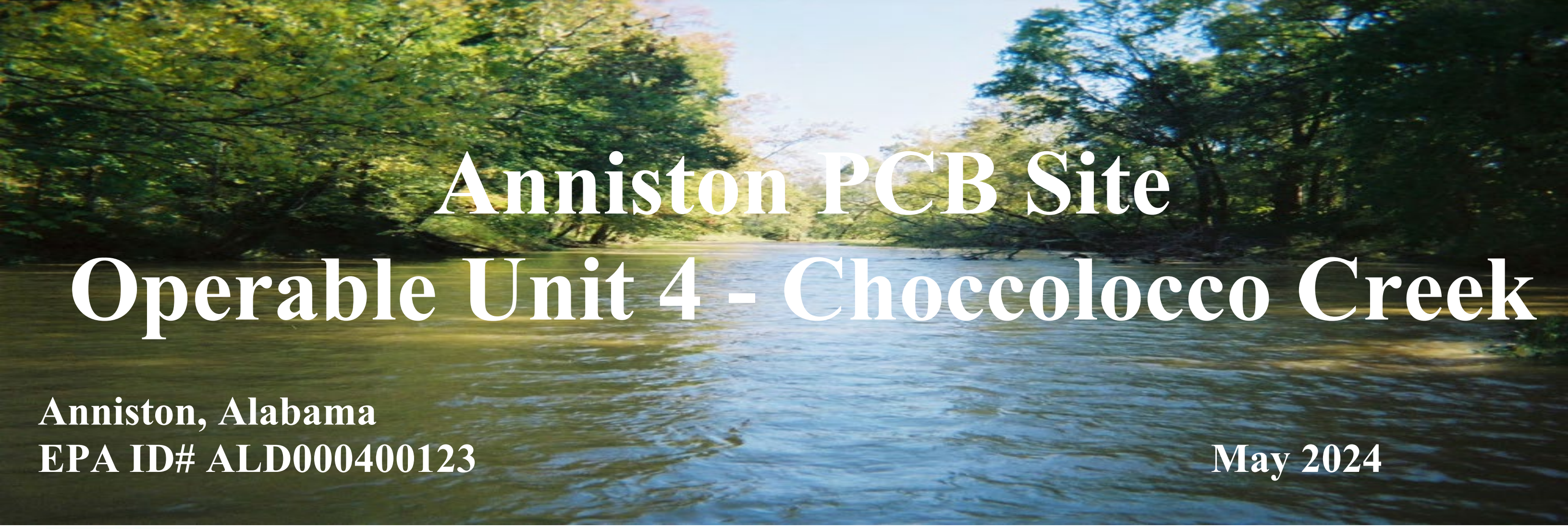

Anniston PCB Site
Operable Unit 4 - Choccolocco Creek

Anniston, Alabama
EPA ID# ALD000400123

May 2024

Superfund Proposed Plan

U.S. Environmental Protection Agency, Region 4

EPA Announces Proposed Plan

The United States Environmental Protection Agency (the EPA) invites comments on the Proposed Plan to address contaminated soil, sediment, surface water and biota in Operable Unit 4 (OU4, Choccolocco Creek) of the Anniston PCB Site (the Site), located in Anniston, Calhoun County, Alabama (Figure 1). OU4 includes Snow Creek and its floodplain downstream of Highway 78 to the confluence of Snow and Choccolocco Creeks, and Choccolocco Creek from the backwater area upstream of Snow Creek to the embayment of Lake Logan Martin on the Coosa River.

WE WANT YOUR INPUT!

Public comment period: June 1, 2024, to July 30, 2024

During the comment period, the EPA is accepting comments on this Proposed Plan, as well as the supporting documents, including the Remedial Investigation, the Feasibility Study, and human health and ecological risk assessments. Mail or email comments to:

Pam Scully
U.S.EPA Region 4
61 Forsyth Street, SW
Atlanta. Georgia 30303
scully.pam@epa.gov

Angela Miller
U.S.EPA Region 4
61 Forsyth Street, SW
Atlanta. Georgia 30303
miller.angela@epa.gov

Mark your calendars!

The EPA is hosting two public meetings to present this Proposed Plan and accept public comment:

6-8 pm Tuesday, June 18, 2024, Oxford Civic Center, 401 McCullars Lane, Oxford, Alabama
6-8 pm Tuesday, July 23, 2024, Oxford Civic Center, 401 McCullars Lane, Oxford, Alabama

The EPA will also host public availability sessions to help the community understand the Proposed Plan:

10am - 2 pm Saturday, June 22, 2024, Anniston Meeting Center, 1615 Noble St, Anniston, Alabama
10am – 2 pm Saturday, July 20, 2024, Lincoln City Center, 140 Jones Street, Lincoln, Alabama

This Proposed Plan identifies the EPA's Preferred Alternative for cleaning up contamination in OU 4 and provides the rationale for the EPA's preference. This Proposed Plan also summarizes background information about the Site, the nature and extent of contamination in OU4, the assessment of human health and environmental risks posed by contaminants, and the identification and evaluation of remedial action alternatives for OU4.

This Proposed Plan is consistent with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Section 300.430(f)(2) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 117(a). Supporting documents including the Remedial Investigation/Feasibility Study (RI/FS) and FS Addendum are included in the Site Administrative Record. Community members can access the Administrative Record containing all documents that support this Proposed Plan on computers located at the following locations:

- Calhoun County Public Library West 10th Street, Anniston, Alabama. Hours: Tue-Fri 8:30am to 6pm; Sat-Sun 1:30pm to 5pm.
- Carver Branch of the Calhoun County Public Library West 14th Street, Anniston, Alabama. Hours: Tue-Thu 12:30am to 5pm. Fri-Mon closed.
- Oxford Public Library, 110 E 6th St, Oxford, Alabama. Hours: Mon-Fri 9am to 5pm; Sat 9am to 1pm; Sun, 1pm to 5pm.
- Lincoln Public Library, 47475 US-78, Lincoln, Alabama. Hours: Mon-Fri, 8am to 6pm; Sat. 9am to 12pm; Sun, closed.

These documents can be found at the EPA website, https://www.epa.gov/superfund/anniston-pcb-site.

At this Site, the EPA is the lead agency, and the Alabama Department of Environmental Management (ADEM) is the support agency. The EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted at the Site. The EPA and ADEM want to hear your views about this Proposed Plan and all the alternatives presented. You can provide comments on the Proposed Plan at the public meeting on June 18, 2024, at 6:00 pm at the Oxford Civic Center located at 401 McCullars Lane in Oxford, Alabama, or at the public meeting on July 23, 2024, at 6:00 pm at the Oxford Civic Center located at 401 McCullars Lane in Oxford, Alabama. Comments can also be submitted through the mail to Pam Scully, U.S.EPA Region 4, 61 Forsyth Street, SW, Atlanta, Georgia 30303 or through email to scully.pam@epa.gov.

An extended 60-day comment period has been approved at the request of the Site's Community Advisory Group (CAG). The comment period begins on June 1, 2024, and ends on July 30, 2024. The EPA, in consultation with ADEM, will select the remedy to address contamination in OU4 after reviewing and considering all information and comments received during the public comment period. The EPA, in consultation with ADEM, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on the alternatives presented in this Proposed Plan.

The Site is a Superfund Alternative Approach (SAA) site. A SAA site is a site that needs a remedial action, and where site contaminants are significant enough that the site is eligible for, but not listed on, the National Priorities List (NPL). SAA sites must also have cooperative financially viable and technically capable potentially responsible parties (PRPs) that are willing to perform the cleanup work under a settlement agreement with the EPA. The EPA anticipates entering a Consent Decree (CD) with the PRPs, Pharmacia LLC and Solutia Inc., for performance of the selected remedy.

The Site has been divided into several OUs based on geographic location and complexity (Figure 1). OU3 includes the facility and two adjacent landfills located at 702 Clydesdale Avenue, Anniston, Alabama. OU1/OU2 is a combination of residential and non-residential properties around the facility and downstream along Snow Creek and its floodplain to Highway 78. OU4 is the subject of this Proposed Plan and includes Snow Creek and its floodplain downstream of Highway 78 to the confluence of Snow and Choccolocco Creeks, and Choccolocco Creek from the backwater area upstream of Snow Creek to the embayment of Lake Logan Martin on the Coosa River.

The Preferred Alternative for OU4 will control sources of contamination and reduce current and potential future risks from exposure to polychlorinated biphenyls (PCB) concentrations in soil, sediment, surface water and biota. The Preferred Alternative includes the following: excavating floodplain soil and backfilling with clean fill; dredging sediment and replacing with a layer of clean fill; stabilizing creek bank soil; monitored natural recovery of sediment; and reducing PCB concentrations in surface water to levels that will be protective of human health and the environment. A conservation corridor and other institutional controls, along with implementation of a Soil Management Plan will prevent future PCB exposures.

Lead contamination in soil on residential properties in the same general area as the Anniston PCB Site is part of the Anniston Lead Site and is not part of this Proposed Plan.

Community Role in the Remedy Selection Process

This Proposed Plan is being issued to inform the public of the EPA's Preferred Alternative and to solicit public comments. The Proposed Plan can be found at the EPA website, https://www.epa.gov/superfund/anniston-pcb-site.

The EPA will select an OU4 remedy after reviewing and considering all information submitted during the public comment period. The public comment period for this Proposed Plan starts on June 1, 2024, and ends on July 30, 2024. The EPA will hold public meetings during the comment period to present information regarding the investigations conducted, the remedial alternatives considered, and the Preferred Alternative. The EPA will answer questions from the public, as well as receive public comments. Additional information on the public meetings and process for submitting written comments can be found on page one (1) of this Proposed Plan. Comments received at the public meetings, as well as written comments received during the public comment period, will be documented in the Responsiveness Summary in the Record of Decision (ROD). The ROD is the document that selects the remedy and provides the EPA's basis for selecting the remedy.

Site Background

As previously mentioned, the primary source of contamination under investigation is a chemical manufacturing facility (the facility) located at 702 Clydesdale Avenue, Anniston, Alabama. The facility is currently active. Manufacturing operations began at the facility in 1917 with the production of ferro-manganese, ferro-silicon, and ferro-phosphorus compounds, and later phosphoric acid by the Southern Manganese Corporation. In 1927, the production of organic chemicals began at this location with the introduction of biphenyl, which remains a major product of the facility. PCB production began in 1929. In 1930, Southern Manganese Corporation became Swann Chemical Company. Monsanto Company purchased Swann Chemical Company in 1935. Monsanto Company created Solutia Inc. as a separate company in 1997 to manage the facility in Anniston. In 2012, Solutia Inc. was merged into Eastman Chemical Company. Today, Solutia Inc.is a wholly owned subsidiary of Eastman Chemical Company.

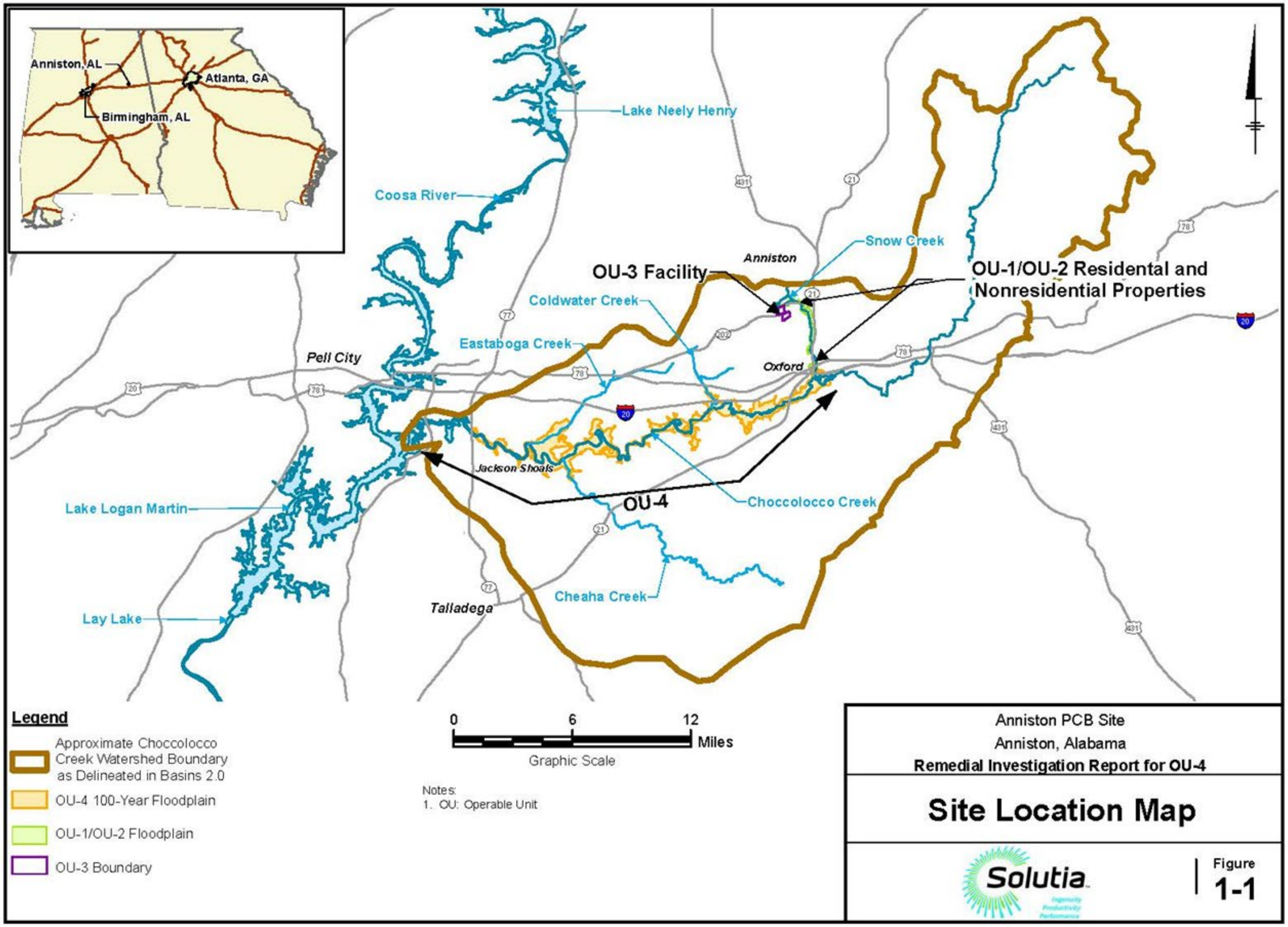

Figure 1. Anniston PCB Site Location Map

A variety of organic and inorganic chemicals have been produced at the facility during its history, including PCBs, parathion, phosphorus pentasulfide, and 4-nitrophenol [also known as para-nitrophenol (PNP)]. PCBs were manufactured from 1929 through 1971. The facility currently manufactures polyphenyl compounds (utilized in a variety of heat transfer fluid, plasticizer, and lubricant applications). In addition, the manufacture of phosphate ester-based non-flammable hydraulic fluids commenced at the facility in 2006.

Regulatory History

The facility is currently operated in accordance with a variety of permits issued under provisions of the Clean Air Act (CAA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), and their state counterparts. There have been several investigations and corrective measures taken over the years to reduce environmental impacts from the facility.

Under CERCLA, the EPA negotiated a Partial Consent Decree (PCD) with Pharmacia LLC and Solutia Inc., to manage corporate liability from PCB contamination, to investigate PCB contamination and investigate any other contamination that may have been released from the facility. The United States District Court for the Northern District of Alabama (the Court) entered the PCD on August 4, 2003. On July 6, 2006, the United States and P/S entered into a Stipulation and Agreement clarifying the PCD.

On September 29, 2011, the EPA signed an Interim Record of Decision (IROD) for OU3 (the facility). P/S agreed to implement the requirements of the IROD in a Remedial Design (RD)/Remedial Action (RA) CD that was approved by the Court on April 17, 2013. On November 8, 2017, the EPA signed a ROD for OU1/OU2 (residential and non-residential properties along Snow Creek). P/S and MRC Corporation (MRC) agreed to implement the requirements of the ROD in two CDs, one with MRC entered by the Court on December 16, 2019, and another with P/S entered by the Court on March 26, 2021.

Previous Response Actions on Residential Properties in OU4

In 2000, a time critical removal action (TCRA) was initiated to address soil contaminated with PCB concentrations greater than 10 mg/kg on residential properties. In 2004, an Action Memorandum for a non-time critical removal action (NTCRA) selected excavation and disposal of PCB contaminated surface soil (0 to 12 inches below ground surface [bgs]) at or above 1 milligram per kilogram (mg/kg) and PCB contaminated subsurface soil (greater than 12 inches bgs) at or above 10 mg/kg on residential properties. Soil with PCB concentrations less than 10 mg/kg was disposed at one of the two soil management areas located near the facility (i.e., central soil staging management area or south soil staging management area). Soil with PCB concentrations greater than 10 mg/kg was disposed offsite at an EPA approved permitted facility.

Most of the residential cleanup was performed in areas around the facility and along Snow Creek. OU4 is significantly less developed and includes more open space and far fewer residential areas than upstream areas (i.e., OU1/OU2).

In total, 59 residential properties were sampled for PCBs in surface soil in OU4. A total of 20 of the 59 properties sampled contained PCB concentrations at or above 1 mg/kg and were targeted for cleanup under the NTCRA. The EPA oversaw the excavation of soil from 19 of the residential properties. One property owner denied access, so there is one remaining residential property that has PCBs in soil above 1 mg/kg in OU4 that will be addressed by this proposed action.

Previous Response Actions on Non-residential Properties in OU4

Response actions have been implemented under RCRA and CERCLA authority to reduce exposure to PCBs in surface soil and potential migration of PCBs from non-residential areas of OU4. The actions include RCRA Final Corrective Measures, RCRA Interim Measures (IMs), and infrastructure improvement support activities. Generally, cleanups finalized under the RCRA corrective action (i.e., final corrective measures) will substantively satisfy the requirements of both RCRA and CERCLA programs. The protectiveness of the IMs needs to be finalized under CERCLA. PCB concentrations found in the dredge spoil IM areas of the Choccolocco Creek floodplains and PCBs remaining after implementation of infrastructure improvement support projects overseen under an additional work clause in the 2001 TCRA in the Snow Creek and Choccolocco Creek floodplains were evaluated as part of the non-residential soil investigation in OU4.

The locations of response actions previously taken in OU4 are shown on Figure 2 and are described below:

RCRA Authority – Final Corrective Measures:

- Highway 21 Bridge; and

  Final corrective measures were implemented to address PCB contaminated soil prior to Alabama Department of Transportation (ALDOT) construction of a bridge replacement at State Highway 21 and Choccolocco Creek, located in both Talladega and Calhoun Counties, Alabama. ADEM approved onsite containment and isolation (by capping) of soil with PCB concentrations between 1 and 50 mg/kg and excavation and offsite disposal of soil with PCB concentrations greater than or equal to 50 mg/kg. Support included sampling and analyses of soil and sediment prior to construction in the proposed excavation footprints to characterize PCB concentrations. A deed notice and associated survey plats, providing for the long-term monitoring and maintenance of the controls, were filed with Calhoun and Talladega Counties as required by the RCRA Permit. Corrective measures effectiveness reports are submitted annually to ADEM to document continued monitoring and maintenance.

- Choccolocco Creek Wastewater Treatment Plant (CCWWTP) Soil Stockpile.

  A final corrective measure was implemented to address a soil stockpile with PCBs located at the CCWWTP in Oxford, Calhoun County, Alabama. The stockpile contained soil excavated from the floodplain of Snow Creek during the construction of detention basins at the CCWWTP. The stockpile was relocated in a final corrective measure to a 16-acre parcel located to the east of Snow Creek. The EPA's Toxic Substances Control Act (TSCA) program approved the plan to place a cap over materials with PCB concentrations greater than or equal to 50 mg/kg, under Section 6(e) of TSCA and the PCB regulations provided in 40 CFR Section 761.61(c). The approval specifically noted that the PCB concentrations ranged from non-detect to approximately 200 mg/kg but averaged less than 50 mg/kg. A deed restriction was filed outlining the site conditions, appropriate site restrictions, and an as-built survey that indicates the location of the cover system with respect to survey benchmarks. Long-term monitoring is conducted in accordance with the Comprehensive Operations and Maintenance Plan for Remedial/Corrective Action Projects. The monitoring consists of inspecting the final corrective measure (monthly and following significant storm events) with maintenance conducted as needed based on the findings of the inspections. Annual effectiveness reports are submitted to ADEM summarizing inspection and maintenance activities and documenting the effectiveness of the final corrective measure.

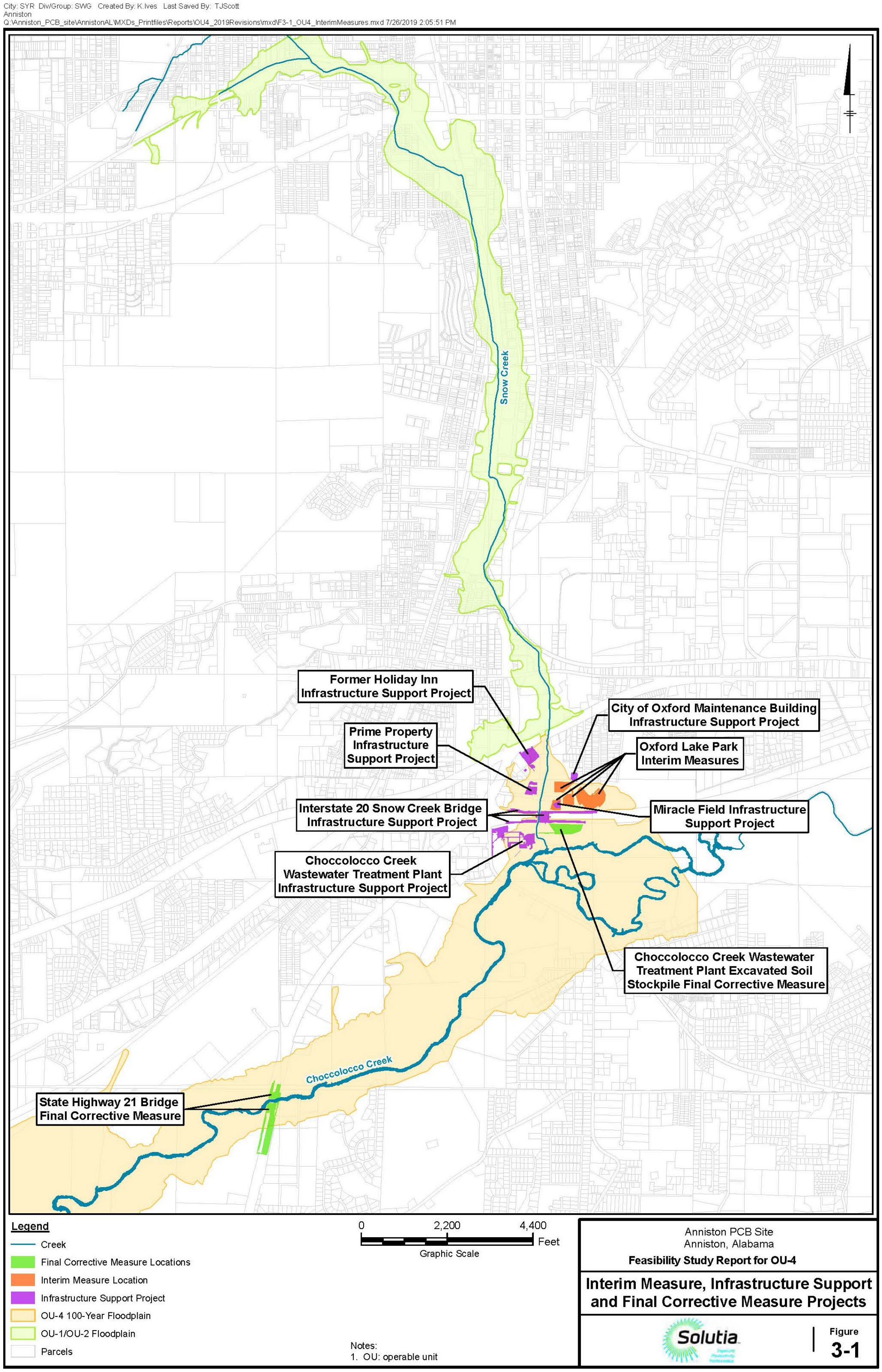

Figure 2. Corrective Measures, Interim Measures, and Infrastructure Support Projects

RCRA Authority – Interim Measures:

- Oxford Lake Park (OLP) (including softball complex, softball field's parking lot; tennis court complex, and southwest portion of the park) - IMs were implemented to address PCB contaminated soil at the Oxford Lake Park located in Oxford, Alabama. The objectives of these improvements were to mitigate potential exposure to contaminated soil and to control erosion and transport of PCB contaminated soil.
  - PCB contaminated surface soil was removed from three softball fields (Fields A, C, and D) and replaced with clean fill and vegetation as needed.
  - Excavated soil with PCB concentrations less than 50 mg/kg were capped for use as a parking lot in the western portion of the park complex.
  - The constructed tennis court complex IM covers approximately 2 acres and includes 8 tennis courts, an adjacent parking lot, and a small utility building in the parking lot. The IM at the tennis court complex and an adjacent parking lot included covering PCB contaminated soil beneath with a soil cover and asphalt to facilitate the intended end uses. As part of the IM, minor soil excavations were conducted to facilitate installation of posts for lighting and the tennis court nets. Sampling indicated that the excavated soil had PCB concentrations below 50 mg/kg.
  - A 1.8-acre area in the southwestern portion of the park complex, south of Recreation Drive and west of the softball field parking lot, was covered with geotextile fabric, compacted fill, and vegetated topsoil. The Miracle Field was later constructed as an infrastructure improvement project over a portion of the 1.8-acre soil cover as described below.

- Choccolocco Creek Dredge Spoil Areas (DSAs).

  Between 1990 and 1994, the National Resources Conservation Service (NRCS) implemented flood protection measures, including dredging sediment to improve stream flows along Choccolocco Creek near Oxford, Alabama. Dredge spoils from Choccolocco Creek were deposited in existing depressions or areas above grade and near the creek. These dredge spoils were stabilized and covered with topsoil and a vegetative cover. Nineteen dredge spoil deposition areas were identified along the banks of Choccolocco Creek between its confluence with Snow Creek and Coldwater Creek. Reconnaissance during the RI found 18 of the 19 dredge spoil areas had a well-established vegetative cover, and no evidence of slumping or instability issues. One area had been deliberately disturbed to create a drainage swale but was appropriately addressed with the property owner by the Land Trust, which holds a conservation easement on the property.

Infrastructure Improvement Project Support:

Several property owners performed infrastructure improvement projects in the floodplain that required the PRPs involvement to ensure PCB impacted soil was handled and disposed of appropriately. Those projects include:

- Lighting and drainage upgrades to the Oxford Lake Softball Complex;
- Construction of a Miracle Field over an IM cover;
- Treatment system upgrades at the Choccolocco Creek Wastewater Treatment Plant (CCWWTP);
- Foundation improvements at a parcel owned by Prime Properties, LLC;
- Widening and bridge construction of I-20;
- Parcel improvements for the former Holiday Inn property; and
- Parcel improvements for the City of Oxford to construct a maintenance garage at OLP.

Site Characteristics

The climate in OU4 is characterized as humid and subtropical, with hot summers, mild winters, and some precipitation during each month of the year. Rainfall is the primary form of precipitation, with an average of 54 inches per year, the majority of which occurs during winter. Droughts are infrequent, and the average annual evapotranspiration rate in the area is approximately 42 inches.

In the coming decades, Anniston, Alabama is predicted to become warmer and is likely to experience more severe floods and drought. Soil has become drier, annual rainfall has increased in most of Alabama, and more rain arrives in heavy downpours. The state is expected to experience increased damages from tropical storms.[1]

OU4 is in Calhoun and Talladega Counties, Alabama. The geology of this area is characterized by folds and thrust faults. Thrust faults are the dominant structural features in this province. A variety of native materials, including soil ranging from clays to gravels as well as areas in contact with bedrock, comprise the bed of the Choccolocco Creek basin. The Choccolocco Creek-Lake Logan Martin watershed consists of unconsolidated Quaternary and Tertiary fluvial deposits and a weathered bedrock residuum, forming a mantle over the Paleozoic stratigraphy in much of the watershed. The fluvial deposit consists of a mix of gravel, silt, and clay and extends to a thickness of up to 100 feet. The bedrock residuum is comprised of mixed residual clay and chert boulders and fragments ranging in thickness from 30 to 100 feet, where present.

OU4 is defined by the boundaries of Choccolocco Creek and the adjacent 100-year floodplain, (a small portion of Snow Creek and its floodplain are also part of OU4). The flow of Choccolocco Creek is generally near the centerline of the 100-year floodplain. Site-specific hydraulic modeling was used to set the initial floodplain location, and subsequent refinements (expansions) of the floodplain were developed using topographic information from the National Elevation Data Set published by the U.S. Geological Survey (USGS) in 2009. The project footprint for the 100-year floodplain is larger than the 100-year floodplain developed by the Federal Emergency Management Agency (FEMA) in several locations. The decision to modify the floodplain was based on the site-specific hydraulic modeling that resulted in a more comprehensive and conservative approach to the floodplain.

The major aquifers within or near OU4 are limestones and dolomites. Rainfall is the principal source of recharge to aquifers in OU4. The estimate for aquifer recharge in the area is about five (5) inches per year. Groundwater within the shallow residuum generally occurs under unconfined conditions beneath Choccolocco Creek, and potentiometric data from the Choccolocco Creek watershed indicate that Choccolocco Creek is a gaining stream, with groundwater discharging into the creek.

Several springs have been identified and located within and near OU4. Coldwater Spring is west of the City of Oxford, approximately one mile north of Interstate 20, and is the primary water source for the City of Anniston, and other municipalities and communities within Calhoun County. The City of Oxford currently relies on groundwater as its primary water source and operates five production wells. Additional public supply wells are located throughout Talladega County, near the 100-year floodplain of Choccolocco Creek. Locations of identified springs, public water supply wells, and the OU4 RI wells are depicted on Figure 3. In addition, Figure 3 shows the active groundwater investigation wells in the OU1/OU2 and OU4 portions of the Site as well as the locations of two private water supply wells that were sampled as part of the OU4 investigation.

[1] USEPA 2016, EPA 430-F-16-003, What Climate Change Means for Alabama.

Snow Creek discharges to Choccolocco Creek at a point 37 miles upstream from where Choccolocco Creek discharges to the Coosa River. The lower 4 to 5 miles of Choccolocco Creek are affected by the impoundment of Lake Logan Martin. The confluence of Snow Creek and Choccolocco Creek occurs at the midpoint of the Choccolocco watershed (which drains an area of 222 square miles at the confluence with Snow Creek, and 502 square miles at Lake Logan Martin). Average daily flow increases from 274 cfs at the confluence with Snow Creek to 715 cfs at the confluence with Lake Logan Martin. Other major tributaries in the Choccolocco Creek watershed include Cottagula, Shoal, Jackson, and Hillabee creeks upstream of Snow Creek, and Coldwater, Salt, Eastaboga, and Cheaha creeks downstream of Snow Creek.

Snow Creek flows through an urbanized corridor of Anniston and Oxford and is a key tributary to Choccolocco Creek that drains the upstream portions of the Site. The mean flow within Snow Creek increases from approximately five (5) cubic feet per second (cfs) at the confluence with the 11th Street Ditch to 28 cfs as it discharges to Choccolocco Creek. The steep basin terrain produces sharp peak flows. The estimated 10-year and 100-year recurrence interval floods for Snow Creek at the point it discharges to Choccolocco Creek are 4,030 cfs and 6,900 cfs, respectively. Snow Creek and Choccolocco Creek are classified F&W, meaning water quality criteria for fish and wildlife are applicable Average surface water flows are shown on Figure 4.

A defining surface water flow feature for OU4 is the backwater area located at the confluence of Snow Creek and Choccolocco Creek (Figure 4). The backwater area receives direct surface water flow from both creeks, and, because of the area's physical configuration and hydraulic characteristics, much of the area acts as a settling basin for solids suspended in the water column. Sediment deposits in large portions of this backwater area are fine-grained and, in some locations, up to five (5) feet thick.

Land Use and Resource Use
The Choccolocco Creek floodplain encompasses approximately 6,000 acres. Only three (3) percent of the floodplain is in residential use; the remaining 97 percent is in non-residential use. Agricultural and forested lands account for 87 percent of the non-residential land use. Commercial and industrial areas, roads, two publicly operated wastewater treatment plants (WWTPs) and parks account for the remaining 10 percent of non-residential land use in the floodplain. Over 1,500 acres of land in OU4 are currently part of a Conservation Corridor (Figure 5). Conservation easements were purchased by several land trusts with financial support from the PRPs. Easement requirements vary based on the distance of the land from the creek bank. Generally, the area closest to the creek bank is expected to be left as natural as possible under the Conservation Corridor.

Nature and Extent of Contamination

Remedial Investigations of soil, groundwater, sediment, surface water, fish and other biota in OU4 began in 2004, and considered data from 1998 through 2010. Below is a summary of the RI findings. Many of the investigations focused only on PCBs. More details can be found in the RI and are summarized below.

Soil

Surface and subsurface soil were evaluated as part of the RI. Surface soil is defined as soil from ground surface to 12 inches bgs. Subsurface soil is defined as soil deeper than 12 inches bgs. Ecological receptors are generally impacted by constituents in soil from ground surface to 6 inches bgs.

