UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

ATLANTA, GA 30303

May 29, 2024

MEMORANDUM

SUBJECT: Addendum to Operable Unit 4 Feasibility Study

FROM: Pam Scully, Remedial Project Manager

TO: Anniston PCB Site File

Pharmacia LLC/Solutia Inc. (P/S) submitted a revised Operable Unit 4 Feasibility Study (OU4 FS) for the Anniston PCB Site (the Site) on May 1, 2023. The EPA reviewed the OU4 FS and used it to draft a Proposed Plan. Some information from the OU4 FS has been changed in the Proposed Plan to reflect EPA's comments and conclusions. This Technical Memorandum is intended to document significant Proposed Plan changes to the FS.

Risk Assessment

1. **Section 5.1.6 of the OU4 FS (Risk from Agricultural Products Consumption)** documents the results of a conservative, modeling-based evaluation of consumption of agricultural products raised in floodplain areas. The modeling indicates that farmers who consume beef and dairy products from cattle raised in areas with total polychlorinated biphenyl (PCB) concentrations as low as 5 mg/kg in soil may experience unacceptable risk. However, typical dairy and beef cattle operations, with less grazing and more silage feeding, would be unlikely to result in any unacceptable health risks. The OU4 FS conclusions are based on a conservative model rather than on sampling of any locally produced beef or dairy products. There are no dairy operations in the floodplain areas at the current time. Some beef cattle are currently raised in the floodplain.

   The Proposed Plan Non-Residential Soil alternatives address ecological risk and will protect cattle from surface soil contamination above a SWAC of 6 mg/kg. The conservation corridor and Soil Management Plan can be used to ensure the floodplain remains protective of agricultural products if future uses change. Discussion of these analyses have been removed from the Proposed Plan so that there is no conflict with USDA authority over concentrations in food products.

Risk Management

2. **Section 6.1.2 of the FS (Constituents of Concern)** identified that PCBs were the primary contaminant of concern (COC) in sediment and soil based on both the Human Health Risk Assessment (HHRA) and the Baseline Ecological Risk Assessment (BERA) .

    a. The HHRA identified PCBs, mercury, and dioxin-like (DL)-PCB congener Toxic Equivalency Quotient (TEQ) as COCs in fish tissue (PCBs for the whole length of Choccolocco Creek and mercury and DL-PCB congener TEQ in the lower portion of Choccolocco Creek). To lower COCs in fish tissue, sediment preliminary remedial goals (PRGs) are established in the FS and are carried through to the Proposed Plan.

       To lower mercury in fish tissue, the FS states that: The mercury concentration profile for Choccolocco Creek sediment located downstream of the backwater area is flat to trending upward at the downstream end of OU-4 and supports the presence of upwind sources to the west. The average mercury concentration in sediment downstream of the backwater area is approximately 0.69 mg/kg. Sediment in the backwater area will be separately targeted for PCBs and addressing this sediment will also remediate the mercury if present. For reference purposes, the remedial goal for mercury in Snow Creek sediment from the OU-1/OU-2 ROD was 1 mg/kg.

       To lower DL-PCB congener TEQ in fish tissue, the FS states that: reducing the impact of PCBs in sediment will reduce the DL-PCB congener risk in sediment and fish tissue. DL-PCB concentrations in sediment are highest in the upper reach where high PCBs and high mercury concentrations in sediment are co-located.

       The Proposed Plan looked further at these assessments for sediment. PCBs remain the primary COC, and the EPA believes concentrations of site-related mercury and /PCDF and DL-PCB TEQ in sediment can be addressed with the cleanup of PCBs.

       Table 4-5a for sediment in the BERA shows that the exposure point concentrations (EPCs) for mercury below the backwater area (reaches C3 through C10) are less than 1 mg/kg, and in the backwater area (reach C2) the mercury EPC is estimated at 27.4 mg/kg. Addressing PCBs in the backwater area will reduce potentially available mercury concentrations in sediment.

       Table 1 below for the DL-PCB TEQ data in surface sediment shows that the highest concentrations in sediment are in the backwater area (reach C2). Concentrations downstream of reach C2 are consistent and low. Subsurface concentrations of DL-PCB TEQ in reach C3 are not shown on the table but are an order of magnitude lower than the 0–6-inch concentrations. The HQs were revised in the BERA Addendum, but the dioxin PRG in sediment (25 pg/g) protective of aquatic receptors and fish are only exceeded in the backwater area where sediment will be removed due to PCBs concentrations.

b. The BERA identified PCBs, mercury, and PCDD/PCDF and DL-PCB congener TEQ as COCs for terrestrial (in contact with soil) and aquatic (in contact with sediment) ecological receptors. The HHRA risk characterization Tables 6-14 and 6-15 show that the risk from PCBs, mercury and DL-PCB congeners in floodplain soil did not exceed EPA's risk range for any exposure pathways.

For mercury in soil, the FS states: The average pre-remediation mercury concentration across the OU-4 floodplain soil is less than 1 mg/kg and would be lowered under any of the remedial alternatives identified for floodplain soil in this OU-4 FS. Additionally, the pre- and post-remediation mercury concentrations in floodplain soil are consistent with PRG ranges for the NOAEL and LOAEL values. Based on these findings, ecological PRG values for mercury in soil are not included in this OU-4 FS.

The FS does not directly discuss dioxin TEQ in sediment because the BERA states: OU--4 creek sediment and floodplain soil TEQ concentrations are unlikely to pose an unacceptable risk to wildlife (birds and mammals) or fish, as all NOAEL-based HQs calculated using modeled tissue TEQ concentrations are less than or equal to 1 for PCDD/PCDF TEQ, DL-PCB TEQ. The HQs were revised in the BERA Addendum but the existing concentrations in soil are less than the LOAEL concentrations required to protect ecological receptors.

The Proposed Plan looked further at these assessments for soil. PCBs remain the primary COC, and the EPA believes concentrations of site-related mercury in soil can be addressed with the cleanup of PCBs.

Table 2 below shows a comparison of the PCB and mercury EPCs in soil in the ecological exposure units from Table 4-7 and 4-8 in the BERA. The highest EPC for mercury is in the riparian corridor for reach C3. A closer look at the highest mercury concentrations in soil on a sample-by-sample basis in Table 3 below shows that high mercury concentrations in surface soil (0-6 inches) are co-located with high PCB concentrations. So even if the PCB cleanup goal of 6 mg/kg for surface soil is based on a 95% upper confidence limit (UCL) surface weighted average concentration (SWAC) for a 5-acre area, the highest mercury concentrations in soil should be addressed by a PCB cleanup of soil.

A risk management decision was made that cleanup for PCBs in soil and sediment will reduce high concentrations of mercury and dioxins in the backwater area and select areas downstream and be protective of PCBs, mercury and dioxins for human health.

Table 1. Surface Sediment (0-6 inches) concentrations of DL-PCB Congeners

Reach/ Program	Depth	Surface DL-PCB Congeners in Sediment			
		Frequency Detected	Min Detected (ng/kg)	Maximum Detected (ng/kg)	Mean Detected (ng/kg)
C1	< 6 in				
C2	< 6 in	3/5	0.066	1,200	614
C3	< 6 in	3/3	2.3	3.6	2.9
C4	< 6 in				
C5	< 6 in	3/3	1.3	4.8	3.5
C6	< 6 in				
C7	< 6 in	2/2	1.4	4.6	3
C8	< 6 in				
C9	< 6 in				
C10	< 6 in				

Table 2. PCB and Mercury EPCs in Soil for ecological exposure units (from Table 4-7 and 4-8 in the BERA).

Reach	Description		PCBs		Mercury	
		Subgroup	EPC (mg/kg)	EPC Basis	EPC (mg/kg)	EPC Basis
C2	Backwater Area	south	11.4	UCL	0.07	UCL
C2	Backwater Area	central	206.5	Maximum	0.2	UCL
C2	Backwater Area	riparian	1.8	Maximum	0.5	UCL
C2	Backwater Area	north	0.4	Maximum	1.4	UCL
C3	Friendship Road to Highway 21	north	32.0	Maximum	3.2	UCL
C3	Friendship Road to Highway 21	south	5.5	UCL	3.4	UCL
C3	Friendship Road to Highway 21	riparian	13.6	UCL	5.9	UCL
C4	Highway 21 to Silver Run Road	riparian	24.0	UCL	3.6	UCL
C4	Highway 21 to Silver Run Road	north	28.3	UCL	2.2	UCL
C4	Highway 21 to Silver Run Road	south	9.4	UCL	2.4	UCL
C5	Silver Run Road to Mitchell Matson Road	riparian	9.5	UCL	1.4	UCL
C5	Silver Run Road to Mitchell Matson Road	north	10.2	UCL	0.7	UCL
C5	Silver Run Road to Mitchell Matson Road	south	1.5	UCL	0.9	UCL
C6	Mitchell Matson Road to 2,000 feet upstream of Curry Station Road	riparian	1.0	UCL	2.0	UCL
C6	Mitchell Matson Road to 2,000 feet upstream of Curry Station Road	north	2.9	UCL	1.6	UCL
C6	Mitchell Matson Road to 2,000 feet upstream of Curry Station Road	south	1.8	UCL	2.8	UCL
C7	Upstream of Curry Station Road to Eastaboga Creek	north	1.4	UCL	0.5	UCL
C7	Upstream of Curry Station Road to Eastaboga Creek	south	2.5	UCL	1.8	UCL
C7	Upstream of Curry Station Road to Eastaboga Creek	riparian	0.7	UCL	3.0	UCL
C8	Eastaboga Creek to Jackson Shoals Dam	south	1.3	UCL	0.8	Maximum
C8	Eastaboga Creek to Jackson Shoals Dam	riparian	1.9	UCL	4.7	Maximum
C8	Eastaboga Creek to Jackson Shoals Dam	north	2.3	UCL	4.7	Maximum
C9	Jackson Shoals Dam to Highway 77	south	0.3	UCL	0.5	UCL
C9	Jackson Shoals Dam to Highway 77	riparian	1.6	UCL	1.7	UCL
C9	Jackson Shoals Dam to Highway 77	north	2.3	UCL	1.7	UCL

Table3. Comparison Highest Mercury Concentrations in Soil (0-6 inches) to PCB Concentrations at Same Sample Locations

Sample Location	Mercury Concentration		PCBs Concentration	
	(mg/kg)	Basis	(mg/kg)	Basis
C4N-43	21.7	mg/kg	24	mg/kg
C4N-13	17.4	mg/kg	18	mg/kg
C3N-05	16.5	mg/kg	75	mg/kg
C4S-04	16.3	mg/kg	52	mg/kg
C-FP02-S1	13	mg/kg	79	mg/kg
C3N-15	12.2	mg/kg	48	mg/kg
C3S-04	11.2	mg/kg	32	mg/kg
C3NX-17	10.7	mg/kg	43	mg/kg
C4S-08	10.4	mg/kg	22	mg/kg
C3S-23	10.1	mg/kg	33	mg/kg
C3N-25	9.9	mg/kg	28	mg/kg
C3NX-20	9.4	mg/kg	40	mg/kg
C-FP03-S7	9.4	mg/kg	35	mg/kg
C4N-10	9.3	mg/kg	31	mg/kg
C4S-25	8.9	mg/kg	17	mg/kg
C6S-02	8.4	mg/kg	10	mg/kg
ELT-07-54	8.4	mg/kg	9.2	mg/kg
C3N-23	8.3	mg/kg	38	mg/kg
C3S-18	7.9	mg/kg	31	mg/kg
C-FP02-N4	7.8	mg/kg	32	mg/kg
C-FP03-S1	7.8	mg/kg	16	mg/kg
C4SX-02	7.7	mg/kg	14	mg/kg
C-FP03-S1	7.7	mg/kg	21	mg/kg
ELT-07-55	7.6	mg/kg	5.3	mg/kg
C3NX-20	7.3	mg/kg	41	mg/kg
C4S-44	7.3	mg/kg	13	mg/kg
EUT-08-50	6.9	mg/kg	25	mg/kg
C3S-25	6.6	mg/kg	25	mg/kg
C3S-28	6.6	mg/kg	24	mg/kg
C3S-24	6.2	mg/kg	12	mg/kg

<u>Preliminary Remedial Action Objectives (RAOs)</u>

3. **Section 6.3.1 of the OU4 FS (Establishment of Preliminary Remedial Action Objectives)** identified 16 RAOs that were required by EPA in previous comments on the FS. Subsequently, EPA reviewers have evaluated the RAOs and determined that the following 10 RAOs should be included in the Proposed Plan. A table comparing the RAOs in the FS with those in the Proposed Plan is provided below.

