Lincoln County Class IV Asbestos Landfill
Quality Assurance Project Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0

1/16/2015

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Region VIII

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A. Project Management

A1. Title and Approval Sheet

Title: Landfill Quality Assurance Project Plan, Libby Asbestos Site, Revision 0, 1/16/2015

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Document Revision Log

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A2. Table of Contents

A. Project Management 2

A1. Title and Approval Sheet 2

A2. Table of Contents 4

A3. Distribution List 10

A4. Project Task Organization 11

A4.1 Project Management 11

A4.2 Technical Support 12

A4.2.1 QAPP Development 12

A4.2.2 Field Sampling Activities 12

A4.2.3 Laboratory Analysis 13

A4.2.4 Data Management 13

A4.3 Quality Assurance 14

A5. Problem Definition/Background 15

A5.1 Site Background 15

A5.2 Reasons for this Project 15

A5.3 Applicable Criteria and Action Limits 16

A6. Project/Task Description 16

A6.1 Task Summary 16

A6.2 Work Schedule 17

A6.3 Locations to be Evaluated 17

A6.4 Resources and Time Constraints 17

A7. Quality Objectives and Criteria 18

A7.1 Data Quality Objectives 18

A7.2 Performance Criteria 18

A7.3 Precision 21

A7.4 Accuracy/Bias and Representativeness 21

A7.5 Completeness 22

A7.6 Comparability 23

A7.7 Method Sensitivity 23

A8. Special Training/Certifications 23

A8.1 Field 23

A8.2 Laboratory 24

A8.2.1 Certifications 24

A8.2.2 Laboratory Team Training/Mentoring Program 25

A8.2.3 Analyst Training 26

A9. Documentation and Records 27

A9.1 Field 27

A9.2 Laboratory 27

A9.3 Logbooks and Records of Modification 27

B. Data Generation/Acquisition 28

B1. Study Design 28

B1.1 Locations 28
B1.2 Sampling Design 28
B1.3 Study Variables 28
B1.4 Critical Measurements 28
B1.5 Data Reduction and Interpretation 28

B2. Sampling Methods 28

B2.1 Field Preparation 30
B2.1.1 Field Team Training 30
B2.1.2 Field Planning Meeting (Readiness Review) 30
B2.1.3 Inventory and Procurement of Equipment and Supplies 31
B2.2 Perimeter Air Samples 32
B2.2.1 Perimeter Air Sample Rationale 32
B2.2.2 Perimeter Air Sampling Methods 32
B2.3 Personal Air Sampling 33
B2.3.1 Personal Air Sampling Rationale 33
B2.3.2 Personal Air Sampling Methods 33
B2.4 Groundwater Sampling 34
B2.4.1 Groundwater Sampling Rationale 34
B2.4.2 Groundwater Sampling Methods 34

B3. General Processes 37

B3.1 Equipment Decontamination 37
B3.2 Investigation-derived Waste 37
B3.3 Field Sample Data Sheets 37
B3.4 Field Logbooks 38
B3.5 Sample Labeling and Identification 38
B3.6 Photographic Documentation 39
B3.7 Modifications to and Deviations from Governing Documents 40
B3.8 Sample Custody 40
B3.9 Sample Packaging and Shipping 41

B4. Analytical Methods and Operations 41

B4.1 Analytical Methods and Turnaround Times 41
B4.1.1 Air Samples 41
B4.1.2 Asbestos Groundwater Samples 42
B4.1.3 Non-Asbestos Groundwater Samples 45
B4.2 Analytical Data Reports 46
B4.3 Laboratory Data Reporting Tools 47
B4.4 Custody Procedures 47