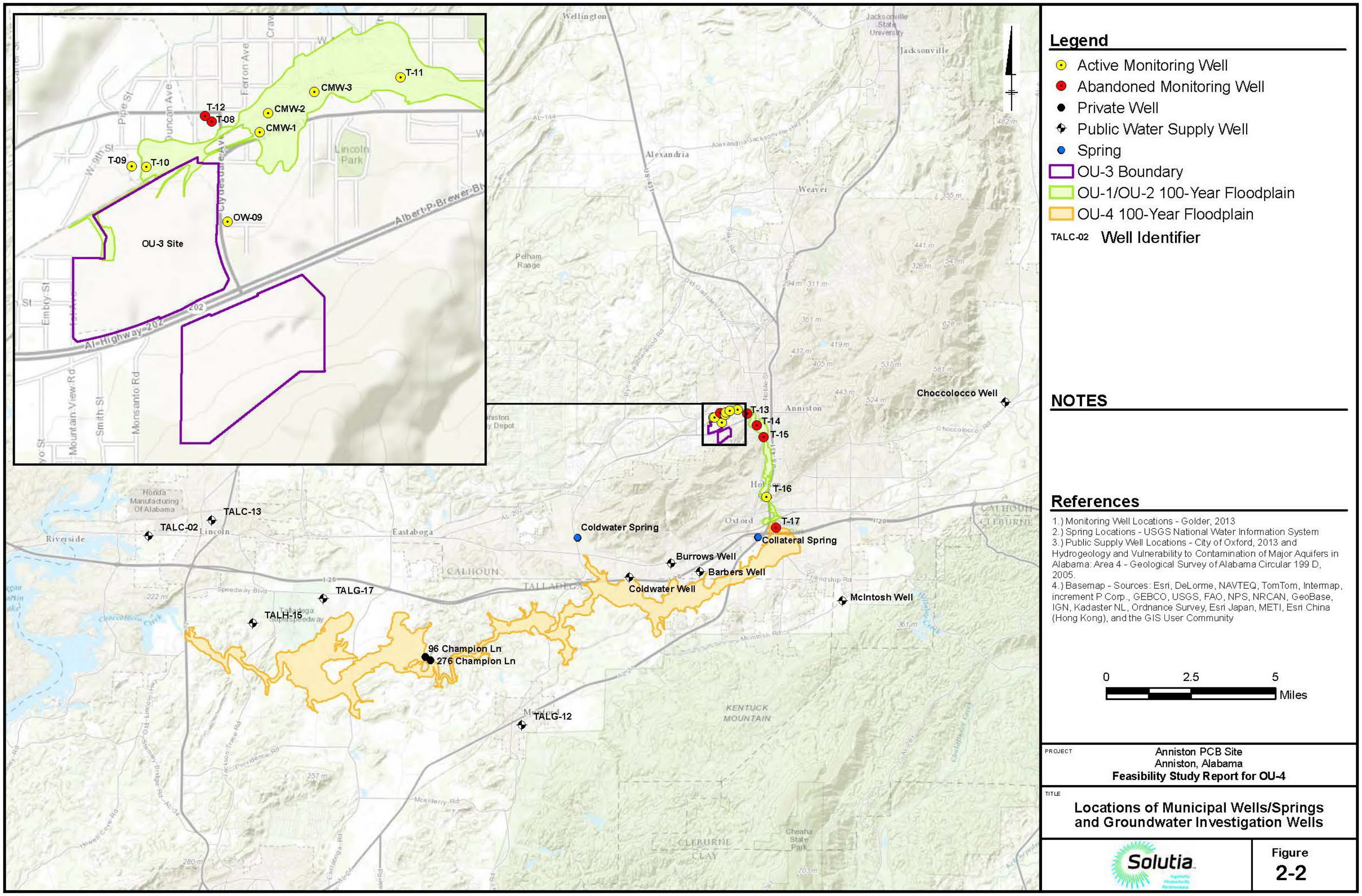

Figure 3. Location of Municipal Wells/Springs and Groundwater Investigation Wells

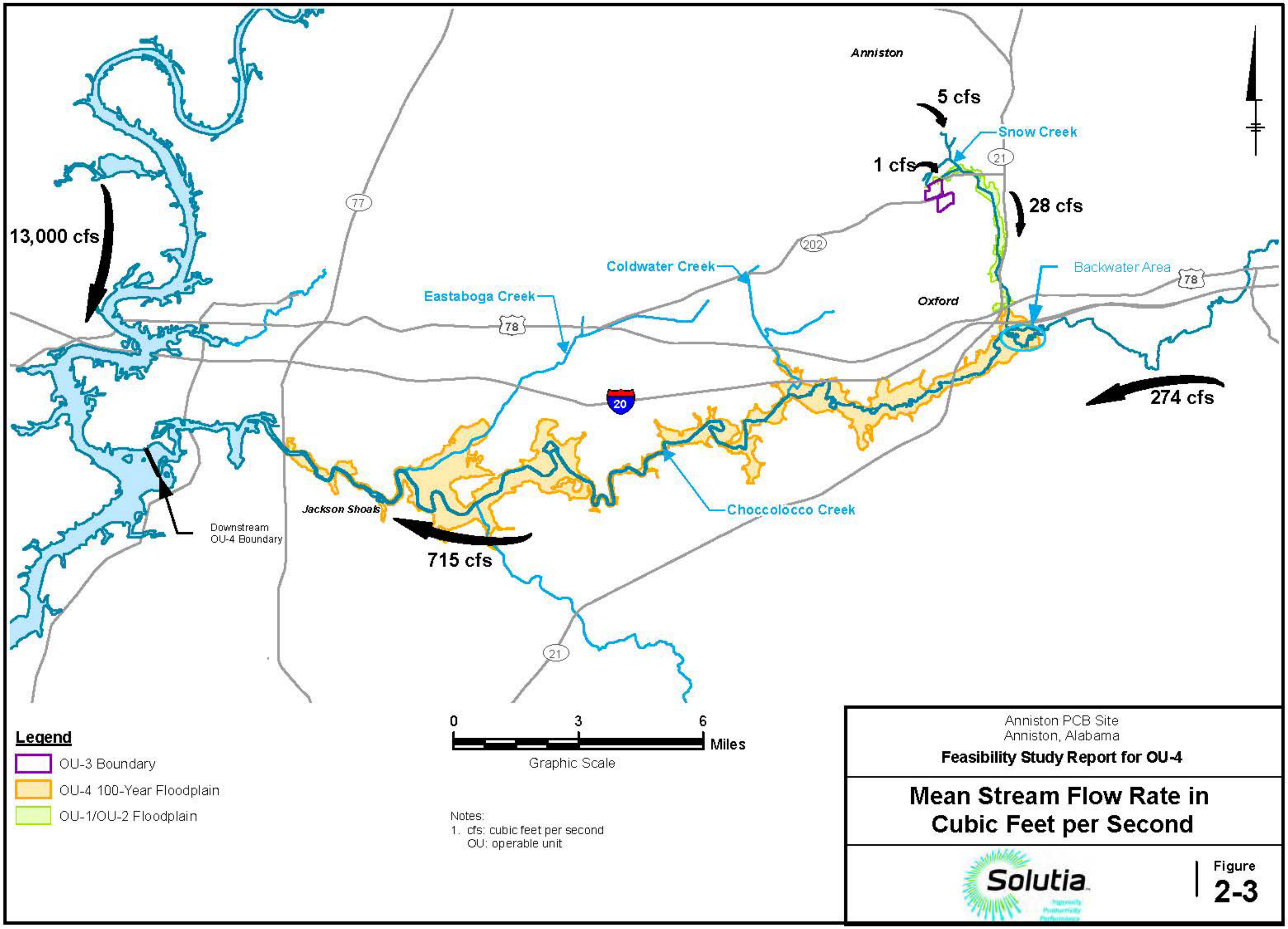

Figure 4. Mean Stream Flow Rate in Cubic Feet per Second

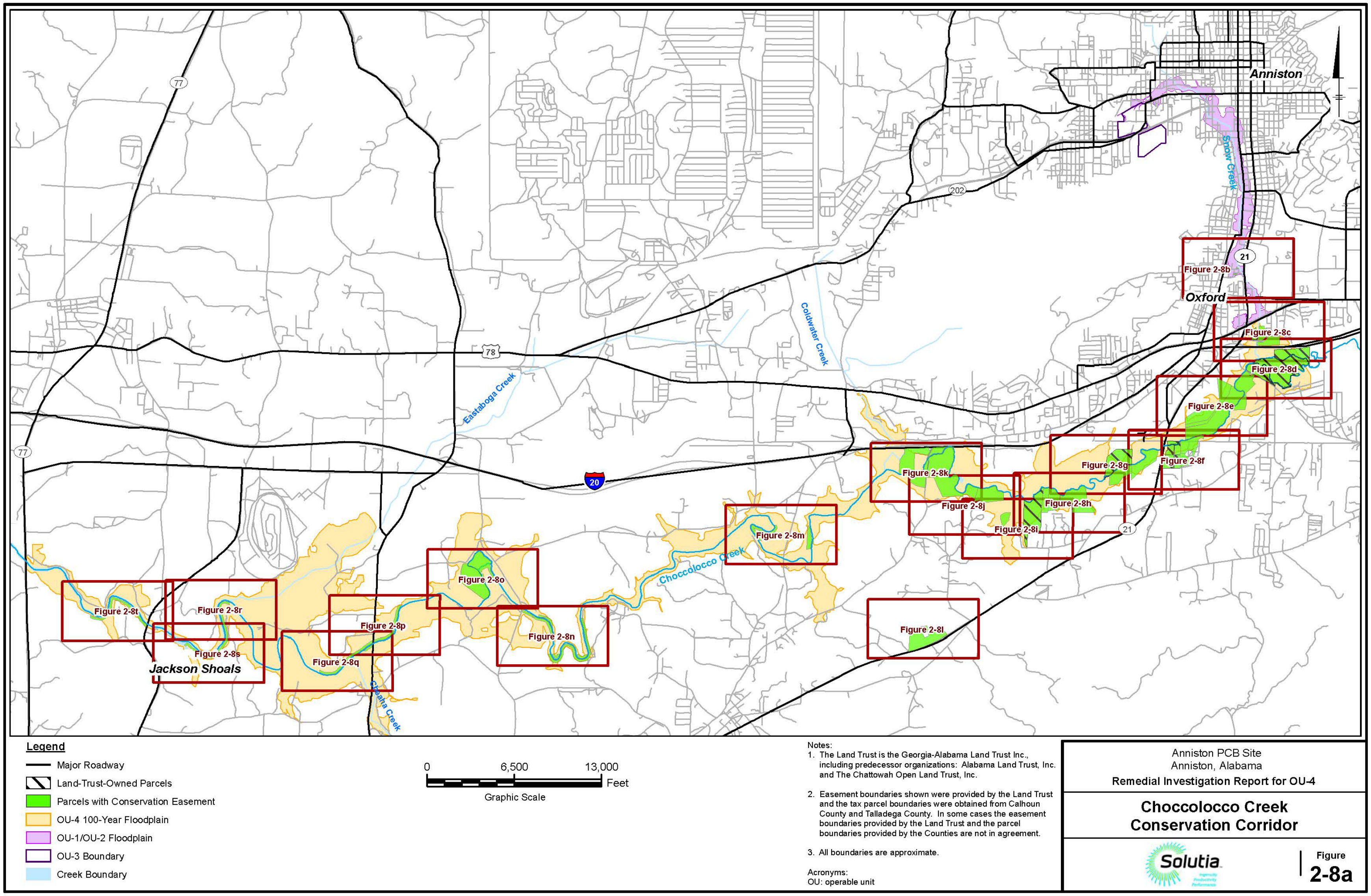

Figure 5. Choccolocco Creek Conservation Corridor

Soil on Current Residential Properties

Soil with PCB concentrations above 1 mg/kg that remain on residential properties in OU4 are considered PCB remediation waste and are addressed by this proposed action. As described in Site background, most PCB contaminated soil on residential properties in OU4 was addressed through the NTCRA. Residual PCBs in soil greater than or equal to 1 mg/kg and less than 10 mg/kg remain in subsurface soil on five residential properties (an area of approximately 1.1 acres) and in surface soil on one property where access to cleanup was not granted (an area of 0.25 acres). In addition, 14 residential structures are located next to areas that required excavation, so long-term monitoring of the residential structures is required to ensure sampling and removal is conducted, where needed, if those structures are demolished (Table 1).

Lead contamination in soil on residential properties in the same general area as the Anniston PCB Site are part of the Anniston Lead Site and are not part of this Proposed Plan.

Soil at RCRA Interim Measures at Oxford Lake Park

Between 2000 and 2012, four IMs were implemented to address PCB contaminated soil in the Oxford Lake Park complex (Figure 6). The IMs at the softball field's parking lot, tennis court complex, and southwest portion of the park (with the infrastructure improvement of adding the Miracle Field) resulted in substantial capping and covers that, if maintained, make the IMs effective at preventing current and future subsurface soil exposure to human health and the environment. The effectiveness of the IM at the softball complex, a soil cap, was evaluated in more detail in the OU4 FS. The park area outside of the IMs was investigated with the non-residential soil investigation activities.

PCB contaminated surface soils have been removed from three softball fields (Fields A, C, and D) and replaced with clean fill and vegetation as needed. Twelve inches of soil were removed within the infield areas of these fields and a minimum of 3 inches was removed from areas in the outfields where concentrations of PCBs exceeded 10 mg/kg. Soil was also excavated to a minimum depth of 3 inches in the grass areas between Fields A and D, and between Fields C and D.

Following excavation, a nonwoven geotextile fabric was placed in the infield areas and covered by 12 inches of soil consisting of a silt and clay mix. In the outfield and grass areas, a nonwoven geotextile fabric was placed in areas where the excavation depth was greater than 12 inches or where PCBs were delineated at concentrations greater than 10 mg/kg. All excavations were subsequently backfilled with clean soil and covered with sod.

Soil samples were collected prior to the construction of the IM covers and analyzed for PCBs. There were 216 soil samples collected from 179 locations in the softball complex that characterize conditions beneath this IM. PCBs were detected in 97% of these samples and concentrations ranged from non-detect to 51 mg/kg and had an average PCB concentration of 6.3 mg/kg.

Table 1. OU4 Residential Properties with Residual PCBs or Future Sampling for PCBs Beneath Structures if Removed.

Figure Reference[1]	Structure ID[2]	PPIN[3]	Residual Management Approach[4]	
			PCBs Remaining	Future Sampling Under Structures[6]
Figure 4-6c	401	50920[3a]	PCB residuals at depth	Yes
Figure 4-6g	407	5341[3a]	PCB residuals at depth	No
Figure 4-6g	111	6445[3a]	PCB residuals at depth	No
Figure 4-6h	117	6886[3a]	PCBs in surface soil[5]	Yes
Figure 4-6i	137	65865[3a]	PCB residuals at depth	No
Figure 4-6i	145	6777[3a]	PCB residuals at depth	No
Figure 4-6i	131	68092[3a]	Unknown	Yes
Figure 4-6b	N/A	29915[3b]	Unknown	Yes
Figure 4-6b	N/A	65958[3b]	Unknown	Yes
Figure 4-6b	N/A	65960[3b]	Unknown	Yes
Figure 4-6b	N/A	725[3b]	Unknown	Yes
Figure 4-6b	N/A	29858[3b]	Unknown	Yes
Figure 4-6b	N/A	30073[3b]	Unknown	Yes
Figure 4-6b	N/A	65955[3b]	Unknown	Yes
Figure 4-6b	N/A	29856[3b]	Unknown	Yes
Figure 4-6b	15	30075[3b]	Unknown	Yes
Figure 4-6e	85	4969[3a]	Unknown	Yes
Figure 4-6d	260	4731[3a]	Unknown	Yes

Notes:

1. Figure references from the Figure 4-6 series from the OU-4 FS where applicable.
2. Structure IDs as shown on the referenced figures where applicable.
3. PPINs are from the following:
   a. Talladega County GIS https://isv.kcsgis.com/al.talladega_revenue/
   b. Calhoun County GIS https://gis.calhouncounty.org/Parcelviewer2/
4. Residuals management to be conducted under long-term soil management.
5. Removal action for Structure ID 117/PPIN 6886 was not implemented as property access was denied by the landowner. The property will be monitored under the long-term soil management program and the removal action implemented if (and when) access is provided.
6. Future potential sampling with structure footprints should the structure be later removed.

GIS: geographic information system
ID: identification
N/A: not applicable
PCB: polychlorinated biphenyl
PPIN: property parcel identification number

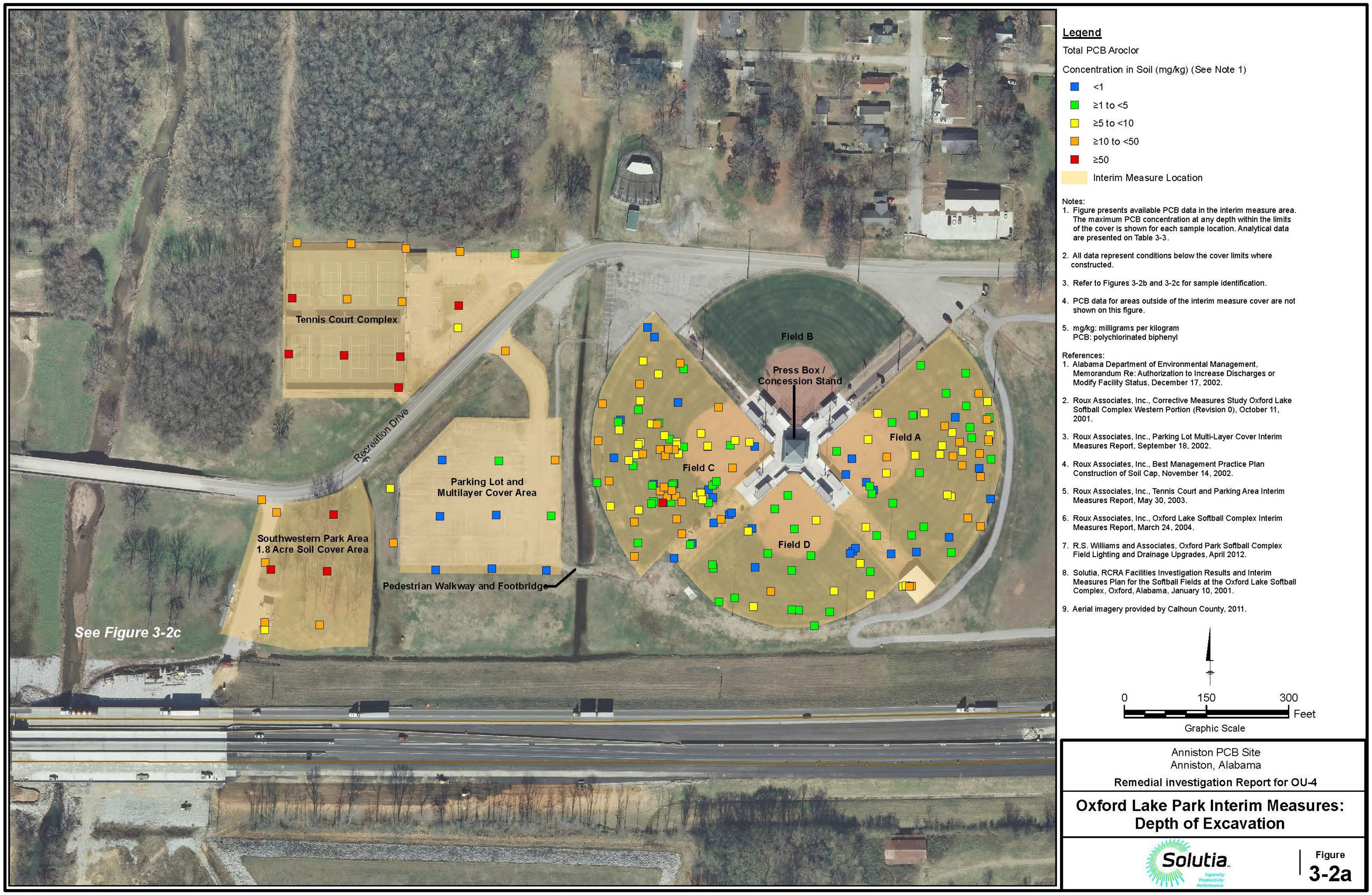

Figure 6. Oxford Lake Park Interim Measures (PCB Detections in Soil Below Interim Measures Shown in Figure)

PCB concentrations for surface soil (0 to 12 inches) and subsurface soil (below 12 inches) for Fields A, C, and D include the following:

- Field A:
  - Surface soil PCB maximum concentration is 47.7 mg/kg and average concentration is 10.8 mg/kg.
  - Subsurface soil PCB maximum concentration is 30.6 mg/kg and average concentration is 4.5 mg/kg.
- Field C:
  - Surface soil PCB maximum concentration is 22.5 mg/kg and average concentration is 6.3 mg/kg.
  - Subsurface soil PCB maximum concentration is 50.6 mg/kg and average concentration is 2.7 mg/kg.
- Field D:
  - Surface soil PCB maximum concentration is 11.8 mg/kg and average concentration is 4.8 mg/kg.
  - Subsurface soil PCB maximum concentration is 8.9 mg/kg and average concentration is 1.8 mg/kg.

<u>Non-residential Soil</u>

Floodplain soil data were collected in a series of sampling events under the RCRA and CERCLA programs. The first soil samples were collected as part of the RCRA program and included samples collected in 1998 from the top of the creek banks that were followed by soil sampling in the broader Choccolocco Creek floodplain. Under the CERCLA program, the nature and extent of PCBs and other constituents in the Choccolocco Creek floodplain were evaluated in a phased sampling approach that began in 2006 and ended in 2009. This approach was designed to provide sufficient data to characterize exposure point concentrations (EPCs) for PCBs for human and ecological receptors using reasonable exposure assumptions and to define the nature and extent of contamination.

The floodplain soil sampling conducted under the CERCLA RI/FS program included 25 individual characterization areas (CAs) which were slightly reorganized into human exposure units (EUs). For assessing ecological impacts, the CAs were also divided into terrestrial exposure units. The initial portion of the floodplain immediately adjacent to the creek bank to 100 feet into the floodplain on both sides of the creek was considered the riparian corridor. A geographic comparison of the CAs and EUs is provided on Figure 7. To define EUs, samples were collected from the creek outward until PCB concentrations were below 1 mg/kg.

PCB concentrations range from non-detect to 353 mg/kg in OU4 non-residential soil (Figure 8). The PCB concentrations in soil consistently decrease with distance downstream from the confluence with Snow Creek (Figure 9) and decrease as a function of distance from the creek bank (Figure 10).

The maximum PCB concentration detected in non-residential surface soil, from 0 to 6 inches in depth, was 228 mg/kg in EU C1-EU2. In surface soil from 6 to 12 inches in depth, the maximum PCB concentrations detected was 194 mg/kg (C3S-EU1). The maximum PCB concentration detected in OU4 subsurface soil was 353 mg/kg (sample depth 24-30 inches, C1-EU1). Sampling and analysis were done using a phased approach and delineated the lateral and vertical extent of PCBs to a concentration of 1 mg/kg or less.

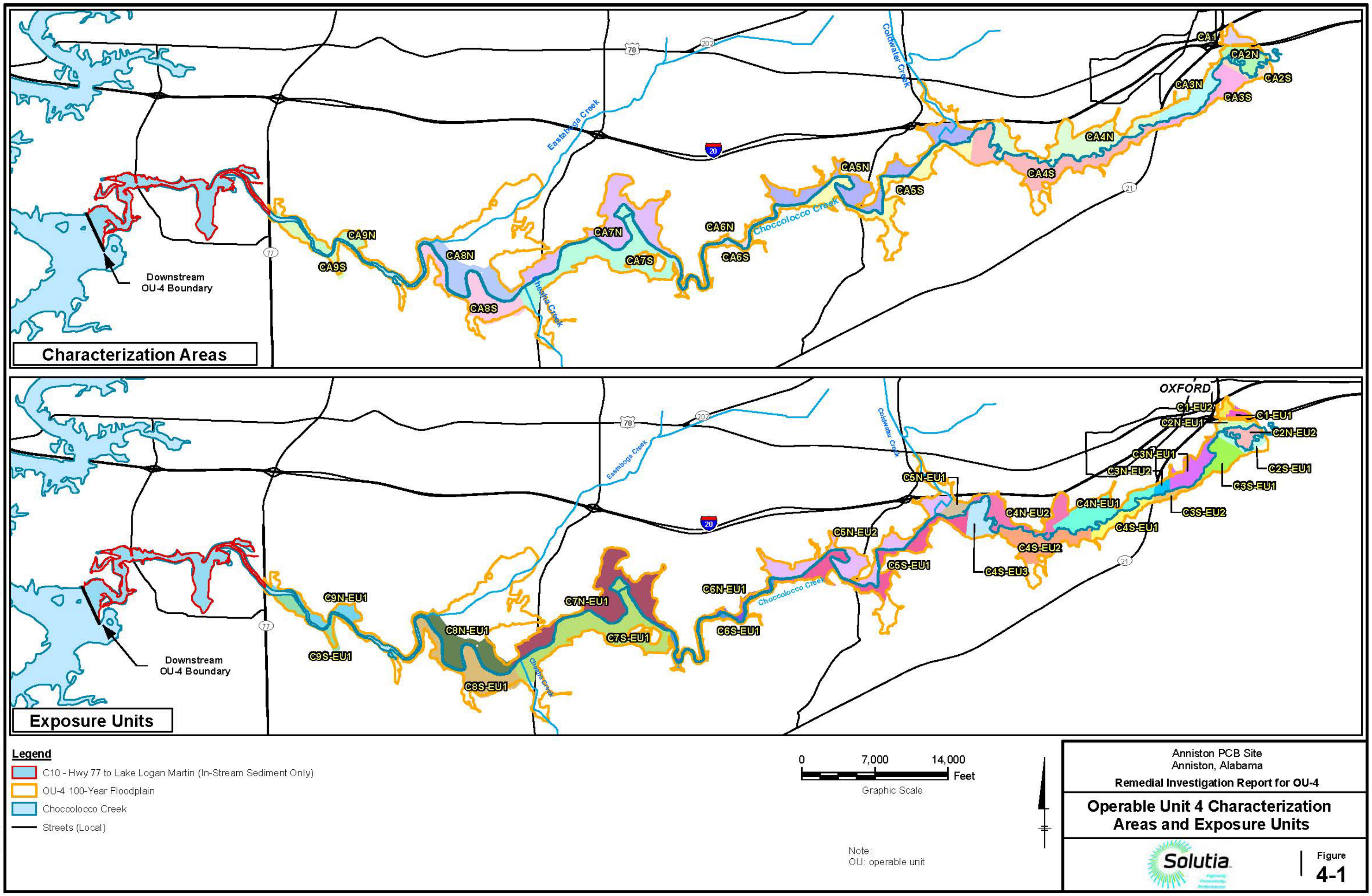

Figure 7. Operable Unit 4 Characterization Areas and Exposure Units

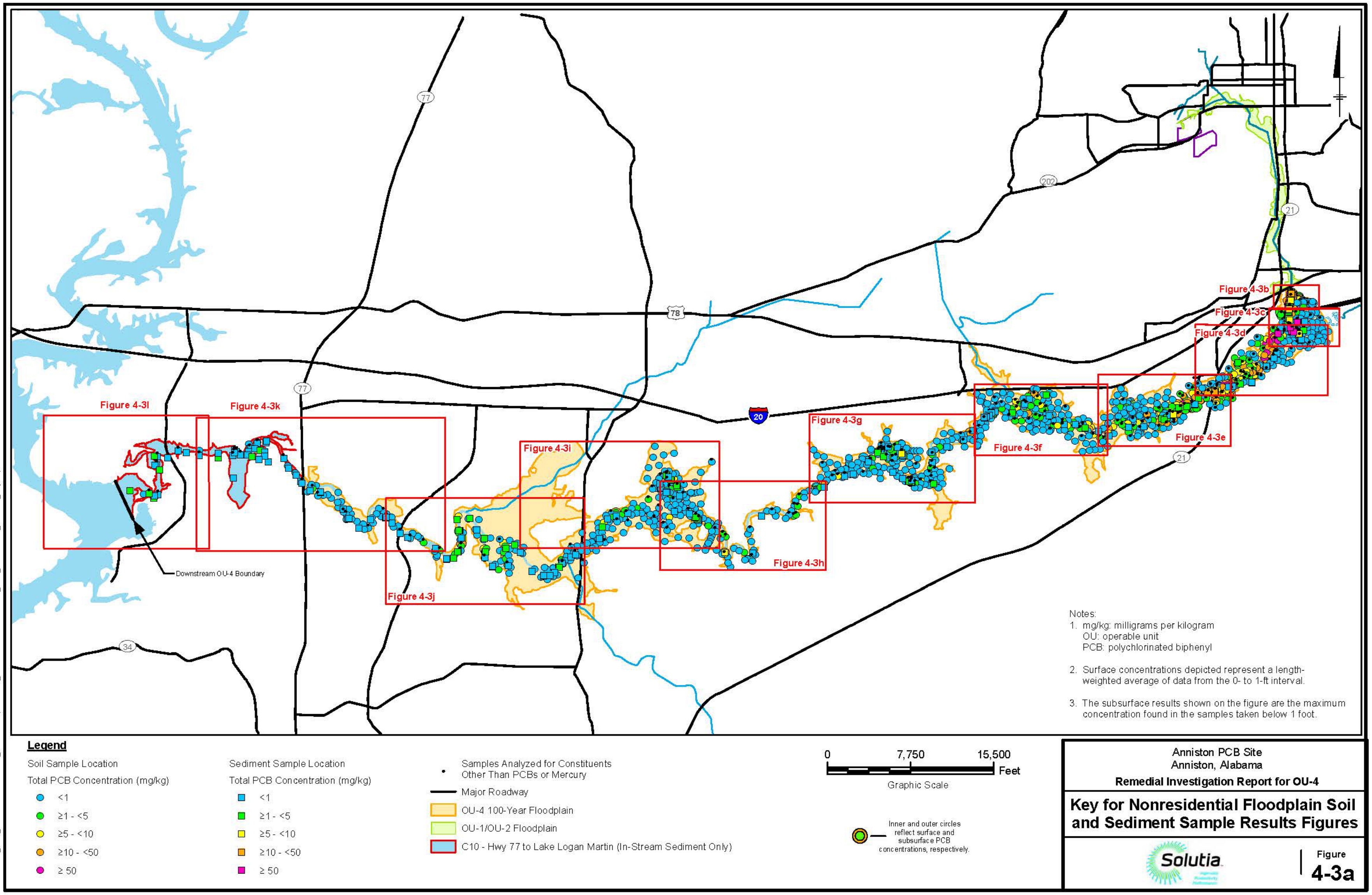

Figure 8. Key for Non-residential Floodplain Soil and Sediment Sample Results Figures

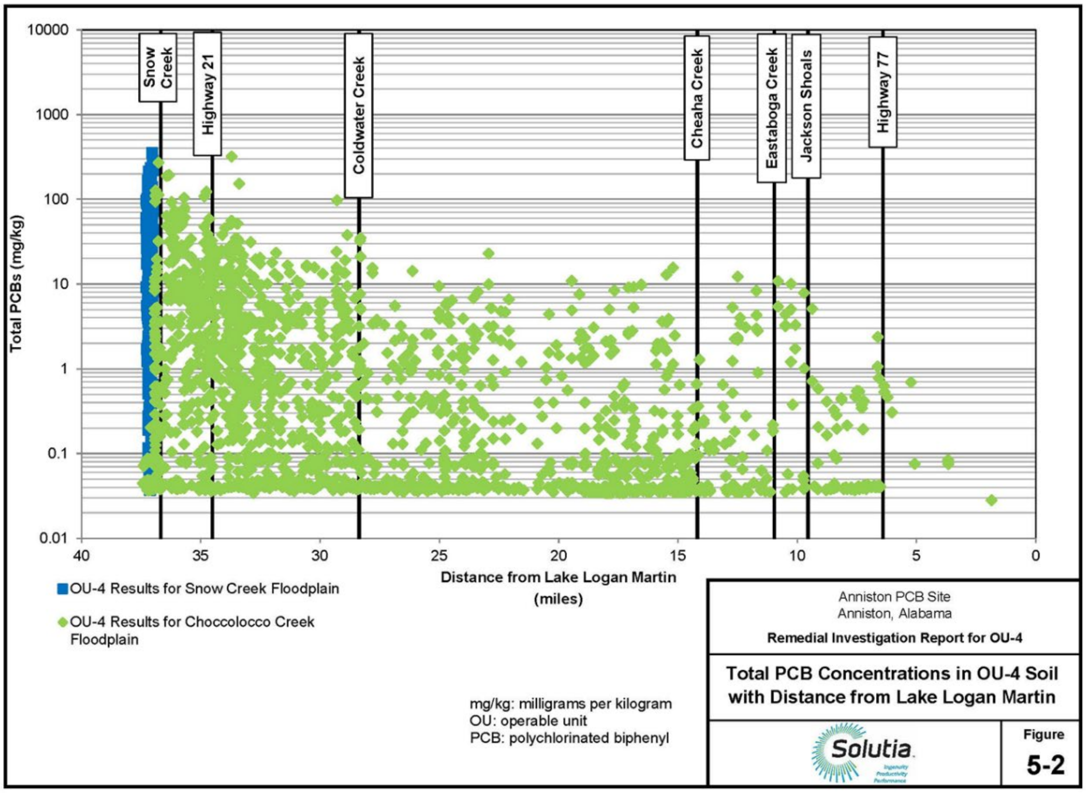

Figure 9. Total PCB Concentrations in OU4 Soil with Distance from Lake Logan Martin

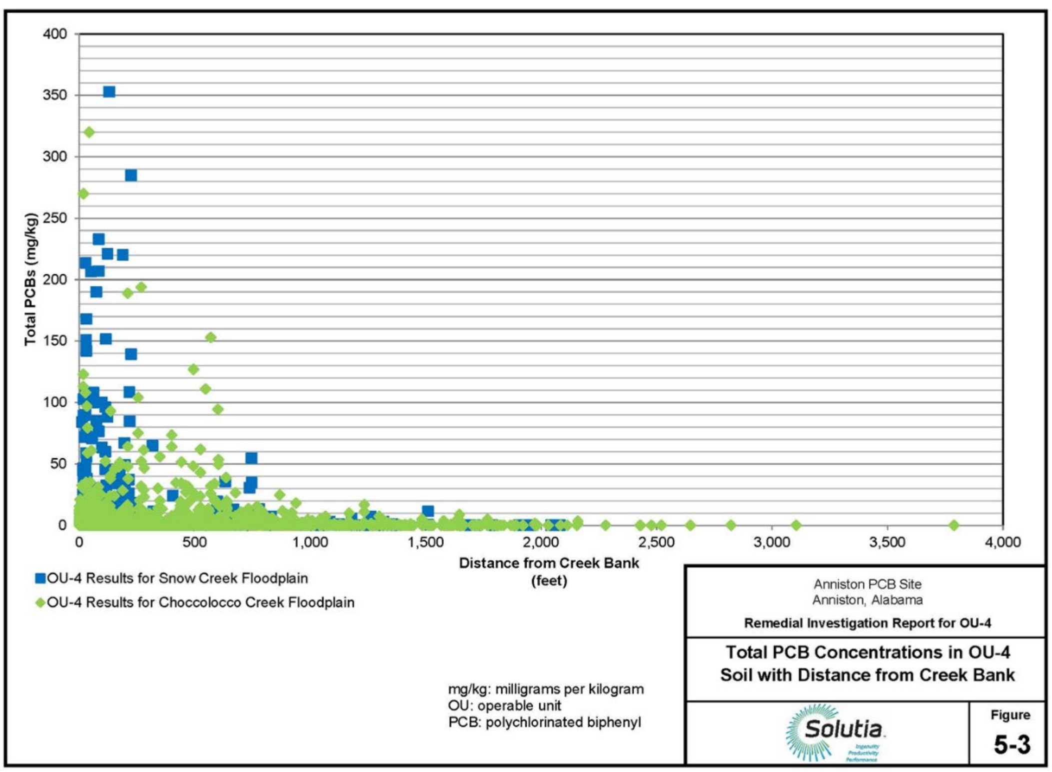

Figure 10. Total PCB Concentrations in OU4 Soil with Distance from Creek Bank

Soil samples were analyzed for a wider constituent list, which included Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), other Semi-volatile Organic Compounds (SVOCs), pesticides, Target Analyte List (TAL) metals, cyanide, polychlorinated-p-dioxins (PCDDs) and dibenzofurans (PCDFs), and dioxin-like (DL)-PCBs congeners.

The constituents in OU4 soil that were assessed in the nature and extent of contamination evaluation included PCBs and mercury. Total PCDD/PCDF and DL-PCB congeners toxicity equivalent (TEQ) values, chromium, lead, and vanadium were considered to a lesser extent. Of these, chromium, lead and vanadium were identified as related to upstream anthropogenic sources.

PCDD/PCDF TEQ and DL-PCB congener TEQ concentrations in soil (total TEQ) ranged from 57 to 4,410 picograms per gram (pg/g). The highest total TEQ concentrations were found in soil in C7S-EU1, unlike PCBs which had high concentrations in C2-EU1. Additionally, the higher TEQ concentrations in soil were often located away from the creek banks, unlike PCBs which are located near the banks. The distribution of total TEQ in soil relative to PCBs suggests another source may be located downstream in OU4.

Mercury concentrations in soil ranged from 0.0048 to 33 mg/kg. The highest concentration was found in soil in C3S-EU2 at a depth of 6 to 12 inches. The highest mercury concentrations in surface soil was 22 mg/kg in exposure unit C4N-EU2. Addressing PCBs in soil will also address Site-related Mercury as the EPCs of concern are co-located.

Groundwater

Groundwater migrating from the facility (OU3) is addressed under the OU3 ROD. Ten temporary wells, T-8 through T-17, were installed and sampled in three sampling phases outside of OU3. All the wells were analyzed for PCBs and filtered and unfiltered results were evaluated for each sample. The well locations are shown in Figure 3.

Monitoring well T-17 was installed in Oxford Lake Park (i.e., in OU4). No PCBs were detected in groundwater at T-17, which was located near the highest PCB concentrations in soil in OU4. Additionally, private wells were identified and sampled on two residential properties in OU4 shown on Figure 3. The samples were analyzed for total PCB Aroclors, total PCB homologues, and mercury. Since PCBs and mercury were not detected in either well, groundwater was not investigated further for OU4.

Sediment and Creek Banks

OU4 sediment was characterized over a series of phased investigations between 1998 and 2009. The characterization included mapping sediment deposits in Snow and Choccolocco Creeks, collecting samples for analyses to characterize the nature and extent of contamination, collecting surface sediment from the same locations as used for fish collection, collecting sediment samples for geochronological analyses to correlate PCB concentrations with the time of deposition, assessing the sediment PCB concentrations based on the grain size distribution of the sediment, and assessing sediment toxicity.

The creeks in OU4 were divided into 10 reaches (C1 through C10) and three (3) assessment areas to support the nature and extent of contamination evaluation and the risk assessments (Figure 11). Reach C1, which is the segment of Snow Creek included in OU4, is evaluated independently. The upper assessment area (UAA) includes reaches C2 through C4. The middle assessment area (MAA) includes reaches C5 and C6. The lower assessment area (LAA) includes reaches C7 thorough C10. The lower end of Choccolocco Creek (C10) has no adjoining floodplain soil areas. Surface water elevations in this lower portion of Choccolocco Creek are controlled by dams located on the upstream and downstream ends of Lake Logan Martin that serve to limit routine flooding of these areas.

Sediment Chemical Analyses

The PCB concentrations in the OU4 portion of Snow Creek (reach C1 in Figure 11) ranged from non-detect to 41 mg/kg. Most sediment samples collected from C1 had relatively low PCB concentrations. The average from the upper 2 inches across all locations in C1 is comparable to the average from the 2-inch to deeper interval (5 and 4 mg/kg, respectively). Only one sample from below 1 foot depth had PCBs detected (5.6 mg/kg).

The PCB concentrations in Choccolocco Creek sediment range from non-detect to 920 mg/kg with the highest concentration being found in reach C2. PCB concentrations consistently decrease with distance downstream from the confluence with Snow Creek (Figure 12). Initial sediment investigation activities in Choccolocco Creek were conducted along transects perpendicular to creek flow. A total of 186 transects were sampled along the approximately 35 miles of Choccolocco Creek, or 1 transect for every 1,000 feet of creek bed from just upstream of the Snow Creek confluence, downstream to Lake Logan Martin. Additional data were collected later to support the risk assessments included collecting sediment samples coincident with the fish tissue samples to support the OU4 HHRA, sediment samples coincident with the biota samples to support the OU4 BERA, and sediment samples to support the sediment toxicity testing and bioaccumulation program.

Sediment samples were analyzed for a wider constituent list, which included VOCs, PAHs, other SVOCs, pesticides, TAL metals, cyanide, PCDD/PCDF, and DL-PCBs congeners. Toxicity equivalent (TEQ) values for PCDD/PCDF and DL-PCB congeners were calculated. The results of these analyses are provided in the RI.

