Operable Unit 5 Railroad Spur Investigation
Quality Assurance Project Plan
Libby Asbestos Site, Operable Unit 5
Libby, Montana

Revision 0

07/08/2014

Project Period 03/30/2014 to 03/29/2015
Contract No. W9128F-11-D-0023
Task Order No. 0007

Prepared for:

ENVIRONMENTAL PROTECTION AGENCY
Region VIII

Prepared under Libby Asbestos Interagency Agreement, Libby, MT (DW96954027) by:

U.S. Army Corps of Engineers
Omaha District
Rapid Response Program
Offutt AFB, Nebraska 68113

With technical assistance from:

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A. Project Management

A1. Title and Approval Sheet

Title: Operable Unit 5 Railroad Spur Investigation Quality Assurance Project Plan, Libby Asbestos Site, Operable Unit 5, Revision 0, 07/08/2014

Reviewed by: _____ Date: 7/8/14
Thomas E. Cook, PMP, CHMM
CDM Smith Project Manager

Reviewed by: _____ Date: 7/8/14
Terry Crowell, CHMM
CDM Smith Quality Assurance Manager

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Mary Darling, PMP
USACE Project Manager

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USACE, Quality Assurance Manager

Approved by: _____ Date: 7/9/14
Dania Zinner
EPA Region VIII Operable Unit 5 Remedial Project Manager

Approved by: _____ Date: 7/9/14
Rebecca Thomas
EPA Region VIII Libby Asbestos Project Team Leader

Approved by: _____ Date: 7/11/14
David Berry
EPA Region VIII Quality Assurance Reviewer

A2. Table of Contents

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Acronyms and Abbreviations

%	percent
A&E	architect and engineering contractor
ACM	Asbestos containing material
AHERA	Asbestos Hazard Emergency Response Act
APP	Accident Prevention Plan
AS	analytical sensitivity
ASTM	American Society for Testing and Materials
CAR	corrective action request
CB&I	CB&I Federal Services
CDM Smith	CDM Federal Programs Corporation
COC	chain-of-custody
CFR	Code of Federal Regulations
DEQ	Montana Department of Environmental Quality
DQOs	data quality objectives
EDD	electronic data deliverable
EDS	energy dispersive spectroscopy
EPA	U.S. Environmental Protection Agency
ERT	EPA Environmental Response Team
ESAT	EPA Environmental Services Assistance Team
f/cc	fibers per cubic centimeter
FPM	field planning meeting
FSDS	field sample data sheet
FTL	Field Team Leader
GIS	geographic information system
GPS	global positioning system
H&S	health and safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
ID	identifier
IDW	investigation-derived waste
LA	Libby Amphibole asbestos
LADT	Libby Asbestos Data Tool
LC	Laboratory Coordinator
N	number
NA	not applicable
ND	none detected
NFG	National Functional Guidelines
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
OU	operable unit
PE	performance evaluation
PLM	polarized light microscopy
PLM-Grav	polarized light microscopy – gravimetric
PLM-VE	polarized light microscopy – visual area estimation

PPE	personal protective equipment
QA	quality assurance
QAM	Quality Assurance Manager
QAPP	quality assurance project plan
QATS	Quality Assurance Technical Support
QC	quality control
ROD	record of decision
ROM	Record of Modification
RPM	Remedial Project Manager
s/cm^2	structures per square centimeter
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure
SPF	sample preparation facility
TEM	transmission electron microscopy
TR	Trace (<0.2% by PLM-VE)
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VRP	Voluntary Recruitment Program
Weston	Weston Solutions, Inc.

A3. Distribution List

Copies of this completed and signed quality assurance project plan (QAPP) will be distributed to:

U.S. Environmental Protection Agency, Region VIII
1595 Wynkoop Street
Denver, Colorado 80202-1129

- Rebecca Thomas, Thomas.Rebecca@epa.gov (electronic copy)
- Dania Zinner, Dania.Zinner@epa.gov (electronic copy)

EPA Information Center
108 East 9th Street
Libby, Montana 59923

- Mike Cirian, Cirian.Mike@epa.gov (1 hard copy, electronic copy)

U.S. Army Corps of Engineers, Omaha District
Attn: CENWO-PM-S
1616 Capitol Avenue
Omaha, Nebraska 68102-4901

- Mary Darling, Mary.N.Darling@usace.army.mil (electronic copy)
- Jeff Hubbard, Jeffrey.W.Hubbard@usace.army.mil (electronic copy)
- Jeremy Ayala, Jeremy.A.Ayala@usace.army.mil (electronic copy)
- Brian Broekemeier, Brian.J.Broekemeier@usace.army.mil (electronic copy)
- David Ray, David.P.Ray@usace.army.mil (electronic copy)
- Molly Maxwell, Molly.C.Maxwell@usace.army.mil (electronic copy)

Montana Department of Environmental Quality
1100 North Last Chance Gulch
Helena, Montana 59601

- Carolyn Rutland, CRutland@mt.gov (electronic copy)

TechLaw, Inc.
ESAT, Region VIII
16194 West 45th Drive
Golden, Colorado 80403

- Doug Kent, Kent.Doug@epa.gov (electronic copy)

CDM Smith, Libby Project Office
60 Port Boulevard, Suite 201
Libby, Montana 59923

- Thomas Cook, cookTE@cdmsmith.com (1 hard copy, electronic copy)
- Scott Felton, feltonDS@cdmsmith.com (1 hard copy, electronic copy)
- Dominic Pisciotta, pisciottadm@cdmsmith.com (3 hard copies, electronic copy)
- Terry Crowell, crowellTL@cdmsmith.com (1 hard copy, electronic copy)

Copies of the QAPP will be distributed to the individuals above by the architect and engineering contractor (A&E) (CDM Federal Programs Corporation [CDM Smith]), either in hard copy or in electronic format (as indicated above). The A&E's Project Manager (or their designee) will distribute updated copies each time a QAPP revision occurs. An electronic copy of the final, signed QAPP (and subsequent revisions) will also be posted to the Libby Field eRoom.

A4. Project Task Organization

Figure A-1 presents an organizational chart that shows lines of authority and reporting responsibilities for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, technical support, and quality assurance (QA) for this project.

A4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within the Libby Asbestos Superfund Site (Site). The EPA Region 8 Libby Asbestos Project Team Leader is Rebecca Thomas. The EPA Remedial Project Manager (RPM) for Operable Unit (OU) 5 is Dania Zinner. The EPA Region 8 Onsite RPM and Field Team Leader (FTL) for the Site is Mike Cirian.

The U.S. Army Corps of Engineers (USACE), Omaha District, is the contracting agency for investigation activities at the Site, on behalf of the EPA. The USACE has an interagency agreement number with the EPA, number DW96954027, through which the USACE investigation work will be performed. Investigation activities will be performed by the A&E (CDM Smith) under contract to the USACE for Architect-Engineering and Surveying Services (Contract Number W9128F-11-D-0023, Task Order 0007) for ongoing response action support to the EPA Region 8. USACE's Project Manager and Contracting Officer Representative (COR) is Mary Darling.

The Montana Department of Environmental Quality (DEQ) is the support regulatory agency for Superfund activities at the Site. The DEQ Project Manager for these activities is Carolyn Rutland. The EPA will consult with DEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act, the National Contingency Plan, and applicable guidance in conducting Superfund activities.

A4.2 Technical Support

A4.2.1 QAPP Development

This QAPP was developed by the A&E at the direction of, and with oversight by, USACE and the EPA. This QAPP contains the required QAPP elements and has been developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA

2001), *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5* (EPA 2002), and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006).

Copies of the QAPP will be distributed by the A&E's Project Manager (or their designee), either in hard copy or in electronic format, as indicated in Section A3. The A&E's Project Manager (or their designee) will distribute updated copies each time a QAPP revision occurs. An electronic copy of the final, signed QAPP (and subsequent revisions) will also be posted to the Libby Field eRoom.

A4.2.2 Field Sampling Activities

The A&E will be responsible for conducting all field investigation activities described in this QAPP. Key A&E personnel that will be involved in this investigation program include:

- Thomas Cook, Project Manager
- Scott Felton, Project Engineer
- Dominic Pisciotta, Task/Field Team Leader
- Tracy Dodge, Sample Coordinator
- Scott Miller, Field Data Manager
- Terry Crowell, Quality Assurance Manager
- Damon Repine, Health and Safety (H&S) Manager

A4.2.3 Asbestos Analysis

All samples collected as part of this project will be sent for preparation and analysis for asbestos at laboratories selected and approved by the EPA to support the Site. The EPA Environmental Services Assistance Team (ESAT) is responsible for procuring all sample preparation facility (SPF) and analytical laboratory services and providing direction to the entities providing these services. Don Goodrich (EPA Region 8) is responsible for managing the ESAT laboratory support contract for asbestos. The ESAT Region 8 Team Manager at TechLaw, Inc. is Mark McDaniel. He is also the designated laboratory coordinator (LC) for the Libby project that is responsible for directing the analytical laboratories, prioritizing analysis needs, and managing laboratory capacity.

A4.2.4 Data Management

The project data management processes and reporting requirements, and related contractor responsibilities, are described in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013). This document is managed by the EPA Data Manager and can be found in both

the Libby Field (https://team.cdm.com/eRoom/R8-RAC/Libby/0_aea4) and Lab eRooms (https://team.cdm.com/eRoom/mt/LibbyLab/0_bf6e). Terry Crowell is the CDM Smith eRoom coordinator responsible for managing user accounts; eRoom accounts may be requested via email at CrowellTL@cdmsmith.com.

All sample and location data generated as part of this QAPP will be managed and maintained in Scribe. The EPA Environmental Response Team (ERT) is responsible for the administration of all Scribe data management aspects of this project. Joseph Schafer is responsible for overseeing the ERT data management support contract. ERT is responsible for the development and management of Scribe and the project-specific data reporting requirements for the Libby project.

CDM Smith's Field Data Manager, Scott Miller, is responsible for overseeing the upload of sample and location information to the field Scribe project database.

ESAT is responsible for uploading new analytical results to the analytical Scribe project database. The ESAT Project Data Manager for the Libby project is Janelle Lohman (TechLaw, Inc.).

In addition to sample and location data, OU5 property information (e.g., addresses, property identifiers [IDs], geounit IDs, contacts, access and property statuses) will be managed in EPA's Response Manager database. Weston Solutions, Inc. (Weston) is responsible for administering the Response Manager database, and Brad Morgan is Weston's Response Manager Administrator.

Because of the quantity and complexity of the data collected at the Site, the EPA has designated a Libby Data Manager to manage and oversee the various data support contractors. The EPA Region 8 Data Manager for the Libby project is Jeff Mosal.

A4.3 Quality Assurance

There is no individual designated as the EPA Quality Assurance Manager (QAM) for the Libby project. Rather, the Region 8 QA program has delegated authority to the EPA RPMs. This means that the EPA RPMs have the ability to review and approve governing documents developed by Site contractors. Thus, it is the responsibility of the EPA RPM or their designee for this sampling effort, David Berry, to ensure that this QAPP has been prepared in accordance with the EPA QA guidelines and requirements. David Berry is independent of the entities planning and obtaining the data described in this QAPP.

For this project, the EPA is supported by the Quality Assurance Technical Support (QATS) contractor, CB&I Federal Services (CB&I). The QATS contractor will evaluate and monitor laboratory QA and quality control (QC) activities and is responsible for performing annual audits of each analytical laboratory. CB&I's QAM for this project is Michael Lenkauskas.

As the project lead on behalf of the EPA, USACE is responsible for overall QA of this investigation program. This includes involvement of USACE QA management and staff, which includes senior-level members that perform duties as QA representatives for the project. These

QA representatives are independent of the USACE project team that manage and execute the work (including data collection and use). They are responsible for assuring work is performed in conformance with the QA program and project-specific requirements. The USACE QAM monitors quality through the assigned onsite personnel listed below. If significant issues are encountered, the QAM has stop work authority via the USACE COR, Mary Darling. It is anticipated that David Ray will serve as the USACE QAM for this investigation effort; however, other staff may ultimately be identified to fill this role. The USACE will notify the EPA of changes in project QA staff.

USACE rotates several personnel to Libby to maintain an onsite presence. Collectively, the onsite personnel are responsible for oversight, coordination of project work/scope objectives, and contract administration. USACE onsite personnel report to the USACE Project Manager. The following onsite USACE personnel will maintain QA oversight of this investigation program:

- Jeremy Ayala, Project Engineer
- Jeff Hubbard, Backup Project Engineer
- Brian Broekemeier, Onsite QAM and Construction Control Representative

CDM Smith's QA Director, Jo Nell Mullins, implements the CDM Smith QA program. She is independent of project technical staff and reports directly to Gwen Baker, the Federal Services Group President on QA matters. The QA Director has the authority to objectively review projects and identify problems, and the authority to use corporate resources, as necessary, to resolve any quality-related problems. CDM Smith's QAM for this project, Terry Crowell, reports to Ms. Mullins on QA matters. Under Ms. Mullin's oversight, Ms. Crowell is responsible for monitoring and evaluating field quality assurance/quality control (QA/QC), providing oversight of field sampling and data collection activities, and coordinating field QA activities, including identifying qualified, independent staff to conduct assessments of field activities (see Section B5.1.4).

A5. Problem Definition/Background

A5.1 Site Background

Libby is a community in northwestern Montana located 7 miles southwest of a vermiculite mine that operated from the 1920s until 1990. The mine began limited operations in the 1920s and was operated on a larger scale by W.R. Grace and Company from approximately 1963 to 1990. Studies revealed that the vermiculite from the mine contains amphibole-type asbestos, referred to as Libby Amphibole asbestos (LA).

Epidemiological studies revealed that workers at the mine had an increased risk of developing asbestos-related lung disease (McDonald *et al.* 1986, Amandus *et al.* 1987, Amandus and Wheeler 1987, Sullivan 2007; Larson *et al.* 2010, 2012a, 2012b). Additionally, radiographic abnormalities were observed in 17.8 percent (%) of the general population of Libby including

former workers, family members of workers, and individuals with no specific pathway of exposure (Peipins *et al.* 2003). Although the mine has ceased operations, historic or continuing releases of LA from mine-related materials could be serving as a source of on-going exposure and risk to current and future residents and workers in the area. The Site was listed on the National Priorities List in October 2002.

A5.2 Reasons for this Project

Previous investigations conducted at the Site have demonstrated that LA is present in soil from source materials (e.g., vermiculite-containing soils, mine wastes) at OU5. OU5 is defined as all properties which were part of the former Stimson Lumber Mill and are now owned and managed by the Lincoln County Port Authority. As a result, individuals may be exposed to LA that is released to air during source disturbance activities. These inhalation exposures may pose a risk of cancer and/or non-cancer effects. Due to plans for property owners of OU5 to conduct upgrades of existing railroad spurs, the need exists to characterize the extent of contamination along the proposed path of new and existing railroad spurs.

The objectives of this Investigation are twofold:

1. Collect data to confirm the presence/absence of LA along selected railroad spurs within OU5 as directed by the EPA and USACE.

2. Collect data to evaluate the extent of LA contamination along selected railroad spurs within OU5 as directed by the EPA and USACE.

A5.3 Applicable Criteria and Action Limits

At the Site, the EPA has developed action levels and cleanup criteria for LA that are applicable to removal actions performed at residential/commercial properties. These are documented in *Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria Technical Memorandum* (EPA 2003) and its amendments (EPA 2011 and 2014). However, these criteria are not applicable to locations outside of the Site. In addition, final action levels for the Site will not be developed until completion of the remedial investigation/feasibility study and the publication of the record of decision (ROD). Decision rules for specific criteria or action levels that apply to this investigation program are provided in **Table A-3** of **Appendix A**. During review of investigation data, the FTL, or designee, will refer to and apply the action levels provided in **Appendix A**.

Personal air monitoring of sampling personnel will be performed in accordance with Occupational Safety and Health Administration (OSHA) requirements, as specified in the Site-specific Accident Prevention Plan (APP) (CDM Smith 2013) and the *Response Action QAPP* (CDM Smith 2014). In accordance with these requirements, samples will be analyzed for asbestos by phase contrast microscopy and compared to the OSHA limits for workplace exposures. The short-term (30-minute) exposure limit is 1.0 fiber per cubic centimeter of air (f/cc), and the long-term time-weighted average exposure limit is 0.1 f/cc.

A6. Project/Task Description

A6.1 Task Summary

Basic tasks that are required to implement this QAPP include the collection of soil samples along designated existing railroad spurs and proposed railroad spur upgrade locations. Specific sampling tasks are described in greater detail in Section B.2. It is anticipated that sampling tasks will occur along a 2,600 linear feet of railroad line within OU5 (see **Figure B-3**).

Decisions regarding removal will be guided by the *Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria Technical Memorandum* (EPA 2003) and its amendments (EPA 2011 and 2014); *Libby Asbestos Superfund Site Response Action Work Plan* (PRI-ER 2014) and supported by the data gathered in accordance with this QAPP.

A6.2 Work Schedule

CDM Smith's current task order period of performance with the USACE extends from March 30, 2014 through March 29, 2015. The work schedule for performing tasks associated with this QAPP begins with collection of soil samples from locations identified for this investigation. It is anticipated that this task will occur during the summer of 2014. Sample analysis and data evaluation and interpretation tasks will be performed immediately following sample collection.

A6.3 Locations to be Evaluated

Location selection for the collection of soil samples is described in Section B1.1.

A6.4 Resources and Time Constraints

Investigation activities associated with this QAPP may be conducted year-round; however, outdoor field work is limited by weather conditions. Railroad spur upgrades are expected to begin in 2015. To meet the anticipated schedule of railroad upgrades by the property owner, sample collection, analysis, data evaluation and interpretation, and necessary removal should be done prior to beginning Railroad spur upgrades.

A7. Quality Objectives and Criteria

A7.1 Data Quality Objectives

Data quality objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The design of a study is closely tied to the DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and types of analyses to be performed. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a field investigation program will be adequate to support reliable Site-specific decision-making (EPA

2001, 2006).

Appendix A provides the detailed implementation of the seven-step DQO process associated with this QAPP.

A7.2 Performance Criteria

The primary goal of this QAPP is to provide data for the purposes of evaluating the extent of LA contamination at the selected locations of railroad spur within OU5. Therefore the performance criteria and analytical requirements are based on the requirements specified in the *Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria Technical Memorandum* (EPA 2003) and its amendments (EPA 2011 and 2014). These requirements are specified as part of the DQOs (see **Appendix A**). The analytical requirements for LA measurements established in Section B4 provide that results from this study will be directly comparable to results from historical and planned future sampling efforts.

A7.3 Precision

The precision of asbestos measurements is determined mainly by the number (N) of asbestos structures counted in each sample. The coefficient of variation resulting from random Poisson counting error is equal to $1/N^{0.5}$. In general, when good precision is needed, it is desirable to count a minimum of 3-10 structures per sample, with counts of 20-25 structures per sample being optimal.

For soil samples, field duplicates for soil sampling activities will be collected (see Section B2.4). Analysis of these field duplicates will provide a measure of the precision of the sampling and analysis process.

A7.4 Bias and Representativeness

To the extent feasible, samples will be collected and analyzed in accordance with the procedures set forth in this QAPP, which are consistent with previous sampling efforts of soil. This will ensure that results of this study are representative and appropriate for comparison to other data sets.

A7.5 Completeness

Target completeness for this project is 100%. That is, 100% of samples collected are expected to be analyzed. If any samples are not analyzed, or if LA analysis is not completed successfully, this could result in incomplete property characterization. In this event, additional sampling may be needed to support EPA decision-making.

A7.6 Comparability

The data generated during this investigation will be obtained using standard or project-specific

analytical methods for LA that have been utilized previously in other studies, and will yield data that are comparable to previous analyses of LA in soil samples.

A7.7 Method Sensitivity

The method sensitivity (analytical sensitivity) needed for LA analysis of each medium is discussed in Section B4.

A8. Special Training/Certifications

A8.1 Field

Asbestos is a hazardous substance that can increase the risk of cancer and serious non-cancer effects in people who are exposed by inhalation. Therefore, all individuals involved in the collection, packaging, and shipment of samples must have appropriate training. Prior to starting field work, field team members must complete the following, at a minimum:

Training Requirement	Documentation Specifying Training Requirement Completion
Read and understand the governing APP (CDM Smith 2013)	APP signature sheet
Attend an orientation session with the field H&S Manager	Orientation session attendance sheet
Complete OSHA 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8-hour refreshers	OSHA training certificates
Hold current 40-hour HAZWOPER medical clearance	Physician letter in the field personnel files
Complete respiratory protection training, as required by 29 Code of Federal Regulations (CFR) 1910.134	Training certificate
Complete asbestos awareness training, as required by 29 CFR 1910.1001	Training certificate

H&S-related training documentation will be stored in the A&E's Libby project office. It is the responsibility of the field H&S Manager to keep H&S-related training documentation up-to-date and on file for each field team member.

Prior to beginning field sampling activities, a field planning meeting will be conducted to discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- QA/QC requirements
- H&S requirements

It is the responsibility of each field team member to review and understand applicable governing documents associated with this investigation program, including this QAPP, associated standard operating procedures (SOPs) (see **Appendix B**), and the applicable APP.

A8.2 Laboratory

A8.2.1 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Each laboratory is accredited by the National Institute of Standards and Technology (NIST)/National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of airborne asbestos by transmission electron microscope (TEM) and/or analysis of bulk asbestos by polarized light microscopy (PLM). This includes the analysis of NIST/NVLAP standard reference materials, or other verified quantitative standards, and successful participation in two proficiency rounds per year each of bulk asbestos by PLM and airborne asbestos by TEM supplied by NIST/NVLAP.

Copies of recent proficiency examinations from NVLAP or an equivalent program are maintained by each participating analytical laboratory. Many of the laboratories also maintain certifications from other state and local agencies. Copies of all proficiency examinations and certifications are also maintained by the LC.

Each laboratory working on the Libby project is also required to pass an onsite EPA laboratory audit. The details of this EPA audit are discussed in Section B5.3.3. The LC also reserves the right to conduct additional investigations deemed necessary to determine the ability of each laboratory to perform the work. Each laboratory also maintains appropriate certifications from the state and possibly other certifying bodies for methods and parameters that may also be of interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

A8.2.2 Laboratory Team Training/Mentoring Program

<u>Initial Mentoring</u>

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The training program includes a rigorous 2-3 day period of on-site training provided by senior personnel from those laboratories already under contract on the Libby project, with oversight by the QATS contractor. The tutorial process includes a review of morphological, optical, chemical, and electron diffraction characteristics of LA, as well as training on project-specific analytical methodology, documentation, and administrative procedures used on the Site. The mentor will also review

the analysis of at least one sample by each type of analytical method with the trainee laboratory.

Site-specific Reference Materials

Because LA is not a common form of asbestos, United States Geological Survey (USGS) has also prepared site-specific reference materials of LA in soil for use during PLM visual area estimation method (PLM-VE) analysis (EPA 2008). These reference materials were prepared by adding aliquots of LA spiking material to uncontaminated Libby soils to obtain nominal LA concentrations of approximately 0.2%, 0.5%, 1.0%, and 2.0% (by weight). Each laboratory was provided with samples of these reference materials for use in training PLM analysts in the visual area estimation of LA levels in soil. In addition, aliquots of these reference materials (as well as other spiked soils) are also utilized as PE standards to evaluate PLM laboratory accuracy.

Regular Technical Discussions

On-going training and communication is an essential component of QA for the Libby project. To ensure that all laboratories are aware of technical or procedural issues that may arise, a regular teleconference is held between the EPA, their contractors, and each of the participating laboratories. Other experts (e.g., USGS) are invited to participate when needed. These calls cover aspects of the analytical process, including sample flow, information processing, technical issues, analytical method procedures and development, documentation issues, project-specific laboratory modifications, and pertinent asbestos publications.

Professional/Technical Meetings

Another important aspect of laboratory team training has been the participation in technical conferences. The Libby laboratory team has convened on multiple occasions at the ASTM Johnson Conferences in Vermont and at the ASTM Michael E. Beard Asbestos Conferences. These conferences enable the Libby laboratory and technical team members to have an ongoing exchange of information regarding all analytical and technical aspects of the project, including the benefits of learning about developments by others.

A8.2.3 Analyst Training

All PLM analysts for the Libby project are expected to be familiar with routine chemical laboratory procedures, principles of optical mineralogy, and proficient in EPA Method 600/R-93/116, NIOSH Method 9002, CARB Method 435, and Site-specific SOPs SRC-LIBBY-01 and SRC-LIBBY-03. Analysts with less than one year of experience specific to the Libby project are required to participate in the laboratory mentoring program to obtain additional guidance and instruction. This training is provided by the laboratory managers and/or senior PLM analysts that are familiar with the types of asbestos and analytical challenges encountered at the Site. Before performing any Site analyses, the analyst must demonstrate the ability to generate acceptable accuracy and precision for the LA-specific reference materials.

Satisfactory completion of each of these training tasks must be approved by a senior PLM analyst. A training checklist or logbook is used to ensure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all analysts have completed the required training requirements.

A9. Documentation and Records

A9.1 Field

Field documentation will be collected and stored in order to meet project data reporting requirements, as specified in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013). Field teams will record information using prescribed electronic technology/systems (e.g., Response Manager), or hard copy forms, as appropriate. Hard copy field documentation will be maintained and archived at the A&E's project office in Libby, MT. Field documentation is discussed in detail in Section B3.1. Field data management, including publishing data to Scribe, is discussed in detail in Section B10.1.

A9.2 Troy Sample Preparation Facility

Prior to asbestos analysis, investigation soil samples are prepared (dried, sieved, ground) at the Sample Preparation Facility (SPF) in Troy, MT. Troy SPF documentation will be prepared and stored in accordance with project data reporting requirements, as specified in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013). Troy SPF personnel will record information using available electronic technology/systems, or hard copy forms, as appropriate, and publish required data to Scribe. All log sheets are maintained and archived at the Troy SPF. Scanned copies of log sheets are maintained on the ESAT network drive. These scanned copies are also emailed to the appropriate project Data Manager. Troy SPF data management is discussed in detail in Section B10.2.

A9.3 Laboratory

Analytical laboratory documentation will be prepared and stored in order to meet project data reporting requirements, as specified in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013). All asbestos analytical (including preparation) data generated in the laboratory will be documented on Site-specific laboratory bench sheets and entered into a database or spreadsheet electronic data deliverable (EDD) for submittal to the ESAT Project Data Manager. Section B4.2 provides detailed information on the requirements for laboratory documentation and records. Laboratory data management is discussed in detail in Section B10.3.

A9.4 Logbooks and Records of Modification

It is the responsibility of field, Troy SPF, and analytical laboratory staff to maintain logbooks

and other internal records throughout the sample lifespan as a record of sample handling procedures. Significant deviations (i.e., those that impact or have the potential to impact investigation objectives) from this QAPP, or procedures referenced herein governing sample handling, will be discussed with the EPA RPMs (or their designee) and the A&E's Project Manager prior to implementation. Such deviations will be recorded on a Record of Modification (ROM) form[1]. Sections B5.1.3, B5.2.2, and B5.3.2 provide detailed information on the procedures for preparing and submitting ROMs by field, Troy SPF, and analytical laboratory personnel, respectively.

A9.5 QAPP Revision

As described in Sections A9.4, B5.1.3, B5.2.2, and B5.3.2, ROM forms will be used to document significant deviations from, or changes to, this QAPP. At the discretion of USACE in consultation with the EPA, substantive changes may require a QAPP revision instead of a ROM form. USACE and EPA approval of ROM forms is required prior to implementation. Approved ROM forms will be provided to all personnel on the distribution list in Section A3.

[1] The current version of the field ROM form is provided in the Libby Field eRoom; current versions of the Troy SPF and laboratory ROM forms are provided in the Libby Lab eRoom.

B1. Study Design

B1.1 Locations

Figure B-1 identifies the location of the Site. **Figure B-2** identifies the OU boundaries for the Site. **Figure B-3** identifies the location of the railroad spur within OU5 where sampling activities will be conducted.

B1.2 Sampling Design

Detailed information on investigation procedures and methods are presented in Section B2.

As previously mentioned, this investigation is designed to characterize specific sections of railroad spurs within OU5 for the presence of LA or LA source materials and evaluate the extent of LA contamination.

