an overview of available habitat types and stream reach features and to reach consensus on the representativeness of sample locations in the reach. The upper and lower boundaries of the reach were recorded using Global Positioning System (GPS) coordinates. General information and physical characterization observations were recorded on the Physical Characterization/Water Quality Field Data Sheet provided in the RBP Guidance. Completed field data sheets are included in Appendix A. Water quality assessment information was collected from the area of the reach best representing flow, depth, and substrate conditions for the entire reach. Water depth was measured with a survey rod marked in tenths of a foot (ft). Flow rate was measured using a Marsh-McBurney Flowmate 2000 flowmeter. Surface water quality parameters (pH, temperature, conductivity, turbidity, dissolved oxygen, and oxidation-reduction potential) were measured using a Horiba U-22 *in situ* multi-parameter probe. Flow rate and water quality parameters were collected from approximately 0.5 ft above the sediment surface to characterize benthic conditions. Sampling personnel approached the measurement location from downstream and remained downstream during measurement to avoid substrate disturbance in the vicinity of the probes. Surface water information was recorded on the Physical Characterization/Water Quality Field Data Sheet provided in the RPB Guidance. Completed field data sheets and pages from the field book are included in Appendix A.

After water quality information was collected, the field team conducted a visual-based habitat assessment, scored each reach, and recorded the information on the Habitat Assessment Field Data Sheet provided in the RBP Guidance. Completed field data sheets are included in Appendix A. The field team discussed each variable or parameter to develop a consensus-based score. Periodic quality assurance spot checks of precision and accuracy between team members were performed to assess a parameter individually, and then compare the individual assessment to those from other team members. The variability between scores and an explanation of factors responsible for the variability (i.e., differences in parameter interpretation, greater significance of certain variables, etc.) was discussed to establish consistency between team members.

Terrestrial

Terrestrial habitats in OU-1/OU-2 were assessed based on a general description of primary habitat, approximate percent cover of habitat types, dominant vegetation, vegetation density, vegetation height, bordering land use, and evidence of natural or anthropogenic disturbance. The qualitative habitat evaluations were collected as additional data at each of the sample locations in Snow Creek and in the stormwater retention structure.

3.1.2.2.4 Benthic Macroinvertebrate (BMI) Community Assessment

Habitat types varied between and within the individual sampling reaches. As such, a multiple-habitat sampling technique was chosen to proportionally represent each habitat type present in the sampling reaches along Snow Creek. Suitable and productive habitat types retained during the BioRecon stage for detailed assessment were sampled during the BMI community assessment activities. Each habitat type within a sampling reach was assigned a percentage representing the portion of that reach covered by that habitat type. A combination of 20 jabs and kicks were divided among the habitat types according to the given percentages (i.e., Habitat A covered 20% of the reach; therefore, 4 kicks were performed in that habitat). The composite of the 20 jabs and/or kicks represented the sample for that reach. The composite sample was sieved in a 500 µm sieve bucket, the remaining material was transferred to a shallow pan where large debris was rinsed and removed, and observations of BMI were recorded. After a short observation period, the sample was decanted through cheesecloth, transferred to a 1-liter (L) plastic sample container, preserved with 70% isopropyl alcohol and glycerin, labeled, sealed, and stored using complete chain-of-custody procedures. Samples were submitted to Normandeau Associates in Stowe, PA for sorting, identification, and enumeration. Completed data sheets from the laboratory analyses conducted by Normandeau Associates are included in Appendix A. Distribution of the sampling effort in each reach is presented in Table 7.

3.1.2.2.5 Fish Community Assessment

A fish community survey was conducted in each sampling reach of Snow Creek and in the stormwater retention structure to identify and estimate abundance of fish species. Each member of the field team obtained a scientific collectors permit from the State of Alabama Department of Conservation and Natural Resources prior to beginning collection activities. Copies of the permits are included as Appendix C. Fish survey activities were conducted at least 12 hours after the BMI community survey activities to avoid biased data resulting from the previous sampling disturbances. Additionally, no rainfall was recorded within the 48 hours prior to sampling. Fish were collected using non-lethal measures, including block netting and electrofishing. Because of the shallow nature of the stream channel in each sampling reach, electrofishing equipment was limited to a battery-powered backpack unit. Block nets, consisting of 3/16-inch polyester mesh with floats along the top and a lead-line at the bottom, were placed at the upper and lower limit of the reach to minimize or eliminate movement of fish in and out of the sampling reach during collection. First the downstream net was placed, making sure to minimize disturbance of the stream. The field team exited the stream downstream of the lower net and moved along the bank to the upper extent of the reach to place the upstream net. Once the nets were installed, the field team, made up of one person with the electrofishing unit and two people with catch nets and livewell totes, entered the stream reach and began shocking at the downstream block net. The team moved in an upstream direction, making sure to shock the entire width of the stream reach as they progressed. Fish placed into taxis by the electricity were netted and retained in the livewells for processing. A running tally of non-target animals (i.e., frogs, crayfish, and turtles) was kept, and returned to the water following identification.

Upon completion of the shocking exercise, the field team sorted, identified, and enumerated the catch. A subset of up to 25 individuals of each species was weighed and measured. A voucher collection, composed of a few individuals of each species observed, was also retained. These specimens were placed in jars and preserved with 70% isopropyl alcohol and 4 milliliters (mL) of glycerin. The remaining live fish were returned to the stream reach from which they were taken. Representative individuals of species unable to be identified in the field were preserved in an isopropyl alcohol/glycerin solution. Photographs of specimens collected are presented in Appendix B.

3.1.2.2.6 Wildlife Assessment

Wildlife use at each station was documented throughout each of the activities conducted in Snow Creek and recorded in a field log book. The field team also conducted a detailed wildlife survey at each stream reach and riparian area by walking two 50-foot transects perpendicular to the stream reach through the stream bank and riparian zone. While walking each transect, the field team recorded observations of wildlife, including both sightings, signs (scat, feeding stations, tracks, burrows, etc.), and songs. Transect locations were recorded using GPS.

3.1.2.3 OU-3

Station reconnaissance, habitat, and biological surveys for OU-3 were conducted on June 14 and 15, 2005. The overall approach used by the field ecologist teams were to preliminarily identify station locations, confirm tasks, and initiate data collection in support of the RBP and KPM. Detailed methods for data collections are described below. Results are described in Sections 3.3.2 and 3.3.3.

3.1.2.3.1 Station Siting

A preliminary reconnaissance of habitat types and review of aerial photography was evaluated by field ecologists before implementing an approach for conducting habitat assessments, soil/grass invertebrate surveys, and wildlife surveys in OU-3. Information collected during this reconnaissance was used to derive the number of sample points, or transects that were used to record observation on habitats and wildlife. The overall approach is described in the sections below.

3.1.2.3.2 Habitat Assessment

Habitats in OU-3 were assessed based on a general description of primary habitat, approximate percent cover of habitat types, dominant vegetation, vegetation density, vegetation height, bordering land use, and evidence of natural or anthropogenic disturbance. Qualitative habitat evaluations were collected as additional data at each of the survey locations within OU-3. To assure a conservative bias in the screening analysis, observations were conducted in the most favorable habitat available at each location. In this "patchy" landscape, the areas of favorable habitat were generally small and isolated by intervening areas entirely lacking functional habitat.

3.1.2.3.3 Soil/Grass Terrestrial Invertebrate Community Assessment

Soil and grass invertebrate surveys were conducted in four general areas of OU-3: Maintained Facility Grounds (5 samples); Open Area (1 sample); West End Landfill (4 samples); and South Landfill (9 samples) for a total of 19 core samples. Locations where sampling occurred were recorded using GPS.

The soil and invertebrate community surveys were conducted using two methods. Soil invertebrates were sampled using a 1-foot polyvinyl chloride (PVC) or Lexan tube. Core sampling at each predetermined sampling location was used to collect the biologically active layer of the soil. Where grass was at sufficient height (greater than 6 inches) sweep nets were used to sample phytophilous invertebrates. Samples were sieved and then placed in pans to more easily sort and identify invertebrates in the field. In samples where invertebrates were numerous, only the first 100 individuals were counted. These procedures are similar to the RBP for aquatic systems. The data were reported as raw counts and relative abundance (as percent) and recorded in field books.

3.1.2.3.4 Wildlife Assessment

Wildlife community surveys were conducted in the four general areas of OU-3: Maintained Facility Grounds, Open Area, West End Landfill and South Landfill (Figure 38). Observations were made along three transects running the length of each sample area. The focus of the wildlife survey was to document the use of OU-3 habitats by birds and mammals either directly or by signs. The survey included a reconnaissance of each sample area and was conducted simultaneously with the invertebrate survey. In addition to direct observations, the ecologists documented wildlife tracks, scat, burrows, daybeds, nests, browse, and any other signs observed in the field.

3.1.3 Identity of Former Sources

Investigations of both current and historical sources of Site-related constituents at the On-Facility area were initiated in 1979 and have continued to the present. During this time, a substantial database of information and analytical results has been generated for all environmental media of interest (BBL, 2000b and 2003). The potential sources of releases from the Facility into Snow Creek include:

- South Landfill Solid Waste Management Unit (SWMU) 1 – Parathion and para-nitrophenol (PNP) have been reported in groundwater from the landfill. Groundwater from the unit is being managed by pumping from the Western and Northern Corrective Action Systems. The cap in this area has also been expanded and upgraded.
- Landfill Catchment Basins (SWMU 2) – These former unlined units captured stormwater runoff from Waste Management Area-1 (WMA-I) and were included in the WMA-I closure.
- Phosphate Landfill (SWMU 6) – This unit was a neutralization pit that provided pre-treatment of acidic scrubber water from the parathion furnace area prior to discharge to the Phosphoric Acid Basins (SWMU 12). No releases were identified in the RCRA Facility Assessment (RFA).
- Santotar® Pit (SWMU 7) – This unit managed Santotar®. No releases were identified in the RFA.
- Old Limestone Bed (SWMU 8) – This unit managed wastes from the PNP and parathion processes. Soils beneath the unit contained PNP and parathion. Groundwater from this unit is currently being managed by the Old Limestone Bed Surface Impoundment (OLBSI) Corrective Action System.
- Lagoon (SWMU 9) – This unit may have handled wastewater containing PNP, parathion, and methyl parathion. Groundwater from this unit is currently being managed by the OLBSI Corrective Action System.
- Phosphoric Acid Basins (SWMU 12) – These unlined units were used to neutralize acid wastewaters from various production processes. No releases were identified in the RFA.
- Scrap Yard Waste Oil Satellite Accumulation Area (SWMU 17) – This unit managed used compressor oils. Staining on the pad, gravel, and surface soils was observed during the RFA.
- Boiler Feed Tank (SWMU 25) – This unit managed Therminol® ends. A leaking flange was observed during the RFA. The tank has since been dismantled.

- Santotar® Tank (SWMU 27) – This unit managed Santotar®. Black stains were observed on the concrete pad during the RFA. Investigation revealed that the stains were associated with pipe insulation.
- Steam Cleaning Pad (SWMU 31) – This unit manages oily condensate from steam cleaning. No releases were identified in the RFA.
- Old Boiler Scrap Yard (SWMU 34) – This unit manages used, decontaminated equipment and scrap metal. Some stained gravel was observed in the area during the RFA. Further investigation suggested that the staining was associated with rust deposits.
- Stormwater Drainage System – Production Area Portion (SWMU 37a) – This system managed stormwater runoff from the polyphenyl and parathion production areas.
- Former Parathion Production Area (SWMU 41) – The buildings have been demolished in this area, and potentially affected soils have been removed. No releases were identified in the RFA.
- Former PCB Production Area (SWMU 42) – The buildings in this area have been demolished, and the area has been covered with asphalt.
- Former Phosphorous Production Area (SWMU 43) – Wastewater from this unit was discharged to the Phosphoric Acid Basins (SWMU 12). The buildings in this area have been demolished, and potentially affected soils have been removed. No releases were identified in the RFA.
- Waste Drum Satellite Accumulation Area (SWMU 44) – This unit manages drums of Therminol® and Santotar® and potentially hazardous wastes awaiting toxicity characteristic leaching procedure (TCLP) analysis. No releases were identified in the RFA. Based on results from the RFI soil sampling, this area was capped with concrete.
- Former Holding Tanks, Aeration Basins, and Clarifiers (SWMU 46) – These units treated wastewaters that contained parathion, PNP, and acetone still bottoms. No releases were identified in the RFA.
- West End Landfill (SWMU 47) – Corrective measures implemented at in this area include construction of a multi-media cap composed clay, a high-density polyethylene (HDPE) liner, drainage fabric, cover soil, and a vegetative layer, as well as the installation of surface water runoff controls.
- Product Storage Tank (Area of Concern A) – This tank managed Santowax®. The base of the secondary containment was previously gravel, and evidence of spills was noted during the RFA. The gravel has since been removed, and the containment system has been upgraded.
- Snow Creek Off-Site Assessment (Area of Concern B) – PCBs have been identified in sediments in drainage ditches leading toward Snow Creek and in a portion of Snow Creek. Between 1986 and 1990, a sediment delineation and removal project was implemented. Additional sampling has been conducted

since 1994 and sampling results have been reported to the ADEM. Large-scale drainage improvements, including the installation of extensive cap and cover systems, have been implemented north and east of the Facility. In addition, in 2004 the 11th Street Ditch was lined with shotcrete. This remedial action was carried out under CERCLA in accordance with the requirements of an AOC for the Removal Actions (USEPA, 2001).

- MCC Warehouse – A PCB flaker unit historically operated in this area. During 2002, efforts to remove and isolate PCB-containing materials were implemented as an ICM. This area has been identified as an SWMU, but has not been formally incorporated in the RCRA Post-Closure Permit. Once it has been incorporated, it will be assigned an SWMU number.
- Underground Product Storage Tanks (USTs) (Area of Concern C) – Four product USTs were removed in the mid-1980s. Three of these tanks were later determined to be in-ground process vessels. The fourth tank was used to store gasoline for a fueling pump at the plant. No evidence of releases was recorded at the time of the removal of the four tanks and no releases were identified in the RFA.

Indirect sources of Facility-related chemicals to other OUs historically may have included soil runoff and subsequent sedimentation and transport from the On-Facility areas, discharge of groundwater from the Facility, and sediments from Facility drainage ditches. Substances also may have been transported by past deliberate human activities not associated with the historical operations and waste management practices at the Facility, such as the disposal of foundry sand, landscaping activities involving relocation of dredged sediment or floodplain soils, and other industrial and commercial operations occurring in the floodplain, as well as other discharges to Snow and Choccolocco Creeks. These activities may have resulted in the presence of PCBs, metals, or other constituents in the floodplain and creek sediments that are not associated with the operations and waste management practices of the Facility.

3.1.4 Constituents of Potential Concern

The COPC selection process is outlined in both the *RFI/CS Report for the Anniston, Alabama Facility* (RFI/CS Report) (Golder, 2002) and the Phase I CSM Report (BBL, 2003) and focused on chemicals associated with Facility-specific activities. This is consistent with the definition of the Site provided in the CD (USEPA, 2002) and USEPA guidance, which recommends that a preliminary identification of potential exposure include the identification of the "types of chemicals *expected* at the site" (USEPA, 1989 [emphasis added]). The screening process is designed to identify those Facility-related compounds that represent a "negligible ecological threat" because of either low inherent toxicity or low concentrations. Because the Facility was associated with past production of PCBs and these constituents are persistent in the environment, off-Facility environmental sampling historically has focused on PCBs. Thus, the current SLERA addresses PCBs as the primary COPC, even prior to performance of this risk-based screening step. This historical focus on PCBs has led to the paucity of environmental media data on other constituents. These data gaps are acknowledged and addressed by including substances that are identified in the CD as well as a wider list of chemical constituents requested by the USEPA. There are not sufficient screening level data for many of these constituents; thus, they will be evaluated in the BERA if the exposure pathways for these chemicals are potentially complete.