The initial findings for the wider constituent list in sediment were evaluated and most of the constituents were found to be non-detect or below screening levels. Therefore, subsequent sampling for characterization did not include analyses for VOCs, SVOCs other than PAHs, pesticides, or some metals. More detailed results of these analyses are provided in the RI.

The constituents in OU4 sediment that were assessed in the nature and extent of contamination evaluation that were carried through sampling events included PCBs, PCDD/PCDF TEQ, DL-PCB congener TEQ, barium, chromium, cobalt, mercury, and vanadium. Based on the sampling results barium, chromium, cobalt and vanadium were determined to be related to upstream anthropogenic background sources. Therefore, the remaining discussion will focus on PCBs, PCDD/PCDF and DL-PCB congeners TEQ, and mercury.

The PCDD/PCDF TEQ ranged from 0.066 pg/g to 317 pg/g. The DL-PCB congener TEQ ranged from 0.051 to 1,200 pg/g (C2-EU1). The combined distributions of total TEQ and PCBs in OU4 sediment, relative to the distance from Lake Logan Martin, indicate that the distribution of total TEQ is like PCBs, with high total TEQ concentrations located in the backwater area.

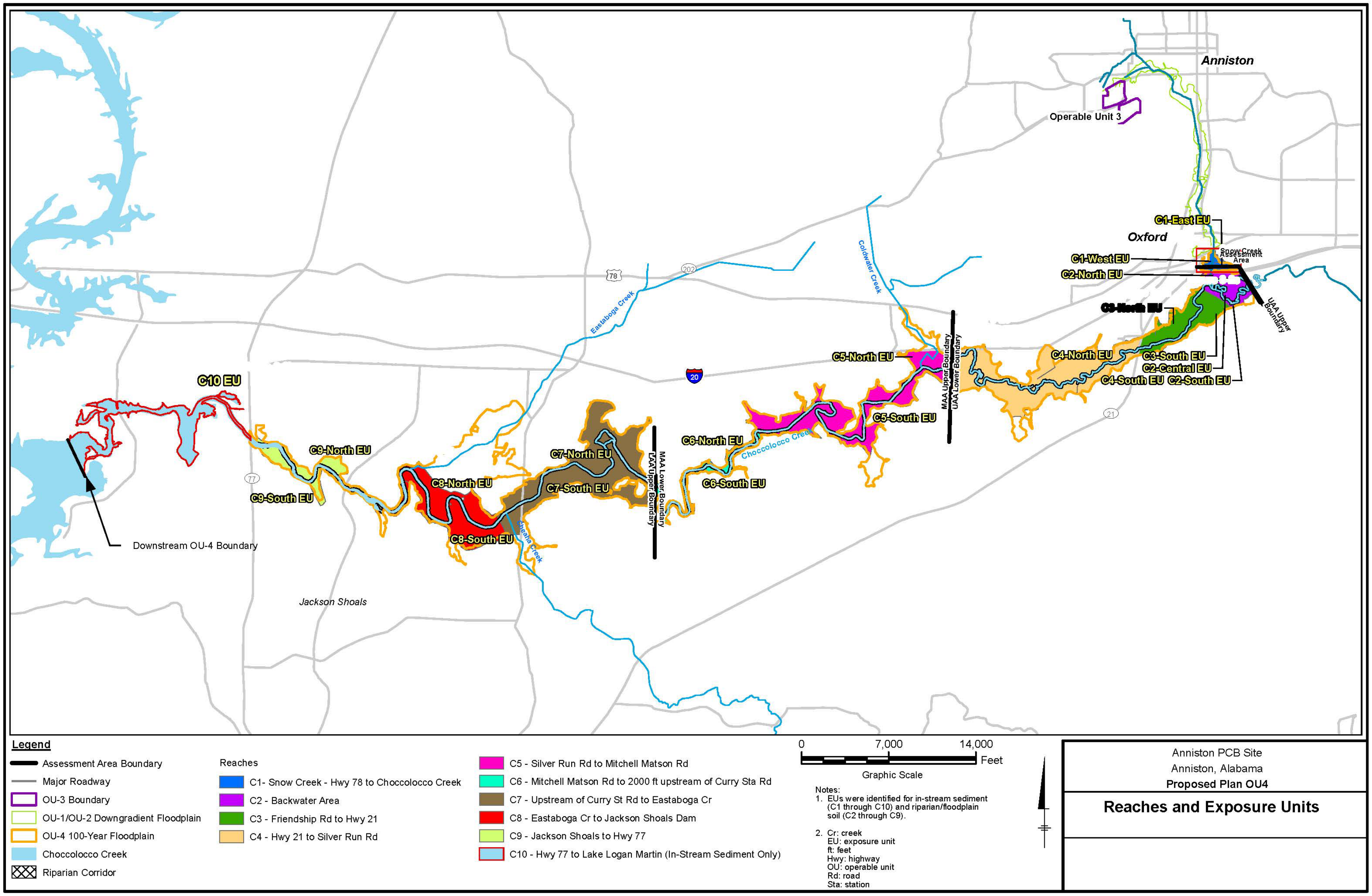

Figure 11. Reaches and Exposure Units.

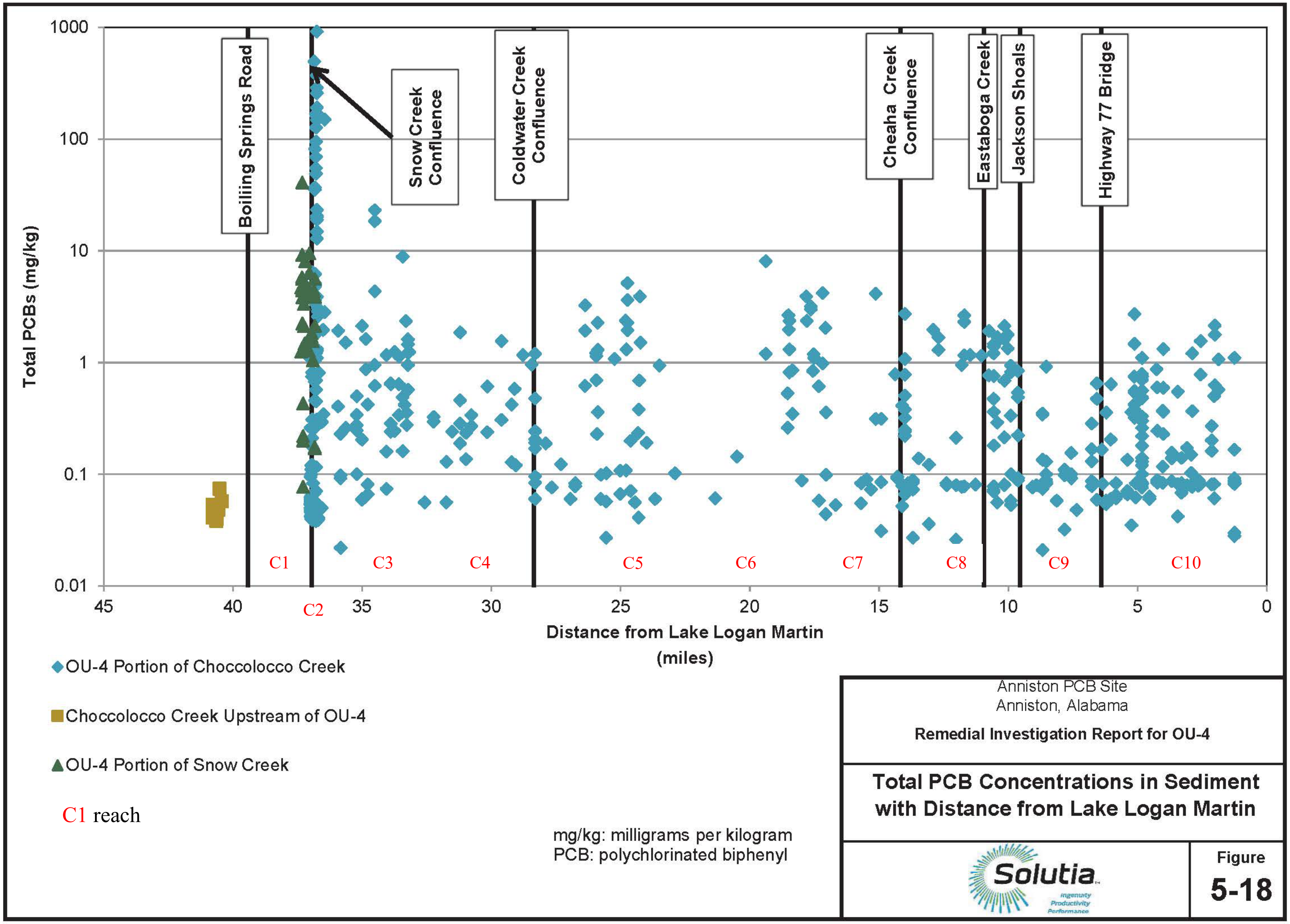

Figure 12. Total PCB Concentrations in Sediment with Distance from Lake Logan Martin.

Mercury concentrations in sediment ranged from 0.011 mg/kg to 96 mg/kg. The highest concentration of mercury is in a 2 to 12-inch sample in the backwater area (reach C2), where the average mercury concentration detected is 20 mg/kg.

Creek Banks Sediment Loading

The PCB loadings for creek bank soil were calculated by combining the estimated creek bank erosion rates with the results of field surveys conducted to characterize creek bank stability conditions and PCB concentrations for creek bank soil samples. Creek banks with severe erosion are identified as unstable and were estimated to recede at 1.0 m/yr. Creek banks with minor or moderate erosion were estimated to recede at 0.1 m/yr. The creek bank conditions survey was conducted using a rating system of five categories of creek bank conditions: stable, moderately stable, minor erosion, moderate erosion, and severe erosion (Figure 13). The creek bank stability results showed that the system becomes more stable downstream of river mile 29.5 (RM 29.5) where PCB concentrations are lower.

Top of bank samples and surrogate values from samples taken within 33 feet of creek banks were used to estimate the average PCB concentrations at each bank area. The averages of these samples at each bank area are as follows:

- Snow Creek (reach C1): 49.3 mg/kg;
- Choccolocco Creek upstream of Highway 21 (reach C2 and C3): 17 mg/kg;
- Choccolocco Creek from Highway 21 to RM 29.5 (reach C4): 6.1 mg/kg; and
- Choccolocco Creek downstream of RM 29.5 (reach C5-C10): 3.3 mg/kg.

The 1999 field survey indicated that approximately 95% of creek banks were stable, moderately stable or had minor erosion. Most of the areas with moderate or severe erosion are located upstream of RM 29.5. A PCB loading estimate using the above surrogate values indicates that creek banks with moderate-to-severe erosion contributed 81% of the PCBs from all creek bank areas. Due to the sparse sampling, use of surrogate samples, and the lack calibration or validation of these approaches, this loading estimate is an imprecise predictor of erosion and PCB loading potential. However, it does suggest that erosive areas in the highly contaminated upper reaches are major contributors of PCBs to the river system.

Geochronological Investigations

Sediment core samples for geochronological testing were collected in 1999 and in 2007 to provide data to assess sediment deposition rates and evaluate sediment stability. Results of the analyses were evaluated to characterize historical and recent sediment transport rates, sediment deposition rates, and surface sediment mixing depths.

The samples collected in 1999 were located where Choccolocco Creek flows into Lake Logan Martin (Figure 14). Core MLM-GEO-7 had the highest PCB concentrations (1.1 mg/kg) from these cores. The PCB data plotted on Figure 14 include the collection interval estimated time (years) that the sediment had been deposited. The temporal (chronological) profile aspect of this figure was developed using a combination of dating techniques. These data indicate that the highest PCB concentrations correspond with the period of the 1960s to 1970s. After this period, sediment PCB concentrations in Choccolocco Creek decline until the early 1990s when a spike in concentration is apparent. Lake Logan Martin was

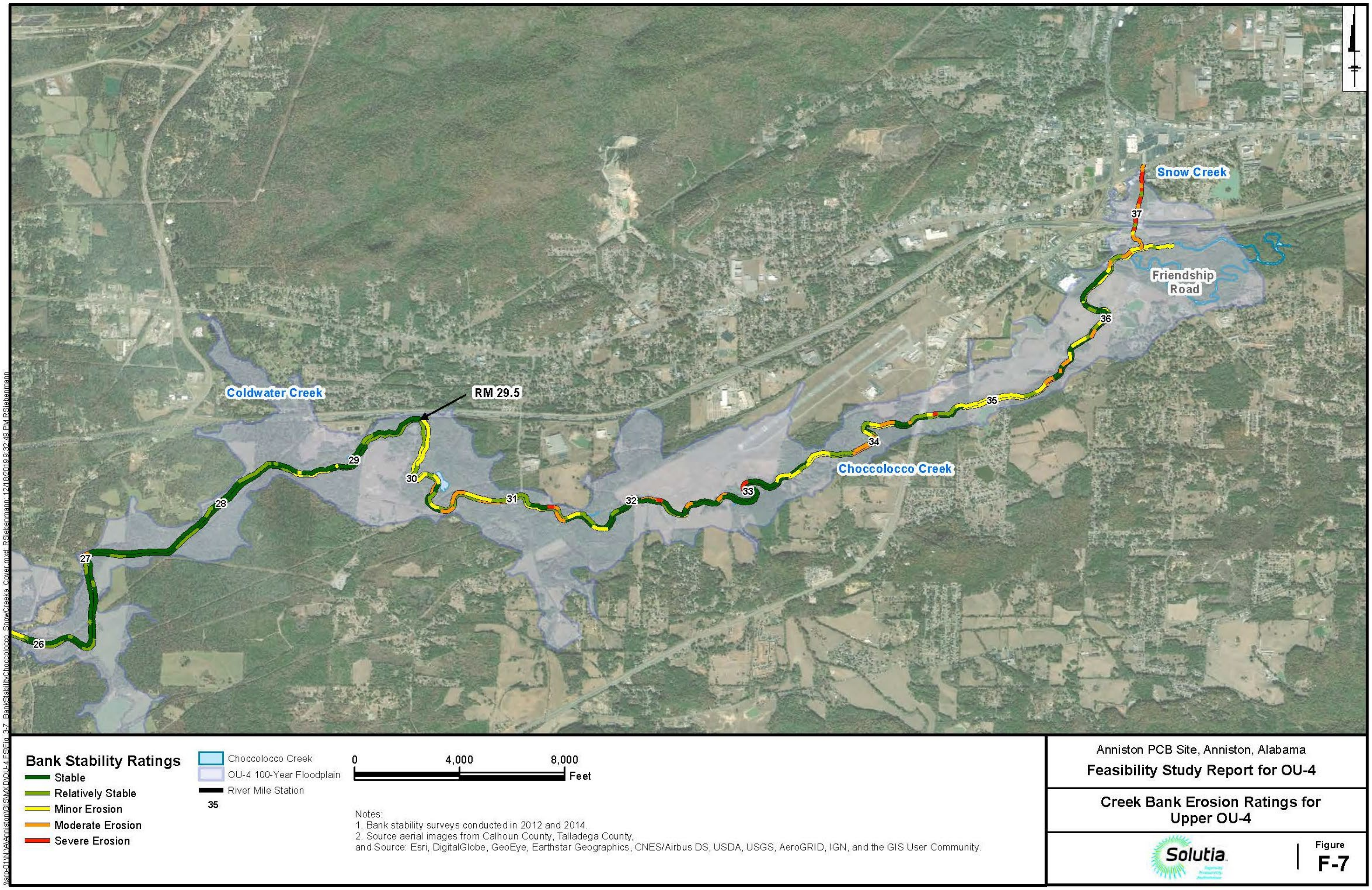

Figure 13. Creek Bank Erosion Ratings for Upper OU4.

impounded in 1964, and 24 inches of sediment was deposited at the location sampled between 1964 and 1999 which is approximately 0.7 inches/year. This data demonstrates that substantial amounts of sediment move through the Choccolocco Creek waterway near fish collection Station 35 in reach C-10.

The samples collected in 2007 were located in the backwater area (Figure 15). In the backwater area (reach C2), two cores were collected for analysis. A geochronological profile was generated for core CU-GEO-02. Using this core, a corresponding date was assigned to each sampling interval based on fixing the 1954 horizon to the first detectable Cs-137. Figure 15 depicts the corresponding PCB concentration to sample depth and year deposited based on this dating. Based on these data, the peak PCB concentration in the core corresponds approximately to the 1948 horizon. Based on the Cs-137 data, an annual sediment deposition rate between 0.3 and 0.4 inches per year is estimated. The Pb-210 profile indicates deposition rates may be as high as 0.5 inches per year. A geochronological profile for core CU-GEO-01 was not developed.

Sediment Stability

A weight-of-evidence approach was used to evaluate sediment stability in the different portions of Choccolocco Creek. Sediment in the Snow Creek portion of OU4 are not considered to be stable due to the high energy nature of the creek, so stability of sediment in Snow Creek was not evaluated. The weight-of-evidence approach looked at a range of considerations including the bathymetry profile of the creek. This included the slope of the creek bed in terms of feet of elevation drop per mile of creek length. Creek bed elevation data were compared to the surface water elevations to estimate water depths along the creek. Measured and modeled surface water velocities of the creek were assessed including the identification of high flow events dating back to the general time frame when PCB manufacturing began in the Anniston area. The thickness of the sediment deposits as a general indicator of depositional environments and radioisotope data to estimate sediment deposition rates were also used as lines of evidence.

Three specific areas were identified where sediment appears to be stable (Figure 16). These three areas include portions of the backwater area, the area upstream of Jackson Shoals, and the embayment area at Lake Logan Martin. The physical characteristics of the streambed in these areas, as well as water velocities and sediment thicknesses indicate that these are depositional areas of the creek.

Surface Water

Surface water investigations conducted focused on understanding surface water and sediment transport during base- and high-flow conditions for Snow and Choccolocco Creeks. These investigations included collecting samples for analysis from total suspended solids (TSS) in the surface water and in whole-water samples using existing and new information. Sampling locations are shown on Figure 17 and the data is summarized in the RI.

The most recent surface water data were collected for the ecological risk assessment under base-flow conditions that exist approximately 90% of the time for OU4. The periods of high surface water flow are episodic with relatively rapid increases and decreases in flow conditions in response to precipitation events. The average whole-water PCB concentration (total PCB homologs) in Choccolocco Creek was last measured in 2009 and 2010 and was reported in 37 of 43 samples at an average concentration of 0.075 µg/L. These surface water data are higher than the chronic national ambient water quality criteria

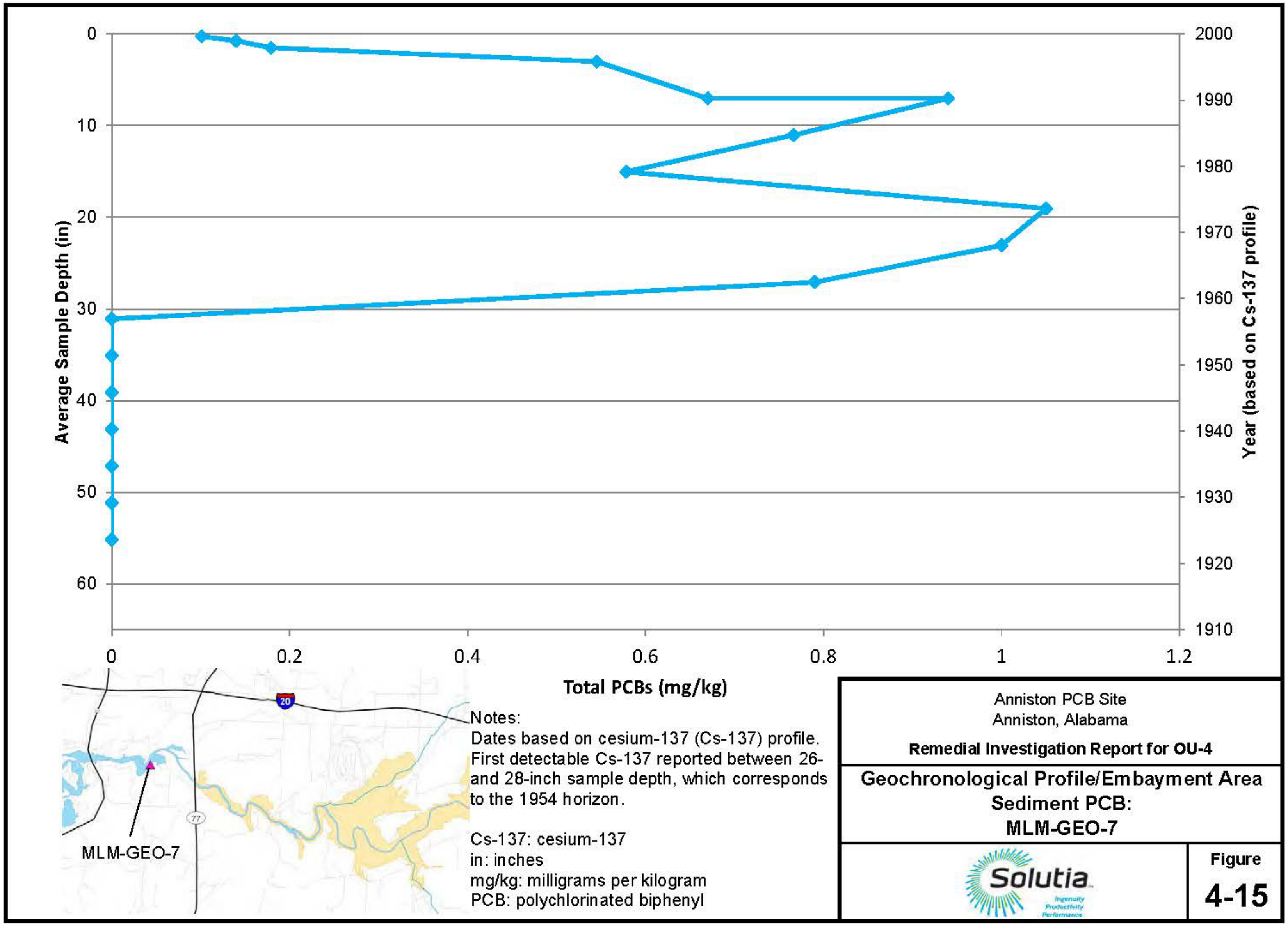

Figure 14. Geochronological Profile/Embayment Area Sediment PCB: MLM-GEO=7

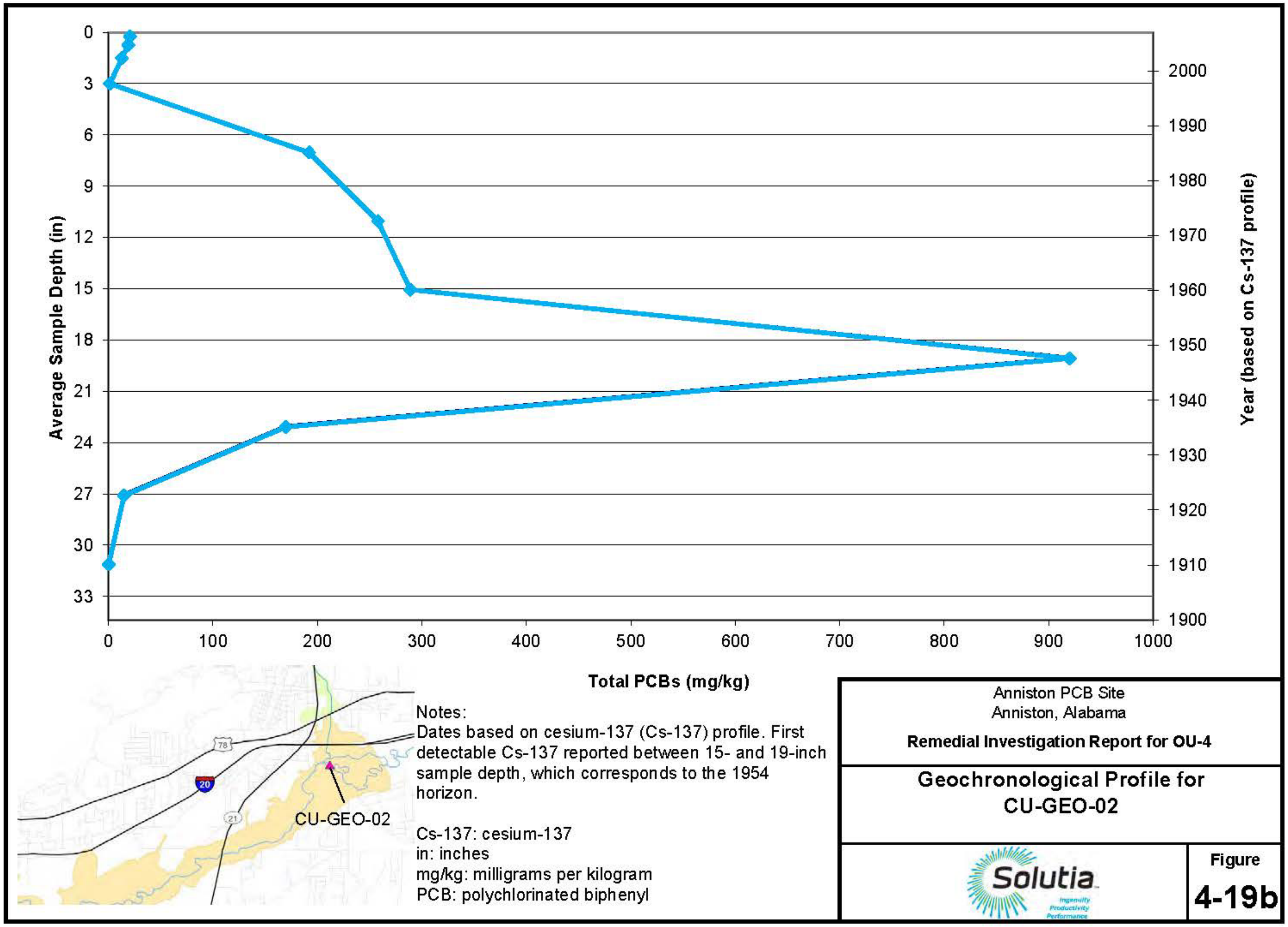

Figure 15. Geochronological Profile for CU-GEO-02

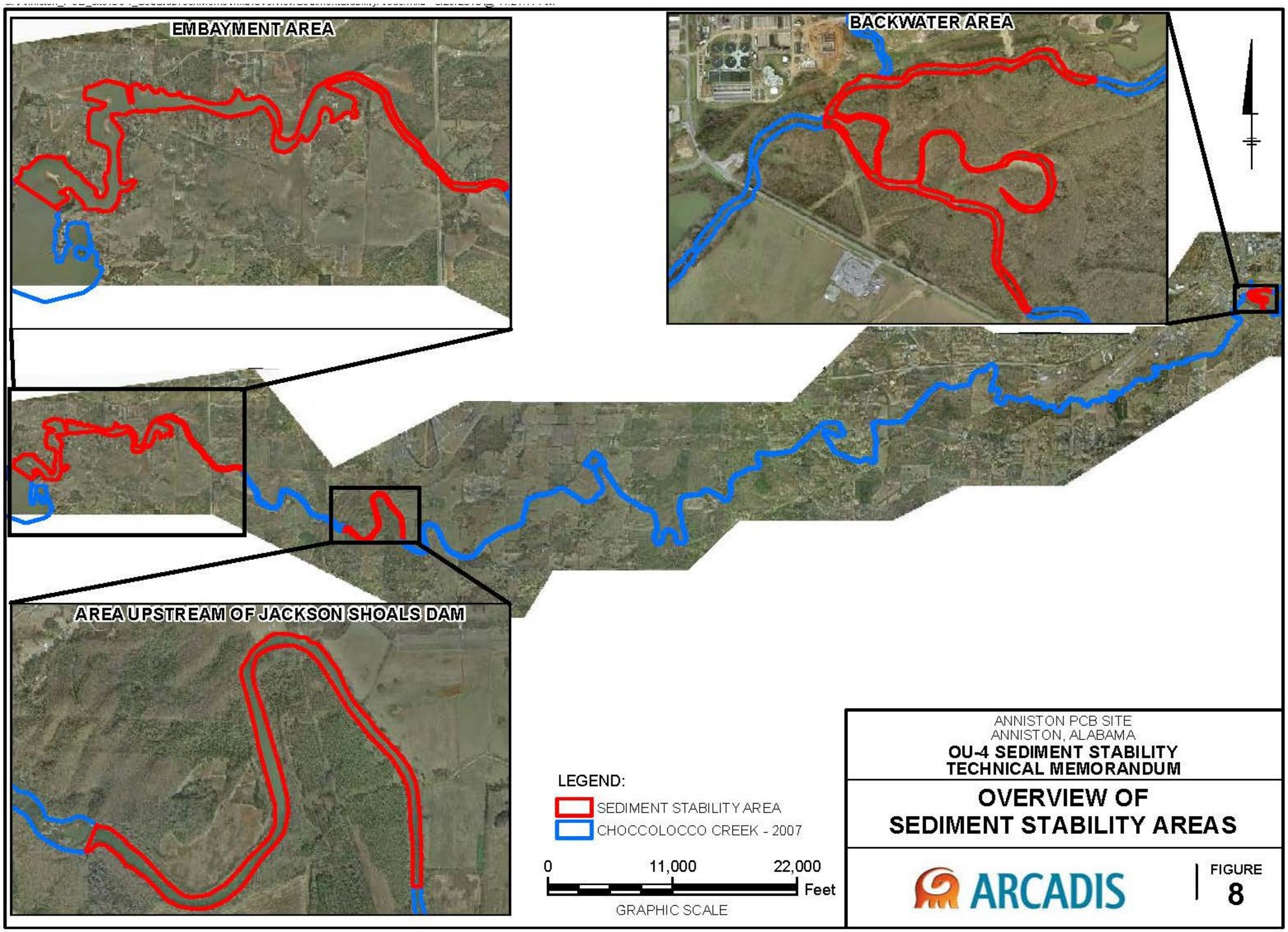

Figure 16. Overview of Sediment Stability Areas

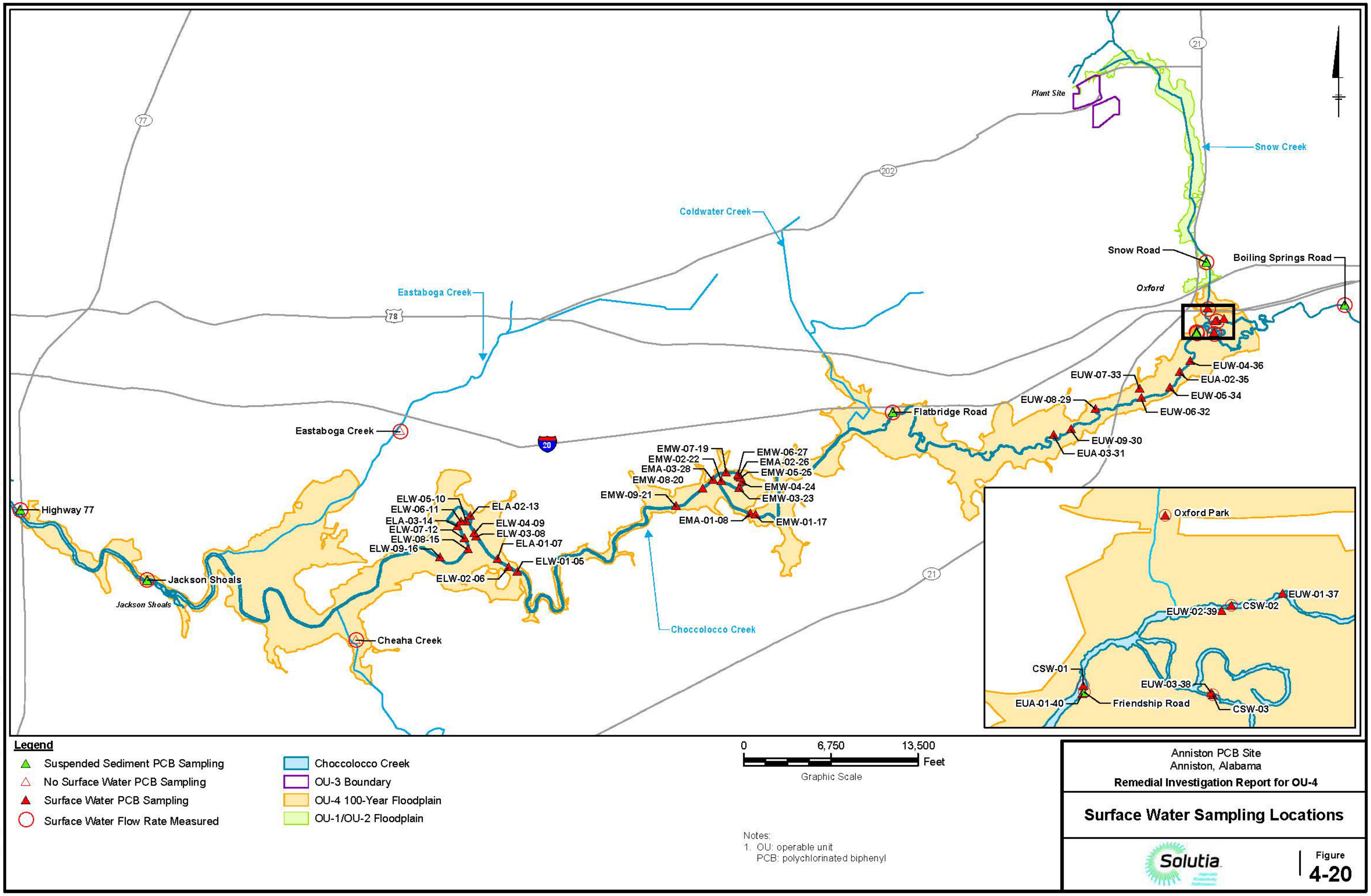

Figure 17. Surface Water Sampling Locations

(AWQC) values (0.014 µg/L for wildlife and 0.000064 µg/L for human exposure from consumption of fish). Mercury was reported in only one of 43 samples at a concentration of 0.069 µg/L. No DL-PCBs were detected in the nine samples tested.

PCB concentrations associated with particulates are likely to continue to decrease over time as upstream remedial measures, including remediation that has been conducted for OU3 and has and will occur in OU1/OU2. The actions have and will remove and/or isolate potential sources of PCBs from surface water runoff to Snow and Choccolocco Creeks. The amount of particulate suspended in water and transported downstream during high-flow events is likely to be similar in future events. However, the concentration of PCBs associated with those particulates will decrease over time.

Fish Tissue Investigations

Several fish tissue collection programs were conducted in OU4 from 1994 to 2016 to characterize the nature and extent of contamination in fish, support the human health risk assessment (HHRA), and evaluate temporal fish tissue concentration trends. The fish tissue sampling programs have collected over 1,200 individual fish tissue samples from OU4. Figure 18 shows the change in fish tissue PCB concentrations over time for samples collected by ADEM at their sampling Station 35 from 1994 to 2016. Station 35 is located at the downstream end of OU4, and the PCB concentration data are presented as the minimum, maximum, and average PCB concentration based on the year of sample collection and the generalized fish type (catfish, panfish, and bass). These data demonstrate a factor of 10 decline in PCB concentrations since 1994 and are consistent with the early source control actions taken in OU1/OU2 and OU3. Average fish tissue PCB concentrations in catfish, panfish, and bass have declined to below 1 mg/kg at Station 35 (reach C10) in 2016.

The 361 fish tissue samples collected in 2008 were used to calculate the EPCs used in the HHRA. The data are also useful for evaluating changes in fish tissue concentrations over time. Fish were collected from nine locations including eight Choccolocco Creek locations and one location at the downstream end of Snow Creek. The sampling program collected target species from three separate trophic levels: predator (largemouth bass or spotted bass); bottom feeder (channel cattish or blue catfish); and forage fish (sunfish or crappie). All fish tissue samples were analyzed for total PCBs (tPCBs, represented as the sum of Aroclors), percent lipid, and mercury. Ten percent of the fish tissue samples were analyzed for a wider list including PCB homologs, PCB congeners, non-mercury metals, and PCDD/PCDFs.

The average PCB and mercury results for fish tissue are shown in Figures 19 and 20, respectively. The sample collection locations labelled HHFL01 through HHFL09 are provided in an insert at the bottom of the figures. It should be noted that the Alabama Department of Public Health has published “do not eat any” fish advisories for PCBs and mercury in Choccolocco Creek for many years. In 2023, these advisories were retained due to continued high PCB and mercury concentrations in fish tissue. Fish consumption advisories for mercury are also present upstream of the confluence of Snow Creek and Choccolocco Creek to Boiling Springs Road.