B1.3 Study Variables

Asbestos concentrations in soil can be heterogeneous; therefore, it is important that soil sampling methods provide an even and representative coverage of the entire sample area along the railroad spur. In addition, current plans for reconstruction of the railroad spur indicate excavation of soils up to three feet below ground surface. To accomplish the goal of characterizing the railroad spur area, each sample will be a comprised of 30-point composites. Each sampling point will be equally spaced such that the 30 sub-sampling points cover the entire sampling area. Additionally, samples will be collected at two separate depths (0-18 inches, 18-36 inches) within each area. Soil from each respective depth range will be composited into one sample. Details regarding sample collection are discussed further in section B2.3

B1.4 Critical Measurements

The primary goal of this project is to evaluate the nature and extent of LA along selected routes of railroad spurs within OU5 to determine response actions needed as part of railroad spur reconstruction. This will be accomplished by sampling for LA in soil.

The analysis of LA may be achieved using several different types of methods. For this investigation effort, all soil samples (including field duplicate samples) will be analyzed for asbestos by the PLM-VE and the PLM gravimetric method (PLM-Grav) in accordance with project-specific SOPs SRC-LIBBY-03 and SRC-LIBBY-01, respectively[2]. To date, these methods have proven to be the most appropriate analytical methods to screen and quantify asbestos in Site source materials.

B1.5 Data Reduction and Interpretation

[2] The current version of each project-specific analysis SOP is provided in the Libby Lab eRoom.

Data collected as part of this investigation are intended to be used to support remedial investigation removal decisions at the site of the investigation. See Section B5.1.2 for information regarding the evaluation of data collected under this QAPP as it relates to the DQOs in **Appendix A**.

B2. Sampling Methods

This section summarizes field activities that will be performed in support this investigation. This section also provides brief summaries of SOPs, including investigation-specific modifications where applicable and investigation-specific details not discussed in the SOPs. As previously mentioned, this investigation is designed to evaluate the nature and extent of LA along selected routes of railroad spurs within OU5 to support subsequent removal decisions.

For comprehensive H&S information, field personnel will refer to the SOPs included in **Appendix B**. H&S protocol for this investigation is provided in the APP (CDM Smith 2013).

Sampling activities will be performed in accordance with this QAPP. The specific procedures that will be employed during this investigation are located in **Appendix B** and listed below:

- Field Logbook Content and Control (SOP EPA-LIBBY-2012-01)
- Photographic Documentation of Field Activities (SOP EPA-LIBBY-2012-02)
- Control of Measurement and Test Equipment (SOP EPA-LIBBY-2012-03)
- Field Equipment Decontamination (SOP EPA-LIBBY-2012-04)
- Handling Investigation-derived Waste (IDW) (SOP EPA-LIBBY-2012-05)
- Sample Custody (SOP EPA-LIBBY-2012-06)
- Packaging and Shipping Environmental Samples (SOP EPA-LIBBY-2012-07)
- Completion of Field Sample Data Sheets (SOP CDM-LIBBY-03)
- Soil Sample Collection at Residential and Commercial Properties (CDM-LIBBY-05)
- Semi-quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties (CDM-LIBBY-06)
- Global Positioning System (GPS) Coordinate Collection and File Transfer Process (SOP CDM-LIBBY-09)
- Libby Chain of Custody Documentation (SOP ER8-LIBBY-01)

The following sections summarize field activities that will be performed during the implementation of the investigation efforts described in this QAPP.

Analytical methods for all samples collected in accordance with this QAPP are discussed in Section B.4.

B2.1 Field Preparation

B2.1.1 Field Team Training

Prior to conducting field activities, field team members must complete the following, at a minimum:

- Read the Site-specific APP (CDM Smith 2013)
- Attend an orientation session with A&E's onsite H&S officer
- Read and understand all relevant governing documents
- Attain OSHA 40-hour HAZWOPER certification and relevant 8-hour refresher course certifications
- Attain respiratory protection course certification as required by 29 CFR 1910.134
- Attain asbestos awareness course certification as required by 29 CFR 1910.1001
- Complete training on sample collection techniques to the satisfaction of the FTL
- Complete training on identifying vermiculite and Libby mine-related materials to the satisfaction of the FTL

Documentation of trainings/certifications will be stored in the Libby project files located at the A&E's Libby project office.

B2.1.2 Field Planning Meeting (Readiness Review)

Prior to beginning field activities, a field planning meeting (FPM) will be conducted by the A&E's FTL, which will be attended by the field team members conducting the work, a member of the A&E's QA staff, and a member of the A&E's H&S staff. The agenda, prepared by the FTL, will be reviewed and approved by QA and H&S staff prior to the FPM. The FPM will briefly address and clarify:

- Documents governing fieldwork that must be in the field
- Changes in the governing documents
- Objectives and scope of the fieldwork
- Equipment and training needs

- Field operating procedures, schedule of events, and individual assignments
- Required QC measures
- H&S requirements

During the FPM, copies of the agenda will be distributed and an attendance list will be circulated for signature. The agenda and the completed attendance list will be maintained in the A&E's project files. Additional meetings will be held if major changes to the documents governing fieldwork occur, or the scope of the assignment changes significantly.

Field team members will perform the following activities before and during field activities, as applicable:

- Review and understand applicable governing documents
- Record appropriate levels of documentation regarding activities conducted
- Ensure coordination between key staff, such as the A&E's sample coordinator and the project's removal contractor
- Obtain required sample containers and other supplies
- Obtain, check, and calibrate field sampling equipment
- Obtain and maintain personal protective equipment (PPE)

B2.1.3 Inventory and Procurement of Equipment and Supplies

An inventory of project-procured equipment and supplies will be conducted by the FTL prior to field work. Any additional required equipment or supplies will be procured. Acceptance of equipment, as pertinent, will be verified according to SOP EPA-LIBBY-2012-03, Control and Measurement and Test Equipment (see **Appendix B**). The following equipment is required for sampling activities conducted under this QAPP:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card, as appropriate
- Sample paperwork and sample labels
- Custody seals
- Plastic zip-top bags
- Soil sampling equipment

- GPS unit(s) (e.g., Trimble® GeoXT or equivalent)
- PPE as required by the Site-specific APP (CDM Smith 2013)
- Measuring wheel/tape
- Land survey and/or aerial photo

B2.3 Sample Collection

This section describes the sampling methods and procedures that will be used to complete this investigation.

B2.3.1 Soil Sampling

Sample Collection Methods

All soil samples will be collected in general accordance with SOP CDM-LIBBY-05 (see **Appendix B**) with the following exceptions:

- A Mini-excavator will be used to excavate five test pits within each sample area. Samples will be collected from sample areas equaling approximately 100 feet in length and 20 feet in width (2,000 square feet) along selected areas of the railroad spur as shown in **Figure B-3**. Test pits will be equally distributed across the sample area as to ensure the sample is representative of the entire sample area (i.e., two test pits on each side of railroad track and one in the middle of track, if capable of doing so). Excavated soil from each of the five test pits will be segregated into two separate stockpiles, each comprised of different depths (i.e., one sample stockpile from 0-18 inches, one sample stockpile from 18-36 inches). The sample areas will be marked prior to sampling using a visual indicator (i.e., pin flags, marker paint, marking stakes) by CDM Smith in coordination with the OU5 property manager.
- Two 30-point composite samples will be collected from each sample area (six sample point aliquots from each sample stockpile). Each aliquot will be collected from different random areas within the sample stockpile to ensure the sample is representative of the entire soil matrix of the soil stockpile.
- The sampler will fill a zip-top plastic bag approximately a quarter full (750-1,000 grams of material). Soil from each aliquot will be homogenized with its respective sample depth (i.e., 0-18 inches, 18-36 inches).

It is anticipated that the length of railroad spur to be sampled is approximately 2600 feet, this equals to an estimated 52 samples (26 samples in 0-18 inch depth range and 26 samples from 18-36 inch depth). This estimate does not include field QC samples, which are set at a frequency of 1 per 20 and discussed in Section B2.4.

B2.4 Field Quality Control Samples

Field QC samples associated with soil samples are field duplicates. These samples are discussed in this section and summarized in **Table B-1**.

Field duplicate samples will be collected at a rate of 1 per 20 field samples collected. Soil field duplicate samples will be collected from areas where a soil field sample has been collected. However, individual composite points for the soil field duplicate sample will be collected from different locations within the same field sample area, thus the field duplicate will reflect the representativeness of the sampling approach. There is currently no acceptance criteria established for soil field duplicates. Field duplicate sample results may be used preferentially to the field sample results (for the same area) for decision making. Additionally, laboratory QC sample results may also be used preferentially to the field sample results for decision making. The FTL or designee is responsible for maintaining soil field duplicate sample collection frequencies.

Table B-1 Summary of Field QC Samples

Sample Type	Associated QC Sample	Collection Frequency	Analysis Frequency	Analysis Request
Soil	field duplicate	1 per 20 field samples	100%	PLM-VE/PLM-Grav

PLM-Grav – polarized light microscopy gravimetric method

PLM-VE – polarized light microscopy visual area estimation method

B2.5 General Processes

This section describes the general field processes that will be used to support the sampling described in this QAPP and includes references to the Site-specific SOPs and project-specific procedures when applicable.

B2.5.1 Equipment Decontamination

Decontamination of reusable field equipment will be conducted in accordance with SOP EPA-LIBBY-2012-04, *Field Equipment Decontamination* (see **Appendix B**) with the following exceptions:

- The bucket of the mini excavator utilized for excavating test pits will be decontaminated prior to collection of each 30-point composite sample (e.g., each 2,000 square foot sample area). A pressurized water system will be utilized to decontaminate the excavator bucket with water being dissipated on the ground where the samples are collected.
- Brushing is only required if visible soil remains after rinsing equipment.
- Air drying decontaminated equipment is not required prior to use.

Materials used in the decontamination process will be disposed of as IDW as described below. Re-usable sampling equipment will be rinsed before and after sample collection (not between

each aliquot) and is not required to be wrapped in plastic or foil between uses.

B2.5.2 Investigation-derived Waste

IDW at each property will consist of excess sample volume, spent decontamination supplies, and PPE. All IDW will be handled in accordance with SOP EPA-LIBBY-2012-05, *Handling Investigation-derived Waste* (see **Appendix B**). In brief, IDW will be double-bagged in clear 6-mil poly bags with 'IDW' written in indelible ink on the outer bag. All IDW generated during this investigation will remain in the custody of the field team, or locked in a storage area, until it can be entered into the waste stream at the local class IV asbestos landfill.

B3. Samples and Locations

B3.1 Field Documentation

In accordance with EPA project records retention requirements, all hard copy and electronic field documentation generated by the A&E as part of this investigation will be retained at the A&E Libby project office until relinquished to the EPA.

B3.1.1 Field Sample Data Sheets

A field sample data sheet (FSDS) will be completed for each soil sample and in accordance with SOP CDM-LIBBY-03, *Completion of Field Sample Data Sheets* (see **Appendix B**) with the following clarification:

Use of standardized forms ensures consistent documentation across samplers. Current versions of media-specific FSDSs are provided in the Libby Field eRoom. FSDSs are location-specific and allow for the entry of up to three individual samples from the same property on the same FSDS form. If columns are left incomplete due to fewer than three samples being recorded on a sheet, the blank columns will be crossed out, dated, and signed by the field team member completing the FSDS. Erroneous information recorded on a hard copy FSDS will be corrected with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

An event ID will be recorded on each FSDS to identify the protocol used for the inspection(s) or sample(s) recorded on that FSDS.

A unique alphanumeric code, or location ID, will identify each location sampled during activities. The coding system will provide a tracking record to allow retrieval of information about a particular location and to ensure that each is uniquely identified. Location IDs will be sequential and will be recorded on the FSDS. For locations where a sample was collected, both the location ID and sample ID will appear on the FSDS.

FSDS information will be completed in the field before field personnel leave the sampling location. To ensure that all applicable data is accurately entered and all fields are complete, a

different field team member will check each FSDS. The team member completing the hard copy form and the team member checking the form will initial the FSDS in the proper fields. In addition, the FTL will also complete periodic checks of FSDSs prior to relinquishment of the samples to the field sample coordinator. Once FSDSs and samples are relinquished to the field sample coordination personnel, the FSDSs are checked for completeness as data are input into the local Scribe field database. Field sample coordination personnel also conduct an independent check of entered data for accuracy and completeness.

If a revision is required to the hard copy FSDS during these checks, it will be returned to the field team member initially responsible for its completion. The error will be explained to the team member and the FSDS corrected. If the team member is no longer at the Site, revisions will be made by the FTL, or designee. It is the responsibility of the Field Data Manager to make the appropriate change in the local Scribe field database.

Each hard copy FSDS is assigned a unique sequential number. This number will be referenced in the field logbook entries related to samples recorded on individual sheets. A&E field administrative staff will manage the hard copy FSDSs in the A&E Libby project office. Original FSDSs will be filed by medium and FSDS number.

B3.1.2 Sample Identification

Samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. The labels will be affixed to the inside of both the inner and outer sample bags and the sample ID number will be written in indelible ink on the outside of each bag.

Sample ID numbers will identify the samples collected during this sampling effort using the following format:

RS-#####

Where:

RS = Prefix that designates samples collected under this QAPP
= A sequential five-digit number

B3.1.3 Field Logbooks

The field logbook is an accounting of sampling activities and will duly note problems or minor deviations from this QAPP. Field logbook entries will be recorded in accordance with SOP EPA-LIBBY-2012-01, *Field Logbook Content and Control* (see **Appendix B**). Sample details will be recorded on an FSDS and FSDS numbers will be recorded in the logbook.

A&E field administrative staff will manage the field logbooks by assigning unique identification numbers to each field logbook, tracking to whom and the date each field logbook was assigned, the type of activities recorded in each field logbook (i.e., OU5 Railroad Spur Sampling), and the

date when the field logbook was returned. As field logbooks are completed, originals will be catalogued and maintained in the A&E project office. Scanned copies of field logbooks will be maintained on the A&E's project server, which is backed up daily to an offsite location.

B3.1.4 Photographic Documentation

All photographic documentation will be in accordance with SOP EPA-LIBBY-2012-02, *Photographic Documentation of Field Activities* (see **Appendix B**). Captions are not required for photographs taken as part of this QAPP.

Photographs will be taken with a digital camera at places that field personnel deem necessary. Electronic photograph files will be saved each day to the A&E's server located at the Libby project office (backed up daily to an offsite location), and named so that photographs for a particular property or activity can easily be retrieved. The photograph file naming convention for photos collected under this QAPP is as follows:

OU5Railroadspur_092113_001

Where:

OU5Railroadspur = the address where activities occurred
092113 = the date the photograph was taken (MMDDYY)
001 = the number of the photograph taken at that property that day

Following completion of sampling activities, all photographic files pertaining to a property will be copied to the A&E server and ultimately copied onto compact disc and filed in Libby along with other property-specific documentation.

B3.1.5 Change Control

Corrections to field documentation, including FSDSs and logbooks, require a single strikeout of the erroneous information, initials, and date. The corrected information will be entered in close proximity to the existing entry. For revisions to FSDSs, it is the responsibility of sampling staff making the revisions to provide the revised originals to the A&E's sample coordinator for updating corresponding electronic data. Updated FSDS data will be published to Scribe by A&E data management staff promptly in order to meet the EPA reporting requirements.

All deviations from the guiding documents will be recorded in the logbooks by the sampling team or on the Record of Modification to Documents Governing Field Activities by the FTL (see Section B5.1.2 for specifics).

As noted in Section A9.4, significant deviations from this QAPP, or procedures referenced herein governing sample handling, will be discussed with the EPA RPMs (or their designee) and the A&E's Project Manager prior to implementation. Such deviations will be recorded on a ROM.

B3.1.6 Global Positioning System Coordinate Collection

GPS location coordinates will be collected for inspected or sampled locations in accordance with SOP CDM-LIBBY-09, *GPS Coordinate Collection and Handling* (see **Appendix B**).

Field-collected GPS data are converted to a usable geographic information system (GIS) format using the general processes described in SOP CDM-LIBBY-09. After the conversion from GPS points to GIS files, 100% of the data is checked visually to identify potential data entry errors (e.g., points display on the correct geounit).

B3.1.7 Field Sample Custody

Sample custody and documentation will follow the requirements specified in SOP EPA-LIBBY-2012-06, *Sample Custody* (see **Appendix B**). In general, all teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. At the end of each day, sampling teams will relinquish samples directly to sample coordination staff or to a designated secure sample storage location. Relinquishment will be documented in the logbook.

B3.1.8 Chain-of-Custody Requirements

For the Libby project, the chain-of-custody (COC) record is employed as physical evidence of sample custody and condition from the sample coordination team to the receiving facility. A completed COC record is required to accompany each batch of samples, whether it is hand-delivered to the EPA LC or shipped to a processing or analytical facility.

The sample coordination team will produce COC records in accordance with SOP ER8-LIBBY-01, *Libby Chain of Custody Documentation*. Only quality-checked sample information will be used for COC records. In the event that electronic systems are unavailable (e.g., due to a power outage), hard copy COC records will be employed. Hard copy COC records will be data-entered as soon as electronic systems are back online.

For hand-deliveries, a sample coordinator will relinquish samples and corresponding COC records to the EPA LC under strict custody. During relinquishment, the sample coordinator will complete the following information in the designated spaces at the bottom of the COC record: signature, company name, date, and time. The EPA LC will also complete the required information and will make a note regarding sample condition (e.g., OK – accept). The sample coordinator will retain the bottom copy of the COC record for the A&E's project record.

B3.1.9 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with SOP EPA-LIBBY-2012-07, *Packaging and Shipping of Environmental Samples* (see **Appendix B**). Samples will be hand-delivered to the EPA LC, picked up by a delivery service courier, or shipped by a delivery service to the designated facility or laboratory, as applicable. For hand-deliveries, the sample coordinator will package samples for transit such that they are contained and secure (i.e., will not be excessively jostled). Clean plastic totes with the lids secured or sample coolers may be used for this purpose.

B3.1.10 Field Equipment Maintenance

Field equipment maintenance will be conducted and documented in accordance with SOP EPA-LIBBY-2012-03, *Control of Measurement and Test Equipment* (see **Appendix B**).

B3.2 Holding Times

For the samples specified for collection in this QAPP, no holding time requirements will be employed.

B3.3 Archival and Final Disposition

All samples and grids will be maintained in storage at the Troy SPF, analytical laboratory, or fire cache sample storage facility, unless otherwise directed by the EPA. When authorized by the EPA, the laboratory will be responsible for proper disposal of remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

B4. Analytical Methods and Operations

The EPA will be responsible for all sample analysis, including sample processing prior to analysis. The A&E will be responsible for relinquishing all samples to the EPA LC, or processing facility or laboratory as designated by the EPA LC. The A&E sample coordinator will also be responsible for communicating with the EPA LC to relay pertinent sample and analysis information including sample quantities; special sample handling requirements, processing, or analysis concerns; and requested turn-around times.

This section discusses the analytical methods, custody and documentation procedures, QA/QC requirements, and data management requirements to be employed by the laboratory in support of this QAPP.

B4.1 Analytical Methods and Turnaround Times

This section describes the analytical methods used for samples collected under this QAPP.

An analytical requirements summary sheet (see **Appendix C**) specific to sampling activities associated with this QAPP will be distributed by the EPA, and reviewed and approved by all participating laboratories prior to sample handling.

The A&E's sample coordinator will provide the EPA LC with requested turn-around times for all samples relinquished. In general, it is expected that analysis, including soil preparation, for all soil samples will be complete within 45 (business) days.

B4.1.1 PLM-VE/PLM-Grav – Soil Samples

Prior to analysis, all soil samples require processing. Soil samples will be processed using the current version of the Libby soil sample processing SOP 16-ASB-06.00. The A&E will indicate the current version of the soil sample processing SOP in the analysis request section of the COC record. It is the responsibility of the soil preparation facility to specify the appropriate PLM method as it corresponds to the specific sample fraction being submitted for analysis (i.e., fine ground or coarse fraction) on their COC records to the laboratory.

All soil samples collected as part of this effort, including field duplicate samples, will be analyzed for asbestos by PLM-VE and PLM-Grav in accordance with SOPs SRC-LIBBY-03 and the most recent version of Libby laboratory modifications LB-000097, LB-000098 and SRC-LIBBY-01 with laboratory modifications LB-000073, LB-000088, respectively.

B4.1.2 Health and Safety Air Samples

The personal air samples collected for the ongoing health and safety monitoring will be analyzed in accordance with the *Response Action SAP* (CDM Smith 2011). In brief, air samples will be prepared and analyzed by PCM in accordance with NIOSH Method 7400, Issue 2 and the most recent version of Libby Laboratory Modification LB-000015. Upon Request from EPA personal air samples may be analyzed by TEM (EPA 1987), and the most recent version of Libby Laboratory modifications LB-000029, LB-000031, LB-000067, LB-000085LB-000091.

B4.2 Analytical Data Reports

An analytical data report will be prepared by the laboratory and submitted to the appropriate LC after the completion of all required analyses within a specific laboratory job (or sample delivery group). This analytical data report includes a case narrative that briefly describes the analytical methods, deviations from the methods, revisions to data reports, COC discrepancies, etc. The data report also includes copies of the signed COC forms, sample preparation logs, and analytical benchsheets. The data report may also include spectra print outs, grid sketches, instrument preparation logs, instrument print outs, instrument maintenance records, analysis run logs, etc. The laboratory provides an electronic scanned copy of the analytical data report to the LC and others, as directed by the LC.

B4.3 Laboratory Data Reporting Tools

Standardized data reporting tools (i.e., EDDs) have been developed specifically for the Libby project to ensure consistency between different laboratories in the presentation and submittal of analytical data. In general, unique Libby-specific EDDs have been developed for each analytical method and each medium. Since the beginning of the Libby project, each EDD has undergone continued development and refinement to better accommodate current and anticipated future data needs and requirements. EDD refinement continues based on laboratory and data user input. Electronic copies of all current EDD templates are provided in the Libby Lab eRoom.

For PLM analyses, optical property details and results will be recorded on the Libby-specific EDDs for PLM. Standard project data reporting requirements will be met for PLM analyses. EDDs will be transmitted electronically (*via* email) to the following:

- Doug Kent, Kent.Doug@epa.gov
- Janelle Lohman, Lohman.Janelle@epa.gov
- Tracy Dodge, DodgeTA@cdmsmith.com
- Phyllis Haugen, HaugenPJ@cdmsmith.com
- Libby project email address for CDM Smith, libby@cdmsmith.com

ESAT has developed a Site-specific analytical results reporting tool, referred to as the Libby Asbestos Data Tool (LADT). This tool is a relational Microsoft® Access database with a series of standard data entry forms specific to each analytical method. The LADT creates a Microsoft® Excel export file that can be directly uploaded into an analytical Scribe project database (see Section B10.4). Currently, LADT is only utilized by the ESAT laboratory for entry of PLM analytical results. Other labs continue to use Libby-specific EDDs as described above.

B4.4 Custody Procedures

Laboratory custody procedures are provided in the QA management plans for each laboratory. These plans were independently audited and found to be satisfactory by the EPA's laboratory audit team.

The basic laboratory sample custody process is as described herein. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC record will be cross-referenced with all of the samples in the shipment. The laboratory sample custodian will sign the COC record and maintain a copy for their project files; the original COC record will be appended to the hard copy data report. Next, the sample custodian may assign a unique laboratory number to each sample on receipt. This number will identify the sample through all further handling at the laboratory. It is the laboratory's

responsibility to maintain internal logbooks and records throughout sample preparation, analysis, data reporting, and sample archiving.

B5. Quality Assurance/Quality Control

B5.1 Field

Field QA/QC activities include all processes and procedures that have been designed to ensure that field samples are collected and documented properly, and that issues/deficiencies associated with field data collection or sample processing are quickly identified and rectified.

B5.1.1 Training

Before performing field work in Libby, field personnel are required to read all governing field guidance documents relevant to the work being performed and attend a field planning meeting specific to sampling efforts described in this QAPP. Additional information on field training requirements is provided in Section A8.1.

B5.1.2 Modification Documentation

All major field deviations from and modifications to this QAPP will be recorded on the Libby field ROM Form. The field ROM forms will be used to document all permanent and temporary changes to procedures contained in guidance documents governing investigation work that have the potential to impact data quality or usability. ROMs will not be implemented until approved by USACE and the EPA. See Section A9.5 for details incorporating deviations from ROM forms during QAPP revision.

Minor deviations (i.e., those that will not impact data quality or usability) will be documented in the field logbooks. ROMs are completed by the FTL overseeing the investigation/activity, or by assigned field or technical staff. As modifications to governing documents are implemented, the FTL will communicate the changes to the field teams conducting activities associated with the modification.

Each completed field ROM is assigned a unique sequential number (e.g., LFO-000026) by the A&E's project QAM. A ROM tracking log for all field modifications is also maintained by the QAM. This tracking log briefly describes the ROM being documented, as well as ROM author, the reviewers, and date of approval. Once a form is prepared, it is submitted to the appropriate EPA RPM and USACE Project Manager for review and approval. Approved field ROMs are maintained on the A&E's project server.

B5.1.3 Field Surveillances

Field surveillances consist of periodic observations made to evaluate continued adherence to investigation-specific governing documents. It is not anticipated that field surveillance will be performed for this sampling effort. However, field surveillances may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies.

B5.1.4 Field Audits

Field audits are broader in scope than field surveillances. Audits are evaluations conducted by qualified technical or QA staff that are independent of the activities audited. Field audits can be conducted by field contractors, internal EPA staff, or EPA contracted auditors. It is the responsibility of the EPA RPM to ensure that field auditing requirements are met for each investigation. Due to the level of effort for sampling and the duration of the activities discussed in this QAPP, a field audit is not anticipated to be scheduled this study.

B5.1.5 Field QC Samples

Field QC samples are typically collected to help ensure that field samples are not contaminated from exogenous sources during sample collection, and to help evaluate the precision of field sample analytical results. Field QC samples are assigned unique field IDs and are submitted to the analytical laboratory along with the associated field samples. For this investigation, field duplicate soil samples will be collected as described in Section B2.4.

B5.2 Troy SPF

Prior to shipment to a laboratory for analysis, soil samples will be dried at the Troy SPF. The sections below provide detailed information on QA/QC procedures for the Troy SPF, which is maintained by adherence to standard preparation procedures, submission of preparation QC samples, facilities monitoring, and audits.

B5.2.1 Training/Certifications

Personnel performing sample preparation activities must have read and understood the *Soil Sample Preparation Work Plan* (TechLaw, Inc. 2007)[3], the *SPF HASP*, and all associated SOPs and governing documents for soil preparation (e.g., SOP 16-ASB-06.00). In addition, all personnel must have completed 40-hour OSHA HAZWOPER training, annual updates, annual respirator fit tests, and annual or semi-annual physicals, as required.

Prior to performing activities at the Troy SPF, new personnel will be instructed by an experienced member of the SPF staff and training sessions will be documented in the SPF project files. It is the responsibility of the SPF QAM to ensure that all personnel have completed the required training requirements.

B5.2.2 Modification Documentation

[3] At the time of this QAPP, this work plan is currently being updated.

When changes or revisions are needed to improve or document specifics about sample preparation procedures used by the Troy SPF, these changes are documented using an SPF ROM form. The SPF ROM form provides a standardized format for tracking procedural changes in sample preparation and allows project managers to assess potential impacts on the quality of the data being collected. SPF ROMs will be completed by the appropriate SPF or technical staff. Once a form is prepared, it is submitted to the ESAT QAM (or their designee) for review. Final review and approval is provided by the appropriate EPA RPM. Copies of approved SPF ROMs are available in the Libby Lab eRoom.

B5.2.3 Soil Preparation Facility Audits

Internal audits of the SPF are conducted by the SPF QAM periodically to evaluate personnel in their day-to-day activities and to ensure that all processes and procedures are performed in accordance with governing documents and SOPs. All aspects of sample preparation, as well as sample handling, custody, and shipping are evaluated. If issues are identified, SPF personnel are notified and retrained as appropriate. Audit reports will be completed following each laboratory audit. A copy of the internal audit report, as well as any corrective action reports, will be provided to the LC and the QATS contractor.