The complete COPC list identified in the CD included 17 non-metals (i.e., OPs; SVOCs, including PCBs; and VOCs) and 11 metals that could be designated as COPCs associated with the "historical and ongoing operation and waste management practices" of the Facility. The identified COPCs, which were also included as Table 1 of Appendix F of the CD for the Site (USEPA, 2002), include the following substances:

Organophosphorus Pesticides

- Parathion
- Methyl parathion
- Tetraethyldithiopyrophosphate (Sulfotepp)

Volatile Organic Compounds

- Chlorobenzene
- Isopropyl benzene (Cumene)
- Methylene chloride
- 1,1,2,2-Tetrachloroethane

Semivolatile Organic Compounds

- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- 2,4-Dichlorophenol
- PNP or 4-nitrophenol
- PCBs
- Phenol
- Pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- o,o,o-Triethylphosphorothioate

Metals

- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Lead
- Manganese
- Mercury
- Nickel
- Vanadium

In addition to the COPCs listed in the CD, the USEPA identified additional constituents potentially present at OUs 1, 2, and 3 in its March 13, 2003 letter (USEPA, 2003) and in the clarifications provided in a letter dated August 19, 2005 (USEPA, 2005), that have been added to the overall list of COPCs. Analytical data for soil, sediment, fish tissue, and surface water for these COPCs, where available, were used in this SLERA.

A significant number of interim corrective measures have been completed at the Facility in the form of a variety of permeable and impermeable source barrier layers. These barrier layers inhibit direct contact with impacted surface soils and reduce the mobility of impacted soils, both through the air pathway (dust or volatilization) and through the surface water runoff pathway. These interim corrective measures have decreased ambient levels of COPCs and this has led to lower exposure potential to ecological receptors at the Facility. Volatility and/or low persistence of some compounds (i.e., VOCs and parathion) also leads to reduced environmental concentrations and the potential for exposure. Soil data for the Facility confirm that PCBs, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium are detected in surface soils.

3.1.5 Chemical Transport and Fate

3.1.5.1 Polychlorinated Biphenyls

The transport pathway for sediment includes potential erosive forces from water flow that may dislodge the sediment from its original location and deposit sediments once surface water velocities have declined to a point where the sediment particle(s) will no longer remain suspended in the water column (NRC, 2001). High-flow events play a significant role in the transport of sediment-bound PCBs within Snow Creek. In addition to sediment erosion and deposition, sediment particles may also be mixed within the sediment or released to surface water via burrowing action or disturbance by benthic organisms, fish, turtles, or terrestrial organisms (NRC, 2001). Human disturbances (e.g., NRCS dredging as discussed in the *Dredge Spoil Area RFI/CS Phase I Report, Snow and Choccolocco Creeks, Calhoun and Talladega Counties, Alabama* [Roux Associates, Inc., 1999]) also contribute to the release and transport of sediment. In addition to the movement of sediment particles, this transport pathway includes the potential for dissolution of PCBs from the sediment particles. However, given the affinity of PCBs for sediment (NRC, 2001), dissolution is considered a relatively minor fate and transport mechanism in OU-1/OU-2.

In addition to surface water transport, other mechanisms may be responsible for the relocation of PCB-containing soils and sediments. Typical non-surface water transport mechanisms include the direct disposal of PCB-containing materials such as foundry sand, or the relocation of existing sediment, foundry sand, or floodplain soils. Relocation activities are often conducted to raise the elevation of the ground surface in low-lying areas of the floodplains that frequently flood. Data collected to date indicate that these mechanisms are important in OU-1/OU-2.

3.1.5.2 Metals

In general, metals in the environment have complex behaviors and their fate is influenced by a number of physical and chemical variables. In water, soil, or sediment, metals undergo oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. These processes are controlled by constantly changing oxidation-reduction potential, pH, sulfide ions, iron, temperature, and salinity of the receiving system. As a result, it is difficult to predict a metal's fate and toxicity in a given medium, but it is possible to identify some generalities. For example, compared to PCBs, metals can be far more soluble and, thus, more bioavailable to plants and biota for direct uptake. Unlike PCBs, metals can sorb and desorb from soil and sediment with equal ease, depending on the metal and the physical and chemical conditions at a particular site or moment in time. Depending on the valence state or the nature of the element, metals may be transported via soil or sediment particles through water flow or wind dispersion. Furthermore, although most metals may be absorbed into plant or animal tissues, they generally do not biomagnify in higher trophic levels. Given the complex and diverse nature of metal behavior in the environment, it is difficult to discuss this group of COPCs beyond this general description. A more detailed discussion of the transport and fate of the individual metals retained for further analysis will be included in the BERA.

3.1.5.3 Semivolatile Organic Compounds

SVOCs, especially those containing chlorine atoms, are relatively persistent in the environment. The higher the number of chlorine atoms, the more likely the SVOC will be persistent and more difficult to degrade. Moreover, the highly substituted molecules are also more likely to be present in the ionic form in the environment. The ionic form controls the fate and transport of SVOCs according to the pH of the receiving medium. In the normal range of pH, chlorinated SVOCs normally exist as an ionic species. This leads to increased water solubility and mobility (and subsequent transport) in the aqueous phase. In air, soil, and water, half-lives are measured in hours. In groundwater and sediment, they are measured in days. The main degradation processes for SVOCs are photolysis and biodegradation. The ionized state of SVOCs also reduces sorption potential and causes increased mobility in soil and sediment (unless oppositely charged particles are encountered). With decreased sorption, there is increased potential for volatilization and transport via air. In neutral form, chlorinated SVOCs tend to have low water solubility but increased capacity for sorption. Some SVOCs may enter the food chain and accumulate in biota to some degree. For example, 2,4-dichlorophenol has a bioaccumulation factor (BCF) ranging from 1.53 for goldfish to 9 for algae. A highly substituted pentachlorophenol may have a BCF as high as 10,000 in fish. Therefore, food chain transfer is important for SVOCs.

3.1.5.4 Volatile Organic Compounds

This group of chemicals is characterized at times by extreme volatility. For example, chlorobenzene will evaporate entirely from an undisturbed solution within 72 hours. As a result, air plays the main role in the environmental transport and degradation of VOCs released into the environment. Once in the atmosphere, VOCs tend to degrade rapidly due to their strong absorptive affinity for ultraviolet rays. The typical half-life of chlorobenzene in air is 20 to 40 hours. Although VOCs have moderate solubility in water, they are rarely found in ambient water samples due to their volatility. However, they sometimes can be detected in groundwater, where the potential for volatilization is limited. In addition to volatilization, VOCs are readily biodegraded. Therefore, concentrations of VOCs in soil, sediment, or water are usually low unless there is an active groundwater recharge zone.

3.1.5.5 Organophosphorus Pesticides

OPs such as parathion and sulfotepp tend to be of relatively low persistence in soil under normal label use. The reported field half-lives in soil range from 1 to 30 days. Under conditions favorable to degradation (high heat and sunlight), OPs may not last more than few days on the surface of soil. However, when large quantities of OPs are found in one location (perhaps as a result of a spill), degradation may take years. With moderate propensity for adsorption to organic and inorganic particles, OPs can be moved via soil and sediment transport mechanisms. However, their normally low residence times preclude them from being significantly mobile. Being soluble, OPs may also be transported via water flow, but since these pesticides break down in water, the total transported distance may be limited. Temperature plays a factor in how quickly OPs degrade, and OPs do not volatilize extensively. Uptake of OPs by plants and animals is rapid, with subsequent distribution within tissues and organ systems. In animals, OPs are readily absorbed into the bloodstream from the skin, lungs, or gut, and OPs can be moderately bioaccumulative in body lipids. However, the metabolism of lipid stores in the liver also brings about the degradation of OPs. The degradation products are excreted via urine.

3.1.6 Potential Pathways and Routes of Exposure

USEPA guidance on conducting ecological risk assessments defines exposure pathways as “the paths of stressors from the source(s) to the receptors” (USEPA, 1998). USEPA (1997a) describes a complete exposure pathway in terms of four components:

1. A source and mechanism of chemical release;
2. A relevant transport medium;
3. A receptor at a point of potential exposure to the affected medium; and
4. A route of uptake at the exposure point.

If any one of these four components is not present, a potential exposure pathway is considered incomplete and is not evaluated further in a risk assessment. If all four components are present, a pathway is considered complete. Complete exposure pathways can be further delineated into those expected to be insignificant due to minimal or unappreciable exposure potential (secondary exposure pathways) and those expected to have more significant exposure potential (primary exposure pathways).

Exposure routes are the "point of contact/entry of a contaminant from the environment into an organism" (USEPA, 1997b). Potential exposure routes for terrestrial animals include inhalation, ingestion, and dermal absorption. Ingestion can either be direct (e.g., incidental ingestion of soil while foraging) or indirect (e.g., ingestion of constituent-containing plants or prey). For aquatic organisms, the potential exposure routes are direct contact with the constituent in water or sediment (with gill or integument) and ingestion of food.

The existing sources of the predicted primary chemical stressor (e.g., PCBs) that could impact ecological receptors are creek sediment and floodplain soils. Ingestion of terrestrial and aquatic food items (e.g., invertebrates, fish, and other prey) is the most important exposure route for most upper-trophic level terrestrial and aquatic organisms. These concepts are illustrated in the exposure pathway diagrams for ecological receptors exposed to constituents present in sediment and soil (Figures 3 though 7). The figures illustrate the constituent sources, release mechanisms, exposure media, exposure pathways, exposure routes, and likely ecological receptors for major constituent groups (bioaccumulative substances – PCBs and methyl mercury, metals, SVOCs, VOCs, and OPs) potentially present at OUs 1, 2, and 3. The exposure model for each group is discussed below. The exposure pathway analysis in this SLERA is enhanced by explicitly considering the quality of habitats available in OUs 1, 2, and 3 to determine whether these areas have the capacity to retain a significant number of ecological receptors (see Section 3.3).

3.1.6.1 PCBs and Methyl Mercury

The exposure pathway diagram on Figure 3 illustrates the hypothetical links between the stressors (PCBs and methyl mercury) in sediment, surface water, surface soil, and prey and the potential ecological receptors. In aquatic systems, PCBs and methyl mercury readily adsorb onto sediments and may be transferred to aquatic organisms and to higher trophic levels. Methyl mercury and, especially, PCBs are found only in a dissolved state within the water column at very low concentrations (MacKay et al., 1992); organic matter in sediments provides the primary reservoir (NRC, 2001). PCBs and methyl mercury accumulate in aquatic organisms because of their high lipid solubility and slow rate of metabolism and elimination (MacKay et al., 1992). Although the transformation of PCBs in aquatic systems can occur via microbial degradation in aerobic surficial sediments, reductive dechlorination in anaerobic sediments, and the metabolic action of organisms that uptake PCBs, these processes are relatively slow and congener-specific (NRC, 2001). For example, less-chlorinated congeners are more likely to biodegrade than those containing a higher number of chlorine atoms. This causes the mixture composition of released PCBs to change over time in favor of the highly chlorinated congeners. The latter tend to accumulate and biomagnify in biota (NRC, 2001).

Because PCBs and methyl mercury bioaccumulate in the food chain, these constituents are easily passed on to organisms occupying higher levels in the food web (NRC, 2001). As a result, the potential exposure of ecological upper-trophic level receptors to PCBs and methyl mercury in aquatic systems is primarily a function of bioaccumulation, although some organisms, especially the benthos, are exposed via direct contact with or ingestion of sediments or pore water.

For persistent, bioaccumulative compounds, the most significant route of exposure for higher-order organisms is the ingestion of constituent-containing prey (Figure 3) (NRC, 2001). This exposure pathway is potentially complete for organisms (e.g., fish and invertebrates) that obtain their food from Snow Creek and/or the associated floodplain (Figure 3). Although sediment is considered the primary exposure medium for PCBs and methyl mercury, the potential for floodplain soils to be washed into the aquatic system is also included in the exposure pathway analysis. Exposure pathways from floodplain surface soil are potentially complete for passerine birds, reptiles, amphibians, omnivorous mammals (e.g., raccoon or groundhog), raptors, and carnivorous mammals.

Because PCBs and methyl mercury are generally not taken up through the root structure of plants and do not accumulate in plants, plant uptake and the ingestion of plant tissue (both aquatic and terrestrial) are not considered primary exposure pathways for these constituents.

3.1.6.2 Other Metals

Figure 4 depicts the exposure pathway diagram for ecological receptors exposed to metals. Metals in the environment have complex behavior and fate. In water, soil, or sediment, metals undergo oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. These processes are often controlled by ever-changing oxidation-reduction potential, pH, sulfide ions, iron, temperature, and salinity and by the biota present. The ultimate effect is that the prediction of metal fate and toxicity in a given medium can be a difficult process. Accordingly, the exposure pathway analysis can complex, especially when generalizing for multiple metals. However, one may adopt some general principles as the basis for identifying potential exposure pathways. For example, compared to PCBs, metals can be far more soluble, and thus, more bioavailable to plants and biota for direct uptake. Also, unlike PCBs, metals can sorb and desorb from soil and sediment with equal ease, depending on the physical and chemical conditions at a particular site or moment in time. Furthermore, although most metals may be absorbed into plant or animal tissues, they generally do not biomagnify in higher trophic levels. Using these general observations, the conclusions described below can be made about the complete pathways for ecological receptors in OUs 1, 2, and 3 that are potentially exposed to metals.

Potentially complete exposure routes for aquatic macrophytes include direct contact with sediment and surface water. Macroinvertebrates have a high potential of exposure via direct contact with sediment and surface water, as well as via the ingestion of food (aquatic plants and invertebrates). Primary exposure routes for fish consist of ingestion of food (aquatic plants, invertebrates, other fish) and water, as well as direct contact with ambient water. Waterfowl may experience direct contact with surface water and may ingest aquatic or terrestrial plants, as well as aquatic invertebrates and water. Complete exposure pathways for metals may also be present for piscivorous birds ingesting water and fish. Piscivorous mammals have a similar exposure pathway potential, but they do not consume plants (Figure 4). Although terrestrial receptors show a lower frequency of complete pathways, each has at least one. Therefore, multiple ecological receptors in OUs 1, 2, and 3 have the potential to have at least one complete exposure pathway for metals.

3.1.6.3 Semivolatile Organic Compounds

As shown on Figure 5, there is some potential for compete exposure pathways to occur between aquatic and semi-aquatic organisms and SVOCs in sediment or surface water. Constituents such as dichlorobenzenes, chlorophenols, and nitrophenols can be present in either medium and can result in direct contact through incidental ingestion by a range of receptor organisms, including macrophytes, invertebrates, fish, birds, and mammals. However, the potential for exposure is minimal because SVOCs tend to readily dissipate in the environment, leading to reduced exposure potential. The potential for exposure (and complete exposure pathways) is also low for aquatic consumers of aquatic plant and animal prey. This is because any dichlorobenzenes, chlorophenols, and nitrophenols taken up are rapidly metabolized and excreted, resulting in low accumulation in prey tissues. This leads to low potential for exposure in predators. For the same reasons, the terrestrial receptors are also associated with low potential for exposure. Some SVOCs volatilize; therefore, these chemicals may be present in the air and higher-order receptors, such as amphibians, reptiles, birds, and mammals, may be exposed to SVOCs via direct contact with vapors and inhalation. However, given the remote and dated nature of the sources, the total contribution of this pathway to the overall exposure is considered insignificant.

3.1.6.4 Volatile Organic Compounds

VOCs are characterized by a considerable propensity to escape from dense environmental media, such as sediment, soil, and water. Moreover, these short-chain molecules tend to degrade relatively quickly once released into the environment. Therefore, these media are usually associated with a low potential for complete or significant exposure pathways where sources are no longer active or are removed from the immediate location of a receptor. Accordingly, Figure 6 shows the potential receptors as having incomplete or insignificant exposure pathways for this group of chemicals.

