SDMS Document ID
2022614

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

December 8, 2003

Ref:8EPR-SR

Mr. Robert Marriam
6401 Poplar Avenue, Suite 301
Memphis, TN 38119-4840

Dear Bob:

As mentioned in my previous comment letter, EPA is providing additional comments regarding sampling and analysis procedures in the draft Removal Action Work Plan (August 2003) for the Flyway Property. In general, the document needs additional detail to clearly discern how and why sampling will occur and how analysis will be performed - a clear sampling rationale and well-defined sampling program is essential to ensuring the work was completed properly, workers were protected, and that contamination did not migrate off-site. This is critical for EPA's ultimate approval of the documents and for community acceptance of the work. Though, in general, the sampling for the Flyway cleanup is fairly straightforward, sampling for a remedial investigation and feasibility study (RI/FS) of the former mine site may not be. Thus, I believe we should take the opportunity to ensure we are able to produce a strong, very detailed sampling and analysis plan that both EPA and W.R. Grace can support on this simple case now, so that we are in a better position to deal with the potential complexities of an RI/FS at the mine site later. The QAPP/SAP and data packages can then serve as a baseline for future work. Because we have postponed work until spring by mutual agreement, we have some additional time to address any issues.

General Comments.

1. Sampling and Analysis Programs. There are several sampling and analysis programs planned as part of this project: ambient air monitoring, personal air monitoring, asbestos in soil confirmation sampling, and PCB's in soil sampling. For clarity, the documents should be revised and organized to differentiate among the various sampling programs. Each sampling program must be treated separately and must discretely describe the rationale for the program and detail the requirements for each sampling and analysis program. Even if these requirements are drawn from EPA's work plans and SAPs, they should be clearly laid out and/or those documents referenced. The requirements for each

Printed on Recycled Paper

program must include all the components required by the DQO process: the reason for the work (sampling and/or excavation), the boundaries of the work (site boundaries and work boundaries such as grids/exclusion zones), the sampling locations and the reason why those sampling locations were identified, the method of analysis and supporting references and/or copies of SOPs, and field and analytical raw data requirements. Tables are very helpful.

2. Action Limits. The documents should clearly and consistently describe action limits and potential actions for each type of sampling activity, including visual inspection. The most important action levels include ND or $\geq 1\%$ for soil confirmation sampling at depth, no substantial visible vermiculite in visual inspections, and detectable Libby asbestos in perimeter samples, either PCM or TEM.

3. PARCC. PARCC is an antiquated term that attempts to indicate all the QA/QC measures necessary to ensure data generation that is of known quantity and quality. It is only useful if the PARCC parameters include proper assessment criteria and recommend appropriate corrective actions when these criteria are not met. No corrective actions are provided in the text, which makes this section of little value, and frankly it is difficult to apply PARCC parameters to all asbestos analysis. I recommend this section be scratched from the document.

4. Analytical Methods. The QAPP & SAP must provide the following for each analysis method planned for use: action limit, action taken if action limit exceeded, required detection limit, analytical method number and reference (including preparation method number and reference and/or counting rules references). The QAPP and & SAP should clearly reference and cross-reference sampling described in the HASP. Again, a table would be helpful.

5. Air Sample Analysis. The HASP, QAPP, & SAP specify the use of TEM and PCM for background, perimeter, and personal samples. EPA generally uses this same approach, using PCM because of it's cost effectiveness and TEM to provide lower detection limits and definitive Libby asbestos identification. However, I must emphasize that TEM should be used for all types of air samples at some specified rate because it provides higher quality data. This is especially true for perimeter samples which provide the basis for EPA and W.R. Grace stating that surrounding properties were not impacted by the work - the SAP appears to call for only PCM analysis of perimeter samples, though it does provide the possibility of TEM analysis. The SAP/QAPP should provide more detail on which method will be used and at what frequency.

6. Splits. EPA will require duplicate/replicate samples submitted for independent analysis. For soils, splits of well homogenized samples should be submitted to EPA. Replicate air samples (a 2nd pump set up along side the 1st pump) should be submitted to EPA. Our on-

site oversight personnel will coordinate this with your field crew. Frequency of these samples (based on practicality and QA/QC goals) can be discussed, but suggested frequencies for each type of sample are provided in the following table.

Table 1. Suggested Frequency Goals for Split Sample Collection

Data Quality Objective[a]	Sample Description	Frequency
PCB Characterization	Soil-PCB Characterization	1 homogenized split for every 5 samples collected (20%)
RA Monitoring	Personal (BZ) Air Monitoring	Not Applicable[b]
RA Monitoring	Perimeter Air Monitoring	1 replicate per EZ; taken every 3 days[d]ENDFIELD Collect the replicate at the downwind location of the EZ perimeter
RA Confirmation	Asbestos in Soil Confirmation	1 homogenized split for every 2 samples collected (50%)[c]
RA Confirmation	PCBs in Soil Confirmation	1 homogenized split for every 5 samples collected (20%)

RA - Removal Action
PCB - Polychlorinated Biphenyls
BZ - Breathing Zone
EZ - Exclusion Zone

a - Describes the specific purpose for sampling.
b - Personal (BZ) air samples are collected to monitor worker safety; worker safety is the responsibility of the employer. Therefore, EPA does not require split samples. In addition, if personal (BZ) air monitoring samples are required for EPA contractors, these will be taken by EPA's contractor under their own Health and Safety plan.
c - EPA will require this rate initially. However, EPA may decide to reduce the rate if data for split pairs are concordant or alternatively increase the rate if data are discordant.
d - One replicate sample must be collected at each EZ, but if work continues at an EZ for more three days, a replicate air sample must be collected every 3rd day until work at that EZ is complete.