Final Feasibility Study RAOs	Proposed Plan RAOs
RAO 1: Reduce risks to residents, including young children and adolescents, and other users from direct contact with, inhalation of, or incidental ingestion of PCBs in residential soil above levels that are protective.	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.
RAO 2: Reduce risks to future human agricultural consumers from ingestion of PCBs in agricultural products from the floodplains above levels that are protective.	RAO 2: Ensure the long-term effectiveness of the previously implemented RCRA interim measures (IMs) in Oxford Lake Park.
RAO 3: Reduce risks to terrestrial and riparian-dependent birds and mammals from exposure to COCs in surface soil (0-6 in) to levels that are protective of local populations.	RAO 3: Reduce PCB concentrations in soil (0-6 inches) to levels that are protective to terrestrial ecological receptors.
RAO 4: Reduce recontamination of surface soil from excavation of subsurface soil containing COCs above levels that are protective.	RAO 4: Reduce PCB concentrations in sediment to levels that reduce PCB concentrations to acceptable levels in fish tissue.
RAO 5: Reduce potential violations of improper disposal of PCB remediation waste in soil. (Source Control - reduce mass of PCBs in soil)	RAO 5: Reduce PCB concentrations in fish tissue to levels that are protective to human fish consumers, including pregnant women, young children, and adolescents.
RAO 6: Reduce migration of COCs from floodplain soil to sediment at concentrations that act as a source of sediment contamination.	RAO 6: Reduce PCB concentrations in sediment to levels that are protective to benthic macroinvertebrate communities.
RAO 7: Reduce risks to benthic macroinvertebrate communities and fish communities from exposure to COCs in sediment to levels that are protective.	RAO 7: Reduce PCB concentrations in sediment to levels that are protective to fish communities and aquatic feeding birds and mammals.
RAO 8: Reduce risk to aquatic-feeding birds and mammals from exposure to COCs in surface sediment to levels that are protective of local populations.	RAO 8: Reduce PCB concentrations to levels that are protective of ecological receptors that consume whole fish.
RAO 9: Reduce risks to human fish consumers, including pregnant women, young children, and adolescents, from COCs in sediment above levels that are protective.	RAO 9: Reduce transport of PCBs in OU4 soil and sediment to downstream areas.
RAO 10: Reduce migration of COCs from creek bank soil to sediment that act as a source to sediment contamination.	RAO 10: Restore surface water to achieve AWQC for PCBs for the protection of wildlife and human consumers of fish.
RAO 11: Prevent the long-term downstream transport of COCs in the creek.	
RAO 12: Reduce risks to human fish consumers, including pregnant women, young children, and	

Final Feasibility Study RAOs	Proposed Plan RAOs
adolescents, from COC concentrations in surface water above levels that are protective.	
RAO 13: Reduce risk to fish communities from COCs in surface water to levels that are protective.	
RAO 14: Reduce exposure to aquatic-feeding birds and mammals from exposure to PCBs in surface water to levels that are protective of local populations.	
RAO 15: Reduce exposure to human fish consumers, including pregnant women, young children, and adolescents, from COCs in fish above levels that are protective.	
RAO 16: Reduce exposure to ecological receptors that consume COCs in prey to levels that are protective.	

Cleanup Levels

4. Section 6.3.2 of the OU4 FS identified PRGs needed to achieve the RAOs. Below are the proposed changes to the FS that will be included in the Proposed Plan:

    - The Proposed Plan did not recommend a change to the residential PRGs in the FS.

    - The Proposed Plan did not recommend a change to the nonresidential PRG in the FS. Because the floodplain PRG is based on ecological risk, the EPA is proposing that the floodplain PRG be applied over a 5 acres area representing a home range for small mammals in contact with contaminated soil. In addition, a statistically robust estimate of the SWAC concentration in the exposure areas is needed. The sampling density should have numbers sufficient to calculate statistics (e.g., 95% UCL on mean) with certainty over the relevant exposure scale defined by the biological endpoints. The EPA notified P/S that the PRG needed to meet a 95% UCL SWAC in previous comments.

      PRG implementation requirements may affect volume and cost of the floodplain alternatives. There is not sufficient data to provide more accuracy to the volume and cost. Data will be collected during the preliminary remedial design (PDI) to provide a better estimate. FS estimates are order-of-magnitude estimates, which are expected to be accurate within the range of +50 to -30 percent.

    - The FS used existing data to predict that creek bank soils downstream of River Mile 29.5 (RM29.5) would not have PCB concentrations significant enough to require bank stabilization. The FS alternatives involve stabilization of creek banks with severe and moderate or severe, moderate, and minor erosion upstream of RM 29.5. The Proposed Plan is proposing a PRG for creek bank soil equal to the not-to-exceed value in sediment for all creek banks with the erosive potential identified in the alternative.

- The FS identified two PRGs for sediment upstream (East) and downstream (West) of Jackson Shoals (JS). The FS also used a mean SWAC to calculate sediment exposure point concentrations. 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 (Exhibit A). 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), the Proposed Plan requires a sediment PRG of 0.1 mg/kg for the whole creek. 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.

- The FS acknowledged the AWQC to protect wildlife of 0.014 µg/L as an ARAR and a PRG for surface water. In previous comments and the Proposed Plan, EPA stated the AWQC to protect human health of 0.000064 µg/L is also considered an ARAR and a PRG. Adequate sampling should be conducted during long-term monitoring to demonstrate if these surface water requirements can be met.

MEDIA	CONTAMINANT	PRG Feasibility Study	PRG Proposed Plan
Soil - residential			
surface	PCBs	1 mg/kg	1 mg/kg
subsurface	PCBs	10 mg/kg	10 mg/kg
Soil - nonresidential			
surface	PCBs (0-6 in)	Mean SWAC 6 mg/kg	95% UCL SWAC 6 mg/kg over 5 acres
Soil – creek banks	PCBs		NTE 2.6 mg/kg
Sediment	PCBs	NTE 2.6 mg/kg North Jackson Shoals Mean SWAC 0.1 mg/kg South Jackson Shoals Mean SWAC 0.2 mg/kg	NTE 2.6 mg/kg 95% UCL SWAC 0.1 mg/kg/reach
Surface Water	PCBs (wildlife) PCBs (HH)	0.014 µg/L	0.014 µg/L 0.000064 ug/L
Fish	PCB (tissue) PCB (tissue) PCB (whole body)	0.04 mg/kg ww West JS 0.08 mg/kg ww East JS 1.3 mg/kg dw	0.04 mg/kg ww 0.04 mg/kg ww 1.3 mg/kg dw

Delete Three (3) Interim Measure Soil Alternatives

5. Five remedial alternatives were developed in the FS for the Oxford Lake Park IMs. Three of the four IMs, the softball field's parking lot, tennis court complex, and the 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 in the alternatives described in the FS.

   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 as they are and further action under CERCLA is not warranted. Long-term maintenance of these covers is needed to ensure long-term protectiveness and is required in IM-2.

Delete Three (3) Non-Residential Soil Alternatives

6. Five remedial alternatives were developed in the Feasibility Study to protect ecological receptors from PCBs in floodplain soil. The first is the no action alternative NRS-1. The second addresses the soil most relevant to ecological risk from 0 to 6 inches below ground surface (alternative NRS-2). Additional alternatives were evaluated that not only address ecological risk

but also consider advanced soil management to reduce PCB concentrations greater than or equal to 50 mg/kg in surface and subsurface soil (alternatives NRS-3, NRS-4, and NRS-5). Alternative NRS-3 focused on floodplain soil located upstream of I-20 (the Oxford Lake Park area) and alternatives NRS-4 and NRS-5 addressed the entire OU4 floodplain. Alternatives NRS-3 and NRS-4 involve removing soil with PCB concentrations greater than or equal to 50 mg/kg within surface soil (0–1-foot horizon), and alternative NRS-5 involves removing soil with PCB concentrations greater than or equal to 50 mg/kg within surface and subsurface soil (0–4-foot horizon).

Although advanced soil management removes higher concentrations of PCBs in soil, the additional removal of concentrations at depth does not improve the protectiveness for ecological receptors because they are not regularly exposed to these deeper soils. For that reason, three active remedial alternatives (Alternatives NRS-3, NRS-4, and NRS-5) were not brought forward into the Proposed Plan.

Only one active alternative (Alternative NRS-2) is strictly risk based. Soil would be removed from 0-6 inches with traditional excavation equipment. The excavated soil would be taken offsite for disposal in a permitted landfill. The excavated areas would be backfilled with clean soil, and vegetation would be planted to stabilize the newly placed surface soil layer. Long-term soil management, including using the Alabama 811 system and conservation easements, is required to identify the potential for intrusive soil disturbance activities that without proper soil management could negatively impact the overall effectiveness of the remedy.

Remedy Names

7. The EPA modifies some of the alternative names as shown in the table below.

Names of Alternatives for Residential, Interim Measures, Non-Residential, and Sediment

Alternative #	Feasibility Study Alternative Name	Proposed Plan Alternative Name
RS-1	No Action	No Action
RS-2	Excavation and on- or off-site disposal for surface soil with PCB concentrations of ≥1.0 mg/kg and subsurface soil PCB concentrations of ≥10.0 mg/kg	Excavation and on- or off-site disposal for surface soil with PCB concentrations of ≥1.0 mg/kg and subsurface soil PCB concentrations of ≥10.0 mg/kg and soil management
RS-3	Excavation and on- or off-site disposal for surface soil and subsurface soil with PCB concentrations of ≥1.0 mg/kg	Excavation and on- or off-site disposal for surface soil and subsurface soil with PCB concentrations of ≥ 1.0 mg/kg
IM-1	No Action	No Action
IM-2	Long-term monitoring and maintenance and soil management	Long-term Monitoring, Maintenance and Soil Management

NRS-1	No Action	No Action
NRS-2	Excavation of Soil in 0–0.5-Foot Soil Horizon, Off-Site Disposal, and Long-Term Soil Management Including Deed Restrictions as Needed	Excavation of Soil in 0–6-inches Soil Horizon, Offsite Disposal, ICs, and Implementation of Soil Management Plan
SED-1	No Action	No Action
SED-2	Creek bank soil source control for contaminated areas with minor, moderate, and severe erosion; dredging of sediment in high-energy areas; off-site disposal for soil and sediment; in-place treatment of sediment in low-energy areas; long-term soil management; and MNR of sediment	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; off-site disposal for soil and sediment; in-place treatment of sediment in low-energy areas; long-term soil management; and MNR of sediment	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
Alternative #	**Feasibility Study Alternative Name**	**Proposed Plan Alternative Name**
SED-4	Creek bank soil source control for contaminated areas with moderate and severe erosion; dredging of sediment in high- and low-energy areas; off-site disposal for soil and sediment; long-term soil management; and MNR of sediment	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; off-site disposal for soil and sediment; capping for low-energy areas; long-term soil management; and MNR of sediment	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; off-site disposal for soil and sediment; long-term soil management; and MNR of sediment	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
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; off-site treatment of PTW; off-site disposal for soil and sediment; long-term soil management; and MNR of sediment	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

To Address MNR Uncertainty

8. The Contaminated Sediment Technical Advisory Group (CSTAG) commented on the Proposed Plan in July 2023 (Exhibit B), and included concerns about the ability of the remedy to attain the MNR goals. As such, several comments and requirements have been included to reflect CSTAG concerns.

    a. The creek bank loading section includes the following comment/requirement on page 25 of the Proposed Plan: Due to the sparse sampling, use of surrogate samples, and the lack of calibration or validation of these approaches, this loading estimate is a less precise predictor of erosion and PCB loading potential.

    b. The Creek Bank and Sediment section of the Proposed Plan includes the following language:

       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 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.

c. The EPA added a section on the RD Preliminary Design Investigation (PDI) requirements that are not in the OU4 FS and are typically part of the Remedial Design/Remedial Action (RD/RA) Statement of Work (SOW). These requirements are as follows:
   - Since the creek 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 sampling will establish a post-construction SWAC in each of the 10 exposure units.
     - Sediment and creek 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 may be necessary to document the change.

d. Sediment Sampling to Support MNR was added to the Long-Term Monitoring Plan. 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 of remedial activities in upstream OUs, including OU4. Sediment sampling would occur with the objective of establishing a post- construction SWAC in each of the 10 exposure units. The sampling design would ensure comparability with PDI SWAC estimates and to 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 PCBs and total organic carbon. Surface sediment sampling locations would be surveyed using conventional ground survey methods or global positioning system (GPS) technology.

e. Fish sampling and associated sediment, surface water, pore water, and sediment trap sampling was changed to collect 9 samples at RI fish sampling locations.

f. Optimization of the remedy to attain MNR has been added as a possible action item for each of the sediment remedies. The exact language added is as follows:

> "Optimization including performance of additional dredging (*and in-place treatment or capping if included in the alternative)* of areas within Snow Creek and Choccolocco Creek will be implemented if determined necessary to achieve RAOs."