3.1.6.5 Organophosphorus Pesticides

OPs, such as parathion and sulfotepp, are less environmentally persistent than organochlorine insect control agents, such as dichlorodiphenyltrichloroethane (DDT). However, there is some potential for OPs to remain in various exposure media and to come into contact with ecological receptors. For example, methyl parathion tends to sorb to soil and may persist there for as long as two months (during fall, winter, and spring when sunlight levels are low). Persistence is measured in years in case of spills. OPs are soluble in water and, therefore, may be found in this exposure medium, as well as in soil and sediment. In aquatic systems, where the destructive action of sunlight (photolysis) may be limited, OPs may also persist long enough to affect receptors (although the absolute exposure period may be measured in days). Therefore, direct contact exposure pathways between sediment and aquatic receptors are potentially complete for those receptors that live in close proximity to sediment and tend to avoid direct sunlight (invertebrates, amphibians, and reptiles) (Figure 7). Because OPs are readily absorbed in biological tissues and subsequently stored in fat, some accumulation in prey may take place. For example, parathion is classified as having low to moderate bioaccumulation. As a result, there is a potential for complete exposure pathways between predators and prey (Figure 7). Breakdown of OPs in vegetation is rapid, so it is unlikely that herbivores would be exposed via the consumption of plants. For terrestrial systems, the species with potentially complete exposure pathways include soil invertebrates (e.g., earthworms) via direct contact, small burrowing mammals via ingestion of soil, and carnivorous mammals and birds via ingestion of prey. Volatilization of applied OPs is not considered extensive, so the air exposure medium was not included in the conceptual exposure model.

3.1.7 Potential Receptors

While the natural environment in OUs 1, 2, and 3 has been significantly altered for residential, commercial, and industrial uses, some habitat suitable for use by local ecological receptor populations may exist. However, based on the information obtained from the habitat evaluations conducted in June 2005, potentially viable habitats are few and isolated, and appear to have a limited capacity to support extensive wildlife communities.

The On-Facility exposure model presented in the RFI/CS Report (Golder, 2002) indicated that there were likely few, if any resident ecological receptor populations potentially exposed to constituents detected within the boundaries of the Facility area due to habitat restrictions. However, some birds and mammals were observed within OU-3.

For the purpose of this SLERA, a single generic ecological receptor is considered that combines the characteristics of all potentially exposed taxa. This is consistent with the explicit intent of the amended guidance for ecological risk assessments (USEPA, 2000). A detailed exposure and risk analysis for representatives of each feeding guild/taxon will be included, as necessary, in the BERA.

3.1.8 Assessment and Measurement Endpoints

According to USEPA guidance, assessment endpoints can be indicative of "any adverse effects on ecological receptors, where receptors are plant and animal populations, communities, habitats, and sensitive environments" (USEPA, 1997a). The assessment endpoint chosen for this screening level ecological risk assessment is the desire for the generic ecological receptor foraging and reproducing in OUs 1, 2, and 3 to survive in a thriving population. The measurement endpoints are the "measurable characteristics" that are used to evaluate the identified assessment endpoint. For the generic ecological receptor, the measurement endpoints include adverse effects on survival, growth, and reproduction. Refined endpoints will be developed as necessary in subsequent steps of the risk assessment process.

3.1.9 Ecological Effects Evaluation

Ecological screening values (ESVs), which are used to determine which substances detected in OUs 1, 2, and 3 might pose risk to resident ecological receptor populations, consist of ecological screening values for various media developed by USEPA Region 4 (USEPA, 2000). The ESVs used in this SLERA are presented on Tables 3 through 5.

3.2 Step 2: Screening Level Preliminary Exposure Estimate and Risk Calculation

As per USEPA guidance (1997a; 2000), screening level estimates of exposure and risk calculations use assumptions that maximize the estimates of both exposure and risk to ensure that sites with potentially unacceptable risk are not inappropriately eliminated from the assessment. The USEPA recommends that maximum concentrations of constituents in each medium be compared to ESVs when conducting SLERAs. The recommended approach is followed in this assessment.

3.2.1 Analytes Detected in Exposure Media

3.2.1.1 OU-1/OU-2

Constituent data from OU-1/OU-2 are available for the following exposure media: soil, Snow Creek sediments, stormwater, and air. Air data will not be considered here because the results from the recently performed air monitoring study (ENSR International, 2004) indicated that there are no fugitive air emissions that could lead to a significant wildlife exposure pathway.

3.2.1.1.1 Soil

A substantial amount of soil sampling has been conducted in the residential and non-residential portions of OU-1/OU-2 by both P/S and the USEPA. Sampling efforts have been conducted by P/S under the AOC and the NTC removal agreements and by the USEPA as part of the CERCLA process for the Site. USEPA has also collected samples in the area as part of investigations associated with the Anniston Lead Site, an unrelated national priorities list (NPL) site sharing a similar geographical location. The current soil data set includes more than 10,000 samples collected from locations spatially distributed across the entire geographic extent of OU-1/OU-2 and analyzed by P/S and USEPA.

The results of the analyses of these thousands of soil samples are summarized as follows. Levels of total PCBs in soil surface ranged from concentrations below the detection limit to 5,501 mg/kg. Levels of chlorobenzene reached a maximum of 0.0045 mg/kg. In addition to total PCBs and chlorobenzene, several metals were also detected in soil samples. Detected metals included arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium. Arsenic was detected at a maximum concentration of 120 mg/kg, barium at a maximum concentration of 12,000 mg/kg, beryllium at a maximum concentration of 10 mg/kg, cadmium at a maximum concentration of 94 mg/kg, chromium at a maximum concentration of 14,000 mg/kg, cobalt at a maximum concentration of 390 mg/kg, lead at a maximum concentration of 19,000 mg/kg, manganese at a maximum concentration of 11,000 mg/kg, mercury at a maximum concentration of 28 mg/kg, nickel at a maximum concentration of 180 mg/kg, and vanadium at a maximum concentration of 150 mg/kg. The identified maxima were used in the SLERA. Soil investigations also identified detectable levels of phenol; however, this reported value was outside the limit of quantification.

3.2.1.1.2 Sediment

The characterization of sediment in Snow Creek was conducted in two phases. In Phase I, Snow Creek was visited on several occasions to collect samples and make visual observations in the stretch between the confluence with Choccolocco Creek and 11th Street Ditch. This was done for all areas of the creek with the exception of areas impeded by construction activities near the Quintard Mall and a short stretch in the vicinity of Sandy Creek Lumber Yard, for which no access was granted. The selection of deposits to sample for the Phase II characterization was based on the distribution of sediment deposits along the creek and the type of sediment. Since higher PCB levels were expected to be associated with fine-grained sediment deposits, these deposits were selected for core collection.

A total of 111 samples from 50 cores were collected for laboratory analysis of PCB and total organic carbon (TOC). Approximately 10 samples were also submitted for the analysis of selected metals. In addition to these deposits downstream of the 11th Street Ditch, 20 samples from 8 cores were collected from upstream of the 11th Street Ditch and submitted for metals analyses. Total PCB concentrations ranged from non-detect to 60 mg/kg. Total PCB concentrations were generally higher in the upstream reaches of the creek and lowest throughout the middle portion of the creek (from the railroad bridge to Highway 78).

The results of metal analyses of sediments collected in Snow Creek indicate the presence of arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium at detectable concentrations. Arsenic was detected at a maximum concentration of 21 mg/kg, barium at a maximum concentration of 410 mg/kg, beryllium at a maximum concentration of 2.0 mg/kg cadmium at a maximum concentration of 3.3 mg/kg, chromium at a maximum concentration of 670 mg/kg, cobalt at a maximum concentration of 26 mg/kg, lead at a maximum concentration of 140 mg/kg, manganese at a maximum concentration of 2,400 mg/kg, mercury at a maximum concentration of 0.11 mg/kg, nickel at a maximum concentration of 37 mg/kg, and vanadium at a maximum concentration of 64.0 mg/kg. The reported maxima were used as inputs in the SLERA.

Limited sampling was also performed for the stormwater retention structure within the bounds of OU-1/OU-2. Analysis of a single composite of five samples resulted in an estimated concentration for total PCBs of 1.14 mg/kg (J qualified). This result was included in the sediment database.

3.2.1.1.3 Stormwater

Surface water drainage from the Facility area (OU-3) to OU-1/OU-2 has been controlled through various corrective actions. Actions taken before 1998 to control stormwater-mediated transport of COPCs to the Off-Facility areas included the closure of the two landfills, the lining and re-routing of storm drains, collection of stormwater runoff from the West End Landfill, construction of a stormwater management structure to collect stormwater runoff from the South Landfill, diversion of stormwater runoff from unaffected areas upstream of the South Landfill, re-piping of process-related water away from the stormwater drainage system to the waste water treatment plant (WWTP) at the Facility, and installation of culverts for drainage through areas of impacted soils (BBL, 2003). These measures have significantly reduced the discharge of COPCs into the stormwater system. Data used in the SLERA were collected during and after 1998 and account for these activities.

As part of the On-Site RFI activities and NPDES permit requirements for the Facility, surface water runoff samples were collected from several outfalls near the Facility and landfills that ultimately drain into OU-1/OU-2. The outfalls sampled included DSN 001 through to DSN 009 and DSN 012. The analytes detected included arsenic, barium, lead, manganese, methyl parathion, parathion, and total PCBs. Arsenic was detected at a maximum concentration of 0.011 mg/L, barium at a maximum concentration of 0.036 mg/L, lead at a maximum concentration of 0.035 mg/L, manganese at a maximum concentration of 0.2 mg/L, methyl parathion at a maximum concentration of 0.012 mg/L, parathion at a maximum concentration of 0.015 mg/L, and total PCBs at a maximum concentration of 0.0225 mg/L. These maximum reported values were used as inputs in the SLERA.

Chlorobenzene, dichlorobenzenes (1,2- and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), pentachlorophenol, phenol, sulfotepp, and tertrachloroethane (1,1,2,2-) were also detected in stormwater samples; however, these detects were outside the limits of quantification.

3.2.1.2 OU-3

OU-3 constituent data are available for the following exposure media: soil, groundwater, and air. Soil and groundwater data were collected during the RFI/CS conducted for the On-Facility area under the RCRA program. Air data have been collected both in conjunction with RCRA investigation activities and independently by the USEPA. Results for groundwater and air sampling will not be considered here because these routes of exposure are either not available to ecological receptors or are of minor importance in driving exposure and risk. Therefore, soil is the only medium that represents a potentially complete and quantitatively significant exposure pathway.

3.2.1.2.1 Soil

RFI/CS activities conducted for the On-Facility area resulted in the collection of 15 surface (or near surface) samples (including one duplicate) for metals. There were 41 surface (or near surface; including two duplicates) samples collected for organic constituents from various locations across the On-Facility area. Based on these results, the primary COPCs detected in surface soils at the Facility are arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs. Several other substances were analyzed for, but were not detected or confirmed in soil. Those included chlorobenzene, dichlorobenzenes (1,2- and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), trichlorophenols (2,4,5- and 2,4,6-), pentachlorophenol, phenol, isopropyl benzene, methylene chloride, methyl parathion, parathion, triethylphosphorothioate, Sulfotepp, and 1,1,2,2-tetrachloroethane.

The highest detected (and unqualified) total PCB concentration in a soil sample was 282 mg/kg in sample SSR-09 from SWMU-7 (old Sanotar pit) (see Figure 39 for sampling locations). A concentration of 230 mg/kg PCB was detected in sample SSR-07 in an adjacent management unit SWMU-6 (old “Phosphate” landfill). Because both sites have been covered with gravel, no direct receptor exposures are expected. Three other samples, SSR-

04, SSR-05, and SSR-15 contained relatively elevated levels of PCBs at 100, 110, and 463 J mg/kg, respectively.

A J-qualified value of 13,400 mg/kg, which was an average of two samples, was reported for SSR-18, which is located immediately downgradient from the former PCB production area. These two surface soil samples were collected from under three inches of gravel that had been placed specifically to serve as a barrier to exposure. The location has since been remediated with a concrete cap. Thus, it is unlikely that receptors would come into a direct contact with soil containing the detected level of PCBs at that location.

The remaining soil samples contained relatively low concentrations of PCBs, all of which below the Site-specific risk-based Tier 2 screening levels (BBL, 2003). This information suggests that the implemented corrective and remediation actions at OU-3 have significantly reduced PCB levels at selected management units and that any future risk assessment activities should focus on non-remediated locations.

Arsenic was detected at a maximum concentration of 14 mg/kg, barium at 780 mg/kg, beryllium at 1.0 mg/kg, cadmium at 0.92 mg/kg, chromium at 48 mg/kg, cobalt at 74 mg/kg, lead at 220 mg/kg, manganese at 12,000 mg/kg, mercury at 1.4 mg/kg, nickel at 2,400 mg/kg, and vanadium at 93 mg/kg. These maxima were used as inputs in the SLERA.

3.2.2 Data Handling and Post-Screening Procedures

Soil, sediment, and stormwater sampling yielded four types of data classified according to quality and availability of screening benchmarks. The four data types are: 1) Detected – Unqualified, 2) Detected – Qualified, 3) Undetected, and 4) No Toxicity Benchmark. The Detected – Unqualified category consists of all data that were above detection and quantification limits, and did not have extraction difficulties or any other quality control issues. The Detected – Qualified category includes all data that were typically above the method detection limit, but below the limit of quantification (designation "J"). The Undetected category encompasses all data that were not analytically detected (designation "U"). Finally, the No Toxicity Benchmark category contains all data for which there are no ecological risk-based benchmarks (for soil, sediment, or stormwater), but for which analytical results are reported. The following decision criteria are used to deal with each type of data prior to proceeding with the SLERA.

1. **Detected – Unqualified:** Use the highest detected concentration.
2. **Detected – Qualified:** Use the highest reporting limit.
3. **Undetected:** Use one-half detection limit.
4. **No Toxicity Benchmark:** Screen the substance through to the BERA.

For those instances where reporting and detection limits exceeded a screening benchmark, a conservative decision was made to retain that substance for further evaluation in the BERA.

3.2.3 Screening COPCs

The estimation of the screening risk level consists of comparing maximum concentrations of detected COPCs found in soil, sediment, or stormwater to ESVs developed for these media.

OU-1/OU-2

Analysis of combined soil, sediment, and stormwater data (full detects; decision criterion 1) for OU-1/OU-2 in context of respective ESVs indicated that arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs exceeded the screening criteria in at least one of the three media (Table 3). All of the data for a particular compound, whether unqualified or unqualified, were included in the screening step. Unqualified data were used preferentially for the screening assessment; however, in all instances, if a qualified value exceeded a screening value, the particular analyte was retained as a COPC.

Analysis of qualified detects data (decision criterion 2) revealed that chlorobenzene, dichlorobenzenes (1,2- and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), pentachlorophenol, phenol, sulfotepp, and tetrachloroethane (1,1,2,2-) also exceeded soil, sediment, or water screening criteria (Table 3).

Examination of non-detect data (decision criterion 3) showed that the candidate COPCs could also include two trichlorophenols (2,4,5- and 2,4,6-) (Table 4). Finally, since there were no ESVs for methylene chloride, parathion, methyl parathion, isopropyl benzene, or triethylphosphorothioate (o,o,o-) in sediment or soil per decision criterion 4, these COPCs were automatically forwarded to the BERA (Table 4).

OU-3

Analysis of full detect (decision criterion 1) soil data from OU-3 relative to ESVs indicated that arsenic, barium, chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs exceeded their respective screening criteria (Table 5). Decision criterion 2 was not applied as there were no qualified results. The following chemicals were not detected above the method detection limit (decision criterion 3): beryllium, cadmium, dichlorobenzenes (1,2- and 1,4-), trichlorophenols (2,4,5- and 2,4,6-), dichlorophenol, nitrophenol (4-), pentachlorophenol, and phenol. The maximum detected concentration for chlorobenzene was below the screening value (Table 5).

Typically, unqualified data are used preferentially for the screening assessment. If an initial decision is made to screen out a COPC using unqualified data, a second test is performed using qualified data to be certain that no COPC is screened out in error. This second test did not apply in the analysis of data from OU-3 since there were no qualified results.