7. Analytical Laboratory. RJ Lee Laboratory is listed as the laboratory planned for analysis.

EPA has significant reservations about the use of this laboratory. EPA has issued a general warning about data generated by the laboratory and Dr. Lee and the RJ Lee Laboratory have failed to produce material QA/QC documentation in this case. Any use of this laboratory would require special consideration and significant oversight.

8. Analytical Raw Data Package. The following information must be provided to EPA for our records. Note that the raw data package must be complete such that any reviewer may assess whether the analysis was performed in accord with methods cited in the planning documents (QAPP/SAP). Supporting documentation is not limited to investigative samples alone, but must also include all supporting documentation for QC samples and must also provide evidence of all other required QA activities such as calibrations, equipment maintenance, etc. Finally, all copies must be fully legible and pages must be sequentially numbered; the total number of pages submitted in each raw data package must be noted on the 1st page.

   a. Copies of signed Chain-of-Custody (COC) documents and air bills for each sample submitted.

   b. Copies of final reports signed by supervisory personnel certifying the results of the analysis as accurate and meeting SOP and QA criteria.

   c. Copies of pertinent laboratory generated SOPs, not just copies of a formal agency generated method.

   d. Case Narrative that indicates any issues/concerns with sample shipment, custody, integrity, preparation, analysis. Also, the narrative must state whether modifications were made to the lab SOP and/or the formal agency generated method at anytime or on certain samples. The modifications to the SOP and the reasons for the modifications must appear in the narrative.

   e. List of all equations/algorithms used in calculations.

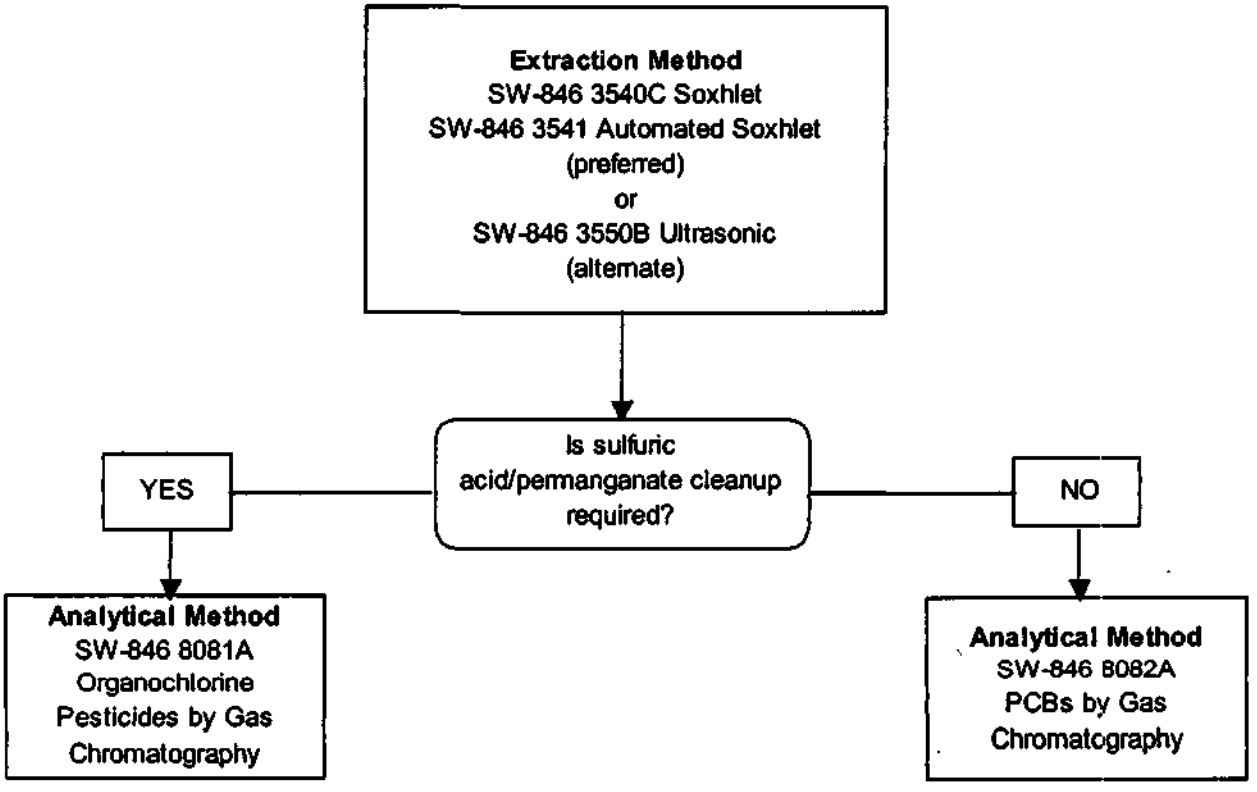
   f. Copy of original <u>raw bench sheets</u> and <u>electronic count sheets (if generated)</u> showing the results of specific point count operations and the results of fiber characteristic determinations. AT NO TIME MAY ANY RAW BENCH SHEETS BE DESTROYED EVEN AFTER INFORMATION IS TRANSFERRED TO ELECTRONIC FORMS.

      - For each fiber identified as asbestiform, the raw data bench sheet should contain documented information on the characteristics of the fiber (e.g. morphology, refractive index, color, etc. that caused the analyst to confirm the identity of the fiber. This also includes all EDS spectra, SAED

diffraction patterns, electron micrographs used in fiber identification.

g. Reports and raw data that indicate the frequency and results of QA analyses (such as duplicate analyses and reference slide analyses).