EXHIBIT A

Summary

This analysis uses existing site data to evaluate additional sediment bed remedial action levels (RALs) in OU4 of the Anniston PCB site. As recommended by CSTAG in 2020 and 2023, this type of analysis considers a broader range of RALs that lessen the reliance on MNR and provides the decision maker with information to compare varying degrees of remediation. The intent is to provide context on the effectiveness and protectiveness of the single evaluated sediment bed RAL compared to additional RALs.

A relationship between RALs and SWACs was developed for Choccolocco Creek reaches above the Lake Logan Martin backwater (see Discussion). The analysis indicates that the remedy could achieve the proposed protective human health PRG with an additional (approximate) 33 acres of remediation (in addition to the 13 acres that are currently proposed).

1 Background

The preliminary remediation goal (PRG) in the sediments of the Anniston PCB site OU4 is a surface-weighted average concentration (SWAC). Despite this, the impact of the proposed remediation on the SWAC was not examined. It is not understood if the proposed RAL of 2.6 mg/kg achieves the PRG or how much remediation would be needed to achieve that goal. As a result, the risk manager does not have the information to evaluate the protectiveness of the alternative at construction completion or how much remediation would be necessary to be protective at that time.

2 Purpose

This analysis addresses two study questions related to SWACs in OU-4 sediments:

1) What are the SWACs after remediating at the proposed RAL (2.6 mg/kg)?

2) What RAL achieves protective SWACs?

This analysis focuses on the approximately 28 miles of creek between the backwater/Friendship Road remediation area (which is proposed to be remediated in its entirety) and the Lake Logan Martin backwater area, which has large areas of lower-level contamination.

3 Methods

3.1 Data

Two data sets from the RI/FS draft dated May 2023 were used in the analysis:

- Table 4-4 in Feasibility Study (FS) draft dated May 2023
- Table 4-6 in Remedial Investigation (RI) Report dated September 3, 2019

Note: The sediment data are generally poorly-suited for determining SWACs in Choccolocco Creek (the data are sparse, decades old, and based on incomplete sampling programs – see CSTAG 2020/2023 comments for further detail). This analysis does not indicate agreement that data are sufficient for study objectives, rather it provides missing analyses based on available data.

3.2 SWAC Areas

The areas used in this analysis are the river reaches presented in the FS SWAC calculations. These areas were chosen for this memo based on their use in the FS, especially to compare to FS calculations.

3.3 Pre-remedy SWACs and remedy area check

The procedures used for SWAC development in the FS are not provided in detail. Results generated in this analysis were checked against FS results. The pre-remedy SWACs calculated in this memo (Table 1) generally agree with those given in Table 4-4 of the FS.

Table 1: Reach-wide pre-remedy SWACs

Reach	FS Table 4.4 SWACs	Calculated SWACs
Backwater to Friendship Road	4.90	4.63*
Friendship Road to Coldwater Creek	0.88	0.84
Coldwater Creek to Cheaha Creek	0.41	0.42
Cheaha Creek to Jackson Shoals	0.53	0.53
Jackson Shoals	0.10	0.11
Jackson Shoals to Lake Logan Martin	0.52	0.52

*(Note: the difference in the Backwater area is due to how "No Recovery" sediment class was handled, which may have been ignored in the PRP calculation)

A description of procedures, assumptions, and an analysis of the impact of those assumptions is provided in the full data evaluation appendix, attached to this memo.

4 Results

4.1 Study question 1: What are the SWACs after remediating at the proposed RAL (2.6 mg/kg)?

This analysis focuses on the approximately 28 creek miles from Friendship Road to Jackson Shoals. Table 2 shows that a RAL of 2.6 mg/kg results in 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.

Table 2: Summary of SWACs and Acres resulting from RAL = 2.6 mg/kg.

Reach	RAL	SWAC	Acres remedy
Friendship Road to Coldwater Creek	2.6	0.51	2.19
Coldwater Creek to Cheaha Creek	2.6	0.23	9.26
Cheaha Creek to Jackson Shoals	2.6	0.49	1.13
Jackson Shoals	2.6	0.11	0.00
Total			**12.58**

4.2 Study Question 2: What RAL achieves protective SWACs?

Table 3 shows that to achieve the PRGs (0.2 mg/kg SWAC above Jackson Shoals; 0.1 below Jackson Shoals), RALs would range from 0.8 to 2.6 ppm and include 46 acres of remediation below the backwater area in Choccolocco Creek.

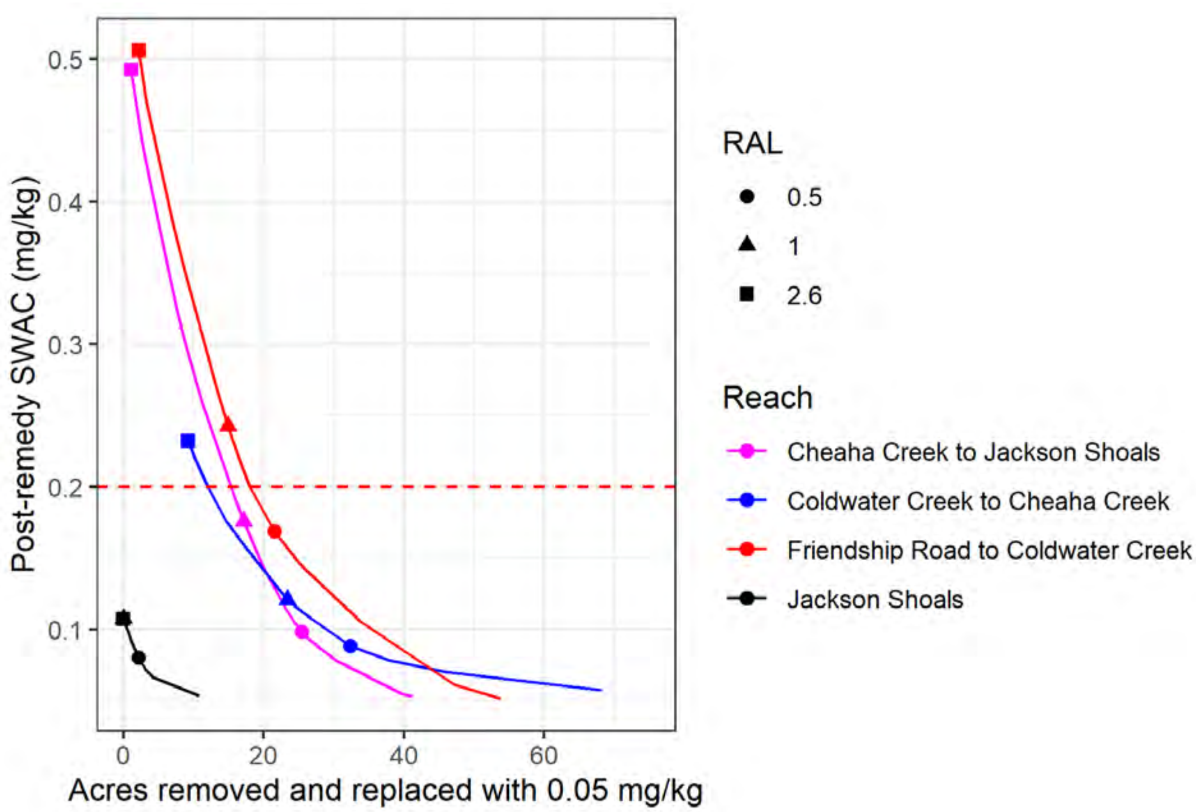
Table 3: Summary RALs/acres that achieve SWAC PRGs

Reach	RAL (mg/kg)	SWAC (mg/kg)	Acres remedy
Friendship Road to Coldwater Creek	0.8	0.20	18.06
Coldwater Creek to Cheaha Creek	1.9	0.20	11.98
Cheaha Creek to Jackson Shoals	1.1	0.19	16.00
Jackson Shoals	2.6	0.11	0.00
Total			**46.04**

5 Discussion

In sum, for the remedy to be protective above the Lake Logan Martin backwater, about 33 additional acres would need to be remediated (i.e., 33 acres in addition to the 12.6 already proposed). The figure below includes the RAL-SWAC relationship for all the evaluated areas. This figure demonstrates the SWACs that would result from various RALs. The shape of these curves (e.g., the "knee of the curve") can be also used to assess when RAL reductions become less effective at reducing SWACs. It suggests that PRG attainment is still in the zone of maximum incremental risk reduction.

Overall, the analysis provides an understanding of the relationship between the remediation and PRG attainment. This information provides a more appropriate basis for selecting the remedy than considering a singular RAL without consideration of the impact on the SWAC PRG, and relying on an MNR model that does not have an appropriate basis (See 2020/2023 CSTAG comments). It also addresses the question of what a protective remedy would entail (at least based on the collected data).



1 Purpose

To calculate potential post-remedy surface-weighted area concentrations (SWACs) in OU-4 sediments at the Anniston PCB site in Anniston, AL.

2 Methods

2.1 Data

Two data sets from the RI/FS draft were used in the analysis:

- Table 4-4 in Feasibility Study (FS) draft dated May 2023
- Table 4-6 in Remedial Investigation (RI) Report dated September 3, 2019

Table 4-4 in the FS summarizes PCB concentrations and surface area by reach and sediment texture and includes the pre-remedy reach-wide SWACs calculated by Solutia. Table 4-6 in the RI includes the sample information (e.g., reach, depth, concentration) for the sediment data set used in the FS.

2.2 Calculations

Surface sediment (0-6”) data were extracted from Table 4-6 from the RI. If a sample location had a field duplicate, the results were averaged into a single concentration at that location. When multiple sample depths were collected at a single location, the PCB concentration used for a surface sediment (0-6”) sample was a weighted average of all PCB concentrations with the bottom of the sample shallower than 6” (e.g., if 0-2”, 2-5”, and 5-8” were taken, only the 0-2” and 2-5” data were used in the weighted average).

The SWAC in the FS is a sediment-texture based SWAC with four textures: Fine (f), Coarse (c), Gravel (g), and No Recovery (nr). The SWAC in each reach was calculated using the average PCB concentration and area for each sediment texture within the reach:

$$SWAC_i = \frac{C_{f,i}A_{f,i} + C_{c,i}A_{c,i} + C_{g,i}A_{g,i} + C_{nr,i}A_{nr,i}}{A_{f,i} + A_{c,i} + A_{g,i} + A_{nr,i}} \tag{1}$$

where $A_{f,i}$ is the area of fines in reach i, $C_{f,i} = \frac{1}{n_{f,i}}\sum_{j=1}^{n_{f,i}}\left(C_{f,j}\right)_i$, and $n_{f,i}$ is the number of samples collected in the fines for reach *i*. The average PCB concentrations for the other sediment classes were calculated similarly.