Internal audits will be conducted following significant procedural changes to the soil preparation processes or other SPF governing documents to ensure the new methods are implemented and followed appropriately.

The Troy SPF is also required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. Audits consist of an evaluation of facility practices and procedures associated with the preparation of soil samples. A checklist of requirements, as derived from the applicable governing documents and SOPs, is prepared by the auditor prior to the audit, and used during the on-site evaluation. Evaluation of the facility is made by reviewing SPF documentation, observing sample processing, and interviewing personnel.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report following the SPF audit. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each SPF to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this report is to identify SPF performance problems and isolate the potential causes.

B5.2.4 Preparation QC Samples

Three types of preparation QC samples are collected during the soil preparation process: sand blanks, drying blanks, grinding blanks, and preparation duplicates. Each type of preparation

QC sample is described in more detail below.

Sand Blank

A sand blank is a sample of store-bought quartz sand that is analyzed to ensure that the quartz sand matrix used for drying and grinding blanks is asbestos-free. Detailed procedures for this certification process are provided in ESAT SOP PLM-02.00, *Blank Sand Certification by Polarized Light Microscopy*. In brief, about 800 grams of sand are split into 40 sand blank aliquots of roughly equal size. Each sand blank is evaluated using stereomicroscopic examination and analyzed by PLM-VE. If a sand blank has detected asbestos, it is re-analyzed by a second PLM analyst to verify the presence of asbestos. The sand is certified as asbestos-free if all 40 sand blanks are non-detect for asbestos. The sand is rejected for use if any asbestos is detected in the sand blanks. Only sand that is certified as asbestos-free will be utilized in the SPF.

Drying Blank

A drying blank consists of approximately 100 to 200 grams of asbestos-free quartz sand that is processed with each batch of field samples that are dried together. The drying blank is then processed identically to field samples. Drying blanks determine if cross-contamination between samples is occurring during sample drying. One drying blank will be processed with each drying batch per oven. It is the responsibility of the SPF QAM to ensure that the appropriate number of drying blanks is collected. Each drying blank is given a unique sample number that is investigation-specific, as provided by the field sample coordinator (i.e., a subset of sample numbers for each investigation will be provided for use by the SPF). SPF personnel will record the sample number of the drying blank on the sample drying log sheet.

It is the responsibility of the QATS contractor to review the drying blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If asbestos is detected in the drying blank, a qualifier of "DB" will be added to the related field sample results in the project database that were dried at the same time as the detected drying blank to denote that the associated drying blank had detected asbestos. In addition, the drying oven will be thoroughly cleaned. If asbestos continues to be detected in drying blanks after cleaning occurs, sample processing must stop and the drying method and decontamination procedures will be evaluated to rectify any cross-contamination issues.

Grinding Blank

A grinding blank consists of asbestos-free quartz sand and is processed along with the field samples on days that field samples are ground. Grinding blanks determine if decontamination procedures of laboratory soil processing equipment used for sample grinding and splitting are adequate to prevent cross-contamination. Grinding blanks are prepared at a frequency of one per grinding batch per grinder per day.

It is the responsibility of the QATS contractor to review the drying blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If any asbestos is detected by PLM-VE in the grinding blank (i.e., result is not Bin A), a qualifier of "GB" is added to the related field sample results in the project database

that were ground at the same time as the detected grinding blank to denote that the associated grinding blank had detected asbestos. In addition, the grinder is thoroughly cleaned. If asbestos continues to be detected in grinding blanks after cleaning occurs, sample processing must stop and the grinding method and decontamination procedures are evaluated to rectify any cross-contamination issues.

Preparation Duplicate

Preparation duplicates are splits of field samples submitted for sample preparation. The preparation duplicates are used to evaluate the variability that arises during the soil preparation and analysis steps. After drying, but prior to sieving, a preparation duplicate is prepared by using a riffle splitter to divide the field sample (after an archive split has been created) into two approximately equal portions, creating a parent and duplicate sample.

Preparation duplicate samples are prepared at a rate of 1 per 20 samples (5%) of samples prepared. It is the responsibility of the SPF QAM to ensure that the appropriate number of preparation duplicates is prepared. Each preparation duplicate is given unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the preparation duplicate and its associated parent field sample on the sample preparation log sheet. Preparation duplicates are submitted blind to the laboratory for analysis by the same analytical method as the parent sample.

Preparation duplicate results will be evaluated based on a comparison of the reported PLM-VE bin for the parent field sample and preparation duplicate sample. Because preparation duplicate samples may have inherent small-scale variability that is random and may be either small or large, there is no quantitative requirement for the agreement of preparation duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability. The QATS contractor will notify the SPF QAM when preparation duplicate results are different from the parent results to determine if corrective action is needed.

B5.2.5 Performance Evaluation Standards

The USGS has prepared several Site-specific reference materials of LA in soil that are utilized as performance evaluation (PE) standards to evaluate laboratory accuracy and precision. These PE standards are kept in storage at the Troy SPF and are inserted into the sample train in accordance with SOP 16-ASB-06.00, with the following project-specific modification:

- PE standards will not be processed prior to insertion (i.e., no sieving or grinding of the standard will be performed).

PE standards of varying nominal levels will be inserted on a quarterly basis at a rate of at least one PE standard per analytical laboratory.

It is the responsibility of the SPF QAM to ensure that the appropriate number of PE standards is inserted. Each PE standard is given a unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the

PE standard, and the nominal level of the PE standard on the sample preparation log sheet. PE standards are submitted blind to the laboratory for analysis by the same analytical method as the field samples.

Results for PE standards will be evaluated by the QATS contractor or their designee. PE standard results will be evaluated based on the nominal concentration of the PE standard. The LC will be notified if PE standard results do not meet acceptance criteria. Corrective action will be taken if the PE standards demonstrate issues with accuracy and/or bias in results reporting. Examples of corrective actions that may be taken include reanalysis and/or repreparation, collaboration between and among laboratories to address potential differences in analysis methods, and analyst re-training.

B5.3 Analytical Laboratory

Laboratory QA/QC activities include all processes and procedures that have been designed to ensure that data generated by an analytical laboratory are of high quality and that any problems in sample preparation or analysis that may occur are quickly identified and rectified. The following sections describe each of the components of the analytical laboratory QA/QC program implemented at the Site.

B5.3.1 Training/Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Additional information on laboratory training and certification requirements is provided in Section A8.2.

Laboratories handling samples collected as part of this investigation program will be provided a copy of and will adhere to the requirements of this QAPP. Samples collected under this QAPP will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures (i.e., Good Laboratory Practices) in order to provide analytical data of known quality and consistency.

B5.3.2 Modification Documentation

All deviations from project-specific and method analytical guidance documents, or this QAPP, will be recorded on the Request for Modification to Laboratory Activities or Request for Modification to Soil Sample Preparation Activities form as appropriate. Deviations that impact, or have the potential to impact, investigation objectives will be discussed with the OU5 EPA Remedial Project Manager and A&E FTL prior to implementation. In addition, the appropriate record of modification form will be used to document information of interest as requested by the EPA. As modifications are approved by the EPA and implemented, the EPA LC will communicate the changes to the EPA laboratories. Sample results data will be delivered to the EPA in accordance with the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013).

B5.3.3 Laboratory Audits

Each laboratory working on the Libby project is required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. These audits are performed by EPA personnel (and their contractors), that are external to and independent of, the Libby laboratory team members. These audits ensure that each analytical laboratory meets the basic capability and quality standards associated with analytical methods for asbestos used at the Site. They also provide information on the availability of sufficient laboratory capacity to meet potential testing needs associated with the Site.

External Audits

Audits consist of several days of technical and evidentiary review of each laboratory. The technical portion of the audit involves an evaluation of laboratory practices and procedures associated with the preparation and analysis of samples for the identification of asbestos. The evidentiary portion of the audit involves an evaluation of data packages, record keeping, SOPs, and the laboratory QA Management Plan. A checklist of method-specific requirements for the commonly used methods for asbestos analysis is prepared by the auditor prior to the audit, and used during the on-site laboratory evaluation.

Evaluation of the capability for a laboratory to analyze a sample by a specific method is made by observing analysts performing actual sample analyses and interviewing each analyst responsible for the analyses. Observations and responses to questions concerning items on each method-specific checklist are noted. The determination as to whether the laboratory has the capability to analyze a sample by a specific method depends on how well the analysts follow the protocols detailed in the formal method, how well the analysts follow the laboratory-specific method SOPs, and how the analysts respond to method-specific questions.

Evaluation of the laboratory to be sufficient in the evidentiary aspect of the audit is made by reviewing laboratory documentation and interviewing laboratory personnel responsible for maintaining laboratory documentation. This includes personnel responsible for sample check-in, data review, QA procedures, document control, and record archiving. Certain analysts responsible for method quality control, instrument calibration, and document control are also interviewed in this aspect of the audit. Determination as to the capability to be sufficient in this aspect is made based on staff responses to questions and a review of archived data packages and QC documents.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report for each analytical laboratory participating in the Libby program. These reports are handled as business confidential items. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each laboratory to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this report is to identify common asbestos laboratory performance problems and isolate the potential causes.

Internal Audits

Each laboratory will also conduct periodic internal audits of their specific operations. Details on these internal audits are provided in the laboratory QA Management Plan. The laboratory QAM will immediately contact the LC and the QATS contractor if any issues are identified during internal audits that may impact data quality.

B5.3.4 Laboratory QC Analyses

The type of microscopy technique utilized to analyze samples for asbestos under this study is PLM. The most recent versions of all referenced analysis methods and SOPs are available in the Libby Lab eRoom.

The following sections summarize project-specific QA/QC requirements. The analytical methods should be consulted for detailed descriptions of method-required QA/QC measures.

B5.3.4.1 Laboratory QC for PLM-VE and PLM-Grav

Laboratory QA/QC for PLM-Grav is ensured through compliance with laboratory-based QA/QC requirements for the NIOSH Method 9002, as specified by NVLAP. No additional project-specific QA/QC requirements have been established for PLM-Grav.

Laboratory-based QC requirements for PLM-VE are specified in SOP SRC-LIBBY-03 and Libby Laboratory Modification LB-000073. Three types of laboratory-based QC analyses will be performed for PLM-VE, including laboratory duplicates, inter-laboratory analyses, and PE standards. Detailed information on the Libby-specific requirements for each type of PLM-VE QC analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in SOP SRC-LIBBY-03 and LB-000073.

It is the responsibility of the laboratory manager to ensure that the proper number of PLM-VE laboratory duplicate analyses is completed. Inter-laboratory analyses for PLM-VE will be selected post hoc by the QATS contractor (or their designee) in accordance with the selection procedures presented in LB-000073. The LC will provide the list of selected inter-laboratory analyses to the laboratory manager and will facilitate the exchange of samples between the analytical laboratories. It is the responsibility of the SPF QAM to ensure that the appropriate number of PE standards is inserted.

B6/B7. Instrument Maintenance and Calibration

B6/B7.1 Field Equipment

All field equipment (e.g., sampling shovels, GPS units) will be maintained in basic accordance with manufacturer specifications. Maintenance and calibration of equipment shall be done in accordance with EPA-LIBBY-2012-03 and/or CDM-LIBBY-09 as included in **Appendix B**. When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled "out of order" and placed in a separate area from the rest of the sampling equipment. The

person who identified the equipment as "out of order" will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the out-of-order equipment. This may include having appropriately trained field team members complete the repair or shipping the malfunctioning equipment to the manufacturer. Field team members will have access to basic tools required to make field acceptable repairs. This will allow timely repair of "out of order" equipment.

B6/B7.2 Laboratory Instruments

All laboratory instruments used for this project will be maintained and calibrated in accordance with the manufacturer's instructions. Specifics regarding maintenance and calibration of equipment are detailed in 16-ASB-06.00, SRC-LIBBY-01, and SRC-LIBBY-03. If any deficiencies in instrument function are identified, all analyses shall be halted until the deficiency is corrected. The laboratory shall maintain a log that documents all routine maintenance and calibration activities, as well as significant repair events, including documentation that the deficiency has been corrected.

B8. Inspection/Acceptance of Supplies and Consumables

B8.1 Field

In advance of field activities, the FTL or designee will check the field equipment/supply inventory and procure additional equipment and supplies that are needed. The FTL or designee will also check that in-house measurement and test equipment used to collect data/samples as part of this QAPP is in good, working order, and procured equipment is acceptance tested prior to use (according to SOP EPA-LIBBY-2012-03, *Control and Measurement and Test Equipment*, **Appendix B**). Items that the FTL or designee deems unacceptable will be removed from inventory and repaired or replaced as necessary. The inventory and procurement of equipment and supplies is discussed in detail in Section B2.1.3.

B8.2 Laboratory

The Laboratory Manager is responsible for ensuring that all reagents and disposable equipment used in this project is free of asbestos contamination. This is demonstrated by the collection of blank samples, as described in Section B5.

B9. Non-direct Measurements

There are no non-direct measurements that are anticipated for use in this project.

B10. Data Management

The following subsections describe the field, Troy SPF, and analytical laboratory data management procedures and requirements for this investigation. These subsections also

describe the project databases utilized to manage and report data from this investigation. Detailed information regarding data management procedures and requirements can be found in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2013).

B10.1 Field Data Management

Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Data for the Site are captured in various Scribe projects. Additional information regarding Scribe and the Libby Scribe project databases is discussed in Section B10.3. The Field Data Manager utilizes a "local" field Scribe project database (i.e., LibbyCDM_Field.mdb) to maintain field sample information. The term "local" denotes that the database resides on the server or personal computer of the entity that is responsible for the creating/managing the database. It is the responsibility of the Field Data Manager to ensure that all local field Scribe project databases are backed-up nightly to a local server.

Field sample information from the FSDS is manually entered by A&E sample coordination staff using a series of standardized data entry forms (i.e., DE Tool). This tool is a Microsoft Access database that was originally developed by ESAT. The DE Tool is currently maintained by the A&E and resides on the local server in the project office. This tool is used to prepare an electronic COC. Data in the DE Tool are imported into the local field Scribe project database by the Field Data Manager.

It is the responsibility of the Field Data Manager to "publish" sample and COC information from the local field Scribe database to Scribe.NET. It is not until a database has been published via Scribe.NET that it becomes available to external users.

B10.2 Troy SPF Data Management

The Troy SPF utilizes a local SPF Scribe project database to maintain soil sample preparation information. Soil preparation information from the preparation log sheets is entered into the local SPF Scribe project database by SPF personnel. After the data entry is checked against the original forms, it is the responsibility of the SPF Manager (or their designee) to publish soil sample preparation information from the local SPF Scribe database to Scribe.NET.

B10.3 Analytical Laboratory Data Management

The analytical laboratories utilize several standardized data reporting tools (Libby-specific EDD and LADT) developed specifically for the Libby project to ensure consistency between laboratories in the presentation and submittal of analytical data. Once the analytical laboratory has generates an EDD with results, the spreadsheet(s) are uploaded to a local FTP site maintained by the ESAT project data manager.

Additionally, EDDs may be transmitted to email recipients as specified by the ESAT LC.

The ESAT Project Data Manager utilizes a local analytical Scribe project database (i.e., LibbyLab2014.mdb) to maintain analytical results information by calendar year. The EDDs are uploaded directly into the analytical Scribe project database. It is the responsibility of the ESAT Project Data Manager to publish analytical results information from the local analytical Scribe database to Scribe.NET.

B10.4 Libby Project Database

As noted above, Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Multiple Scribe projects can be stored and shared through Scribe.NET, which is a web-based portal that allows multiple data users controlled access to Scribe projects. Local Scribe projects are "published" to Scribe.NET by the entity responsible for managing the local Scribe project. External data users may "subscribe" to the published Scribe projects via Scribe.NET to access data. Subscription requests are managed by ERT.

All data collected for this investigation will be maintained in Scribe. As discussed above, data will be are captured in various Scribe project databases, including a field Scribe project (i.e., LibbyCDM_Field.mdb) and an analytical results Scribe project (i.e., LibbyLab2014.mdb).

B10.5 Data Reporting

Data users can access data for the Libby project through Scribe.NET. To access data, a data user must first download the Scribe application from the EPA ERT website[4]. The data user must then subscribe to each of the published Scribe projects for the Site using login and password information that are specific to each individual Scribe project. Scribe subscriptions for the Libby project are managed by ERT. Using the Scribe application, a data user may download a copy of any published Scribe project database to their local hard drive. It is the responsibility of the data user to regularly update their local copies of the Libby Scribe projects via Scribe.NET.

The Scribe application provides several standard queries that can be used to summarize and view results within an individual Scribe project. However, these standard Scribe queries cannot be used to summarize results across multiple Scribe projects (e.g., it is not possible to query both field and lab projects using these standard Scribe queries).

If data users wish to summarize results across multiple published Scribe projects, there are two potential options. Data users may request the development of a "combined" project from ERT. This combined project compiles tables from multiple published Scribe projects into a single Scribe project. This allows data users to utilize the standard Scribe queries to summarize and view results.

[4] http://www.ertsupport.org/scribe_home.htm

Alternatively, data users may download copies of multiple published Scribe project databases for the Site and utilize Microsoft Access to create user-defined queries to extract the desired data across Scribe projects. This requires that the data user is proficient in Microsoft Access and has an intimate knowledge of proper querying methods for asbestos data for the Site.

It is the responsibility of the data users to perform a review of results generated by data queries and standard reports to ensure that they are accurate, complete, and representative. If issues are identified by the data user, they will be reported to the EPA Region 8 Data Manager or their designate for resolution using Google Docs. It is the responsibility of the EPA Region 8 Data Manager to notify the appropriate entity (e.g., field, Troy SPF, analytical laboratory) in order to rectify the issue.

C1. Assessment and Response Actions

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities.

C1.1 Assessments

Performance assessments are quantitative checks on the quality of a measurement system and are appropriate to analytical work. Performance assessments for the laboratories may be accomplished by submitting blind reference material (i.e., performance evaluation samples). These assessment samples are samples with known concentrations that are submitted to the laboratories without identifying them as such to the laboratories. Performance assessments will be coordinated by the EPA or the QATS contractor.

System assessments are qualitative reviews of different aspects of project work to check the use of appropriate QC measures and the general function of the QA system. Field and office system assessments will be performed under the direction of CDM Smith's QA Director, with support from the CDM Smith QAM. Field surveillances may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies. It is not anticipated that a field audit will be conducted for this sampling effort.

Laboratory system assessments/audits will be coordinated by the EPA. Performance assessments for the laboratories may be accomplished by submitting blind reference material (i.e., performance evaluation samples). These assessment samples are samples with known concentrations that are submitted to the laboratories without identifying them as such to the laboratories. Performance assessments will be coordinated by the EPA.

C1.2 Response Actions

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or EPA LC). For deficiencies or quality problems that are not resolved with rapid corrective action, the individual identifying the quality problem will initiate a corrective action request (CAR) and will forward the form to the QA manager, who will be responsible for investigating the problem and following up on the resolution of the problem. The CAR and documentation of the resolution will be provided to the EPA Remedial Project Manager and the A&E project manager. EPA project management will be notified when quality problems arise that cannot be corrected quickly through routine procedures.

In addition, when modifications to this QAPP are required, either for field or laboratory activities, a ROM must be completed by field staff and approved by the EPA prior to implementation.

C2. Reports to Management

No regularly-scheduled written reports to management are planned as part of this project. However, QA reports will be provided to management for routine audits and whenever quality problems are encountered. Field staff will note any quality problems on FSDSs or in field logbooks. Further, the field and laboratory managers will inform the EPA RPM upon encountering quality issues that cannot be immediately corrected.

D1. Data Review, Verification and Validation

D1.1 Data Review

Data review of project data typically occurs at the time of data reporting by the data users and includes cross-checking that sample IDs and sample dates have been reported correctly and that calculated analytical sensitivities or reported values are as expected. If issues or discrepancies are found in asbestos data, the data reviewer will contact the EPA Region 8 Data Manager (Jeffrey Mosal), who will then notify the appropriate party in order to correct the issue.

D2. Verification and Validation Methods

D2.1 Data Verification

Data verification includes checking that results have been transferred correctly from the original hand-written, hard copy field and analytical laboratory documentation to the project database. The goal of data verification is to identify and correct data reporting errors.

For analytical laboratories that utilize the Libby-specific EDD spreadsheets for asbestos data reporting, data checking of reported analytical results begins with automatic QC checks that have been built into the spreadsheets. In addition to these automated checks, a detailed manual data verification effort will be performed for 10% of all non-investigative Libby samples (i.e., samples that are not directly used in the risk assessment to make risk assessment decisions). This data verification process utilizes Site-specific SOPs[5] developed to ensure analytical results and field sample information in the project database is accurate and reliable.

The data verification review ensures that data reporting issues are identified and rectified to limit the impact on overall data quality. If issues are identified during the data verification, the frequency of these checks may be increased as appropriate.

Data verification will be performed by A&E staff familiar with project-specific data reporting, analytical methods, and investigation requirements. The data verifier will prepare a data verification report (template reports are included in the SOPs) to summarize any issues identified and necessary corrections. A copy of this report will be provided to the appropriate project Data Manager, LC, and the EPA RPM. It is the responsibility of the project database manager to coordinate with the FTL and/or LC to resolve any project database corrections and address any recommended field or laboratory procedural changes from the data verifier. The database manager is also responsible for electronically tracking in the project database which data have been verified, who performed the verification, and when.

[5] Site-specific field sample information and data review/data entry verification SOPs are available on the EPA Libby document website (http://www2.epa.gov/region8/libby-site-documents).

D2.2 Data Validation

Unlike data verification, where the goal is to identify and correct data reporting errors, the goal of data validation is to evaluate overall data quality and to assign data qualifiers, as appropriate, to alert data users to any potential data quality issues. Data for asbestos in air and soil will be validated by the QATS contractor (CB&I) in accordance with the applicable method, investigation-specific Analytical Requirements Summaries, laboratory ROMs, and Libby-specific data validation SOPs developed by CB&I, which include SOP QATS-70-094 (*Validation of PLM Data Deliverables*) and SOP QATS-70-096 (*Validation of PCM Data Deliverables*). Criteria that will be evaluated include sample receipt, sample preparation, microscope alignment, instrument calibrations, stopping rules, structure recording and identification, blank analysis (if applicable), recount/repreparation analysis (if applicable), and overall assessment of data. A total of 5% of sample results are selected annually by CB&I for validation by randomly choosing sample results to be representative of each laboratory, analytical method, and media type. A comprehensive data validation effort will be completed annually by the QATS contractor and results will be reported in a yearly data validation report. This report shall detail the validation procedures performed and provide a narrative on the quality assessment for all analytical methods, including a summary of any data qualifiers that are to be added to the project database to denote when results do not meet project-specific acceptance criteria, and shall detail any deficiencies and required corrective actions stemming from the data validation review. Results of the data validation will be summarized in an addendum to the *Quality Assurance and Quality Control Summary Report for the Libby Asbestos Superfund Site* (CDM Smith 2012; 2014). This addendum will also include recommendations for Site QA/QC program changes to address any data quality issues. For OU5 data reviews, provide a summary of the records that have been validated (AnalysisID and SampNo), the date they were validated, any recommended data qualifiers, and their associated reason codes to the ESAT Region 8 Data Manager. It is the responsibility of the EPA Region 8 Data Manager to ensure that the appropriate data qualifiers and reason codes recommended by the data validator are added to the project database, and to electronically track in the project database which data have been validated, who performed the validation, and when.

D3. Reconciliation with User Requirements

Once all samples from a specific property have been collected and analytical data has been generated, data will be reviewed to evaluate whether investigation objectives were achieved. This is typically performed by the A&E's FTL (or other designated investigation staff) whose responsibility it is ensure reported investigation results are adequate and appropriate for their intended use. To the extent possible, this data usability assessment will utilize results of any data verification and data validation efforts to provide information on overall data quality specific to each investigation.

The data usability assessment will evaluate results with regard to several data usability indicators, including precision, accuracy/ bias, representativeness, comparability, completeness, and whether specified analytic requirements (e.g., sensitivity) were achieved. **Table D-1** provides detailed information for how each of these indicators may be evaluated for

the reported asbestos data. The data usability assessment results and conclusions will be included in any investigation-specific data summary reports.

Non-attainment of project requirements may result in additional sample collection or field observations in order to achieve project needs.