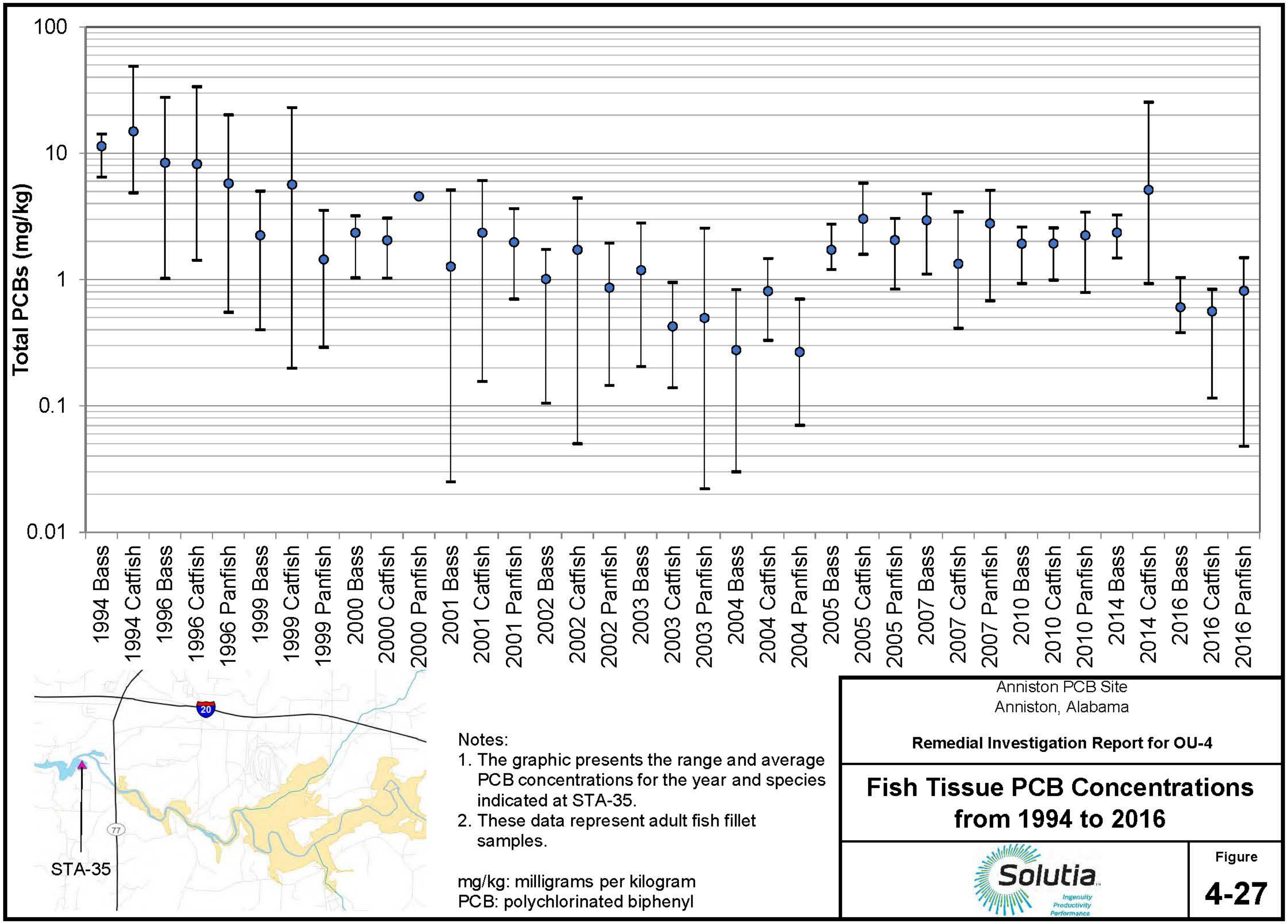

Figure 18. Fish Tissue PCB Concentrations at ADEM Fish Sampling Location STA-35 (in Reach 10) from 1994 to 2016

Ecological Investigations

Ecological investigations were conducted for OU4 and included habitat assessments and ecological surveys of vegetation, benthic macro-invertebrates, fish, reptiles, amphibians, birds, and mammals. In addition to the habitat and survey data collected, terrestrial and aquatic biotic tissue samples were collected for chemical analysis to evaluate exposure based on dietary food chains.

The biological sampling program was structured around three identified assessment areas (upper, middle, and lower) and three reference areas. Three major nonaquatic habitat types were identified within OU4: forested floodplain, maintained fields, and successional fields. Five major aquatic habitat types in OU4 were identified: riffles, runs, emergent aquatic vegetation, tributary confluences (backwaters), and depositional environments (islands, banks/bars).

Tissue samples from various organisms within the food web were collected and analyzed for PCBs and mercury. PCBs were measured as Aroclors or homologs when small sample sizes precluded Aroclor methods. In addition, 10% of the tissue samples collected were analyzed for 10 metals (arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel, and vanadium), PCB homologs (when Aroclors methods were the primary method), mono- and -ortho-substituted congeners, and PCDD/PCDFs.

The results of the tissue analysis for PCBs concentrations are presented for terrestrial tissue, aquatic tissue, and whole-body fish in Figures 21, 22, and 23 respectively. PCBs generally appear to be elevated in biota tissue samples collected within OU4 compared to reference locations. Several of the biota samples, including crayfish, emergent insects, frogs, and worms, demonstrated a concentration gradient in tissue like that seen in soil and sediment with higher PCB concentration in tissues from the Upper Assessment Area (UAA) than in the Middle Assessment Area (MAA) and Lower Assessment Area (LAA). Mercury tends to demonstrate similar concentrations between the assessment areas.

Other metals (arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel, and vanadium) were generally similar between OU4 and the reference areas with few exceptions based on the limited number of samples collected for these analytes. PCDD/PCDF concentrations seemed to be elevated in the LAA and MAA compared to the UAA samples, and OU4 samples were generally elevated relative to reference areas. The wider list of constituents analyzed in biological samples are documented in the baseline ecological risk assessment.

Sediment Toxicity and Bioaccumulation Testing were performed by the U.S. Geological Survey (USGS) and the U.S. Army Corps of Engineers (USACE), respectively between 2010 and 2011. A total of 32 sediment samples were collected for toxicity and bioaccumulation testing. This included 26 sediment samples from 6 different locations in OU4 and 6 reference area sediment samples from Choccolocco Creek. The sample locations were identified to collectively span a wide range of combinations of total PCB and organic carbon concentrations, instead of randomly sampling the OU4 sediment. Because high-concentration samples were needed, much of the sediment collection effort was conducted in the backwater area. The sediment was analyzed for a range of geochemical parameters and for concentrations of organic carbon, PCBs, 23 major and trace metals, 46 parent and alkylated PAHs, 21 pesticides, and 17 PCDD/PCDF congeners. In general, the highest concentrations of PCBs were associated with the highest concentrations of PAHs, dioxins, and pesticides.

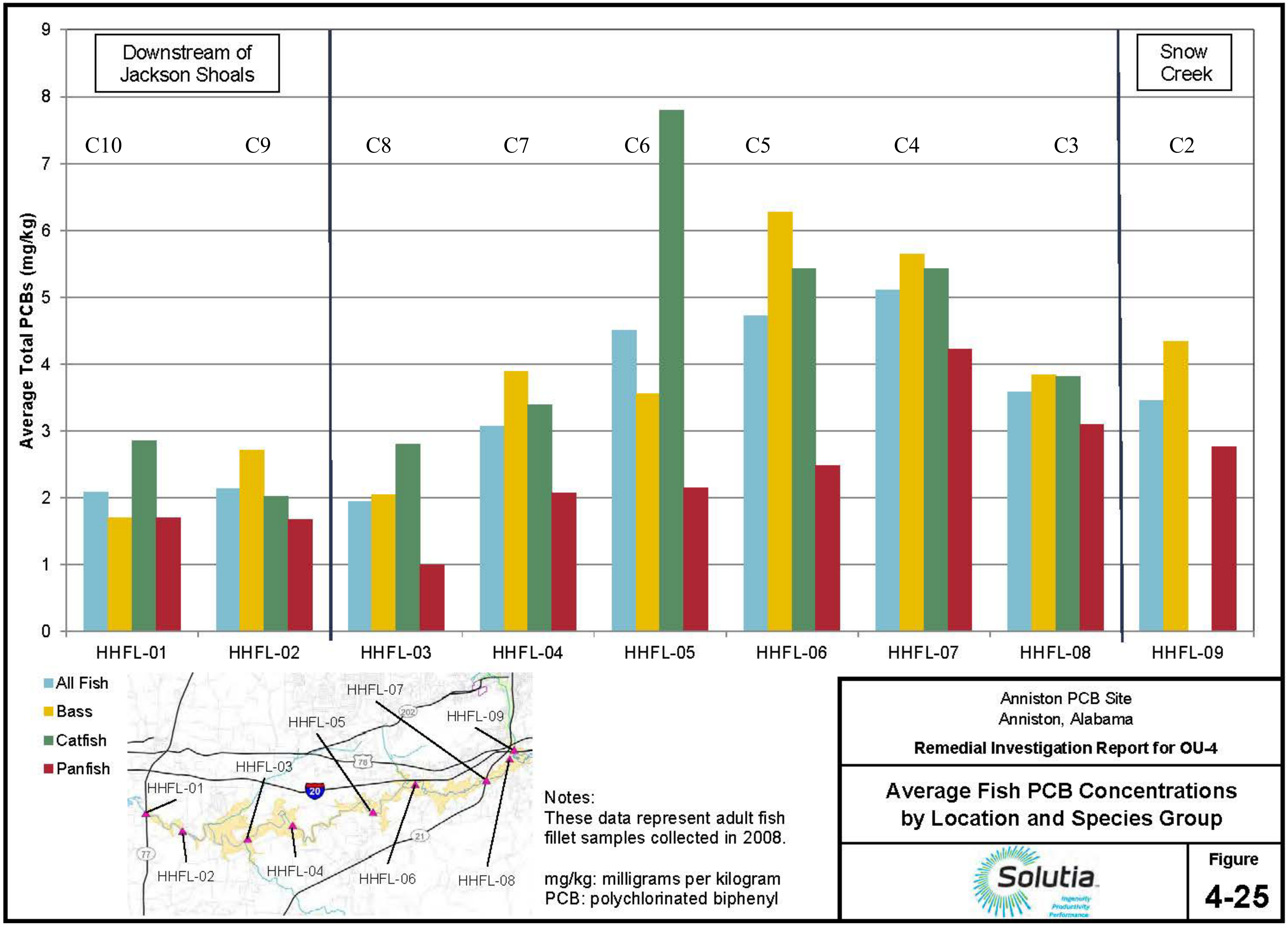

Figure 19. Average Fish PCB Concentrations by Location and Species Group

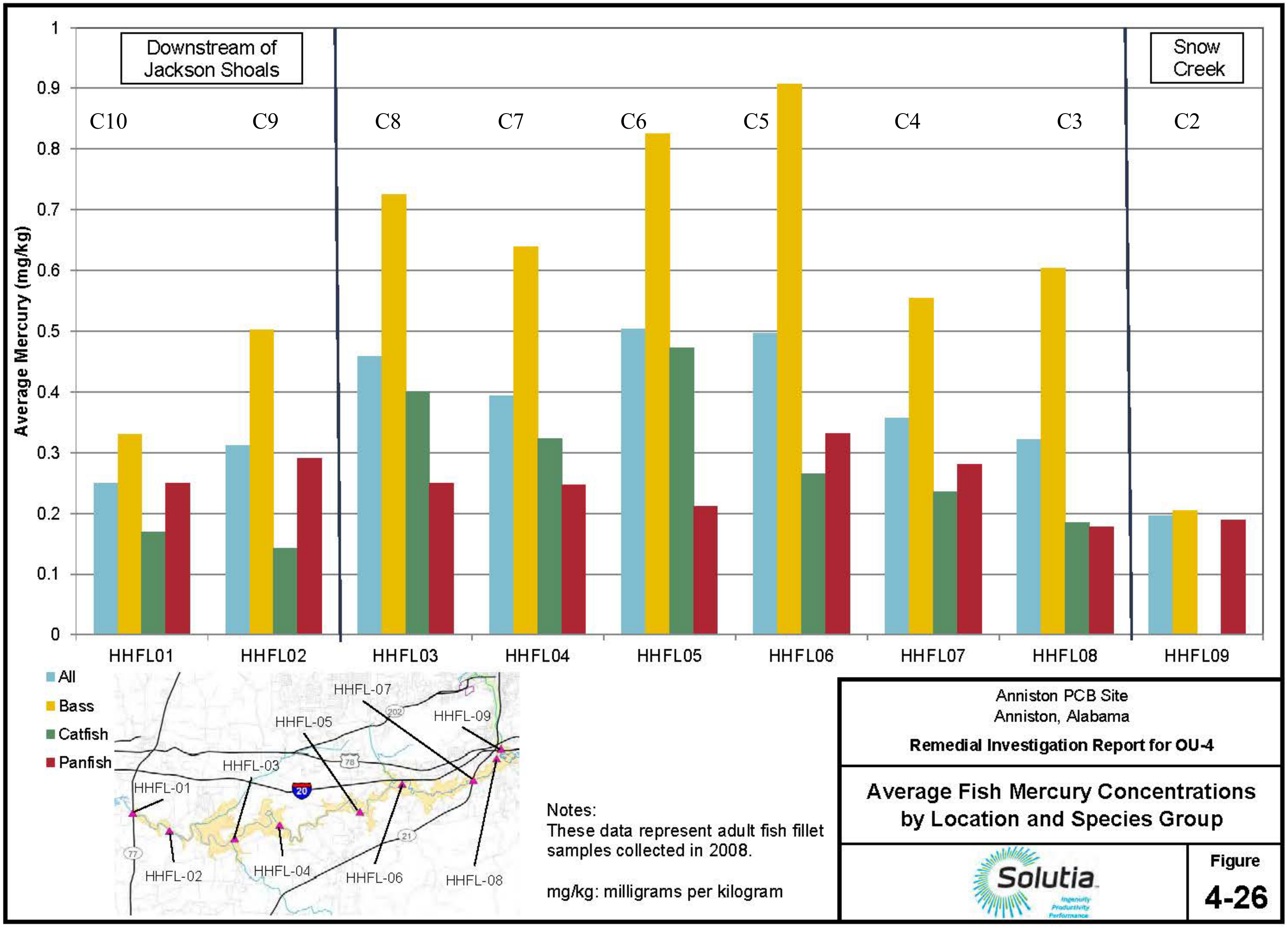

Figure 20. Average Fish Mercury Concentrations by Location and Species Group

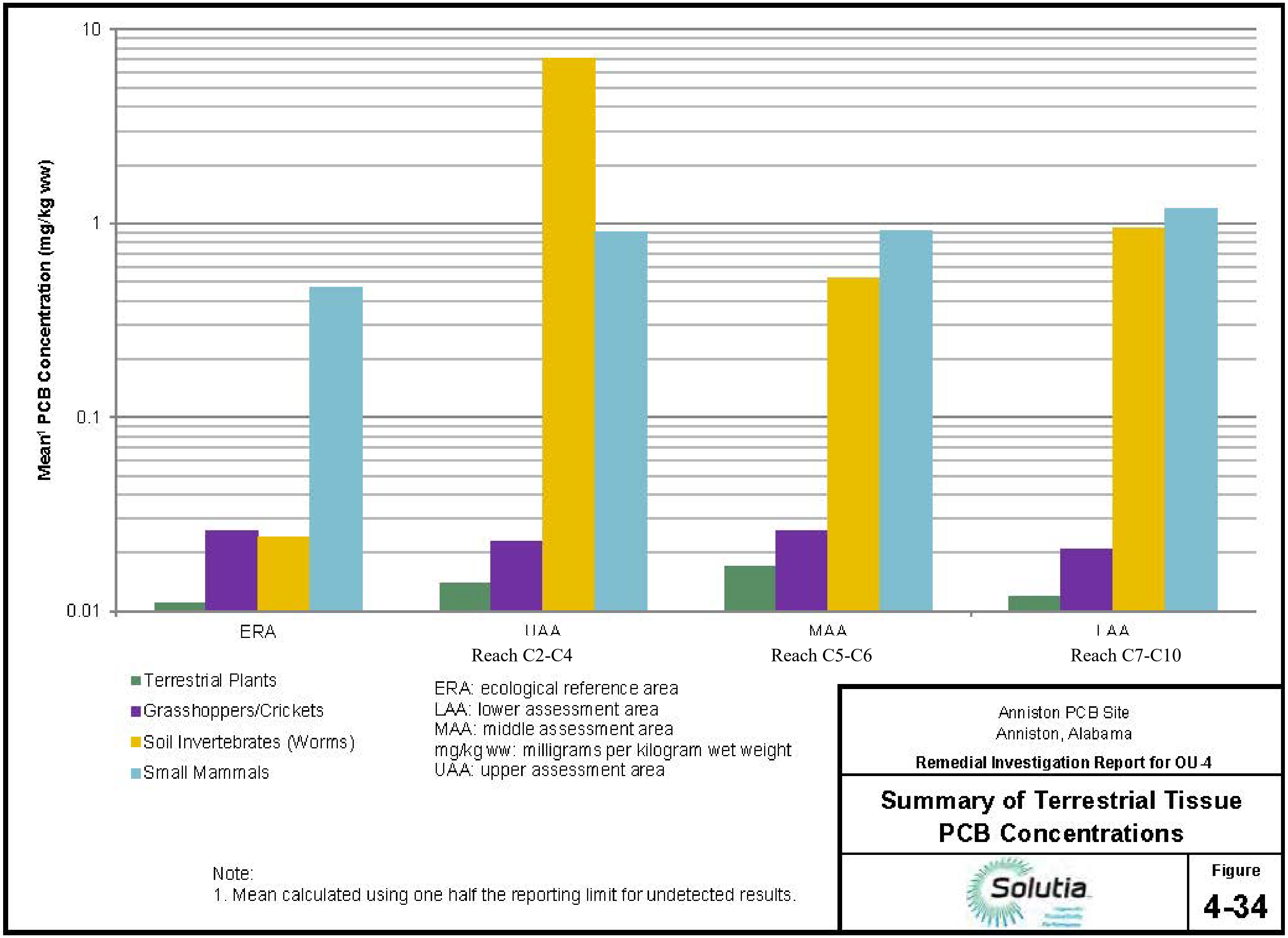

Figure 21. Summary of Terrestrial Tissue PCB Concentrations

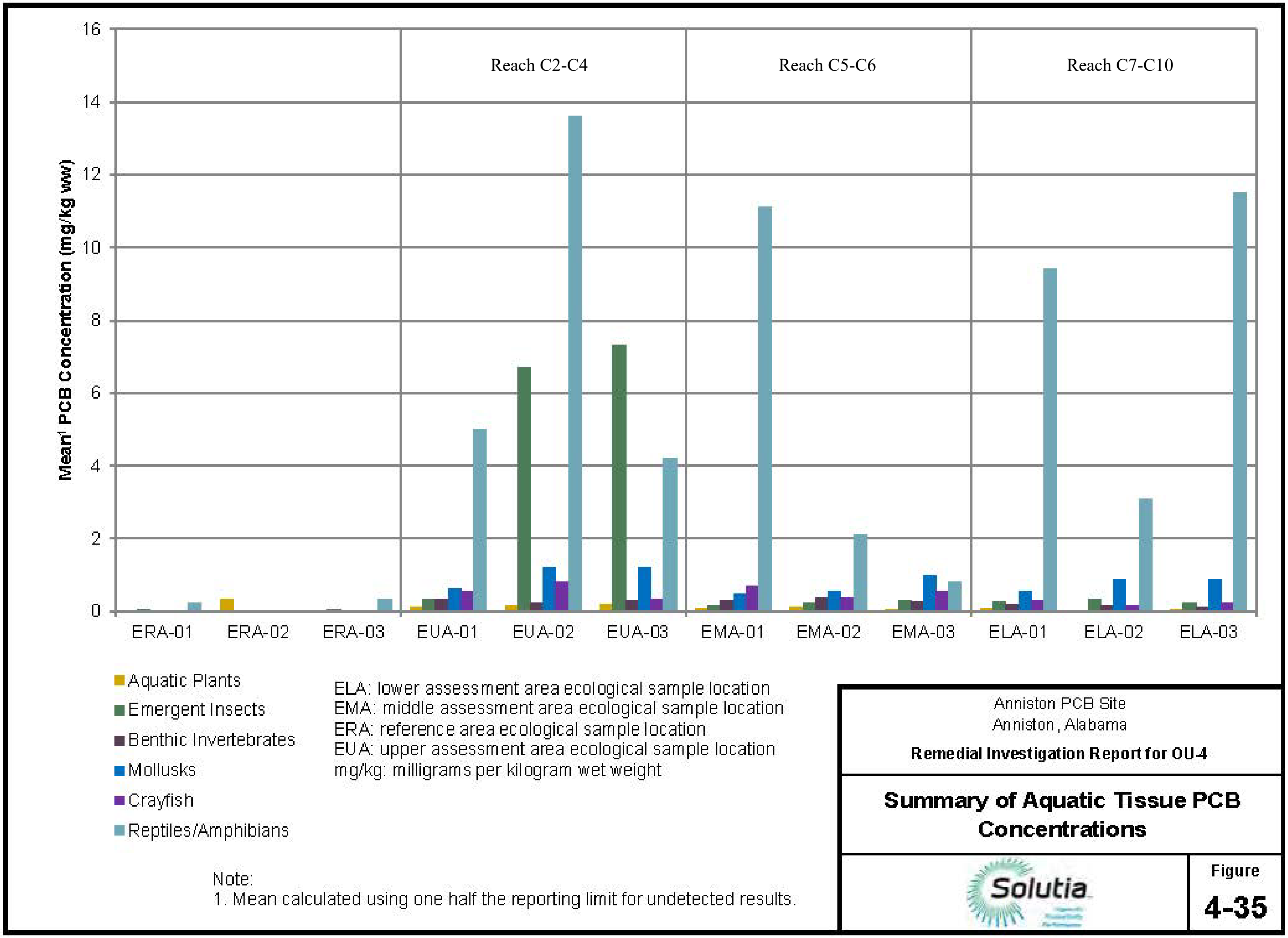

Figure 22. Summary of Aquatic Tissue PCB Concentrations

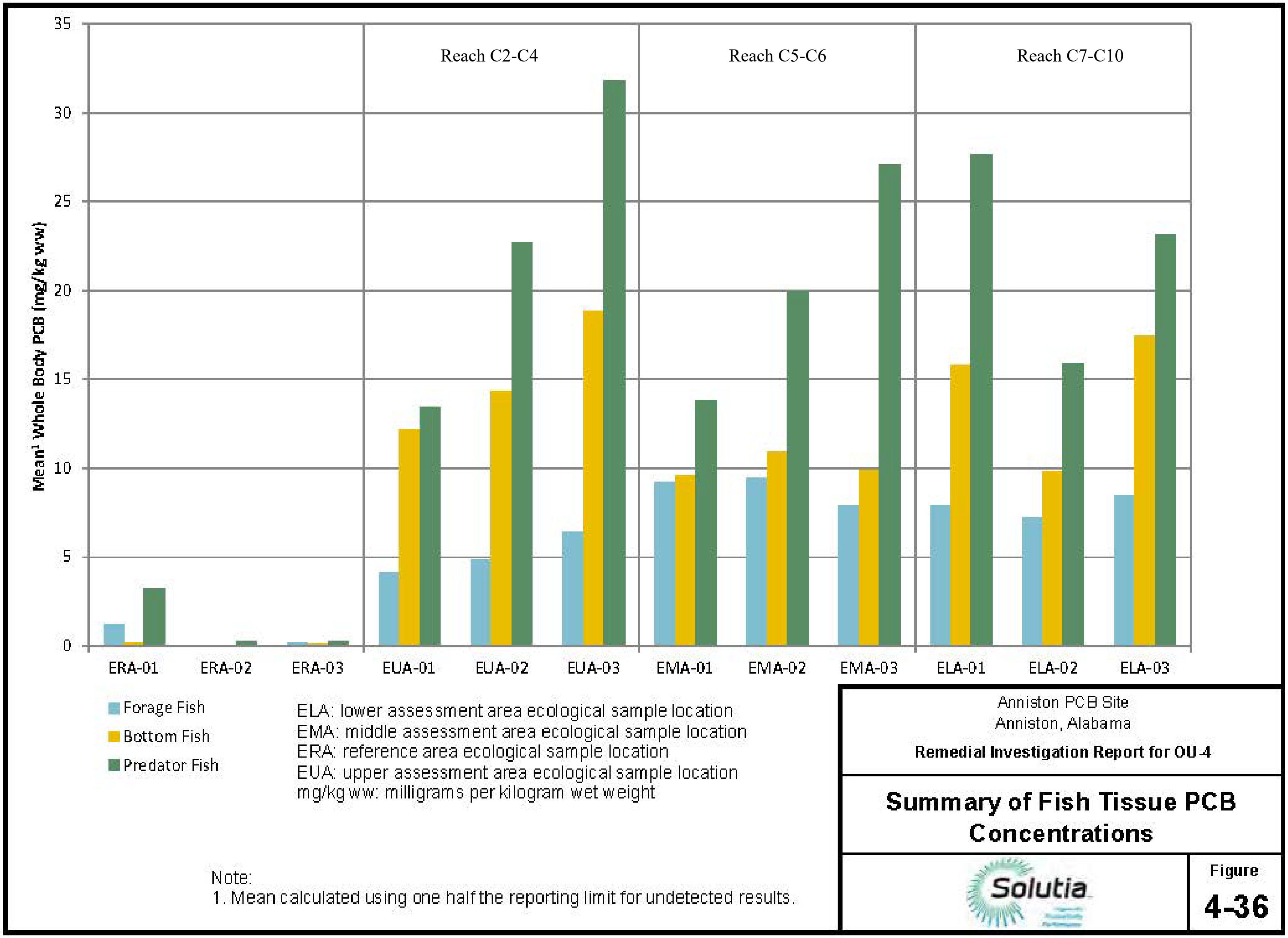

Figure 23. Summary of Fish Tissue PCB Concentrations

Contaminant Transport

Documented elevated concentrations of PCBs in soil and groundwater at the facility (OU3) are the known source for historical deposition of PCBs to OU1/OU2 and subsequently to OU4 primarily via movement of fine-grained particulates in surface water flow. These particulates have settled into stable OU4 sediment and were deposited into floodplain soil during periods of overbank flooding. Remedial activities at OU3 and OU1/OU2 are either complete or underway and will limit the potential for ongoing transport into OU4.

For those constituents that are typically bound to soil and sediment (e.g., PCBs), the most important mechanism of fate and transport can be understood by examining erosional (from creek banks and high energy areas in the sediment beds) and depositional processes for soil (in the floodplains and sediment in low-energy areas of sediment beds). Sediment particles may also be mixed within the sediment column or released to surface water through disturbance by benthic organisms, fish, turtles, or terrestrial organisms. In addition to sediment transport, surface water transport, and dissolution, other mechanisms may be responsible for the relocation of soil and sediment in OU4. These mechanisms may include the direct disposal of contaminant-containing materials such as foundry sand, or the relocation of existing sediment, foundry sands, or floodplain soil. For other contaminants that are not lipophilic in nature (e.g., metals), surface water may be the primary fate and transport medium.

Contaminants of concern are primarily present in the soil and sediment. Surface water concentrations generally reflect contaminants present in sediment or creek bank soil entering the creeks through surface water runoff. Once sediment and creek bank soil are addressed, surface water concentrations are expected to decline in a corresponding manner. Air and groundwater are not significantly affected by the constituents in OU4.

Principal Threat Waste

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in ground water may be viewed as source material. Principal threat wastes (PTW) are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Scope and Role of Operable Unit or Response Action

The Site has been divided into several operable units, which were selected based on geographic location and complexity. OU1/OU2 is a combination of residential and non-residential properties around the facility and downstream along Snow Creek and its floodplain to Highway 78. OU3 includes the facility and two adjacent landfills located at 702 Clydesdale Avenue, Anniston, Alabama. OU4, the subject of this Proposed Plan, consists of Snow Creek and its floodplain downstream of Highway 78 to the confluence of Snow and Choccolocco Creeks, and Choccolocco Creek from the backwater area upstream of Snow Creek to the embayment of Lake Logan Martin on the Coosa River. The EPA may identify other OUs for the Anniston PCB Site after data from OU4 and any other studies become available and are reviewed.

In addition to previously described response actions, the EPA has already selected the following response actions to reduce the risk to residents first, then to reduce the sources at the facility, followed by downstream areas in OU1/OU2.

Actions taken in OU1/OU2

- CERCLA Time-Critical Removal Action (October 2001) and NTCRA (February 2004) to address residential soil PCB contamination in surface and subsurface soil. Soil contaminated with PCB concentrations greater than 1 mg/kg was identified on 632 properties. Soil removal has been performed on 584 of these properties. Twelve (12) properties remain unremediated due to access issues and 36 properties are wooded/overgrown and not prioritized for removal until clearing is needed for development.
- Record of Decision for OU1/OU2 (Snow Creek and its floodplain from the facility downstream to Highway 78) dated November 8, 2017.

  The selected remedy consists of the following:
  - excavation with onsite and offsite disposal of PCB contaminated soil from residential and special use properties (i.e., schools, churches, day-care centers, community centers, playgrounds, and parks);
  - incorporates as CERCLA remedies all the interim corrective measures implemented at OU1/OU2 under ADEM's RCRA oversight, as well as the non-time critical removal action and any IMs implemented under the EPA's CERCLA oversight, prior to issuance of this ROD;
  - additional excavation and offsite disposal of PCB contaminated soil around the IM areas is needed to make the IMs protective over the long-term;
  - removal and offsite disposal of soil in four (4) dredge spoil piles adjacent to Snow Creek;
  - containment of contamination in unapproved waste disposal areas at locations west and east of the facility, where auto fluff waste was found mixed with significant PCB and lead contamination in soil;
  - on other non-residential properties, such as commercial/industrial properties, excavation to meet the non-residential surface soil cleanup goals for PCBs (21 mg/kg), chromium (382 mg/kg), PAHs (153 mg/kg), and PCDD/PCDF and /DL-PCBs TEQ (0.73 µg/kg) and offsite disposal of contaminated soil at approved facilities is required;
  - excavation of PCB PTW in soil at well T-11, installation of a low permeability cap, and groundwater extraction and treatment for PCBs in groundwater (0.5 µg/L), discharge of treated groundwater to Snow Creek, and offsite disposal of contaminated soil at approved facilities is required;
  - excavation of contaminated sediment to meet sediment goals for PCBs (3 mg/kg), barium (322 mg/kg), chromium (111 mg/kg), cobalt (59 mg/kg), lead (128 mg/kg), manganese (1,100 mg/kg), mercury (1 mg/kg), nickel (46 mg/kg), and vanadium (41 mg/kg), offsite sediment disposal; stabilization of 1,400 linear feet of bank area;

- long-term management of residual PCB concentrations in soil more than 1 mg/kg on all properties;
- ICs to (1) protect human health and the environment by limiting exposure to PCB impacted soil left in place and (2) protect the long-term integrity of the engineered components of the selected remedy;
- deed notices where possible on residential and special use properties with PCB > 1 mg/kg in subsurface soil and potentially under structures; and
- environmental easements/covenants will be implemented on Solutia owned properties where IMs have been taken, Unapproved Waste Disposal Areas, and the groundwater at T-11 area to maintain the integrity of caps from current or future activities.

The RD for OU1/OU2 is still being performed by the PRPs.

Actions taken in OU 3:

- CERCLA IROD (facility and two adjacent landfills soil and groundwater) dated September 29, 2011.

  The selected remedy consists of the following:
  - installation of a new, RCRA Subtitle C-compliant cap over the Cells IE, 2E, and 3E of the South Landfill excavation;
  - installation of a cap over impacted soils in Areas A and E to eliminate dermal contact, minimize potential soil leaching to groundwater, prevent erosion, and direct storm water away from the impacted area;
  - installation of a cap over impacted soils in Areas C and D to eliminate dermal contact exposure, prevent erosion, and direct storm water away from the impacted area;
  - enhanced institutional controls with a "no dig policy" restricting excavation within the Facility (particularly in Area F);
  - installation of perimeter fencing in the northeast portion of the Facility and along the southern portion of the employee parking lot.
  - verification with confirmation samples that the principal threat waste under cover in Area B has been removed;
  - verification with subsurface soil and/or groundwater confirmation samples that there are no groundwater impacts in Areas B, F, and G;
  - verification with confirmation samples that the PCB remedial goal is protective for dioxin toxic equivalency (TEQ) where dioxin TEQ includes dioxin-like PCBs, PCDDs and PCDFs;
  - execution and recording (by Solutia) an environmental covenant with ADEM to restrict land and groundwater use in the 0U3 area and the North Side and East Side Properties (in the vicinity of monitoring wells O W-21A and O W-10);
  - monitoring of select wells for natural attenuation parameters to demonstrate continued natural attenuation of PNP and parathion;
  - optimization and expand the existing groundwater corrective action system to provide further containment of groundwater near OW-21A and Area A (OW-lO/OW-11);
  - pre-treatment of extracted groundwater using a carbon filtration system;
  - after filtration, allow the water to flow to the on-Site equalization basin for discharge to

the Anniston POTW for further treatment; and

– provide operation, monitoring, and maintenance of soil ICMs, caps, groundwater corrective action system, carbon filtration system, and institutional controls to ensure continued long-tern effectiveness of the remedy.

The interim groundwater remedy is constructed, and groundwater monitoring is being performed. A final groundwater remedy for OU3 with final groundwater remedial goals will be selected in a future decision document.

Action taken in OU4:

- NTCRA to address residential soil PCB contamination in surface and subsurface soil in October 2001 and February 2004, respectively. In OU4, PCB concentrations greater than 1 mg/kg were identified on 20 properties as part of these agreements. Removal actions have been performed on 19 of these properties. One (1) remains unfinished due to access issues.

This Proposed Plan presents a Preferred Alternative to control sources of and reduce current and future potential risks from exposure PCBs in soil, sediment, surface water and fish and other biota or ecological receptors in OU4, which is downstream of OU1/OU2 and OU3. This Proposed Plan will also finalize IMs previously performed under RCRA in OU4 (see previous description) and address residual PCBs that remain in residential soil. The following sections will present the contaminants of concern for each media and alternatives to reduce or eliminate exposure. This is the third CERCLA remedial action proposed for the Anniston PCB Site.

Summary of OU4 Risks

The assessment of risk prepared for this portion of the Site identifies and quantifies the risks the contamination in OU4 pose to human health and the environment if no action is taken. It provides the basis for taking CERCLA action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The OU4 risk assessment consists of a Human Health Risk Assessment (HHRA) and a Baseline Ecological Risk Assessment (BERA). The HHRA and BERA were developed with data gathered in previous RCRA investigations and during the RI, and include analyses of samples of soil, sediment, groundwater, surface water, fish, and other biota in OU4. More information and details of the risk assessments and their findings can be found in the RI and in the HHRA and BERA reports.

Human Health Risk Assessment

A Human Health Risk Assessment (HHRA) was conducted to assess the cancer risks and non-cancer health hazards associated with exposure to Contaminants of Concern (COCs) present at the Site. Exposure to COCs present in soil and sediment, as well as COCs consumed in fish and agricultural products raised within the Site was considered. Consistent with EPA guidance, risks were evaluated without taking into consideration the current fish consumption advisory. Both a reasonable maximum exposure (RME) and a central tendency exposure (CTE) were evaluated to estimate cancer risks and non-cancer hazards. Remedial decisions are based on the RME, consistent with the NCP.

Receptors and Exposure Pathways
People could be exposed to contaminants in the floodplain through a variety of activities that are consistent with both current and potential future uses of the Site. These include people who work in the floodplain, use the floodplain for high-contact and low-contact recreation, farm in the floodplain, and live in the floodplain. People may consume fish from Choccolocco Creek despite the no consumption fish advisories.

The exposure units in Figure 7, as well as the eight agricultural exposure units in Figure 24, were used to evaluate human risk from dermal contact and incidental ingestion of soil. Fish sampling results were grouped into location groupings to evaluate consumption risk:

- Group A – Locations HHFL01 (reach C9 and C10) and HHFL02 (reach C9)
- Group B – Locations HHFL03 (reach C8 and C7) and HHFL04 (reach C7 and C6)
- Group C – Locations HHFL05 through HHFL09 (reach C5 through C2)

Hazard Identification
A contaminant of potential concern (COPC) screening was performed. Total PCBs (tPCBs, represented as the sum of Aroclors), PCB dioxin-like congener TEQ, dioxin TEQ, and mercury were identified as COPCs for the recreational fish ingestion pathway. Total PCBs and mercury were identified as the primary COPCs in the floodplain soil. See COPCs on Table 2.

Table 2. Contaminants of Potential Concern

COPCs	HHRA Media		BERA Media	
	Soil	Fish	Soil	Sediment
PCBs	x	x	x	X
WHO Congener TEQ (ND = 0)		x	x	X
WHO Dioxin TEQ (ND = 0)		x	x	X
Mercury	x	x	x	X
Barium				X
Chromium			x	X
Cobalt				X
Lead			x	X
Vanadium			x	X

ND= non detect

Toxicity Assessment and Risk Characterization
In evaluating chemical exposure risk to humans, estimates for risk from carcinogens and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently. The EPA also considers the cumulative carcinogenic and non-carcinogenic effects when multiple chemical exposures with similar target endpoints are present.

For carcinogens, cancer slope factors (CSFs) are the dose-response values used to evaluate potential carcinogens. Carcinogenic risk estimates are expressed in terms of probability. For example, exposure to a particular site-related carcinogenic chemical may present a 1 in 1,000,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as one-in-a-million or 1 x 10^{-6} excess lifetime cancer risk. CERCLA's acceptable risk range for carcinogens is 1 x 10^{-6} (1 in 1,000,000) to 1 x 10^{-4} (1 in 10,000) over a 70-year lifetime. In general, site-related risks higher than (greater than 1 in 10,000) this range warrant action under CERCLA.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). RfDs are developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without an appreciable risk of developing adverse health effects. The exposure dose is divided by the RfD to calculate the ratio known as a hazard quotient (HQ) to determine whether non-cancer adverse health effects would likely occur or not. The hazard index (HI) is the sum of the HQs from multiple contaminants. An HI greater than 1 suggests that adverse effects may be possible and would require consideration of cleanup alternatives.