The FS proposes removal of nearly all sediments from the backwater area and targeted removal areas upstream of Jackson Shoals that exceeded the not-to-exceed (NTE) remedial action level (RAL) of 2.6 mg/kg dry weight (dw) in surface sediments, with a maximum length of sediment removed of 200 ft upstream and downstream from the sample location (Figures 7-14 and 7-15 of the FS). This memo takes a different approach for calculating the remedial area. Instead of removing specific areas over the RAL, the area targeted for removal is proportional to the ratio of samples exceeding the RAL to the total number of samples for the sediment texture in the reach:

$$A_{(remedy,i)} = A_{tot,i}\left(\frac{n_{exceed,i}}{n_{tot,i}}\right) \tag{2}$$

where *i* stands for a sediment texture and reach group. Essentially, for ease of calculation, this approach assumes each core location in a reach/sediment texture group covers the same amount of area within that group. This approach was also chosen to partially incorporate the areas assigned to sample textures that had no chemical data, giving a more realistic estimate of potential remedial area.

To develop RAL-SWAC-Acre plots, chemical data from each surface sediment sample were compared to the RAL, and those exceeding were targeted for removal. A PCB concentration of 0.05 mg/kg was assumed to be remaining after surface sediment removal; this concentration can be adjusted in future analyses. Post-remedial average PCB concentrations were calculated for each reach using the remaining samples and the assigned post-remedy concentrations in the removed areas.

2.3 Assumptions

The assumptions made for areas with no chemical data are key aspects for calculating SWACs in OU-4. Solutia made the following assumptions in calculating the SWACs given in Table 4-4:

- A value of 0.05 mg/kg was assigned to areas with coring locations designated "No Recovery". This affects 120.9 acres of OU-4 sediments, mainly between Coldwater Creek to Jackson Shoals.
- For reaches where no chemical information was taken in "Gravel" areas, the average PCB concentration of those areas was assumed to be equal to the average PCB concentration of the "Coarse" samples taken within the same reach. The following reaches were affected:
  - Cheaha Creek to Jackson Shoals (1.4 acres): Gravel area assigned 0.47 mg/kg.
  - Jackson Shoals to Lake Logan Martin (35.4 acres): Gravel area assigned 0.38 mg/kg.

In the FS, these areas where concentrations were assigned amount to about 30% of the area upstream of Jackson Shoals, giving these assumptions a lot of influence in the SWAC calculations.

This analysis takes three approaches in calculating post-remedy SWACs:

1. **Scenario 1**: The sediment textures without any chemical data in a reach are omitted from the calculations.
2. **Scenario 2**: Approach taken in the FS—Solutia's Gravel area assignments are retained, and the "No Recovery" areas are assigned a replacement value.
3. **Scenario 3**: All areas without chemical data are assigned the same replacement value.

3 Results

First, note it is unclear what "upstream of Jackson Shoals" means for the classification of the Jackson Shoals reach (i.e., whether it is upstream or downstream of Jackson Shoals). In these discussions, the Jackson Shoals reach is considered to be upstream of Jackson Shoals and subject to the less-stringent long-term goal of 0.2 mg/kg on a reach-wide SWAC basis.

3.1 Pre-remedy SWACs and remedy area check

The pre-remedy SWACs depend on the assumptions about concentrations in sediment textures where no samples were collected. Table 1 summarizes pre-remedy SWACs calculated using the raw data for each scenario. Table 1 also includes the pre-remedy SWACs calculated using data in Table 4-4 to check Solutia's calculation of the SWACs reported in Table 4-4.

The calculated pre-remedy SWACs under all scenarios generally agree with those given in Table 4-4 of the FS. A noteworthy departure is for the Backwater area, where the Scenarios 2 and 3 result in a decrease of about 5%—this is due to "No Recovery" sediment class, which may have been ignored in the SWAC given in Table 4-4.

This memo uses a different methodology for identifying remedial area than was done in the FS, thus a check is needed on whether methods used in this memo would find a similar remedy footprint to what is given in the FS (i.e., about 25 acres, page 7-11 in FS). To do so, an NTE RAL of 2.6 mg/kg was assumed upstream of Jackson Shoals (i.e., Jackson Shoals to Lake Logan Martin is not targeted for remediation), and Scenario 2 was used because it mirrors the assumptions in the FS.

Calculating remedy area by using the average surface area per core in a reach/sediment texture combination results in a remedy footprint of 12.58 acres between the Backwater area and Jackson Shoals (Table 2), which is not substantially different than the 12 acres downstream of the backwater targeted for remediation in the FS. The remedy area in the Backwater area is underestimated using the approach in this memo, and the footprint of Snow

Creek is also omitted because the area for Snow Creek was not given in Table 4-4. The good agreement between the downstream remedy footprint suggests the method used in this memo works well and can be used to develop RAL-Area-SWAC curves to support the FS, but the surface areas calculated in this memo underestimate the remedial footprint in the Backwater area.

Table 1: Reach-wide pre-remedy SWACs under different scenarios

Reach	Tab 4.4 As-is	Tab 4.4 Calculated	Scenario 1	Scenario 2	Scenario 3
Backwater to Friendship Road	4.90	4.92	4.91	4.63	4.63
Friendship Road to Coldwater Creek	0.88	0.88	0.93	0.84	0.84
Coldwater Creek to Cheaha Creek	0.41	0.41	0.58	0.42	0.42
Cheaha Creek to Jackson Shoals	0.53	0.53	0.79	0.53	0.52
Jackson Shoals	0.10	0.10	0.18	0.11	0.11
Jackson Shoals to Lake Logan Martin	0.52	0.48	0.53	0.52	0.49

Table 2: Summary of Scenario 2 remedial footprint with a RAL = 2.6 mg/kg. Note this area excludes Snow Creek.

Reach	RAL	n_{tot}	$n_{removed}$	$SWAC_{pre}$	$SWAC_{post}$	Acres remedy
Backwater to Friendship Road	2.6	41	8	4.63	0.37	2.22
Friendship Road to Coldwater Creek	2.6	46	4	0.84	0.51	2.19
Coldwater Creek to Cheaha Creek	2.6	79	9	0.42	0.23	9.26
Cheaha Creek to Jackson Shoals	2.6	38	1	0.53	0.49	1.13
Jackson Shoals	2.6	15	0	0.11	0.11	0.00

The following subsections walk through the RAL-Area-SWAC curves and associated remedial areas needed to achieve the long-term RAL of 0.2 mg/kg upstream of Jackson Shoals for each assumption scenario.

3.2 Scenario 1 - Omission of areas with sediment textures with no chemical data

Figure 1 shows combinations of the RAL, acres removed, and post-remedy SWAC when sediment textures without any chemical data in a reach are omitted from the remedy and from the SWAC calculations. For these calculations, the replacement concentration in areas remediated in these calculations was 0.05 mg/kg.

The stated long-term cleanup goals are reach-wide SWACs of 0.2 mg/kg in areas upstream of Jackson Shoals. The Backwater to Friendship Road reach will require the least amount of surface sediment removal to reach this SWAC at a little over three acres; three other reaches require around 20 acres each under this scenario to get to the long-term protectiveness goal of 0.2 mg/kg. The total area remediated is 62.15 acres in this scenario. A summary of the required RALs to reach the long-term protectiveness is given in Table 3.

Table 3: Summary of Scenario 1 reach-wide RALs, SWACs, and remedy size

Reach	RAL	n_{tot}	$n_{removed}$	$SWAC_{pre}$	$SWAC_{post}$	Acres remedy
Backwater to Friendship Road	1.6	41	12	4.91	0.20	3.27
Friendship Road to Coldwater Creek	0.6	46	21	0.93	0.18	21.50
Coldwater Creek to Cheaha Creek	1.2	79	23	0.58	0.20	17.55
Cheaha Creek to Jackson Shoals	0.9	38	16	0.79	0.19	19.83
Jackson Shoals	2.6	15	0	0.18	0.18	0.00

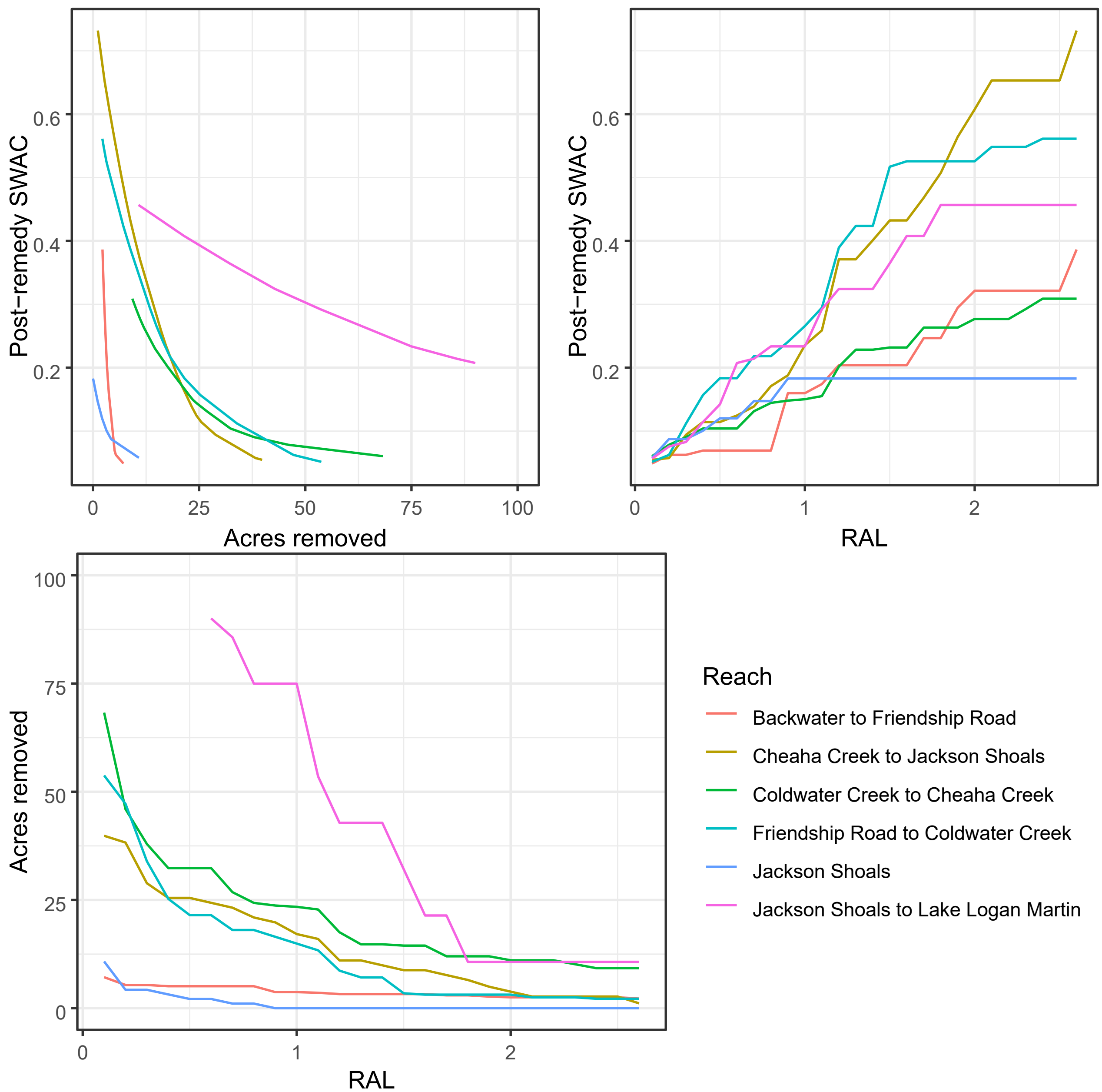


Figure 1: Sediment textures with no chemical data removed from the remedy and SWAC calculations. Note the Jackson Shoals to Lake Logan Martin reach is truncated at 100 acres to enable better viewing for other reaches.

3.3 Scenario 2 - Solutia approach

Figure 2 shows combinations of the RAL, acres removed, and post-remedy SWAC when Solutia's assumptions are used to calculate the SWAC: areas of no recovery are assigned a value of 0.05 mg/kg, and gravel areas where no samples were taken are assigned the respective average concentration of the coarse samples within the reach. Scenario 2 would require less surface area be remediated upstream of Jackson Shoals than Scenario 1 to reach the long-term SWAC goal of 0.2 mg/kg. The total surface area to be remediated under this scenario is 49.31 acres. A summary of the required RALs to reach the long-term protectiveness is given in Table 4.