Finally, there are no ESVs for methyl parathion, parathion, sulfotepp, triethylphosphorothioate (o,o,o-), tetrachloroethane (1,1,2,2-), isopropyl benzene, or methylene chloride. As a result, per data screening criterion 4, all these compounds were included in the list of COPCs retained for the BERA even though these compounds were not detected in measurable concentrations at the Facility. The chemicals that were carried through this preliminary screening step are summarized in Table 5.

3.3 Exposure Pathway Analysis

The screening level problem formulation in Step 1 was based on conservative assumptions and did not take into account Site-specific habitat information. In Step 2, Site-specific data were used to evaluate the completeness of various exposure pathways. As an enhancement to that assessment, a detailed exposure pathway analysis was undertaken to document the quality of habitat and species assemblages of OUs 1, 2, and 3. This enhanced exposure pathways analysis provides information regarding the nature and distribution of active and complete pathways in the context of the COPC assessment. This exposure pathways analysis begins with an overview of the results of habitat and biological assessment investigations introduced in Section 3.1.2. Data sheets generated during the field work are provided in Appendix A. A photographic log of the fish sampling effort is presented in Appendix B.

3.3.1 OU-1/OU-2 – Snow Creek and Stormwater Retention Structure

3.3.1.1 Habitat

As part of the RBP habitat assessment, a variety of habitat parameters in each of the five Snow Creek reaches evaluated were assigned scores based on the condition of each particular parameter. An optimal habitat would have received a score of 200. The results described below, ranged from a score of 121 (STA-2) to 130 (STA-4). The selection of survey locations was purposefully biased toward the highest quality habitat locations, in keeping with the conservative approach of this SLERA. Much of OU-1/OU-2 was not assessed because the area is an urban corridor primarily comprised of industrial, commercial, and residential land uses that do not support diverse, thriving ecological communities.

Station 1

The reach of Snow Creek designated as Station 1 was a run (100%) surrounded by residential land use. The reach was partly shaded. The riparian zone was 12 to 18 meters wide and dominated by herbaceous plants (clover). An emergent plant, Alligator weed, grew over approximately 35% of the creek bed.

Sand/gravel was the primary component of the Station 1 habitat type (60%). Cobbles and vegetated banks each composed 20% (Figures 26 and 27 and Table 7). Under the RBP habitat assessment, only channel flow status was given an optimal score. Pool substrate characterization, sediment deposition, and channel alteration were categorized as suboptimal. With the exception of pool variability and channel sinuosity (characterized as poor), all remaining parameters were found to be marginal. The total score for Station 1 was 122 (Table 8).

Station 2

Station 2 was primarily a run with some riffle areas (10%), and the reach was partly shaded. This portion of Snow Creek was located in a residential area. The banks of the southern end of Station 2 were paved, where the creek passed under a bridge. The riparian zone for the remainder of Station 2 was between 6 and 18 meters wide, and dominated by grasses. No aquatic vegetation was observed.

Habitat type in Station 2 was equally divided between cobbles and sand/gravel (Figures 28 and 29 and Table 7). The total score for the RBP habitat assessment at Station 2 was 121. Two parameters were scored as optimal conditions: channel flow status and channel alteration. Epifaunal substrate/available cover was the only parameter ranked as suboptimal. While pool variability and the left bank's riparian vegetative zone width were ranked as poor, all remaining parameters were observed as marginal (Table 8).

Station 3

The Station 3 reach consisted of half riffle and half run areas, and was partly open. A railroad track ran along the western side of the creek and the reach was bordered by a combination of commercial and industrial land use. The banks at the northern end of Station 2 were paved where the creek flowed under a bridge. The remainder of the riparian zone was less than 6 meters wide, dominated by grasses mixed with some areas of trees. No aquatic vegetation was observed.

Like Station 2, the habitat type of Station 3 was equally divided between cobbles and sand/gravel (Figures 30 and 31 and Table 7). The total score for the RBP habitat assessment was 124, and four parameters were ranked as optimal: epifaunal substrate/available cover, sediment deposition, channel flow status, and channel alteration. The rest of the parameters were ranked as marginal or poor (channel sinuosity and riparian vegetative zone width) (Table 8).

Station 4

The Station 4 reach consisted of half riffle and half run areas, and was partly shaded. The station was bordered by a combination of commercial and industrial land use. A box culvert carried discharge into Snow Creek in the middle portion of the reach. A low flow into the creek was observed from the culvert. The riparian zone was less than 12 meters wide and dominated by woody vegetation such as sycamore, willow, and privet. No aquatic vegetation was observed.

Slight variation of habitat type was identified at Station 4 as 60% was identified as cobbles and 40% identified as sand/gravel (Figures 32 and 33 and Table 7). Station 4 had the highest overall RBP habitat assessment score of 130. Channel flow status and channel alteration were considered optimal. Three parameters were scored as suboptimal: epifaunal substrate/available cover, pool variability, and sediment deposition. Significant points came from parameters ranked as marginal. Only the riparian vegetative zone width was observed as poor (Table 8).

Station 5

Station 5 consisted of riffle (25%), run (50%), and pool morphology (25%). This reach was located in a commercial area. The riparian zone was less than 6 meters wide and dominated by trees such as sycamore, mimosa, and willow. No aquatic vegetation was observed.

The greatest diversity in habitat type was observed in Station 5: 35% cobbles, 15% snag, 35% sand/gravel, and 15% bedrock outcrops (Figures 34 and 35 and Table 7). The overall score for the RBP habitat assessment at Station 5 was 125. Three habitat parameters were observed under optimal conditions: epifaunal substrate/available cover, sediment deposition, and channel flow status. Pool variability was the sole parameter marked as suboptimal. While pool substrate characterization and riparian vegetative zone width were both ranked as poor, the remaining parameters were marginal (Table 8).

Stormwater Retention Structure

The stormwater retention structure is located west of Snow Creek in a residential area. Approximately 60% of its banks are vegetated. Vegetation documented at the stormwater retention structure includes approximately 30% cattail and 10% alligator weed around the perimeter of the pond (Figures 36 and 37). RBPs were not conducted for the stormwater retention structure because the procedures and methods of scoring developed in these protocols are not meant for, and do not accurately score, habitat within stormwater retention structures or other similar artificial structures.

3.3.1.2 Biota

Benthic Macroinvertebrates

Results from the BMI sampling event are presented in Tables 9 through 14. The most abundant and diverse collection of benthic macroinvertebrates was found in the stormwater retention structure, where no fish were observed (Table 9). The retention structure samples contained a total of 331 macroinvertebrate specimens representing 31 different taxa. The most abundant species was a mayfly (*Callibaetis* sp). There were 120 counted, composing 36.3% of the total sample. Damselfly (*Enallagma* sp.) (54 specimens) composing 16.3% of the sample, and back swimmer (*Notonecta indica*) (36 specimens) composing 10.9% of the sample, were the second and third most abundant species, respectively.

On Snow Creek, the most abundant and diverse samples were found at Station 1 (Table 10) and Station 2 (Table 11). At Station 1, 97 specimens were collected composing a total of 19 different taxa. The top three species counts consisted of: tubeworm (*Limnodrilus* sp.), 23 specimens (23.7%); damselfly (*Ischnura* sp.), 14 specimens (14.4%); and midges (*Thienemannimyia* gr.), 12 specimens (12.4%). Station 2 had 13 different taxa for a total specimen count of 106. A species of midge (*Thienemannimyai* gr.) was the most abundant at 42.5% (45 specimens) for Station 2. The second and third most abundant species at Station 2 were mayfly (*Baetis* sp.) composing 25.5% (27 specimens) and caddisfly (*Cheumatopsyche* sp.) composing 16% (17 specimens) of the total sample, respectively.

A decrease in specimen abundance and diversity was observed when the results from Stations 3, 4, and 5 were compared to those from Stations 1 and 2. Only 16 specimens were counted at Station 3, composed of five different taxa. Seven midges (*Thienemannimyia* gr.) composed 43.8% of the total sample (Table 12). Seven different taxa representing 28 total specimens composed the total sample for Station 4, where 60.7% of the total sample was composed of 17 midges (*Thienemannimyia* gr.) (Table 13).

Station 5 had two sample sets, 5A and 5B (Table 14). The first contained 16 specimens representing four different taxa. Nine mayflies (*Baetis* sp.) composed 56.3% of the total sample. Station 5 data set 5B contained 53 total specimens and 18 different taxa. In this set, 14 midge specimens (*Thienemannimyia* gr.) composed 26.4% of the total sample, while seven specimens of a different midge species (*Ablabesmyia mallochi*) composed 13.2% of the total sample. A pouch snail species (*Physa* sp.) also composed 13.2% of the sample with seven specimens.

Fish

Table 15 summarizes the results of the fish community sampling. Three taxa composed the 127 fish counted at Station 1: largescale stoneroller (*Campostoma oligolepis*), eastern mosquitofish (*Gambusia holbrooki*) and bluespotted sunfish (*Enneacanthus gloriosus*). Eastern mosquitofish was the dominant species with 110 total specimens. Fifteen largescale stonerollers were counted at Station 1. This species was the dominant species for the entire sampling length of Snow Creek.

At Station 2, 58 specimens representing five taxa were recorded. Largescale stoneroller was the highest species count at 21 fish. The remaining four specimens included eastern mosquitofish, unknown shiner #1 (*Notropis* sp.), unknown shiner #2 (*Notropis* sp.), and bluespotted sunfish. Six taxa representing 22 specimens were recorded at Station 3. The six species included largescale stoneroller, unknown shiner #1, unknown shiner #2, unknown shiner #3, bluespotted sunfish, and creek chub (*Semotilus atromaculatus*). The eight unknown shiner #2 represented the greatest sample count.

The largest fish count was recorded at Station 4, with 177 specimens and eight different species. Largescale stoneroller was the most abundant fish with 70 specimens. Unknown shiner #2 was the second largest count with 62 specimens. The remaining species included eastern mosquitofish, unknown shiner #1, bluespotted sunfish, bluegill (*Lepomis macrochirus*), unknown shiner (*Cyprinella* sp.), and suckermouth minnow (*Phenacobius mirabilis*).

Eight different species were also identified at Station 5 among 103 specimens. The largest fish count was again largescale stoneroller with 91 specimens. The remaining species were represented by fewer than five specimens each, and included unknown shiner #1, unknown shiner #2, bluespotted sunfish, unknown shiner (*Cyprinella* sp.), longear sunfish *(Lepomis megalotis),* black redhorse *(Moxostoma duquesnei),* and yellow bullhead *(Ameiurus natalis*).

No fish were observed or collected from the stormwater retention structure, and no fish collected in Snow Creek were identified as threatened or endangered in the state of Alabama. A photographic log of the fish sampling effort is presented in Appendix B.

Wildlife – Station Observations

Results from wildlife observations are presented in Table 16 Station 2 had the greatest diversity of avian and mammalian species, while Station 1 had the greatest diversity of herpetiles and amphibians. The lowest level of diversity observed was at Station 5.

At Station 1, ten avian species were observed. Barn swallows (*Hirundo rustica*), chimney swifts (*Chaetura pelgica*), and tree swallows (*Tachycineta bicolor*) were all observed while foraging. Four species were noted through calls: northern mockingbird (*Mimus polyglottos*), red-winged blackbird (*Agelaius phoeniceus*), robin (*Turdus migratorius*), and yellow shafted flicker (*Colaptes auratus*). Both common grackles (*Quiscalus quiscula*) and starlings (*Sturnus vulgaris*) were observed feeding, while a blue jay (*Cyanocitta cristata*) was noted resting.

Also observed at Station 1 were various mammalian and herpetile species. A muskrat (*Ondatra zibethica*) was observed foraging on the bank. An unidentified species of bat (*Mycrotis* spp.) was observed in flight. Musk turtle (*Sternotherus odoratus*), Gulf Coast spiny softshell (*Apalone spinifera aspera*), and a cottonmouth (*Agkistrodon piscivours*) were observed foraging. An American toad (*Bufo americanus*), a bull frog (*Rana catesbeiana*), a green frog (*Rana clamitans melanota*), and a southern leopard frog (*Rana utricularia*) were also identified by sight and/or call. A crayfish burrow was identified on the upper bank of Station 1.

Station 2 had the greatest diversity of avian species. Species observed foraging or feeding included barn swallow, Carolina chickadee (*Parus carolinensis*), common grackle, phoebe (*Sayornis phoebe*), robin, and tree swallow. English house sparrows (*Passer domesticus*) and mourning doves (*Zenaida macroura*) were found resting. Cardinal (*Cardinalis cardinalis*), gray catbird (*Dumetella carolinensis*), northern mockingbird, and song sparrows were all noted through calls. Three species were noted while in flight: belted kingfisher (*Ceryle alcyon*), rock dove (*Columba livia*), and starling. In addition, the tracks of cats (*Felis domestica*), dogs (*Canis domestica*), and rats (*Rattus norvegicus*) were all observed within the bounds of Station 2. A muskrat burrow and crayfish were also observed.

Station 3 wildlife tracks were restricted to observations of rats. Nine avian species were observed in some form of activity. Barn swallows, brown thrashers (*Toxostoma rufum*), and chimney swifts were observed while foraging. Cardinals, gray catbirds, and northern mockingbird were identified through calls. A belted kingfisher was observed in flight and a starling was observed resting. A tree swallow in Station 2 was the only species in all five reaches observed in a nest.

The least avian diversity existed at Station 4 with only four species: common grackle, northern mockingbird, rock dove, and starling. Evidence of mammalian, herpetile, amphibian, and crustacean species were also observed within the bounds of Station 4. Muskrat and rat tracks were observed, as were a Gulf Coast spiny softshell, a copperhead, a southern two-line salamander, and crayfish.

Five avian species were noted at Station 5 along with herpetiles and crustaceans. Northern mockingbirds and robins were both recorded through their calls. A starling was observed in flight and a barn swallow was observed feeding. An English house sparrow was also noted. Both a Gulf Coast spiny softshell and copperhead were observed as well as crayfish.

At the stormwater retention structure, several species of wildlife were documented. Species included several red-winged blackbirds nesting in the broadleaf cattail and dead/live black willow habitats, as well as barn swallow, chimney swift, red-tailed hawk, and tree swallow. Also observed was a muskrat feeding station in the broadleaf cattail habitat and a harvest mouse. Whitetail deer browse was noted on vegetation along the edge of the stormwater retention structure, and a bull frog was identified by its call.

3.3.2 OU-3 (Facility and Landfill Areas)

3.3.2.1 Habitat

South Landfill

The South Landfill is a vegetated landfill cap that includes sampling areas identified as MFES, TGF, and LVF. These areas were sampled along transect lines shown on Figure 38. In general, the primary habitats identified throughout the three sampling areas of the South Landfill were vegetated fields containing various grass and clover species. The percent vegetation cover observed in each sampling area was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey.

The most northerly section of the South Landfill, MFES, was a mowed clover and grass field dominated by red clover (*Trifolium pretense*) and white clover (*Trifolium repens*). The vegetation cover at this location was approximately 100%. Other herbaceous species were also found in the field: common cinquefoil (*Pontentilla simplex*), daisy fleabane (*Erigeron annus*), dogbane (*Apocynum cannabinum*), and English plantain (*Plantago lanceolata*). A silk/mimosa tree *(Albizia julibrissin)* was also observed.

The centrally located sampling area of the South Landfill, TGF, was a tall grass field. The vegetation cover at this location was approximately 100%, and composed of a mixture of grass species. Herbaceous species found in this area included catbrier (*Smilax glauca*), common cinquefoil, dogbane (*Apocynum cannabinum*), curled dock (*Rumex crispus*), daisy fleabane, pokeweed (*Phytolacca Americana*), red clover, white clover, grass and crabgrass, and oat. Trumpet creeper (*Campsis radicans*), a vine, was also observed. Areas of disturbance were noted in the TGF sampling area including vehicle tracks. These may be remnants of capping activities on the former landfill.

The final sampling area within the South Landfill, LVF, was a slender bush clover-dominated field. The vegetation cover at this location was approximately 95% with the remaining 5% bare soil. The dominant slender bush clover (*Lespedeza virginica*) left little room for other species. Those few included: curled dock, dwarf raspberry *(Rubus articus),* and shrubby cinquefoil *(Potentilla fruticosa*). The early successional state of the area was indicative of a recently capped, former landfill.