9. Soil PCBs. The SAP (Section 3.3) states that one soil sample will be collected near the old electrical transformer for PCB analysis. If only one sample can be afforded, this should be a composite sample which is made up of at least 5 grab samples in the area of the transformer and focusing/biasing sampling in areas that appear oil stained. Use Figure 1 to cite appropriate preparation and analysis methods for PCBs in soil. The reference for the compendium of methods (SW-846) is: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition* (website:



http://www.epa.gov/epaoswer/hazwaste/test/main.htm).

Figure 1. Preparation and Analysis Methods for PCBs in Soil

10. Documentation/Records. EPA must be provided legible/readable copies of all information generated during the cleanup. That includes (but may not be limited to): all electronic databases, copies of all field log book pages and log/note sheets, chain of custody forms, analytical raw data package, communication logs, etc. Note that the QAPP (page 5-22) indicates that analytical results are maintained in the Libby version 2 secured project database. This conflicts with statements made elsewhere in the documents. While EPA concurs with the concept of maintaining all data collected at the Flyway within Libby2, the information planned for collection as presented in these planning documents is insufficient to by imported into Libby2. I recommend we work to resolve this and aim for inclusion of all data into Libby2. This will be valuable for the project itself and, more importantly, will serve as a basis for potential future RI/FS work, where use of the database will be critical and absolutely required.

11. Quality Control Samples. There is no place in the planning documents where QC samples planned for collection are unambiguously identified. That is, some QC samples are appropriate for some sampling and analysis methods, but inappropriate for others. The documents must list the QC samples to be collected and for which sampling and analysis program. Further, the following must be defined for each QC sample: its purpose, frequency of collection, acceptance criteria, corrective action taken if outside the acceptance criteria.

12. Soil sampling. Given that no soil sampling other than confirmation sampling at depth is planned, there is no need for Remedium to use or reference SOP SRC-Libby-03 (Rev 0) or ISSI-Libby-01 (Rev 7), which are designed for investigatory surface soil sampling and are site-specific Libby methods. At depth, EPA is using NIOSH 9002 (a standard PLM method) for confirmation samples. The rationale for this is basically two fold: (1) rapid turnaround time is necessary for confirmation samples, and the above Libby specific methods require extensive analysis time, and (2) at depth, the lower detection limits and analytical uncertainty associated with NIOSH 9002 PLM analysis is less of a problem, as this material is less likely to be contacted than surface soil. I provided these site specific SOP's in case Remedium proposed additional surface soil sampling to delineate areas of excavation. If investigatory surface soil sampling is proposed in work plan revisions, samples should indeed be prepped in accordance with ISSI-Libby-01 (Rev 7) and analyzed in accordance with SRC-Libby-03. All confirmation soil samples, regardless of depth, should be collected from a depth of 0-2" at current ground surface, as opposed to 0-6" and can be analyzed by NIOSH 9002.

13. Potential changes to RAWP. EPA and Remedium have discussed the possibility of using surface scrapes in certain areas of the Flyway as a remediation strategy. If ultimately used, such a process will require slight modifications to the soil confirmation sampling and analysis approach. This is because excavation will not proceed automatically to a

default excavation depth of 18 inches. EPA's standard for "no action" or "excavation complete" that we apply to residential cleanups is generally different for three depths: (1) for investigatory surface samples, we require a non-detect via SRC-Libby-03 (and no visible vermiculite) to state that cleanup will likely not be required. (2) Once excavation begins, we may proceed in lifts of about six inches depending upon conditions and equipment being used. Based upon judgement of the field staff (no visible vermiculite, natural ground surface), confirmation samples may be taken at any depth from about 6-18 inches. Up to a depth of 18 inches, we require a non-detect via NIOSH 9002 to state that excavation is complete. (3) At a depth of 18 inches, which is our general maximum excavation depth, we will only continue excavation if there is substantial asbestos containing material (such as mine waste) or samples via NIOSH 9002 are greater than or equal to 1%.

Specific Comments

Some specific details about areas where the SAP and QAPP could be improved are provided below.

1. QAPP, Section 1.1 Project Organization. The Project Coordinator (PC) and the Quality Assurance Manager/Coordinator (QAM) are identified as the same person. This is not desirable; however, if the Project Coordinator will not be participating in any of the field, sampling, or analysis activities it <u>may</u> be feasible for the PC/QAM to remain objective. If the PC/QAM cannot remain objective and removed from data generation activities, the QAM position must be assigned to a person independent of the data generation activities. Also, there are many references to that "appropriate personnel" must be notified under certain circumstances; however the personnel and the circumstances are often vague. An organization chart that includes internal communication lines within W.R. Grace and its contractors and external lines of communication with EPA and other entities should be provided.

2. QAPP, page B-1-2, 3rd bullet. Please revise this bullet to read: "Assuring that planning documents are implemented as written or documented with appropriate scientific justification, if changed/modified"

3. QAPP, Page B-1-4. Mr. Patrick McGurren is identified as the sample coordinator for all onsite PCM analyses. This is the first time onsite PCM analysis is mentioned. Is Remedium considering on-site analysis? If so, detail about the onsite laboratory operations must be provided in the QAPP. Additionally, an LQAP for the onsite laboratory must be submitted to EPA for review.

4. QAPP, page B-1-4. This section states that "Remedium will provide a QA/QC review of the field data package..." This is an important step; however, both the review steps to be

taken and a list of the information contained within the field data package must presented in the planning documents.

5. QAPP, Page B-1-4, Section 1.1.3, 1st bullet. Please revise this bullet to read: "....QA audits are documented and implemented."

6. Section 1.4.1 DQOs. An example set of data quality objectives that may be applicable for the Flyway cleanup activities are provided in Attachment A. While these recommendations generally follow EPA guidelines, Remedium must review all information for accuracy and applicability. Further, note that all areas highlighted in blue require Remedium to address.