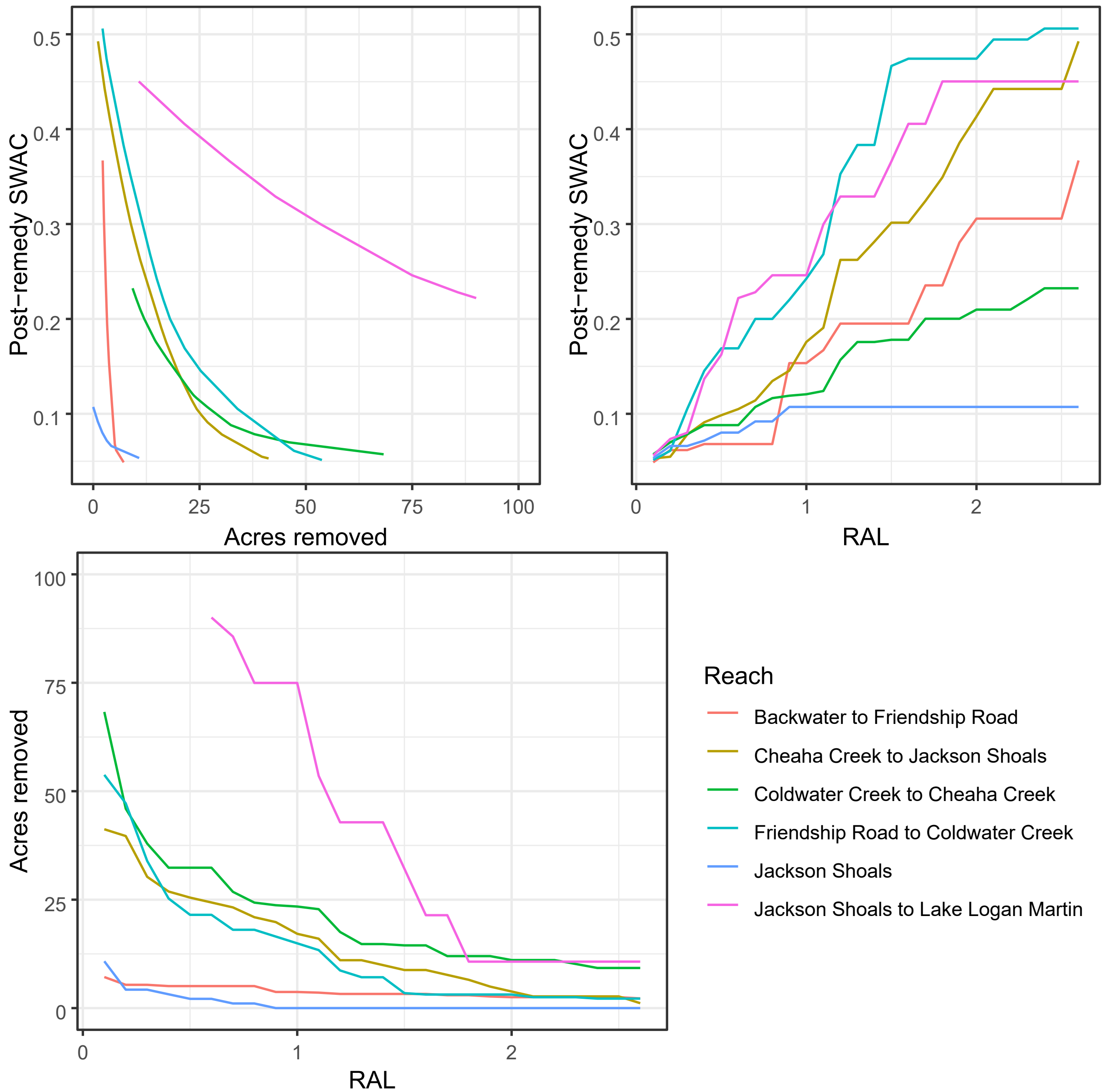


Figure 2: Areas of no recovery are assigned a value of 0.05 mg/kg, and gravel areas where no samples were taken are assigned the respective average concentration of the coarse samples within the reach. Note the Jackson Shoals to Lake Logan Martin reach is truncated at 100 acres to enable better viewing for other reaches.

Table 4: Summary of Scenario 2 reach-wide RALs, SWACs, and remedy size

Reach	RAL	n_{tot}	$n_{removed}$	$SWAC_{pre}$	$SWAC_{post}$	Acres remedy
Backwater to Friendship Road	1.6	41	12	4.63	0.20	3.27
Friendship Road to Coldwater Creek	0.8	46	18	0.84	0.20	18.06
Coldwater Creek to Cheaha Creek	1.9	79	18	0.42	0.20	11.98
Cheaha Creek to Jackson Shoals	1.1	38	13	0.53	0.19	16.00
Jackson Shoals	2.6	15	0	0.11	0.11	0.00

3.4 Scenario 3 - All sediment texture areas with no chemical data assigned a replacement value of 0.05 mg/kg

Figure 3 shows combinations of the RAL, acres removed, and post-remedy SWAC when areas of no recovery and the gravel areas where no samples were taken are assigned a value of 0.05 mg/kg. This scenario is expected to be the least conservative set of assumptions. Scenario 3 would require the same surface area to be remediated as Scenario 2 to reach the long-term SWAC goal of 0.2 mg/kg. A summary of the required RALs to reach the long-term protectiveness is given in Table 5.

Table 5: Summary of Scenario 3 reach-wide RALs, SWACs, and remedy size

Reach	RAL	n_{tot}	$n_{removed}$	$SWAC_{pre}$	$SWAC_{post}$	Acres remedy
Backwater to Friendship Road	1.6	41	12	4.63	0.20	3.27
Friendship Road to Coldwater Creek	0.8	46	18	0.84	0.20	18.06
Coldwater Creek to Cheaha Creek	1.9	79	18	0.42	0.20	11.98
Cheaha Creek to Jackson Shoals	1.1	38	13	0.52	0.18	16.00
Jackson Shoals	2.6	15	0	0.11	0.11	0.00

4 Discussion

Using the data set from RI/FS, to achieve the long-term PRG of a reach-wide SWAC of 0.2 mg/kg upstream of Jackson Shoals, about 33 acres would be needed to be removed in addition to the 25 acres proposed, assuming Scenarios 2 or 3 and a replacement value of 0.05 mg/kg in remediated areas. For Scenario 1, where no concentrations were assigned to sediment textures without chemical data (i.e., these areas were not targeted for remediation and not used in SWAC calculations), about 47 acres would be needed in addition to the proposed 25 acres to achieve the long-term SWAC-based PRG.

This analysis has some caveats. First, a replacement concentration of 0.05 mg/kg was used in remediated areas. This assumes either clean backfill or clean material left in place. If backfilling with clean material is not planned, the concentration in remediated areas may exceed 0.05 mg/kg and a larger remedial footprint than presented may be needed. Second, this analysis only calculates the immediate post-remedy SWAC and does not consider the effect of contaminated sediment from upstream depositing on remediated areas. Lastly, this calculation method does not consider remedy footprints around the sample points; a GIS-based analysis may lead to different findings.

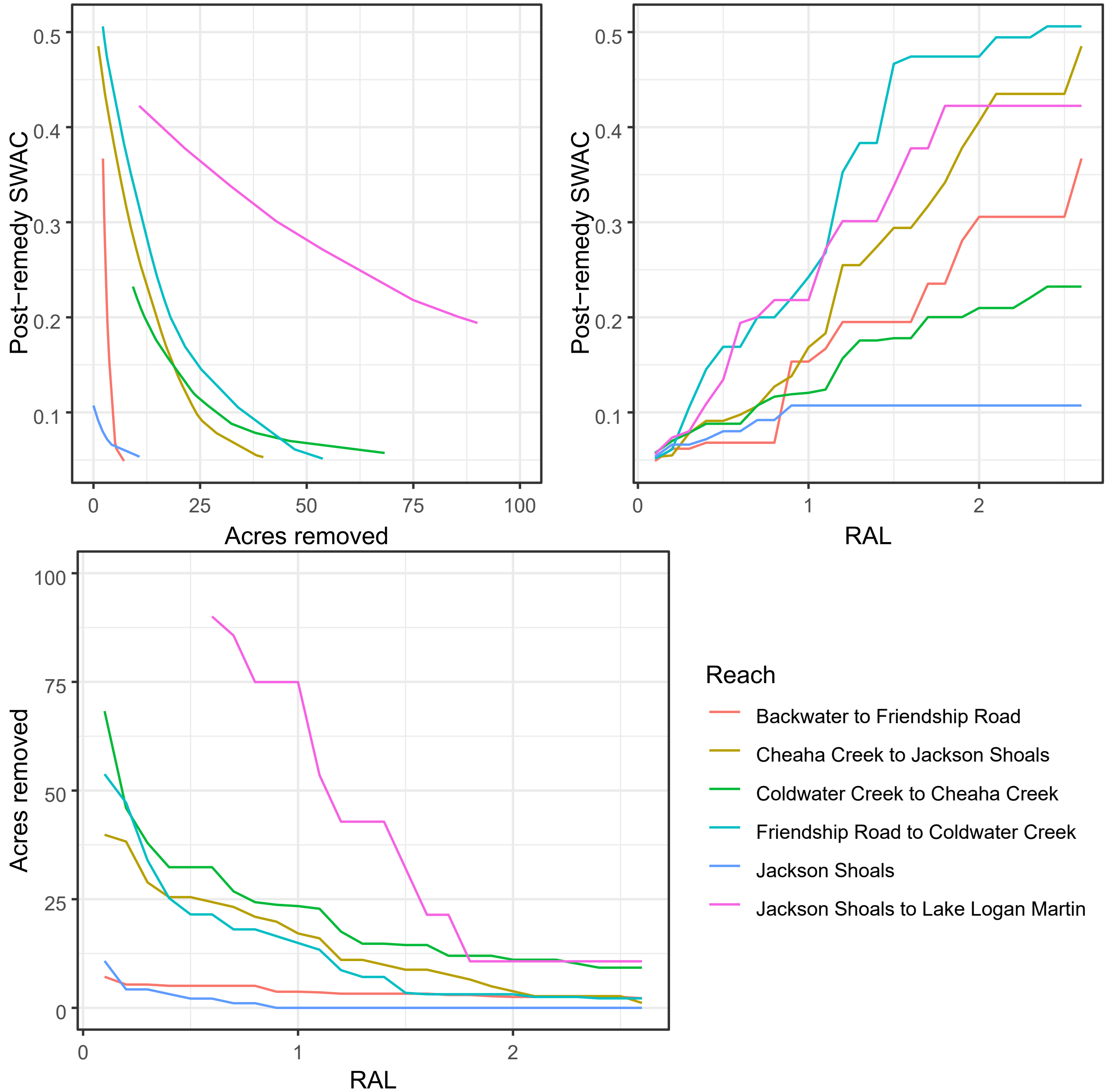


Figure 3: Sediment textures where no samples were collected are assigned a value of 0.05 mg/kg. Note the Jackson Shoals to Lake Logan Martin reach is truncated at 100 acres to enable better viewing for other reaches.

EXHIBIT B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

July 31, 2023

OFFICE OF
LAND AND EMERGENCY
MANAGEMENT

MEMORANDUM

SUBJECT: CSTAG Recommendations on Operable Unit 4, Anniston PCB Site. CSTAG Final Milestone Meeting

FROM: Karl Gustavson, Chair, on behalf of the Contaminated Sediments Technical Advisory Group (CSTAG), Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency (EPA).

TO: Pamela Scully, Remedial Project Manager, Superfund and Emergency Management Division, EPA Region 4.

BACKGROUND

OSWER Directive 9285.6-08, Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (February 12, 2002)[1], established the Contaminated Sediments Technical Advisory Group (CSTAG) to "monitor the progress of and provide advice regarding a small number of large, complex, or controversial contaminated sediment Superfund sites," which are known as "Tier 2" sites. CSTAG members are site managers, scientists, and engineers from EPA and the U.S. Army Corps of Engineers (USACE) with expertise in Superfund sediment site characterization, remediation, and decision-making. One purpose of CSTAG is to help Regions manage sediment sites in accordance with the 11 risk management principles described in the 2002 OSWER Directive, the 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA-540-R-05-012)[2], and the 2017 OLEM Directive on Remediating Contaminated Sediments (OLEM Directive 9200.1-130)[3].