Table D-1: General Evaluation Methods for Assessing Asbestos Data Usability

Data Usability Indicator	General Evaluation Method
Precision	Sampling – Review results for co-located samples and field duplicates to provide information on variability arising from medium spatial heterogeneity and sampling and analysis methods. Analysis – Review results for PLM laboratory duplicates repreparations to provide information on variability arising from analysis methods. Review results for inter-laboratory analyses to provide information on variability and potential bias between laboratories.
Accuracy/Bias	PLM – Review results for LA-specific performance evaluation standards to provide information on direction/magnitude of potential bias. Review results for blanks to provide information on potential contamination.
Representativeness	Review relevant audit report findings and any ROMs for potential data quality issues.
Comparability	Compare the sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Determine the percent of samples that were able to be successfully collected and analyzed (e.g., 99 of 100 samples, 99%).
Sensitivity	*Not applicable to PLM analysis.*

SOP - standard operating procedure

ROM - record of modification

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Quality Assurance Manager
Sample Coordinator
Senior Analyst(s)

Troy Soil Preparation Facility Management Staff:
Laboratory Manager
Quality Assurance Manager
Sample Coordinator

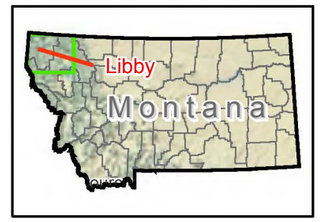
EPA Region 8 Staff
USACE Staff
MDEQ Staff
CDM Smith Staff
TechLaw Staff
TechLaw Subcontractors
CB&I Staff
Lines of authority
Lines of communication

Figure A-1
Organizational Chart for OU5 Railroad Spur Sampling
Libby Asbestos Site
Lincoln County, Montana
CDM Smith

Revised 06/03/14

Figure B-1
Site Location Map
Libby Asbestos Site
Lincoln County, Montana

Approximate Site Boundary



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CDM Smith

Path: R:\2603-Volpe\Libby\GIS\libby_loc_map_060725.mxd

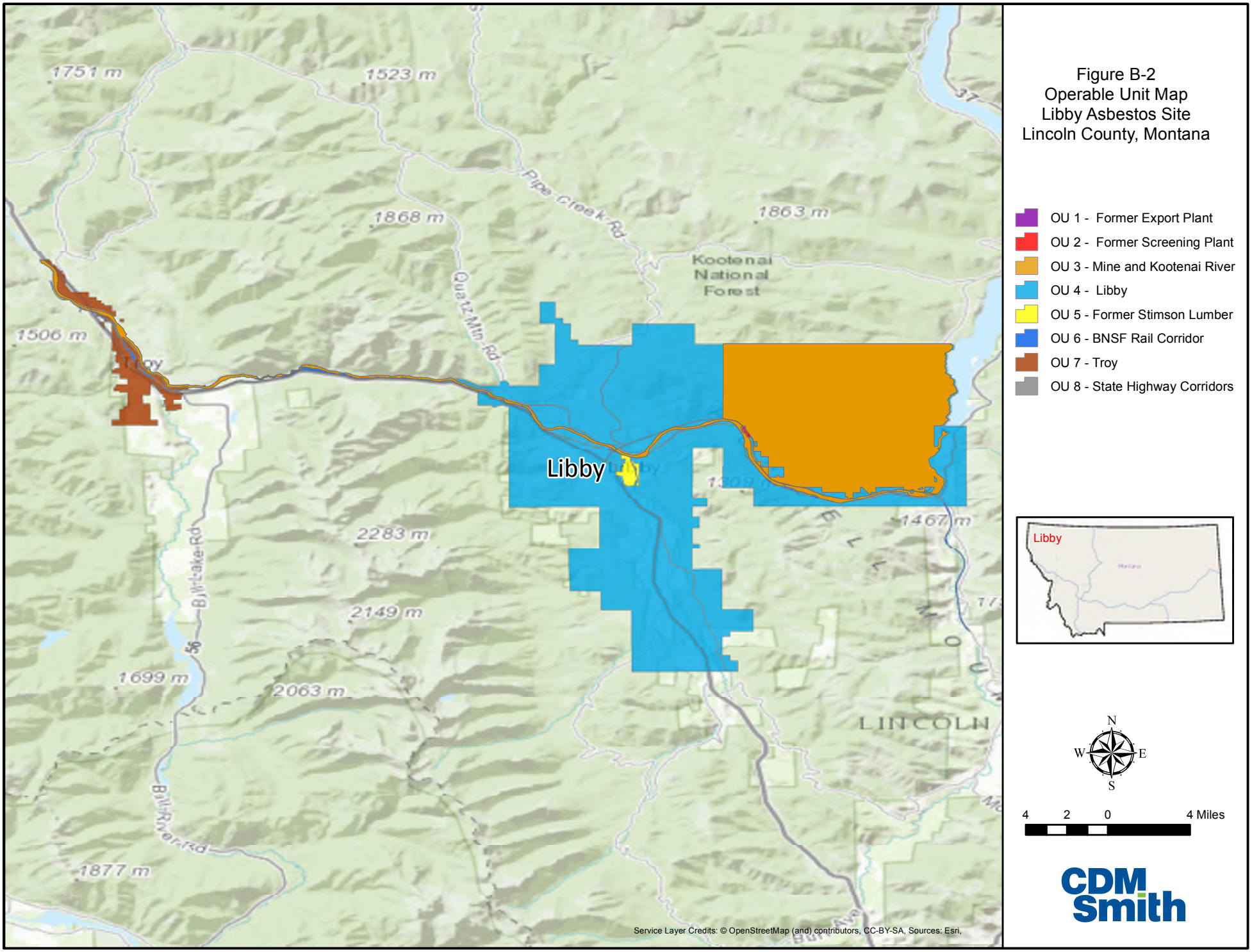
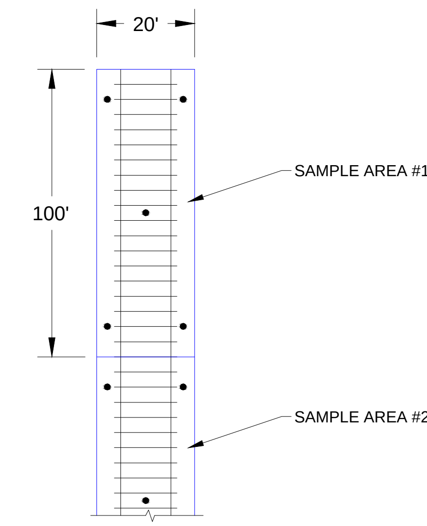


Figure B-2
Operable Unit Map
Libby Asbestos Site
Lincoln County, Montana
OU 1 - Former Export Plant
OU 2 - Former Screening Plant
OU 3 - Mine and Kootenai River
OU 4 - Libby
OU 5 - Former Stimson Lumber
OU 6 - BNSF Rail Corridor
OU 7 - Troy
OU 8 - State Highway Corridors
Libby
N
W
E
S
4 2 0 4 Miles
CDM Smith
Libby
1751 m
1523 m
1868 m
1863 m
Kootenai National Forest
Pipe Creek Rd
Quartz Mtn Rd
1506 m
2283 m
1467 m
2149 m
1699 m
2063 m
LINCOLN
Bull River Rd
1877 m
Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA, Sources: Esri,



DETAIL
TEST PIT LOCATION & SAMPLING AREAS
Not To Scale

• - TEST PIT LOCATIONS

SCALE IN FEET

NOT TO SCALE

FOR OPTIMAL CLARITY REPRODUCE IN COLOR

REVISION #:	REVISION DATE:	DESCRIPTION:
A	06/03/14	N/A
B	07/08/14	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

DRAWING BY/DATE: J. WOOD 06/03/14

QC REVIEW BY/DATE: D. PISCIOTTA 06/03/14

DRAWING FINALIZED BY/DATE: J. WOOD 06/03/14

FIGURE B-3
OU5 RAILROAD SPUR
SAMPLE LOCATION MAP

LIBBY ASBESTOS PROJECT
LINCOLN COUNTY, MONTANA

US EPA
Region VIII
Denver, Colorado

US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT
RAPID RESPONSE PROGRAM

SHEET: 1 OF 1

V:\Properties by Street\0_MILL TRAIN TRACK\Mill-train.dwg

Operable Unit 5 Railroad Spur Investigation
Quality Assurance Project Plan
Libby Asbestos Site, Operable Unit 5
Libby, Montana

Revision 0

07/08/2014

Project Period 03/30/2014 to 03/29/2015
Contract No. W9128F-11-D-0023
Task Order No. 0007

APPENDIX A
Detailed Data Quality Objectives

Appendix A

Data Quality Objectives

The DQO process, based on scientific methods, is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The DQOs presented in this section were developed in accordance with EPA guidance (EPA 2006).

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps include:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify tolerable limits on decision errors
7. Optimize the design

A.1 Step 1 – State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will be unambiguous.

Previous investigations conducted at the Site have demonstrated that LA is present in soil from source materials (e.g., vermiculite-containing soils, mine wastes) at OU5. As a result, individuals may be exposed to LA that is released to air during source disturbance activities. These inhalation exposures may pose a risk of cancer and/or non-cancer effects. Due to plans for property owners of OU5 to conduct upgrades of existing railroad spurs, the need exists to characterize the extent of contamination along the proposed path of new and existing railroad spurs.

The sampling program described in this QAPP is designed to:

1. Collect data to confirm the presence/absence of LA along selected railroad spurs within OU5 as directed by the EPA and USACE.

2. Collect data to evaluate the extent of LA contamination along selected railroad spurs within OU5 as directed by the EPA and USACE.

Section B.2 of this QAPP describes the sampling procedures that will be used to collect data of sufficient quality and representativeness to evaluate each of these items.

A.2 Step 2 – Identify the Decision

This step identifies what questions the investigation will attempt to resolve and what actions may result. The principal study questions and possible alternative actions are as follows:

Table A-1 Decision Statements

Response Item Evaluated	Principal Study Question	Alternative Actions
Evaluate level and extent of LA present in Soil	Is LA detected at levels >TR in any soil samples?	▪ Document location and extent of LA-contaminated soil for removal action ▪ Take no action
	Is LA detected at levels equal to or <TR in any soil samples	▪ Document location and extent of LA-contaminated soil for removal action ▪ Take no action

LA – Libby Amphibole asbestos
TR – Trace (<0.2%)
> – greater than
< – less than

A.3 Step 3 – Identify the Inputs to the Decision

The purpose of this step is to identify the information and measurements that need to be obtained to resolve the decision statements. The information needed to resolve the principal study questions are summarized in Table A-2.

A.4 Step 4 – Define the Boundaries of the Study

This step specifies the spatial and temporal boundaries of this investigation.

A.4.1 Spatial Bounds

The information gathered to answer the objectives will be collected from areas along the OU5 Railroad Spur as shown on **Figure B-3**. The vertical spatial boundaries extend from ground surface of the sampling area to a depth of 36 inches below ground surface.

A.4.2 Temporal Bounds

It is not thought that asbestos concentrations in soil are likely to be time-variable in its current environment. Thus the time of field sampling effort is primarily dependent upon ease of site access and sample collection (i.e., easier to collect soil samples in the summer than in the winter). However, sampling should occur prior to installation/repair of proposed railroad spur work and any associated disturbance activities. Railroad work is anticipated to commence in the summer of 2015.

A.5 Step 5 – Develop Decision Rules

The purpose of this step is to describe the method that the EPA will use to assess whether the data collected indicate acceptance and the resulting decision applied when acceptance is not obtained. The principal study question, inputs to resolve study questions, action levels, and decision rules are summarized in Table A-3.

A.6 Step 6 – Specify Tolerable Limits on Decision Errors

The tolerable limits on decision errors, used to establish performance goals for the data collection design, are specified in this step.

Specific to performing this sampling investigation, two types of decision errors are possible:

- A Type I (false negative) decision error would occur if a risk manager decides that a sample does not contain LA above a level of concern, when in fact it is of concern.

- A Type II (false positive) decision error would occur if a risk manager decides that a sample does contain levels of LA above a level of concern, when in fact it does not.

The EPA is most concerned about guarding against the occurrence of Type I errors, since an error of this type may leave humans exposed to unacceptable levels of LA.

The EPA is also concerned with the probability of making Type II decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. Generally, the EPA allows for a 20 percent false positive rate.

For the purposes of completing all seven steps of the DQO process, the null hypotheses and consequences of making an incorrect decision are summarized in Table A-4. However, the gray region and tolerable limits on decision errors are not proposed because they are not applicable in this case.

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/practicability, and cost. As stated in the guidance document for development of DQOs: QA/G-4 (EPA 2006), solely statistically generated tolerable limits on decision errors are not necessary in certain cases provided that 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) and its amendments (EPA 2011 and 2014) for DQOs for the following soil sampling

A.7 Step 7 – Optimize the Design for Obtaining Data

This step identifies a resource-effective data collection design for generating data that are expected to satisfy the DQOs. The data collection design is described in detail in the remaining sections of this QAPP and other site documents referenced in Section B.

Referencing the *Action Level/Clearance Criteria Technical Memorandum* (EPA 2003) and its amendments (EPA 2011 and 2014) and data previously generated for the site, the DQOs have been designed to support the proposed activities and represent the best possible project planning effort. However, in implementing the requirements contained in this QAPP, 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 of the data gathering design. Recommendations must come through proper channels (i.e., through the FTL) and documented using either a Record of Modification to Documents Governing Field Activities form or an addendum to this QAPP. All modifications or addendums must be approved prior to making the proposed changes.

Table A-2 Summary of Inputs to Resolve Study Questions and Use of Information Acquired from Inputs

Principal Study Question	Input to Resolve Question	Use of Input to Resolve Question
Is LA detected at levels >TR in any soil samples?	Soil Samples	Soil samples will be collected from areas along the OU5 Railroad Spur. The results of the soil samples will be used to evaluate the extent of LA contamination and to assess whether removal is required.

TR – Trace (<0.2%)
LA – Libby Amphibole asbestos

Table A-3 Decision Rules

Principal Study Question	Input to Resolve Question	Input Requirements	Action Level	Decision Rule
Is LA detected at levels >TR in any soil samples?	Soil Samples	Analysis: PLM-VE and PLM-Grav with project-specific modifications Reported Result: % LA AS: 0.2%	> TR LA	If levels of LA > TR are detected in surface soil samples, area will be delineated for removal of contamination. If ≤TR LA is detected, take no action.

TR – Trace (<0.2%)
LA – Libby Amphibole asbestos
PLM-VE – polarized light microscopy visual area estimation
PLM-Grav – polarized light microscopy – gravimetric

Table A-4 Limits on Decision Errors

Principal Study Question	Null Hypothesis	Type I Error Will Result in:	Type II Error Will Result in:
Is LA detected at levels >TR in any soil samples collected from the OU5 Railroad Spur?	Surface soils are contaminated with LA at levels >TR	Determining that surface soils are not contaminated with LA at levels >TR when they actually are. This may result in no subsequent exterior removal and in turn, an increased risk to human health.	Determining that surface soils are contaminated with LA at levels >TR when they actually are not. This would result in unnecessarily including exterior excavation in the removal action and adds unnecessary costs to the removal.

LA – Libby Amphibole asbestos
TR – Trace (<0.2%)

Operable Unit 5 Railroad Spur Investigation
Quality Assurance Project Plan
Libby Asbestos Site, Operable Unit 5
Libby, Montana

Revision 0

07/08/2014

Project Period 03/30/2014 to 03/29/2015
Contract No. W9128F-11-D-0023
Task Order No. 0007

APPENDIX B
Standard Operating Procedures

Libby Asbestos Superfund Site
Standard Operating Procedure
Field Logbook Content and Control

Prepared by: _____ Date: 7/23/12
CDM Smith

Approved by: _____ Date: 7/23/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--
1	7/23/12	To maintain consistency with requirements for completing other field documentation (e.g., field sample data sheets), eliminated the requirement to strike through, initial, and date any self-adhesive labels placed in the logbook.

1.0 Objective

Logbooks are an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the content and control of Libby Site field logbooks. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Ruler or similar scale – Used with a property-specific drawing or plan to measure distance and sizes of objects, buildings, and zones.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

2.2 Discussion

Field logbooks are an accounting of observations and/or activities occurring at or associated with the Libby Site. Field logbooks are also used to duly document changes to or deviations from governing documents referencing this SOP. Information recorded in field logbooks includes date/time, site personnel, observations, calculations, weather, locations of field activities, and a description of the field activity, methods, instruments, and results. Additionally, the logbook may contain descriptions of waste, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for documenting activities in field logbooks will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of data entries are in accordance with this procedure. It is also the responsibility of the TL to communicate the need for any changes to/deviations from the SOP with the appropriate personnel, and document the change/deviation using a Libby Field Record of Modification Form.

Field Team Members – Field team members who make entries in field logbooks are required to read this procedure before engaging in this activity. Field team members will be assigned a field logbook prior to field activities and will be responsible for the care and maintenance of the logbook. Field team members will return field logbooks to the project file at the end of the assignment.

4.0 Equipment

The following is required for the proper completion of field logbooks:

- Logbook
- Indelible black or blue ink pen
- Ruler or similar scale

5.0 Procedures

5.1 Preparation

Commercially available, bound field logbooks with waterproof paper and lined, consecutively numbered pages will be used. Separate field logbooks will be kept for each field activity and the cover (some items may be recorded on the inside cover) of each field logbook shall clearly indicate:

- Field logbook sequence number
- Start date and end date of entries
- Title of document governing field activities
- Activity (if the logbook is to be activity-specific), site name, and location
- Contact name and phone number (typically the Project Manager)

For ongoing field activities that may span months or years, designated staff (e.g., field administrative staff) shall manage the field logbooks by tracking to whom and the date each field logbook was assigned, the general activities recorded in each field logbook, and the date the field logbook was returned to the project file.

The first two pages of the logbook will be reserved for a table of contents (TOC), and the third page will be reserved for abbreviations, acronyms, and definitions.

5.2 Operation

The following general requirements will apply when completing logbook entries for the Libby Site:

- Record equipment calibrations, work, observations, and quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are required by the governing document referencing this SOP, the information collected on the form does not need to be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.
- Correct erroneous information recorded in a field logbook with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not remove any pages from the logbook.
- Document relinquishment of the logbook from one author to another (both parties must sign and date the transfer).
- Sign and date the final entry each day.
- When columns are used to organize information recorded on laboratory documents, the information recorded in the columns shall be identified in a column heading.

Entries into the field logbook shall be preceded with the time (written in military units) of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In these cases, the logbook must reference the automatic data record or form.

At each location where a sample is collected or an observation or measurement made, a detailed description of the location is required and a sketch of the location may be warranted. All maps or sketches made in the logbook should have descriptions of the features shown and a direction indicator. It is preferred that maps and sketches be oriented so that north is toward the top of the page. Any maps, sketches, figures, or data that will not fit on a logbook page, or any separate forms or drawings (e.g., FSDS sheets, drawing markups) required by the governing document referencing this SOP should be referenced in the logbook.

Other events and observations that should be recorded include:

- Changes in weather or site conditions that impact field activities or have the potential to impact data collection (e.g., rain impacting air samples, upwind disturbances)
- Deviations from procedures outlined in any governing documents referencing this SOP, including the rationale and authorization for the deviation as appropriate
- Problems, downtime, or delays
- Visitors to the site

5.3 Post-operation

To guard against loss of data as a result of damage or disappearance of logbooks, completed pages and any supporting attachments shall be periodically photocopied (weekly, at a minimum) and maintained in the project file.

At the conclusion of each field activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated, that corrections were made properly, and that the cover information and TOC are complete. As field logbooks are completed, electronic copies may need to be posted to a project eRoom – refer to the governing document referencing this SOP for requirements. All original logbooks will be catalogued and maintained in the project file.

6.0 Restrictions/Limitations

Field logbooks constitute the official record of onsite technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by governing agency personnel and their subcontractors. They are documents that may be used in court to indicate dates, personnel, procedures, and techniques employed during site activities. Entries made in these logbooks should be factual, clear, precise, and non-subjective. Field logbooks, and entries within, are not intended for personal use.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure consistency in recording information in field logbooks for Libby Site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

7.2 Field Checks

Field logbooks may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the author and corrected. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-1, Field Logbook Content and Control, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Photographic Documentation of Field Activities

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

Photographic documentation, which includes still and digital photography and videotape or digital versatile/video disc (DVD) recordings, is an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for photographic documentation. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Arrows and Pointers – Used to indicate and/or draw attention to a special feature within the photograph.

Contrasting Backgrounds – Backdrops used to lay soil samples, cores, or other objects on for clearer viewing and to delineate features.

Data Recording Camera Back – A camera attachment or built-in feature that will record, at the very least, frame numbers and dates directly on the film. Digital cameras and recorders may also be equipped with a date stamping feature.

Identifier Component – Visual components used within a photograph such as visual slates, reference markers, and pointers.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Photographer – The camera operator (professional or amateur) for still photography, including digital photography, or videotape or DVD recording, whose primary function with regard to this SOP is to produce documentary or data-oriented visual media.

Reference Marker – A reference marker used to indicate a feature size in the photograph and is a standard length of measure, such as a ruler, meter stick, etc. In limited instances, if a ruled

marker is not available or its use is not feasible, it can be a common object of known size placed within the visual field and used for scale.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Slates – Blank white index cards, paper, or a dry-erase board used to present information pertaining to the subject/procedure being photographed. Letters and numbers on the slate will be bold and written with black indelible marking pens.

2.2 Discussion

Photographs and videotape or DVD recordings made during field activities are used as an aid in documenting and describing site features, sample collection activities, equipment used, and conditions during the field activity being performed. This SOP is designed to illustrate the format and desired placement of identifier components, such as visual slates, standard reference markers, and pointers. These items shall become an integral part of the "visual media" that, for the purpose of this document, shall encompass still photographs, digital photographs, videotape recordings (or video footage), and recordings on DVDs. The use of a photographic logbook and standardized entry procedures are also outlined. These procedures and guidelines will minimize potential ambiguities that may arise when viewing the visual media and ensure the representative nature of the photographic documentation.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for photographic documentation will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of photographic documentation are in accordance with this procedure. The TL is responsible for directing the photographer to specific situations, site features, or operations that the photographer will be responsible for documenting.

Photographer – The photographer shall seek direction from the TL and regularly discuss the visual documentation requirements and schedule. The photographer may be responsible for maintaining a logbook or itemization of photos/recordings or providing captions. Specific requirements will be defined in the governing document referencing this SOP.

4.0 Equipment

The following equipment may be used for photographic documentation:

- 35-millimeter (mm) camera and appropriate film (e.g., medium speed or multi-purpose fine-grain color)
- Disposable, single-use camera (35mm or panoramic use)
- Digital camera
- Video camera and appropriate storage media (e.g., videotapes, DVDs)
- Extra batteries
- Standard reference markers
- Slates

- Arrows or pointers
- Contrasting backgrounds
- Logbook
- Data recording camera back (if available)
- Indelible black or blue ink pen
- Storage medium for digital camera

5.0 Procedures

5.1 Preparation

In addition to this SOP, photographers must be familiar with all procedures applicable to the field activity being performed. These procedures should be consulted as necessary to obtain specific information about equipment and supplies, health and safety (including requirements for personal protective equipment at a site), sample collection, equipment and personnel decontamination, documentation, etc. These procedures should be maintained on site by field staff at all times for easy reference.

The photographer should also be aware of any potential physical hazards while photographing the subject (e.g., traffic, operating equipment, low overhead hazard, edge of excavation area).

If required, a commercially available, bound logbook will be used to log and document photographic activities. Alternatively, a portion of the field logbook may be designated as the photographic log and documentation section.

Because digital cameras and DVD recorders have multiple photographic quality settings, if not specified in the governing document referencing this SOP, the TL shall specify the resolution (quality) at which photographic documentation should be collected. It should be noted that a camera or DVD recorder that obtains a higher resolution (quality) has a higher number of pixels and will store a fewer number of photographs per digital storage medium.

5.2 Operation

The following sections provide general guidelines that should be followed to visually document field activities and site features using still/digital cameras and video equipment. Slate and caption information will not be required at the Libby Site unless specified in the governing document referencing this SOP.

5.2.1 Still Photography

Slate Information

Each new roll of film or digital storage medium will contain on the first usable frame (for film) a slate with consecutively assigned control numbers (a unique, consecutive number that is assigned by the photographer).

Caption Information

Still photographs will have a full caption permanently attached to the back or permanently attached to a photo log sheet. Digital photographs should have a caption added after the photographs are downloaded. Unless modified by the governing document referencing this SOP, captions should contain the following information:

- Film roll control number (if required) and photograph sequence number
- Site name or location

- Description of activity/item shown
- Date and time
- Direction (if applicable)
- Photographer

Close-up and Feature Photography
Close-up photographs should include a standard reference marker of appropriate size as an indication of the feature size.

Feature samples, core pieces, and other lithologic media should be photographed as soon as possible after they have been removed from their *in situ* locations to enable a more accurate record of their initial condition and color for formal lithologic observations and interpretations.

Site Photography
Site photography, in general, consists predominantly of medium- and wide-angle shots. A standard reference marker should be placed adjacent to the feature or, when this is not possible, within the same focal plane. While it is encouraged that a standard reference marker and caption/slate be included in the scene, it is understood that situations will arise that preclude their inclusion within the scene. This will be especially true of wide-angle shots. In such a case, the logbook (field or photographic), photographic caption, or digital file name shall specify all information pertinent to the scene.

5.2.2 Photographic Documentation Using Video Cameras
As a reminder, it is not within the scope of this document to set appropriate guidelines for presentation or "show" videotape or DVD recording. The following guidelines are set for documentary videotape or DVD recordings only and should be implemented at the discretion of the site personnel.

Documentary videotape or DVD recordings of field activities may include an audio slate for all scenes, as directed by the governing document referencing this SOP. At the beginning of each video session, an announcer will recite the following information: date, time (in military units), photographer, site ID number, and site location. This oral account may include any additional information clarifying the subject matter being recorded.

A standard reference marker may be used when taking close-up shots of site features with a video camera. The scene may also include a caption/slate. It should be placed adjacent and parallel to the feature being photographed.

A standard reference marker and caption/slate may be included in all scenes, as directed by the governing document referencing this SOP. The caption information is vital to the value of the documentary visual media and should be included. If it is not included within the scene, it should be placed before the scene.

Original video recordings will not be edited. This will maintain the integrity of the information contained on the videotape or DVD. If editing is desired, a working copy of the original video recording can be made.

A label should be placed on the videotape or DVD with the appropriate identifying information (project name, project number, date, location, etc.).

5.2.3 Photographic Logs

Photographic activities shall be documented in a photographic log or in a section of the field logbook, as directed by the governing document referencing this SOP. The photographer will be responsible for making proper entries.

The following information shall be maintained in the appropriate logbook:

- Photographer name
- Roll/tape/DVD control number (as appropriate)
- Sequential tracking number for each photograph taken (for digital cameras, the camera-generated number may be used)
- Date and time (military time)
- Location
- Description of the activity/item photographed
- Description of the general setup, including approximate distance between the camera and the subject
- Other pertinent information to assist in the identification of the subject matter

5.3 Post-operation

5.3.1 Processing

All film will be sent for development and printing to a photographic laboratory (to be determined by the photographer). The photographer will be responsible for arranging transport of the film from the field to the photographic laboratory. The photographer will also be responsible for arranging delivery of the negatives and photographs, digital storage medium, or videotape or DVD to the TL to be placed in the project file.

Digital media should be downloaded daily to a personal computer or secure server; the files should be in either “JPEG” or “TIFF” format. Files should be renamed at the time of download in accordance with any file-naming conventions required by the governing document referencing this SOP, or to correspond to the logbook. At a minimum, the file name should include the corresponding sampling location and/or sample number and the photograph date (e.g., “123 Elm St_2-15-2011”, “AA-12345_3-18-2009”).

5.3.2 Documentation

At the end of each day’s photographic session, the photographer(s) will ensure that all photographic documentation has been maintained in accordance with this SOP.

5.3.2 Archive

Unless otherwise specified in Libby Site data management requirements or the governing document referencing this SOP, digital photographs will be stored on a secure server (with a nightly backup) or posted to a web-based location (e.g., an eRoom or SharePoint portal). These files will be archived until project closeout, at which time project management will determine a long-term electronic file storage system.

6.0 Restrictions/Limitations

This document is designed to provide a set of guidelines for the field personnel to ensure that an effective and standardized program of visual documentation is maintained.

The procedures outlined herein are general by nature. The photographer is responsible for specific operational activity or procedure. Questions concerning specific procedures or requirements should be directed to the TL.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure quality photographic documentation is gathered to support site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

7.2 Field Checks

Photographic documentation processes may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the photographer and corrected. If field activities continue beyond six months, the frequency of assessing photographic documentation will be established by the Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-2, Photographic Documentation of Field Activities, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Control of Measurement and Test Equipment

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the control of measurement and test equipment (M&TE) used by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Traceability – The ability to trace the history, application, or location of an item and like items or activities by means of recorded identification.

2.2 Discussion

M&TE may be government furnished (GF), rented or leased from an outside vendor, or purchased. It is essential that measurements and tests resulting from the use of equipment be of the highest accountability and integrity. To facilitate that, the equipment shall be used in full understanding and compliance with the instructions and specifications included in the manufacturer's operations and maintenance and calibration procedures, and in accordance with any other related requirements specified in the governing document referencing this SOP.

3.0 Responsibilities

All staff with responsibility for the direct control and/or use of M&TE is responsible for being knowledgeable of, and understanding and implementing the requirements contained herein, as well as any additional related requirements.

Team Leader (TL) – Responsible for identifying the technical specifications (e.g., precision, accuracy) for M&TE needed to meet project data collection objectives, and determining any

additional applicable Libby Site-specific requirements (e.g., periodic calibration of primary calibration sources) for M&TE.

Requisitioner – Responsible for ensuring M&TE is obtained or procured that meets the technical specifications identified by the TL, and facilitates obtaining the manufacturer's operations and maintenance and calibration procedures prior to field work.

Receiver – Responsible for receipt and/or unpackaging of M&TE and notifying the TL that the item has been received.

User – Responsible for the proper preparation and use of M&TE to collect the quality and quantity of data needed to meet project objectives. Users are typically field team members.

4.0 Equipment

Required M&TE will be specified in the governing document referencing this SOP.

5.0 Procedures

The following general requirements apply to M&TE at the Libby Site. Additional details and responsibilities are described later in this section.

- Manufacturer maintenance and calibration procedures must be followed when using M&TE
- Obtain the maintenance and calibration procedures if they are missing or incomplete
- Attach or include the maintenance and calibration procedures with the M&TE
- Prepare and record maintenance and calibration in an equipment or field log according to requirements stated in the governing document referencing this SOP
- Maintain M&TE records
- Label M&TE requiring routine or scheduled calibration (when required)
- Perform maintenance and calibration using the appropriate procedure and calibration standards
- Identify and take action on nonconforming M&TE

5.1 Preparation

5.1.1 Obtain the Operating, Maintenance, and Calibration Documents

For Procured M&TE

Requisitioner – Specify that the maintenance and calibration procedures be included.

For GF M&TE Acquired as a Result of Property Transfer

TL – Inspect the M&TE to determine whether maintenance and calibration procedures are included with the item. If missing or incomplete, obtain the appropriate documentation from the manufacturer.

For Rented or Leased M&TE

Requisitioner – Specify that the maintenance and calibration procedures, the latest calibration record, and the calibration standards certification be included. If this information is not delivered with the M&TE, request it from the vendor.

5.1.2 Prepare and Record Maintenance and Calibration Records

For All M&TE

Receiver – Upon receipt of an item of M&TE, notify the TL for the overall property control of the equipment.

TL and User – Record all maintenance and calibration events in an equipment or field log. The log must have sequentially-numbered pages.

5.2 Operation

TL and User – Operate, maintain, and calibrate M&TE in accordance with the maintenance and calibration procedures. Record maintenance and calibration actions in the equipment log or field log.