7. QAPP, Section 1.4.2.2, Accuracy. This section and others in the QAPP indicate LCS and MS analyses for accuracy assessments. Indicate which of the planned analyses will uses these QC samples in accuracy assessments. EPA would like to see a table listing the QC sample, its precision and/or accuracy criteria and the analytical methods appropriate for that QC analysis.

8. QAPP, page B-1-11, Reporting limits. This section does not provide guidelines on minimum reporting limits and detection limits/sensitivity and erroneously defines a reporting limit as minimum value without a qualifier. Further, it suggests that the laboratory will monitor sensitivity with performance checks. Please clarify how this happens for each different analytical method that will be performed.

9. QAPP, Section 1.5. It is unclear what training is required for field workers, lab personnel, management personnel. This must be clarified.

10. QAPP, Section 2.3.1.3. This section indicates an SOP for packaging of samples in the field, but no SOP number or SOP is attached. Please provide this information for review.

11. QAPP, Section 3.1.1. Please revise this section to state that EPA may perform onsite field and/or laboratory audits or visits at anytime.

12. QAPP, Section 3.2, State in this section that EPA will receive copies of all management reports.

13. QAPP, Section 4.1, 2nd paragraph. This section states: "Data validation consists of examining the sample data package(s) against pre-determined standardized requirements." The pre-determined standardized requirements must either be stated here or an SOP containing that information be referenced and attached to the RAWP.

14. QAPP, Section 4.2. RJ Lee Group is identified for DQO reconciliation. This is not

appropriate. As presented, Remedium is identified at the data user and evaluator and DQO developers. The analytical laboratory (RJ Lee Group) must document any deviations to the analytical methods cited in the SAP/QAPP and indicate their impact to the project requirements in the case narrative which is contained within the analytical raw data package. However, the laboratory is in no position to assess and/or report on activities performed in the field. Remedium must take responsibility for evaluating whether project DQOs were achieved for the completed project which includes the quality of field and laboratory activities.

15. SAP, Section 2.1. Please provide more specific guidelines for the collection of perimeter samples in the "most safe and healthful means possible" such as location with respect to wind direction and working zones.

Again, I believe your proposed sampling approach is consistent with our goals for the cleanup and with the documents and guidance I provided, but both the SAP and QAPP need additional detail. In these comments, I tried to be as specific as possible, but in some cases I recognize that you may want further clarification from EPA. I invite you to travel to Denver to meet with me and our project chemist, Mary Goldade, to further discuss our comments and potential resolutions if you need to. Again, my goal is to ensure we produce a high quality sampling plan that can serve as a model or baseline for future data collection activities, is similar to and consistent with current EPA procedures for Libby, provides adequate detail to ensure we avoid problems EPA has observed with commercial asbestos analysis, and minimizes the possibility of miscommunication or misunderstandings later. If you have any questions, please contact me at (303) 312-6748. I look forward to working with you on the rest of the Flyway project.

Sincerely,

Jim Christiansen
Remedial Project Manager

cc: Matthew Cohn, 8ENF-L

Attachment A

Data Quality Objectives for Flyway SAP

3.1 Data Quality Objectives – Organization

To accomplish the project goals, the SAP calls for the sampling and analysis of a variety of media for various purposes. For convenience and to clarify the specific purpose of each sampling and analysis program, the DQOs are organized separately by medium and respective purpose. Whenever possible, this is accomplished in tabular form. As shown, the various DQOs are segregated into the following: (1) Asbestos in Soil Confirmation Samples, (2) Personal Air (BZ) Monitoring Samples, (3) Perimeter Monitoring Air Samples, (4) PCBs in Soil Characterization Samples, and (5) PCBs in Soil Confirmation Samples.

Step 1: State the Problem

Identify the planning team members including the decision makers:

All project personnel are detailed in Section 4. The decision makers for the activities described in this SAP are Jim Christiansen (EPA RPM), **add others as appropriate**.

Describe the problem:

Previous investigations at the Flyway near Libby **(cite the SAP/QAPP)** were designed to characterize Libby amphibole asbestos (LA) contamination at that location. Removal activities will be performed at the Flyway in areas that have been found to contain LA asbestos-contaminated soils. During removal activities, the potential for LA fibers to migrate offsite increases. Likewise, during these activities, the potential for LA exposure to workers is also increased. Therefore, it is important to ensure worker safety and contaminant containment through periodic monitoring. Following cleanup, confirmation samples must be collected and analyzed expeditiously to determine if the removal actions met project goals. Therefore, a program must be put in place to monitor: (1) worker exposure and contaminant containment during removal activities; and (2) the effectiveness of the cleanup (ie., confirmation) following removal activities.

In addition, reconnaissance at the site revealed an old electrical transformer located outside the pump house **(cite the SAP/QAPP or memo identifying the potential problem)**. Toxic chemicals called polychlorinated biphenyls (PCBs) are commonly found in old transformers. As a precautionary measure, the soils near the transformer must be sampled to determine if PCBs are present. If PCBs are found in the soils at a level of concern, the soils must be excavated and properly disposed. A program is necessary to characterize the PCB levels in soils near the electrical transformer and to remove contaminated soils, if found.

Determine resources:

Provide a detailed description of resources, budget, and schedule for sampling and analysis and

removal response activities.

Step 2: Identify the Decision

Identify the principle study question, alternative actions, and decision statements:
The principle study question(s), alternative actions, and decision statements are summarized in Table 3-___.