Open Area

In general, the primary habitats identified in the open area were a hardwood forest and an open area with low-lying vegetation. The percent vegetation cover observed in the sampling area was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey, and the open area sampling location is identified as "OA" on Figure 38.

The open area was characterized by a hard-wood forest dominating 90% of the area. Trees included pecan (*Carya Illinoinensis*), sweetgum (*Liquidambar styraciflua*), tree of heaven (*Ailanthus altissima*), turkey oak (*Quercus laevis*), wild black cherry (*Prunus serotina*), and willow oak (*Quercus phellos*). No shrubbery was present on the remaining 10% of the area. The open area was also characterized by low-lying vegetation on approximately 80% of the area. These herbs included crabgrass (*Digitaria* spp.), silkgrass (*Piyopsis* spp.), and white clover. Multiple vines were also observed: dewberry (*Rubus flagellaris*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*). A shrub, privet (*Ligustrum vulgare*), was also observed.

The average canopy height in the wooded area was between 40 and 50 feet. Low lying herbaceous vegetation grew on the ground beneath it. The ground was also covered by filter fabric, which could present an obstacle for burrowing animals, but 2-inch diameter burrows were noted in an intermittent stream corridor.

The sampling area was surrounded by open fields, roads, and buildings. It appeared that the area was intended for use as a park for employees. The shrub layer had been removed and walking trails and picnic tables were present. Disturbance in this would likely be from anthropogenic impacts.

Maintained Facility

In general, the primary habitat identified in the maintained facility (designated as sampling area CY) was a clover field. This area was surrounded by buildings and roads. The percent vegetation cover observed in the sampling area was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey, and the sampling transects are identified on Figure 38.

The maintained facility was dominated by a field of white clover. Other dominant herbaceous species in the field included Bermuda grass (*Cynodon dactylon*), common dandelion (*Taraxacum officinale*), common plaintain (*Plantago major*), crabgrass, and white clover. The vegetation covered 100% of the maintained facility area. It also appeared that the maintained facility sample area was routinely mowed to about two to four inches.

West End Landfill

In general, the primary habitat identified at the West End Landfill (designated as WLF) was a field composed of herbs and grasses growing over the landfill cap. The percent vegetation cover observed in the sampling area was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey, and the sampling transects are identified on Figure 38.

The West End Landfill was 100% covered by herbs and grasses. Herbaceous species observed in the field included common plantain, daisy fleabane, evening primrose (*Oenothera biennis*), goldenrod (*Solidago spp*.), little bluestem (*Schizachyrium scoparium*), Queen Anne's Lace (*Daucus carota*), red clover, slender bush clover, sweet yellow clover (*Melilotus officinalis*), upland boneset (*Eupatorium sessilifolium*), and white clover. A vine, trumpet creeper, was also observed, as was a silk/mimosa tree and a wild black cherry tree.

The field showed indications of periodic mowing, and was at a height of 1 to 2 feet during field observations. As its name indicates, the area was a former landfill, but is now capped and maintained. The vegetation present was indicative of a recently disturbed area.

3.3.2.2 Biota

Soil/Grass Invertebrates

Results from this sampling event are presented in Table 19. The South Landfill had the greatest species diversity and abundance of the four sample areas with 30 different taxa (32 when including the dogbane sweep). Short-horned grasshoppers (family Acrididae) and crickets (family Gryllidae) were the most abundant in both the survey and sweep of the South Landfill. At the West End Landfill, a total of 12 different families were noted with short-horned grasshoppers the most abundant. Out of 11 organisms collected from the open area, the most abundant were black flies (family Simuliidae), with three individuals. Oligochaetes were the most abundant organism from the maintained facility, comprising seven individuals of 11 in the sample.

Wildlife – Station Observations

The South Landfill was split into three sampling areas with three wildlife transects in each (Table 20). The most northern is MFES where both mammals and birds were observed. Eight different species of birds and their activities were noted. A barn swallow was observed foraging. Five species were observed perching: blue jay, indigo bunting (*Passerina cyanea*), mourning dove (*Zenaida macroura*), northern mockingbird, and summer tanager (*Piranga rubra*). Four species were noted in flight: cardinal, indigo bunting, northern mockingbird, and an immature red-tailed hawk (*Buteo jamaicensis*). Deer tracks were observed in this area.

Various avian species were noted in the two remaining sections of the South Landfill, but no mammals were observed. In the central area of the landfill, four avian species were observed in flight: mourning dove, red-winged black bird, sparrow hawk (*Falco sparverius*), and summer tanager. The sparrow hawk was also observed feeding at the most southern sampling area. Barn swallows, brown headed cowbirds (*Molothrus ater*) and chimney swifts were observed in flight over the southern area, and sparrow hawks and red-winged blackbirds were observed feeding.

At the open area (designated as SMF on the table), maintained facility (designated as CY on the table), and West End Landfill, few species were observed (Table 20). No avian species were noted in the open area, but two-inch burrows were observed in a small wet depositional area that were suspected to be from chipmunks (*Tamias striatus*), squirrels, or armadillo *(Dasypus novemcinctus)*. Meadowlark (*Sturnella magna*) and mourning dove were seen perching at the maintained facility. Only meadowlarks were observed at the West End Landfill.

3.3.3 Habitat Quality Assessment

3.3.3.1 OU-1/OU-2

Habitat quality assessments for exposure pathways analysis were performed at five locations on Snow Creek and near the stormwater retention structure. All habitats in these areas were disturbed, and only fragments of vegetated habitats remain in the urbanized environment along Snow Creek. Habitat remnants in these areas were typically narrow, and altered by mowing, clearing, or development of parking lots, roadways, or rail infrastructure. Using the KPM described in Section 3.1.2.1, these narrow vegetated habitat remnants were assigned ratings substantially below what would be awarded to an undisturbed woodland that represents "climax" conditions in the area (see the column titled "KP Value Score" in Table 6). Scores were generally low due to limited structural quality, low diversity, dominance of non-native and invasive species, and intrusive levels of disturbance. In addition, the overall landscape is impacted by development.

The area around the stormwater retention structure has large areas of mowed fields that provide poor wildlife habitat, but the landscape in this area does include a mix of habitat types, including patches of more diverse vegetation of several kinds. As a result, the area ranks relatively high on the KPM scale, even though overall habitat conditions in OU-1/OU-2 are generally poor.

Because the Site-specific KPM score does not reflect the overall quality of the landscape and the highly isolated condition of the habitat remnants surveyed, as described in Section 3.1.2.1, the KP Value Scores presented in Table 6 were modified. Specifically, we applied a Site-specific interspersion factor of -1.0 to account for the fact that the areas adjacent to the habitats surveyed were primarily developed/impacted land. This modification extends the KPM and makes it applicable in the land use matrix along Snow Creek and in OU-3. The application of this interspersion category is reflected in the column titled "Modified KP Value Score" in Table 6, and that modified score was used to assign the "Adjusted Habitat Quality Rating" shown on Table 6.

3.3.3.2 OU-3

The habitat characteristics of four areas were evaluated in OU-3, including the open area, maintained facility, the West End Landfill, and the South Landfill. In general the habitat quality of these areas was poor, reflecting maintenance activities (cutting and mowing), low plant diversity, and poor soil conditions. The low diversity of herbaceous vegetation and the lack of woody vegetation resulted in fairly low scores across the OU (see the column titled "KP Value Score" in Table 6). The only exception was the employee park (the open area), which supports nature trails through a forested area. The KP Value Score of 5.25 earned it a "fair" ranking, and even after applying the Site-specific interspersion factor of -1.0, the area still falls into the "fair" category. This employee park is highly disturbed by daily activities and is actively maintained. As a result, this isolated area of more diverse habitat is not a focus for exposure due to the daily disturbance and ongoing maintenance activities.

4. Uncertainty

In each step of the ecological risk assessment process, assumptions must be made that are based on professional judgment in the absence of concise scientific data, and every assumption introduces some degree of uncertainty into the risk assessment process. In a SLERA, the conservative assumptions that are made throughout the process are included in an effort to sufficiently protect ecological receptors and ensure that potential risk, if identified, is evaluated further. When all of the assumptions are added together, it is much more likely that the risks are overestimated rather than underestimated. The approach is consistent with USEPA guidance (USEPA 1997a). Specific points of uncertainty in the SLERA for OUs 1, 2, and 3 are as follows:

- *Selection of Constituents*. First, the COPCs considered originated from a previously defined list of COPCs, rather than from an analysis of the universe of substances from comprehensive sampling scans. While it is possible that by using this approach some substances may have been omitted, the probability of omitting critical compounds associated with the Facility is low. This is because the original list of COPCs was prepared after extensive consultations between the Facility operators and various regulatory agencies. Some of these constituents are not suspected to persist or bioaccumulate in higher trophic level organisms (e.g., barium, beryllium, cobalt, manganese, nickel, vanadium) and occur only infrequently in samples at the Site. Second, the frequency of detection was not accounted for in the COPC screening process as a conservative measure to ensure that the list of COPCs retained for the BERA included any compound potentially significant from a risk perspective. The magnitude of uncertainty associated with the potential that analytes critical to the determination of ecological risk may have been incorrectly omitted is low, and in fact insignificant from a risk assessment perspective. Nevertheless, in future sampling efforts, a subset of samples will be evaluated for a wide range of chemical constituents to confirm previous findings and provide information relevant to the ASM process.

- *Potential Pathways and Routes of Exposure.* By ensuring that the exposure assessment is conservative, the effects assessment and preliminary risk characterization will be inherently conservative as well. In this SLERA, maximum concentrations for each COPC were assumed to be representative of exposure point concentrations for ecological receptors. However, ecological receptors are more likely to be exposed to a range of COPC concentrations – some of which will be well below the maximum detected value – as well as some media where COPCs are not present. The latter point is particularly notable for areas in OU-3 that have been remediated and capped with clean soils. Furthermore, it is unlikely that of the ecological receptors observed in OU-1/OU-2, any one receptor (or community) would forage exclusively at the Site and be exposed to chronic levels of COPCs.

- *Effects Evaluation.* The primary uncertainty associated with the ecological effects evaluation in this SLERA is the selection of benchmarks for comparison with maximum concentrations of Site constituents. The benchmarks considered in this SLERA were from sources that incorporate specific approaches in the methods used to derive a concentration that is protective of ecological receptors. For example, ORNL documents (Efroymson et al., 1997a and b) were used to derive soil benchmarks presented in the USEPA (1997a) guidance. The ORNL authors readily acknowledge that there is some level of uncertainty associated with their derivation methodology. This uncertainty stems from the fact that most of the studies used to derive the soil benchmarks were laboratory-controlled dose studies that artificially increase the bioavailability of constituents to organisms so that a response can be detected. However, and in accordance with the conservative nature of the SLERA process, the authors also acknowledge that the soil benchmarks selected are sufficiently conservative to protect organisms at the community level (Efroymson et al., 1997a and b). This situation is the same for the benchmarks considered for the other media considered in this SLERA.

- *Preliminary Exposure Estimate and Risk Calculation.* As per USEPA's (2000) guidance, screening level estimates of exposure and risk calculations use assumptions that maximize the estimate of risk to ensure that only those chemicals that represent a *de minimis* risk are eliminated from further consideration, and those that potentially pose an unacceptable risk will be retained for consideration in subsequent steps of the assessment. The comparison of maximum concentrations of constituents in each medium to ESVs is a conservative approach to minimize this type of uncertainty (Type II error).

- *Exposure Pathway Analysis*. Uncertainties in the exposure pathway analysis are biased conservatively. Habitat characterizations were made at the highest quality habitat present in each location, reflecting the highest quality habitat in the area as a whole. In nearly all cases, the assessments were conducted in small patches of extant habitat in a landscape lacking such habitats, or, in the case of OU-3, in a landscape of managed lands similar to the assessment location. Additional quantitative evaluation of exposure pathways via receptor and habitat analysis would yield substantially fewer estimates of complete pathways and identify poorer quality habitat.

5. Conclusions

This SLERA employs a conservative evaluation methodology (USEPA, 2000). Use of this approach in the SLERA for OUs 1, 2 and 3 (Steps 1 and 2) revealed that several metals, OPs, VOCs, SVOCs (including total PCBs and specific PCB homologues and congeners), PAHs, and PCDD/PCDFs require investigation in a BERA (see Tables 3 through 5). The application of risk assessment guidance (USEPA, 1997a) in a subsequent step (Step 3), as well as the collection of new data and information, may lead to the refinement of the list of COPCs. As noted in the Phase I CSM Report (BBL, 2003), these COPCs, including PCBs, metals, OPs, VOCs, and SVOCs are present throughout the Anniston area and are associated with a range of potential sources, including the relocation of dredged sediment, the placement of foundry fill, and other industrial activities in the Choccolocco Creek watershed. As discussed earlier, an ASM approach will be applied to the continued evaluation of COPCs for the Site. This process will include an evaluation of the data to refine the list of COPCs. This refinement process could lead to the addition or deletion of COPCs based on the data collected.

To supplement the identification of COPCs and the application of the ASM process, a screening assessment of exposure pathways was conducted using aquatic and terrestrial habitat evaluation results. This screening level exposure pathways assessment incorporated direct measures of habitat quality and receptor distribution. This is in keeping with the specifications in USEPA's ecological risk assessment guidance (1998) for evaluation of "measures of ecosystem and receptor characteristics," and with the Superfund ecological risk assessment guidance (USEPA, 1997a) that specifies a pathways analysis in the screening assessment problem formulation step. Applied here in the screening phase, the pathways assessment provides a basis for focusing the BERA on appropriate receptors and ecosystem components as well as COPCs identified through toxicological screening and further application of the process.

An exposure pathway assessment based on the aquatic and terrestrial habitat investigations is provided in Table 21. This table shows that terrestrial exposure pathways throughout OUs 1, 2, and 3 are truncated and incomplete. Habitat throughout is disturbed; dominated by mowed and maintained lands with low-habitat quality plant cover, impervious surfaces, and transportation infrastructure. Development pressure is strong in OU-1/OU-2, and over time remaining terrestrial habitat fragments will likely be subject to increasing disturbance as more urban infrastructure is constructed.

In contrast, aquatic ecosystems in Upper Snow Creek (above Highway 78), while disturbed and of generally low quality, do support complete exposure pathways. Based on the conservative assumptions applied in this SLERA, the aquatic exposure pathways in Snow Creek and associated COPCs will be evaluated in a BERA (see Table 21). The BERA for Snow Creek will be coordinated with BERA activities planned in OU-4, such that relevant investigations and findings of OU-4 activities will be applied to the assessment of Snow Creek.