The Anniston PCB site in Anniston, AL is a Tier 2 CSTAG site, and the contaminated sediment actions are subject to CSTAG review per CSTAG's policies and procedures[4]. (Other areas and media in Operable Unit [OU]4 are subject to headquarters review conducted by the Region 4 remedy coordinator.) CSTAG met at the site in 2005 during planning for the remedial investigation (RI). In 2020, CSTAG reviewed milestones 2 and 3 during development of the feasibility study (FS), including the site's remedial action objectives (RAOs), preliminary remedial goals (PRGs), overall risk reduction strategy, and the

[1] Available at: https://semspub.epa.gov/src/document/HQ/174512
[2] Available at: https://semspub.epa.gov/src/document/HQ/174471
[3] Available at: https://semspub.epa.gov/src/document/11/196834
[4] Available at: https://semspub.epa.gov/src/document/HQ/100003253

development and evaluation of remedial alternatives. That meeting included a stakeholder and community listening session. This review is the final milestone review, conducted prior to issuing the proposed plan. CSTAG's written recommendations and Regional responses from its meetings are available at the CSTAG website.[5]

BRIEF DESCRIPTION OF THE SITE

The Anniston PCB Site is located in the city of Anniston, and parts of Calhoun and Talladega Counties, approximately 50 miles east of Birmingham, AL. The Anniston PCB Site includes commercial, industrial and residential properties and downstream areas of Snow and Choccolocco Creek and their floodplains.

PCBs were produced at the facility from 1929 to 1971. Chlorine was also produced using a mercury cell process between the 1950s and 1969 to support PCB manufacturing. During precipitation events, surface water flowed through areas with PCB-containing soil or waste, across the Solutia facility, and into various drainage ditches leading to Snow Creek. Subsequently, PCBs sorbed to suspended solids and settled in the floodplains of these drainage ditches, Snow Creek, Choccolocco Creek, and possibly further downstream. Surface water, sediments, floodplain soils, and riverbanks are contaminated with PCBs throughout the site, posing a significant threat to human health and the environment.

OU-1 and OU-2 of the site include residential and nonresidential properties, respectively, around and downstream of the facility along Snow Creek to US Highway 78. A combined OU-1/OU-2 Record of Decision (ROD) was issued in 2017. OU-3 includes the facility and two closed landfills adjoining the facility. An interim ROD for OU-3 was issued in 2011 and a future final ROD for OU-3 groundwater is anticipated. OU-4 is the most geographically expansive of the current OUs. It includes approximately 37 miles of Snow and Choccolocco Creeks and 6,000 acres of floodplain. OU4 includes the lower end of Snow Creek from downstream of Highway 78 to the confluence of Snow and Choccolocco Creeks, and Choccolocco Creek from the backwater area upstream of the Snow Creek confluence downstream to Lake Logan Martin (a reservoir on the Coosa River). EPA has committed to the State of Alabama and the Natural Resource Trustees to consider whether additional investigations are necessary in the Coosa River downstream of OU-4.

SITE REVIEW

This CSTAG review was held May 23-25, 2023 and included a site tour, material review, discussions with Region 4, and CSTAG deliberation sessions. To support CSTAG's review, the Anniston project team provided a site information package that included the Tier 2 consultation memo describing the site's consideration of sediment risk management principles and supporting references including the site's RI (including the human health and ecological risk assessments), FS, an early draft of the proposed plan, and other supporting documents. CSTAG also relied on its 2020 review and the site's online public document repository. The following recommendations represent the consensus view of the CSTAG.

[5] https://www.epa.gov/superfund/large-sediment-sites-tiers-1-2

DISCUSSION AND RECOMMENDATIONS

1. Protectiveness of the proposed final remedial alternatives

The Region's current plan is to select a final and protective remedy for the 37 river miles of OU4 (i.e., a remedy that will achieve remediation goals in fish tissue and the sediment bed in a reasonable timeframe and satisfy RAOs and ARARs). All the proposed remedial alternatives focus on an identical 25-acre sediment footprint and near-identical bank areas in the most upstream 7.5 miles. Below, CSTAG describes significant concerns with the primary approaches and assumptions used to support the determination that the alternatives will be final and protective.

PCB loading estimates – Since CSTAG's 2020 review of the alternatives and supporting materials, additional documentation was provided on the data, assumptions, and calculations used to apply the Bank Stability and Toe Erosion Model (BSTEM) (FS, Appendix F). This model was used to predict the effect of creek bank source control actions and to justify the exclusion of the lower 29.5 river miles from consideration for bank remediation. This model combined estimates of creek bank recession (erosion) with predicted average PCB concentration for lengths of the creek to estimate annual PCB loadings (FS, Table F-5 and F-6).

CSTAG appreciates that simple models can help managers understand system processes and potential outcomes. However, the riverbank erosion model and the contaminated sediment loading estimates have a high level of assumption, oversimplification, and uncertainty. The approach uses a simplistic model (BSTEM) with no calibration or validation; it is parameterized with coarse resolution, often surrogate COC data[6,7]; the model is coupled to an incomplete hydrologic data set[8]; and model calculations are based on two river cross sections that are extrapolated to the entire river system using riverbank erosion classifications (where erosion rates of 3 of 5 erosion classifications are estimated, not calculated [FS Appendix F, pp. F-3, F-7]). This approach predicts that banks with moderate-to-severe erosion located upstream of RM 29.5 contribute 81% of PCB loading, 91% of the modeled load if areas of minor erosion upstream of RM 29.5 are included [FS Appendix F, Figure F-10]).

These results are then used to justify the exclusion of the lower 29.5 river miles from consideration for bank remediation in any of the alternatives. CSTAG observes a stark discontinuity between the model's high level of assumption and extrapolation and its use to derive a highly certain and consequential contaminated sediment management decision. This level of analysis is more appropriate to generally indicate that upstream areas are sources to be addressed in an early or interim action, but not to exonerate nearly 30 miles of downstream contaminated banks from further consideration.

Monitored Natural Recovery (MNR) modeling – The remedies rely significantly on MNR to achieve a final, protective condition (e.g., one model indicates approximately 38 years of natural recovery to achieve the sediment remediation goal over approximately 28 river miles). The site-specific information needed to support MNR as a viable remedy does not meet expectations set forth in EPA's contaminated sediment guidance (see recommendation 8c in the 2020 CSTAG recommendations). The MNR predictions continue to be based on the simplistic decay curves reviewed by CSTAG in 2020. Declines in surface sediment concentrations for the 9 miles of river downstream of Jackson Shoals are simulated by

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[6] CSTAG requested but did not receive the data set used to derive the concentrations.

[7] "To develop an understanding of the PCB concentrations along the creek bank areas, PCB results within a 33-footwide swath on both sides of Snow Creek and Choccolocco Creek were averaged along several reaches." (FS, Appendix F, p. F-6).

[8] Flows beyond the average 10-year flow event are not contemplated (see Figure F-4), despite data in the FS (Figure 4-62) that support a 50-year flow event of 52,000 cfs. However, the hydraulics for the BSTEM were developed using site-specific data collected from 1984 through 2012 and the probability distribution based on this data set (Figure F-4) shows 0 percent probability of exceedance beyond a daily mean of 10,000 cfs.

applying a decay rate obtained from analyzing one core in an embayment of the Lake Logan Martin backwater area.[9] Concentration declines in the upstream 28 river miles are based on "winnowing-out of PCB-containing fine-grained materials from the sediment bed in areas where active remediation is not conducted" (FS, Appendix G, p. G-2). The "winnowing out" is represented by a universally applied 6% decay rate for which the basis is not stated.[10]

There is insufficient evidence for the fundamental assumptions behind these sediment recovery models (Appendix G and FS Figure 10-2) and for the assumption that they represent sitewide processes (e.g., that the approximately 31 river miles upstream of Jackson Shoals will behave uniformly and release contaminated solids at a constant rate to the point of depuration, or that areas downstream of Jackson Shoals will all decay in a manner similar to core MLM7's calculated decay from 1990-1999). The downstream depositional model should not have been used in a riverine watershed system that is subject to flash floods during runoff events and it contains incorrect assumptions (e.g., that resuspension and subsequent transport does not occur and that the surface layer has a constant volume and is perfectly mixed). The upstream and downstream MNR models are not technically defensible and do not provide adequate support for the resulting contaminated sediment management decisions. The result is a lack of certainty regarding whether MNR will achieve remediation goals as predicted in the FS.

Sediment bed sampling and analysis – The current sediment dataset is not suitable for identifying areas requiring remediation, leaving large uncertainty as to whether the proposed remedies would be protective of ecological and human health. The proposed sediment remedies are based on two quantitative criteria: removal of sediment with PCB concentrations greater than 2.6 mg/kg, and a post-remedy surface-weighted average concentration (SWAC) of less than 1 mg/kg[11]. After analysis of surface sediment data (RI, Table 4-6), CSTAG can state with confidence that the previous sediment sampling efforts missed areas where sediment PCB concentrations exceeded the remedial action level (RAL) of 2.6 mg/kg.[12] Furthermore, the downriver distance between samples often exceeded 1000 feet, with some stretches exceeding a mile. This is potentially much further than the distance where sediment PCB concentrations correlate with one another, leaving large portions of the riverbed uncharacterized.[13]

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[9] "Based on rate of decline in PCB in geochronological core MLM7 from 1990 to 1999" (FS, Appendix G, p. G-4).

[10] "This projection is based on an annual 6% PCB mass loss rate (winnowing or exchange rate) for fine-grained particles within the sediment matrix for these portions of the creek." (FS, p. 10-36).

[11] The second RAL used in the FS is "achieving a post-remediation SWAC less than 1 mg/kg as a RAL" (FS, p. 7-10). A RAL is a contaminant threshold commonly used to identify areas for remedial action when samples exceed the RAL. CSTAG has not previously seen a "SWAC RAL" and this unconventional application would seem to trigger the active remediation of a whole river reach. CSTAG could not find a basis for the 1 mg/kg threshold or for its application to broad river reaches (however, 1 mg/kg PCB applied at <u>point</u> location is a RAL at several other contaminated sediment Superfund sites). At this site, a 1 mg/kg SWAC RAL is considered a "target goal" (FS p. 7-10) used to determine that upstream riverbed remediation meets that goal. This approach is confusing, unconventional, apparently not associated with the site PRGs, and afflicted by the sampling and statistical issues identified in this section.

[12] Based on an analysis of RI Table 4.6, CSTAG used two approaches to conclude that areas exceeding 2.6 mg/kg were missed. First, for the reach of Coldwater Creek to Cheaha Creek, only 1 sample from the RFI exceeded the RAL of 2.6 mg/kg PCB. The more recent Phase 2 Ecological sampling found 8 more samples that exceeded 2.6 mg/kg. Were we to assume the RFI sampling found all areas exceeding the RAL, no additional sample exceedances would have been found. Second, CSTAG conducted a more quantitative analysis of the "coarse" surface (top 6") sediment class samples in the Coldwater Creek to Cheaha Creek reach. Of 155 coarse sediment samples taken in this reach, 42 were analyzed for PCBs, leaving 113 sample locations with no PCB data. The distribution of PCB concentrations in the 42 samples was approximately fit to a lognormal distribution that was slightly biased toward lower concentrations. A Monte Carlo sampling (n = 10000) of the lognormal distribution for the other 113 unanalyzed samples showed that, had the other 113 samples been analyzed, at least one sample would have exceeded 2.6 mg/kg in 98% of the simulations, with an average number of 4 samples exceeding 2.6 mg/kg.

[13] There are many statistical methods to develop the confidence that most hotspots have been found, but no such analysis was presented to CSTAG or to the Region. One such analysis is a semivariogram, which can estimate the a "zone of influence" of

More extensive sampling is needed to better identify sediment areas that exceed RALs. The proposed predesign sampling is not adequate to correct for this shortcoming. It does not attempt to fill in these gaps and focuses only on delineating areas that exceeded 2.6 mg/kg in samples taken 14-24 years ago (see recommendation 5 for further discussion).