5.2.2 Traceability of Calibration Standards

For All M&TE

TL and User –

- When ordering calibration standards, request nationally recognized standards as specified or required. Request commercially available standards when not otherwise specified or required. Or, request standards in accordance with other related project-specific requirements.
- Require certifications for standards that clearly state the traceability.
- Require Material Safety Data Sheets to be provided with standards.
- Note standards that are perishable and consume or dispose of them on or before the expiration date.

5.2.3 M&TE That Fails Calibration

For any M&TE item that cannot be calibrated or adjusted to perform accurately:

User – Immediately discontinue use and segregate the item from other equipment.

TL – Review the current and previous maintenance and calibration records to determine if the validity of current or previous measurement and test results could have been affected and notify the appropriate authorities (typically the Project Manager) of the results. Any test results that are known to impact or have the potential to impact project data will be documented using a Libby Field Record of Modification Form.

5.3 Post-operation

M&TE shall be promptly returned to the owner at the end of field activities. All operations, maintenance, and calibration procedures shall be retained with the M&TE. Project M&TE records (e.g., equipment logs) will be retained in the project file.

6.0 Restrictions/Limitations

On an item-by-item basis, exemptions from the requirements of this SOP may be granted by the Health and Safety Manager and/or Quality Assurance Manager. All exemptions shall be documented by the grantor and included in the equipment records as appropriate.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes. Every effort will be made to ensure the appropriate and functional M&TE are used to support site activities. This will be achieved to the extent possible through proper training, use of qualified procurement and designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require discussion with appropriate management and, as appropriate, re-training of the field team members. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 5-1, Control of Measurement and Test Equipment, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Field Equipment Decontamination

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

Decontamination of field equipment is necessary to ensure acceptable quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off site. The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the decontamination of field equipment used by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Definitions

Clean – Free of contamination and when decontamination has been completed in accordance with this SOP.

Cross contamination – The transfer of contaminants through equipment or personnel from the contamination source to less contaminated or non-contaminated samples or areas.

Decontamination – The process of rinsing or otherwise cleaning the surfaces of equipment to rid them of contaminants and to minimize the potential for cross contamination of samples or exposure of personnel.

De-mineralized water – Water that has had most to all minerals removed from it. De-mineralized water shall only be stored in clean glass, stainless steel, or plastic containers that can be closed when not in use.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Material Safety Data Sheet (MSDS) – Document that discusses the proper storage and physical and toxicological characteristics of a particular substance used during field operations. MSDSs are to be maintained on site at all times during field operations.

Potable water – Tap water may be obtained from any municipal system. Chemical analysis of the water source may be required before it is used.

Sampling equipment – Equipment that comes into direct contact with the sample media. Such equipment includes split spoon samplers, well casing and screens, and trowels or bowls used to collect and/or homogenize samples.

Soap – Low-sudsing, non-phosphate detergent (e.g., Liquinox®).

Solvent rinse – Pesticide-grade (or better) isopropanol, acetone, or methanol.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for field equipment decontamination will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader - The TL is responsible for ensuring that field personnel are properly trained and that decontamination is conducted in accordance with this procedure and any other pertinent Libby Site decontamination processes cited in the governing document referencing this SOP.

Field Team Members – Field team members performing operations on the Libby Site are responsible for adhering to the procedures contained in this SOP and any other decontamination processes specified in the governing document referencing this SOP. If required, field team members will collect and document rinsate samples (also known as equipment blanks) to provide quantitative verification that these procedures have been correctly implemented. Field team members are also responsible for communicating any problems pertaining to the decontamination of field equipment to the TL.

4.0 Equipment

The following equipment may be employed wholly or in part during use of this SOP (refer to the governing document referencing this SOP for detailed requirements):

- Stiff-bristle scrub brushes
- Plastic buckets, scoops, trowels, and troughs
- Soap
- Nalgene® or Teflon® sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayers (pump sprayer material must be compatible with the solution used)
- Plastic sheeting, plastic bags, and/or aluminum foil to keep decontaminated equipment clean between uses
- Disposable wipes, rags, or paper towels
- Potable water (potable water may be required to be tested for contaminants before use)
- De-mineralized water
- Gloves, safety glasses, and other protective clothing as specified in the health and safety plan
- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source

- Tools for equipment assembly and disassembly
- 55-gallon drums or tanks for temporary storage of decontamination water
- Pallets for drums or tanks holding decontamination water

5.0 Procedures

All reusable equipment (non-dedicated) used to collect, handle, or measure samples shall be decontaminated before coming into contact with any sample media or personnel using the equipment. Decontamination of equipment shall occur either at a specified location, central decontamination station or at portable decontamination stations set up at the sampling location, drill site, or monitoring well location. The centrally-located decontamination area may include an appropriately-sized bermed and lined area on which equipment decontamination occurs and equipped with a collection system and/or storage vessels. In certain circumstances, berming may not be necessary when small quantities of water are being generated and for some short duration field activities. Equipment shall be transported to and from the decontamination area in a manner to prevent cross contamination of equipment and/or the area.

Typically at the Libby Site, decontamination water will not be captured and will be discharged to the ground at the site. However, the exact procedure for decontamination waste disposal may be discussed in the governing document referencing this SOP. Also, solvent rinse fluids may need to be segregated from other investigation-derived waste (IDW).

All items that come into contact with potentially contaminated media shall be decontaminated before use, between sampling locations (does not need to be performed between aliquots of an individual sample) and/or drilling locations, and after use. All decontamination procedures for the equipment being used are provided in the following sections.

General Guidelines

- Potable or de-mineralized water shall be free of all contaminants of concern. Depending upon the governing document referencing this SOP, analytical data from the water source may be required to ensure it is clean.
- Sampling equipment that has come into contact with oil and grease shall be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Regulatory or Libby Site-specific requirements regarding solvent use shall be stated in the governing document referencing this SOP.
- All solvents[1] shall be pesticide-grade or better and traceable to a source. The corresponding lot numbers shall be recorded in the appropriate field logbook.
- Decontaminated equipment shall be allowed to air dry before being used.
- Documentation of all equipment, including type of equipment, date, time, method of decontamination, and any associated field quality control sampling, shall be recorded in the field logbook.

[1]Solvents are potentially hazardous materials and must be handled, stored, and transported accordingly. Solvents shall never be used in a closed building. See the investigation-specific health and safety plan and/or the chemical's MSDS for specific information regarding the safe use of the chemical.

- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment shall be used as specified in the governing document referencing this SOP and/or health and safety plan.

5.1 Heavy Equipment Decontamination

Heavy equipment typically used at the Libby Site includes drilling rigs, trucks, and excavators. For any heavy equipment used during EPA response actions, the equipment decontamination procedures provided in the current version of the Libby Asbestos Site Response Action Work Plan shall apply. For all other field activities, follow these steps when decontaminating heavy equipment:

1. Establish a bermed decontamination area that is large enough to fully contain the equipment to be cleaned. If available, an existing wash pad or appropriate paved and bermed area may be used; otherwise, use one or more layers of heavy plastic sheeting to cover the ground surface and berms. All decontamination pads shall be upwind of the investigation area(s).
2. With the heavy equipment in place, spray areas (rear of rig or backhoe) exposed to contaminated media by pressurized means. Be sure to spray down all surfaces, including the undercarriage.
3. Use brushes, soap, and appropriate decontamination water to remove dirt whenever necessary.
4. Remove equipment from the decontamination pad.
5. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

5.2 Downhole Equipment Decontamination

Downhole equipment includes hollow-stem augers, drill pipes, rods, and stems. Follow these steps when decontaminating this equipment:

1. Set up a centralized decontamination area, if possible. This area shall be set up to collect contaminated rinse waters and to minimize the spread of airborne spray.
2. Set up a “clean” area upwind of the decontamination area to receive cleaned equipment for air-drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination areas shall be upwind of any areas under investigation.
3. Using soap and appropriate water with pressurization (e.g., Hudson® sprayer), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.
4. If using soapy water, rinse the equipment using clean appropriate water with pressurization.
5. Remove the equipment from the decontamination area and place in a clean area upwind to air dry.
6. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing

contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

5.3 Sampling Equipment Decontamination

Follow these steps when decontaminating sampling equipment:

1. Set up a decontamination line. The decontamination line shall progress from "dirty" to "clean." A clean area shall be established upwind of the decontamination wash/rinse activities to dry the equipment.
2. Disassemble any items that may trap contaminants internally. Do not reassemble the items until decontamination and air drying are complete.
3. Wash the items with appropriate water and soap using a stiff brush as necessary to remove particulate matter and surface films. With the exception of polyvinyl chloride or plastic items, the items may be steam-cleaned using soap and hot water as an alternative to brushing. Items that have come into contact with concentrated and/or oily contaminants may need to be rinsed with a solvent such as hexane and allowed to air dry prior to this washing step.
4. Thoroughly rinse the items with potable water.
5. If sampling for organic compounds, thoroughly rinse the items with solvent (e.g., isopropanol) followed by a rinse using de-mineralized water. The specific chemicals used for the solvent rinse phase shall be specified in the work plan. Solvents are potentially hazardous materials and care must be exercised when using these chemicals to prevent adverse health effects. Appropriate personal protective equipment (PPE) must be worn when using these chemicals. These chemicals (including spent rinsate) must be managed and stored appropriately. Special measures such as proper labels, paperwork, notification, etc. may be required when transporting or shipping solvent chemicals.
6. Rinse the items thoroughly using de-mineralized water.
7. Allow the items to air dry completely.
8. After decontamination activities are completed, collect all plastic sheeting, and disposable PPE. Place the contaminated items in properly labeled bags or containers for disposal. Refer to the governing document referencing this SOP for labeling and waste management requirements.

5.4 Pump Decontamination

Follow the manufacturer’s recommendation for specified pump decontamination procedures. At a minimum, follow these steps when decontaminating pumps:

1. Set up the decontamination area and separate “clean” storage area using plastic sheeting to cover the ground, tables, and other surfaces. Set up three containers: the first container shall contain dilute (non-foaming) soapy water; the second container shall contain potable water; and the third container shall contain de-mineralized water.
2. The pump shall be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first container. Pump soapy water through the pump assembly. Scrub the outside of the pump and other wetted parts with a metal brush.

3. Move the pump assembly to the potable water container while leaving discharge outlet in the waste container. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.
4. Move the pump intake to the de-mineralized water container. Pump the water through the pump assembly. Pump the volume of water through the pump specified in the field plan. Usually, three pump-and-line-assembly volumes shall be required.
5. Remove the decontaminated pump assembly to the clean area and allow it to air dry upwind of the decontamination area. Intake and outlet orifices shall be covered to prevent the entry of airborne contaminants and particles.

5.5 Instrument Probe Decontamination

Instrument probes used for field measurements (e.g., pH meters, conductivity meters) shall be decontaminated between samples and after use with de-mineralized water. At no time shall a sample probe be placed in contact with water within a sample container.

5.6 Waste Disposal

Waste disposal should follow the requirements listed in Libby project-specific SOP for handling investigation-derived waste (IDW) and the governing document referencing this SOP. The following are guidelines for disposing of waste:

- Decontamination water will typically not be captured, packaged, labeled, or stored as IDW at the site. Decontamination water will be discharged to the ground at the work site. Other materials used in the decontamination process will be disposed of as IDW.
- Small quantities of decontamination solutions may be allowed to evaporate to dryness.
- If large quantities of used decontamination solutions shall be generated, each type of waste shall be segregated in separate containers.
- Plastic sheeting and disposable protective clothing will be treated and disposed of as asbestos-containing materials.

6.0 Restrictions/Limitations

If the field equipment is not thoroughly rinsed and allowed to completely air dry before use, volatile organic residue, which interferes with the analysis, may be detected in the samples. The occurrence of residual organic solvents is often dependent on the time of year sampling is conducted. In the summer, volatilization is rapid, and in the winter, volatilization is slow. Check with EPA Region 8 and the State of Montana for approved decontamination solvents.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper field equipment decontamination, which will be achieved to the extent possible through proper training, use of designated field staff, and

provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Adherence to field equipment decontamination requirements may be checked on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any non-compliance discussed with the field team member. If field activities continue beyond six months, the frequency of assessing field equipment decontamination will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-5, Field Equipment Decontamination, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Handling Investigation-derived Waste

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for handling investigation-derived waste (IDW) resulting from work performed by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Hazardous Waste – Discarded material that is regulated listed waste, or waste that exhibits ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.3 or state regulations.

Investigation-derived Waste (IDW) – Discarded materials resulting from field activities such as sampling, surveying, drilling, excavation, and decontamination processes that, in present form, possess no inherent value or additional usefulness without treatment.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Treatment, Storage, and Disposal Facility (TSDF) – Permitted facilities that accept hazardous waste shipments for further treatment, storage, and/or disposal. These facilities must be permitted by the EPA and appropriate state and local agencies.

2.2 Discussion

At the Libby Site, field investigation and response action activities may result in the generation of IDW. IDW may include soil and cuttings from test pits or well installation; soil and other materials from the collection of samples; personal protective equipment (PPE); and other wastes or supplies used during the sampling and testing of potentially hazardous materials.

The vast majority of Libby Site IDW is expected to relate to the contaminant of concern – Libby amphibole asbestos. The overall management of IDW must comply with applicable regulatory requirements.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for handling IDW will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for identifying Libby Site-specific requirements for the disposal of IDW in accordance with federal, state, and/or facility requirements, and ensuring that all IDW procedures are conducted in accordance with this SOP. The TL will communicate with the field team members regarding the specific objectives and anticipated situations that require deviation from this SOP.

Field Team Members – Field team members are responsible for adhering to the procedures contained in this SOP, and communicating any unusual or unplanned condition to the TL.

4.0 Equipment

Equipment required for IDW containment may vary according to field activity requirements. Management decisions concerning the necessary equipment required shall consider containment method, sampling, labeling, maneuvering, and storage (if applicable). Equipment must be onsite and inspected before commencing work.

4.1 IDW Containment Devices

The appropriate containment device (e.g., bags, drums, tanks, etc.) and the ultimate disposition of the IDW shall be specified in the governing document referencing this SOP. Typical IDW containment devices include:

- Plastic sheeting (polyethylene) with a minimum thickness of 6 mil
- U.S. Department of Transportation (DOT)-approved steel containers
- Polyethylene or steel bulk storage tanks

The volume of the appropriate containment device shall be specified in the governing document referencing this SOP.

4.2 IDW Container Labeling

A “Waste Container” or “IDW Container” label or indelible marking shall be applied to each container. Labeling or marking requirements for onsite IDW not expected to be transported offsite are as detailed below.

- Labels and markings must contain the following information: project name, generation date, location of waste origin, container identification number, sample number (if applicable), and contents.

- Each label or marking will be applied to the upper one-third of the container at least twice, on opposite sides.

- Containers that are 5 gallons or less may only require one label or set of markings.

- Labels or markings will be positioned on a smooth part of the container. The label must not be affixed across container bungs, seams, ridges, or dents.

- Labels must be constructed of a weather-resistive material with markings made with a permanent marker or paint pen and capable of enduring the expected weather conditions. If markings are used, the color must be easily distinguishable from the container color.

- Labels will be secured in a manner to ensure that they remain affixed to the container.

Labeling or marking requirements for IDW expected to be transported off of the work site must be in accordance with the requirements of 29 CFR 1926.1101.

4.3 IDW Container Movement

Staging areas for IDW containers shall be predetermined and in accordance with investigation-specific requirements. Arrangements shall be made before field mobilization as to the methods and personnel required to safely transport IDW containers to the staging area. Transportation of IDW containers offsite via a public roadway is prohibited unless 49 CFR 172 requirements are met.

4.4 IDW Container Storage

Containerized IDW awaiting results of pending chemical analysis or further onsite treatment shall be staged on site. Staging areas and bulk storage procedures are to be determined according to investigation-specific requirements. Containers are to be stored in such a fashion that the labels can be easily read. A secondary/spill container must be provided for liquid IDW storage and as appropriate for solid IDW storage (e.g., steel drums shall not be stored in direct contact with the ground).

5.0 Procedures

The three general options for managing IDW are: 1) collection and onsite disposal; 2) collection for offsite disposal; and 3) collection and interim management. The option selected shall take into account the following factors:

- Type (soil, sludge, liquid, debris), quantity, and source of IDW
- Risk posed by managing the IDW onsite
- Compliance with regulatory requirements
- IDW minimization and consistency with the Libby Site remedy

5.1 Collection and Onsite Disposal

5.1.1 Soil/Sludge/Sediment

Unless otherwise specified in the governing document referencing this SOP, when handling soil/sludge/sediment IDW at the Libby Site, the following will apply:

- Return IDW to boring, pit, or source immediately after generation as long as returning the media to these areas will not increase site risks (i.e., the contaminated soil will not be in a different area or at a different depth than from where it was originally obtained).

5.1.2 Aqueous Liquids

Unless otherwise specified in the governing document referencing this SOP, options for handling aqueous liquid IDW at the Libby Site are listed below. These options may require results of laboratory analysis to obtain client and/or regulatory approval.

- Discharge to ground surface close to the well from which it was extracted, only if soil contaminants will not be mobilized in the process and the action will not contaminate clean areas. If IDW from the sampling of background up-gradient wells is not a community concern or associated with soil contamination, this presumably uncontaminated IDW may be released on the ground around the well.
- When small amounts (i.e., less than 5 gallons) of used decontamination fluids are generated during site characterization activities (e.g., during soil sampling), the fluids may be discharged to the ground surface within the sampling area or allowed to evaporate from an open bucket.

5.1.3 Disposable PPE

Disposable PPE IDW (not including excess soil volume) for the Libby Site will be collected in garbage bags and marked “IDW” with an indelible ink marker. These bags will be deposited into the asbestos-containing material (ACM) waste stream for appropriate disposal at the local Class IV asbestos landfill. Excess soil volume will be returned to the area from where it was collected.

5.2 Collection and Interim Management

Collection and interim management options that may be employed for Libby Site IDW are provided herein.

Storing IDW onsite until the final action may be practical in the following situations:

- Returning wastes (especially sludges and soils) to their onsite source area would require re-excavation for disposal as determined for the final site remedy.
- Interim storage in containers may be necessary to provide adequate protection to human health and the environment.
- Storing IDW until the final disposal of all wastes from the site will eliminate the need to address this issue more than once.
- Interim storage may be necessary to provide time for sampling and analysis.

6.0 Restrictions/Limitations

Managers of the site shall determine the most appropriate disposal option for IDW an activity-specific basis. Parameters to consider, especially when determining the level of protection, include: the volume of IDW and the nature of contaminants present in the site soil. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components and therefore may need to be handled, treated, and disposed as non-liquid waste. Disposable sampling materials, disposable PPE, decontamination fluids, etc. will always be

managed on a site-specific basis. Under no circumstances shall these types of materials be stored in a site office, facility, or warehouse.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper handling of IDW, which will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Adherence to requirements for handling IDW may be checked on a daily basis by the TL (or their designate) for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require field team member re-training. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager or their designate.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-2, Guide to Handling Investigation-derived Waste, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Sample Custody

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

Sample custody procedures are integral to maintaining and documenting the possession of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for sample custody for the Libby Site. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Facility – A designated sample processing facility, analytical laboratory, or long-term storage area, for Libby Site samples.

Field sample data sheet (FSDS) – A controlled document used to record sample information.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Sample – Material to be analyzed that is contained in single or multiple containers representing a unique sample number.

Sample custody – The possession or safe-keeping of samples in such a manner that prevents tampering, damage, or loss.

Sample labels – Adhesive-backed labels that contain, at a minimum, the unique sample number/identifier. Sample labels are typically used on field documentation, sample cassettes, and containers, and may be pre-printed to minimize sequencing or transcription errors.

2.2 Discussion

Because of the evidentiary nature of samples collected during environmental investigations, possession must be traceable from the time the samples are collected until their derived data are introduced as evidence in legal proceedings. To maintain and document sample possession, sample custody procedures must be followed.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for the custody of samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for ensuring that strict chain-of-custody procedures are maintained during all sampling events.

Sampler – Responsible for the care and custody of samples from the time of collection until they are transferred.

Field Sample Coordinator (FSC) – Responsible for accepting samples into their custody from the sampler(s), producing COCs, and relinquishing or shipping samples to the appropriate facility.

Laboratory Coordinator (LC) – Responsible for coordinating the preparation and/or analysis of Libby Site samples with project facilities in order to achieve requested turnaround times for analytical data.

4.0 Equipment

Depending upon staff responsibility, the following equipment will be employed during use of this SOP:

- Field logbook
- FSDSs
- Indelible blue or black ink pens
- Sample labels
- Zip-top plastic bags
- Custody seals
- Container(s) in which to keep/protect samples

5.0 Procedures

5.1 Preparation

Communications between the TL, sampler(s), the FSC, the LC are critical to ensure the efficient throughput of samples to meet project data objectives. As such, an FSC will attend all field planning meetings to gather information about sampling events (e.g., sample quantities, special sample handling, processing, or analysis concerns, and requested turnaround times). For long-term field programs, sampling staff will notify the FSC daily of the estimated number and type of samples to be collected. In either case, the FSC will relay the pertinent investigation-specific information to the LC, who will, in turn, coordinate preparation and/or analysis with project facilities. On an as-needed basis (typically daily during the field season), the FSC will schedule meetings in which to relinquish samples to the LC.

5.2 Operation

A sample is under custody if it is: 1) in your possession, 2) in your view after being in your possession, 3) in your possession and you locked it up, or 4) in a designated secure area. The following procedures detail the process used to maintain the custody of each Libby Site sample. Note that if at any point samples are left unattended or receipt of samples is refused, this must be documented in the field logbook or on the COC, as appropriate.

5.2.1 Sampler Custody

Sample custody begins at the time of sample collection and will be maintained using a field logbook and FSDSs to document pertinent sample-related information. Samples will be placed in safe areas where they are protected from tampering, damage, or loss. Following sample collection, custody seals will be used as an indicator of tampering. Samples will remain in the sampler's possession, within sight, or in a secure area (e.g., locked vehicle) until the sample is relinquished.

For samples collected using zip-top bags as the primary container, all samples will be double-bagged and custody sealed on the outer bag by the sampler. For samples collected using cassettes, the cassette will be custody sealed so that both end caps of the sampling cassette are covered but sample labels or identifiers are not obstructed. The cassette will then be placed in a zip-top bag.

Sampler(s) may be required to transfer custody of samples directly to an FSC or a designated secure sample storage location, or to hand deliver or ship samples to a facility – refer to the governing document referencing this SOP for specifics. Project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*, will be followed for samples that are required to be shipped.

If relinquishing to an FSC or secure storage area, the sampler will note in the field logbook the time of transfer, and the name and company affiliation of the receiver or dedicated storage location. Completed and quality-checked FSDSs will accompany the samples.

5.2.2 FSC Custody

Upon receipt of samples and accompany FSDSs, the FSC will verify that:

- Each FSDS is complete
- Each sample is accounted for
- Soil samples are double-bagged
- Each cassette is sealed in its own zip-top bag and caps on cassettes are in place
- Sample containers (e.g., bags, bottles) are tightly sealed
- Custody seals are correctly and securely placed on each sample
- Samples appear to be in an acceptable condition (i.e., cassettes are not cracked; sample containers are not leaking, etc.).
- No information is provided on the sample or sample container that would disclose the origin of the sample to the facility

The FSC will immediately contact the sampler if any acceptance issues are encountered. Once accepted, the FSC will prepare a COC using EPA-specified data management tools (e.g., Data Entry Tool, Scribe). An investigation-specific Analytical Summary Sheet (available in the SAP or Libby Field eRoom) will be attached to the COC. The FSC will group or batch the appropriate number of individual samples on a COC to facilitate data reporting, or as otherwise requested by the LC.

The following general batching guidelines will be used for commonly sampled Libby Site media:

- 10 or fewer non-clearance air samples on one COC
- one set of five clearance air samples and two corresponding field blanks on one COC
- 20 or fewer soil or soil-like (e.g., duff, wood chip) samples on one COC
- 10 or fewer dust samples on one COC

Following coordination with the LC, the FSC will hand deliver or ship samples (following project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*) to the designated facility. All samples will be maintained in a secure location by the FSC until they are relinquished to another party.

5.3 Post-operation

Sample documentation (logbooks, FSDSs, field copy of the COC, etc.) will be maintained in accordance with Libby Site data management requirements and any special requirements stated in the governing document referencing this SOP (e.g., posting to an eRoom).

6.0 Restrictions/Limitations

For EPA Contract Laboratory Program sampling events, combined chain-of-custody/traffic report forms generated with Scribe or other EPA-specific records may be used. Refer to EPA regional guidelines for completing these forms. Scribe software may be used to customize sample labels and custody records when directed by the client.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any non-compliance issues will be discussed with field personnel and corrected. If field activities continue beyond six months, the frequency of assessing sample custody procedures will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 1-2, Sample Custody, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Packaging and Shipping Environmental Samples

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the packaging and shipping of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Sections 2.0 through 7.0 of this SOP outline requirements for the packaging and shipping of regulated environmental samples under the U.S. Department of Transportation (DOT) Hazardous Materials Regulations, the International Air Transportation Association (IATA), and International Civil Aviation Organization (ICAO) Dangerous Goods Regulations (for shipment by air) and applies only to domestic shipments.

This SOP does not cover the requirements for packaging and shipment of equipment or bulk chemicals that are regulated under the DOT, IATA, and ICAO, nor does it address shipment of hazardous materials. Hazardous material will not be shipped unless personnel have received training that meets the requirements of the governing agency and the DOT.

Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Bottle ware – Plastic or glass bottles or jars used to contain sampled material. Their purpose is to keep sampled material from mixing with the ambient environment.

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Environmental sample – An aliquot of air, water, plant material, sediment, or soil that represents potential contaminant levels at a site. This procedure applies only to environmental samples that

contain less than reportable quantities for any foreseeable hazardous constituents according to DOT regulations promulgated in 49 CFR - Part 172.101 Appendix A.

Facility – A sample processing facility, analytical laboratory, or long-term storage area that serves as the receiver for Libby Site samples.

Excepted quantity – Excepted quantities are limits to the mass or volume of a hazardous material in the sample containers below which DOT, IATA, ICAO regulations do not apply. The excepted quantity limits are very low. Most regulated shipments will be made under limited quantity.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Limited quantity – Limited quantity is the maximum amount of a hazardous material below which there are specific labeling or packaging exceptions.

Performance testing – Performance testing is the required testing of outer packaging. These tests include drop and stacking tests.

Qualified Shipper – A qualified shipper is a person who has been adequately trained to perform the functions of shipping hazardous materials.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

2.2 Discussion

Proper packaging and shipping is necessary to ensure the integrity of environmental samples during transport. These shipments are potentially subject to regulations published by DOT, IATA, or ICAO. Failure to abide by these rules places both the governing agency and the individual employee at risk of serious fines.

3.0 Responsibilities

Successful execution of this SOP requires a clear definition of assigned roles and responsibilities. All staff responsible for packaging or shipping Libby Site environmental samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for overseeing sample packaging and shipping processes as described in this SOP.

Packager/Shipper – Party (typically the Field Sample Coordinator or Sampler) responsible for properly packaging and shipping samples to the designated project facility.

Qualified Shipper – Responsible for ensuring that samples undergoing shipment contain no other contaminant that meets the definition of "hazardous material" as defined by DOT, and for determining the amount of preservative in each sample so that accurate determination of quantities can be made.

4.0 Equipment

4.1 Environmental Samples without Preservatives

The following equipment will be used when packaging and shipping Libby Site samples:

- Shipping containers (e.g., insulated cooler for limited quantities, a sturdy box for air samples)
- Bubble wrap or other space filler
- Heavy-duty plastic garbage bags
- Plastic zip-top bags
- Custody seals
- Clear packaging tape
- Completed chain-of-custody record
- Duct tape
- Completed shipping label
- Completed return address label (for return of coolers)

Vermiculite, shredded paper, expanded polystyrene, or other absorbent material will not be used for packaging or shipping Libby Site samples. Plastic bubble wrap and ice (as required) is acceptable packing material.