Risks from Fish Consumption

Risks were evaluated using a RME for fish ingestion which exceeded the CERCLA's acceptable cancer risk range (1E-06 to 1E-04). The cancer risks from total PCBs were greater than 1E-04 for all locations and fish groupings (Table 3a). The cancer risks from DL-PCB congener TEQ and PCDD/PCDF TEQ were less than the risks from total PCBs (Table 4a). Total PCBs resulted in HQs greater than one (1) for every location. The HQs from mercury, DL-PCB congener TEQ, and PCDD/PCDF TEQ were greater than one (1) at several locations but were far less than the total PCBs HQs. When compared to the Central Tendency Evaluations in Tables 3b and 4b where PCBs are the only contaminant that generates unacceptable risk, it is clear that PCBs are the risk driver for fish.

Risk from Direct Contact Exposure to Soil

The farmer cancer risks based on both total PCBs and DL-PCB congener TEQ in soil were either within or less than the CERCLA's acceptable cancer risk range (1E-06 to 1E-04) at all applicable exposure units (Table 5). The soil recreational user and utility worker cancer risks for both total PCBs and DL-PCB congener TEQ were less than the acceptable cancer risk range (1E-06 to 1E-04) at all exposure units (Table 6). The noncancer soil recreational exposure HIs were less than one for total PCBs, DL-PCB congener TEQ, and mercury. The utility worker and farmer HIs were also less than one at all direct contact exposure units.

The residential risk assessment was prepared for the NTCRA agreement and was verified to be valid in the OU4 HHRA. For the limited number of properties evaluated at that time of the NTCRA streamlined risk assessment, the calculated cancer risks were within the CERCLA's protective risk range of $1x10^{-4}$ to 1x10-6. However, the non-cancer HI was greater than 1.0 at all properties.

The RCRA IMs were intended to eliminate potential exposure to PCB contamination in non-residential soil. To determine if there were risks that still needed to be accounted for, the EPCs for Field A, C, and D were calculated in the OU4 Feasibility Study for surface soil (0 to 12 inches) as 15.9 mg/kg, 8.9 mg/kg and 6.4 mg/kg, respectively. These EPCs are lower than the EPCs for high activity recreational use on Table 6, and therefore, they do not exceed the CERCLA's risk range and do not warrant further action under CERCLA.

Table 3a. Summary of Cancer Risks and Hazard Indices from Primary Contaminants of Potential Concern – RME Scenario

Location Grouping	Species	Cancer Risk	Hazard Index		PCB Dioxin-like Congener TEQ	
		Total PCBs	Total PCBs	Mercury	Cancer Risk	Hazard Quotient
A Reaches C9 & C10	All Fish	**1E-03**	**62**	**2**	**5E-04**	**12**
	Bass	**1E-03**	**71**	**3**	**6E-04**	**15**
	Catfish	**1E-03**	**77**	1	**2E-04**	**4**
	Panfish	**9E-04**	**55**	**2**	**4E-04**	**9**
B Reaches C6 toC8	All Fish	**6E-04**	**38**	1	1E-04	**3**
	Bass	**1E-03**	**62**	**2**	1E-04	**4**
	Catfish	**9E-04**	**52**	1	7E-05	**2**
	Panfish	**4E-04**	**24**	1	6E-05	**2**
C Reaches C5 to C2	All Fish	**1E-03**	**71**	1	1E-04	**3**
	Bass	**1E-03**	**68**	**2**	1E-04	**3**
	Catfish	**1E-03**	**87**	1	1E-04	**3**
	Panfish	**7E-04**	**43**	1	1E-04	**4**

Bold = cancer risk greater than 1E-04 or hazard index greater than 1.0.

Table 3b. Summary of Cancer Risks and Hazard Indices from Primary Contaminants of Potential Concern – CTE Scenario

Location Grouping	Species	Cancer Risk	Hazard Index		PCB Dioxin-like Congener TEQ	
		Total PCBs	Total PCBs	Mercury	Cancer Risk	Hazard Quotient
A Reaches C9 & C10	All Fish	5E-05	**6**	0.2	4E-05	1
	Bass	6E-05	**7**	0.2	6E-05	1
	Catfish	6E-05	**7**	0.09	2E-05	0.4
	Panfish	4E-05	**5**	0.2	3E-05	0.9
B Reaches C6 toC8	All Fish	6E-05	**7**	0.2	2E-05	0.5
	Bass	1E-04	**12**	0.4	3E-05	0.7
	Catfish	8E-05	**10**	0.2	1E-05	0.4
	Panfish	4E-05	**5**	0.1	1E-05	0.3
C Reaches C5 to C2	All Fish	1E-04	**13**	0.2	2E-05	0.6
	Bass	1E-04	**14**	0.3	2E-05	0.6
	Catfish	1E-04	**17**	0.2	2E-05	0.6
	Panfish	7E-05	**8**	0.1	3E-05	0.7

Bold = cancer risk greater than 1E-04 or hazard index greater than 1.0.

Table 4a. Summary of Cancer Risks and Hazard Indices – RME Scenario - TEQs

Location Grouping	Species	Cancer Risk			Contribution of PCB Dioxin-like Congener to Total TEQ Risk	Hazard Quotient			Contribution of PCB Dioxin-like Congener to Total TEQ HQ
		PCB Dioxin-like Congener TEQ	2,3,7,8-TCDD TEQ	Total		PCB Dioxin-like Congener TEQ	2,3,7,8-TCDD TEQ	Total	
A	All Fish	**5E-04**	1E-04	**6E-04**	76%	**12**	**4**	**16**	76%
Reaches C9 & C10	Bass	**6E-04**	1E-04	**7E-04**	84%	**15**	**3**	**18**	84%
	Catfish	**2E-04**	3E-05	**2E-04**	86%	**4**	0.7	**5**	86%
	Panfish	**4E-04**	1E-04	**5E-04**	71%	**9**	**4**	**13**	71%
B	All Fish	1E-04	3E-05	1E-04	81%	**3**	0.6	**3**	81%
Reaches C6 toC8	Bass	1E-04	4E-05	**2E-04**	81%	**4**	0.9	**5**	81%
	Catfish	7E-05	1E-05	9E-05	85%	**2**	0.3	**2**	85%
	Panfish	6E-05	2E-05	8E-05	73%	**2**	0.6	**2**	73%
C	All Fish	1E-04	1E-05	1E-04	91%	**3**	0.3	**3**	91%
Reaches C5 to C2	Bass	1E-04	1E-05	1E-04	91%	**3**	0.3	**3**	91%
	Catfish	1E-04	2E-05	1E-04	89%	**3**	0.4	**4**	89%
	Panfish	1E-04	9E-06	1E-04	94%	**4**	0.2	**4**	94%

Bold = cancer risk greater than 1E-04 or hazard quotient/index greater than 1.0.

Table 4b. Summary of Cancer Risks and Hazard Indices – CTE Scenario - TEQs

Location Grouping	Species	Cancer Risk			Contribution of PCB Dioxin-like Congener to Total TEQ Risk	Hazard Quotient			Contribution of PCB Dioxin-like Congener to Total TEQ HQ
		PCB Dioxin-like Congener TEQ	2,3,7,8-TCDD TEQ	Total		PCB Dioxin-like Congener TEQ	2,3,7,8-TCDD TEQ	Total	
A	All Fish	4E-05	1E-05	6E-05	76%	1	0.4	2	76%
Reaches C9 & C10	Bass	6E-05	1E-05	7E-05	84%	1	0.3	2	84%
	Catfish	2E-05	3E-06	2E-05	86%	0.4	0.07	0.5	86%
	Panfish	3E-05	1E-05	5E-05	71%	0.9	0.4	1	71%
B	All Fish	2E-05	5E-06	2E-05	81%	0.5	0.1	0.6	81%
Reaches C6 toC8	Bass	3E-05	7E-06	3E-05	81%	0.7	0.2	0.9	81%
	Catfish	1E-05	2E-06	2E-05	85%	0.4	0.06	0.4	85%
	Panfish	1E-05	4E-06	2E-05	73%	0.3	0.1	0.4	73%
C	All Fish	2E-05	2E-06	2E-05	91%	0.6	0.06	0.6	91%
Reaches C5 to C2	Bass	2E-05	2E-06	2E-05	91%	0.6	0.05	0.6	91%
	Catfish	2E-05	3E-06	3E-05	89%	0.6	0.07	0.7	89%
	Panfish	3E-05	2E-06	3E-05	94%	0.7	0.04	0.7	94%

Bold = cancer risk greater than 1E-04 or hazard quotient/index greater than 1.0.

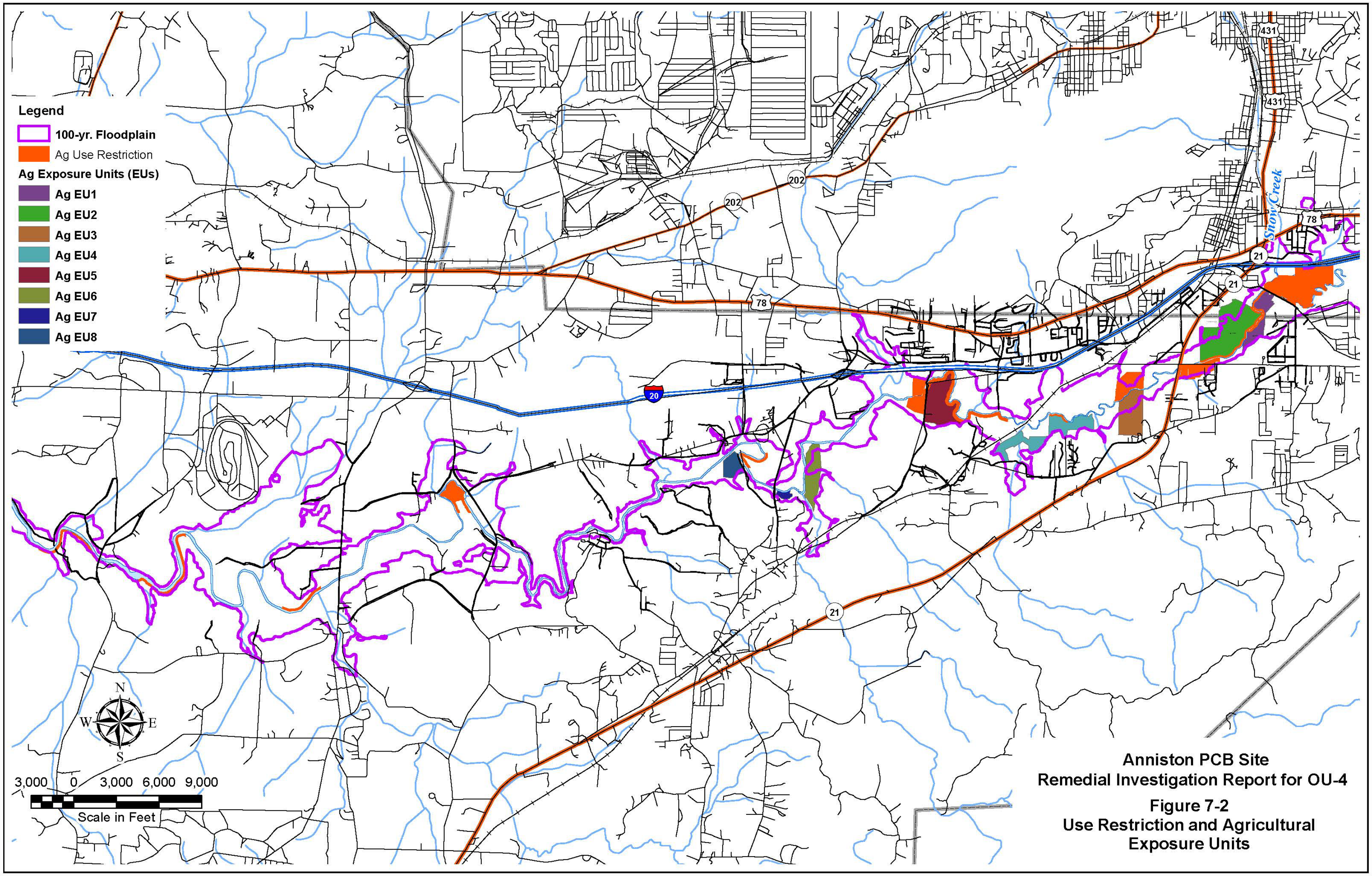

Figure 24. Use Restrictions and Agricultural Exposure Units

Table 5. Summary of Cancer Risks and Hazard Indices from Primary Contaminants of Potential Concern Agricultural Exposure Units - RME Scenario

Exposure Unit	Exposure Scenario	Receptor	Cancer Risk (Total PCBs)	Hazard Index (Total PCBs and Mercury)	Cancer Risk (PCB Dioxin-like Congener TEQ)	Hazard Index (PCB Dioxin-like Congener TEQ)
Ag-EU1	Farmer	Adult	3E-06	0.1	3E-07	0.007
Ag-EU2	Farmer	Adult	1E-06	0.06	2E-07	0.004
Ag-EU3	Farmer	Adult	2E-06	0.08	2E-07	0.005
Ag-EU4	Farmer	Adult	1E-07	0.005	1E-08	0.0003
Ag-EU5	Farmer	Adult	3E-07	0.01	4E-08	0.0008
Ag-EU6	Farmer	Adult	3E-09	0.0002	8E-11	0.000002
Ag-EU7	Farmer	Adult	5E-08	0.002	6E-09	0.0001
Ag-EU8	Farmer	Adult	3E-08	0.002	3E-09	0.00006

Table 6. Summary of Cancer Risks and Noncancer Hazard Indices from Primary COPCs

Exposure Unit	Exposure Scenario	Receptor	Cancer Risk (Total PCBs)	Hazard Index (Total PCBs and Mercury)	Cancer Risk (PCB Dioxin-like Congener TEQ)	Hazard Index (PCB Dioxin-like Congener TEQ)
C1-EU1	High contact recreational	Young child	4E-06	0.4	5E-07	0.06
		Adolescent	3E-06	0.5	4E-07	0.03
		Adult	2E-06	0.1	2E-07	0.006
C1-EU2	Low contact recreational	Adolescent	7E-06	1	9E-07	0.07
		Adult	4E-06	0.2	5E-07	0.01
	Worker	Adult	1E-07	0.2	2E-08	0.01
C2N-EU1	Low contact recreational	Adolescent	2E-06	0.4	3E-07	0.02
		Adult	1E-06	0.08	2E-07	0.005
	Worker	Adult	6E-08	0.1	8E-09	0.006
C3N-EU1	Low contact recreational	Adolescent	3E-06	0.6	4E-07	0.03
		Adult	2E-06	0.1	2E-07	0.006
C3N-EU2	Low contact recreational	Adolescent	5E-06	0.6	4E-07	0.03
		Adult	3E-06	0.1	2E-07	0.006
C3S-EU1	High contact recreational	Young child	7E-06	1	9E-07	0.1
		Adolescent	6E-06	1	7E-07	0.06
		Adult	3E-06	0.2	4E-07	0.01
C3S-EU2	High contact recreational	Young child	8E-06	1	3E-06	0.3
		Adolescent	7E-06	1	2E-06	0.2
		Adult	4E-06	0.2	1E-06	0.03
C4N-EU1	Low contact recreational	Adolescent	1E-06	0.2	2E-07	0.01
		Adult	7E-07	0.04	1E-07	0.003
	Worker	Adult	1E-08	0.02	2E-09	0.001
C4N-EU2	Low contact recreational	Adolescent	1E-06	0.2	2E-07	0.01
		Adult	7E-07	0.04	1E-07	0.003
C4S-EU1	Low contact recreational	Adolescent	2E-06	0.4	4E-07	0.03
		Adult	1E-06	0.09	2E-07	0.006
C4S-EU2	Low contact recreational	Adolescent	4E-07	0.06	5E-08	0.004
		Adult	2E-07	0.01	3E-08	0.0007
C4S-EU3	Low contact recreational	Adolescent	8E-07	0.1	1E-07	0.008
		Adult	5E-07	0.03	6E-08	0.002
C5N-EU1	Low contact recreational	Adolescent	9E-07	0.2	1E-07	0.009
		Adult	5E-07	0.03	7E-08	0.002
	Worker	Adult	2E-08	0.04	3E-09	0.002
C5S-EU1	Low contact recreational	Adolescent	2E-07	0.03	2E-08	0.002
		Adult	1E-07	0.007	1E-08	0.0004
C6N-EU1	Low contact recreational	Adolescent	3E-07	0.05	4E-08	0.003
		Adult	2E-07	0.01	2E-08	0.0006
C6S-EU1	Low contact recreational	Adolescent	4E-07	0.07	5E-08	0.004
		Adult	3E-07	0.02	3E-08	0.0008
C7S-EU1	Low contact recreational	Adolescent	2E-07	0.03	2E-08	0.002
		Adult	1E-07	0.007	1E-08	0.0004
C8N-EU1	Low contact recreational	Adolescent	4E-07	0.08	7E-08	0.005
		Adult	3E-07	0.02	4E-08	0.001

Baseline Ecological Risk Assessment

The OU4 BERA was conducted using a wide range of scientific data and information to develop various lines-of-evidence (LOEs) for characterizing risks. To complete the OU4 BERA, chemical data were collected from abiotic media (surface water, sediment and soil) and a range of biotic tissue; ecological community data were collected; and habitat studies were conducted over the course of 15 years. Site-specific sediment toxicity and bioaccumulation studies were also conducted. These studies and data collection activities provide extensive site-specific data with which to perform a robust risk assessment. The site-specific data, complemented with relevant literature-based information, were incorporated into the OU4 BERA to support a range of conclusions regarding potential risks to ecological receptors that may reside or forage within OU4.

Multiple Measurement Endpoints (MEs) and LOEs were evaluated along with uncertainties associated with each to evaluate each Assessment Endpoint (AE) identified for the OU4 BERA. In many cases, identified uncertainties were mitigated by using conservative assumptions. Risk conclusions were developed based on comparison of measured COPC concentrations in Site media or estimated dietary exposure concentrations with toxicity benchmarks or toxicity reference values (TRVs).

The 2016 BERA followed the eight-step process outlined in the EPA's Ecological Risk Assessment Guidance for Superfund. A 2018 BERA Addendum was prepared by the EPA to focus on the specific technical issues where agreement was not reached during the BERA comment and review process. The conclusions below are based on the BERA Addendum.

The BERA identified constituents of potential ecological concern (COPCs). While PCBs are considered the primary COPC, seven other constituents (barium, chromium, cobalt, lead, mercury, vanadium, and PCDD/PCDFs) were identified as being potentially elevated above background concentrations and were also included as COPCs (see Table 2).

Seven AEs were established to represent valuable ecological resources that need to be protected from risk potentially created by COPCs. They include survival, growth, and reproduction of the following: aquatic/terrestrial plant communities; benthic invertebrate communities; terrestrial invertebrate communities; fish communities; birds; mammals; and amphibians and reptiles.

Exposure to COPCs for lower-trophic-level receptors consisting of benthic and terrestrial invertebrate communities, aquatic and terrestrial plant communities, and aquatic life (invertebrate, fish, and amphibian communities) were quantitatively evaluated based on direct contact with environmental media (sediment, soil, and surface water). Exposure to COPCs for upper-trophic level receptors consisting of birds and mammals were quantitatively evaluated based on dietary food web exposure estimated using measured tissue EPCs or modeled tissue EPCs calculated from abiotic media EPCs and bioaccumulation factors (BAFs). In addition, tissue-burden-based exposures were evaluated for invertebrates, fish, birds, and small mammals.

Due to lack of sufficient toxicity data for amphibians and reptiles, potential risk to these receptors were not quantitatively evaluated. Concentrations of PCBs measured in frogs collected in the UAA are similar to tissue concentrations measured in forage fish, and concentrations of PCBs measured in reptiles are similar to tissue concentrations measured in predator fish OU-wide. The PCB concentrations observed in amphibians and reptiles (Figure22) were used in the food-chain models for receptors assumed to consume amphibians and reptiles. Actions taken to reduce the body burdens in forage and predator fish will also reduce the body burdens in reptiles and amphibians.

Because of the large size of OU4 (37 creek miles and 6,000 floodplain acres) and high degree of habitat variability, the Choccolocco Creek portion of OU4 was divided into smaller subunits/reaches for the assessment: UAA, MAA, and LAA. These assessment areas were further divided into smaller EUs where data are available to support these smaller groupings. The boundaries are based on logical break points using a combination of natural and human-made features within OU4 that could affect the transport mechanisms of solids to and from the floodplain and the introduction of non-PCB-containing suspended solids through tributary creek inputs. For example, major roads and bridges, confluence points associated with tributaries and creeks, the physical attributes of the backwater area, and significant changes in the width of the floodplain were considered in identifying the break points between reaches.

The reaches (C1 through C10, shown on Figure11) are used as EUs for aquatic receptors. Reach C1, which is the segment of Snow Creek included in OU4, is evaluated independently. The UAA includes reaches C2 through C4. The MAA includes reaches C5 and C6. The LAA includes reaches C7 thorough C10. The lower end of Choccolocco Creek is identified as C10, and this EU only includes the creek and its sediment (no adjoining floodplain soil areas). Surface water elevations in this lower portion of Choccolocco Creek are controlled by dams located on the upstream and downstream ends of Lake Logan Martin that serve to limit routine flooding of these areas.

The results of the BERA are summarized on Table 7 and include a range of aquatic and terrestrial receptors. The aquatic receptor predicted risk will be addressed though sediment remedies, the terrestrial/riparian receptors predicted risk will be reduced through soil remedies, and the mixed aquatic and terrestrial diet receptors will be addressed through sediment and soil remedies. The risks for C1 through C10 are categorized as being acceptable, generally acceptable, indeterminate, unacceptable, or highly unacceptable. The table also groups EUs by overall assessment areas, including UAA (C2 through C4), MAA (C5 and C6), and LAA (C7 through C10). The results for the C1 were not grouped with the UAA results because of the physical break that I-20 forms between C1 and C2.

The overall conclusions from the BERA and BERA Addendum are similar. PCBs are the primary contaminants that contribute to the unacceptable risk. Predicted risk for aquatic receptors is highest for piscivorous birds and mammals and are primarily due to PCB concentrations in fish tissue. Predicted high risk for aquatic invertivorous/ insectivorous birds is primarily due to modeled PCB concentrations in aquatic worms. Predicted risk is unacceptable for fish throughout OU4. Risk to benthic invertebrates is highest and unacceptable in reaches C1 and C2, which includes Snow Creek and the backwater area, respectively. Predicted risk is unacceptable for aerial insectivores (swallows and bats) in reaches C1 through C4 and acceptable in reaches C5 through C10. Predicted risk to terrestrial receptors is unacceptable for some receptors in reaches C1 through C4 and generally indeterminate or acceptable in reaches C5 through C10.

Risks were also evaluated for 7 additional secondary COPCs (i.e., mercury, PCDD/PCDF and DL-PCB congener TEQ, barium, chromium, cobalt, lead, and vanadium), and are reported in the BERA Addendum. Although unacceptable risks were identified in some areas of OU4 for some of these COPCs, overall risks in OU4 are primarily due to PCBs. The “unacceptable risk” was derived by using the highest concentrations in each area. However, the areas showing unacceptable risks for COPCs had EPCs that were lower than what would have been the goals for the COPCs.

Table 7. Predicted Risk for Ecological Receptors Exposed to PCBs in OU4.

Assessment Endpoint			UAA			MAA		LAA			
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Aquatic Receptor Predicted Risk											
Aquatic Plants/ Aquatic Life		U	A	A	A	A	A	A	A	A	A
Benthic Invertebrates		U	U	GA	GA	GA	A	U	GA	A	GA
Fish/Aquatic Life		U	U	U	U	U	U	U	U	U	U
Piscivorous Birds	Belted kingfisher	U	U	U	U	U	U	U	U	U	U
Insectivorous Birds	Sandpiper	HU	HU	U	U	U	U	U	U	U	U
Aerial Insectivorous Birds	Swallow	U	U	U	U	A	A	A	A	A	A
Piscivorous Mammals	Otter/mink	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU
Aerial Insectivorous Mammals	Bat	U	U	U	U	A	A	A	A	A	A
Terrestrial/Riparian Receptor Predicted Risk											
Terrestrial Plants		U[1]	A	A	A	A	A	A	A	A	A
Terrestrial Invertebrates		U[1]	I	I	I	A	A	A	A	A	I
Herbivorous Birds	Dove	U[1]	A	I	A	A	A	A	A	A	A
Insectivorous Birds	Wren	U	U	U	U	I	I	I	I	I	--
Omnivorous Birds	Blue jay	U	I	I	I	A	A	A	A	A	--
Carnivorous Birds	Hawk	HU	U	U	U	I	A	A	I	A	--
Herbivorous Mammals	Deer	A	A	A	A	A	A	A	A	A	--
Insectivorous/ Invertivorous Mammals	Shrew	U	U	U	U	I	I	I	I	I	--
Carnivorous Mammals	Weasel	U[1]	A	U[2]	I	A	A	A	A	A	--
Mixed Aquatic and Terrestrial Diet Receptor Predicted Risk											
Omnivorous Birds	Wren	HU	U	U	U	I	I	I	I	I	--
Omnivorous Mammals	Raccoon	I	I	I	I	I	I	I	I	I	I
Omnivorous Mammals	Mink	HU	HU	HU	HU	HU	HU	HU	HU	HU	HU

Notes:

[1]Unacceptable for C1 West only; C1 East risk is indeterminate.

[2]Unacceptable for C3 South only; C3 North risk is indeterminate.

-- Terrestrial and riparian habitat not evaluated in Reach C10

BERA: baseline ecological risk assessment

LAA: lower assessment area

LOE: line of evidence

MAA: middle assessment area

UAA: upper assessment area

Risk categories:

A	Acceptable risk
GA	Generally acceptable risk
I	Indeterminate risk
U	Unacceptable risk
HU	High unacceptable risk

Terrestrial/ Riparian Receptors (in contact with soil)

Aquatic Receptors (in contact with sediment)

<u>Threatened and Endangered Species</u>

The potential for adverse effects to populations of Threatened and Endangered (T&E) species that may occur in OU4 was qualitatively evaluated based on the risk conclusions for each assessment endpoint that corresponds with the relevant T&E species. No unacceptable risk to local populations of T&E plants is estimated. Unacceptable risks to threatened or endangered benthic invertebrates may be present. No unacceptable risks to T&E invertebrates in OU4 is predicted. Unacceptable risks to the forage fish community (which would include T&E blue shiner and pygmy sculpin) may be present. No T&E birds have been observed within OU4. Insectivorous aerial mammals, which may include Indiana bats, grey bats, and the northern long-eared bat, indicates potential unacceptable risks.

Risk Assessment Conclusions

The results of the HHRA, BERA, and nature and extent of contamination results together lead to the following conclusions for OU4 moving forward:

- The primary contaminants of concern for soil based on the BERA are PCBs and mercury, as all no observed adverse effect level (NOAEL)-based HQs calculated using modeled tissue TEQ concentrations are less than or equal to 1 for PCDD/PCDF and DL-PCB TEQ in soil;
- Addressing PCBs in soil will address Site-related Mercury as exposure point concentrations of concern are co-located;
- The contaminants of concern for sediment based on the HHRA and BERA are PCBs, mercury, PCDD/PCDF and DL-PCB TEQ.
- Addressing PCBs in sediment will address Site related Mercury and PCDD/PCDF and DL-PCBs. The exposure point concentrations of concern are co-located in the backwater area.

Based on the HHRA and BERA action under CERCLA is warranted and actions are necessary to protect human health or the environment from actual or threatened releases of hazard substances into the environment.

Remedial Action Objectives

The Remedial Action Objectives (RAOs) provide the overall goals that a remedy needs to achieve to protect human health and the environment based on the risk assessments.

RAO 1: Reduce PCB concentrations in residential soil to levels that are protective to residents, including young children and adolescents, and other users from direct contact with or incidental ingestion exposure. This RAO is expected to be achieved when access for soil cleanup is granted and cleanup is performed at the one remaining property or when existing structures are removed.

RAO 2: Ensure the long-term effectiveness of the previously implemented RCRA interim measures in Oxford Lake Park. This RAO is expected to be achieved when actions are finalized in this decision document.

RAO 3: Reduce PCB concentrations in soil (0-6 inches) to levels that are protective to terrestrial ecological receptors. This RAO is expected to be achieved by meeting COC remedial goal concentrations in soil (Table 8).

RAO 4: Reduce PCB concentrations in sediment to levels that reduce PCB concentrations to acceptable levels in fish tissue. This RAO is expected to be achieved over time by meeting PCB remedial goal concentrations in sediment (Table 8).

RAO 5: Reduce PCB concentrations in fish tissue to levels that are protective to human fish consumers, including pregnant women, young children, and adolescents. This RAO is expected to be achieved over time by meeting PCB remedial goal concentrations in fish tissue.

RAO 6: Reduce PCB concentrations in sediment to levels that are protective to benthic macroinvertebrate communities. This RAO is expected to be achieved by dredging and/or capping of sediment.

RAO 7: Reduce PCB concentrations in sediment to levels that are protective to fish communities and aquatic feeding birds and mammals. This RAO is expected to be achieved over time by meeting PCB remedial goal concentrations in sediment.

RAO 8: Reduce PCB concentrations to levels that are protective of ecological receptors that consume whole fish. This RAO is expected to be achieved over time by meeting PCB remedial goal concentrations in whole body fish.

RAO 9: Reduce transport of PCBs in OU4 soil and sediment to downstream areas. This RAO is expected to be achieved by meeting PCB remedial goal concentrations in sediment and on creek banks.

RAO 10: Restore surface water to achieve AWQC for PCBs for the protection of wildlife and human consumers of fish. This RAO will be achieved when ARARs are met.

Preliminary Remediation Goals

In general, preliminary remediation goals (PRGs) are the contaminant concentrations that need to be met for the remedial alternatives to achieve the RAOs or attain Applicable or Relevant and Appropriate Requirements (ARARs). Site-specific PRGs are summarized in Table 8, at the end of this section.

Soil PRGs

<u>Residential</u>

The PCB PRGs for <u>residential soil</u> were established in the NTCRA and are required to satisfy RAO 1. The removal action level for PCBs in residential soil was established at 1 mg/kg in surface soil and 10 mg/kg in subsurface soil. These concentrations have been achieved for most residential properties at the Site. However, any soil with PCB concentrations greater than 1 mg/kg that remain on the property are considered PCB remediation waste if removed. The PRPs still have Toxic Substances Control Act (TSCA) obligations related to future soil disturbance activities that could create an unacceptable risk by

Table 8. Summary of Preliminary Remediation Goals OU4 Media

MEDIA	CONTAMINANT	PRELIMINARY REMEDIATION GOAL	BASIS	RAO
Soil - residential				
surface	PCBs	1 mg/kg	NTCRA HHRA	1
subsurface	PCBs	10 mg/kg	PCB Guidance	
Soil - non-residential surface	PCBs (0-6 in)	95% UCL SWAC 6 mg/kg over 5 acre	BERA	3
Soil – creek banks	PCBs	NTE 2.6 mg/kg	BERA	9
Sediment all	PCBs	NTE/RAL 2.6 mg/kg	BERA	6
		95% UCL SWAC 0.1 mg/kg in each reach[1]	HHRA/BERA	4, 7, 9
Surface Water	PCBs (wildlife)	0.014 µg/L	ARAR	10
	PCBs (HH)	0.000064 ug/L	ARAR	10
Fish	PCB (tissue) upstream Jackson Shoals	0.08 mg/kg ww	HHRA	5
	PCB (tissue) downstream Jackson Shoals	0.04 mg/kg ww	HHRA	5
	PCB (whole body)	1.3 mg/kg dw	BERA	8

[1] The sediment remedy has two PRGs applied at different spatial scales: 1) an NTE PRG of 2.6 mg/kg total PCBs where individual sediment samples are not to exceed 2.6 ppm total PCBs (this NTE PRG is also being used as a RAL to delineate areas for active remediation); and 2) a SWAC PRG of 0.1 mg/kg total PCBs where the 95% UCL of the measured SWAC will not exceed the 0.1 mg/kg total PCB PRG in each of the ten creek reaches (C1 through C10) (see Figure 11 and FS figures 5-7a-k). Although Mean SWAC was used over the risk assessment exposure areas in the FS, a 95% UCL of the SWAC over the relevant creek reach will be required.

NTE – not to exceed.
SWAC – surface weighted average concentration
HHRA – human health risk assessment
ARAR – applicable, relevant and appropriate requirements
UCL – upper confidence limit
HH – human health
BERA – baseline ecological risk assessment

bringing subsurface soil with PCB concentrations greater than 1 mg/kg to the surface. The alternatives considered for residential exposure need to address the one property that has not been cleaned up and the residual PCB concentrations greater than 1 mg/kg in subsurface soil and potentially beneath structures on residential properties.

Non- Residential

The IMs in OU4 are recreational areas fenced or closely monitored by the Oxford Lake Park and City of Oxford staff. Monitoring and maintenance are needed and/or alternatives to reduce remaining PCB concentrations greater than 1 mg/kg below the clean soil caps to satisfy RAO 2. There is no PRG for IMs.

The PRG for non-residential soil was established to reduce exposure to ecological receptors that are exposed to, ingest, and bioaccumulate PCBs in soil (0-6 inches bgs). The PRG for floodplain soil for protection of ecological receptors was selected from the range of lowest observed adverse effect level (LOAEL)-based RGOs for terrestrial and semiterrestrial receptors evaluated in the OU4 BERA Addendum. The selected value is protective of at least one exposure scenario for all receptor groups evaluated, including avian and mammalian herbivores, omnivores, invertivores, and carnivores.

Compliance will be measured through the 95% Upper Confidence Level (UCL) of the surface weighted average concentrations (SWAC) in each 5-acre exposure unit. The RAL needed to meet the SWAC in each exposure unit will be developed in RD. The PRG for non-residential soil satisfies RAOs 3.

Creek Banks

The PRG for creek bank soil was established to keep PCB concentrations in soil on creek banks from re-contaminating the sediment and contributing to downstream migrations of PCBs in sediment to Lake Logan Martin. The PRG for creek bank soil contributes to the achievement of RAO 9.

Sediment PRGs

The not-to exceed/ remedial action level (NTE /RAL) PRG of 2.6 mg/kg total PCBs for sediment satisfies RAO 6. The results of the OU4 sediment toxicity test were considered as the basis for a NTE PCB PRG in sediment. Specifically, the PCB PRG value proposed is the PCB concentration that would cause an additional 10% effect beyond the lowest response measured in the reference sediment (EC10). This PRG is also applied as a RAL and sample locations that exceed the RAL will be actively remediated.

For comparison, the EPA used existing site data to evaluate additional sediment bed RALs to provide context on the effectiveness and protectiveness of the single evaluated sediment bed RAL versus other RALs. A relationship between RALs and SWACs was developed for Choccolocco Creek reaches between the backwater/Friendship Road area (which is proposed to be remediated in its entirety) and the Choccolocco Creek embayment area (Lake Logan Martin backwater). The analysis shows that a RAL of 2.6 mg/kg results in post-removal SWACs ranging from 0.11 to 0.51 mg/kg in these reaches. The combined footprint is 12.58 acres, which corresponds to the FS estimate of 12 acres of remediation below the backwater area in Choccolocco Creek. To achieve the final sediment PRGs protective of fish tissue consumption (0.2 mg/kg SWAC above Jackson Shoals; 0.1 below Jackson Shoals) in the analyzed river sections, with no monitored natural recovery (MNR) component, RALs would range from 0.8 to 2.6 ppm and include a combined 46 acres of remediation below the backwater area in

Choccolocco Creek. The selected RAL does not achieve protection of human health at the completion of construction. Rather, a risk management decision was made to select a RAL and rely on MNR after remedy construction to achieve protective levels in sediment and fish tissue.

To be protective of aquatic and semi-aquatic ecological receptors (mink and otter), a sediment PRG of 0.1 mg/kg should be met for each of the 10 creek reaches. This sediment PRG is protective of human health and ecological exposure pathways, as discussed in RAOs 4 and 7. This PRG also contributes to the achievement of RAO 9 to reduce transport of PCB contaminated sediment to downstream areas. Compliance will be achieved when the 95% UCL of the measured sediment SWAC is less than or equal to the 0.1 mg/kg total PCB SWAC in each creek reach.

Surface Water PRGs

The PRGs for contaminants in surface water are established by chemical specific ARARs and satisfy RAO 10. Nationally recommended water quality criteria for aquatic life and for human consumption of fish are ARARs for the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to most species in a given environment. AWQC for total PCBs in surface water are 0.014 µg/L (for wildlife) and 0.000064 µg/L (for human consumption of fish).

Biota PRGs

Meeting the PCB PRGs for fish tissue upstream and downstream of Jackson Shoals will satisfy RAO 5. The human health PCB PRGs for fish tissue ares based on the RME value.