B5. Quality Assurance/Quality Control 48

B5.1 Field 48

B5.1.1 Training ... *48*
B5.1.2 Document Review ... *48*
B5.1.3 Modification Documentation ... *48*
B5.1.4 Field Surveillances ... *49*
B5.1.5 Field Audits ... *49*
B5.1.6 Field QC Samples ... *49*
B5.2 Analytical Laboratory ... **53**
B5.2.1 Training/Certifications ... *53*
B5.2.2 Modification Documentation ... *53*
B5.2.3 Facility Non-conformance ... *54*
B5.2.4 Laboratory Audits ... *54*
B5.2.5 Laboratory QC Analyses ... *55*

B6/B7. Instrument Maintenance and Calibration ... 56
B6/B7.1 Field Equipment ... **56**
B6/B7.2 Laboratory Instruments ... **56**

B8. Inspection/Acceptance of Supplies and Consumables ... 56
B8.1 Field ... **56**
B8.2 Laboratory ... **57**

B9. Non-direct Measurements ... 57

B10. Data Management ... 57
B10.1 Field Data Management ... **57**
B10.2 Asbestos Laboratory Data Management ... **58**
B10.3 Libby Project Database ... **58**
B10.4 Data Reporting ... **58**

C1. Assessment and Response Actions ... 60
C1.1 Assessments ... **60**
C1.2 Response Actions ... **60**

C2. Reports to Management ... 61

D1. Data Review/Evaluation ... 62
D1.1 Data Review ... **62**
D1.1.1 Air Sample Data ... *62*
D1.1.2 Groundwater Sample Data ... *62*

D2. Verification and Validation Methods ... 63
D2.1 Data Verification ... **63**
D2.2 Data Validation ... **63**

D3. Reconciliation with User Requirements ... 65

D4. Final Reporting ... 66

References ... 67

Tables

Table A-1 Groundwater, Perimeter Air, and Personal Air Decision Rules
Table A-2 Field Training Requirements
Table B-1 List of Standard Operating Procedures for Sample Collection
Table B-2 Selecting Air Sample Locations
Table B-3 Groundwater Sampling Parameters
Table B-4 Summary of Field QC Samples for Air
Table B-5 Summary of Field QC Samples for Groundwater
Table B-6 Groundwater Analytical Methods and Reporting Limits
Table D-1 Evaluation Methods for Assessing Data Usability

Figures

Figure A-1 Organization Chart
Figure B-1 Site Location Map
Figure B-2 Landfill Site Map

Appendices

Appendix A Standard Operating Procedures
Appendix B Air Monitoring Frequencies
Appendix C Analytical Requirements Summary Sheet (**LCLGW-1214_Rev1**)

Acronyms and Abbreviations

A&E	architect and engineering contractor
AHERA	Asbestos Hazard Emergency Act
APP	Accident Prevention Plan
ARM	Administrative Rules of Montana
ASTM	American Society for Testing and Materials
bgs	below ground surface
CAR	corrective action request
CB&I	CB&I Federal Services
CDM Smith	CDM Federal Programs Corporation
CLP	Contract Laboratory Program
COC	chain-of-custody
CFR	Code of Federal Regulations
DEQ	Montana Department of Environmental Quality
DQOs	data quality objectives
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERT	Environmental Response Team
ESAT	Environmental Services Assistance Team
FPM	field planning meeting
FSDS	field sample data sheet
FTL	Field Team Leader
GPS	global positioning system
H&S	health and safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICP-MS	inductively coupled plasma-atomic emission spectrometry
ID	identifier
IDW	investigation-derived waste
ISO	International Organization for Standardization
LA	Libby Amphibole asbestos
LC	Laboratory Coordinator
Landfill	Lincoln County Class IV Asbestos Landfill
L/min	liters per minute
MCE	mixed cellulose ester
MFL	million fibers per liter
mm	millimeter
MS/MSD	matrix spike/matrix spike duplicate
NA	not applicable
N	number
NFG	National Functional Guidelines
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NELAP	National Environmental Laboratory Accreditation Program
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration

OU	operable unit
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCM	phase contrast microscopy
poly	polyethylene
PPE	personal protective equipment
PRI-ER	Project Resources, Inc. – Environmental Restoration Joint Venture
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manager
QAPP	quality assurance project plan
QATS	Quality Assurance Technical Support
QC	quality control
RA	response action
RC	removal contractor
ROM	record of modification
RPD	relative percent difference
RPM	Remedial Project Manager
RSL	regional screening level
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure
STEL	short-term exposure limit
TEM	transmission electron microscopy
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOC	volatile organic compound
%	percent
µm	micrometer

A3. Distribution List

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

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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 any subsequent revisions) will also be posted to the Libby Field eRoom[1]. Terry Crowell is the CDM Smith eRoom coordinator responsible for managing user accounts; eRoom accounts may be requested via email at CrowellTL@cdmsmith.com.

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 EPA Region 8 is the lead regulatory agency for Superfund activities within the Libby Asbestos Superfund Site (Site). The EPA Libby Project Team Leader is Rebecca Thomas. The EPA Remedial Project Manager (RPM) for Landfill sampling is Elizabeth Fagen. The EPA Region 8 Onsite RPM and EPA Field Team Leader (FTL) for Landfill sampling is Mike Cirian.

[1] Libby Field eRoom can be accessed at (https://team.cdm.com/eRoom/R8-RAC/Libby/0_aea4) and Lab eRooms (https://team.cdm.com/eRoom/mt/LibbyLab/0_bf6e)

The U.S. Army Corps of Engineers (USACE), Omaha District, is the contracting agency for Landfill sampling activities at the Site, on behalf of the EPA. The USACE has an interagency agreement with the EPA, number DW96954027, through which work will be performed under this QAPP. The USACE Program Manager is Mary Darling. The USACE Construction Control Representatives are Jeremy Ayala, Brian Broekemeier, and Jeff Hubbard.

Two principal firms are contracted to the USACE for site work under the current removal action implementation process: CDM Smith for project A&E services, and Project Resources, Inc. – Environmental Restoration Joint Venture (PRI-ER) for removal contractor (RC) services. The CDM Smith Project Manager is Thomas Cook, who is responsible for implementing the field component of this QAPP. The PRI-ER Project Manager is Chuck Jackson, who is responsible for the RC Landfill operations.

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 all 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. In the event substantive changes are warranted, this QAPP will be revised and approved by the EPA and USACE prior to changes being implemented. 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 any subsequent revisions) will also be posted to the Libby Field eRoom.

A4.2.2 Field Sampling Activities

The A&E will be responsible for sample collection, handling, and coordination, and managing associated field data. Key A&E personnel that will be involved in this program include:

- Thomas Cook, Site Manager/Project Manager

- Scott Felton, Assistant Site Manager
- Damon Repine, Construction Manager
- Tracy Dodge, Lead Sample Coordinator
- Diane Rode, Field Data Manager
- Terry Crowell, QA Manager (QAM)
- Dominic Pisciotta, Health and Safety (H&S) Manager

A4.2.3 Laboratory Analysis

It is anticipated that all samples collected as part of this project will be sent to laboratories selected and approved by the EPA to support the Site. The EPA Environmental Services Assistance Team (ESAT) is responsible for procuring all 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, and managing EPA's Contract Laboratory Program (CLP). The CLP Manager is responsible for designating laboratories to provide environmental analysis services. The ESAT 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

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

The project data management processes, 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 Region 8 Data Manager and can be found in both the Libby Field and Lab eRooms.

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 asbestos data collected as part of the Libby project.

CDM Smith's Field Data Manager (Diane Rode) is responsible for overseeing the upload of sample and location information to the field Scribe project database.

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

Non-asbestos data are collected more infrequently at the Libby Site and not formally managed in a Site database. For this investigation, analytical results will be retained by CDM Smith on a secure project server.

A4.3 Quality Assurance

There is no individual designated as the EPA 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, Elizabeth Fagen (or designee), to ensure that this QAPP has been prepared in accordance with the EPA QA guidelines and requirements for this sampling effort. Ms. Fagen is independent of the entities planning and obtaining the data described in this QAPP.