Table 3-__. Identify the Decision

Data Quality Objective	Sample Description	Principle Study Question(s)	Alternative Actions	Decision Statements
PCB Soil Characterization	PCBs in Soil	Are PCBs detected in the soils collected near the old electrical transformer above action limits?	1) Removal Action DQO: Remove PCB contaminated soil 2) Take no action	Are PCBs in soils detected above action limits? If yes, remove PCB contaminated soil; refer to Removal Action DQO. If no, no action is required.
RA Monitoring	Personal (BZ) Air Monitoring	Is LA asbestos detected in the workers' breathing zone above worker safety limits?	1) Continue contaminated soil and/or VCI removal and re-evaluate engineering controls, work practices, and/or PPE 2) Stop work 3) Take no action	Are LA asbestos fibers collecting in the workers' breathing zone above worker safety limits? If yes, engineering controls, work practices, and/or PPE will be re-evaluated and/or work will stop. If no, cleanup activities will continue with no additional evaluation.

Data Quality Objective	Sample Description	Principle Study Question(s)	Alternative Actions	Decision Statements
RA Monitoring	Perimeter Air Monitoring	Are LA asbestos fibers detected in air along the perimeter boundary of an exterior cleanup site?	1) Continue contaminated soil removal and re-evaluate engineering controls and work practices 2) Take no action	Are LA fibers migrating to the exclusion zone boundary during LA contaminated soil removal? If yes, engineering controls and/or work practices, will be re-evaluated and/or work will stop. If no, excavation activities will continue with no additional evaluation.

Data Quality Objective	Sample Description	Principle Study Question(s)	Alternative Actions	Decision Statements
RA Confirmation	Asbestos in Soil Confirmation	Is LA asbestos detected in the soil surface of the excavated area, after soil removal? If so, has the maximum excavation depth of 18 inches or 4 feet (soil contamination only or ACM/mine waste contamination, respectively) been achieved?[a]	1) Remove additional soils by either excavation or surface scraping 2) Stop removal and designate as either a non-contaminated area or an area of no further removal action	If LA is detected, and – Max. excavation depth <u>is not</u> achieved: 1) Remove additional soils 2) Continue until no LA asbestos is detected or max. excavation depth achieved 3) Stop removal and designate as a non-contaminated area (if [LA] is ND) Max. excavation depth <u>is</u> achieved: 1) Continue removing additional soils IF [LA] ≥1% 2) Stop removal and designate as either a non-contaminated area (if [LA] is ND) or an area of no further removal action (if [LA]<1%)

Data Quality Objective	Sample Description	Principle Study Question(s)	Alternative Actions	Decision Statements
RA Confirmation	PCBs in Soil Confirmation	Are PCBs detected in the soil surface of the excavated area at the action limit, after soil removal?	1) Excavate additional soils 2) Designate as either a non-contaminated area or an area of no further removal action	Are PCBs detected in the soil surface of the excavated area at the action limit, after soil removal? If yes, continue excavation until PCB levels are below the action level. If no, then no further action is required; designate as a non-contaminated area.

PCBs - Polychlorinated biphenyls
RA - Removal Action
ACM - Asbestos Containing Material
BZ - Breathing Zone
PPE - Personal Protective Equipment
bgs - below ground surface

a - Up to a depth of 18 inches, we require a non-detect via NIOSH 9002 to state that excavation is complete. At a depth of 18 inches, which is our general maximum excavation depth, we will only continue excavation if there is substantial asbestos containing material (such as mine waste) or samples via NIOSH 9002 are greater than or equal to 1%.

Step 3: Identify the Inputs to the Decision

Identify the information needed. Determine the basis for determining the Action Levels. Identify sampling and analysis methods that can meet the data requirements.

The information needed for the decision, the action levels, the basis for the action levels, and analytical method summaries are provided in Table 3-__. Further details about the sampling and analysis methods that can meet the data requirements are summarized in the SAP Section(s) ____.

This SAP is designed only for cleanups for which LA characterization at the Flyway property (e.g., soil concentration) has been performed through another investigation (SAP). Analytical results (that are confirmatory and do not serve to characterize contamination) are needed within hours of sampling so that excavation/cleanup work may continue with relative continuity. As such, confirmation soil samples will not be ground as in previous characterization studies and will be analyzed via polarized light microscopy (PLM) Method NIOSH 9002. Further, analyses will generally be performed onsite in Libby to ensure expedited results.

Table 3-___. Inputs to the Decision

Data Quality Objective	Sample Description	Information Needed	Action Level[h]	Basis for Action Level	Analytical Method
PCB Soil Characterization	PCBs in Soil	EMDL: 0.057-0.070 mg/kgENDFIELD Approx. Mass: two 4 oz glass jars[e] ENDFIELD Collect: (minimum) one 5 grab sample composite; homogenized	0.2 mg/kg[g]	USEPA Region 9 PRGs[g]	Sum of the 7 individual arochlor concentrations by GC: SW-846 8082A or 8081A[f]
RA Monitoring	Personal (BZ) Air Monitoring	AS_{PCM}: 1 f/cc AS_{TEM}: 0.1 LA s/cc Min. Volume: 400 L[a] ENDFIELD Collect: ENDFIELD TWA: 8-hour TWA ENDFIELD STEL: 30 minute excursion sample	TWA: 0.1 PCME s/cc ENDFIELD STEL: 1.0 s/cc	OSHA Worker Safety Regulations	PCM: NIOSH 7400 ENDFIELD TEM[d]: TEM AHERA