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Tables

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

TABLE 1
COMMON PLANT AND WILDLIFE SPECIES OBSERVED IN RESIDENTIAL AND NON-RESIDENTIAL HABITATS

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Trees	Herbaceous	Shrubs
Acer negundo (Box-elder, FACU)	*Ambrosia artemisiifolia* (Common Ragweed, FACU)	*Gaylussacia* sp. (Huckleberry, NS)
Acer rubrum (Red Maple, FAC)	*Ambrosia trifida* (Great Ragweed, FAC)	*Ligustrum vulgare* (European Privet, FACU)
Acer saccharinum (Silver Maple, FACW)	*Apocynum cannabinum* (Clasping-leaf Dogbane, FACU)	*Rhus copallinum* (Dwarf Sumac, NL)
Ailanthus altissima (Tree of Heaven, NL)	*Aster vimineus* (Small White Aster, NL)	*Rhus copallinuum* (Winged Sumac, NI)
Albizia julibrissin (Silk Tree, NL)	*Conyza canadensis* (Canada Horseweed, UPL)	*Rosa multiflora* (Multiflora Rose, FACU)
Asimina triloba (Common Pawpaw, FAC)	*Cyperus strigosus* (Straw-color Flat Sedge, FACW)	*Vaccinium angustifolium* (Lowbush Blueberry, FACU-)
Betula populifolia (Gray Birch, FAC)	*Daucus carota* (Queen-Annes Lace, NL)	*Vaccinium corymbosum* (Highbush Blueberry, FACW)
Carya glabra (Sweet Pignut Hickory, FACU-)	*Erigeron annuus* (White-top Fleabane, FACU)	*Viburnum acerifolium* (Maple-leaved Viburnum, UPL)
Carya tomentosa (Mockernut Hickory, NL)	*Eupatorium perfoliatum* (Common Boneset, FACW+)	
Cornus florida (Flowering Dogwood, FACU-)	*Helenium tenuifolium* (Fine-leaved Sneezeweed, NL)	**Grasses**
Fraxinus quadrangulata (Blue Ash, NL)	*Juncus effusus* (Soft Rush, FACW+)	*Dichanthelium clandestinum* (Deer-tongue witchgrass, FAC+)
Juglans nigra (Black Walnut, FACU)	*Lespedeza virginica* (Slender Bush Clover, NL)	*Eulalia viminea* (Nepal Microstegium, FAC)
Juniperus virginiana (Eastern Red Cedar, FACU)	*Oenothera biennis* (Evening Primrose, FACU-)	*Leesia oryzoides* (Rice Cutgrass, OBL)
Liquidambar styraciflua (Sweetgum, FAC)	*Oxalis montana* (Wood Sorrel, FAC-)	*Phalaris arundinacea* (Reed Canary Grass, FACW+)
Magnolia virginiana (Sweetbay, FACW+)	*Panicum virgatum* (Switchgrass, FAC)	*Schizachyrium scoparium* (Little Bluestem, FACU-)
Morus rubra (Red Mulberry, FACU)	*Phytolacca americana* (Pokeweed, FACU+)	*Setaria glauca* (Yellow Foxtail, FAC)
Paulowina tomentosa (Princess Tree)	*Plantago lanceolata* (English Plantain, NL)	*Eustachys petraea* (Finger Grass, FACU-)
Platanus occidentalis (Sycamore, FACW-)	*Plantago major* (Common Plantain, FACU)	
Quercus phellos (Willow Oak, FAC+)	*Polygonum hydropiperoides* (Swamp smartweed, OBL)	**Vines**
Quercus prinus (Chestnut Oak, UPL)	*Polygonum persicaria* (Lady's thumb, FACW)	*Campis radicans* (Trumpet-creeper, FAC)
Quercus rubra (Red Oak, FACU-)	*Solidago gigantea* (Late Goldenrod, FACW)	*Humulus lupulus* (Common Hop, FACU)
Rhus glabra (Smooth Sumac, NL)	*Thelypteris noveboracensis* (New York Fern, FACW)	*Lonicera japonica* (Japanese Honeysuckle, FAC-)
Robinia pseudo-acacia (Black Locust, FACU-)	*Trifolium repens* (White Clover, FACU-)	*Smilax rotundiflolia* (Greenbrier, FAC)
Salix exigua (Sandbar Willow, OBL)	*Typha latifolia* (Common Cattail, OBL)	*Toxicodendron radicans* (Poison Ivy, FAC)
Salix nigra (Black Willow, OBL)	*Verbena bonariensis* (South Americam Vervain, FAC+)	*Pueraria montana* (Kudzu, NL)
Sassafras albidum (Sassafras, FACU-)		
Ulmus americana (American elm, FACW-)		
Birds	**Herptiles**	**Insects**
Cyanocitta cristata (Common bluejay)	*Rana clamitans* (Green frog)	Coenagrionidae (Damselflies)
Turdus migratorius (American robin)		Corixidae (Water boatmen)
Sturnus vulgaris (Common Starling)		Gryllidae (Common cricket)
Melospiza melodia (Song sparrow)		
Melanotis sp. (Mockingbird)		
Cuculus sp. (Cuckoo)		
Zenaida macroura (Mourning dove)		
Poecile carolinensis (Carolina chickadee)		
Sitta carolinensis (White breated nuthatch)		
Ardea herodias (Great blue heron)		
Columba livia (Rock dove)		
Riparia riparia (Bank swallow)		
Cardinalis cardinalis (Red cardinal)		
Sialia sp. (Bluebird)		
Quiscalus quiscula (Common grackle)		

Note: 1) The following are the wetland classification for the individual species
2) A negative sign (-) indicates a species less frequently found in wetlands. A positive sign (+) indicates a species more frequently found in wetlands (Reed 1986).

OBL-A plant species that is generally (>99% of the time) found only in wetlands under natural conditions.
FACW-A plant species that usually (>66% to 99% of the time) is found in wetlands, but which may be found occasionally in uplands under natural conditions.
FAC-A plant species that sometimes (>33% to 66% of the time) is found in wetlands, but which may also be found commonly in uplands.
FACU-A plant species that is seldom (<33% of the time) found in wetlands and that usually occurs in uplands.
UPL-A plant species that is generally (>99% of the time) found only in uplands under natural conditions.
NI-Currently no agreement as to indicator status.
NC-A plant species not classified (recent additions to indicator list).
NL-A plant species not listed.
NS-A plant that has been identified to only Genus.

TABLE 2
COMMON WILDLIFE SPECIES OBSERVED IN RESIDENTIAL AND NON-RESIDENTIAL HABITATS

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Birds	Herptiles	Insects
Cyanocitta cristata (Common bluejay)	*Rana clamitans* (Green frog)	Coenagrionidae (Damselflies)
Turdus migratorius (American robin)		Corixidae (Water boatmen)
Sturnus vulgaris (Common Starling)		Gryllidae (Common cricket)
Melospiza melodia (Song sparrow)		
Melanotis sp. (Mockingbird)		
Cuculus sp. (Cuckoo)		
Zenaida macroura (Mourning dove)		
Poecile carolinensis (Carolina chickadee)		
Sitta carolinensis (White breated nuthatch)		
Ardea herodias (Great blue heron)		
Columba livia (Rock dove)		
Riparia riparia (Bank swallow)		
Cardinalis cardinalis (Red cardinal)		
Sialia sp. (Bluebird)		
Quiscalus quiscula (Common grackle)		

TABLE 3
SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS DETECTED IN SOIL, SEDIMENT, AND STORMWATER (OU-1/OU-2)

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Constituents		Soil				Sediment				Stormwater			
	Units	Max Conc.	Max EQL	ESV_{soil}	ESV_{soil} Exceeded?	Max Conc.	Max EQL	$ESV_{sed.}$	$ESV_{sed.}$ Exceeded?	Max Conc.	Max EQL	ESV_{water}	ESV_{water} Exceeded?
Full Detects													
Arsenic	ppm	120		10	**Yes**	21		7.24	**Yes**	0.011		0.190	**No**
Barium	ppm	12,000		165	**Yes**	410		NA	**NA**	0.036		NA	**NA**
Berylium	ppm	10		1.1	**Yes**	2.0		NA	**NA**	NA		0.00053	**NA**
Cadmium	ppm	94		1.6	**Yes**	3.3		1.0	**Yes**	NA		0.00066	**NA**
Chromium	ppm	14,000		0.4	**Yes**	670		52.3	**Yes**	NA		0.011	**NA**
Cobalt	ppm	390		20	**Yes**	26		NA	**NA**	NA		NA	**NA**
Lead	ppm	19,000		50	**Yes**	140		30.2	**Yes**	0.035		0.00132	**Yes**
Manganese	ppm	11,000		100	**Yes**	2,400		NA	**NA**	0.2		NA	**NA**
Mercury	ppm	28		0.1	**Yes**	0.11		0.13	**No**	NA		0.000012	**NA**
Nickel	ppm	180		30	**Yes**	37		15.9	**Yes**	NA		0.0877	**NA**
Vanadium	ppm	150		2.0	**Yes**	64		NA	**NA**	NA		NA	**NA**
Chlorobenzene	ppm	0.0045		0.05	**No**	NA		NA	**NA**	NA		0.195	**NA**
Total PCBs	ppm	5,501		0.02	**Yes**	60		0.033	**Yes**	21.9		0.000014	**Yes**
Merthyl parathion	ppm	NA		NA	**NA**	NA		NA	**NA**	0.012		NA	**NA**
Parathion	ppm	NA		NA	**NA**	NA		NA	**NA**	0.015		0.000013	**Yes**
Qualified Detects													
Chlorobenzene	ppm		NA	0.05	**NA**			NA	**NA**		5	0.195	**Yes**
Dichlorobenzene (1,2-)	ppm		NA	0.01	**NA**			NA	**NA**		10	0.0158	**Yes**
Dichlorobenzene (1,4-)	ppm		NA	0.01	**NA**			NA	**NA**		10	0.0112	**Yes**
Nitrophenol (4-)	ppm		NA	7.0	**NA**			NA	**NA**		50	0.0828	**Yes**
Dichlorophenol (2,4-)	ppm		NA	20	**NA**			NA	**NA**		10	0.0365	**Yes**
Pentachlorophenol	ppm		NA	0.002	**NA**			NA	**NA**		50	0.013	**Yes**
Phenol	ppm		1.2	0.05	**Yes**			NA	**NA**		10	0.256	**Yes**
Sulfotepp	ppm		NA	NA	**NA**			NA	**NA**		0.5	NA	**Yes**
Tetrachloroethane (1,1,2,2-)	ppm		NA	NA	**NA**			NA	**NA**		5	0.240	**Yes**

TABLE 3
SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS DETECTED IN SOIL, SEDIMENT, AND STORMWATER (OU-1/OU-2)

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Notes:

Max. Conc. – Maximum detected concentration
Max. EQL – Maximum method quantification limit
ESV_{soil} – Ecological screening value for soil
$ESV_{sed.}$ - Ecological screening value for sediment
ESV_{water} - Ecological screening value for water
NA-not available

TABLE 4
SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS NOT DETECTED IN OU-1/OU-2 SOIL, SEDIMENT, OR STORMWATER FOR WHICH THERE ARE NO ENVIRONMENTAL SCREENING VALUES

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

Constituents		Soil			Sediment			Stormwater		
	Units	1/2 MDL	ESV_{soil}	ESV_{soil} Exceeded?	1/2 MDL	$ESV_{sed.}$	$ESV_{sed.}$ Exceeded?	1/2 MDL	$ESVw_{water}$	ESV_{water} Exceeded?
Non Detects										
Trichlorophenol (2,4,5-)	mg/kg	235	4.0	**Yes**	NA	NA	**NA**	25	NA	**NA**
Trichlorophenol (2,4,6-)	mg/kg	1,250	10	**Yes**	NA	NA	**NA**	5	0.0032	**Yes**
No Benchmark										
Methylene chloride										
Methyl parathion										
Isopropyl benzene										
Triethylphosphorothioate (o,o,o-)										

Notes:

½ MDL – Highest ½ detection limit
ESV_{soil} – Ecological screening value for soil
$ESV_{sed.}$ - Ecological screening value for sediment
ESV_{water} - Ecological screening value for water

TABLE 5
RESULTS OF SCREENING LEVEL ECOLOGICAL ASSESSMENT FOR OU-3

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

	Maximum Detected Concentration	1/2 Detection Limit	Units	ESV_{soil}	Units	ESV_{soil} Exceeded?
Full Detects						
Arsenic	14		mg/kg	10	mg/kg	Yes
Barium	780		mg/kg	165	mg/kg	Yes
Berylium	1.0		mg/kg	1.1	mg/kg	No
Cadmium	0.92		mg/kg	1.6	mg/kg	No
Chromium	48		mg/kg	0.4	mg/kg	Yes
Cobalt	74		mg/kg	20	mg/kg	Yes
Lead	220		mg/kg	50	mg/kg	Yes
Manganese	12,000		mg/kg	100	mg/kg	Yes
Mercury	1.4		mg/kg	0.1	mg/kg	Yes
Nickel	2,400		mg/kg	30	mg/kg	Yes
Vanadium	93		mg/kg	2.0	mg/kg	Yes
Total PCBs	282		mg/kg	0.02	mg/kg	Yes
Qualified Data						
Berylium		3.0	mg/kg	1.1	mg/kg	Yes
Cadmium		3.0	mg/kg	1.6	mg/kg	Yes
Chlorobenzene		0.00335	mg/kg	0.05	mg/kg	No
Dichlorobenzene (1,2-)		19	mg/kg	0.01	mg/kg	Yes
Dichlorobenzene (1,4-)		19	mg/kg	0.01	mg/kg	Yes
Nitrophenol (4-)		95	mg/kg	7.0	mg/kg	Yes
Trichlorophenol (2,4,5-)		19	mg/kg	4.0	mg/kg	Yes
Trichlorophenol (2,4,6-)		19	mg/kg	10	mg/kg	Yes
Dichlorophenol		19	mg/kg	0.01	mg/kg	Yes
Pentachlorophenol		95	mg/kg	0.002	mg/kg	Yes
Phenol		19	mg/kg	0.05	mg/kg	Yes
No Benchmark						
Methyl Parathion Parathion Sulfotepp Triethylphosphorothioate (o,o,o-) Tetrachloroethane (1,1,2,2-) Isopropyl benzene Methylene chloride						

ESV_{soil} – Ecological screening value for soil (US EPA 2000)

TABLE 6
TERRESTRIAL WILDLIFE HABITAT EVALUATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Location	Habitat Type	Evaluation Key	KP Optimum Habitat Score	KP Value Score (1)	Site-Specific Interspersion Factor (2)	Modified KP Value Score	Adjacent Habitat	Adjusted Habitat Quality Rating (3)
OU-1/OU-2								
SC-1 East Bank	Mowed Field	Odd Area	10	3.0	-1.0	2.0	Residential development and a park	Poor
SC-1 West Bank	Mowed Field	Odd Area	10	2.5	-1.0	1.5	Residential homes and roads	Poor
SC-2 East Bank	Narrow (30-ft) riparian corridor	Odd Area	10	2.5	-1.0	1.5	Residential development	Poor
SC-2 West Bank	Narrow (30-ft) mowed field	Odd Area	10	2.0	-1.0	1.0	Residential development and road ditches	Poor
SC-3 East Bank	Narrow (20-ft) upland	Woodland	10	4.75	-1.0	3.75	Abandoned construction yard	Fair
SC-3 West Bank	Narrow (10-ft) riparian upland	Woodland	10	3.75	-1.0	2.75	ROW	Poor
SC-4 East Bank	Narrow (20-ft) steep slope	Odd Area	10	4.0	-1.0	3.0	15-ft wide mowed area adjacent to a parking lot	Poor
SC-4 West Bank	Junkyard	Woodland	10	5.25	-1.0	4.25	No access	Fair
SC-5 East Bank	Narrow (10-ft) railroad ROW	Woodland	10	4.5	-1.0	3.5	Railroad line	Fair
SC-5 West Bank	Narrow (10-ft) forest edge	Woodland	10	4.5	-1.0	3.5	Parking lot	Fair
Stormwater Retention Structure	Mowed Field	Odd Area	10	5.0	0.0	5.0*	Mature forest, open water, and a wetland	Fair
OU-1/OU-2 Average				**3.9**		**2.9**		**Poor**
OU-3								
Open Areas	Park Area	Woodland	10	5.25	-1.0	4.25	Park area with trails, benches, and tables	Fair
Maintained Areas	Mowed Field	Odd Area	10	1.0	-1.0	0.0	Mowed grass	No Rank
West End Landfill	Landfill	Odd Area	10	3.0	-1.0	2.0	Landfill	Poor
South Landfill	Mowed Field	Odd Area	10	2.0	0.0	2.0*	Mowed fields with low vegetative diversity; mature forest border	Poor
OU-3 Average				**2.7**		**2.1**		**Poor**

Notes:

1- The KP Value Score is the habitat quality score resulting from the characteristics of the highest quality habitats in the evaluation area.

2- A site-specific interspersion factor was developed and applied to the KP Value score to account for the developed, urban nature of the land use bordering Snow Creek.

3- The Adjusted Habitat Quality Rating is the qualitative ranking of habitat quality reflected by the Modified KP Value score. Scores that fall within established ranges in the KP Method are ranked as follows:

KP Value Score range	Rank
1.0 - 3.0	poor
3.1 - 5.5	fair
5.6 - 7.9	good
8.0 - 10.0	excellent

* - Denotes a location where no modification of the KP Value Score was applied.