4.2 Environmental Samples with Preservatives

In addition to the equipment listed in Section 4.1, the following additional equipment is required when packaging samples containing preservatives:

- Sample containers
- Insulated coolers
- ice packs/bags or “blue ice”
- Sample labels
- Nitrile gloves

5.0 Procedures

5.1.1 Preparation

Considerations that must be made prior to shipping samples include selecting the appropriate shipping option (e.g., overnight delivery) so that analytical holding times for the samples are not exceeded; packaging samples in time to meet courier or shipping service pick-up times; and making arrangements with the project facility regarding Saturday receipt of samples.

5.2 Operation

5.2.1 Solid Media Samples without Preservatives

The following processes will be employed by the Packager/Shipper for non-preserved, solid media samples (soil, duff, bark, bulk material), and samples collected on cassettes (air, dust). Section 5.2.2 provides procedures for packaging and shipping aqueous samples (groundwater, surface water), or samples with aqueous content (sediment, sludge). Due to the potential for cross contamination, samples collected on cassettes must not be shipped in the same container as solid media samples. Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Select a sturdy shipping container. Ensure that coolers are in good repair. Air and dust samples must be shipped in separate containers from solid media samples.
3. Place samples into the shipping container. During placement, ensure custody seals are securely in place and verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the shipping container.
4. Fill all remaining space with bubble wrap or other appropriate space filler, to prevent the sample(s) from being jostled.
5. After the COC has been signed and dated (time included), retain the field copy of the COC. If using a cooler, place the following items into a zip-top plastic bag for inclusion in the cooler: the top two copies of the COC, an analytical parameters table (if applicable), a copy of the investigation-specific analytical requirements summary sheet (applicable to any asbestos analysis), a completed return shipping label for return of the cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close. If using a box, include all aforementioned documentation inside the box along with the samples.
6. Attach a completed custody seal across the opening of the shipping container on opposite sides. If using a cooler, the cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
7. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
8. Once the container is shipped, notify the laboratory of the shipment number and anticipated arrival date/time.

5.2.2 Aqueous or Aqueous-content Samples without Preservatives

This process below will be employed by the Packager/Shipper for non-preserved, aqueous (or aqueous content) samples collected in bottle ware (water, sediment, sludge). Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Be sure the caps on all bottles are tightened to prevent leaking. Ensure custody seals are securely in place.
3. For glass containers, wrap each container in bubble wrap and secure with waterproof tape to prevent breakage.
4. Place each plastic or bubble-wrapped glass container into a zip-top bag. Smaller glass containers, such as 40-milliliter vials, may be wrapped together for the same sample.
5. Remove as much trapped air when sealing the bag.

6. Select a sturdy cooler in good repair. To control contents: duct tape closed any interior drain plugs from the inside; duct tape closed any exterior drain plugs from the outside; and line the cooler with two large heavy-duty plastic garbage bags.
7. Place the samples into the cooler with sufficient space to allow for the addition of packing material between the samples. It is preferable to place glass sample bottles and jars into the cooler vertically (glass containers are less likely to break when packed vertically rather than horizontally). During placement, verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the cooler.
8. Fill all remaining space with bubble wrap or other appropriate space filler to prevent the sample(s) from being jostled.
9. After the COC has been signed and dated (time included), retain the field copy of the COC. Place the following items into a zip-top plastic bag for inclusion in the cooler: the top two copies of the COC, an analytical parameters table (if applicable), a copy of the Analytical Summary Sheet as provided in the governing document referencing this SOP (only applicable to asbestos analysis), a completed return shipping label for return of the cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close.
10. Fill all remaining space between the samples with packing material. Remove excess air from garbage bags and seal each bag by securely taping the opening closed and then applying a custody seal on the outermost bag.
11. Attach a completed custody seal across the opening of the cooler on opposite sides. The cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
12. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
13. Once the container is shipped, notify the laboratory of the shipment number and anticipated arrival date/time.

5.2.3 Samples Requiring Temperature Controls

If temperature controls (i.e., ice) are required (refer to the guidance document referencing this SOP), in addition to the procedures listed in Section 5.2.1 (for solid media samples) or Section 5.2.2 (for aqueous samples), the Packager/Shipper will:

1. Duct tape closed any drain plugs (inside and outside) and line the cooler with two large heavy-duty plastic garbage bags. (This step will already have been performed for aqueous/aqueous-content samples.)
2. Place ice in one-gallon plastic zip-top bags and properly seal the bags.
3. Place bags of ice on top of and between the samples to ensure adequate temperature controls during transport.
4. Ensure a temperature blank is secured inside the cooler.

5.2.4 All Samples with Preservatives

Prior to shipping samples with preservatives, the Qualified Shipper will determine the amount of preservative in each sample. Excepted quantities of preservatives are provided in the following table:

Excepted Quantities of Preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
5 drops = 1 ml		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
NaOH	30%	>12	0.08%	--	0.25	0.5	1	2
HCl	2N	<1.96	0.04%	0.2	0.5	1	--	--
HNO_3	6N	<1.62	0.15%	--	2	4	5	8
H_2SO_4	37N	<1.15	0.35%	0.1	0.25	0.5	1	2

Conc. = concentration
ml = milliliters
% = percent
L = liter
NaOH = sodium hydroxide
HCl = hydrochloric acid
HNO_3 = nitric acid
H_2SO_4 = sulfuric acid

In addition to the steps outlined in the appropriate section above for the specific media sampled, these additional steps are to be followed when packaging limited-quantity sample shipments:

1. Nitrile gloves are to be worn by anyone handling the sampling containers.
2. All sample containers will be labeled with the sample number and what preservative is being used. Protect the labels with waterproof tape. At a minimum the sample label must contain:

    - Sample number
    - Project or Case number
    - Date and time of sample collection
    - Preservative
    - Analysis

The FSDS will be used to collect all other sample information.

3. The Packager/Shipper will ensure a trip blank(s) is secured inside the cooler(s).
4. The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited-quantity shipment of dangerous goods.

5.3 Post-operation

Shipping documentation will be maintained by the Packager/Shipper to confirm that shipments have been delivered and accepted by the receiver.

6.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

6.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

6.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL (or their designate) for the first week of each investigation. These checks can be extended to once per month as investigation activities continue, and any errors noticed during the checks will be discussed with field personnel and corrected. If investigation activities continue beyond six months, the frequency of assessing sample packaging and shipping procedures will be established by the field Quality Assurance Manager or their designate.

7.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-1, Packaging and Shipping Environmental Samples, January 2012.

Libby Asbestos Superfund Site
Site-specific Procedure
Completion of Field Sample Data Sheets

Prepared by: Tracy Dodge Date: 3/28/14
Tracy Dodge, CDM Smith

Reviewed by: Diane M. Rode Date: 3/27/14
Diane Rode, CDM Smith Technical Reviewer

Reviewed by: Terry Crowell Date: 3/27/14
Terry Crowell, CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/8/02	--
1	5/16/03	Annual update to align guidance with current versions of FSDSs
2	--	Not finalized/approved
3	4/12/06	Annual update to align guidance with current versions of FSDSs
4	4/13/09	Annual update to align guidance with current versions of FSDSs
5	5/26/09	Minor administrative changes to address FSDS changes
6	4/18/12	Annual update to align guidance with current versions of FSDSs
7	3/27/14	Annual update to align guidance with current versions of FSDSs

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the completion of field sample data sheets (FSDSs) by the U.S. Environmental Protection Agency (EPA) or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Data Entry Tool (DET) – A local MS Access® tool used to enter information from the FSDS and used to temporarily store information until it is published to Scribe.

Field sample data sheet (FSDS) – The hard copy form on which sample and location information is recorded.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map. Note that the Libby Site is organized into 8 formal OUs numbered 1 through 8; OU99 is used to identify properties that lie outside the EPA National Priorities List Site boundary

and properties that do not require investigation and response action for Libby amphibole contamination.

Response Manager – An EPA data management system used to manage Libby Site property information.

Scribe – An EPA data management system used to manage location, sample, and analytical data.

3.0 Responsibilities

Team Leader (TL) – Responsible for ensuring that FSDSs are completed in accordance with this procedure and any additional FSDS requirements stated in the governing document referencing this procedure.

Sampler – Responsible for completing FSDSs in accordance with this procedure and any additional FSDS requirements stated in the governing document referencing this procedure.

Field Sample Coordinator (FSC) – Staff member to whom samples and FSDSs are relinquished; responsible for preparing chain-of-custody forms (COCs) and submitting samples to the appropriate project facility.

Office Administrator – Responsible for preparing sample number and location identification (ID) logs and labels, and preparing unique and sequentially numbered FSDSs for completion in the field.

4.0 Operation

4.1 Recording Information for All Sample Media

This section provides background information, as well as descriptions and instructions for completing FSDS data items common to all sample media. Data items specific to certain media are discussed in Section 4.2.

Some FSDS data items are required to be completed to be in compliance with EPA data reporting requirements or the governing document referencing this procedure, or to track other critical field information. These data items will be referred to as "required" throughout this procedure. Required data items are indicated on FSDSs with an asterisk (*). A required data item must be populated with an appropriate valid value. Note that "NA" (not applicable) may be a valid value.

Other data items may be required conditionally. These will be referred to as "conditional" throughout this procedure and these fields will not be asterisked on the FSDS. Conditional data items and any corresponding valid values may be specified in EPA data reporting requirements or the governing document referencing this procedure.

Data items that are not required or conditional may be left blank. Information recorded on the FSDS is entered into the DET.

Field team members are not required to line out any labels, initial, or date them, unless they are making a revision. To revise a data item on an FSDS, line through the incorrect data (single line), record the correct data in close proximity to the erroneous data, and date and initial the change.

Sheet No.: A pre-assigned unique, sequential sheet number assigned by an Office Administrator, in the format: $$-###### or $-######, where $ refers to the media being sampled and ###### refers to the sequential number.

Event ID: An identifier for a specific data collection effort, most commonly a combination of the event-specific sample number prefix and the approved date of the document governing the event. These Event IDs use the format: $-###### or $$-######, where $ or $$ is a one- or two-digit set of characters, as specified in the governing document referencing this procedure, and ###### refers to the governing document date in MMDDYY format.

Address: The concatenated address (as it appears in Response Manager) of the property being investigated and/or sampled.

Date: The date of sample collection in the format MM/DD/YY. For air samples collected over more than one day using the same cassette, the end date (i.e., date the sample period concludes) will be recorded.

Property ID: For non-OU7 properties, a unique identifier assigned to each property in the format: AD-######, where ###### is a unique number. OU7 and some OU99 Property IDs are in the format: AD-2#####. Property IDs should be verified using Response Manager before being transcribed to the FSDS. Property IDs may be used as Location IDs in appropriate circumstances.

Field Logbook No.: The number of the logbook being used to record information specific to the samples on the FSDS.

Page No.: The page number(s) in the logbook being used to record information specific to the samples on the FSDS.

Sampler(s): The first initial and full last name of all members of the field team. For data entry, the FSC will select only one of the field team members listed. The company affiliation of the field team member(s) need only be listed after their name if they work for a company other than "CDM Smith".

Location ID: A unique number assigned to each location representing the investigated and/or sampled area specific to the information on the FSDS. Previously assigned Location IDs should be verified using Scribe before being transcribed to the FSDS, whenever possible. Contact a member of the onsite data management team for assistance with verification.

Location IDs in the format BD-###### will be assigned to (or used for, in the case of previously assigned Building Location IDs) habitable, fully enclosed primary or secondary buildings, including buildings that may have broken windows and/or missing doors. All primary and secondary buildings will be assigned a BD-###### number.

Location IDs in the format XX-###### will be assigned to secondary structures (e.g., open structures, 3-sided structures, carports, and lean-tos).

Location IDs in the format XX-###### will be assigned to outdoor investigation areas and may be used for any GPI soil samples collected, including samples collected within primary and secondary buildings and secondary structures with prior approval by the TL. XX-###### Location IDs will not be used during removal soil confirmation sampling.

Location IDs in the format SP-###### will be assigned to excavated soil areas (including areas with open structures) during removal soil confirmation sampling. SP-###### Location IDs will be used for air and water monitoring events and fill material sampling as specified in the governing document referencing this procedure.

For personal and stationary air samples, a previously assigned Property ID or Building Location ID will be used in most cases. If a new Location ID is assigned, the Location portion of the Soil-like and Location FSDS must be completed in addition to the Air FSDS.

For lot blanks, "AD-OU4NA" is used for the Property ID and Location ID.

For field blanks, generally, the Property ID where field samples are being collected is used for outdoor sampling, while the Building Location ID is used if sampling occurs indoors. For air and dust field blanks specifically, the Location ID should be used that corresponds to the air space where the field blank is exposed (i.e., Property ID for field blanks exposed in outdoor spaces; Building Location ID for field blanks exposed in indoor living spaces).

Sample ID: Unique number assigned to each sample in the format $-##### or $$-#####, where $ or $$ is a one– or two-digit set of characters indicating the governing document referencing this procedure, and ##### is a 5-digit sequential number.

For Field Team Completion, Completed by: Initials of the field team member, verifying that required data items on the FSDS have been completed correctly.

For Field Team Completion, Quality Checked (QC) by: Initials of the second field team member (independent of the member completing the FSDS) or other trained reviewer, verifying that required data items on the FSDS have been completed correctly.

For Data Entry, Entered by: Initials of the FSC or data entry staff performing data entry of FSDS information into the DET.

For Data Entry, QC by: Initials of the FSC or other trained reviewer verifying FSDS data entered into DET is complete and accurate.

4.2 Recording Location Information

The following sections provide instructions for recording location information on FSDSs. Note that new locations for air sampling locations must be recorded on a Soil-like Sample & Location FSDS.

Is this a new Location?: Indicate "Yes" when assigning a new Location ID, indicate "No" when a Location ID has previously been assigned, and indicate "Revised" when revising previously collected location data. If the response is "No", "Z" through the rest of the location section. Data for new locations will be imported to Scribe. Revised location data will be manually edited in Scribe.

Location Type: Record the location type of the area being investigated and/or sampled.

For removal confirmation soil samples, record "EA" for excavation area. For perimeter or clearance air samples, or water samples, record "NA".

For General Property Investigation (GPI) locations/samples, select from the following values (abbreviations may be used):

SUA – specific-use area	CUA – common-use area	LUA – limited-use area
NUA – non-use area	PB – primary building	SB – secondary building
SS – secondary structure		

Location Description: Record the description of the area being investigated and/or sampled. Select from the values listed below (do not abbreviate). Additional values may be added with prior approval by the TL and FSC.

alley	flowerbed	road (paved)
animal pen	former house foundation	road (unpaved)
apartment	garage	root zone
barn	garden	shed
borrow source	greenhouse	shop
brush	house	shrub bed
building	lean-to	stockpile
burnpile	NA	underneath porches/decks
carport	outhouse	underneath secondary building
corral	park	undeveloped area
decorative gravel/rock	parking lot (paved)	verge
driveway (paved)	parking lot (unpaved)	walkway (paved)
driveway (unpaved)	planter	walkway (unpaved)
field (maintained)	play area	wooded area
field (unmaintained)	property	yard
firepit	pumphouse	

Location Area (ft^2): Record the square footage of the area to which the FSDS pertains. This data item may be left blank if not specified in the governing document referencing this procedure.

Location Comment: For GPIs, describe the restoration type applicable to a location. This data item may be left blank if not required by the governing document referencing this procedure.

building	pea gravel	topsoil
chipped rock	potting soil	topsoil w/liner
common fill	sand	washed rock
grass	structural fill	wood chips
landscape rock	tall grass	wooded area

Location Comment 2: Record the detailed description of the location that may not be reflected in the Location Comment. This data item may be left blank if not specified in the governing document referencing this procedure.

4.3 Recording Media-specific Information

The following sections provide instructions for recording media-specific information on FSDSs. FSDS may be customized to accommodate event-specific data requirements (e.g., matrix, if other than soil); however, the TL will consult with the FSC prior to any field work to prepare the customized FSDS.

4.3.1 Soil-Like Material

Use based on: To distinguish whether location information is assigned based on current use or reasonably anticipated future use (RAFU), check the appropriate box. If "Current Use" is selected, or the data item is not applicable (i.e., for non-GPI samples), no data will be entered. If marked "RAFU", the acronym will be appended to the Location Comment 2 information by the FSC.

Location Zone: Record the location zone if required by the governing document referencing this procedure. This data item may be left blank if not specified in the governing document referencing this procedure.

Visible Vermiculite: Record the total number of visual inspection points of no (N), low (L), intermediate (M), or high (H) levels of vermiculite observed during the semi-quantitative visual inspection for vermiculite. For visible vermiculite observations corresponding to a sample, the sum of these fields must equal the number of sample aliquots (e.g., 30). Values for visual inspection point observations (N, L, M, or H) must be provided; record "0" to indicate no observations were required/made.

Soil Depth Top: Record the top depth of the sample/visual inspection observation, recorded in inches, in relation to ground surface. For samples collected below ground surface, record a positive, whole number. For samples collected above ground surface (e.g., vegetative samples), record a negative, whole number.

Soil Depth Bottom: Record the bottom depth of the sample/visual inspection observation, recorded in inches, in relation to ground surface. For samples collected below ground surface, record a positive, whole number. For samples collected above ground surface (e.g., vegetative samples), record a negative, whole number.

VV Sub Location: For exterior samples, record "property (exterior)". For GPI interior locations, select from the list below. If "other interior soil" is selected, record details in the visible vermiculite comments. This data item may be left blank if not specified in the governing document referencing this procedure.

property (exterior)	crawlspace	soil floor
basement	cellar	interior planter
other interior soil		

Visible Vermiculite Comments: Record any comments pertaining to the visual inspection observation. This data item may be left blank if not specified in the governing document referencing this procedure.

Sample ID: Record the unique sample number assigned to each sample, as designated by the governing document referencing this procedure.

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: For removal confirmation soil samples, circle the appropriate clearance sequence. For all other samples, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Delineation sample?: This question is not a required database item, rather a cue for the sampler to record the parent sample ID the next field. Circle "No" or "Yes".

Sample Parent ID: For field QC samples (e.g., field duplicates), record the Sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements. For other requirements using Sample Parent ID (e.g., delineation samples), refer to the governing document referencing this procedure.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or indicate the number of aliquots collected/inspected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: For exterior removal confirmation soil samples, provide the sampling area designation(s) corresponding to the draft redline sketch. For interior removal confirmation soil samples, record the building description and the sampling area designation(s) corresponding to the draft redline sketch location of where the sample was collected (e.g., Area 1 – greenhouse; Area 12 – pumphouse; Area 3 – crawlspace). For GPI and other sampling programs, provide any detailed location information that may not be reflected in the general Location Description, such as specific location within the building that was sampled (e.g., middle of barn, SW corner of crawlspace.) The square footage of the sampled area inside a building may be recorded here.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

4.3.2 Stationary Air

As mentioned in Section 4.1, a previously assigned Property ID or Building Location ID will be used on the FSDS for stationary air samples in most cases. Property IDs are used for stationary air samples collected outside buildings, while Building Location IDs are used for samples collected inside buildings. If a new Location ID is assigned, the Location portion of the Soil-like and Location FSDS must be completed in addition to the Air FSDS.

Sample ID: A unique sample number assigned to each sample, as designated by the governing document referencing this procedure.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Sample Venue: Record whether the sample was collected indoors, outdoors, both, or NA. The Sample Venue for field blanks should be recorded as "NA". For samples collected inside a vehicle with the windows closed, circle "Indoor". For samples collected inside a vehicle with the windows open, circle "Both".

Sample PrePostClear: For removal clearance air samples, circle the appropriate clearance sequence. For all other samples, including field blanks, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, "LB" for lot blank, "DB" for drying blank, or write in an alternative sample type as specified in the governing document referencing this procedure.

Sample Parent ID: Applicable to the high volume sample, when co-located high- and low-volume samples are collected. For the high-volume sample, record the low-volume Sample ID as the Sample Parent ID. For the low-volume sample, the Sample Parent ID is left blank.

Sample Location Description: Provide a detailed description of the indoor or outdoor sample location. Record "Blank" for field blanks. Refer to the governing document referencing this procedure for any additional requirements.

Sample Air Type: Circle the appropriate stationary air type (Ambient or Perimeter). The Sample Air Type for blanks should be recorded as "NA".

Sample Air Volume Type: When co-located high- and low-volume samples are collected, record "LV" for low-volume or "HV" for high-volume samples. Record "NA" for all other samples.

Flow Meter Type: Circle the applicable flow meter used. Circle "NA" for all types of blank samples.

Cassette Lot Number: Record the cassette lot number of the sample cassettes being used.

Flow Meter ID Number: Record the identification number of the flow meter used. If more than one flow meter is used, use Sample Field Comments to record the additional Flow Meter ID(s).

Pump ID Number: Record the ID of the pump used. If more than one pump is used, use Sample Field Comments to record the additional pump ID(s), and provide the reason for use of multiple pumps. For all types of blank samples, "Z" out the data items from "Pump ID" to "Sample Air Stop Flow".

Sample Air Start Date: Record the start date in the format MM/DD/YY. Note that multiple start and stop dates/times, as well as start and stop flow rates, may need to be recorded for samples collected over multiple days using the same cassette. Refer to the governing document referencing this procedure for additional requirements.

Start Time: Record the starting time (in military units) of each air sample aliquot.

Start Flow: Record the starting pump flow rate, in liters per minute (L/min) for the air sample collected.

Stop Date: Record the stop date in the format MM/DD/YY.

Stop Time: Record the stopping time (in military units) of each air sample aliquot.

Stop Flow: Record the stopping pump flow rate (in L/min) for the air sample collected. If a flow rate is recorded while the pump is running, the stop time and next recorded start time will be the same.

Pump Fault: Circle "Y" or "N" to indicate a pump fault. For all types of blank samples, circle "NA". Use Sample Field Comments to note if a pump faulted during air sample collection, as determined by an unacceptable flow rate deviation (refer to the governing document referencing this procedure for flow rate requirements), or due to a mechanical fault (pump shut-off).

Sample Total Time (min): Sample Total Time is the total sample collection period in minutes (min). TLs will provide direction on calculating sample times. Generally, removal-related air sample total times will be calculated by the FSC, while other programs (e.g., ABS) will call for samplers to calculate total times.

Sample Quantity (L): The sample quantity represents the total volume in liters (L) of the sample collected. TLs will provide direction on calculating sample quantities. Generally, removal-related air sample quantities will be calculated by the FSC, while other programs (e.g., ABS) will call for samplers to calculate sample quantities.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

Filter Diameter: For all standard Libby Site air sampling, sample cassettes with a 25-millimeter filter diameter will be used. This data item is pre-printed on the Air FSDS.

Pore Size: For standard Libby Site air sampling, sample cassettes with a 0.8-micron filter pore size will be used. This data item is pre-printed on the Air FSDS.

4.3.3 Personal Air

Complete Personal Air FSDSs as for Stationary Air, with the following adjustments:

Sample PrePostClear: For all personal air samples and blanks, circle "NA" unless otherwise specified by the governing document referencing this procedure.

Sample Air Type: Circle one of the following personal air types:

- TWA – Time-weighted average sample, collected over an 8-hour period (may be composited with other personal air samples to represent an average work day)
- EXC – Excursion sample, collected over a 30-minute period (time may be approximate)

- ABS – Sample collected during activity-based sampling (not health and safety related)
- NA – Use for all types of blank samples, or as otherwise specified in the governing document referencing this procedure

Personnel ID: Record the company-assigned ID of the worker being monitored.

Name: Record the first and last name of the worker being monitored.

Personnel Task: For health and safety-related samples, select from the list below. For samples collected as part of ABS, refer to the governing document referencing this procedure for requirements.

bulk removal	investigation (Level D)	removal oversight (Level D)
demolition	laborer	support personnel
detailing attic	operator	truck driver (Level C)
excavator operator	other	truck driver (Level D)
investigation (Level C)	removal oversight (Level C)	wet wipe/HEPA vac living space

For samples collected at Rainy Creek Rd or Lincoln County Landfill, select the most appropriate value from the list above, and then provide additional information in Sample Field Comments from the list below:

upper dozer	laborer - PAPR
water truck driver – PAPR	equipment operator - PAPR
truck driver – PAPR	truck driver – Level C and Level D

4.3.4 Bulk-Like Material

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Matrix if other than Bulk: Record tissue, ash, or other bulk-like material here.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: For removal-related samples, circle the appropriate clearance sequence. For all other samples, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Sample Parent ID: For field QC samples (e.g., field duplicates), record the Sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or indicate the number of aliquots inspected/collected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: Record any detailed location information that may not be reflected in the general Location Description, such as specific location within the building that was sampled (e.g., chimney; chinking SW wall). Refer to the governing document referencing this procedure for any specific requirements.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

4.3.5 Water

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: Circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Sample Parent ID: For field QC samples (e.g., field duplicates), record the Sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or indicate the number of aliquots inspected and/or collected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: Record any detailed location information that may not be reflected in the general Location Description. Refer to the governing document referencing this procedure for any specific requirements.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

Libby Asbestos Superfund Site
Site-specific Procedure
30-point Composite Sampling of Surface Soil for Asbestos

Prepared by: _____ Date: 4-1-14
CDM Smith

Reviewed by: _____ Date: 4/1/14
CDM Smith Technical Reviewer

Reviewed by: _____ Date: 4/1/14
CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/7/02	--
1	5/17/03	• Administrative updates • Updated land use area designations • Updated sampling approach to collect samples in large land use areas (driveways and yards) where vermiculite is observed
2	5/10/07	• Administrative updates • Addition of Responsibilities and Sample Custody sections • Separate QA/QC requirements into new section • Updated sampling approach and collection requirements, including: – subsample requirements changed from 5-point to 30-point – refinement of property zone definitions and sizes – updated land use area designations – changes in sample depth increments for use areas – use of formalized procedure for the semi-quantitative estimation of visible vermiculite in soil
3	5/1/12	• Administrative updates • Eliminate the use of bowls used to homogenize soil samples • Eliminate the use of aluminum foil for wrapping re-usable sampling equipment during transport • Addition of reference to Libby Site-specific standard Operating Procedures throughout • Change in composited soil sample size from 2,000 – 2,500 grams to 750 – 1,000 grams
4	2/12/13	• Clarify the definition of visible vermiculite
5	4/1/14	• Administrative updates • Addition of Secondary Structure to use areas

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the collection of 30-point composite surface soil samples by the U.S. Environmental Protection Agency (EPA) or its contractors related to investigations conducted at the Libby Asbestos Superfund Site (Libby Site). This procedure describes the equipment and operations to be used for sampling surface soils for the analysis of Libby amphibole asbestos. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Composite sampling – A sampling approach in which multiple sample points are compiled together and submitted for analysis as a single sample.

Field sample data sheet (FSDS) – The controlled (i.e., pre-numbered and tracked) hard copy form on which sample and location information, and any visible vermiculite observations, is recorded.

Land use area – A portion of a property segregated according to how the property owner uses the area.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the current version of the OU boundary map.

Point inspection (PI) – A PI is an intrusive visual inspection of the top portions of the soil at a randomly selected point within a land use zone. A PI consists of the active displacement of the surface soil with a small shovel and visual inspection of the displaced soil and surface soil within an approximate 2-foot radius of the displaced soil (i.e., immediate field of view) for visible vermiculite (VV). If VV is observed during the PI, the location and a semi-quantitative estimate of VV will be recorded.

Subsample – The portion of a composite sample representing a discreet location within the sampled area.

Visible Vermiculite – Exfoliated and/or unexfoliated vermiculite, amphibole asbestiform minerals, and mine tailings present in soils as part of response actions – herein collectively referred to as visible vermiculite (VV).

3.0 Responsibilities

Successful execution of this procedure requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for collecting soil samples using this procedure will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this procedure.

Team Leader (TL) – The TL is responsible for overseeing the sample collection process outlined in this procedure, and for checking and verifying that the work performed satisfies the objectives of the governing document referencing this procedure. The TL will communicate with the field team members regarding specific collection objectives, and will communicate the need for any deviations from this procedure with the appropriate client personnel, and document the deviations using a Libby Field Record of Modification Form, as provided in the governing document referencing this procedure.

Field Team Members - Field team members performing the sampling described in this procedure are responsible for adhering to the tasks specified herein. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of sample points, within the boundaries outlined by the TL.