Data Quality Objective	Sample Description	Information Needed	Action Level[h]	Basis for Action Level	Analytical Method
RA Monitoring	Perimeter Air Monitoring	AS_{TEM}: ~0.005 LA AHERA/cc Min. Volume: 1200 L ENDFIELD Collect: 4 samples, min. along north, south, east & west boundaries of EZ	Each air sample <AS_{TEM} ENDFIELD Approx. 0.005 AHERA s/cc	Removal Action Clearance Criteria[b]	TEM AHERA
RA Confirmation	Asbestos in Soil Confirmation	Reported Result: % LA by VAEENDFIELD AS: Method defined as 1%, but qualitative estimates of LA present below 1% reported as trace or NDENDFIELD Approx. Mass: 1 kg[e]	Up to max. cleanup depth of 18 inches: ND ENDFIELD Beyond max. cleanup depth: ≥1% LA by VAE[b,c]	Removal Action Clearance Criteria[b,c]	Preparation: Homogenize, Cone & CutENDFIELD Analysis: NIOSH 9002
RA Confirmation	PCBs in Soil Confirmation	EMDL: 0.057-0.070 mg/kgENDFIELD Approx. Mass: two 4 oz glass jars[e] ENDFIELD Collect: (minimum) one 5 grab sample composite; homogenized	0.2 mg/kg[g]	USEPA Region 9 PRGs[g]	Sum of the 7 individual arochlor concentrations by GC: SW-846 8082A or 8081A[f]

AS-Analytical Sensitivity
EMDL - Estimated Method Detection Limit

GC - Gas Chromatography
RA - Removal Action
ND - Not Detected or non-detect
VAE - visual area estimation
f/cc - fiber per cubic centimeter
ppm - parts per million
bgs - below ground surface
PCME - Phase Contrast Microscopy Estimate
TWA - Time Weighted Average
STEL - Short-term Exposure Limit
AHERA s/cc - AHERA structures per cubic centimeter of air
TEM AHERA - All samples are analyzed by transmission electron microscopy using the counting method as described in the Asbestos Hazard Emergency Response Act (AHERA) (EPA 1987) with project specific modifications.
SW-846 - Solid Waste compendium of methods (SW-846) *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition.*
EZ - Exclusion Zone

a - Minimum volume requirements according to the method are 25 L. However, in order to achieve a reasonable analytical sensitivity by TEM, the sampler should attempt to collect 400 L of air for the BZ sample.
b - Action Level/Clearance Criteria Technical Memorandum (EPA 2003).
c - In the spirit of statements made in the technical memorandum (EPA 2003), efforts will be made to avoid having to repeat cleanup activities by cleaning soils to ND up to the maximum cleanup depth of 18 inches. Excavation beyond the maximum cleanup depth will only continue if soils have concentrations ≥1% LA. Excavation will stop at a maximum depth of 4 feet bgs.
d - If PCM results are above the OSHA limit, TEM confirmation must be performed.
e - Approximately 0.5 kg for analysis and 0.5 kg for EPA split sample (when required).
f - Refer to Figure B- for the complete extraction and analytical method decision tree (EPA Flyway General Comment #9).
g -USEPA Region 9 Preliminary Remediation Goals for PCBs in soils at residential locations (represents 1 in a million risk).
h - Action must be taken at the levels presented here.

Step 4: Define the Study Boundaries

Define the target population, spatial and temporal boundaries, potential constraints, and the smallest subpopulation.

The target population, spatial and temporal boundaries, potential constraints, and the smallest subpopulation are summarized in Table 3-___.

Table 3-[ ]. Study Boundaries

Data Quality Objective	Sample Description	Target Population	Spatial Boundaries	Temporal Boundaries[b]	Potential Constraints	Smallest Sub-population
PCBs in Soil Characterization	PCBs in Soil	Surface soil near the old electrical transformer; biased for areas with apparent oil staining	Vertical: ENDFIELD 6 inches bgs to ground surface ENDFIELD Horizontal: site boundary	Collected before removing any soil near the electrical transformer	Inaccessibility to all soil due to obstacles on property	5-grab sample composite
RA Monitoring	Personal (BZ) Air Monitoring	Ambient air within the workers' breathing zone; during removal activities	Each individual worker's breathing zone for the activity type performed	Collected during exterior or interior removal activities (ie., excavation, VCI removal, interior cleaning)	NA	1 air sample for each work activity per week. DEFINE THE WORK ACTIVITIES HERE

Data Quality Objective	Sample Description	Target Population	Spatial Boundaries	Temporal Boundaries[b]	Potential Constraints	Smallest Sub-population
RA Monitoring	Perimeter Air Monitoring	Ambient air at the boundary of the EZ; during removal activities	Vertical: Air space above the exclusion zone to sampling height (~4-6 ft.) ENDFIELD Horizontal: perimeter bounding the site-specific EZ	Collected during exterior removal activities (ie., excavation)	Inaccessibility due to property boundaries or other obstacles ENDFIELD Inclement weather such as rain that can cause the sample to be void[c]	4 air samples that bound the EZ
RA Confirmation	Asbestos in Soil Confirmation	Surface soil at the bottom of the excavation site; after soil removal activities	Vertical[a]: ENDFIELD Generally: 18 inches bgs to ground surface ENDFIELD Maximum: 4 feet bgs to ground surface ENDFIELD Horizontal: site-specific EZ	Collected after all contaminated soil is excavated and removed from the site and will continue until the area is designated as either non-contaminated or removal actions are discontinued (no further action)	No soil available for sampling because excavation continued to bedrock	1 soil sample for every 100 ft^2 excavated

Data Quality Objective	Sample Description	Target Population	Spatial Boundaries	Temporal Boundaries[b]	Potential Constraints	Smallest Sub-population
RA Confirmation	PCBs in Soil Confirmation	Surface soil at the bottom of the excavation site; after soil removal activities	Vertical: ENDFIELD extent of PCB contamination; (generally 12-18 inches bgs to ground surface) ENDFIELD Horizontal: site boundary	Collected after all contaminated soil is excavated and removed from the site and will continue until the area is designated as either non-contaminated or removal actions are discontinued (no further action)	Inaccessibility to all soil due to obstacles on property	5-grab sample composite at excavation surface, per 100 ft^2