Meeting the PRG for whole body fish will satisfy RAO 8. The PRGs for piscivorous wildlife and fish were developed based on a range of measured PCB concentrations in fish. The one difference in approach is PCB concentrations in fish for ecological purposes are assessed on a whole-body basis in contrast to fish tissue PCB concentrations that are used to quantify human health exposure conditions. A PCB concentration of 1.3 mg/kg dry weight in whole-body fish is proposed as the target PRG range for fish and receptors that consume fish (from LOAEL-Based Remedial Goal Options for the otter evaluated in the BERA).

Description of Alternatives

General response actions and remedial technologies for reducing unacceptable risks to contamination in soil, sediment, surface water, and biota at OU4 were developed and screened.The potential technologies were first screened based on effectiveness, implementability, and cost. The technologies that were not feasible or had limitations that might prevent achievement of RAOs were eliminated in the screening process, with the remaining technologies considered to be better suited for further consideration in developing remedial alternatives.

Treatment alternatives for PCB contamination in soil and sediment have previously relied on incineration or thermal desorption of PCBs as the most effective treatment. The Anniston community is particularly sensitive to the use of thermal technologies due to activities at the Anniston Chemical Agent Disposal Facility (ANCDF) at the Anniston Army Depot.
Thermal desorption of PCB contaminated soil was included in RODs for OU1/OU2 and OU3 but were not selected because of concerns that onsite thermal desorption could create addition air pollution;

excavation and offsite disposal provides a faster remedy to the local community than thermal desorption; and all alternatives result in equal long-term protection while thermal desorption is more expensive.

No treatment was included for OU4 soil alternatives because the reasons for not selecting thermal treatment in previous OUs still apply. Instead, alternatives were evaluated that remove additional PCB contamination in subsurface soil for unlimited use/ unlimited exposure designation or removing PCB concentrations greater than 50 mg/kg in subsurface soil to reduce concerns about improper handling of TSCA hazardous waste. Onsite and offsite treatment of sediment was evaluated for sediment considered PTW in the backwater area.

COMMON ELEMENT OF ALL ALTERNATIVES

PCBs remaining in soil at concentrations greater than 1 mg/kg are subject to a Site Soil Management Plan and institutional controls (ICs) to ensure no unreasonable risk of injury to human health or the environment occurs. Implementation of the Soil Management Plan includes annual dashboard checks (drive by observation) and letters notifying landowners where PCBs remain on the property, as well as providing residents with contact information for coordination where soil disturbances are planned. ICs include investment in the Alabama 811, one-call system used by local utilities where soil disturbances are planned, and support for land trust conservation corridors in impacted portions of the Site. In some cases, deed restrictions may be requested to further protect human health and the environment where owners are willing to participate.

The retained technologies are used to develop four categories of remedial alternatives for the media of concern:

- Residential soil;
- Interim measures at Oxford Lake Park;
- Non-residential soil; and
- Sediment and creek banks.

Remedial Alternatives for Residential Soil

Three remedial alternatives were developed for soil on residential properties. Each alternative includes the removal actions already completed in OU4 under the NTCRA Agreement and finalizing them through this remedial action. The alternatives are consistent with the range of remedial alternatives for residential soil evaluated by the EPA for the OU1/OU2 portion of the Site. The removal actions already completed under the NTCRA were performed on the residential use areas on OU4 properties.

Residential cleanup alternatives are needed to manage residual PCBs that may remain on residential use areas of OU4 properties. Residual PCBs in soil greater than or equal to 1 mg/kg and less than 10 mg/kg remain in subsurface soil on five residential properties (an area of approximately 1.1 acres) and in surface soil on one property where access to cleanup under the NTCRA was not granted (an area of 0.25 acres). In addition, 14 residential structures are located next to areas that required excavation under the NTCRA, so long-term monitoring is required to make sure sampling and soil removal is conducted where necessary if structures are demolished in the future (Table 1).

The Key ARARs for the Residential Soil alternatives include:

- Regulations at 40 Code of Federal Regulations (C.F.R.) Part 262.11(a)-(d) for the management and disposal of remediation wastes.
- Regulations at 40 C.F.R. Part 761 for the management, storage and disposal of PCB remediation wastes.
- Regulations at 40 C.F.R. § 761.61(c) for risk-based disposal of PCB remediation wastes.

The Residential Soil (RS) remedial alternatives developed are summarized below:

RS-1: No Further Action

RS-2: Excavation and On- or Offsite Disposal for Surface Soil with PCB Concentrations ≥ 1.0 mg/kg and Subsurface Soil PCB Concentrations ≥ 10.0 mg/kg

RS-3: Excavation and On- or Offsite Disposal for Surface Soil and Subsurface Soil with PCB concentrations ≥ 1 mg/kg

ALTERNATIVE RS-1: No Further Action

Estimated Capital Cost: $0
Estimated Annual Operation &Maintenance (O&M) Cost: $0
Estimated Present Worth Cost: $0

Alternative RS-1 is the no further action alternative, which would involve no further action beyond the residential removals that have already been completed under the TCRA and the NTCRA. RS-1 would leave contaminated surface soil with PCBs above 1 mg/kg in in the one residential area (0.25 acres) where access for removal has not been granted. Under this alternative no further action would be taken at this property and in residential areas where PCBs remain at concentrations above 1 mg/kg and below 10 mg/kg at depths below 1 foot. The RS-1 alternative would also not include implementation of a Soil Management Plan to monitor property uses and changes in the future throughout OU4.

ALTERNATIVE RS-2: Excavation and On- or Offsite Disposal for Surface Soil with PCB Concentrations ≥ 1 mg/kg and Subsurface Soil PCB Concentrations ≥ 10 mg/kg

Estimated Capital Cost: $105,600
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $400,000

RS-2 includes the removal actions conducted to date under the TCRA and the NTCRA Agreements and long-term management of PCB residuals through implementation of a Soil Management Plan. PCB residuals remain at depth for residential use areas at five properties and potential PCB-containing soil may be present beneath pavement or structures on 14 properties (Table 1). These PCB residuals would be managed in perpetuity through implementation of a Soil Management Plan. The remaining residential removal action that has yet to be implemented due to the lack of property access would be conducted when access is provided by the landowner.

To implement RS-2, 540 tons of refined materials, including sandy backfill materials, topsoil, and a high-density polyethylene (HDPE) liner (from decontamination area), would need to be used.

Implementing RS-2 would generate approximately 600 tons of soil with PCB concentrations less than 50 mg/kg for offsite disposal.

The following components are part of alternative RS-2:

- Follow an approved Soil Management Plan which requires:
  - periodic attempts to gain access to properties identified with PCBs in surface and/or subsurface soil and performance of cleanup identified below;
  - periodic notification that residual PCBs > 1 mg/kg are or may be present in subsurface soil or beneath structures; and
  - PCB sampling and cleanup, if needed, of soil below demolished structures (i.e.,building, shed, or paved area that limits exposure) on properties where previous cleanups have occurred or in areas where present in subsurface.
- Residential cleanup includes all activities conducted under the NTCRA, which applies to the one residential property and any properties identified in the future where existing structures are removed:
  - Excavate surface soil with PCB concentrations greater than or equal to 1 mg/kg and subsurface soil with PCB concentrations greater than or equal to 10 mg/kg.
  - Clean interior surfaces of homes with dust concentrations above 1 mg/kg.
  - Excavate or install barriers in accessible crawl spaces with PCB concentrations in surface soil above 1 mg/kg.
  - Dispose of soil with PCB concentrations less than 10 mg/kg onsite at the South Site Soil Management Area (SSSMA) located near the facility, provided the material passes leachability testing, or at an offsite disposal facility.
  - Dispose of soil with PCB concentrations greater than or equal to 10 mg/kg PCBs at an approved offsite disposal facility.
  - Backfill excavated areas with clean soil and topsoil to approximately the same grades that existed prior to excavation.
  - Re-vegetate the property as close to original conditions as possible.
- ICs include investment in the Alabama 811, one-call system used by local utilities where soil disturbances are planned.

The estimated time frame to complete this remedial alternative and achieve RAO 1 would be several months after the property owner grants access, recognizing the time frame necessary to mobilize construction equipment for this relatively small project. The in-field construction time at the property would be 1 to 2 weeks; the remainder of the time is associated with planning, coordinating, and final reporting.

ALTERNATIVE RS-3: Excavation and On- or Offsite Disposal for Surface Soil and Subsurface Soil with PCB Concentrations ≥ 1.0 mg/kg

Estimated Capital Cost: $ 1,044,500
Estimated Annual O&M Cost: $ 0
Estimated Present Worth Cost: $ 1,390,000

Alternative RD-3 is complete residential removals for all surface and subsurface soil in accessible areas on residential properties up to 4 feet bgs with PCB concentrations greater than or equal to 1 mg/kg. Soil located beneath developed portions of the residential use areas (e.g., walkways, driveways, sheds) would not be removed and would be addressed through implementation of a Soil Management Plan. These remedial actions would address PCBs remaining in subsurface soil with concentrations between 1 mg/kg and 10 mg/kg for the five residential use areas where surface removals have already been conducted and the one (1) residential use area with surface soil PCB concentrations greater than or equal to 1 mg/kg where access has been denied. This process would also include removing the clean surface soil that was placed on the five residential use areas several years ago as part of the surface soil removals before the subsurface soil is excavated. In total, removal would be required for 1.35 acres of residential use area, and 7,400 cubic yards of material that would be disposed of at an approved soil management area, provided the material passes leachability testing, or offsite in an approved disposal facility. The alternative would also include removal of soil from the property where access to conduct the surface soil removal has yet to be granted.

RS-3 would require using 12,700 tons of refined materials for implementation of the remediation activities, including sandy backfill materials, topsoil, and HDPE liner (from decontamination area). Implementing RS-3 would generate 11,100 tons of soil with PCB concentrations of less than 50 mg/kg for offsite disposal. Restoration water use during implementation of the remedial activities would be limited to hydroseeding activities and would total 4,000 gallons. Other water use, including public, surface, ground, storm, and reclaimed water would be negligible.

The following components are part of alternative RS-3:

- Follow an approved Soil Management Plan which requires:
    - periodic attempts to gain access to properties identified with PCBs in surface and/or subsurface soil and performance of cleanup identified below;
    - periodic notification that residual PCBs > 1 mg/kg are or may be present beneath structures; and
    - PCB sampling and cleanup, if needed, of soil below demolished structures (i.e., building, shed, or paved area that limits exposure) on properties where previous cleanups have occurred or in areas where present in subsurface.
- Residential cleanup includes:
    - Excavate surface soil with PCB concentrations greater than or equal to 1 mg/kg and subsurface soil with PCB concentrations greater than or equal to 1 mg/kg up to 4 ft bgs.
    - Clean interior surfaces of homes with dust concentrations above 1 mg/kg.
    - Excavate or install barriers in accessible crawl spaces with PCB concentrations in surface soil above 1.0 mg/kg.
    - Dispose of soil with PCB concentrations less than 10 mg/kg at the SSSMA located near the facility, provided the material passes leachability testing, or at an offsite disposal facility.
    - Dispose of soil with PCB concentrations greater than 10 mg/kg PCBs at an approved offsite disposal facility.
    - Backfill excavated areas with clean soil and topsoil to approximately the same grades that existed prior to excavation.
    - Re-vegetate the property as close to original conditions as possible.
- ICs include investment in the Alabama 811, one-call system used by local utilities where soil disturbances are planned.

The estimated time frame to complete construction and achieve RAO 1 is several months to a year after obtaining property access from the landowners.

Remedial Alternatives for Interim Measures Soil at Oxford Lake Park

Remedial alternatives developed for the Oxford Lake Park IMs considered several factors, including (i) the protective nature of how the IMs were implemented, including removal of soil and cover systems; (ii) that, where applicable, monitoring and maintenance activities have been conducted since the IMs were constructed; and (iii) that the IMs are constructed on property owned by the City of Oxford and are deed restricted from future development adverse to their current recreational purposes. The IMs at the softball field's parking lot, tennis court complex, and southwest portion of the park (with the infrastructure improvement of adding the Miracle Field) resulted in substantial capping and covers that make the IMs effective at preventing current and future subsurface exposure to human health and the environment if maintained. The softball fields have soil covers that vary in depth and were considered for additional action to protect for future risk.

The IMs, as constructed and maintained, are protective of human health and the environment. Three of the remedial alternatives (IM-3, IM-4, and IM-5) were identified in the FS to improve soil covers on the softball fields. Those alternatives were not brought forward into the Proposed Plan because the IM covers are protective and further action under CERCLA is not warranted. Long-term maintenance of these covers is needed to ensure long-term protectiveness.

The Key ARARs for the IM Soil alternatives include:

- Regulations at 40 Code of Federal Regulations (C.F.R.) Part 262.11(a)-(d) for the management and disposal of remediation wastes.
- Regulations at 40 C.F.R. Part 761 for the management, storage and disposal of PCB remediation wastes.
- Regulations at 40 C.F.R. § 761.61(c) for risk-based disposal of PCB remediation wastes.

The IM remedial alternatives developed are summarized below:

IM-1: No Further Action
IM-2: Long-term Monitoring, Maintenance and Soil Management

ALTERNATIVE IM-1 No Further Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0

The No Further Action alternative is intended to serve as a baseline for comparison with the other alternatives. This alternative would leave the previously implemented IMs in place without finalizing them as CERCLA actions and would not include long-term maintenance.

ALTERNATIVE IM-2 Long-term Monitoring, Maintenance and Soil Management

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $400,000
Estimated Present Worth Cost: $400,000

IM-2 will finalize the previously implemented RCRA IMs at the Oxford Lake Park softball fields, the softball fields' parking lot, tennis court complex, and southwest portion of the park (with the infrastructure improvement of adding the Miracle Field). IM-2 will continue the monitoring and maintenance of the IMs. If cap or cover repairs are needed or if subsurface intrusive activities are needed, maintenance activities may include removing contaminated soil, disposing offsite, and bringing in clean backfill. Repaving the parking lot and tennis court areas may also be required as part of long-term maintenance. Inspections would document the effectiveness of maintenance activities conducted by the City of Oxford's routine maintenance.

The City of Oxford has restricted the deed of the park and agreed to notify the PRPs of any intrusive or land-disturbance work that may occur in this area so that soil management support can be provided, if appropriate.

The following components are part of Alternative IM-2:

- Adopt RCRA IMs at Oxford Lake Park softball fields, the softball field's parking lot, the tennis court complex, and the southwest portion of the park (with the infrastructure improvement of adding the Miracle Field) as final CERCLA remedies;
- ICs include investment in the Alabama 811, one-call system used by local utilities where soil disturbances are planned, and support for land trust conservation corridors in impacted portions of the Site;
- Maintain the existing deed restriction IC for recreational use at Oxford Lake Park; and
- Implement the Soil Management Plan.

Development and approval of the Soil Management Plan and O&M plan can be done during remedial design and will achieve RAO 2 when the plans are approved.

Remedial Alternatives for Non-Residential Soil

The non-residential soil remedial alternatives developed include removing floodplain soil and disposing of it offsite. Although placing cover materials directly over the floodplain soil was initially considered as a potential remedial approach, an initial evaluation of this approach revealed that target areas were in the FEMA floodway; therefore, placing cover soil without first excavating the existing soil would not be permitted. Based on these factors, remedial alternatives requiring placement of cover soil within the floodway were not developed.

Five remedial alternatives were developed in the Feasibility Study to protect ecological receptors from PCBs in floodplain soil. The soil most relevant to ecological risk is from 0 to 6 inches below ground surface. Pre-remediation mean SWAC PCB concentrations in non-residential soil for ecological exposure conditions (0 to 6 inches) is shown in Figure 25. Three of the remedial alternatives (NRS-3, NRS-4, and NRS-5) were identified in the FS to address subsurface PCB concentrations. Those

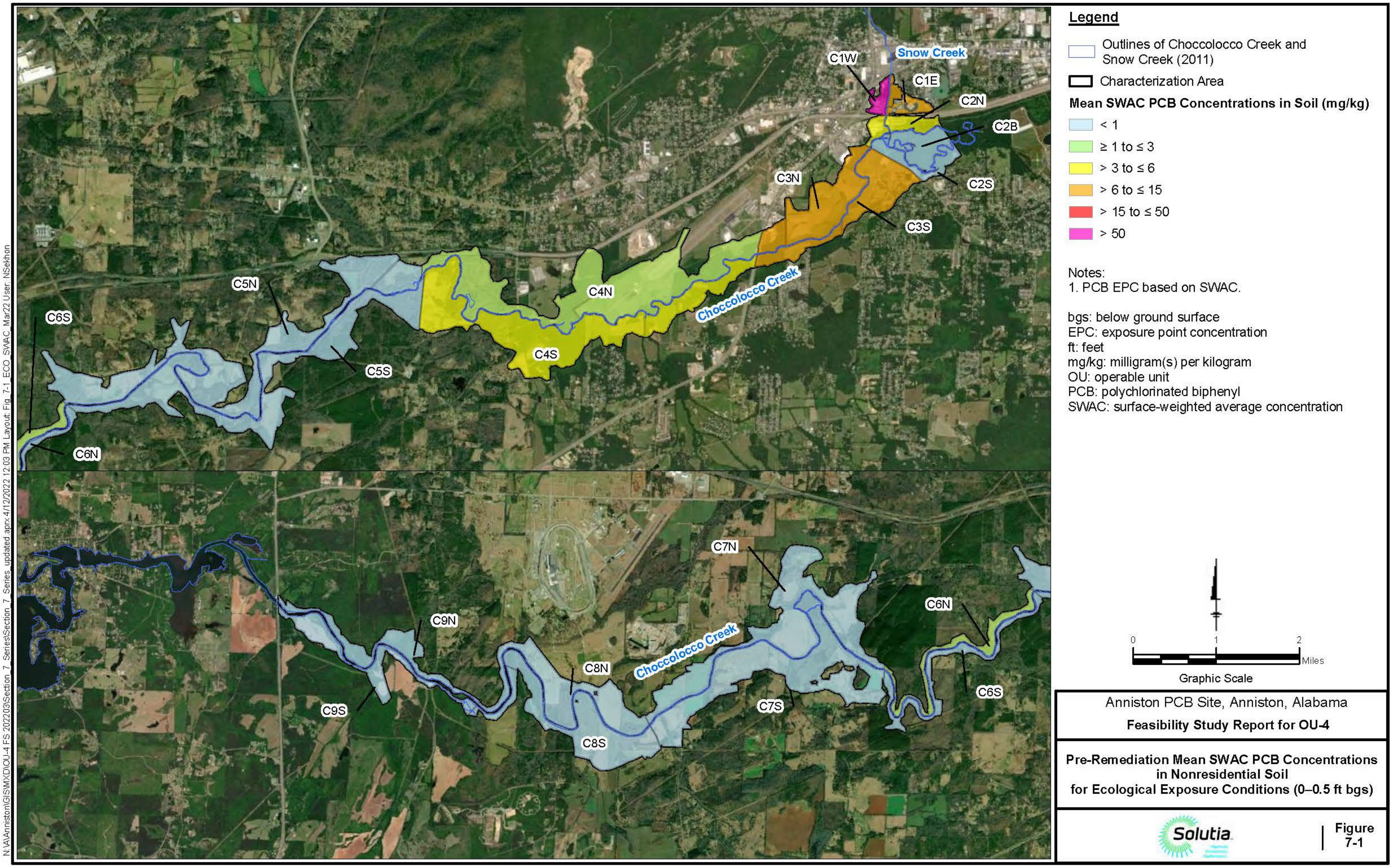

Figure 25. Pre-Remediation Mean SWAC PCB Concentrations in Non-residential Soil for Ecological Exposure Conditions

alternatives were not brought forward into the Proposed Plan because subsurface PCB concentrations did not pose unacceptable risk and action under CERCLA is not warranted.

Key ARARs for Non-Residential Soil Alternatives include:

- Regulations at 40 Code of Federal Regulations (C.F.R.) Part 262.11(a)-(d) for the management and disposal of remediation wastes.
- Regulations at 40 C.F.R. Part 761 for the management, storage and disposal of PCB remediation wastes.
- Regulations at 40 C.F.R. § 761.61(c) for risk-based disposal of PCB remediation wastes.

The Non-Residential Soil (NRS) remedial alternatives developed are summarized below:

NRS-1 – No Further Action

NRS-2 – Excavation of Soil in 0–6-inches Soil Horizon, Offsite Disposal, ICs, and Implementation of Soil Management Plan

ALTERNATIVE NRS-1 No Further Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0

For NRS-1, no further action would be taken to protect human health and the environment. Previous action to cover dredge spoil piles and for infrastructure support projects provide some management, but no future soil management activities would be performed.

ALTERNATIVE NRS-2 Excavation of Soil in 0–6-inches Soil Horizon, Offsite Disposal, ICs, and Implementation of Soil Management Plan

Estimated Capital Cost: $29,500,000
Estimated Annual O&M Cost: $1,400,000
Estimated Present Worth Cost: $30,900,000

NRS-2 would remove soil using traditional excavation equipment from the 0–6-inches horizon based on achieving a PCB PRG of 6 mg/kg surface weighted average concentration (SWAC) for ecological receptors (Figure 26). The estimated home range for small birds and mammals of 5 acres should be used in calculating the SWAC.

The excavated soil would be taken offsite for disposal at an approved facility (landfill). The excavated areas would be backfilled with clean soil to the original grade. Vegetation would be planted to stabilize the newly placed surface soil layer.

NRS-2 requires using 63,554 tons of refined materials, including sand, topsoil, and HDPE liner (for decontamination area). This alternative would generate 60,340 tons of soil with PCB concentrations
.

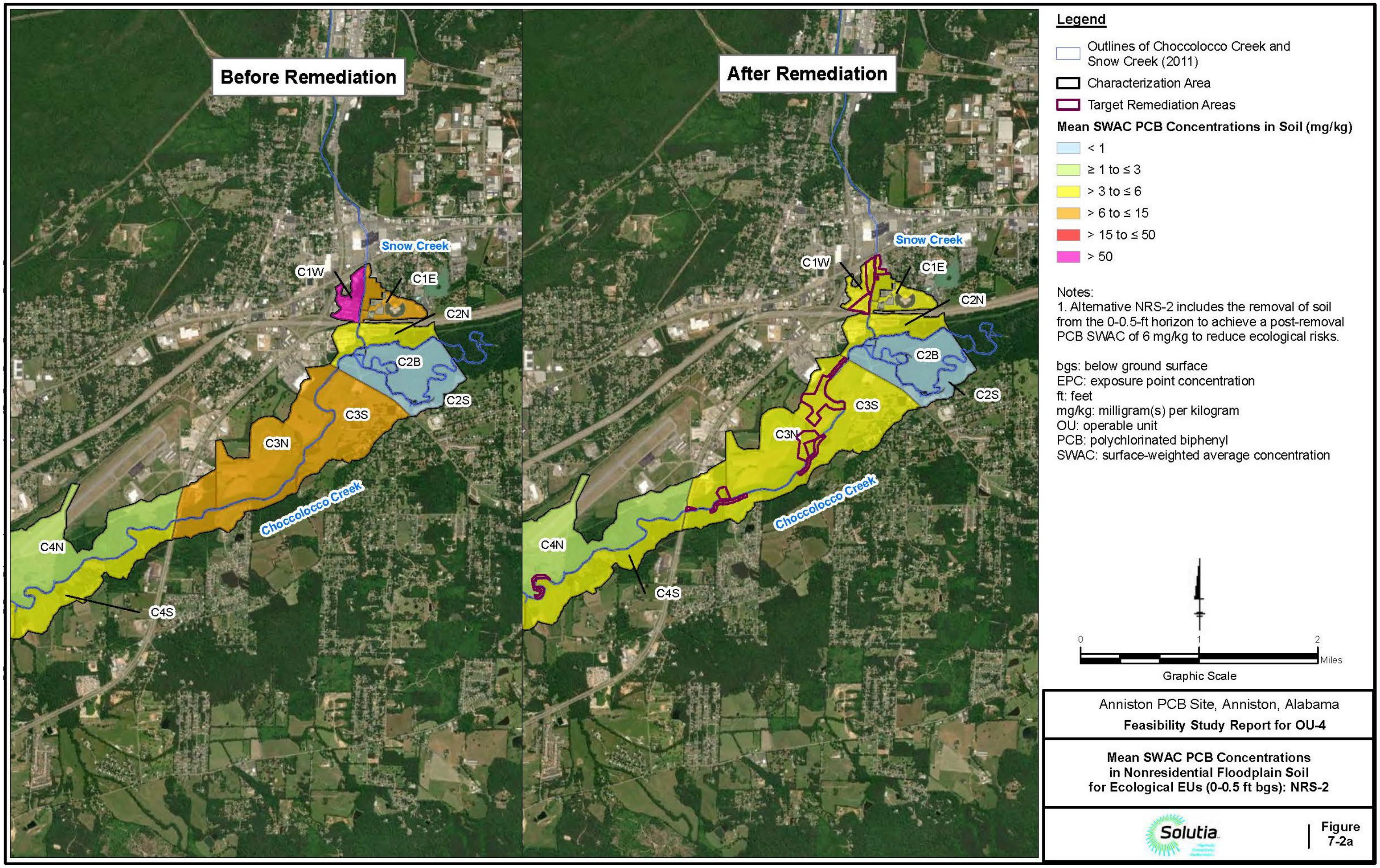

Figure 26. Mean SWAC PCB Concentrations in Non-residential Floodplain Soil for Ecological EUs, (0-6 in bgs) NRS-2

greater than or equal to 50 mg/kg for offsite disposal at a TSCA-regulated disposal facility and 25,860 tons of soil for disposal in an offsite Subtitle D facility.

NRS-2 includes long-term soil management, as has been implemented for the non-residential portion of the Site over the past 20 years. Figures 7-2b through 72t in the Feasibility Study (FS) show where PCB concentrations in soil may remain greater than 1 mg/kg and be subject to the implementation of a Soil Management Plan.

The following components are part of Alternative NRS-2:

- Excavate soil in 0–6 inches soil horizon to achieve PCB SWAC of 6 mg/kg;
- Dispose of excavated soil at an approved offsite disposal facility;
- Backfill excavated areas with clean soil and topsoil;
- Re-vegetate and restore the property as close to original conditions as possible;
- ICs include investment in the Alabama 811, one-call system used by local utilities where soil disturbances are planned, and support for land trust conservation corridors in impacted portions of the Site; and
- Implementation of the Soil Management Plan.

The estimated duration to implement NRS-2 and meet RAO 3 is approximately 2 years.

Remedial Alternatives for Creek Bank Soil and Sediment

Creek bank soil and sediment alternatives are required to protect both human and ecological receptors. Reducing the erosion of contaminated creek bank soil will reduce a source of contamination to the sediment in Snow Creek and Choccolocco Creek, as well as downstream areas. Reducing contaminated sediment concentrations will reduce contaminant concentrations in fish, other biota, and surface water, and will also reduce the transport of contaminants to downstream areas. Seven alternatives, one no action alternative and six active alternatives, that address creek bank soil and sediment were considered.

Note: The estimated areas of creek bank stabilization, volumes of dredged material, surface areas for in-place treatment or capping are assumptions for purposes of developing cost estimates for the remedial alternatives. These assumptions were developed based on the existing data and will be finalized during the RD, after design level data to refine the baseline conditions are obtained.

COMMON ELEMENTS OF THE CREEK BANK AND SEDIMENT ALTERNATIVES

Common elements of the six active alternatives are discussed below. Additionally, all the active creek bank and sediment alternatives include an allowance for a significant preliminary design investigation (PDI) sampling program to completely define the current nature and extent of PCBs in sediment. All the active remedial alternatives also need to meet similar ARARs. Where the alternatives differ, additional descriptions are provided for each alternative.

Creek Bank Soil Approach

The characterization of creek bank soil erosion and PCB loading to sediment from bank erosion were described previously on pages 25 to 26 in this Proposed Plan. Each of the six active alternatives include measures to address the creek bank areas that are contributing PCBs to OU4 sediment. There are two approaches for creek bank source control. One approach targets contaminated creek banks that exhibit moderate and severe erosion. The second approach targets contaminated creek banks that exhibit minor, moderate, and severe erosion. If erosive creek banks exceed the PCB RAL of 2.6 mg/kg, those creek banks will be included in the delineation of the area to be actively remediated.

The creek bank areas would be addressed through several actions, depending on the physical characteristics of the area and findings from the RD process. The creek bank stabilization measures will likely include stabilization with shoreline hardening techniques such as riprap or geotextile; bioengineering, including root wads and plantings; reshaping/grading of creek banks that may include removing soil to increase the cross-section flow area; or combinations of these approaches. If soil that exceeds the bank RALs is left in place, the design will ensure that contaminants are isolated from erosion and release (for example, with geotextile behind stabilization measures). The conceptual approach for creek bank stabilization assumes that soil in the creek bank areas will require excavation and disposal at an approved offsite facility. This soil may be excavated to support reshaping creek banks, placing riprap, or other related support activities. The specific type of creek bank stabilization activity for the various locations targeted for creek bank stabilization will be determined during the RD with the intent of removing the potential for bank sediment and bank soil that exceed the PCB RAL to be exposed and/or erode into the creek. The design process will include geomorphological and hydraulic evaluations, relevant predesign investigations, sampling, evaluations and modelling and input received through outreach with local landowners.

The conceptual approach to address creek banks along the OU4 portion of Snow Creek that are mostly characterized as having severe erosion is shown below in Figure 27a. The conceptual approach to address creek banks along Choccolocco Creek with severe erosion is shown in Figure 27b. (Note: The portion of the creek bank from the top of the bank to the creek water level is creek bank soil and the portion of the creek bank below the water level is considered sediment. The PCB PRG is the same for sediment and creek bank soil.)

Most of the creek bank areas targeted for potential source control actions are characterized as having moderate or minor erosion and would be addressed using a range of available natural approaches. Pilot design studies could also be included in the RD process to iteratively evaluate the performance of different natural techniques and adaptively advance the design to provide an effective remedy over the long term. The stabilization methods will also consider any habitat requirements if there are ecological areas that would not be re-established post restoration.

<u>Sediment approach</u>

The characterization of sediment contamination, sediment stability, and potential sedimentation rates (from geochronological data analysis) were described on pages 22 to 30 in this Proposed Plan. Considering that data, each of the active sediment alternatives include activities that actively address the same sediment footprint (currently estimated at 25 acres) where all sediment that exceeds the PCB RAL concentration of 2.6 mg/kg are addressed. The differences in the alternatives are based on what remedial technologies would be used to actively address the sediment footprint (e.g., dredging, capping, in-place treatment). The range of alternatives developed for this sediment footprint provides an opportunity to evaluate different remedial approaches in the backwater area located at the confluence of Snow Creek and Choccolocco Creek.

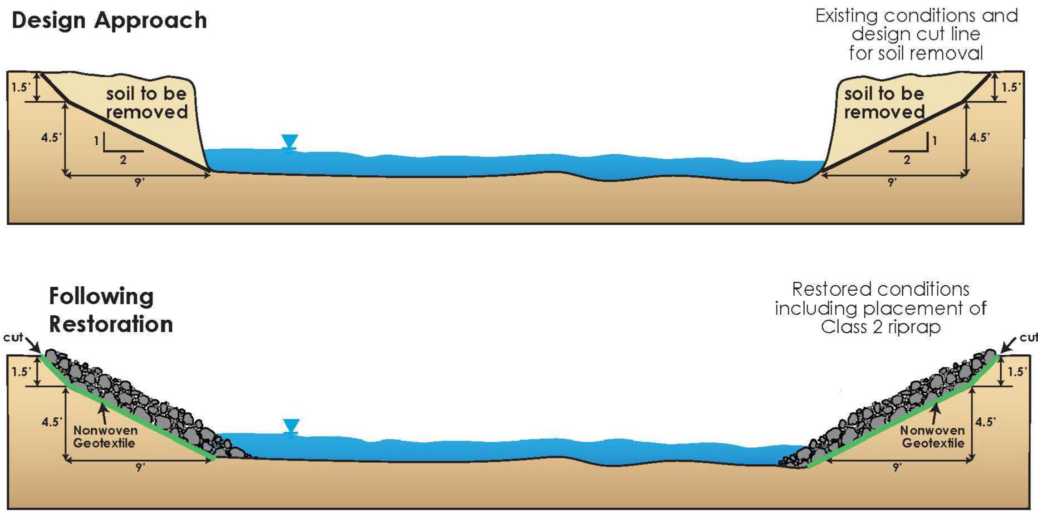

Figure 27a. Conceptual Creek Bank Approach for OU4 Portion of Snow Creek

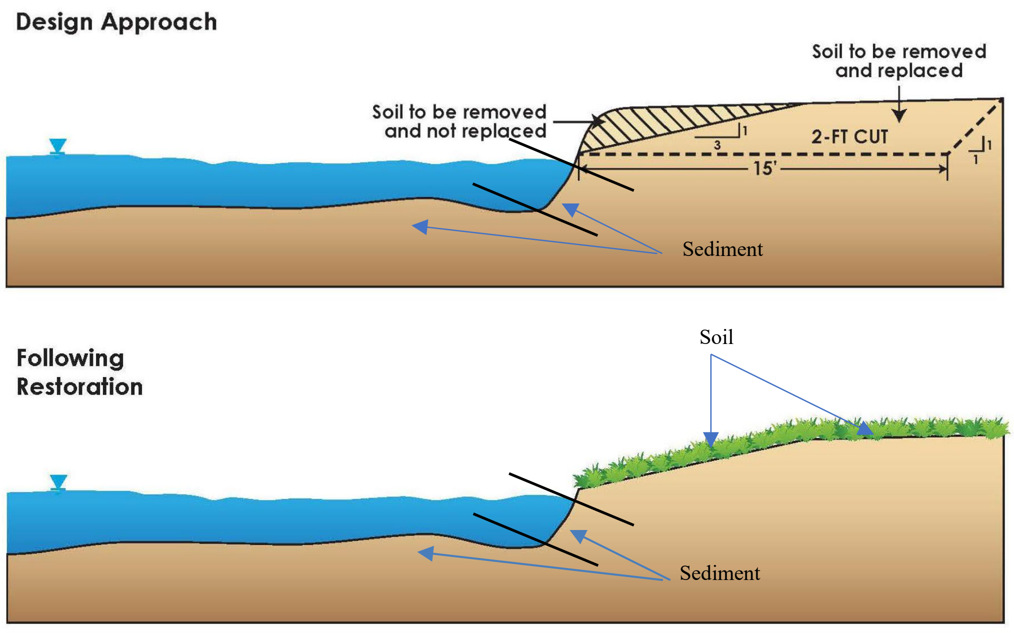

Figure 27b. Conceptual Approach for Choccolocco Creek Banks

The creek channels, especially in the backwater area, have been identified based on flow rates as low energy or high energy to identify which remedial technology (e.g., dredging, capping, in-place treatment) might be most effective in different areas. The high-energy portion of the remedial footprint for sediment in OU4 includes Snow Creek, the upper or northern branch of Choccolocco Creek that flows east-to-west through the backwater area (Figure 28), and the portions of Choccolocco Creek sediment located downstream of the backwater area shown on Figure 29 (Based on current data but modified by information gathered during RD). The low-energy portion of the remedial footprint for the 4.1 acres of sediment in the backwater area allows for approaches that include dredging, capping, and in-place treatment.

Dredging

Each remedial alternative involves some sediment removal (dredging) from the sediment footprint. The sediment remediation footprint for the upper portion of OU4, including Snow Creek and Choccolocco Creek, includes the backwater area (Figure 28). Additional sediment remediation is targeted for multiple locations along Choccolocco Creek based on achieving the NTE/RAL criterion of 2.6 mg/kg (Figure 29). For each alternative, sediment would be dredged from Snow Creek, the high-energy portion of the backwater area, and multiple locations along Choccolocco Creek (Figures 28 and 29).

The alternatives differ in the way they address the low-energy areas in the backwater area. Four active alternatives would require dredging all sediment in the low-energy portions of the backwater area. One active remedial alternative would remove a 1-foot layer of existing sediment from the low-energy portions of the backwater area and then place a 1-foot-thick sand cap layer to maintain the current bathymetry after the cap is placed.

Dredging would likely be conducted from the shore using long-reach excavators, and the materials would be placed in off-road transport vehicles. For a limited number of cases, earthen pedestals may need to be constructed along the creek banks such that the long-reach excavator can access the sediment targeted for removal. The potential need for this approach will be evaluated during the RD phase of the project following the ROD and will incorporate the results of predesign investigations and available property access along the creeks.

Backfill

Consistent with other environmental dredging projects, a layer of clean backfill materials would be placed in the dredge areas once removal has been completed. For OU4, the approach would be to replace the layer of sediment removed with clean sand up to a maximum layer thickness of 1 foot. This backfill would replace the biological strata removed during dredging and assist in mitigating the potential for PCB residuals. Even with careful execution and the placement of backfill following dredging, the actions of dredging and changes to creek channel alignment associated with dredging (and creek bank work) will result in changes to channel morphology. The potential impacts of these changes will be assessed during the RD. The restoration and habitat requirements of the channel will also be included during the RD.