4.0 Equipment

The following equipment will be used during implementation of this procedure:

- Measuring tape or wheel – Used to estimate the square footage of each land use area.
- Pin flags – Used to identify subsample points within each sampling area.
- Trowel or push probe
- Shovel
- Gallon-sized plastic zip-top bags – Used to homogenize soil subsamples following collection (two bags per sample).
- Personal protective equipment (PPE) – For personal protection and to prevent cross-contamination of samples (e.g., disposable, powderless plastic or latex gloves).
- Field sprayers – Used to suppress dust during sample collection and to decontaminate non-disposable sampling equipment between samples.
- De-mineralized water – Used in field sprayers to suppress dust and to clean and decontaminate sampling equipment.
- Plastic bristle brush – Used to clean and decontaminate sampling equipment.
- Alconox – Used to clean and decontaminate sampling equipment weekly.
- Paper towels – Used to dry decontaminated sampling equipment.
- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).
- Trash bag – Used to store and dispose of general trash.
- Indelible ink pen (blue or black ink only)
- Field logbook – Used to record progress of sampling effort and record any problems and field observations.
- Blank FSDSs

- Sample Identification (ID) Labels – Pre-printed self-adhesive stickers used to label sample containers and on field documentation (e.g., FSDSs).
- Cooler or other rigid container – Used to store samples while in the field.
- Custody Seals – Self-adhesive seals applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

5.0 Sampling Approach

Upon arrival at each property, the field team will locate all parcels requiring sample collection depending on the investigation-specific objectives detailed in governing guidance documents. Parcels on a property will be sectioned into zones that share a similar land use. Zones established by land use areas may be subdivided based on site conditions (e.g., access, construction setup considerations, etc.). Use areas include:

- Specific-use area (SUA): flowerbed, garden, stockpile, play area, dog pen, driveway (non-paved), parking lot (non-paved), road (non-paved), alley (non-paved), fire pit/burn pile
- Common-use area (CUA): yard, former garden, former flowerbed, walkway, maintained/mowed field
- Limited-use area (LUA): pasture, un-maintained field, overgrown areas with trails/footpaths, overgrown areas in between SUAs/CUAs
- Non-use area (NUA): wooded lot,. NUAs will be identified but will not be sampled because they are not presently considered a complete exposure pathway. However, to the extent that NUAs may become a complete exposure pathway in the future, they may be revisited.
- Primary building (PB): crawlspace, earthen basement
- Secondary building (SB): soil floor of garage, pumphouse, shed, greenhouse, etc.
- Secondary structure (SS): lean-to, barn

After areas have been designated as zones (i.e., SUA zones, CUA zones, LUA zones, etc.), the field team will measure the zones with a measuring wheel and label the zone type and approximate square footage on the field sketch and/or design drawings. This procedure does not specify a minimum or maximum square footage restriction on any zone; however, the governing document referencing this procedure may specify zone size.

In establishing zones at the property, no area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be separated into unique zones for soil sampling. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the TL but consistent among the teams. Conversely, not all land use areas previously mentioned will be applicable at every property.

It is anticipated that SUA, SS, PB, and SB zones will generally tend to be smaller areas. Combining small, proximal SUAs of similar type into one zone will be at the discretion of the TL but consistent

among teams (e.g., two separate flowerbeds). With the exception of proximal SUAs, all other land use areas will be contiguous when establishing zones at each property.

Composite sampling requires soil collection from multiple (subsample) points. Composite samples will be collected from similar land use areas (i.e., SUA, CUA, etc.) and will not be combined with any other use area.

For SUAs (e.g., driveway, garden, flowerbed), composite samples will be collected from the 0- to 6-inch depth interval. If a depth of 6 inches cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented on the FSDS. For non-SUAs (e.g., yard, former flowerbed, crawlspace, etc.), composite samples will be collected from the 0- to 3-inch depth interval. All composite soil samples will have 30 subsamples (i.e., 30-point composite sample) of approximately equal size for a final sample volume between 750 and 1,000 grams. Table 1 lists the sample depth for each type of land use area.

Table 1. Sampling Area and Depth

Land Use Area	Sampling Depth Increment (inches)
Specific-use Area (SUA)	0 – 6
Common-use Areas (CUA)	0 – 3
Limited-use Area (LUA)	0 – 3
Non-use Area (NUA)	Not Sampled
Secondary structure (SS)	0 – 3
Secondary Building (SB)	0 – 3
Primary Building (PB)	0 – 3

In cases where an SS or SB is used in the same manner as an SUA (e.g., a greenhouse where part or all of the soil floor is used as a garden), the sampling team shall use the more conservative (i.e., deeper) sampling depth.

As each subsample is collected, the soil will be inspected for VV and the location and semi-quantitative estimates of VV will be recorded on the FSDS in accordance with the current version of CDM-LIBBY-06 (Semi-Quantitative Visual Estimation of Vermiculite in Soil). Areas with VV will not be sampled with areas that do not have VV. However, if an SUA is less than 1,000 square feet (ft^2), it is not necessary to split it into samples with and without VV.

6.0 Sample Collection

Don the appropriate PPE as specified in the governing health and safety plan and/or governing document referencing this procedure. A new pair of disposable gloves will be worn for each sample collected. Segregate land use areas on the property into zones as described in Section 5.0. To reduce dust generation during sampling, use a sprayer with de-mineralized water to wet each subsample location prior to collection. Use the trowel to check beneath the surface soil layer, but do not advance more than 6 inches. If VV is observed, record the information on the field sketch or design drawing.

Within each zone, select 30 subsample locations equidistant from each other. These 30 subsample locations will comprise the 30-point composite sample for that zone. All composite subsamples will originate from the same land use area – do not mix subsamples from one land use area with subsamples from a different land use area.

Clean the subsample locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel or push probe, excavate a hole in the soil approximately 2 inches in diameter and 6 inches deep for SUAs, or 3 inches deep for non-SUAs. Conduct PI and place the material into the zip-top plastic bag. Repeat this step for each subsequent subsample until the appropriate number of composite subsamples has been collected. VV observations associated with a sample will be recorded on the FSDS as described in the current version of CDM-LIBBY-06 (Semi-Quantitative Visual Estimation of Vermiculite in Soil).

Homogenize the sample as required by the governing document referencing this procedure. Once the sample is homogenized, fill the zip-top plastic bag approximately a quarter full (750 – 1,000 grams of material). Affix the sample ID label to the inside of the bag and write the sample ID number on the outside of the bag, or affix an additional label using clear packing tape. The sample ID number format will be specified in the governing document referencing this procedure. Double bag the sample and repeat the labeling process for the outer bag.

Decontaminate equipment between composite samples (not between subsamples of one sample), as discussed in Section 7.2 below.

Repeat steps outlined above until all samples from a property have been collected. Refer to Section 8.2 for field quality control (QC) sample requirements.

7.0 Associated Procedures

7.1 Field Documentation

Field documentation for samples collected using this procedure will follow the current versions of CDM-LIBBY-03 (Completion of Field Sample Data Sheets) and EPA-LIBBY-2012-01 (Field Logbook Content and Control) unless otherwise specified in the governing document referencing this procedure.

7.2 Field Equipment Decontamination

All reusable sampling equipment must be decontaminated between composite samples in accordance with EPA-LIBBY-2012-04 (Field Equipment Decontamination) unless otherwise specified in the governing document referencing this procedure.

7.3 IDW

IDW will be managed as described in EPA-LIBBY-2012-05 (Handling IDW) and any other applicable governing documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas such as playgrounds are sampled, refilling the soil plug is not necessary. Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Spent wipes, gloves, and PPE must be disposed of or stored properly as IDW in accordance with EPA-LIBBY-2012-05 (Handling IDW) unless otherwise specified in the governing document referencing this procedure.

7.4 Sample Custody, Packaging, and Shipping

Sample custody requirements for samples collected using this procedure will follow the current version of EPA-LIBBY-2012-06 (Sample Custody), unless otherwise specified in the governing document referencing this procedure.

As may be applicable, sample packaging and shipping will follow the procedures outlined in EPA-LIBBY-2012-07, unless otherwise specified in the governing document referencing this procedure.

8.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this procedure will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this procedure.

8.1 Training

Every effort will be made to ensure consistency in collecting surface soil samples in support of the Libby Site. Consistency will be achieved to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this procedure noted by the TL will require re-training of field team members.

8.2 Field Quality Control Samples

Soil field duplicate samples will be collected at the rate specified in the governing document referencing this procedure. Field duplicate samples will be collected as co-located samples in the same zone as the parent sample. The duplicate will be collected from the same number of subsamples as the parent sample, but the subsample locations of the duplicate sample will be randomly located in the zone. The inspection for VV at each subsample location will follow the same protocol as referenced above. These samples will be independently collected with separate sampling equipment or with the original sampling equipment after it has been properly decontaminated. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing document referencing this procedure. These samples will be used to determine the variability of sample results in a given land use area, but will not be used to determine variability in sampling technique.

Libby Asbestos Superfund Site
Site-specific Procedure
Semi-Quantitative Visual Estimation of Vermiculite in Soils

Prepared by: _____ Date: 3/20/13
CDM Smith

Reviewed by: _____ Date: 3/20/13
CDM Smith Technical Reviewer

Reviewed by: _____ Date: 3/20/13
CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	10/12/06	--
1	5/10/07	• To refine the process after initial trial phase.
2	03/20/13	• To reflect current documentation procedures and clarify the definition of visible vermiculite. • To align with current procedure format.

1.0 Objective

The EPA will identify and delineate the extent of any visible vermiculite, amphibole asbestiform minerals, and mine tailings suspected to be sourced from the former W.R. Grace mine – herein collectively referred to as visible vermiculite (VV) – present in soils as part of investigations conducted at the Libby Asbestos Superfund Site (Site) and specified in governing documents referencing this procedure. The goal of this standardized procedure is to provide a consistent approach to identify and characterize any VV present in soils.

The semi-quantitative approach presented in this procedure for visually estimating VV in soil will be revised as required to optimize data collection as the sampling teams gain experience. This will be accomplished by expanding and/or improving this procedure, supporting pictorial standards, and additional electronic data acquisition efforts, as necessary.

2.0 Definitions

Specific-use Area (SUA) – Discrete exterior parcels on a property with a designated specific use. Due to the nature of activities typically carried out in SUAs, residents may be especially vulnerable to exposures when Libby amphibole asbestos (LA)-contaminated soil becomes airborne. SUAs may be bare or covered with varying amounts of vegetation. SUAs include, but are not limited to:

- Flowerbeds
- Gardens
- Stockpiles

- Play Areas
- Dog Pens
- Driveways (non-paved)[1]
- Parking Lots (non-paved)
- Roads (non-paved)
- Alleys (non-paved)

Common-use Area (CUA) – Exterior parcels on a property with varied or generic use. CUAs may be bare or covered with varying amounts of vegetation. CUAs include, but are not limited to:

- Walkways
- Yards (front, back, side, etc.)
- Former Gardens
- Former Flowerbeds

Limited-use Area (LUA) – Exterior parcels on a property that are accessed, utilized, and maintained on a very limited basis. LUAs may be bare or covered with varying amounts of vegetation. LUAs include, but are not limited to:

- Pastures
- Maintained/Mowed Fields
- Area underneath porches/decks[2]
- Overgrown Areas (with trails/footpaths, or between SUAs/CUAs)

Primary Building (PB) – Has four walls and a roof, a fully-enclosed design, and is intended for residential or commercial occupancy. PBs include, but are not limited to:

- Houses (including understructures)
- Some shops (when the shop is the primary occupied building on the property)
- Warehouses

Secondary Building (SB) – Has four walls and a roof, a fully-enclosed design, and is large enough for human entry. SBs include, but are not limited to:

- Garages
- Some shops (when another primary building is present on the property)
- Barns
- Sheds

[1] Non-paved driveways considered an SUA starting 2007 – previously considered a CUA.
[2] The soils underneath porches and decks will be classified as CUAs or LUAs depending on ground clearance and accessibility to homeowners and pets. If these areas are not accessible, they will be classified as NUAs.

- Enclosed lean-tos
- Some pump houses
- Larger animal houses

Secondary Structure (SS) – Designed to be open on at least one side and/or is mobile. Some SSs may be enclosed similar to a SB, but are too small or are not intended for human occupancy (e.g., pump or dog houses). SSs include, but are not limited to:

- Carports
- Open lean-tos
- Some pump houses
- Dog houses
- Other small animal housing

Non-use Area (NUA) – Exterior parcels on a property with no current use (e.g., areas that are un-maintained and not accessed). NUAs may be bare or covered with varying amounts of vegetation. NUAs include:

- Wooded lots
- Un-maintained fields
- Inaccessible areas below porches/decks

Because NUAs are not currently accessed, they are not presently considered a complete exposure pathway. As such, semi-quantitative visual estimates of vermiculite in soil will not be captured at this time. However, to the extent that NUAs may become a complete exposure pathway in the future at a property, the EPA may revisit NUAs at a later date or include NUAs as part of long-term site operations and maintenance.

Zone[3] – Parcels on a property that share a similar land use or subdivisions of a land use area based on site conditions (e.g., access, construction setup considerations) or sampling requirements. Within a zone, no area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be separated into unique zones for visual inspection. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones depending on site conditions. Sectioning properties into additional zones will be at the discretion of the field team leader (FTL) but consistent among the teams using this procedure as specified in the governing document referencing this procedure.

It is anticipated that SUA, PB, SB, and SS zones will generally tend to be smaller parcels. Combining small, proximal SUAs into one zone will be at the discretion of the FTL but consistent among the teams. In addition, combining small, proximal CUAs into one zone will be at the discretion of the

[3] The restriction on the maximum square footage of SUA zones (1,000 ft^2) and non-SUA zones (2, 500 ft^2) was eliminated from a previous iteration of this SOP after the data were reviewed by the EPA and determined to sufficiently characterize the presence of VV regardless of zone square footage. Additionally, this will allow the flexibility necessary for field teams to identify areas of zones most cost effectively for removal purposes.

FTL but consistent among teams. No PB, SB, or SS will be combined with any other PB, SB, or SS for visual inspection. There is not a maximum square footage restriction for any zone.

Point Inspection (PI) – Used in SUA, CUA, LUA, PB, SB, and SS zones. A PI is an intrusive visual inspection of the top portions of the soil at a randomly selected point within a zone. A PI consists of the active displacement of the surface soil with a small shovel and visual inspection of the displaced soil to determine if VV is present. If VV is observed during the PI, the location and a semi-quantitative estimate of VV contamination will be recorded.

Libby Asbestos Superfund Site (site) - All buildings and land within the boundaries of each operable unit (OU) of the site as illustrated on the most recent version of the OU boundary map.

3.0 Responsibilities

Field Team Leader – The FTL is responsible for overseeing the visual inspection process for their field teams, ensuring field team members are adequately trained in this procedure, and checking for consistency among their field teams.

Field team members – Field team members are responsible for conducting visual inspection, as specified in this procedure and the governing document referencing this procedure, and reporting any irregular observations or issues to the FTL.

4.0 Applicability

This procedure applies to properties within the site that will undergo screening and detailed investigations and, as applicable, certain risk-based investigations. Investigation-specific modifications to this procedure shall be outlined in the investigation-specific guidance document. The following locations on a property will be evaluated for the presence/absence of VV:

- All zones where soil samples are being collected.
- All zones requiring visual inspection per the requirements in the governing document referencing this procedure.

5.0 Procedure

Figure 1 illustrates the procedures and decision rules for this procedure. The three primary procedural steps are listed below:

- Establish preliminary zones
- Perform PI
- Perform semi-quantification of VV

Each is described in the following subsections.

5.1 Establish Preliminary Zones

Upon arrival at the property, the field team will locate all areas requiring visual inspection. Parcels will be identified as SUA zones, CUA zones, LUA zones, PB zones, SB zones, SS zones, or NUA zones.

Zones will be assigned according to the definitions provided above. Zone boundaries may be updated on the field sketch based on visual inspection results.

5.2 Point Inspections[4]

As defined above, a PI is an intrusive visual inspection performed at randomly selected points across the entire surface of a zone. Professional judgment may be used to determine the exact location of PIs; however, the following guidelines will be implemented to maintain consistency.

A minimum of 30 PIs will be evaluated per zone if sampling is required within that zone. If soil sampling is not required, a minimum of five PIs will be evaluated within each zone. Zones larger than 500 square feet (ft^2) will require evaluation at a minimum of 1 PI per 100 ft^2 (10 foot by 10 foot area). The PI locations will be randomly selected and will be spatially representative of the entire zone. Locations of the PIs and semi-quantitative estimates of VV (i.e., low [L], intermediate [M] or high [H]) will be recorded on the field sketch for each PI. While a minimum of five PIs will be conducted per zone, there is no set maximum. Rather, the maximum number of PIs is variable, dependent upon the total area of the zone and achieving the minimum required frequency of one PI per 100 ft^2.

The following sections outline procedures for inspecting each use area (e.g., SUA, CUA, LUA, PB, SB, SS). The procedure for semi-quantification of VV is provided in the next section.

SUA Zone:

- Use a spade or trowel to remove any cover material, including excess debris (e.g., mulch, rock) and organic material, from the surface of the soil. Remove and visually inspect soil to a depth of 0-6 inches below ground surface[5].
- If a depth of 6 inches cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented in the field logbook and on the field sample data sheet (FSDS).
- Record semi-quantitative estimate of VV observed as described in Section 5.3.
- Replace soil and cover material.
- Repeat as necessary employing procedure outlined above.

CUA and LUA Zones:

- Using a spade or trowel, carefully removing organic material, including grass, from the surface of the soil. Remove and visually inspect soil to a depth of 0-3 inches below ground surface[6].
- Record semi-quantitative estimate of VV observed as described in Section 5.3.

[4] Surface Inspections- The non-intrusive visual inspection of the immediate surface of a zone was eliminated from a previous iteration of this SOP after their data were reviewed and determined by the EPA to provide no additional information over that gained through Point Inspections.
[5] A soil depth of 6 inches for SUAs was chosen to approximate the depths to which digging would be expected during typical activities occurring in these SUA zones (e.g., gardening, child digging in dirt).
[6] A soil depth of 3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these CUA and LUA zones (e.g., lawn mowing).

- Carefully replace all soil and organic material.
- Repeat as necessary employing procedure outlined above.

PB, SB, and SS Zones:

- Move items as necessary to access the soil surface.
- Using a spade or trowel, remove and visually inspect soil to a depth of 0-3 inches below ground surface[7].
- Record semi-quantitative estimate of VV observed as described in Section 5.3.
- Repeat as necessary employing procedure outlined above.

If during the PI, VV is observed to be localized within a zone, the portion with vermiculite will be denoted on the field sketch. If additional PIs are necessary to determine the boundaries of the area, approximately 10 to 20% additional PIs will be evaluated to determine the extent of localized vermiculite.

5.3 Semi-Quantification of Visual Vermiculite

During a PI, the field team will estimate the quantity of vermiculite observed. Each PI location for all zones will be assigned a semi-quantitative estimate of visible vermiculite content using a 4-point scale: none (blank), L, M, and H[8]. For PI locations where VV is observed, semi-quantitative estimates (e.g., L, M, or H) will be recorded on the field sketch. PI locations where VV is not observed will not be recorded on the field sketch. Photographs illustrating these quantities are attached to this procedure as Figure 2.

6.0 Health & Safety/Engineering Controls

All personnel will carry out visual inspections in accordance with proper personal protective equipment (PPE) and other monitoring/governing requirements outlined in the current version of the Accident Prevention Plan governing the work being conducted.

All visual inspections will employ appropriate engineering controls to minimize dust (e.g., wetting soil during inspection) as prescribed in the current version of CDM-LIBBY-05 (30-point Composite Sampling of Surface Soil for Asbestos).

7.0 Equipment Decontamination

Equipment decontamination is not required between each PI from the same zone, but is required before moving to another inspection zone. Decontamination of equipment will be conducted as required by the governing document referencing this procedure.

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[7] A soil depth of 3 inches was chosen to approximate the depths to which soil disturbance would be most likely during typical activities occurring in these PB, SB, and SS zones (e.g., entering crawlspace, retrieving items from shed).

[8] Based on the EPA's review of previous data, the 5-level scale VV identification scheme was not meaningful and has been reduced to a 4-level scale. As such, the semi-quantitative estimation "Gross" VV in a previous iteration of this procedure was combined with "High" estimations. Previously collected data of Gross VV should be considered analogous to High VV under this revised procedure.

8.0 Documentation

As noted above, information about the presence of vermiculite will be recorded on the field sketch for the property under investigation. Each zone will be marked with:

- Zone type (i.e., SUA, CUA, LUA, PB, SB, SS, or NUA)
- Semi-quantitative estimate of VV content for each PI (i.e., L, M, H)

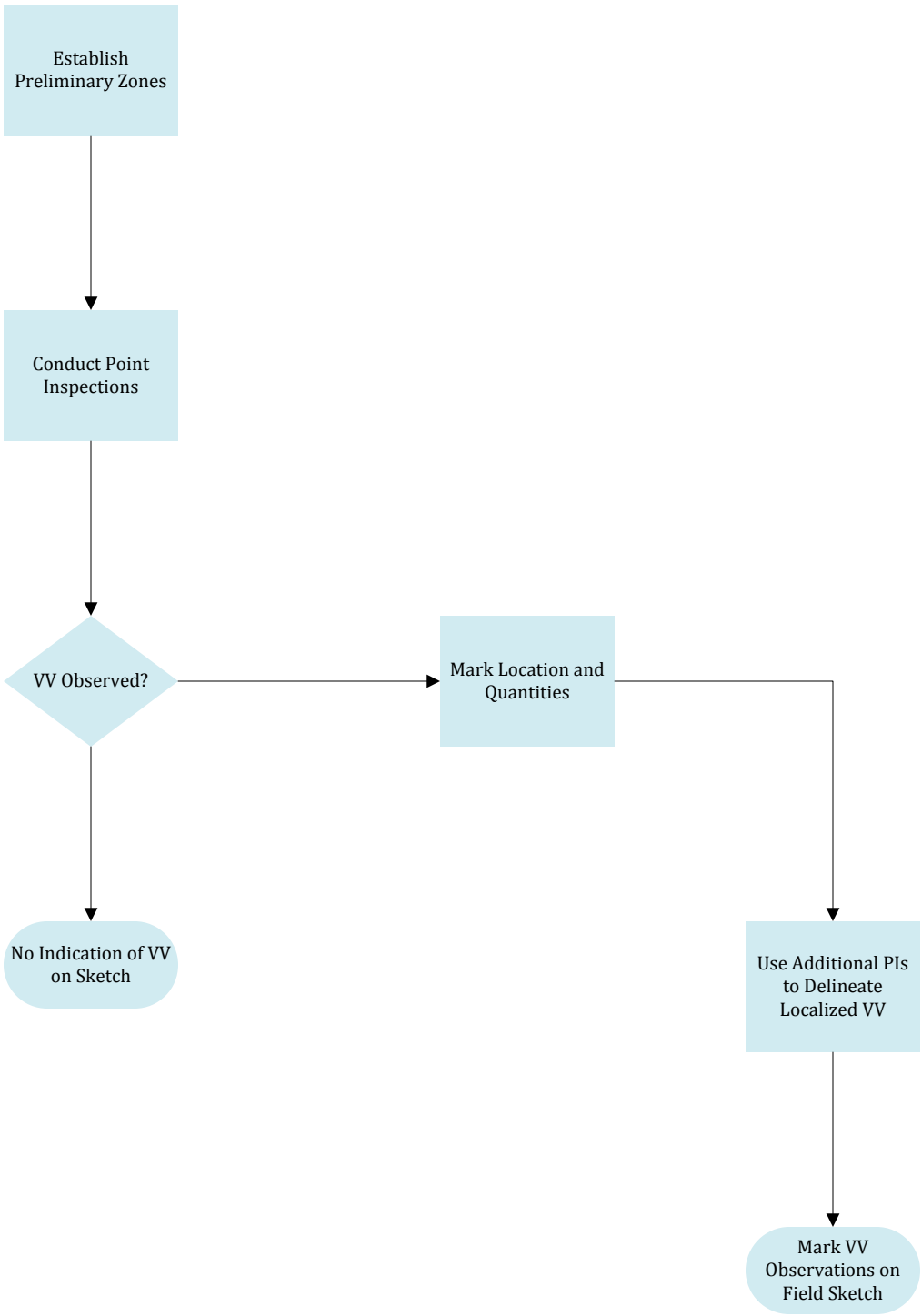
In addition to field sketch documentation, each field team will document the semi-quantitative visual estimates of VV on the FSDS for each zone. If material other than vermiculite was observed during the inspection (e.g., tremolite, mine tailings, micaceous minerals), the specific location and material observed should be noted on the field sketch and recorded in the visible vermiculite comment field on the FSDS. The FSDS will be managed according to governing guidance documents.

9.0 Quality Assurance/Quality Control

Every effort will be made to maintain consistency in the semi-quantitative evaluation of VV in soil. Quality assurance/quality control processes and measures will include training; use of specimen examples (e.g., jars/photographs of low, intermediate, and high quantities of vermiculite); use of designated field staff; and oversight by the FTL. Figures illustrating none, low, intermediate, and high quantities of vermiculite are attached to this procedure for reference (Figure 2).

To maintain consistency over time, the FTL will verify semi-quantitative assignments at a rate of one zone per team per week, or at the rate specified in the governing document referencing this procedure. The FTL will sign off on those field sketches that were verified. If inconsistencies are noted, the FTL will hold re-training with all teams participating simultaneously. Updates to this procedure and its attached specimen examples will occur as necessary and the EPA will be notified when these updates are recommended by FTL or field investigation manager.

Figure 1
Inspection Process



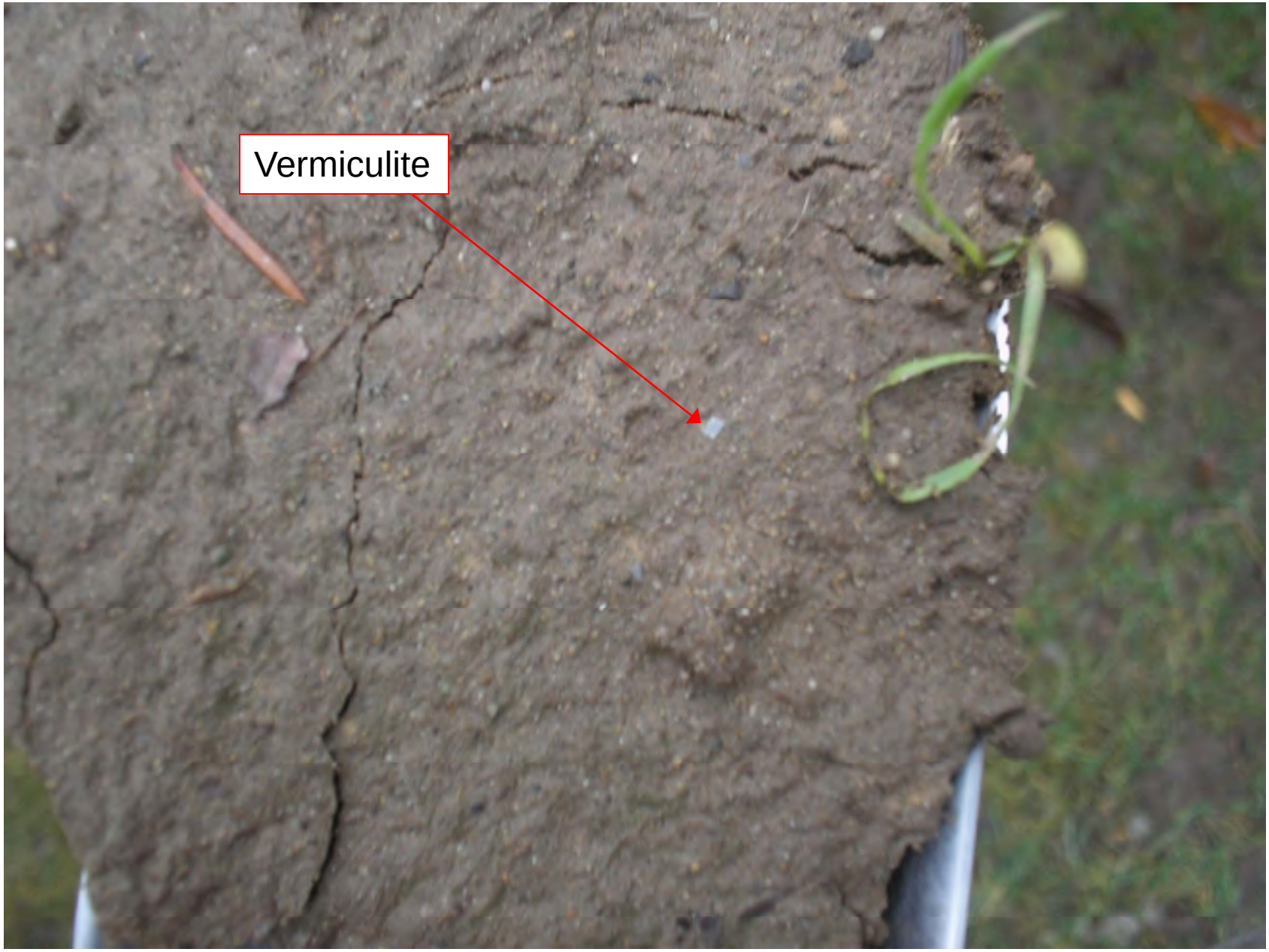


Figure 2a: *Low Visible Vermiculite* – A maximum of a few flakes of vermiculite observed within a given visual inspection point

Figure 2b: *Medium Visible Vermiculite* – Vermiculite easily observed throughout visual inspection point, including the surface.