TABLE 7
BENTHIC MACROINVERTEBRATE COMMUNITY SURVEY DATA SUMMARY— SNOW CREEK

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Habitat Type	Percentage of Habitat by Location				
	SC-STA-1	***SC-STA-2***	***SC-STA-3***	***SC-STA-4***	***SC-STA-5***
Cobble	20	50	50	60	35
Snag					15
Vegetated Banks	20				
Sand/gravel	60	50	50	40	35
Submerged Aquatic Vegetation					
Bedrock outcrops					15
BioRecon - Distribution of Sampling Effort					
Habitat Type	***Number of Jabs/Kick per Habitat***				
	SC-STA-1	***SC-STA-2***	***SC-STA-3***	***SC-STA-4***	***SC-STA-5***
Cobble	1	2	2	2	1
Snag					1
Vegetated Banks	1				
Sand/gravel	2	2	2	2	1
Submerged Aquatic Vegetation					
Bedrock outcrops					1
Other -					
Benthic Invertebrate Community Assessment - Distribution of Sampling Effort					
Habitat Type	***Number of Jabs/Kick per Habitat***				
	SC-STA-1	***SC-STA-2***	***SC-STA-3***	***SC-STA-4***	***SC-STA-5A/5B****
Cobble	4	10	10	12	8
Snag					3
Vegetated Banks	4				2
Sand/gravel	12	10	10	8	9
Submerged Aquatic Vegetation					
Bedrock outcrops					2
Other - detritus/leaf litter					2

* - distribution of jabs among samples SC-STA-5A and SC-STA-5B, additional jabs collected to adequately characterize the range of habitat type present

TABLE 8
RAPID BIOASSESSMENT PROTOCOL HABITAT ASSESSMENT SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Habitat Parameters - Low Gradient Streams Reaches	Condition Catergory & Score Optimal (20 - 16) --- Suboptimal (15 - 11) --- Marginal (10 - 6) --- Poor (5 - 0)				
	SC-STA-1	*SC-STA-2*	*SC-STA-3*	*SC-STA-4*	*SC-STA-5*
Epifaunal Substrate/Available Cover	8	11	17	12	17
Pool Substrate Characterization	14	8	7	8	4
Pool Variability	3	4	8	11	15
Sediment Deposition	14	12	17	14	17
Channel Flow Status	17	17	17	17	18
Channel Alteration	14	17	18	18	9
Channel Sinuosity	5	6	3	4	6
Bank Stability					
Right Bank (10 - 0)	9	9	7	10	10
Left Bank (10 - 0)	9	9	10	10	10
Vegetative Protection					
Right Bank (10 - 0)	9	9	7	10	9
Left Bank (10 - 0)	8	8	10	9	7
Riparian Vegetative Zone Width					
Right Bank (10 - 0)	6	6	1	5	2
Left Bank (10 - 0)	6	5	2	2	1
TOTAL SCORE	122	121	124	130	125

TABLE 9
BENTHIC MACROINVERTEBRATE DATA STORMWATER RETENTION STRUCTURE

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station RP-01**		
		Sample Date:	13-Jun-05		
		Sample Type:	Kick Net		
Taxon:			**Common Name**	**Number**	**Percent**
Rhyncobdellida					
	Glossiphoniidae				
		Helobdella papillata	leech	2	0.6%
Hydrachnidia					
	Limnesiidae				
		Limnesia sp.	mite	13	3.9%
Ephemeroptera					
	Baetidae				
		Callibaetis sp.	mayfly	120	36.3%
	Caenidae				
		Caenis sp.	mayfly	3	0.9%
Odonata					
	Aschnidae				
		Aeschna sp.	dragonfly	8	2.4%
		Anax sp.	dragonfly	1	0.3%
	Coenagrionidae				
		Enallagma sp.	damselfly	54	16.3%
	Libellulidae (early instar)		dragonfly	1	0.3%
		Erythemis simplicollis	dragonfly	3	0.9%
Hemiptera					
	Belostomatidae				
		Belostoma sp.	giant water bug	4	1.2%
	Corixidae				
		Hesperocorixa sp.	water boatman	1	0.3%
		Sigara sp.	water boatman	2	0.6%
	Gerridae				
		Gerris sp.	water strider	2	0.6%
	Mesoveliidae				
		Mesovelia mulsanti	water treader	6	1.8%
	Naucoridae				
		Pelocoris femoratus	creeping water bug	9	2.7%
	Notonectidae				
		Notonecta indica	back swimmer	36	10.9%
Coleoptera					
	Dytiscidae				
		Ilybius sp.	diving beetle	5	1.5%
	Haliplidae				
		Haliplus sp.	crawling water beetle	2	0.6%
		Peltodytes sp.	crawling water beetle	1	0.3%
	Hydrophilidae				
		Berosus sp.	scavenger beetle	1	0.3%
		Tropisternus sp.	scavenger beetle	22	6.6%
	Noteridae				
		Hydrocanthus sp.	burrowing water beetle	1	0.3%
Diptera					
	Ceratopogonidae				
		Palpomyia gr.	biting midge	4	1.2%
	Chaoboridae				
		Chaoborus punctipennis	phantom midge	1	0.3%
	Chironomidae				
		Cricotopus bicinctus	midge	1	0.3%
		Endochironomus nigricans	midge	6	1.8%
		Larsia sp.	midge	10	3.0%
		Parachironomus chaetoalus	midge	5	1.5%
		Paratanytarsus sp.	midge	1	0.3%
	Culicidae				
		Culex sp.	mosquito	5	1.5%
	Stratiomyiidae				
		Odontomyia sp.	soldier fly	1	0.3%
		Total Number of Specimens		**331**	100.0%
		Total Number of Taxa		**31**	

TABLE 10
BENTHIC MACROINVERTEBRATE DATA STATION 1

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station SC-1**		
		Sample Date:	10-Jun-05		
		Sample Type:	Kick Net		
Taxon:			**Common Name**	**Number**	**Percent**
Tubificida					
	Tubificidae				
		Bothrioneurum vejdovskyanum	tubeworm	1	1.0%
		Branchiura sowerbyi	tubeworm	3	3.1%
		Ilydrilus templetoni	tubeworm	1	1.0%
		Limnodrilus sp.	tubeworm	23	23.7%
Basommatophora					
	Ancylidae				
		Ferrissia rivularis	limpet snail	3	3.1%
	Lymnaeidae				
		Fossaria sp.	pond snail	3	3.1%
	Physidae				
		Physa sp.	pouch snail	9	9.3%
Veneroida					
	Sphaeriidae				
		Pisidium sp.	pill clam	3	3.1%
Decapoda					
	Cambaridae				
		Orconectes sp.	crayfish	1	1.0%
Odonata					
	Aschnidae				
		Aeschna sp.	dragonfly	6	6.2%
	Coenagrionidae				
		Enallagma sp.	damselfly	7	7.2%
		Ischnura sp.	damselfly	14	14.4%
Coleoptera					
	Haliplidae				
		Peltodytes sp.	crawling water beetle	1	1.0%
Diptera					
	Chironomidae				
		Chironomus sp.	midge	1	1.0%
		Natarsia sp.	midge	3	3.1%
		Phaenopsectra obedians gr.	midge	3	3.1%
		Stictochironomus sp.	midge	2	2.1%
		Tanypus sp.	midge	1	1.0%
		Thienemannimyia gr.	midge	12	12.4%
		Total Number of Specimens		97	100.0%
		Total Number of Taxa		19	

TABLE 11
BENTHIC MACROINVERTEBRATE DATA STATION 2

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station SC-2**		
		Sample Date:	10-Jun-05		
		Sample Type:	Kick Net		
Taxon:			**Common Name**	**Number**	**Percent**
Tubificida					
	Tubificidae				
		Bothrioneurum vejdovskyanum	tubeworm	3	2.8%
		Limnodrilus sp.	tubeworm	1	0.9%
Arhyncobdellida					
	Erpobdellidae				
		Mooreobdella sp.	leech	1	0.9%
Basommatophora					
	Physidae				
		Physa sp.	pouch snail	1	0.9%
	Planorbidae				
		poss. *Planorbella sp.* (tent.)	orb snail	1	0.9%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	27	25.5%
Odonata					
	Coenagrionidae				
		Ischnura sp.	damselfly	1	0.9%
Trichoptera					
	Hydropsychidae				
		Cheumatopsyche sp.	caddisfly	17	16.0%
Coleoptera					
	Elmidae				
		Stenelmis crenata gr.	riffle beetle	6	5.7%
Diptera					
	Ceratopogonidae				
		Atrichopogon sp.	biting midge	1	0.9%
	Chironomidae				
		Cryptochironomus fulvus gr.	midge	1	0.9%
		Thienemannimyia gr.	midge	45	42.5%
	Empididae				
		Hemerodromia sp.	dance fly	1	0.9%
		Total Number of Specimens		**106**	100.0%
		Total Number of Taxa		**13**	

TABLE 12
BENTHIC MACROINVERTEBRATE DATA STATION 3

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station SC-3**		
		Sample Date:	10-Jun-05		
		Sample Type:	Kick Net		
Taxon:			**Common Name**	**Number**	**Percent**
Lumbricina					
	Lumbricidae				
		Eiseniella tetraeidra	earthworm	1	6.3%
Basommatophora					
	Physidae				
		Physa sp.	pouch snail	1	6.3%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	3	18.8%
Diptera					
	Chironomidae				
		Orthocladius sp.	midge	4	25.0%
		Thienemannimyia gr.	midge	7	43.8%
		Total Number of Specimens		**16**	100.0%
		Total Number of Taxa		**5**	

TABLE 13
BENTHIC MACROINVERTEBRATE DATA STATION 4

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station SC-4**		
		Sample Date:	10-Jun-05		
		Sample Type:	Kick Net		
Taxon:			**Common Name**	**Number**	**Percent**
Basommatophora					
	Physidae				
		Physa sp.	pouch snail	1	3.6%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	3	10.7%
Trichoptera					
	Hydropsychidae				
		Cheumatopsyche sp.	caddisfly	1	3.6%
Diptera					0.0%
	Chironomidae				
		Ablabesmyia mallochi	midge	1	3.6%
		Orthocladius nigritus	midge	1	3.6%
		Orthocladius sp.	midge	4	14.3%
		Thienemannimyia gr.	midge	17	60.7%
		Total Number of Specimens		**28**	100.0%
		Total Number of Taxa		**7**	

TABLE 14
BENTHIC MACROINVERTEBRATE DATA STATION 5

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		Sample Location:	**Station SC-5**				
		Sample Date:	10-Jun-05				
		Sample Type:	Kick Net				
				SC-5A		**SC-5B**	
Taxon:			**Common Name**	**Number**	**Percent**	**Number**	**Percent**
Lumbricina							
	Lumbricidae		earthworm			1	1.9%
Tubificida							
	Tubificidae						
		Limnodrilus sp.	tubeworm	1	6.3%		0.0%
Mesogastropoda							
	Hydrobiidae						
		poss. *Fontigens sp.* (tent.)	dusky snail			1	1.9%
Basommatophora							
	Lymnaeidae						
		Stagnicola sp.	pond snail			1	1.9%
	Physidae						
		Physa sp.	pouch snail			7	13.2%
	Planorbidae						
		poss. *Planorbella sp.* (tent.)	orb snail			2	3.8%
Ephemeroptera							
	Baetidae						
		Baetis sp.	mayfly	9	56.3%	1	1.9%
Trichoptera							
	Hydropsychidae						
		Cheumatopsyche sp.	caddisfly	1	6.3%	1	1.9%
Coleoptera							
Diptera							
	Chironomidae						
		Ablabesmyia mallochi	midge			7	13.2%
		Chironomus sp.	midge			1	1.9%
		Cricotopus bicinctus	midge			1	1.9%
		Cricotopus/Orthocladius sp.	midge			1	1.9%
		Dicrotendipes sp.	midge			1	1.9%
		Orthocladius sp.	midge			2	3.8%
		Phaenopsectra obedians gr.	midge			6	11.3%
		Polypedilum tritum	midge			4	7.5%
		Thienemannimyia gr.	midge	5	31.3%	14	26.4%
	Tipulidae						
		Limonia sp.	crane fly			1	1.9%
		Limonia canadensis	crane fly			1	1.9%
		Total Number of Specimens		**16**	100.0%	**53**	100.0%
		Total Number of Taxa		**4**		**18**	

TABLE 15
FISH COMMUNITY SURVEY DATA SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Species Observed	Count by Location					*Total Fish*
	SC-STA-1	*SC-STA-2*	*SC-STA-3*	*SC-STA-4*	*SC-STA-5*	
Largescale Stoneroller (*Campostoma oligolepis*)	15	21	2	70	91	199
Eastern Mosquitofish (*Gambusia holbrooki*)	110	2		7		119
Unknown Shiner #2 (*Notropis* spp.)		5	8	62	3	78
Unknown Shiner #1 (*Notropis* spp.)		12	3	23	4	42
Bluespotted Sunfish (*Enneacanthus gloriosus*)	2	18	1	5	1	27
Unknown Shiner #3 (*Notropis* spp.)			7			7
Bluegill (*Lepomis macrochirus*)				6		6
Unknown Shiner (*Cyprinella* sp.)				3	1	4
Creek Chub (*Semotilus atromaculatus*)			1			1
Suckermouth minnow (*Phenacobius mirabilis*)				1		1
Longear Sunfish (*Lepomis megalotis*)					1	1
Black Redhorse (*Moxostoma duquesnei*)					1	1
Yellow Bullhead (*Ameiurus natalis*)					1	1
Total Fish	127	58	22	177	103	487
# Taxa	3	5	6	8	8	
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049

Note: Results of the RP-1 fish survey are intentionally omitted from this table - no fish were observed during 1,700 seconds of shocking in the stormwater retention structure

TABLE 16
WILDLIFE OBSERVATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Common Name	Scientific Name	Observation Location					
		SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	SRS
Birds							
Barn swallow	*Hirundo rustica*	FG	FG	FG		FE	FG
Belted Kingfisher	*Ceryle alcyon*		FL	FL			
Blue jay	*Cyanocitta cristata*	RS					
Brown Thrasher	*Toxostoma rufum*			FG			
Cardinal	*Cardinalis cardinalis*		CA	CA			
Carolina chickadee	*Parus carolinensis*		FG				
Chimmey Swift	*Chaetura pelgica*	FG		FG			FG
Common grackle	*Quiscalus quiscula*	FE	FG		FL		
English house sparrow	*Passer domesticus*		RS			RS	
Gray catbird	*Dumetella carolinensis*		CA	CA			
Mourning dove	*Zenaida macroura*		RS				
Northern mockingbird	*Mimus polyglottos*	CA	CA	CA	CA	CA	
Phoebe	*Sayornis phoebe*		FG				
Red-Tailed Hawk	*Buteo jamaicensis*						FG
Red-winged blackbird	*Agelaius phoeniceus*	CA					CA
Robin	*Turdus migratorius*	CA	FE			CA	
Rock dove	*Columba livia*		FL		FL		
Song sparrow	*Melospiza melodia*		CA				
Starling	*Sturnus vulgaris*	FE	FL	RS	FG	FL	
Tree swallow	*Tachycineta bicolor*	FG	FG	NE			FG
Yellow shafted flicker	*Colaptes auratus*	CA					
Mammals							
Cat	*Felis domestica*		TR				
Dog	*Canis domestica*		TR				
Harvest Mouse	*Reithrodontomys humulis*						FG
Muskrat	*Ondatra zibethica*	FG	DHB		TR		FG
Rat	*Rattus norvegicus*		TR	TR	TR		
Bat		FL					
Herptiles							
Musk turtle	*Sternotherus odoratus*	FG					
Gulf Coast Spiny Softshell	*Apalone spinifera aspera*	FG			OB	OB	
Copperhead	*Agkistrodon contortix*				FG	RS	
Cottonmouth	*Agkistrodon piscivours*	FG					
Amphibians							
American Toad	*Bufo americanus*	OB					
Bull Frog	*Rana catesbeiana*	CA					CA
Green Frog	*Rana clamitans melanota*	CA					
Southern Leopard Frog	*Rana utricularia*	CA					
Southern Two-lined Salamander	*Eurycea cirrigera*				OB		
Crustaceans							
Crayfish		DHB	OB		OB	OB	

Wildlife Observation Codes:

CA=Calling	SC=Scat	CA=Calling	FG=Browse/Forage
FL=Flight	SL=Slide	NE=Nest	DHB=Den, Hut, Burrow
FG=Foraging	TR=Tracks	OB=Observed	
FE=Feeding	DB=Day bed	RS=Resting/Perching	

SRS: Stormwater retention structure

TABLE 17
HABITAT OBSERVATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

	MFES	TGF	LVF	OA	CY	WLF
Primary Habitat	Mowed clover and grass field.	Tall Grass Field	Lespedeza Field	Forested	Clover Field	Mowed field
Cover Type & % Cover	100% vegetation cover	100% vegetation cover	95% Vegetative Cover, with 5% bare areas	90% tree coverage, No habitat present on 10% of the area. Open area 80% vegetated with herbs and grasses.	100% cover by herbs (clover)	100% vegetation cover
Dominant Vegetation, Density & Height	red & white clover		slender bush clover	40' to 50' average canopy height in wooded area. Herb vegetation	White clover, common plaintain, common dandelion, & crabgrass, mowed to 2"-4"	1' to 2' tall field,with a mix of herbs and grasses.
Surrounding Habitats & Land Use	Landfill cap and forested	Landfill cap and forested	Landfill cap and forested	open fields, roads, and buildings	buildings, roads	landfill cap
Indications of Disturbance	recently mowed	Vehicle tracks observed.	routinely mowed		routinely mowed	periodic mowing
Other observations	No signs of burrows runs or trails.	No signs of non-avian wildlife were observed.	No signs of non-avian wildlife were observed.	Much of the ground is covered by filter fabric which will limit burrowing. Shrub layer has been removed and trails and picnic tables present. 2" diameter burrows were noted in an intermitent stream corridor are a possible armadillo dig area, a nest (potentially squirrel) in a tree was observed.	No signs of non-avian wildlife were observed.	No signs of non-avian wildlife were observed.