EZ - Exclusion Zone
RA - Removal Action
bgs - below ground surface
NA - Not Applicable

a - These are generally the vertical boundaries for soil. If LA contamination ≥ 1% is found, the vertical boundary shall be extended for that location until the concentration is below 1% LA or until a depth of 4 feet bgs is achieved (whichever is achieved first).
b - A general schedule/timeline for cleanups is provided in the Flyway RAWP. This section is specific to timeframes for sampling at a particular property and/or exclusion zone.
c - If it is raining, attempts will be made to protect the sample from moisture.

Step 5: Develop a Decision Rule

Population Parameter, Action Levels, Decision Rule:
The population parameter, action levels, and decision rules are summarized in Table 3-___.

Table 3- . Decision Rule

Data Quality Objective	Sample Description	Population Parameter	Action Level	Decision Rule
PCBs in Soil Characterization	PCBs in Soil	one 5-grab sample composite representing the areas most likely contaminated with PCBs	0.2 mg/kg[c]	If the concentration of PCBs in soils are ≥0.2 mg/kg, then remove PCB contaminated soil (refer to Removal Action DQO). If concentrations are not above the action level, no action is required.
RA Monitoring	Personal (BZ) Air Monitoring	1 air sample representing the breathing zone for the activity conducted	TWA: 0.1 PCME s/cm^3 STEL: 1.0 s/cm^3	If the concentrations of the BZ samples ≥0.1 s/cm^3 (TWA) or ≥1.0 s/cm^3 (STEL) engineering controls, work practices, and/or PPE will be re-evaluated and/or work will stop. If concentrations are not above action levels, cleanup activities will continue with no additional evaluation.

Data Quality Objective	Sample Description	Population Parameter	Action Level	Decision Rule
RA Monitoring	Perimeter Air Monitoring	4 air monitoring samples that bound the perimeter of the EZ	Each air sample $<AS_{TEM}$ ENDFIELD Approx. 0.005 AHERA s/cm^3	If the concentration of any of the 4 samples ≥0.005 AHERA s/cm^3, then excavation engineering controls and work practices will be re-evaluated and/or work will be stopped. If all 4 perimeter air samples are ND, then no action will be taken.

Data Quality Objective	Sample Description	Population Parameter	Action Level	Decision Rule
RA Confirmation	Asbestos in Soil Confirmation	Soil sample representing the area of excavation, per 100 ft^2	Up to max. cleanup depth of 18 inches: ND ENDFIELD Below max. cleanup depth (& up to 4 feet bgs): <1% LA by VAE[a,b]	If LA is detected, and – Max. excavation depth is not achieved: 1) Remove additional soils 2) Continue until no LA asbestos is detected or max. excavation depth achieved 3) Stop removal and designate as a non-contaminated area (if [LA] is ND) Max. excavation depth is achieved: 1) Continue removing additional soils IF [LA] ≥1% 2) Stop removal and designate as either a non-contaminated area (if [LA] is ND) or an area of no further removal action (if [LA]<1%) 3) Stop work at a depth of 4 feet bgs.

Data Quality Objective	Sample Description	Population Parameter	Action Level	Decision Rule
RA Confirmation	PCBs in Soil Confirmation	5-sample composite soil sample representing the area of excavation, per 100 ft^2	0.2 mg/kg[c]	If PCB concentrations in the soil surface of the excavated area are ≥0.2 mg/kg after soil removal, continue excavation until PCB levels are below the action level. If PCB concentrations are not above the action level, then no further action is required; designate as a non-contaminated area.

EZ - Exclusion Zone
RA - Removal Action
ND - Not Detected or Non-detect
PCME - Phase Contrast Microscopy Equivalent
TWA - Time Weighted Average
STEL - Short-term Exposure Limit

a - Action Level/Clearance Criteria Technical Memorandum (EPA 2003).
b - In the spirit of statements made in the technical memorandum (EPA 2003), efforts will be made to avoid having to repeat cleanup activities by cleaning soils to ND up to the maximum cleanup depth of 18 inches. Excavation beyond the maximum cleanup depth will only continue if soils have concentrations ≥1% LA. Excavation will stop at a maximum depth of 4 feet bgs.
c - USEPA Region 9 Preliminary Remediation Goals for PCBs in soils at residential locations (represents 1 in a million risk).

Step 6: Specify Tolerable Limits on Decision Errors
Null Hypotheses, consequence of making an incorrect decision, gray region, tolerable limits:

For the purposes of completing all six steps of the DQO process, the null hypotheses, consequences of making an incorrect decision, gray region, and tolerable limits are summarized in Table 3- .

Typically, Step 6 of the DQO process is useful to encourage careful design of decision rules by defining and integrating the errors that are acceptable based upon a myriad of integrated project management decisions such as reduction in risk to human health, implementability/practability, and cost. As stated in the guidance document for development of DQOs: QA/G-4 (EPA 2000), solely statistically generated tolerable limits on decisions errors are not necessary in certain cases providing a line of reasoning (scientific justification) is presented that adequately defines acceptable limits or decision errors. This particular effort was put forth in the Action Level/Clearance Criteria Technical Memorandum (EPA 2003) for the following DQOs: (1) Asbestos in Soil Confirmation Samples and (2) Perimeter Monitoring Air Samples. The decision rule for the personal (BZ) air monitoring samples has been promulgated by legislation, and as such, limits on decision errors do not apply.