CSTAG also has concerns regarding the calculation of SWACs that were used in site decisions (such as the RAL comparison described in footnote 11). SWACs were calculated based on estimated areas of sediment texture instead of a spatial area. This is a novel approach that needs more quantitative justification.[14] The sediment texture was determined from visual inspection of sediment transects of the river approximately 1000 feet apart, and a fraction of the samples collected from these transects were analyzed for PCBs. This method (FS p. 4-38) has three issues. First, no protocol for assigning the sediment texture between transects was described, giving considerable uncertainty to the estimated areas for each sediment texture within each reach. Second, the calculation method assigns mean PCB concentrations of analyzed locations to unanalyzed areas, based on the assigned sediment texture. To do so, enough samples need to be analyzed from each sediment texture in each reach to have high confidence in the sample mean of each class (e.g., 95% UCL of mean within a factor 1.5 of the mean).[15] No quantitative analysis of the representativeness or uncertainty of analyzed samples is given, and thus CSTAG has low confidence in the appropriateness of applying the analyzed mean values to the unanalyzed samples for calculating the SWAC. Lastly, “not recoverable” was considered a sediment texture that was then assigned to unsampled areas which in turn were assigned a non-detect concentration. In some reaches, this decreased the SWAC by a factor of 2. Not including the non-recoverable area in SWAC calculations would be a more conservative estimate and better align with more likely aquatic habitats and areas driving PCB exposure.

Recommendations

a. Consistent with its 2020 recommendations, CSTAG does not agree that the OU4 FS can support a final ROD. Doing so puts the Region on record as assuring the public and the court of their confidence that the proposed remedy will achieve remediation goals at appropriate spatial scales throughout OU4, in a reasonable timeframe. CSTAG’s previous and current evaluations do not indicate that a record exists to support that conclusion. Instead, CSTAG recommends the Region consider moving forward with one of the following options:

Interim OU4 ROD: CSTAG suggests that the assembled record better supports an interim action. The interim remedy could be positioned as a source control action that targets OU4’s creek bank sources of COCs and the highest COC concentration bed sediments to decrease COC exposure and downstream transport. After remediating the riverbanks identified as PCB source areas and sediments throughout OU4 that exceed a RAL, the Region could determine if the interim remedy is effective and if natural recovery is occurring in downstream areas as predicted to develop a record to support a final OU4 ROD.

Split OU4 into two OUs: The NCP (300.430 (a)(ii)(B)) states “Sites should generally be remediated in operable units when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate

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samples (i.e., the distance from a sample where the sediment concentration no longer correlates with the concentration at the sample location).

[14] The approach is also different than the SWAC calculation method presented in FS Appendix H (p. H-1) which reviews SWAC application at U.S. contaminated sediment sites.

[15] The Hudson River Superfund site is one example where this approach was used: https://www3.epa.gov/hudson/Design_Support_FSP_10_final.pdf

given the size or complexity of the site, or to expedite the completion of total site cleanup." The Region could consider dividing OU4 into two OUs and pursue a final ROD upstream of RM 29.5 where bank remediation is proposed while deferring action on the downstream OU until the remedy has been implemented and sufficient time has elapsed to recharacterize the downstream OU. This would require analyses that demonstrate protectiveness in the upstream OU and compare alternatives against the nine NCP criteria and each other.

b. CSTAG recommends that these options require 1) predesign sampling throughout OU4 to fill data gaps (not just in areas identified in the pre-2008 RI/FS sampling) with the objective of identifying sediments greater than RAL concentrations and establishing a pre-remediation baseline concentration (recommendation 5a) in appropriately sized SWAC exposure areas (recommendation 3); 2) post-remediation sampling within the remediated areas to establish effectiveness and document post-remediation conditions (recommendation 6a); 3) MNR evaluations of trends in fish, sediment, and surface water PCB concentrations (see recommendation 6c); and 4) a plan with a timeline to conduct the early action (interim or upper OU), assess goals, and establish decision time points to determine whether additional remediation is warranted for a final remedy (see 2020 recommendation 9b). The Region should also consult EPA's adaptive site management framework[16] that describes how to implement interim actions to support a final remedy through planning, goal identification, and iterations of remediation, monitoring, and evaluation.

2. RAO refinement

CSTAG appreciates that the Region incorporated RAOs to reduce migration of COCs from creek bank soil and to prevent the long-term downstream transport of COCs in the creek. These RAOs can also serve as interim remedy RAOs that are focused on source control in reaches with active remediation. These RAOs specify that an objective of the remediation is to lessen inputs of contaminated banks to Choccolocco Creek and transport of contaminants to downstream, less contaminated areas, thus providing an additional basis for the action beyond reducing risk to human and ecological receptors.

Recommendation

CSTAG recommends that language be incorporated into the RAO or PRG descriptions to clarify how achievement of the downstream transport and riverbank soil migration RAOs will be assessed. For example, if a protective PRG is attained in the sediment bed, then it is anticipated that the objective of reducing downstream migration of contaminants will be achieved. Contaminated sediment sites commonly use contaminant thresholds (RALs) for the management of contaminated media, including riverbanks. If erosive banks that exceed the RAL value are stabilized or removed, then it is anticipated that the riverbank RAO will be achieved.

3. Remediation goals and SWACs

The Region presented remediation goals for PCBs in fish tissue, sediment, and water. Sediment remediation goals were presented in the draft FS for ecological protection using a point not-to-exceed (NTE) concentration of 2.6 mg/kg in sediments and a SWAC of 0.63 mg/kg (FS, p. 6-14). In the FS, PRGs for the protection of human health via the consumption of contaminated fish were developed with different values applied to areas upstream or downstream of Jackson Shoals (0.056 or 0.11 mg/kg PCB in fish tissue and 0.1 or 0.2 mg/kg PCB as a sediment SWAC, respectively) (FS, p. 6-18).

[16] Available at: https://semspub.epa.gov/work/HQ/100003040.pdf

The area over which a SWAC will be applied and measured (i.e., the exposure unit) is central to whether it is an appropriate goal for the receptor and exposure pathway. If the SWAC area is too large, areas not relevant to receptor exposures are included; if it is too small, relevant areas are excluded. Currently, the smallest SWAC areas (described on FS, p. 7-10) are river reaches above and below Jackson Shoals (approximately a 9 or 28 river mile SWAC). The SWAC for the protection of ecological receptors appears to be site wide (37 river miles). SWAC exposure areas of this size are not likely to be biologically relevant because the SWAC assumes that all areas of the 9-, 28-, or 37-mile long reach equally drive exposure to the receptor, which is unlikely. In all cases, applying SWACS across such large river reaches could result in areas with significant PCB concentrations in sediment/porewater, and fish tissue goals may never be achieved.

Recommendation

Similar to CSTAG's 2020 recommendation 6 on SWAC application in OU4, CSTAG recommends that the Region specify the area over which the SWACs will apply and provide a rationale for choosing these areas. CSTAG recommends developing biologically and physically relevant exposure area/units using the physical characteristics of the river and biological characteristics of the receptor. The smallest exposure area relevant to the human health and ecological risk receptors should be used in SWAC derivation and application. The SWAC-based remediation goals will be evaluated in these areas. A "moving window" analysis based on the smallest relevant exposure area may be preferred in the absence of physical barriers or other logical separations. Throughout the RI and FS, OU4 is divided into ten reaches and various evaluations have been conducted in each reach. At a minimum, the SWAC remediation goal for PCBs that is protective of human health through fish consumption could be evaluated over each of these 10 river reaches.

4. Additional alternatives

In 2020, CSTAG recommended that if the Region intended to develop a final ROD, the FS should evaluate a range of alternatives varying in the degree of cleanup from MNR-only to the "*maximum extent feasible*" sediment bed and creek bank remediation. CSTAG also recommended that bank removal alternatives should be based on PCB loading potential, independent of river mile (recommendation 8a). The FS now contains a subset of alternatives that also includes bank remediation with minor erosion (instead of only banks with moderate and severe erosion). However, active remediation is only applied upstream of RM 29.5.[17]

All six active remedial alternatives address the same 25-acre sediment footprint and rely on MNR to the same extent.[18] The result is a relatively narrow range of alternatives, with the estimated cost of the six active alternatives not varying substantially (i.e., $43.6 to $54.0 million). There is considerable uncertainty as to whether any of the remedial alternatives can achieve remediation goals in a reasonable timeframe given the significant reliance on MNR. Because none of the alternatives consider

[17] The FS does not include or screen an alternative with a lower RAL. However, the text describes an "alternative scenario" using a PCB RAL of 0.1 mg/kg to "provide context for the remedial alternatives for sediment presented in this OU-4 FS" (FS, p. 7-11). This text confuses a RAL with a SWAC PRG which inflates the footprint and degree of remediation. A RAL of 0.1 mg/kg is likely not needed to achieve a SWAC of 0.1 mg/kg aggregated over a SWAC exposure area. This "alternative scenario" simply considered removing <u>all</u> sediment in the OU (estimated at 2 million cubic yards of sediment, 85% of which resides downstream of Jackson Shoals).

[18] With extensive reliance on dispersion (i.e., "winnowing out") as the mechanism of natural recovery. "Dispersion is least preferable basis for MNR in remedy selection because "it generally increases exposure to contaminants and may result in unacceptable risks to downstream areas or other receiving water bodies" (EPA 2005 Contaminated Sediment Remediation Guidance, p. 4-1).

more active sediment remediation to lessen the reliance on MNR, the uncertainty in the ability of any of the alternatives to meet remediation goals in a reasonable time frame is similar across alternatives. Evaluation of the NCP's balancing factors and selection of the optimal remedy is not possible without a broader range of alternatives that includes larger active remediation footprints.

Even for an interim remedy, it is problematic for the FS to consider such a narrow set of alternatives. The site does not have a singular waste area to be managed. The 37 river miles is a continuum of PCB source and exposure levels. If an interim remedy is intended to improve conditions so that a no action remedy may be viable in a future, final ROD, then managers should have information to optimize the size of the interim remedy (in particular, to balance the degree of remediation, the degree of MNR sampling, and the potential need for future active remediation). While fewer and more limited alternatives are anticipated for an interim remedy (ROD guidance[19], highlight 8-7), EPA FS guidance[20] is clear: "Alternatives should be developed that will provide decision-makers with an appropriate range of options and sufficient information to adequately compare alternatives against one another" (p. 4-7).

Recommendations

a. The interim action approach recommended by CSTAG above (recommendation 1a) should consider a broader range of RALs that lessen the reliance on MNR and provide the decision maker with sufficient information to compare alternatives.

b. CSTAG does not recommend proceeding with a final ROD for OU4 as currently defined. However, if the Region intends to pursue a final remedy for OU4 (or the upper portion of OU4), the proposed cleanup plan should present a full range of remedial alternatives, including alternatives with lower RALs that lessen the reliance on MNR. A full range of alternatives would vary in the degree of active remedy from MNR only to a "maximum extent feasible" sediment bed and creek bank remediation. For example, at least two additional alternatives should be included that rely less on MNR to achieve the remediation goal: 1) a "maximum extent feasible" sediment bed and creek bank remediation alternative, which would include achieving the sediment remediation goal/CUL upon completion of remediation (i.e., an analysis of the RAL that will achieve the CUL/RG in each SWAC exposure unit and inclusion of erosive banks greater than a bank source control RAL); and 2) an alternative with an intermediate RAL that evaluates more sediment bed and creek bank active remediation than the alternatives, but less than the "maximum extent feasible" alternative. Alternatives would evaluate the post-remediation SWAC achieved within each SWAC exposure area compared to the PRG and whether PRGs are achieved post-remediation or within a reasonable time frame (e.g., 20 years). Similar to recommendation 1b above, common elements would include river-wide predesign sampling, post-remediation sampling, and long-term monitoring (see recommendations 5 and 6).

CSTAG reiterates that a primary issue with this approach is that MNR, especially for extended time periods, would have to be considered as unreliable or unknown, which would decrease the acceptability of MNR-reliant alternatives in the nine criteria evaluation. The uncertainty associated with MNR could potentially be ameliorated with robust post-implementation remediation goal monitoring program with unambiguous triggers and timelines for additional remediation if media COC concentrations are not met.