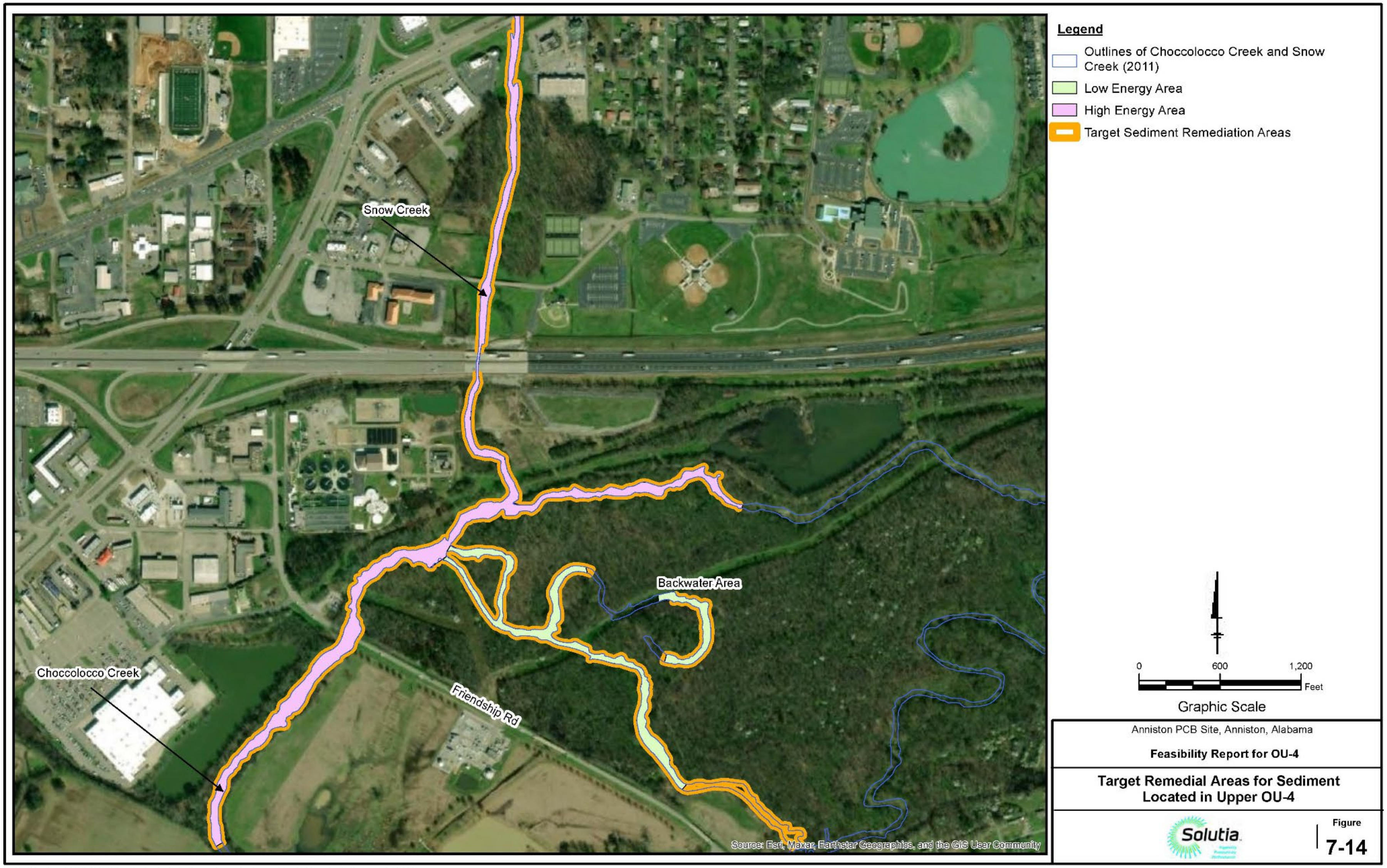

Figure 28. Remedial Areas for Sediment Located in Upper OU4

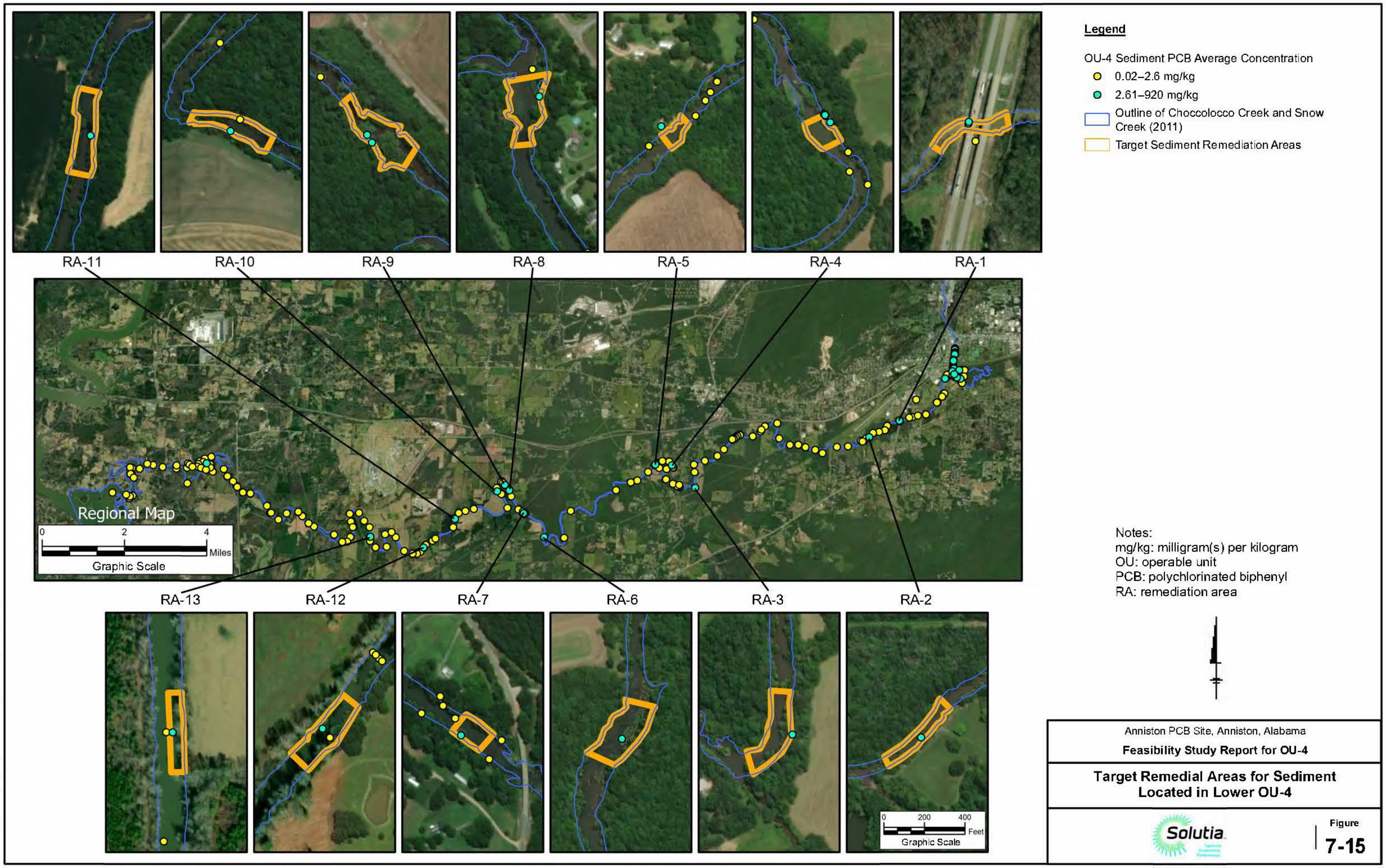

Figure 29. Remedial Areas for Sediment Located in Lower OU4.

Offsite Disposal

A combination of soil and sediment would be generated for offsite disposal for the remedial alternatives that address creek bank areas and in-creek sediment. The estimated quantity of soil associated with creek bank stabilization efforts requiring offsite disposal at a TSCA-regulated facility (i.e., PCB concentrations greater than or equal to 50 mg/kg) is approximately 10,000 tons, and the estimated quantity of soil requiring offsite disposal at a Subtitle D facility (i.e., PCB concentrations less than 50 mg/kg) is approximately 1,800 tons.

For the sediment portions of these remedial alternatives, the materials would be removed from the creeks by dredging and would be transported to a staging area, dewatered, and subsequently transported to an offsite, licensed landfill or to a permitted treatment facility in the case of the one alternative. The off-road vehicles used for sediment transport would likely transport the sediment to a local consolidation area for dewatering prior to being shipped offsite. If the sediment is dry enough to pass a paint filter test upon excavation, it could be direct-loaded into over-the-road trucks and transported to the offsite disposal facility.

Principal Threat Waste (PTW)

All the sediment alternatives address a portion of sediment classified as PTW, or sediment with PCB concentrations greater than 500 mg/kg, which is considered highly toxic and potentially mobile. This concentration was considered PTW in previous OUs and the definition is applied to a small known quantity of sediment in OU4. The estimated quantity of PTW in sediment is 228 CY, located in the backwater area (reach C2). Although located in an area of relatively lower energy, the high concentrations are located at the beginning of the OU near higher population areas. The success of the remedy in the backwater area will determine the success of the remedy in the whole OU. Some alternatives include onsite stabilization (SED-4 and SED-6) of PTW with the addition of cement. Offsite incineration of the PTW is evaluated in SED-7 due to community sensitivity to onsite incineration/thermal desorption technologies.

Monitored Natural Recovery

Monitored Natural Recovery (MNR) for sediment relies on natural processes to reduce COC exposure concentrations over time. For PCBs in sediment, the primary MNR mechanism is introducing and mixing relatively cleaner sediment brought into the aquatic system through flow from upstream. Other processes for sediment, such as biodegradation, volatilization, dispersion, adsorption, and dissolution, play a lesser role in MNR of PCBs.

There are multiple lines of evidence to support that natural recovery has occurred in OU4 sediment. Sediment cores taken in stable locations such as the backwater area (reach C-2, Figure 15) and the Lake Logan Martin embayment area (reach C-10, Figure 14) demonstrate that higher PCB concentrations have been buried beneath newer, less contaminated sediment over time. The lower sediment concentrations in surface sediment over time help to explain the order of magnitude decrease in fish tissue concentrations found at downstream end of OU4 from 1994 through 2016 (reach 10, Figure 18). Sedimentation rates estimated in the upstream and downstream reaches of OU4 are sufficient to support continued MNR, once source control measures in creek bank soil and in-creek sediment have been implemented. The sedimentation rate in C10 can be estimated at 0.7 in/year rates based on the depth of sediment accumulation since Lake Logan Martin was impounded in 1964. This amount is supported by geochronological data from reach C-10 (Figure 14). The sedimentation rates estimated in the backwater area can be estimated at 0.25 to 0.5 in/year based on geochronological data from reach C-2 (e.g., Figure 15).

It is very challenging to estimate the rate and degree of natural recovery that will occur over time throughout a creek that is as long, ever-changing, and with as many sediment PCB sources as well as sources of uncontaminated sediments such as several tributaries to Choccolocco Creek. The lines of evidence described above suggest that natural recovery may be reasonably anticipated in some areas following the remediation of creek bed and bank PCBs, but that process, its rates, and the areas over which it will occur are uncertain. MNR sampling will be designed to evaluate whether natural recovery is occuring and contaminated media (including fish, sediments, and surface water) are trending towards and expected to attain the PRGs and RAOs in an acceptable time frame. The timeframe for sediment PRG and RAO attainment is 20 years below Jackson Shoals and 30 years at and above Jackson Shoals. If the monitoring indicates that sediment concentrations are not trending toward or are not likely to achieve the PRGs within these time frames, in the ten exposure areas, the data will be used to identify other high COC concentration areas that are limiting PRG attainment. Any findings would be used to inform decisions regarding additional active remediation needed to achieve PRGs and RAOs and would be used to develop and evaluate such actions in a future decision document.

Long-term Monitoring

A long-term monitoring plan (LTMP) has been developed at the conceptual level to describe proposed long-term monitoring to assess the effectiveness of the OU4 remedy. This conceptual LTMP would be refined as part of the RD for OU 4. This refinement process would include developing detailed field sampling plans (FSPs) and quality assurance projects plans (QAPPs). While the sampling program is designed to assess remedy effectiveness, baseline (pre-remedy) monitoring would be conducted during the RD to document current conditions. The conceptual LTMP is summarized in Table 9 and described in greater detail below.

- ***Sediment Sampling to Support MNR***
  Surface sediment samples would be collected for the top 6 inches of sediment at all locations necessary to estimate a SWAC in the ten reaches of Choccolocco Creek. The samples would be collected using grab sampling techniques (e.g., Ekman grab sampler or Lexan core), and the analytical results for these samples would track changes in sediment concentrations over time following construction in OU4. Sediment sampling would occur with the objective of establishing a post- construction SWAC in each of the 10 reaches. Sediment sampling would begin the year following remediation and the sampling design would ensure comparability with PDI SWAC estimates and establish a statistically robust SWAC and 95th UCL estimate of the 10 reaches, for example using unbiased sampling in a grid. All samples would be analyzed for PCB Aroclors, PCB homologs, and total organic carbon. Surface sediment sampling locations would be surveyed using conventional ground survey methods or global positioning system (GPS) technology.

- ***Creek Banks***
  Creek Banks will be monitored after significant flow events or at a minimum annually to ensure that areas that have been stabilized remain protective and to identify any new areas of concern. Climate impacts should be considered in the design of creek bank stabilization and monitoring plans.

- ***Sediment Traps***
  In addition to grab samples, sediment traps would be deployed to document changes in PCB concentrations in sediment transported in the water column. These data would be important to document the effectiveness of upstream source control actions and MNR in decreasing the

downstream transport of contaminated sediment. The potential locations identified in Figure 30 would include sediment traps designed to collect localized, time-integrated data on the deposition of sediment for a range of flow conditions in the system. Data from sediment traps provide additional information on suspended sediment conditions, particulate-phase constituent concentrations, and deposition rates during each sampling period. At each of the deployment locations, a set of three sediment traps would be deployed for a period of 6 months to 1 year. Once the sediment traps are deployed, they would collect sediment that settles out of the water column over the deployment duration. After the deployment period and prior to retrieval, the equipment would be observed to ensure it remains in place and in the proper orientation and to note the conditions of the equipment and any concerns or issues. Accumulated sediment from the traps would be measured, photographed, and collected. Samples would be submitted for laboratory analysis for the following parameters (in order of priority): PCB Aroclors, PCB homologs, DL-PCB congeners, mercury, and total organic carbon. Sediment trap locations would be surveyed using GPS technology.

- ***Surface Water Sampling***
  The surface water program would characterize total and dissolved concentrations in surface water as a function of time, including concentration declines following remediation. Surface water would be sampled at the same sediment sampling locations using grab sampling and passive sampling techniques. Grab sampling would be used to measure total and dissolved concentrations of PCB Aroclors, PCB homologs, and DL-PCBs congeners, and mercury in surface water. The samples would be collected during non-storm conditions (not within 7 days of a precipitation event that results in 0.1 inches of precipitation at the Anniston Airport). In situ passive samplers, specifically commercially available polyethylene (PE) passive samplers, would be used to measure PCB concentrations (PCB Aroclors, PCB homologs, and DL-PCB congeners). The PE samplers would measure PCBs that are truly dissolved in surface water in contrast to PCBs that may be associated with suspended particles or colloids. The in situ passive samplers would be deployed at each location for 4 to 8 weeks in the general proximity of where fish samples are collected. The grab samples would be collected at these same locations when the PE sampling devices are being deployed or retrieved. Total (unfiltered and filtered) surface water sample results would be compared to ambient water quality criteria (AWQC) as part of assessing remedy performance. Additionally, the surface water results collected using passive samplers in combination with the fish tracking results and tissue/whole body concentrations measured for fish would be critical to assessing long-term remedy performance. The truly dissolved PCB results from the passive samplers would also be compared against the AWQC values.

  Grab samples of surface water would be collected using bottle immersion, Kemmerer sampler (or equivalent), or a peristaltic pump depending on the water depth at a given location. Filtered samples would be collected using a 0.1-micron filter to evaluate the dissolved fractions of PCBs and mercury. Surface-water filtering would be completed in the field.

  PE passive samplers would be deployed at the same sampling locations. The configuration of these passive samples would depend on whether the sampling location is classified as low energy or high energy. For low-energy settings, the PE passive sampler would be secured to a line held in place by an anchor and marked with a buoy. For high-energy settings, the PE passive sampler would be secured to a piece of steel rebar driven into the rocky substrate. The PE samplers would be preloaded with stable isotope-labeled performance reference compounds, including 13C PCB-28, 13C PCB-47, 13C PCB-70, 13C PCB-80, 13C PCB-111, 13C PCB-141, and 13C PCB-182. Once deployed, the sampling devices would be left in place for 4 to 8 weeks. After the deployment, the passive samplers would be retrieved and shipped for analysis.

- ***Porewater Sampling***
  Porewater would be sampled using the same passive sampling techniques proposed for surface water sampling and would be sampled at all sampling locations. PE passive samplers would be used to measure PCB concentrations truly dissolved in porewater (PCB Aroclors, PCB homologs, and DL-PCB congeners). PE passive samplers would be deployed at each location in the general proximity of where the other media samples are collected. As with surface water, the configuration of the porewater PE samplers would depend on whether the location is classified as low energy or high energy. For low-energy settings, the PE passive sampler would be inserted into the sediment, secured to a line held in place by an anchor, and marked with a buoy.

  For high-energy settings, the PE passive sampler would include two deployment methods 1) securing the sample media to a brick placed at the sediment-water interface, and 2) direct insertion of the sample media into the rocky substrate. The brick would be worked into the rocky substrate such that its surface is at a similar elevation to the surrounding rocky substrate. This placement would protect the sampling device from potential damage due to bedload transport during high-flow conditions and provide an opportunity to assess exposure conditions from light, flocky materials that periodically form on these surfaces between high-flow events. A second PE sampling device would be inserted into the rocky substrate to obtain measurements of porewater conditions.

  The PE samplers would be preloaded with the same stable isotope-labeled performance reference compounds as the surface water samplers. As with the surface water samplers, once deployed, the porewater PE sampling devices would be left in place for 4 to 8 weeks. After the deployment, the passive samplers would be retrieved and shipped to the laboratory for analysis.

  Additionally, for low-energy settings, separate sediment grab samples would be collected for ex situ porewater evaluations using methods described in Section 2.1. Similar sediment grab samples would not be collected for ex situ porewater evaluations at high-energy setting locations because of the difficulties associated with maintaining the in-situ structure of a rocky substrate sample following its collection and shipment to the laboratory. The grab samples would be shipped to the laboratory for processing and analysis. Collected sediment mass would be homogenized and divided into equal volumes (approximately 500 milliliters) for assessment of PCB Aroclors PCB homologs, and DLPCB congeners. A PE sampler preloaded with stable isotope-labeled performance reference compounds would be placed into each jar, and the jars would be tumbled for a minimum of 28 days and approximately the same duration as the devices that were deployed in the field. After tumbling is complete, the PE samplers would be removed from the sediment for extraction and analysis.

  Results from the passive porewater sampling would also be used in assessing PCB concentrations in fish and for comparison with the AWQC values.

- ***Fish Sampling***
  The fish monitoring program is proposed to characterize constituent concentrations in fish tissue as a function of time, including concentration declines following construction. The skin-off fillet fish tissue samples would be analyzed for PCB Aroclors and homologs, mercury, and percent lipids. The whole-body fish samples would be analyzed for these same constituents plus DL-PCB congeners. As described, surface water, porewater, and sediment would also be sampled at the fish tissue

sampling stations to assist in characterizing exposure conditions. The general approach for the collection of fish samples builds on the work conducted for OU4 under the CERCLA and Resource Conservation and Recovery Act (RCRA) programs and work conducted by ADEM and would be based on the technical approach provided in Using Fish Tissue Data to Monitor Remedy Effectiveness (USEPA 2008). The conceptual proposed long-term monitoring for OU4 includes different trophic levels and feeding guilds, species targeted by local anglers, collection slot size based on ADEM procedures, and comparability with historical data:

- 10 individual fillet samples and 10 whole-body samples of predator fish (i.e., spotted bass [Micropterus punctulatus] or largemouth bass [Micropterus salmoides])
- 10 individual fillet samples and 10 whole-body samples of bottom feeder fish (i.e., channel catfish [Ictalurus punctatus] or blue catfish [Ictalurus furcatus])
- 10 individual fillet samples and 10 whole-body samples of forage fish (i.e., sunfish [Centrarchidae] or crappie [Pomoxis])

The proposed sample locations, species, numbers of samples, and sampling approaches (grab versus composites) would be finalized as part of developing the FSP and QAPP in collaboration with the EPA.

The conceptual LTMP is summarized in Table 9. Proposed fish and associated sediment, surface water, and pore water sampling locations are shown on Figure 30 (the same locations where RI samples HHFL-1 through HHFL-9 were collected in the RI).

Institutional Controls (ICs)

For creek banks and sediment alternatives in OU4, ICs will include maintaining fish consumption advisory signage for as long as they are needed and educating the community about the importance of adhering to the advisories. ICs will also include conservation corridors to control adjacent land use and restrict access, if needed, to banks, which will help maintain the creek bank and sediment alternatives. Monitoring, including inspections, will be needed to ensure that restrictions are functioning as intended. Additional institutional control mechanisms may be developed during RD.

The approach for soil management support (described below) would be gated through the 811-utility clearance system as an institutional control (IC). Use of the 811 system to register intrusive soil disturbance work prior to implementation is required by law in Alabama.

Potential intrusive work for creek bank and in-creek areas located downstream of Jackson Shoals would also be subject to an additional IC from the Alabama Power Company (APCO). This additional IC includes a formal permitting process that requires APCO review and approval prior to project implementation. As part of reviewing the permit applications, APCO, as a matter of practice, shares the permit applications with the EPA and the PRPs for the purpose of identifying any contamination concerns.

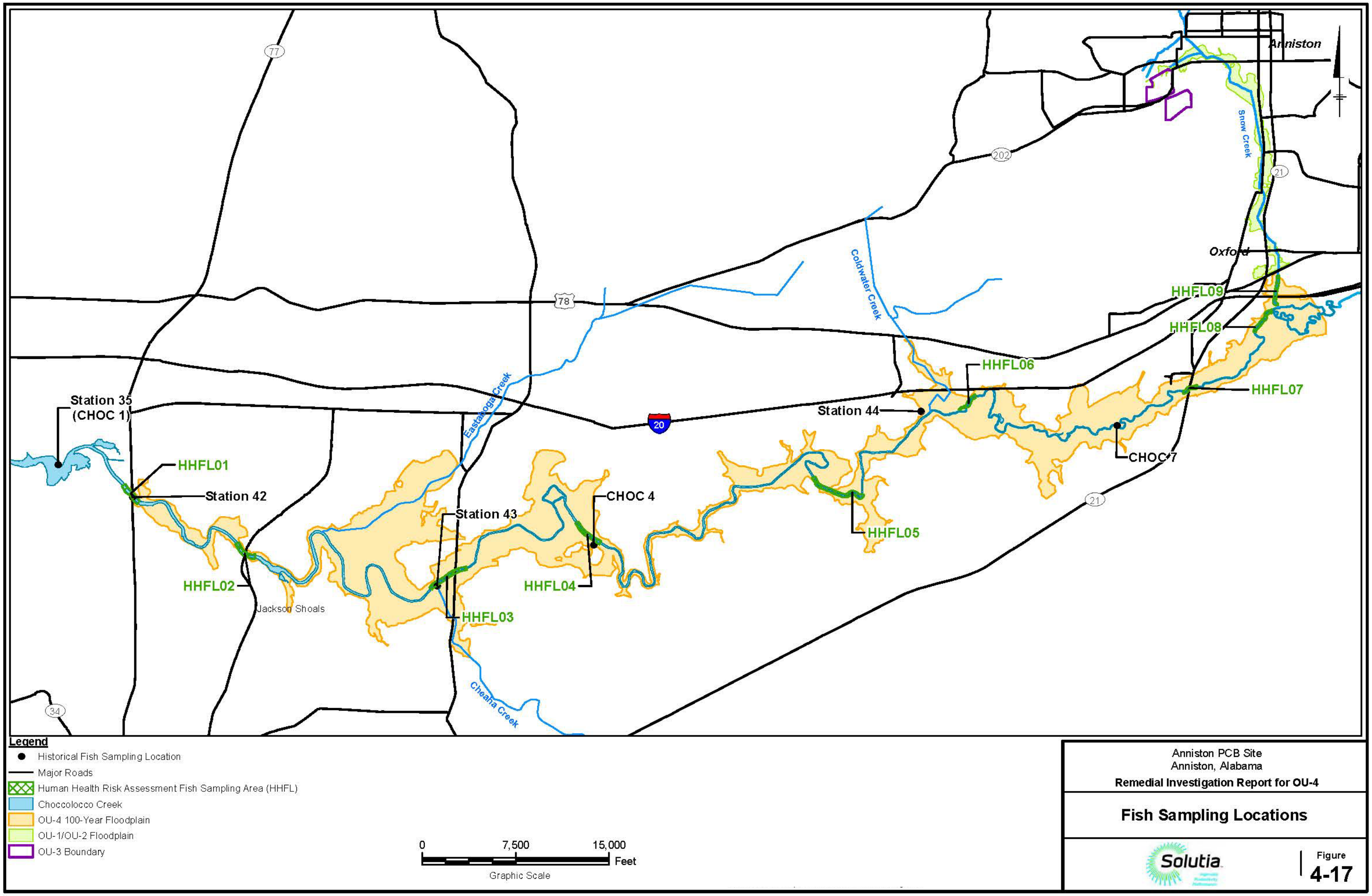

Figure 30. Long-term Monitoring Plan Locations for Fish Sampling (HHFL-1 to HHFL-9).

Table 9. Conceptual Long-term Monitoring Plan

RAO	Media	Number of Locations[1]	Samples/ Location	Total Number of Samples	Analyses	Schedule
4, 7	Sediment	9 Fish Sampling Locations	1 grab	9	PCBs Aroclors, PCB homologs, DL-congeners, mercury, total organic carbon	Years 1, 3, and 5 following remedy completion the,n years 8,13,18, etc.
	Sediment	10 reaches	TBD*	Sum of sediment samples in the ten reaches	PCBs	Years 1, 3, 8, 13, and 18, then every 5 years until goal for reach achieved or additional action taken
9	Creek Bank Soil	entire impacted length	entire impacted length	entire impacted length	Inspections	After TBD-year flow events (minimum annually)
	Sediment	9 Fish Sampling Locations	3 sediment traps	27	PCBs Aroclors, PCB homologs, DL-congeners, mercury, total organic carbon	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
10	Surface Water	9 Fish Sampling Locations	1 grab whole water	9	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc. Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
	Surface Water	9 Fish Sampling Locations	1-grab filtered (0.1 micron)	9	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
	Surface water	9 Fish Sampling Locations	1 passive sampler over 4-8 weeks	9	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
	Pore Water	9 Fish Sampling Locations	1 passive sampler over 4-8 weeks	9	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
5, 8	Fish (Tissue)	9	10 predator, 10 bottom feeder, 10 forage	90 predator, 90 bottom feeder, 90 forage	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
	Fish (Whole)	9	10 predator, 10 bottom feeder, 10 forage	90 predator, 90 bottom feeder, 90 forage	PCBs Aroclors, PCB homologs, DL-congeners, mercury	Years 1, 3, and 5 following remedy completion then years 8,13,18, etc.
	Fish Tracking - Passive	9	TBD	TBD	3 sets data downloads	9 months
	Fish Tracking - Active	9	TBD	TBD	3 sets data downloads	9 months

*The sample size required in each reach (and strata, where applicable) may vary and will be determined based on a statistical evaluation of the sample variance within each reach. The goal is to have an adequate number of samples such that the 95% UCL of the SWAC is within 30% of the calculated SWAC (e.g., a 95% UCL of 0.13 mg/kg for a calculated SWAC of 0.10 mg/kg)."

Notes:
1. With the exception of tissue collection for human receptors, sample locations will be consistent throughout all years of monitoring. Tissue collection for human receptors will be collected from the same zones; however, actual sample locations may change depending on Site conditions at the time of sampling.
2. To be determined. The number of samples is dependent upon the final acreage of disturbed marsh areas, which will be determined after construction has been completed.
3. It is anticipated that at least fish tissue sampling will be needed beyond 5 years; modifications to the LTMP including changes to the frequency of sampling would be considered following review of the Year 5 data.

Soil Management Plan

The approach for managing soil in the creek banks and sediment in OU4 in the future would be consistent with the rest of the Soil Management Plan for the Site that focuses on construction-related projects that could disturb PCB residuals. This would also apply to in-creek sediment. These projects could include new construction or the repair of existing infrastructure. Projects with intrusive activities could include bridges, pipelines, utilities, shoreline retaining walls/structures, or docks.

Preliminary Design Investigation/ RD

A Preliminary Design Investigation (PDI) will be conducted to resolve uncertainties associated with the age of the data, close any gaps in the types and quantity of data needed for RD, and serve as a comprehensive pre-remediation (baseline) sampling event. A few of the uncertainties than must be addressed include the following:

- Since the bank stability analysis that categorized the erosive areas was conducted in 2012 and 2014, it will be updated.
- Since creek bank and sediment data are not current or comprehensive enough to ensure the remedy will address all the contaminated areas, the full extent of the sediment bed and creekbanks will be re-sampled/characterized.
    - An objective and spatially comprehensive procedure will be developed for updating and determining the location of creek bed PCBs, sediment deposits, and to develop strata for sediment sampling.
    - Sediment and bank locations that exceed the NTE/RALs will be identified for active remediation.
- The sediment sampling design will ensure comparability with SWAC estimates derived in long-term monitoring and establish a statistically robust SWAC and 95th UCL estimate of each of the 10 exposure units, for example using unbiased sampling in a grid. Additional PCB delineation may be necessary to refine the dredge locations.
- All sediment samples will be analyzed for PCB Aroclors, PCB homologs, and total organic carbon.
- Surface sediment sampling locations will be surveyed using conventional ground survey methods or global positioning system (GPS) technology.
- Updated sampling may result in an increase or decrease of the remediation footprint, and a future decision document revision may be necessary to document the change.

ARARs

The following are key ARARs for the sediment:

- Regulations at 40 Code of Federal Regulations (C.F.R.) Part 262.11(a)-(d) for the management and disposal of remediation wastes;
- Regulations at 40 C.F.R. Part 761 for the management, storage and disposal of PCB remediation wastes;
- Regulations at 40 C.F.R. § 761.61(c) for risk-based disposal of PCB remediation wastes;
- Regulations at 40 C.F.R. § 131.36 for the chronic AWQC for PCBs (0.014 µg/L for wildlife and

0.000064 µg/L for human health) and the parallel regulations under the State of Alabama's Administrative Code 335-6-10;
- Regulations at 40 C.F.R. § 230 regarding dredging and filling in the creek;
- Regulations at U.S.C 4001 et seq. and 4101 regarding alternation of the creek; and
- Section 404(b)(1) of the CWA for mitigation of wetlands.

ALTERNATIVES

The following seven remedial alternatives for creek banks and sediment are as follows:

SED-1: No action;
SED-2: Creek bank soil source control for contaminated areas with moderate and severe erosion; dredging of sediment in high-energy areas; backfill dredged areas; offsite disposal for excavated soil and dredged sediment; in-place treatment for sediment in low-energy areas; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan;
SED-3: Creek bank soil source control for contaminated areas with minor, moderate, and severe erosion; dredging of sediment in high-energy areas; backfill dredged areas; offsite disposal for excavated soil and dredged sediment; in-place treatment of sediment in low-energy areas; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan;
SED-4: Creek bank soil source control for contaminated areas with moderate and severe erosion; dredging of sediment in high- and low-energy areas; backfill dredged areas; offsite disposal for excavated soil and dredged sediment; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan;
SED-5: Creek bank soil source control for contaminated areas with minor, moderate, and severe erosion; dredging of sediment in high-energy areas; backfill dredged areas; offsite disposal for excavated soil and dredged sediment; capping for low-energy areas; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan;
SED-6: Creek bank soil source control for contaminated areas with minor, moderate, and severe erosion; dredging of sediment in high- and low-energy areas; backfill dredged areas; offsite disposal for excavated soil and dredged sediment; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan; and
SED-7: Creek bank soil source control for contaminated areas with minor, moderate, and severe erosion; dredging of contaminated sediment in high- and low-energy areas; backfill dredged areas; offsite treatment of PTW; offsite disposal for excavated soil and dredged sediment; MNR of sediment; long-term monitoring; ICs; and implementation of Soil Management Plan.

ALTERNATIVE SED-1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0

For SED-1, no action would be conducted to address creek bank areas or sediment deposits in OU4. PCB sources in bank soil and sediment would continue to impact human health and the environment.

ALTERNATIVE SED-2: Creek Bank Soil Source Control for Contaminated Areas with Moderate and Severe Erosion; Dredging of Sediment in High-Energy Areas; Backfill Dredged Areas;

Offsite Disposal for Excavated Soil and Dredged Sediment; In-place Treatment for Sediment in low-energy areas; MNR of sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $31,600,000
Estimated Annual O&M Cost: $12,000,000
Estimated Present Worth Cost: $43,600,000

SED-2 includes efforts to stabilize creek bank soil with moderate and severe erosion that exceed 2.6 mg/kg total PCB concentrations, dredging with offsite disposal of sediment from high-energy creek areas that exceed the 2.6 mg/kg total PCB concentrations, and in-place treatment for low-energy areas that exceed 2.6 mg/kg total PCB concentrations (Figures 28 and 29). The high-energy areas are not amenable to capping given the thickness of armor stone that would be necessary to protect the underlying sediment from erosion during high-flow events. The existing sediment in the high-energy areas is typically underlain by bedrock; therefore, the removal of additional material to place a cap without changing the hydrology of the creek is not practicable. The high-energy areas targeted for sediment removal include Snow Creek, the main reach of Choccolocco Creek that flows east-to-west through the backwater area, and the portion of Choccolocco Creek located downstream of the backwater area.

The estimated quantity of soil associated with creek bank stabilization efforts for severe erosion is the same for all alternatives and is discussed in the common elements. The estimated quantity of sediment to be dredged from the creeks and disposed of offsite under this remedial alternative is approximately 37,600 cubic yards, and the estimated area to receive in-place treatment is 4.1 acres. The estimated quantity of clean backfill materials for this remedial alternative is 33,800 cubic yards. The estimated quantities of sediment for offsite disposal of sediment dredged from Snow and Choccolocco Creeks with PCB concentrations greater than or equal to 50 mg/kg is 27,900 tons. The estimated quantity of dredged sediment with PCB concentrations less than 50 mg/kg for offsite disposal is 39,200 tons.

The in-place treatment of sediment for the low-energy areas (Figure 28) that exceed 2.6 mg/kg total PCBs, (Figure 29) would include placing activated carbon onto the sediment surface to reduce the bioavailability of the PCBs. Typically, the activated carbon would not significantly raise the elevation or change the hydrology of the low-energy areas, therefore dredging to make room for the cover materials is not expected to be necessary. The activated carbon would be mixed into the upper layer of the sediment matrix through natural processes, including bioturbation and the incorporation of additional sediment that settles out from the water column into these low-velocity areas over time. The activated carbon would absorb the PCBs, thereby reducing the bioavailability. PCBs would become bound to the carbon and not desorbed into the sediment porewater where they could otherwise be transferred to biota.

For the purposes of estimating carbon dosing to treat the in-place sediment, 6% by weight would be applied based on treating a 6-inches layer of sediment (i.e., the Biologically Active Zone, BAZ), and the materials are anticipated to be applied over a 3-year period. The 6% dosing is an estimation for costing purposes. The actual percentage would be developed during the RD. To minimize concerns for benthic toxicity associated with placing activated carbon and to assist in more evenly applying the materials across the BAZ, this remedial alternative includes placing one-third of the activated carbon over the treatment area, once per year for three years, during the late summer, low-flow period.

Once the construction of the remedial alternative is complete, MNR will be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring will be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek will be implemented if determined necessary to achieve RAOs. SED-2 would also include the implementation of the Soil Management Plan

The following components are part of Alternative SED-2:

- Creek bank soil stabilization (may include excavation) for contaminated areas with moderate and severe erosion;
- Dredging of sediment in high-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- In-place treatment for sediment in low-energy areas with activated carbon;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;
- Optimization of the remedy will be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permits reviews;
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-2 and meet RAO 6 is 3 to 4 years. The time to achieve MNR following remedy construction and meet RAOs 4, 5, 7, 8, 9, and 10 is projected to be 30 to 35 years.

ALTERNATIVE SED-3: Creek Bank Soil Source Control for Contaminated Areas with Minor, Moderate, and Severe Erosion; Dredging of Sediment in High-Energy Areas; Backfill Dredged Areas; Offsite Disposal for Excavated Soil and Dredged Sediment; In-place Treatment of Sediment in Low-energy Areas; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $35,000,000
Estimated Annual O&M Cost: $12,000,000
Estimated Present Worth Cost: $47,400,000

SED-3 includes efforts to stabilize creek bank soil with minor, moderate and severe erosion that exceed 2.6 mg/kg total PCB concentrations, dredging with offsite disposal of sediment from high-energy creek areas that exceed the 2.6 mg/kg total PCB concentrations, and in-place treatment for low-energy areas that exceed 2.6 mg/kg total PCB concentrations (Figures 28 and 29). The high-energy areas are not amenable to capping given the thickness of armor stone that would be necessary to protect the underlying sediment from erosion during high-flow events. The existing sediment in the high-energy areas is typically underlain by bedrock; therefore, the removal of additional material to place a cap without changing the hydrology of the creek is not practicable. The high-energy areas targeted for sediment removal include Snow Creek, the main reach of Choccolocco Creek that flows east-to-west through the backwater area, and the portion of Choccolocco Creek located downstream of the backwater area.