A discussion follows regarding the tolerable limits on decision errors for the remaining DQOs: (1) PCBs in Soil Characterization and (2) PCBs in Soil Confirmation Samples. EPA recognizes acceptable human health risk to cancer due to exposure to toxic chemicals falls between 1 person in ten thousand (1E-4) and 1 person in one million (1E-6). As stated above, the exact risk value settled on at a Superfund site is usually a risk management decision which is based upon implementability, practability, and costs associated with clean up. In the case of PCBs in soils, the analytical sensitivity is well established and a practical quantitation limit corresponding to a risk of 1E-6 is generally achievable. Therefore, providing a clean fill material is locally available, achieving a risk goal of 1E-6 is reasonable. The action level that corresponds to a risk of 1E-6 is 0.2 mg PCBs/kg soil. However, if site conditions dictate such and the EPA RPM approves, an action level of 2 mg PCBs/kg soil that corresponds to a risk of 1E-5 is tolerable.

Table 3-__. Limits on Decision Errors

Data Quality Objective	Sample Description	Null Hypothesis	Type I Error	Type II Error	Gray Region	Tolerable Limits
			Will Result in:	Will Result in:		
PCBs in Soil Characterization	PCBs in Soil	The surface soils near the old electrical transformer are contaminated with PCBs.	determining that the surface soils are not contaminated with PCBs when they actually are. This in turn, results in an increased risk to human health.	determining that the surface soils are contaminated with PCBs when they are not. This in turn, results in excavation of additional soils when it was not necessary and adds unnecessarily to cleanup costs.	Human Health Cancer Risk: 1E-5 to 1E-6 Represents the chance of getting cancer from ingestion of PCBs as: 1 person in 100 thousand or 1 person in one million, respectively	AL_{1E-6}: 0.2 mg/kg ENDFIELD AL_{1E-5}: 2 mg/kg; ENDFIELD AS is sufficient to support a cleanup goal of AL_{1E-6}, but AL_{1E-5} is tolerable, if site conditions dictate the need and is documented

Data Quality Objective	Sample Description	Null Hypothesis	Type I Error	Type II Error	Gray Region	Tolerable Limits
			Will Result in:	Will Result in:		
RA Monitoring	Personal (BZ) Air Monitoring	The BZ air is contaminated with LA above the worker safety action levels.	determining that the BZ air is not contaminated with LA above the worker safety action levels when it actually is. This in turn, results in and increased risk to workers performing removal actions.	determining that the BZ air is contaminated with LA above the worker safety action levels when it is not. This in turn, results in re-evaluating engineering controls, possibly stopping work, or increasing the level of PPE when it is not necessary and adds unnecessarily to cleanup costs.	NA	NA

Data Quality Objective	Sample Description	Null Hypothesis	Type I Error	Type II Error	Gray Region	Tolerable Limits
			Will Result in:	Will Result in:		
RA Monitoring	Perimeter Air Monitoring	The perimeter air is contaminated with LA.	determining that the perimeter air is not contaminated with LA when it actually is. This in turn, results in an increased risk to human health.	determining that the perimeter air is contaminated with LA when it is not. This in turn, results in re-evaluating engineering controls and possibly stopping work when it is not necessary, and adds unnecessarily to cleanup costs.	NA	NA
RA Confirmation	Asbestos in Soil Confirmation	The soils below an excavation are still contaminated with LA after removal.	determining that the surface soils at the bottom of the excavated area are not contaminated with LA when they actually are. This in turn, results in an increased risk to human health.	determining that the surface soils at the bottom of the excavated area are contaminated with LA when they are not. This in turn, results in excavation of additional soils when it was not necessary and adds unnecessarily to cleanup costs.	NA	NA

Data Quality Objective	Sample Description	Null Hypothesis	Type I Error	Type II Error	Gray Region	Tolerable Limits
			Will Result in:	Will Result in:		
RA Confirmation	PCBs in Soil Confirmation	The soils below an excavation are still contaminated with PCBs after removal.	determining that the surface soils at the bottom of the excavated area are not contaminated with PCBs when they actually are. This in turn, results in an increased risk to human health.	determining that the surface soils at the bottom of the excavated area are contaminated with PCBs when they are not. This in turn, results in excavation of additional soils when it was not necessary and adds unnecessarily to cleanup costs.	Human Health Cancer Risk: 1E-5 to 1E-6 Represents the chance of getting cancer from ingestion of PCBs as: 1 person in 100 thousand or 1 person in one million, respectively	AL_{1E-6}: 0.2 ppm ENDFIELD AL_{1E-5}: 2 ppm; ENDFIELD AS is sufficient to support a cleanup goal of AL_{1E-6}, but AL_{1E-5} is tolerable, if site conditions dictate the need and is documented

NA - Not Applicable
RA - Removal Action
PPE - Personal Protective Equipment
AL_{1E-6}: Action Level for PCBs in residential soils that corresponds to a risk of cancer as 1 person in one million.
AL_{1E-5}: Action Level for PCBs in residential soils that corresponds to a risk of cancer as 1 person in one hundred thousand.
AS - Analytical Sensitivity

A7: Optimize the Design for Obtaining Data

Using data previously generated for the site, the DQOs have been designed to support the proposed removal activities for the Flyway RAWP and represents the best possible project planning effort. However, in implementing the SAP, unforeseen situations may arise or team members may find more efficient means to carry out some of the day-to-day activities. Therefore, team members are always afforded the opportunity to recommend optimization the data gathering design. Recommendations must come through proper channels as described in Section and documented using either a modification form or and addendum to the RAWP. All modifications or addendums must be approved prior to making the proposed changes.