TABLE 18
VEGETATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

		South Landfill (SL)			Open Area	Maintained Facility	West End Landfill
		MFES	TGF	LVF	SMF	CY	WLF
Grasses & Herbs							
bermuda grass	*Cynodon dactylon*					X	
catbrier	*Smilax glauca*		X				
common cinquefoil	*Potentilla simplex*	X	X				
common dandelion	*Taraxacum officinale*					X	
common plaintain	*Plantago major*					X	X
crabgrass (spp)	*Digitaria spp.*		X		X	X	
curled dock	*Rumex crispus*		X	X			
daisy fleabane	*Erigeron annus*	X	X				X
dogbane	*Apocynum cannabinum*	X	X				
English plantain	*Plantago lanceolata*	X					
evening primrose	*Oenothera biennis*						X
goldenrod, spp.	*Solidago spp.*						X
grass (spp)	Various species		X				
little bluestem	*Schizachyrium scoparium*						X
oat (spp)	Various species		X				
pokeweed	*Phytolacca americana*		X				
Queen Anne's lace	*Daucus carota*						X
red clover	*Trifolium pratense*	X	X				X
silkgrass	*Pityopsis spp.*				X		
slender bush clover	*Lespedeza virginica*			X			X
sweet yellow clover	*Melilotus officinalis*						X
upland boneset	*Eupatorium sessilifolium*						X
white clover	*Trifolium repens*	X	X		X	X	X
Vines							
dewberry	*Rubus flagellaris*				X		
dwarf raspberry	*Rubus articus*			X			
poison ivy	*Toxicodendron radicans*				X		
trumpet creeper	*Campsis radicans*		X				X
Virginia creeper	*Parthenocissus quinquefolia*				X		
Shrubs							
privet	*Ligustrum vulgare*				X		
shrubby cinquefoil	*Potentilla fruticosa*			X			
Trees							
silk/mimosa tree	*Albizia julibrissin*	X					X
pecan	*Carya Illinoinensis*				X		
sweetgum	*Liquidambar styraciflua*				X		
tree of heaven	*Ailanthus altissima*				X		
turkey oak	*Quercus laevis*				X		
wild black cherry	*Prunus serotina*				X		X
willow oak	*Quercus phellos*				X		

TABLE 19
TERRESTRIAL INVERTEBRATES SUMMARY

CREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SI
ANNISTON PCB SITE, ANNISTON, ALABAMA

Family	Common Name	Number of Individuals
South Landfill (SL)		
Acrididae	Short-Horned Grasshoppers	29
Anisopodidae	Wood Gnats	3
Braconidae	Braconids	1
Carabidae	Ground Beetles	1
Cecidomyiidae	Gall Gnats	2
Cephidae	Stem Sawflies	2
Chrysomelidae	Leaf Beetles	8
Chrysopidae	Green Lacewings	1
Cynipidae	Cynipids	1
Flea unidentified[1]	Flea - unspecified	1
Formicidae	Ants	3
Gryllacrididae	Camel Crickets	4
Gryllidae	Crickets	53
Hemiptera nymph unidentified[1]	Bugs - unspecified	1
Hydrometridae	Water Measurers	1
Hydropsychidae	Net-Spinning Caddisflies	2
Hymenopteran nymph unidentified[1]	Sawflies/Ants/Wasps/Bees/Chalcids - unspecified larvae	1
Lepidopteran unidentified[1]	Butterflies/Moths - unspecified	8
Millipede unidentified[1]	Millipede	1
Miridae	Leaf/Plant Bugs	4
Nabidae	Damsel Bugs	1
Oligochaeta	Oligochaete	4
Phloeothripidae	Tube-Tailed Thrips	1
Rhopalidae	Scentless Plant Bugs	1
Saldidae	Shore Bugs	9
Simuliidae	Black Flies	7
Sphecidae	Sphecid Wasps	2
Spider	Spider	2
Spider unidentified[1]	Spider	2
Tick unidentified[1]	Tick	1
Tingidae	Lace Bugs	3
Wolf spider	Spider	3
West End Landfill (WEL)		
Acrididae	Short-Horned Grasshoppers	6
Chrysomelidae	Leaf Beetles	1
Coccinellidae	Ladybird Beetles	2
Dipteran nymph unidentified[1]	Fly nymph - unspecified	1
Dytiscidae	Prdeaceous Diving Beetles	3
Mantidae	Mantids	3
Membracidae	Treehoppers	2
Millipede unidentified[1]		1
Oligochaeta	Oligochaete	3
Pulicidae	Common Flea	1
Saldidae	Shore Bugs	8
Spider unidentified[1]	Spider	1
Open Area (OA)		
Cerambycidae	Long-Horned Beetles	2
Dipteran nymph unidentified[1]	Fly nymph - unspecified	1
Formicidae	Ants	1
Gryllidae	Crickets	2
Mantidae	Mantids	1
Simuliidae	Black Flies	3
Spider unidentified[1]	Spider	1
Maintained Facility (MFG)		
Chironomidae	Midges	2
Coleopteran larvae unidentified[1]	Beetle larvae - unspecified	1
Dytiscidae	Prdeaceous Diving Beetles	1
Oligochaeta	Oligochaete	7

Notes:
[1] Organisms listed as "unidentified" could not be identified in the field with the available microscope, investigators needed higher power lens to see body parts.

TABLE 20
WILDLIFE OBSERVATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Common Name	Scientific Name	Observation Location					
		South Landfill (SF)			Maintained Facility		West End Landfill
		MFES	TGF	LVF	SMF	CY	WLF
Birds							
Barn swallow	*Hirundo rustica*	FG		FL			
Belted Kingfisher	*Ceryle alcyon*						
Blue jay	*Cyanocitta cristata*	RS					
brown headed cowbird	*Molothrus ater*			OB			
Brown Thrasher	*Toxostoma rufum*						
Cardinal	*Carlinalis cardinalis*	FL					
Carolina chickadee	*Parus carolinensis*						
Chimney Swift	*Chaetura pelgica*			FL			
Common grackle	*Quiscalus quiscula*						
English house sparrow	*Passer domesticus*						
Gray catbird	*Dumetella carolinensis*						
Indigo bunting	*Passerina cyanea*	FL/ RS					
Meadowlark	*Sturnella magna*					RS	RS
Mourning dove	*Zenaida macroura*	RS	FL			RS	
Northern mockingbird	*Minus polyglottos*	FL/ RS					
Phoebe	*Sayornis phoebe*						
Red-Tailed Hawk	*Buteo jamaicensis*	FL (immature)					
Red-winged blackbird	*Agelaius phoeniceus*		FL	FE			
Robin	*Turdus migratorius*						
Rock dove	*Columba livia*						
Song sparrow	*Melospiza melodia*						
Sparrow Hawk (Kestrel)	*Falco sparverius*		FG/ FL	FE			
Starling	*Sturnus vulgaris*						
Summer Tanager	*Piranga rubra*	RS	FL				
Tree swallow	*Tachycineta bicolor*						
Yellow shafted flicker	*Colaptes auratus*						
Mammals							
Armadillo	*Dasypus novemcinctus*				DHB		
Chipmunk	*Tamias striatus*				DHB		
Deer (spp)		TR					
Squirrel (spp?)					DHB		
Herptiles							
none observed							
Amphibians							
none observed							
Crustaceans							
none observed							

Wildlife Observation Codes:

CA=Calling	SC=Scat	CA=Calling	FG=Browse/Forage
FL=Flight	SL=Slide	NE=Nest	DHB=Den, Hut, Burrow
FG=Foraging	TR=Tracks	OB=Observed	
FE=Feeding	DB=Day be	RS=Resting/Perching	

TABLE 21
EXPOSURE PATHWAY ASSESSMENT

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Operable Units OU-1/OU-2						
Receptor Group	**Representative Species**	**Exposure Pathways [(a)]**	**Spatial Scale**	**Temporal Scale**	**Eliminated as Receptor?**	**Rationale for Elimination**
Aquatic invertebrates	Various freshwater taxa	Potentially complete: ingestion of and dermal contact with sediment	Snow Creek and stormwater retention structure substrates	Year-round with seasonal fluctuations	No	NA
Terrestrial invertebrates	Various taxa	Incomplete	Limited to areas above creek bank	Year-round with seasonal fluctuations	Yes	Limited habitat and generally low habitat quality
Omnivorous fish	Suckers; minnows	Potentially complete: diet, maternal transfer, dermal contact with sediment	Snow Creek only; no fish in stormwater retention structure	Year-round with seasonal fluctuations and spawning in the spring	No	NA
Predatory fish	Largemouth bass	Not Applicable	Not present in Snow Creek or in stormwater retention structure	Not Applicable	Yes	Predatory fish not present in Snow Creek; limited to warmwater species tolerant of low dissolved oxygen
Reptiles/amphibians	Various turtle and frog species	Potentially complete: diet, maternal transfer, dermal contact with sediment	Snow Creek and stormwater retention structure	Year round with seasonal abundance in spring, summer and fall	No	NA
Invertivorous birds	Passerines	Incomplete	Snow Creek and stormwater retention structure substrates; but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Low habitat quality (see results of KPM); low population densities using only small isolated patches of fragmented habitat that borders creek
Omnivorous birds	Pheasants, ducks, geese	Incomplete	Wooded areas and shallow vegetated pools or reaches in Snow Creek and along shore of retention structure	Spring, summer, and fall	Yes	Habitat limited or poor; lower potential for exposure than insectivorous or piscivorous birds; populations actively managed
Piscivorous birds	Great blue heron; kingfisher	Incomplete	Calhoun County; Snow Creek, but with habitat constraints (see Rationale)	Spring, summer, and fall	Yes	Low habitat quality (see results of KPM); low population densities using only small isolated patches of fragmented habitat that borders creek; large home and forage range
Carnivorous birds	Bald eagle, hawks, falcons, owls	Incomplete	Calhoun County but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Habitat limited or poor (see results of KPM); lower potential for exposure than piscivorous birds; large home ranges; low population densities
Invertivorous mammals	White footed mouse; shrew	Incomplete	Terrestrial borders of Snow Creek	Spring, summer, and fall	Yes	Restricted to terrestrial habitats above Snow Creek bank; lower potential of exposure to sediments - diet from terrestrial invertebrates
Omnivorous mammals	Martens, fishers, raccoons	Incomplete	Terrestrial and riparian wooded borders of Snow Creek and stormwater retention structure	Year-round with seasonal fluctuations; spring kits	Yes	Habitat limited or poor (see results of KPM); lower potential for exposure than piscivorous mammals; large home ranges; low population densities
Piscivorous mammals	River otter; mink	Incomplete	Choccolocco Creek Valley and catchment area; Snow Creek, but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations; spring kits	Yes	Suitable habitat not present; highly fragmented by bordering land uses, roads, rails; fish community (as food source) limited to small popualtions of tolerant species
Carnivorous mammals	Long-tailed weasel, ermine	Incomplete	Terrestrial and riparian wooded borders of Snow Creek and stormwater retention structure	Year-round with seasonal fluctuations	Yes	Lower potential for exposure than piscivorous mammals; large home ranges; low population densities

TABLE 21
EXPOSURE PATHWAY ASSESSMENT

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE
ANNISTON PCB SITE, ANNISTON, ALABAMA

Operable Unit OU-3						
Receptor Group	**Representative Species**	**Exposure Pathways [(a)]**	**Spatial Scale**	**Temporal Scale**	**Eliminated as Receptor?**	**Rationale for Elimination**
Terrestrial invertebrates	Various taxa	Incomplete	Limited to tall grasses in successional old field surface of landfill caps; open area	Dependent on successional stage development; frequent maintainance disturbs seasonal succession of habitat and establishment of invertebrate communities	Yes	Poor habitat quality (see results of KPM); compaction of soil habitat truncates exposure to contaminants; frequent disturbance of landfill cap surfaces by bushhogging; mowing, etc.; open area is isolated and bordered by fence and maintained grounds or impervious layers.
Invertivorous birds	Passerines	Incomplete	Potentially all areas; but with habitat constraints (see Rationale)	Year-round with seasonal changes in abundance	Yes	Poor habitat quality (see results of KPM); cover and perch sites minimal or absent; terrestrial invertebrates low potential of exposed to PCBs so not contaminated food source
Omnivorous birds	Pheasants, geese	Incomplete	Wooded areas	Spring, summer, and fall	Yes	Habitat (cover) extremely limited or poor; lower potential for exposure than insectivorous birds; populations actively managed
Carnivorous birds	Bald eagle, hawks, falcons, owls	Incomplete	Calhoun County but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Habitat limited or poor (see results of KPM); large home ranges; low population densities and low prey density (see invertivorous mammals)
Invertivorous mammals	White footed mouse, shrew	Incomplete	Potentially all areas; but with habitat or access constraints (see Rationale)	Year-round with seasonal changes in abundance	Yes	Poor habitat quality. Mammals not observed by sight, track, burrows or other means during survey work. Most areas fenced in making access to habitats difficult. Fabric on landfill is barrier to burrowing. Terrestrial invertebrates low potential of exposure to PCBs so not contaminated food source
Omnivorous mammals	Martens, fishers, raccoons	Incomplete	Mainly wooded areas	Year-round with seasonal fluctuations; spring kits	Yes	Habitat limited or poor (see results of KPM); most areas fenced in making access to habitats difficult; large home ranges; low population densities
Carnivorous mammals	Long-tailed weasel, ermine	Incomplete	Mainly wooded areas	Year-round with seasonal fluctuations	Yes	Most areas fenced in making access to habitats difficult; large home ranges; low population densities

Note:

1. This table lists the most important exposure pathways for each receptor group. Certain exposure pathways are not listed because they would not contribute appreciably to exposure. These include inhalation, plant uptake by herbivores, and gill transfer in fish.
2. Potentially complete exposure pathways are highlighted.