For this project, the EPA QAM 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.

Additional QA support is provided by 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 to the QA program and project-specific requirements. It is anticipated that David Ray will serve as the USACE QA representative for Landfill sampling; however, other staff may ultimately be identified to fill this role. The USACE will notify the EPA of any 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, review of property-specific removal designs, and contract administration. USACE onsite personnel report to the USACE Project Manager. The following onsite USACE personnel will maintain QA oversight of this sampling program:

- Jeremy Ayala, Project Engineer
- Jeff Hubbard, Backup Project Engineer
- Brian Broekemeier, 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 the firm's 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). 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 a variety of media (e.g., soil, bulk materials, dust) from source materials (e.g., vermiculite insulation, vermiculite-containing soils, mining wastes) at Site properties, which include residential, commercial, municipal, and industrial properties, as well as transportation corridors in and around the communities of Libby and Troy. 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.

Cleanup work at the Site is ongoing and includes response actions to remove the LA-containing media (e.g., vermiculite insulation, soil, dust, and building materials). The Lincoln County Class

IV Asbestos Landfill (Landfill) serves as the primary location for the disposal of materials resulting from these response actions. This QAPP details the methodology and evaluation procedures for collecting and analyzing samples associated with project Landfill operations. Samples will be collected by the project A&E, CDM Smith, of personal air, perimeter air, and groundwater. The objectives of the Landfill operations sampling are to:

1. Collect data to confirm project Landfill operations have not impacted groundwater quality in the underlying aquifer above specified action levels.

2. Collect data to assess whether project worker exposure to nuisance dust and LA at the Landfill is within acceptable limits.

3. Collect data to evaluate the effectiveness of equipment-use practices and engineering controls during project Landfill operations.

A5.3 Applicable Criteria and Action Limits

For this sampling program, criteria and action limits have been established according to Administrative Rules of Montana (ARM) 17.50.511(1)(i), the owner/operator of a Landfill unit must ensure no violation of requirements developed under the state implementation plan, approved or promulgated by the EPA Administrator pursuant to Section 110 of the Clean Air Act, as amended. Air monitoring requirements for asbestos projects are also included in ARM 17.74.338, Asbestos Abatement Project Control Measures.

At the Libby Site, the EPA has developed action levels and cleanup criteria for LA that are applicable to response actions (EPA 2003, 2011a, and 2014). Final action levels for the Site are in development and will be published in the final record of decision. As noted above, the primary objective of the sampling program described in this QAPP is to collect data of sufficient quality and quantity to evaluate impacts of handling and disposing LA-containing materials at the Landfill. Decision rules for specific criteria or action levels that apply to this sampling program are provided in Section A7.

A6. Project/Task Description

A6.1 Task Summary

Since 2001, the EPA has been performing response actions to remove LA-contaminated media at Site properties. The purpose of this document is to outline the air and groundwater sampling program for operations at the Landfill, which serves as a disposal location for double-bagged vermiculite, bulk vermiculite-containing insulation, and LA-contaminated non-soil waste and demolition debris resulting from the response actions.

Air monitoring during project Landfill operations will be performed by the A&E, who will supply all required air monitoring stations, sampling equipment, and personnel. Air samples

will be analyzed by an ESAT-contracted laboratory. The A&E will evaluate and provide air sample results to project staff, as appropriate, as they become available.

Semi-annual groundwater sampling will be performed by the A&E, who will supply all required sampling equipment and personnel. Groundwater samples will be analyzed by an A&E-contracted laboratory for non-asbestos analytes and EPA-contracted laboratories for asbestos analyses. The A&E will prepare written summary reports for groundwater sample results containing an evaluation of sample results in comparison to acceptable levels on a bi-annual basis, which will be distributed as appropriate. Section B4.2 details additional reporting requirements.