The estimated quantity of soil associated with creek bank stabilization efforts for severe erosion is the same for all alternatives and is discussed in the common elements. The estimated quantity of sediment to be dredged from the creeks and disposed of offsite under this remedial alternative is approximately 37,600 cubic yards, and the estimated area to receive in-place treatment is 4.1 acres. The estimated quantity of clean backfill materials for this remedial alternative is 33,800 cubic yards. The estimated quantities of sediment for offsite disposal of sediment dredged from Snow and Choccolocco Creeks with PCB concentrations greater than or equal to 50 mg/kg is 27,900 tons. The estimated quantity of dredged sediment with PCB concentrations less than 50 mg/kg for offsite disposal is 39,200 tons.

Like SED-2, SED-3 requires the in-place treatment of sediment for the low-energy areas (Figure 28) that exceed 2.6 mg/kg total PCBs, would include placing activated carbon onto the sediment surface to reduce the bioavailability of the PCBs. Typically, the activated carbon would not significantly raise the elevation or change the hydrology of the low-energy areas, therefore dredging to make room for the cover materials is not expected to be necessary. The activated carbon would be mixed into the upper layer of the sediment matrix through natural processes, including bioturbation and the incorporation of additional sediment that settles out from the water column into these low-velocity areas over time. The activated carbon would absorb the PCBs, thereby reducing the bioavailability. PCBs would become bound to the carbon and not desorbed into the sediment porewater where they could otherwise be transferred to biota.

For the purposes of estimating carbon dosing to treat the in-place sediment, 6% by weight would be applied based on treating a 6-inches layer of sediment (i.e., the Biologically Active Zone, BAZ), and the materials are anticipated to be applied over a 3-year period. The 6% dosing is an estimation for costing purposes. The actual percentage would be developed during the RD. To minimize concerns for benthic toxicity associated with placing activated carbon and to assist in more evenly applying the materials across the BAZ, this remedial alternative includes placing one-third of the activated carbon over the treatment area, once per year for three years, during the late summer, low-flow period.

Once the construction of the remedial alternative is complete, MNR would be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring would be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek would be implemented if determined necessary to achieve RAOs. SED-3 would also include the implementation of the Soil Management Plan.

The following components are part of Alternative SED-3:

- Creek bank soil stabilization (may include excavation) for contaminated areas with minor, moderate and severe erosion;
- Dredging of sediment in high-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- In-place treatment for sediment in low-energy areas with activated carbon;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;
- Optimization of the remedy would be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permits reviews;
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-3 and meet RAO 6 is 3 to 4 years. The time to achieve MNR following remedy construction and meet RAOs 4, 5, 7, 8, 9, and 10 is projected to be 20 to 30 years.

ALTERNATIVE SED-4: Creek Bank Soil Source Control for Contaminated Areas with Moderate and Severe Erosion; Dredging of Sediment in High- and Low-energy Areas; Backfill Dredged Areas; Offsite Disposal for Excavated Soil and Dredged Sediment; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $37,700,000
Estimated Annual O&M Cost: $12,000,000
Estimated Present Worth Cost: $49,700,000

Like SED-2, SED-4 includes efforts to stabilize creek bank soil with moderate and severe erosion that exceed 2.6 mg/kg total PCB concentrations. Unlike SED-2 and SED-3, SED-4 includes dredging with offsite disposal of sediment from high- and low-energy creek areas that exceed the 2.6 mg/kg total PCB concentrations (Figures 28 and 29). The sediment removed through dredging would be transported to a staging area, dewatered, and subsequently transported to an offsite, licensed landfill.

The off-road vehicles used for sediment transport would likely transport the sediment to a localized consolidation area to be dewatered before being shipped offsite for disposal. If the sediment was sufficiently dry that it would pass a paint filter test after a brief period of drying at the consolidation areas, it could be direct-loaded into over-the-road trucks and transported to the offsite disposal facility. Sediment dredged from the low-energy portions of OU4 is expected to be finer grained and require the addition of a dewatering admixture (e.g., Portland cement) to pass the paint filter test.

It is expected that the PCB concentration category for the sediment can be identified prior to removal. This includes classifying general areas as having sediment PCB concentrations greater than or equal to 50 mg/kg and less than 50 mg/kg. The estimated quantity of soil associated with creek bank stabilization efforts for severe erosion is the same for all alternatives and is discussed in the common elements. The estimated quantity of sediment to be dredged under this remedial alternative is 52,100 cubic yards. The estimated quantity of sediment for offsite disposal with PCB concentrations greater than or equal to 50 mg/kg is 48,200 tons. The estimated quantity of materials with PCB concentrations less than 50 mg/kg for offsite disposal is 39,200 tons.

A layer of clean backfill material would be placed in the dredged areas once removal has been completed. For OU4, the approach would be to replace the layer of sediment removed with clean sand backfill up to a maximum layer thickness of 1 foot. This backfill would replace the biological strata removed during dredging and assist in mitigating the potential for PCB residuals associated with dredging to be present. The estimated quantity of clean backfill materials for this remedial alternative is 40,400 cubic yards.

Once the construction of the remedial alternative is complete, MNR would be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring would be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek would be implemented if determined necessary to achieve RAOs. SED-4 would also include the implementation of the Soil Management Plan.

The following components are part of Alternative SED-4:

- Creek bank soil stabilization (may include excavation) for contaminated areas with moderate and severe erosion;
- Dredging of sediment in high-energy and low-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- In-place treatment for sediment in low-energy areas with activated carbon;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;
- Optimization of the remedy would be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permits reviews;
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-4 and meet RAO 6 is 3 to 4 years. The time to achieve MNR following remedy implementation and meet RAOs 4, 5, 7, 8, 9, and 10 is projected to be 30 to 35 years.

ALTERNATIVE SED-5: Creek Bank Soil Source Control for Contaminated Areas with Minor, Moderate, and Severe Erosion; Dredging of Sediment in High-energy Areas; Backfill Dredged Areas; Offsite Disposal for Excavated Soil and Dredged Sediment; Capping for Low-energy Areas; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $37,100,000
Estimated Annual O&M Cost: $13,500,000
Estimated Present Worth Cost: $50,600,000

SED-5 would include the same source control actions for creek bank soil as SED-3 (i.e., creek bank areas with minor, moderate, and severe erosion). SED-5 would also include sediment removal with offsite disposal for materials from the high-energy portions of the creeks and capping sediment in the low-energy areas (Figure 28). Dredging in the high-energy areas would be conducted using 2.6 mg/kg as an PCB NTE value.

The low-energy portions of sediment targeted for capping include the braided stream network portion of the backwater area. Capping the 4.1 acres of the low-energy areas would include removing the upper 1 foot of sediment and replacing it with a 1-foot layer of clean capping materials (e.g., sand). The 1-foot-thick sand cap would provide an effective chemical isolation barrier to prevent PCBs from moving upward and impacting exposure conditions for biota that might otherwise contact sediment in the BAZ that is assumed for this Site to be the 0–6-inches horizon. Removing a 1-foot layer of existing sediment prior to placing the cap would be necessary because placing the cap directly over the existing sediment would change the hydraulic characteristics of this braided stream network and could potentially contribute to local flooding.

The estimated quantity of sediment to be dredged under this remedial alternative is 44,200 cubic yards, and the area to be capped is 4.1 acres. The estimated quantities of sediment for offsite disposal of materials with PCB concentrations greater than or equal to 50 mg/kg is 37,200 tons, and the estimated quantity of sediment for offsite disposal with PCB concentrations less than 50 mg/kg is 39,200 tons.

Consistent with other remedial alternatives, up to a 1-foot layer of clean backfill materials would be placed in the areas that are dredged and not capped. The combined quantities estimated for clean backfill and cap materials for this remedial alternative is 40,400 cubic yards.

Once the construction of the remedial alternative is complete, MNR would be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring would be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek would be implemented if determined necessary to achieve RAOs. SED-5 would also include the implementation of the Soil Management Plan.

The following components are part of Alternative SED-5:

- Creek bank soil stabilization (may include excavation) for contaminated areas with minor, moderate and severe erosion;
- Dredging of sediment in high-energy areas;
- Capping of sediment in Low-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;
- Optimization of the remedy would be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permits reviews; and
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-5 and meet RAO 6 is 3 years. The time to achieve MNR following remedy implementation and meet RAOs 4, 5, 7, 8, 9, and 10 is projected to be 20 to 30 years.

ALTERNATIVE SED-6: Creek Bank Soil Source Control for Contaminated Areas with Minor, Moderate, and Severe Erosion; Dredging of Sediment in High- and Low-energy Areas; Backfill Dredged Areas; Offsite Disposal for Excavated Soil and Dredged Sediment; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $41,500,000
Estimated Annual O&M Cost: $12,000,000
Estimated Present Worth Cost: $53,500,000

SED-6 is identical to SED-4 with the exception that it includes addressing creek bank soil with minor, moderate and severe erosion that exceed 2.6 mg/kg total PCB concentrations.

Like SED-4, SED-6 includes dredging with offsite disposal of sediment from high- and low-energy creek areas that exceed the 2.6 mg/kg total PCB concentrations (Figures 28 and 29). The sediment removed through dredging would be transported to a staging area, dewatered, and subsequently transported to an offsite, licensed landfill.

The estimated quantity of sediment to be dredged under this remedial alternative is 52,100 cubic yards. The estimated quantities of sediment for offsite disposal of materials with PCB concentrations greater than or equal to 50 mg/kg is 48,200 tons, and the estimated quantity of sediment for offsite disposal with PCB concentrations less than 50 mg/kg is 39,200 tons.

Once the construction of the remedial alternative is complete, MNR would be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring would be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek would be implemented if determined necessary to achieve RAOs. SED-5 would also include the implementation of the Soil Management Plan.

The following components are part of Alternative SED-6:

- Creek bank soil stabilization (may include excavation) for contaminated areas with minor, moderate and severe erosion;
- Dredging of sediment in high-energy and low-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;
- Optimization of the remedy would be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permit reviews; and
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-6 and meet RAO 6 is 3 to 4 years. The time to achieve MNR following remedy implementation and meet RAOs 4, 5, 7, 8, 9, and 10 is projected to be 20 to 30 years.

ALTERNATIVE SED-7: Creek Bank Soil Source Control for Contaminated Areas with Minor, Moderate, and Severe Erosion; Dredging of Contaminated Sediment in High- and Low-energy Areas; Backfill Dredged Areas; Offsite Treatment of PTW; Offsite Disposal for Excavated Soil and Dredged Sediment; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan

Estimated Capital Cost: $42,000,000
Estimated Annual O&M Cost: $12,000,000
Estimated Present Worth Cost: $54,000,000

SED-7 is like SED-6 with one exception. SED-7 includes the use of offsite treatment (incineration) for a small portion of the excavated sediment. SED-7 includes efforts to stabilize creek bank soil with minor, moderate and severe erosion that exceed 2.6 mg/kg total PCB concentrations and dredging with offsite disposal of sediment from high-energy and low-energy creek areas that exceed the 2.6 mg/kg total PCB concentrations (Figures 28 and 29).

The estimated quantity of soil associated with creek bank stabilization efforts for severe erosion is the same for all alternatives and is discussed in the common elements. The estimated quantity of sediment to be dredged from the creeks under this remedial alternative is approximately 52,100 cubic yards. The estimated quantity of clean backfill materials for this remedial alternative is 40,400 cubic yards. The estimated quantities of sediment for offsite disposal of sediment dredged from Snow and Choccolocco Creeks with PCB concentrations greater than or equal to 50 mg/kg is 48,200 tons. The estimated quantity of dredged sediment with PCB concentrations less than 50 mg/kg for offsite disposal is 39,200 tons.

The dredged sediment would be removed, staged, and dewatered. A small portion of the dredged sediment (with PCB concentrations greater than or equal to 500 mg/kg) would be transported to a licensed facility for offsite treatment. As described for soil, offsite incineration is the most commercially available technology and was used as an example technique for offsite treatment in the screening analysis. Materials would be transported to one of the three TSCA-permitted facilities in Texas or Kansas and incinerated, and the resulting ash would be disposed of by the treatment facility. The remaining sediment (sediment with PCB concentrations below 500 mg/kg) would be transported to a licensed facility for disposal.

Once the construction of the remedial alternative is complete, MNR would be relied upon to achieve further reductions of PCB concentrations in sediment, surface water, and biota over time (see PRG Table 8). Monitoring would be conducted to track the remedy effectiveness trends and implement a range of short- and long-term remedy monitoring and metrics, including traditional approaches (e.g., assessing PCB concentration trends in sediment, surface water, and biota) to document concentration reductions over time. Optimization including performance of additional dredging and/or in-place treatment of areas within Snow Creek and Choccolocco Creek would be implemented if determined necessary to achieve RAOs. SED-2 would also include the implementation of the Soil Management Plan.

The following components are part of Alternative SED-7:

- Creek bank soil stabilization (may include excavation) for contaminated areas with moderate and severe erosion;
- Dredging of sediment in high-energy and low-energy areas;
- Backfilling excavated/dredged areas with clean soil;
- Offsite disposal for excavated/dredged soil and sediment;
- Offsite Treatment of PTW;
- Wetland mitigation where needed;
- MNR of PCB concentrations in sediment;
- MNR of PCB concentrations in surface water and biota;

- Optimization of the remedy would be implemented as needed to ensure MNR is progressing as intended;
- Long-term monitoring to assess post-remedy conditions in OU4;
- ICs in the form of fish advisories, 811 utility clearance system, and APCO permits reviews; and
- Implementation of the Soil Management Plan.

The duration to implement the field construction components of SED-7and meet RAO 6 is 3 to 4 years. The time to achieve the MNR sediment PRG following remedy implementation and meet RAOs 4, 5, 7, 8, 9,and 10 are projected to be 20 to 30 years.

Comparative Evaluation of Alternatives

Each alternative was evaluated using the nine evaluation criteria in the NCP, 40 C.F.R. Section 300.430(e)(9)(iii). Two of the nine criteria, overall protection of human health and the environment, and compliance with ARARs, are threshold criteria. If an alternative does not meet these two criteria, it cannot be considered as a remedy for the category being compared in OU4.

- **Overall Protectiveness of Human Health and the Environment** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
- **Compliance with ARARs** evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Five of the criteria are balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume of contaminants through treatment; short-term effectiveness, implementability, and cost. The EPA can make tradeoffs between the alternatives with respect to the balancing criteria.

- **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
- **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
- **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
- **Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
- **Cost** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Two of the criteria are modifying criteria, state/support agency acceptance and community acceptance. These modifying criteria are formally considered after public comment is received on the Proposed Plan and RI/FS and may be used by the EPA to modify the proposed remedy.

- **State/Support Agency Acceptance** considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
- **Community Acceptance** considers whether the local community agrees with the EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

This section summarizes the comparison of each category of alternatives to two threshold and five balancing CERCLA evaluation criteria and to each other. The final two modifying criteria will be summarized after the public comment period for this Proposed Plan.

Residential Soil

Residential cleanups of PCB contaminated surface soil have been implemented at most yards/properties except where access has not been granted. In addition to the previously completed removal actions under the NTC Removal Action Agreement, RS-2 would use a soil management approach (i.e., operations and maintenance) to address the PCB residuals at depth beneath previously remediated yards. Soil management would also be used to monitor locations where structures may be removed over time and additional evaluations and/or removal actions may be needed at these locations. The only difference between RS-3 and RS-2 is the approach to address the PCB residuals at depth. Under RS-3, subsurface soil with PCB concentrations between 1 mg/kg and 10 mg/kg would be removed and disposed of onsite. The onsite soil management area would be used for the disposal of materials with PCB concentrations less than 10 mg/kg that have been characterized with five-point composite samples. Offsite disposal would also be an option.

<u>Overall protection of human health and the environment</u>
Alternatives RS-2 and RS-3 would meet the overall protection of human health and the environment threshold criterion. RS-1 would meet this criterion for the areas/ properties where removals have been conducted but would not meet this criterion for the few remaining residential properties with surface soil concentrations above 1 mg/kg and where removals have not been conducted because the property is wooded and overgrown. RS-1 would not provide management of residual PCBs in the subsurface of some properties or under structures.

<u>ARARs</u>
Both RS-2 and RS-3 would both require proper handling and disposal of PCB remediation waste.

<u>Short-term effectiveness</u>
Short-term impacts are higher for alternative RS-3 than under RS-2. These impacts are associated with returning to properties where surface soil was previously removed and repeating the process to remove subsurface soil with PCB concentration between 1 mg/kg and 10 mg/kg. RS-3 would have a larger environmental impact in terms of energy use and greenhouse gas emissions than RS-2. RS-3 would also take two to three months longer to implement than RS-2.

Long-term effectiveness and permanence
RS-2 and RS-3 alternatives provide long-term effectiveness and permanence where removals/backfill have been or would be completed. RS-2 and RS-3 would both provide protection by completing the necessary removal actions as required and conducting long-term residuals management with RS-3 providing greater permanence through the removal of subsurface soil.

Reduction of toxicity, mobility or volume through treatment
The RS alternatives do not include treatment and therefore do not reduce toxicity, mobility or volume of contaminants through treatment. However, principal threat concentrations (PCBs ≥ 500 mg/kg) have not been detected in residential soil.

Implementability
Both RS-2 and RS-3 alternatives are implementable. The components of RS-2 have been or would be implemented in the same manner as previously conducted for the residential properties through the removal actions. RS-3 would be conducted in the same manner but requires excavating to greater depths around structures and other obstructions, which can present implementability challenges. However, those types of challenges can easily be addressed over time.

Cost
There is no cost associated with RS-1. RS-2 is estimated cost $0.4M, and RS-3 is estimated to cost $1.4M.

RS-1 was eliminated from further evaluation because it does not provide overall protection where cleanups have not yet been performed and does not provide for management of residual PCBs on residential properties. RS-2 and RS-3 are similar in that surface soil on most of the affected residential properties have already been effectively addressed. Alternatives RS-2 provides more short-term effectiveness but less long-term effectiveness, while RS-3 provides more long-term effectiveness but less short-term effectiveness. The primary differences between RS-2 and RS-3 are the increased level of community impact and implementability challenges under RS-3, and the increase in permanence that RS-3 provides. There is also a substantial difference in cost between the two approaches ($0.4M for RS-2 and $1.4M for RS-3).

Remedial Alternatives for Interim Measures Soil at Oxford Lake Park

Two alternatives were evaluated to for IMs. IM-1 is no further action. The difference between IM-1 and IM-2 is that IM-2 would continue to ensure that the previously constructed IMs remain in place and are protective by continuing the inspection, monitoring, and repairs of the IMs, if needed.

Overall protection of human health and the environment
AlternativeIM-2 would be protective of human health and the environment in the short and long term. Because the no action alternative (IM-1) does not include long-term monitoring, maintenance, or soil management for the previously constructed caps and covers, it would not offer overall protectiveness.

ARARs
IM-2 complies with ARARs by ensuring that any PCB impacted soil that needs to be removed during maintenance are properly disposed. Remedial alternative IM-1 would not provide the oversight to ensure that ARARs for disposal of PCB remediation waste are complied with.

<u>Short-term effectiveness</u>
There is no short-term effectiveness associated with IM-1. IM-2 is effective in the short-term because the measures in place would be maintained.

<u>Long-term effectiveness and permanence</u>
IM-1 does not include monitoring and, therefore, has no mechanism to ensure long-term effectiveness. IM-2 offers long-term effectiveness and permanence through continued monitoring, maintenance, and repairs, if needed.

<u>Reduction of toxicity, mobility or volume through treatment</u>
IM-1 does not include an action and therefore there is no further reduction in toxicity, mobility, or volume through treatment. Although IM-2 does not include treatment to reduces toxicity, mobility, and volume, it does include long-term monitoring to ensure long-term effectiveness of the IMs. No PTW has been identified in the IM areas.

<u>Implementability</u>
IM-1 does not have an action and therefore has no implementability issues. IM-2 would require coordination with landowners to continue with ongoing monitoring, maintenance, and soil management support activities.

<u>Cost</u>
IM-1 does not have a cost as the no action alternative. IM-2 is estimated to costs $400,000.

IM-2 alternative relies on measures that have already been constructed and are currently effective and protective. Because IM-1 does not include long-term monitoring to ensure that controls remain in place and are maintained, it would not be protective in the long term. Under IM-2, long-term protectiveness and permanence would be ensured with continued monitoring, maintenance, and implementation of the Soil Management Plan.

Non-residential Soil

As with all the categories, the first alternative (NRS-1) would be no action. The only other alternative (NRS-2) actively addresses the non-residential soil to protect ecological receptors. The remedial volume for soil under NRS-2 reflects the excavation of soil from the 0–0.6 inches horizon over a to achieve the ecological PRG.

<u>Overall protection of human health and the environment</u>
The no action alternative, NRS-1, would not be protective of human health and the environment, as it would leave soil with concentrations above acceptable concentrations in surface soil. NRS-2 would remove the soil that poses an unacceptable risk to ecological receptors.

<u>ARARs</u>
NRS-1 does not have any ARARs. NRS-2 would comply with ARARs by ensuring that PCB contaminated soil is properly disposed in accordance with regulations.

Short-term effectiveness
NRS-1 would not be effective in the short-term as no action is taken. NRS-2 would remove and replace contaminated soil from the 0–6-inch horizon over a 71-acre footprint to achieve the identified PRG. This alternative may disturb the local neighborhood as it would require offsite truck transport for the excavated soil.

Long-term effectiveness and permanence
NRS-1 would not be effective in the long term as it does not provide for any additional action. NRS-2 provides for long-term effectiveness and permanence by removing and replacing contaminated surface soil to levels that are protective of ecological receptors. Additionally, institutional controls (e.g., investment in the Alabama 811 one-call system, the conservation corridors, deed restrictions) and implementation of the Soil Management Plan would ensure long-term protection.

Reduction of toxicity, mobility or volume through treatment
NRS-1 and NRS-2 do not include a treatment technology and would not reduce the toxicity, mobility, or volume of material. NRS-2 does include actions to reduce ecological risk to acceptable levels. No PTW was identified in floodplain soil.

Implementability
NRS-1 has no implementability issues since there is no action. NRS-2 would be implementable using proven technologies and licensed operators, where appropriate. NRS-2 would have moderate but workable implementability challenges relative to access and coordination with local landowners.

Cost
NRS-1 does not have a cost as the no action alternative. The costs for NRS-2, including offsite disposal (landfilling) would be $30.9M.

The no action alternative (NRS-1) would not meet the threshold criteria, and therefore it is not protective. NRS-2 would be protective as it meets the PRG for ecological receptors. NRS-2 complies with ARARs, is implementable, ensures long-term effectiveness and permanence, and is cost effective.

Creek Bank Soil and Sediment

Each of the six active creek bank and sediment alternatives would address the same footprint (determined during RD) to meet the human health and ecological PRGs. The alternatives reflect different technologies and combinations of technologies, including excavation/dredging, excavation/dredging and capping, and excavation/dredging and in-place treatment. The alternatives also include different offsite disposal methods with alternatives SED-2 through SED-6 using permitted offsite landfills and SED-7 using offsite treatment with incineration for a small quantity of sediment (225 cubic yards) with PCB concentrations ≥ 500 mg/kg. Each of the active remedial alternatives include source control measures to address creek bank areas that are contributing PCBs to OU4.

Overall protection of human health and the environment
SED-1 is the no action alternative. The SED-1 alternative would not meet threshold criteria and is used, in accordance with the NCP, as a reference point for comparison with the other alternatives. All other sediment alternatives are protective of human health and the environment. Stabilizing the creek banks that are the least stable and that have the highest PCB concentrations would address a significant source of PCB loading to Choccolocco Creek. The creek bank actions would be combined with active sediment

remediation over Snow Creek, the backwater area, Choccolocco Creek downstream of the backwater area, and other areas that in RD are identified to exceed the sediment PCB NTE/RAL. Residual risk following construction will be addressed through MNR. The EPA recognizes there is significant uncertainty associated with the rates and extent of contaminant decline predicted in the site modeling. To address this uncertainty and ensure a protective remedy, a robust monitoring program will be implemented to document that contaminated media are trending towards and achieving remediation goals in the anticipated time frame of 20 years (below Jackson Shoals) and 30 years (at and above Jackson Shoals). If the PRGs are not attained in the anticipated time frame, additional remedial actions will be taken to ensure a protective remedy.

ARARs

Except for SED-1, the no action alternative, it is expected that each alternative would comply with ARARs, the second threshold criteria. The ARARs are identified on page 82 of this Proposed Plan.

Short-term effectiveness

Each of the sediment alternatives would have similar short-term risks and impacts to Site workers and the community. These risks and impacts are associated with removing trees and constructing and removing staging and dewatering areas. Most of this clearing would be located directly along the edge of the creek in the riparian buffer zone. The excavation, staging, and dewatering of sediment along with the necessary truck traffic could cause noise, dust, and odors that might disturb the local communities. Risks to Site workers and the communities might also be associated with dust generated during excavation, stockpiling, and loading trucks for offsite transportation and disposal.

Although sedimentation controls would be in place for all activities, work along the creek banks and sediment removal would unavoidably cause a short-term increase in suspended solids in the surface water column and an associated increase in contaminant concentrations in surface water and potentially fish tissue. Creek banks may be stabilized using hard engineering (such as riprap or concrete) in places, which would permanently affect the aesthetics of the creek banks. There are significant, but manageable logistical issues associated with accessing and removing sediment from the different reaches of OU4.

The alternatives that cap (SED-5) or treat sediment in situ (SED-2 and SED-3) would involve less time dredging and less disturbance of sediment that could be resuspended and transported downstream. Therefore, these alternatives would have a shorter temporary increase in surface water, biota, and downstream sediment concentrations than SED-4, SED-6, and SED-7, and take less time to recover. SED-5 would involve some dredging in the low-energy areas to leave room for the cap, and SED-2 and SED-3 would be less disruptive and have fewer impacts because dredging would not be required prior to placing the activated carbon as part of the treatment process. Although SED-4, SED-6, and SED-7 would be more impactful to surface water, they would also generate greater amounts of sediment to be staged, handled, transported, and areas to be backfilled. This would increase local disturbances by truck traffic, dust, and noise.

Each active alternative would take approximately the same amount of time to complete, approximately 3 to 4 years. Although some of the construction activities are different for SED-2, SED-3, and SED-5 (i.e., capping or in-place treatment), the durations for the activities and the associated noise and other disturbances would likely be similar.

Because SED-7 involves transport to an out of state incineration facility and would potentially negatively impact communities outside of the OU4 area.

Long-term effectiveness and permanence

Each of the active SED alternatives would be effective and permanent. Each alternative would stabilize creek bank soil and remove or isolate creek sediment. The PRGs are anticipated to be achieved through a combination of these actions and MNR. A robust sediment and fish tissue monitoring program is included as a part of all alternatives to ensure that the PRGs are achieved in the anticipated time frames. Over time, SED-2 and SED-4 would achieve the PRGs over 30 to 35 years, and SED-3, SED-5, SED-6, and SED-7 would achieve the PRGs in approximately 20 years.

SED-2, SED-3, and SED-5 would implement proven technologies of capping and in-place treatment where they are best suited, which are the low-energy areas of the creek. Capping (SED- 5) uses physical isolation (1-foot cap) to keep the BAZ and the organisms that live in that zone from contacting the underlying sediment where PCBs remain. SED-2 and SED-3 use activated carbon to absorb the PCBs, effectively preventing their bioavailability and bioaccumulation in the food chain. These technologies have been proven effective in aquatic systems. These Alternatives' long-term effectiveness and permanence for OU4 would be confirmed through a long-term monitoring and maintenance program. The long-term monitoring program is anticipated to measure and evaluate metrics for surface water, sediment, and biota to track attainment of sediment, fish tissue, and surface water remediation goals over relevant spatial areas (i.e., for the sediment bed, to ensure no samples exceed 2.6 mg/kg and that a SWAC of 0.1 mg/kg is attained over the 10 ecological exposure areas). The monitoring would be supplemented with passive sampling devices and fish tracking.

All the active creek bank and sediment alternatives include implementation of a Soil Management Plan to manage PCB residuals associated with future infrastructure construction or improvement projects that may occur in creek bank or sediment portions of OU4.

Reduction of toxicity, mobility or volume through treatment

SED-2 and SED-3 would reduce the bioavailability of PCBs in sediment through in-place treatment. The addition of activated carbon to the sediment surface would sorb the PCBs, preventing them from being released to surface water and from being bioaccumulated in the food chain. SED-4, SED-6, and SED-7 include the addition of portland cement to stabilize sediment dredged from the low-energy area. Additionally, SED-7 includes treatment (incineration) of the PTW concentrations in sediment from the low-energy area at an offsite incinerator in Texas or Kansas.

Implementability

Each of the SED alternatives would be implementable using commercially available and proven technologies. Each alternative has specific logistical issues that would be managed using standard engineering practices. As with some of the other evaluation criteria, such as short-term effectiveness, the logistical issues associated with floodplain/creek bank staging areas and truck traffic would be more noticeable to the local community in proportion to the amount of material that would be transported to and from the Site. The range of active remedial alternatives can be organized into two major groups of implementability, with the first group being more implementable than the second group. The groupings are based on the quantity of sediment removed and transported offsite for disposal. With each group, the active remedial alternatives are organized from most easily implemented to least easily implemented:

- Group 1 (more easily implemented): SED-2, SED-3, and SED-5; and
- Group 2 (less easily implemented): SED-4, SED-6, and SED-7.

Cost

The estimated costs for the alternatives that do not include offsite treatment range from $43.6M for SED-2 to $53.5M for SED-6. The estimated costs for SED-3, SED-4, and SED-5 are in the middle of this range and are $47.4M $49.7M, and $50.6M, respectively. The cost differences between alternatives SED-3 through SED-5 are associated with the various quantities of sediment being dredged, capped, and/or treated in-place. The two different approaches to creek bank source control (i.e., addition of minor erosion areas for some alternatives) also account for a small portion of the differences. SED-7 is the most expensive alternative ($54M) based on transportation and treatment costs associated with offsite treatment (incineration) of PTW.

Preferred Alternative

The Preferred Alternative includes one alternative from each of the four categories of alternatives as follows:

RS-2: Excavation and On- or Offsite Disposal for Surface Soil with PCB Concentrations ≥ 1.0 mg/kg and Subsurface Soil PCB Concentrations ≥ 10.0 mg/kg;

IM-2: Long-term Monitoring, Maintenance, and Implementation of Soil Management;

NRS-2: Excavation of Soil in 0–6-inches Soil Horizon, Offsite Disposal, ICs, and Implementation of Soil Management Plan; and

SED-6: Creek Bank Soil Source Control for Contaminated Areas with Minor, Moderate, and Severe Erosion; Dredging of Sediment in High- and Low-energy Areas; Backfill Dredged Areas; Offsite Disposal for Excavated Soil and Dredged Sediment; MNR of Sediment; Long-term Monitoring; ICs; and Implementation of Soil Management Plan.

Based on information currently available, the EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Proposed Remedy to satisfy the following statutory requirements of CERCLA 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the statutory preference for treatment of PTW.

These remedial alternatives proposed include removal of contaminated soil/sediment exceeding the cleanup goals and offsite disposal of excavated material from the residential, IMs, non-residential, and creek bank soil and sediment from Snow Creek and Choccolocco Creek. These remedial actions were proposed for several reasons.

- A similar residential alternative was selected in the November 8, 2017, ROD for OU1/OU2. To date, monitoring and soil management have been effective for maintaining the residential remedy in OU1/OU2 and should also be effective in OU4.
- Even though the Oxford Lake Park IMs are located near residential neighborhood, the IMs are fenced or closely monitored by the park and City of Oxford staff. The

opportunity for exposure to PCBs in soil due to penetration of the cover soil on the softball fields or paved and built-up areas is limited. Although the exposure point concentration on Field A exceeds the ecological PRG of 6 mg/kg, the concentration is acceptable for recreational use. IM 2 was proposed because the engineering and administrative controls in place for OLP and the recreational use limit the opportunity for ecological impacts.

- Non-residential soil (0-6 inches bgs) is a risk to ecological receptors. NRS-2 provides risk reduction needed to protect human health and the environment.
- Excavation of sediment in high and low energy areas of OU4 and stabilization of creek banks would help ensure that recontamination of sediment from an upstream source does not occur. Offsite treatment of PCB PTW was not selected because the expense would not provide additional protection to the community but might threaten other communities during extended transit.

A Soil Management Plan for these alternatives would be implemented by the PRPs. The Soil Management Plan would extend to dealing with property owners, local government agencies, and utilities on non-residential properties, transportation corridors, and waterways where PCBs concentrations exceed 1 mg/kg in surface and subsurface soil.

Dredging is intended to excavate sediment to the depth of native or unimpacted sediment, verified by using a PCB performance standard in the excavation footprint. Backfilling will occur when dredging of targeted PCBs is verified. Unremediated contaminated sediments in the aquatic portions of OU 4 would be addressed through natural recovery, as verified by monitoring the contaminated media, including surface water, sediments, and fish tissue over time. The contaminated sediment is expected to attain the PRG in an acceptable time frame, which is 20 years below Jackson Shoals and 30 years above Jackson Shoals, following construction of the sediment bed and creek bank work. If the monitoring indicates that media are not trending toward achieving the PRG within these time frames, in the ten reaches, the data will be used to identify other high COC concentration areas that are limiting the attainment of the PRG. Any findings would be used to identify additional active remediation needed to achieve PRGs and RAOs consistent with the current or a future decision document. The process of setting goals, stating the expectations for goal attainment, monitoring post-remediation, and making decisions on remedy adaptation is described in the EPA's 2022 Guidance on Adaptive Site Management at Contaminated Sediment Sites. That process will be used to ensure that additional remediation is taken if warranted by future site conditions.

Conservation easements and deed restrictions are already in place for 1500 acres of PCB impacted areas in the floodplain. Additional institutional controls may be implemented as part of the Preferred Alternative. A Final Institutional Controls Implementation Plan would be developed during the RD and would identify the institutional controls available to help protect the remedies.

Five-year reviews will be conducted to evaluate the implementation and performance of the Preferred Alternatives and to determine if the remedies continue to be protective of human health and the environment. Five-year reviews would be conducted as required under CERCLA and the NCP.

The estimated total present worth cost for the proposed remedy is $85.2 million. Total costs are based on a 7% discount rate applied to all costs incurred after the first year to find the present worth cost of the Selected Remedy.

These alternatives:

- Provide for long-term stewardship of PCBs that remain in the environment at concentrations greater than 1 mg/kg.
- Provide acceptable protection of humans and ecological receptors.
- Provide for the restoration of fishable waterways.

Five Year Reviews

Because the Preferred Alternative leaves waste on site above levels that allow for unlimited use and unrestricted exposure (UU/UE) five-year reviews would be conducted, consistent with CERCLA requirements. These reviews would be conducted to determine that the remedy continues to be protective of human health and the environment and evaluate the implementation and performance of the Preferred Alternatives.

Community Participation

Since 2000, the EPA and the PRPs have been working to keep the community, natural resource trustees, other governmental entities, the Community Advisory Group, the Technical Advisor, the United States District Court for the Northern District of Alabama, and all other interested parties informed about Site activities. Information has been disseminated through websites, fact sheets, open houses, availability meetings, and public meetings.

The RI Report, FS Report, FS Addendum, baseline risk assessment reports, and this Proposed Plan for OU4 of the Anniston PCB Site are scheduled for release to the public on May 31, 2024. These documents are incorporated in the Administrative Record for the Site. A copy of the Administrative Record, upon which this Preferred Alternative is based, can be accessed or downloaded from the Site webpage at https://www.epa.gov/superfund/anniston-pcb-site. Hard copies of documents in the administrative record are no longer maintained. Assistance with accessing the site webpage is available from the designated Information Repositories. Notices about the availability of these documents have been published in the Anniston Star and announced on Anniston radio stations.

A 60-day comment period has been approved at the request of the Site's CommunityAdvisory Group (CAG). The comment period begins on June 1, 2024, and ends on July 30, 2024. On June 18, 2024, the EPA will present its Preferred Alternative for OU4 of the Anniston PCB Site during a public meeting at the Oxford Civic Center, Recreation Drive, Oxford, Alabama. A similar meeting will be held at the Oxford Civic Center on July 23, 2024. At these meetings, EPA representatives will answer questions about sampling, the risk assessments for OU4 and the remedial alternatives under consideration. A transcript of the meetings will be prepared and will be available with the ROD electronically at the EPA webpage https://www.epa.gov/superfund/anniston-pcb-site. A recording of the Proposed Plan presentation will be available on the EPA webpage https://www.epa.gov/superfund/anniston-pcb-site. The EPA may also present portions of the Proposed Plan at community meetings sponsored by the Community Advisory Group, the Technical Advisor, and other local groups, as needed during the public comment period.

The EPA will also host public availability sessions to help the community understand the Proposed Plan on Saturday, June 22, 2024, at the Anniston Meeting Center, 1615 Noble St, Anniston, Alabama and Saturday, July 20, 2024, at the Lincoln City Center, 140 Jones Street, Lincoln, Alabama.

Site Contacts for the Anniston PCB Site				
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