Figure 2c: *High Visible Vermiculite* – Visual inspection point contains Approximately 50% (or greater) vermiculite by volume

Libby Asbestos Superfund Site
Site-specific Procedure
GPS Coordinate Collection and Handling

Prepared by: _____ Date: 03/24/14
CDM Smith

Reviewed by: _____ Date: 3/24/14
CDM Smith Technical Reviewer

Reviewed by: _____ Date: 3/24/14
CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/21/07	--
1	--	Not finalized/approved
2	7/27/09	Updated to align processes with current GPS collection equipment, and data management processes and requirements
3	4/24/12	Updated to align processes with current GPS collection equipment, and data management processes and requirements
4	8/14/13	Updated to align processes with current GPS collection equipment, and data management processes and requirements
5	03/24/14	Updated to align processes with current location coordinate sourcing from geo-referenced surveys

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for collecting and handling global positioning system (GPS) data by the U.S. Environmental Protection Agency (EPA) or its contractors related to investigations conducted at the Libby Asbestos Superfund Site (Libby Site). This procedure describes the equipment and operations to be used for collection of location coordinate data. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Background

2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Libby_YYMMDD.ddf Data Dictionary (Libby data dictionary) – The filename for the Libby data dictionary contains the date of the latest revision in the format YYMMDD. All Trimble® handheld units

used by CDM Smith at the Libby Site should be pre-loaded with a generic data dictionary that handles collection of lines, points, and areas. In addition, the Trimble® units will be uploaded with the Libby data dictionary by designated onsite data management staff.

Scribe – An EPA data management system used to manage location, sample, and analytical data.

2.2 Discussion

The Libby data dictionary is set up to meet the location coordinate requirements discussed in Appendix C of the *Libby Asbestos Site Data Management Plan* (EPA 2013). For all locations assigned by CDM Smith during investigation and soil excavation activities, a latitude and longitude coordinate representing the location will be collected; additional specifics for coordinate collection will be included in the governing document referencing this procedure. All personnel required to collect GPS data will be familiar with the contents of the Libby data dictionary.

The following attributes are required to be collected, as indicated in **Table 1**, for each feature type when a GPS coordinate is collected:

Table 1. Attributes Collected in the Libby_YYMMDD Data Dictionary

Feature	Attributes Collected
Any Location	LocationID
BD Location	LocationID
SP Location	LocationID
XX Location	LocationID

These features are discussed in detail in Section 4.0 of this document. Instructions for loading a data dictionary onto a datalogger are discussed in Section 4.3.

3.0 Responsibilities

Team Leader (TL) – The TL is responsible for overseeing the GPS point collection process for their field teams, ensuring field team members are adequately trained and coordinating with onsite data management staff to ensure the completeness of the GPS dataset required to be collected (as specified in the governing document referencing this procedure).

Field sample data sheet (FSDS) – The hard copy form on which sample and location information is recorded.

Field team members – Field team members are responsible for collecting GPS data, as specified in the governing document referencing this procedure, and reporting any data collection issues to the TL. For readability, field team members are also referred to as Trimble® unit "operators" throughout this procedure.

Onsite data management staff – This staff is responsible for publishing finalized GPS data to Scribe. This staff will also support the TL to ensure the required GPS dataset for each field activity is complete.

4.0 Equipment, Software, and Configuration

Software can vary with rental equipment; however, the preferred software for transfer and processing of GPS data is GPS Pathfinder Office and TerraSync. **Table 2** contains guidelines for configuration settings (based on TSC1 5.27 software), that should be implemented for GPS point collection. Configuration settings for TerraSync are outlined immediately following Table 2. Note that some GPS Pathfinder Office and TerraSync settings can be changed to accommodate data collection needs.

Table 2. Configuration Settings for Trimble® ProXRS

GPS Rover Options - Logging Options		
Logging Intervals	Point feature	1 s
	Line / area	3 s
	Not in feature	none
	Velocity	none
Confirm end feature	no	
Minimum Positions	30	
Carrier phase	Carrier mode	off
	Minimum time	10mins
GPS Rover Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	6.0	
DOP type	PDOP	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Rover Options – Real-time input		
Preferred correction source	use uncorrected GPS	
GPS Rover Options – General real-time settings		
Correction age limit	10s	
GPS Rover Options – Antenna options		
Height	Set according to model	
Measure	Vertical	
Confirm	Never	
Type	auto-filled when part number is entered	
Part number	get part number off of antenna	
GPS Rover Options – Initial Position		
North	USft	
East	USft	
GPS Rover Options – 2D altitude		
Altitude(MSL)	USft	
Computed at	time	
Computed at	date	
GPS Base Station Options – Logging Options		
Logging Intervals	Measurements	5s
	Positions	30s
Audible Click	Yes	
Log DOP data	Yes	
GPS Base Station Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	4.0	
PDOP mask	6.0	

PDOP switch	4.0	
GPS Base Station Options – Real-time output options		
Real-time output mode	off	
Radio type	Custom	
Baud rate	9600	
Data bits	8	
Stop bits	1	
Parity	Odd	
RTCM options	Station	1
	Message type	Type 1
	Message interval	5s
	Message suffix	None
	CTS flow control	Off
	CTS xmit delay	0ms
	RTS mode	High
	RTS edge delay	0ms
GPS Base Station Options – Reference position		
Datum	WSG 1984	
Zone	11 North	
NMEA/TSIP Output options		
Output	TSIP	
Baud rate	38400	
Coordinate System	Latitude/Longitude	
Map display options	All show with no background	
Units and Display		
Units	Distance(2D)	US Survey Ft
	Area	Square feet
	Velocity	Miles/Hour
	Angle format	DDMMSSss
	Order	North/East
	North reference	True
	Magnetic declination	Auto
	Null string	
	Language	English
Time and Date	24 hour clock	Yes
	Time	##:##:##
	Date format	MM/DD/YYYY
	Date	MM/DD/YY weekday
Quickmarks	Attributes	Repeat
	Confirm	No

TerraSync (v4.15) Setup

The following configuration settings should be employed:

Logging Settings: Antenna Height

GPS Settings: PDOP Settings are determined on basis of Productivity versus Precision. Slide the bar to obtain the highest precision for a given location.

Real-time Settings: Use Uncorrected GPS

Coordinate System Settings: Coordinate System: Latitude/Longitude; Datum: WGS84

Units: Distance Units: US Survey Feet; Area Units: Square Feet; Angle Units: Degrees; Lat/Long Format: DD°MM'SS.ss; Offset Format: Horizontal/Vertical; North Reference: True; Magnetic Delination: Auto(15.2°E);

External Sensors: None

5.0 Procedures

The following sections describe how GPS points are collected and handled for features commonly used at the Libby Site.

5.1 Selecting Locations

All features collected at the Libby Site are point features. Any location feature will allow the entry of any 9-digit text value, which will correspond to the Location ID assigned on the field sample data sheet (FSDS). For ease and accuracy of data entry of location values, three additional location features are available for which the Location ID attribute defaults to the values "BD-", "SP-", or "XX-"accordingly. The prefix code values are specific to the field event and defined in the governing document referencing this procedure.

Building Locations

For building locations, a GPS point is collected near the front door or main entrance of the building. Refer to the governing document for details regarding building location types.

Locations Where No Sample is Collected

For investigation locations where a sample is not collected, a GPS point is collected at the approximate center of each location area, or as specified in the governing document referencing this procedure.

Soil Sample Locations

For grab sample locations, a GPS point is collected at the exact sampling location.

For composite sample locations, a GPS point is collected at the approximate center of the sample area. In the case of an irregular-shaped sample area or sample area that is non-continuous (e.g., a flowerbed that wraps around a house), a GPS point is collected at the center of the largest continuous sample area.

A GPS point is collected once per unique sample location. All subsequent samples taken at that location (including field duplicate samples) will use the previously assigned Location ID and corresponding coordinates.

Outdoor Stationary Air and Dustfall (Settled Dust) Samples

For permanent outdoor stationary air and dustfall sample locations (i.e., those representing a consistent monitoring zone or area, and are collected on a routine schedule), a GPS point is collected once per unique sample location. All subsequent samples taken at that location use the previously assigned Location ID and corresponding coordinates.

Interest Point, Interest Area
GPS points for interest point and interest area features are not routinely collected at the Libby Site. However, they are included in the Libby data dictionary in the event that a GPS point or a series of points is collected to document the perimeter of an interest area or sample area or other point that does not correspond to a location in the Scribe database.

Pre-determined Sample Areas
For pre-determined sample areas (e.g., gridded) where waypoints are available, the Trimble® units may be pre-loaded with waypoint files to guide samplers to sampling locations. Pre-loading of coordinates is typically performed by onsite data management staff. It should be noted that, in order to ensure GPS coordinate data are included in the project database, *GPS points will also be collected at the time of sampling for sample locations located using waypoint files*.

Features Not Requiring GPS Points
GPS points are not collected for the following features, unless otherwise specified in the governing document referencing this procedure:

- Stationary air, dust, and soil samples collected inside or beneath buildings (these locations are associated with the coordinates of the building where the sample was collected)
- Stationary air samples, with the exception of permanent monitoring locations as designated in site-specific removal work plans or Response Action Work Plan Addenda
- Duplicate or replicate air or dust samples (which are assigned the same Location ID and coordinates as the parent sample)
- Soil samples taken at depth from the same sample area as a previously collected sample (the at-depth soil sample will be assigned the same Location ID as the shallower sample in order to relate both samples to the same coordinates)
- Duplicate or split soil samples (which are assigned the same Location ID and coordinates as the parent sample)
- Personal air samples (locations are associated with the coordinates of the building (i.e., BD Location ID) or property (i.e., AD Location ID) where the sample was collected)

5.2 Operation of GPS Handheld Units

GPS points at the Libby Site will be collected using Trimble® GPS handheld units, or equivalent equipment that meets the EPA's accuracy standards for geospatial data. Operators must be standing at the sample location before the unit starts to collect positions. Once the unit has started collecting positions, the operator must remain standing at the sample location until the minimum required positions have been collected. A minimum of 30 positions will be collected for each GPS location point. More positions may be required in circumstances where the GPS collection parameters are excessive due to poor satellite position. GPS target parameters should be consistent with those listed in **Table 2** (Configuration Settings for Trimble® ProXRS). These parameters should be emulated as closely as possible if using other GPS unit models.

Accuracy Criteria

Due to GPS unit availability from third-party vendors, various Trimble® models may be used at the Libby Site. However it is imperative the model's performance rating not exceed accuracy exceptions greater than 5 meters, in order to comply with EPA Policy CIO 2131.0 *National Geospatial Data Policy, Tier 2* standards (EPA 2005). EPA verification of these standards is built into post-processing logarithms. Data verification in the upload process will check for a horizontal precision of less than 5 meters and that a minimum of 30 positions were compiled for each point (see Section 6.0 for more detail).

Record-keeping Requirements

Serial numbers of the Trimble® datalogger, receiver, and antenna or beacon will be recorded in a field logbook. GPS filenames will be recorded in the logbook. Recording GPS filenames on FSDSs is not required.

Upgrades to GPS Equipment and Software

GPS unit equipment and software is subject to change according to availability. The TL or designee is responsible for contacting the technical support of the vendor if there are any questions regarding setup, operation, or data transfer of models not previously used at the Libby Site.

5.3 GPS Data Transfer from Handheld Units to Lbysvr1

Most Trimble® units connect to a personal computer (PC) through the charger unit using a universal serial bus (USB) cable (type A to type B), and Microsoft Active Sync software. Note that there are Active Sync connection settings to enable or disable once the device is connected to the PC: from the Active Sync menu, select Tools, select Options. These connect the Trimble® to other Windows applications on the PC (e.g., email, task managers, etc.). The main reason to disable these settings at the CDM Smith Libby project office is that the Trimble® units are shared and it does not make sense to activate them.

1. Turn on the Trimble® unit
2. Open Terrasync
3. Select Data
4. At the bottom of list, select File Manager
5. Open Pathfinder
6. Select Utilities
7. Select Data Transfer. The receive tab should be active.
8. From the Device list, select GIS Datalogger on Windows CE
9. Click on the connect icon (the button with the checkmark circled in green). A picture on the right will indicate the connection status.
10. Select Add

11. Select Open (make sure all files are highlighted)

12. Select Transfer All

Note: To load a data dictionary onto the datalogger, from Step 7, select the Send tab. When adding the file, navigate to the file you wish to load onto the datalogger. Make sure the file is highlighted before selecting transfer all.

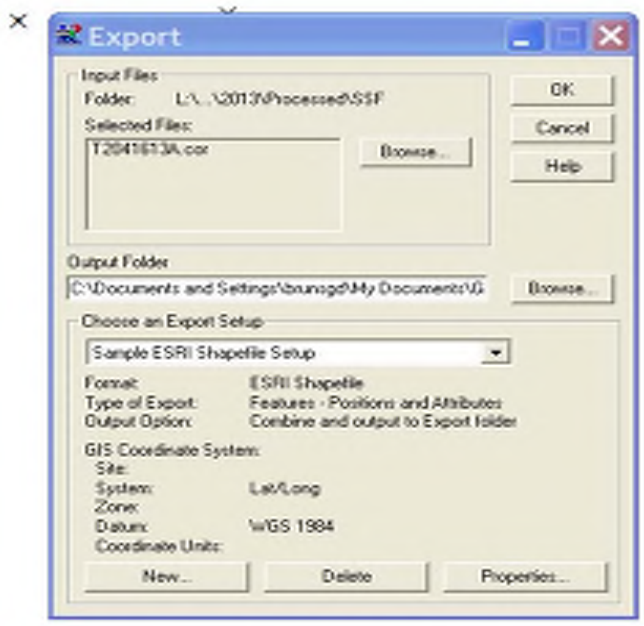
5.4 GPS Data Processing

Following download, the Trimble® files are stored on the CDM Smith Libby project server in the *Lbysvr1**Projects**Data Management**Pfdata**Libby* folder. The files, denoted by their .ssf extension, are differentially corrected and coordinate data for each unique location is uploaded to the Scribe location table using the procedures below:

1. Open GPS Pathfinder Office. Establish default folder and differential correction settings as shown in Table 3. Drag the .ssf files of interest to the Pathfinder map window. From the Pathfinder main menu options select Utilities. Select Differential Correction. A .cor file will be generated with a filename that corresponds with the .ssf filename. The .ssf files and the .cor files will be filed within the *Lbysvr1**Projects**Data Management**Pfdata**Libby* folder.

2. In order to prepare files for updating Scribe and to produce maps for a quality control (QC) verification of the points, select Utilities from the Pathfinder menu. Select Export. Review the selected file and output folder shown in the Export window. Choose an Export Setup of "Sample ESRI Shapefile Setup"(**Figure 1**).

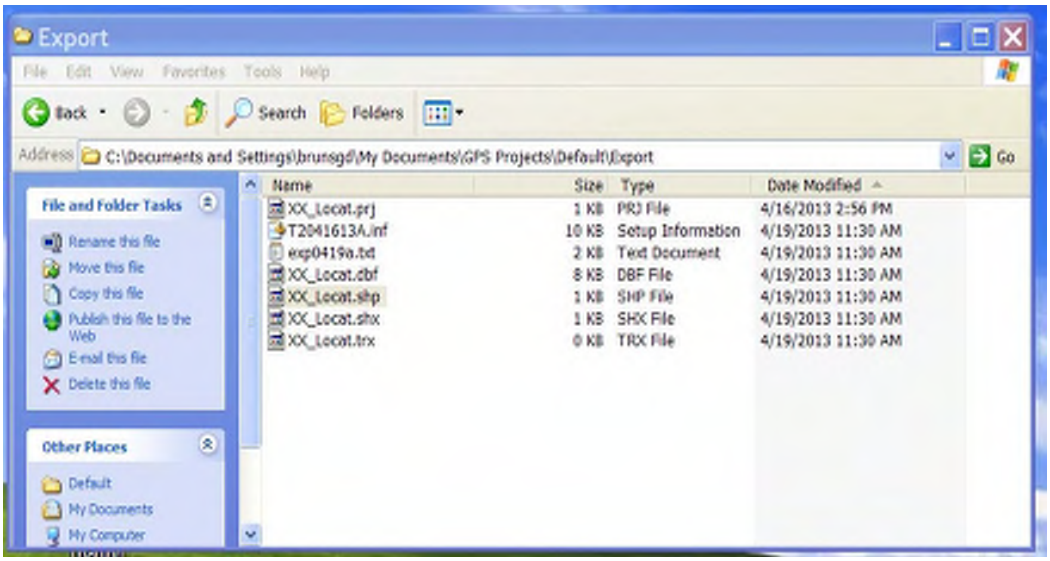
Figure 1



3. From the Export window select Properties. Under the Coordinate System tab, set Export Coordinates to "XY" and choose a directory for the projection file (.prj) (ideally the same as the output folder established in Step 1). Select OK.

4. Select OK at the top right corner of the Export window. A series of files will be generated in the previously defined output folder (**Figure 2**).

Figure 2



5. Use Arc Catalog to rename the .prj, .dbf, .shp, .shx, and .trx files to include the GPS filename (captured in the .inf file). As an example, XX-Locat.dbf would be renamed to T2041613A-XX.dbf.

6. The renamed files will be temporarily maintained in the *Lbysvr1**Projects**Data Management**Pfdata* *Libby*\2013*Processed**Shapefiles* directory where data is consolidated for updating Scribe.

5.5 GPS Data Transfer to Scribe

7. Open the DataConsolidation MS Access database located in the *Lbysvr1**Data Management**Pfdata**Libby**2013**Processed* folder.

8. On the right side of the main window, click on "Files Not Processed." A table will appear showing the .dbf files that have not been uploaded to Scribe. Make a note of these and close the table.

9. Click on Select a File. Select one of the unprocessed files and click on Open. The Select File Location window will disappear.

10. Click on Run Process. Data will be queued for updating location coordinates in the Scribe location table.

11. Repeat steps 10 and 11 until all the unprocessed files are queued. Once this occurs, click on Update Scribe which updates the Scribe location table.

12. To review any location coordinates that have not been successfully updated in Scribe, click "See Points w Issues." Make revisions/corrections to this table as needed and update Scribe as needed.

Table 3. Pathfinder Office Settings

Pathfinder Differential Correction
Processing Type - Automatic Carrier and Code Processing
H-Star Processing - Use a Single Base Provider
o Correct Settings
▪ Output corrected and uncorrected positions
▪ Smart automatic rover filtering
▪ Re-correct real-time positions
o Base Data – Bonners Ferry or other nearest
o Folder Search – set to default
o Reference Position - Bonners Ferry or other nearest
o Output folder - set to directory of input file
o Output filename - Use original filename, overwriting any existing .cor file
Pathfinder Export
Input files - .cor file
Output Folder – set to default
Choose an Export Setup - Sample ESRI Shapefile Setup
Properties
Coordinate System
o Use Current Display Coordinate System
▪ Export Coordinates As XY
▪ Projection File – set to default
o ESRI Shapefile
▪ Export Tracking Themes
▪ Track ID Attribute Name
o Position Filter
▪ GPS Position Info
▪ Minimum Satellites – 2D (3 or more SVs)
▪ Maximum PDOP – Any
▪ Minimum HDOP - Any
o Include Positions That Are
▪ All options other than Uncorrected
▪ Options other than Filter By Precision (68% confidence)
▪ Include Non-GPS Positions
o Data
▪ Features – Position and Attributes. Export All Features
▪ Output - Combine all input and output to export folder under Output Files
▪ DOS Files under System File Format
o Attributes
▪ Attribute Value under Export Menu Attributes As

▪ Generated Attributes, all options for All Feature Types and Point Features
▪ No selections for Line Features or Area Features
o Units - Use Current Display Units
▪ Distance Units: US Survey Feet
▪ Area Units: Square Feet
▪ Velocity Units: Feet Per Second
o Decimal Places
▪ Lat/Long: 9
▪ North/East: 3
▪ Precision: 1 Time: 0
▪ All other selections: 3
Pathfinder Options
o Units
▪ Distance – US Survey Feet
▪ Area – Square Feet
▪ Velocity – Feet per second
▪ Offsets – US Survey Feet
▪ Offset Distance Format: Horizontal and Vertical
▪ Precisions – US Survey Feet
▪ Confidence – 68% Precisions
▪ North Reference: True
o Coordinate System
▪ Coordinate System and Zone
▪ System – Lat / Long
▪ Datum WGS 1984
▪ Altitude Measured: MSL
▪ Altitude Units - Meters

5.6 Digitized Coordinates

For situations where GPS points are not collected using a GPS unit (i.e., detailed investigation [DI] portion of the General Property Investigation and planned exterior soil removals), location coordinates will be digitized by the drafting team using the property-specific land survey provided by a certified surveyor contracted to the RC. The CAD drawing is composed by the drafting team using the survey and the coordinates provided in the land survey. The CAD drawing is geo-referenced with the survey coordinates provided by the surveyor; therefore, these coordinates meet the standard of the survey-grade GPS unit used for survey, which are well within EPA's Tier 2 standards.

Afterwards, the desired points are digitized using the DI sketch (for GPIs) or the draft redline drawing (for planned exterior soil removals). A Microsoft Excel export file containing the location coordinates is then emailed to CDM Smith. Data is imported into the DataConsolidation MS Access database where updates are made to the Scribe location table.

6.0 Quality Assurance/Quality Control (QA/QC)

All GPS data are visually reviewed and verified after processing.

Visual review involves using the shapefile exported in Step 5 in Section 5.4, in a geographic information system (e.g., ArcView), by the TL. Mapped points are viewed to ensure they represent the expected area at the expected property. Points with obvious errors are omitted and/or recollected.

Verification involves comparing data attributes against EPA-established accuracy criteria, which is performed by onsite data management staff during the "Run" process (Step 11 in Section 5.4). Any point location not within 5 meters of "Horz_Prec" (horizontal precision) or collected using less than 30 positions is flagged in the DataConsolidation MS Access database. Additionally, the following formula is applied to each point to evaluate the point's accuracy: [Horz_Prec] + (1.645 X [Stnd_Dev]) = X , where X must be less than 5 to ensure the point falls within 5 meters of the intended target with 95% confidence. Any point exceeding a 5-meter calculated position is flagged. These flagged points will be reviewed a minimum of once per month by the CDM Smith onsite data manager.

7.0 References

EPA. 2005. CIO Policy Transmittal 05-002, *National Geospatial Data Policy*. August 24. [http://www.epa.gov/irmpoli8/policies/21310.pdf].

EPA. 2013. *EPA Data Management Plan, Libby Asbestos Superfund Site, Version 2013.1*. July 3. [https://team.cdm.com/eroom/R8-RAC/libby/Libby Data Management Plan]

Operable Unit 5 Railroad Spur Investigation
Quality Assurance Project Plan
Libby Asbestos Site, Operable Unit 5
Libby, Montana

Revision 0

07/08/2014

Project Period 03/30/2014 to 03/29/2015
Contract No. W9128F-11-D-0023
Task Order No. 0007

APPENDIX C
Analytical Requirements Summary Sheet (OU5RS-0714)

QAPP ANALYTICAL SUMMARY # __OU5RS-0714_
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

Title: Operable Unit 5 Railroad Spur Investigation Quality Assurance Project Plan, Revision 0, Libby Asbestos Site

QAPP Date/Revision: July 8, 2014 (Revision 0)

EPA Technical Advisor: Dania Zinner (303-312-7122, Dania.Zinner@.epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: The objectives of the OU5 Railroad Spur sampling investigation are two-fold: 1) collect data to confirm the presence of Libby amphibole asbestos (LA) along selected railroad spurs within OU5 and 2) collect data to evaluate the extent of LA contamination along selected railroad spurs within OU5 to assist with removal decisions. The sampling will consist of collecting 30-point composite soil samples and routine health and safety monitoring of field personnel in accordance with OSHA guidelines.

Sample ID Prefix: RS- for soil and health & safety air samples

PLM Preparation and Analytical Requirements:

Medium Code	Sample Type	Preparation Method	Analysis Method	Applicable Laboratory Modifications (current version of)
A	Soil – all field samples and field duplicate samples	16-ASB-06.00 Rev. 0	PLM-Grav: SRC-LIBBY-01 Rev. 3 PLM-VE: SRC-LIBBY-03 Rev. 3	LB-000073, LB-000088, LB-000097, LB-000098

Medium-Specific TEM/PCM Preparation and Analytical Requirements for Field Samples:

Medium Code	Medium, Sample Type	Preparation Details				Analysis Details			Applicable Laboratory Modifications (most current version)
		Investi-gative?	Indirect Prep?		Filter Archive?	Method(s)	Recording Rules	Analytical Sensitivity/ Prioritized Stopping Rules	
			With Ashing	Without Ashing					
B	Health & Safety Personal Air	No	No	Yes[a], if material is overloaded (>25%) or unevenly loaded on filter	Yes	PCM – NIOSH 7400, Issue 2 TEM– AHERA (upon request)	For PCM: NIOSH 7400, "A" rules If AHERA is requested: All asbestos[b], L ≥ 0.5 µm AR ≥ 5:1	For PCM: Count until 100 fibers are detected. Count a minimum of 20 FOVs. Stop at 100 FOVs regardless of count. For AHERA: Count until one is achieved: i) Target S = 0.005 cc^{-1}, or ii) Evaluate a minimum filter area of 0.1 mm^2, or iii) 25 LA structures are enumerated (finish GO where 25th LA found)	For PCM: LB-000015 For AHERA: LB-000029, LB-000031, LB-000067, LB-000085 LB-000091

[a] See most current version of EPA-LIBBY-08 for preparation details

[b] Recording of chrysotile can stop after 25 chrysotile structures have been recorded (finish GO where 25th chrysotile found).

PCM Preparation and Analytical Requirements for Field Quality Control Samples:

Medium Code	Medium, Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications (most current version)
		Indirect Prep?		Archive?	Method	Recording Rules	Stopping Rules	
		With Ashing	Without Ashing					
C	Air, Field Blank	No	No	Yes	PCM – NIOSH 7400, Issue 2	NIOSH 7400, "A" rules	Examine 100 FOVs.	LB-000015

Laboratory Quality Control Sample Frequencies:

PLM [e]:
Lab Duplicates – 10% (cross-check 8%; self-check 2%)
Inter-laboratory – 1% [a, b]

PCM [c]: Blind Recounts – 10%

[a] *Post hoc* selection to be performed by the QATS contractor
[b] See LB-000073 for inter-laboratory acceptance criteria
[c] See NIOSH 7400 for QC acceptance criteria

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	07/08/2014	N/A

Analytical Laboratory Review Sign-off:

☐ EMSL – Libby [sign & date: _____]
☐ EMSL – Cinnaminson [sign & date: _____]
☐ EMSL – Denver [sign & date: _____]
☐ EMSL – Manhattan [sign & date: _____]
☒ ESAT [sign & date: _Douglas_Kent_14_July_2014___]
☐ RESI [sign & date: _____]
☐ Hygiea [sign & date: _____]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]