[19] Available at: https://www.epa.gov/sites/default/files/2015-02/documents/rod_guidance.pdf
[20] Available at: https://semspub.epa.gov/work/HQ/100001529.pdf

5. Predesign sampling

Potential remedies will rely heavily on predesign sampling. Most of the chemical and physical data in the FS used to characterize Choccolocco Creek downstream of the backwater area were collected in the late 1990s as part of the 2000 "Offsite RCRA Facility Investigation (RFI) Report". In that report, the aforementioned transect sampling was used to establish bathymetry and sediment thickness (by probing), sediment texture and grain size, sediment bed PCB (by analyzing a subset of sediment samples [described above]), and riverbank PCB concentrations (by "top of bank" sampling at 36 locations [RFI Report, p. 3-19]). Site remediation is intended to control PCB sources and to remove contaminated sediments that exceed a RAL, so remedy effectiveness will be dictated by whether those materials are accurately identified for remediation.

Sediment sampling – CSTAG has significant concerns with the use of the outdated data and proposed approaches to support remedial design. The current data set is insufficient to identify all the areas within the OU that exceed the RAL (see recommendation 1, "sediment bed sampling and analysis"). To address this issue, predesign sampling was included in the FS "to completely define the current nature and extent of PCBs in sediment in the areas targeted for remediation" (FS, p. 9-8). However, the proposed sampling applies only to areas where historic samples exceeded 2.6 mg/kg and it employs a composite sampling approach over the river reach surrounding the point RAL exceedance.[21] Compositing will likely dilute any RAL exceedances and it effectively changes the metric for evaluating a RAL exceedance (by converting a point concentration RAL exceedance criterion into a SWAC exceedance criterion). The effect of the proposed approach can only be to eliminate areas from the proposed remediation footprint, it cannot identify new areas or areas missed in the sparse historic sampling described in recommendation 1.

Recommendations

a. CSTAG recommends that predesign sediment sampling be conducted throughout OU4, (including in areas previously estimated to be "not recoverable"). The sampling design objectives should be to provide assurance that RAL exceedances will be identified if they are present and to generate a statistically robust estimate of the SWAC concentration in the exposure areas for use as a baseline in remedy effectiveness evaluations. Here and in the other phases of sampling, a sample density greater than that used in the RI will be needed, preferably using a spatially balanced, random stratified survey design to reduce potential biases and increase statistical confidence in the monitoring design and SWAC estimates. The sampling density should have numbers sufficient to calculate SWAC statistics (e.g., 95% UCL on mean) with certainty over the relevant exposure scale defined by the biological endpoints.

b. CSTAG recommends that the Region consult with Agency resources to develop a procedure for updating and objectively determining the location of sediment deposits and developing strata for sediment sampling and analysis to support remedial design. This effort should include an updated, comprehensive sediment bed characterization that combines modern techniques such as LiDAR, sampling, and geomorphology to establish the location of actionable sediment deposits. If the remedial design is performed by PRPs, this procedure would be shared with those parties to incorporate into the remedial design.

[21] "The estimated remedial footprint was… based on going to locations where the surface sediment PCB concentrations exceed 2.6 mg/kg and extending a removal footprint upstream and downstream halfway to locations where the PCB concentrations were equal to or below 2.6 mg/kg" (FS, p. 7-11).

Bank sampling – Despite the small number of bank samples and the importance of source control in contaminated sediment management, the FS does not appear to consider whether banks downstream of river mile 29.5 should be evaluated for PCB levels and considered for remediation (or even whether riverbanks upstream of 29.5 should be sampled for PCBs prior to their removal). Recontamination from uncharacterized or unremediated COC sources is a primary reason why the EPA guidance emphasizes that source control is critical to reaching remedial action objectives in a reasonable time frame (EPA 2005 Contaminated Sediment Remediation Guidance, p. 4-11). In 2020, CSTAG recommended bank management based on PCB loading potential, independent of river mile because of the limited understanding of bank PCB concentrations and the potential for banks to serve as a PCB source to the system.[22] Understanding the presence (or absence) of PCB sources is critical to effective site management.

Recommendation

c. CSTAG recommends that the Region evaluate whether bank sampling is sufficient to provide confidence that PCB sources have been identified throughout OU4. Source control should occur where sources are present, independent of river mile. If current sampling is inadequate, it should be updated during pre-design sampling and results incorporated in the remedial design to ensure that PCB sources are controlled.

6. Post-remediation monitoring

The 2005 Contaminated Sediment Remediation Guidance states that post-remediation monitoring should be conducted "1) to assess compliance with design and performance standards; 2) to assess short-term remedy performance and effectiveness in meeting sediment cleanup levels; and/or 3) to evaluate long-term remedy effectiveness in achieving remedial action objectives…" Short- and long-term monitoring elements are discussed below.

Performance monitoring in the remediation areas – Except for the alternatives that specified a 1-foot dredge prior to capping, the FS is vague about the technology's performance objectives, performance standards within the RAL footprint[23], and the need for performance monitoring.

Recommendation

a. CSTAG recommends that the proposed plan includes post-remediation monitoring to verify that dredging achieved its objectives in the areas it was applied. To support this, the expectations of the remediation approaches should be explicitly stated (i.e., that dredging is intended to excavate materials to the depth of native or unimpacted sediment, verified by using a PCB performance standard in the excavation footprint).

MNR sampling – EPA's 2017 Directive on Remediating Contaminated Sediments recommends to "collect baseline contaminant trend data in all appropriate media and use monitoring data to evaluate remedial effectiveness." Similarly, Appendix B of the FS describes the site's long-term monitoring plan that includes baseline and long-term monitoring timeframes and states objectives to assess remedy effectiveness based on the RAOs and PRGs for OU4. Monitoring "will also be used to assess the potential

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[22] The FS sampling (Appendix F, p. F-7) describes average PCB concentrations in banks throughout the system as higher than the proposed sediment RAL, indicating the potential of bank soils to serve as a source of PCBs to contaminated sediment.

[23] For example, the typical description is "Dredging would be conducted in the high-energy and low-energy areas using PCB RALs of 2.6 mg/kg as an NTE value and a SWAC less than 1 mg/kg" (FS p. 10-48).

for changes in the monitoring program or refinements to the remedy as part of the five-year review process using ASM [adaptive site management]" (FS, Appendix B, p. B-2).

MNR is a central component of the evaluated alternatives (and potential interim action) so the sampling plan should be able to evaluate whether MNR is functioning as intended by reducing COC concentrations to achieve PRGs in fish, sediment, and water in the anticipated timeframe. Several elements of the plan support this overall objective, but others are lacking. The monitoring plan focuses on media directly relevant to the remediation goals (sediments, water, and fish tissue) and contains other evaluations to better understand observations (sediment traps, porewater sampling, and fish tracking). The plan appropriately includes an objective to update baseline concentrations prior to remediation to provide a basis for comparison to post-remediation data. The post-remediation frequency is planned at years 1, 3, and 5 following remedy implementation and then every 5 years (FS, Appendix B, p. B-4). Greater sampling frequency followed by decreased frequency is common in long-term monitoring program design, however, there is no discussion on how that timing reflects the site's anticipated changes in concentrations and if that timing can support decisions on remedy effectiveness and adaptation. The plan has few monitoring stations (4) for 37 miles of river. This program is much smaller than the 9 RI/FS sampling areas designed to characterize the nature and extent of contamination in fish tissue and to support the OU4 HHRA, and a rationale was not provided for deviating from that precedent. CSTAG also notes that the "background" stations are now placed in the downstream Lake Logan Martin and not the Choccolocco Creek background area upstream of the site. Despite the use of SWAC-based sediment remediation goals, the sampling design does not develop SWACs. In fact, it appears that only 1 sediment sample is planned in each of the 4 locations (FS, Appendix B, p. B-4). Four sediment samples in OU4 are inadequate to reflect remedy effectiveness or attainment of the sediment remediation goal. The fish tissue sampling appears more robust, with different fish species, trophic guilds, fillet, and whole-body samples, and replicates of 10 individuals at each station with a consideration for increasing the fish sample number to accommodate fish compositing strategies (FS, appendix B, p. B-7). These data can also be used to further refine the fish tissue BSAFs (when SWACs are appropriately measured) to ensure that sediments are managed to COC levels that correspond with acceptable fish tissue concentrations. The sampling plan's proposed water, porewater, and fish tracking studies can further support developing this understanding.[24]

Recommendation

b. CSTAG recommends that the sampling frequency be revisited to ensure it supports the needs of the action (e.g., an interim action approach may need higher resolution in the years prior to selecting a final remedy). Sampling time points should be based on the expected post-remediation conditions and COC trends to provide an appropriate basis for remedy decisions.

c. CSTAG recommends that MNR monitoring directly address whether natural recovery of sediment PCBs is occurring, in the relevant area, over the specified time frame. Sampling should replicate the proposed baseline effort (recommendation 5a) and be designed to demonstrate the progress toward (or attainment) of remediation goals. The sample distribution and density should be sufficient to calculate SWAC statistics of each SWAC area with certainty for comparison to SWAC PRGs.

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[24] "To supplement the traditional monitoring methods, the long-term monitoring program includes collecting dissolved-phase surface water and porewater data and conducting fish tracking studies. These studies will be useful to understand the long-term distribution and time-based constituent concentrations in fish, and ultimately the effectiveness of the OU-4 remedy over time" (FS, Appendix B, p. B-2).

d. CSTAG recommends the Region consider replicating the upstream background areas and fish sampling areas used to support the RI/FS. Lake Logan Martin sampling areas may play a role in decision making for the lake, but they have low relevance as background for Choccolocco Creek. The "CERCLA program fish tissue sampling" investigation was used to depict fish trends in OU4 and risk to receptors in the RI/FS. Gaps in spatial characterization may exist with this design, but sampled fish likely integrate exposures over larger areas and the monitoring program recommended includes comprehensive sediment sampling. As such, retaining this sampling design for fish tissue is a reasonable balance that would provide a longer term, more complete record to evaluate fish tissue COC trends.

7. Lake Logan Martin special studies

Appendix A of the FS describes special studies that are needed to "fill data gaps regarding the nature and extent" of PCBs and other COCs in areas downstream of OU-4. The appendix describes that the special studies can be used by EPA "to evaluate the nature and extent of contamination and communicate current conditions to local stakeholders for areas downstream of OU-4" (p. A-1). Following a review of existing PCB data, special studies were proposed, stating that sampling in Lake Logan Martin will provide information to support the following:

- "Document continued concentration declines and exposure conditions.
- Assess remedy effectiveness monitoring for upstream sources, including the Coosa River and the Site.
- Assist with closure for the total maximum daily load process for the Coosa River that is linked to completing upstream source controls, including the Site remedies" (FS, Appendix A, p. A-20).

Seven multimedia (e.g., water, sediment, and fish) sampling sites of the 40-mile-long lake stretch were proposed to collect the necessary information to evaluate the conditions upstream and downstream of the input from with Choccolocco Creek. Furthermore, tracking of fish movement was proposed to evaluate each receptor's geographical domain and the overlap with known regions of contamination.

While the data collection will improve EPA's ability to understand downstream contamination resulting from upstream OUs, there is an unclear connection between the stated objectives and EPA's needs for Superfund decision making. The design appears insufficient to resolve the nature, extent, and trends of contamination in fish and surface and subsurface sediments, but without more clearly stated objectives, the appropriateness of the design is unable to be discerned.

Recommendation

EPA's expectation is "Environmental programs performed for, or by, the Agency be supported by environmental data of an appropriate type and quality for their expected use."[25] CSTAG recommends the Region use the data quality objective process to clearly state the objectives of the collection and expected uses in Superfund site decision making. This process will allow the development of study design capable of satisfying the study questions, discerning if objectives have been met, and arriving at a decision regarding whether Superfund activities are necessary in the Coosa River downstream of OU4. The OU4 and downstream monitoring programs should be coordinated and consistent to permit site wide comparisons.

[25] https://www.epa.gov/sites/default/files/documents/guidance_systematic_planning_dqo_process.pdf

8. Community concerns

The Region discussed the outreach efforts they have used to understand community concerns and communicate EPA decisions to the communities impacted by the actions taken to date at OU1, OU2 and OU3. While some of these communities may also be impacted by potential remedies at OU4, some of the communities that are affected by OU4 are new.

Recommendation

CSTAG recommends that the Region consider developing or updating a Community Involvement Plan (CIP) for OU4. The development of the CIP will include identifying and interviewing people in these communities who understand how people may most effectively receive information, including identifying social media options and which communities use these tools. The CIP would clearly document environmental justice factors identified using EJ Screen that the Region would need to understand and integrate into remedy evaluation and communication.