A6.2 Work Schedule

Depending on project funding, contracting, and yearly project goals, it is anticipated that response actions will continue in Libby for the next 3 to 5 years. Most remaining properties that require response actions have exterior contamination. Therefore, future annual removal schedules will be set, in part, based on seasonal project and weather considerations. It is anticipated that the Landfill will serve as the primary location for disposing of contaminated materials, at the discretion of the EPA, resulting from current and near-future response actions at the Site.

CDM Smith's current task order period of performance with the USACE extends from March 30, 2014 through March 28, 2015 for which this QAPP has been prepared. Sampling of personal air and stationary perimeter air will be conducted as necessary within this time frame (or under future task orders) as weather permits, generally from April through October. Groundwater monitoring will be performed semi-annually (in June and December) in order to capture data associated with both low and high aquifer tables.

This QAPP covers the current period of performance and is anticipated, through annual reviews, updates, and amendments, to be in use at least through 2015. Annual reviews will be documented using the EPA QAPP Review Crosswalk and the document revision log updated to reflect any changes made to the QAPP.

A6.3 Locations to be Evaluated

All locations evaluated under this QAPP are present at the Landfill as discussed in Section A6.2. Figure A-2 shows the location of the Landfill and specifics regarding each type of sampling are discussed in Section B2.

A6.4 Resources and Time Constraints

Landfill air sampling will generally be conducted during the "construction season" as stated in Section A6.2; however, as noted above, sampling may be limited by weather conditions. The numbers of response actions affecting Landfill operations performed each year depends upon

goals set by the EPA and USACE for cleanups and property owner participation. Groundwater sampling will be conducted semi-annually (in June and December) as required by DEQ.

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 program will be adequate to support reliable site-specific decision-making (EPA 2001, 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 Boundaries of the Study
5. Develop Decision Rules
6. Specify Tolerable Limits on Decision Errors
7. Optimize the Design for Obtaining Data

A7.2 Performance Criteria

The objectives of this QAPP are presented in Section A5.2. In order to meet these objectives data are needed for groundwater, personal air, and stationary perimeter air. These data need to be of sufficient quality such that the analytical results are adequate to perform the statistical evaluations detailed in Section X.X.

Groundwater

The analytical requirements established in Section B4 are such that concentrations of LA in groundwater will be reliably detected and quantified if present at or above the maximum

contaminant level[2] (MCL) for asbestos in drinking water is 7 million fibers per liter (MFL), which is based on fibers longer than 10 micrometers (µm) in length for asbestos in drinking water. In addition, non-asbestos analytes will be reliably detected and quantified if present at or above Montana Groundwater Quality Standards.

Personal Air
The analytical requirements established in Section B4 are such that worker exposure will be reliably detected at or above acceptable limits established by OSHA.

Stationary Perimeter Air
The analytical requirements established in Section B4 are such that perimeter air measurements can be compared to requirements specified in the *Action Level/Clearance Criteria Technical Memorandum* (EPA 2003) and amendments (EPA 2011a, 2014). Table A-1 provides the decision rules and input requirements for collecting perimeter air and personal air samples during landfill activities.

[2] http://water.epa.gov/drink/contaminants/index.cfm#List

Table A-1: Groundwater, Perimeter Air and Personal Air Decision Rules

Principal Study Question	Input to Resolve Question	Input Requirements	Action Level	Decision Rule
Are LA structures in ambient air migrating beyond the exclusion zone boundary during landfill activities?	Perimeter Air Samples	Analysis: TEM AHERA with site-specific modifications AS: ~0.005 s/cc Minimum Volume: 1200 L/sample Collect: 1 sample along exclusion zone downwind of excavation	≥ 2 LA structures on one sample	If sample results exceed the action level or samples are overloaded, then engineering controls and work practices will be evaluated by the removal contractor and presented to a USACE representative. Collect additional air sample as deemed necessary. If the sample is not overloaded and results are below the action level, take no action.
Are fibers detected in the workers' breathing zone above worker safety limits?	Personal Air Samples	Analysis: PCM by NIOSH 7400; TEM Asbestos Hazard Emergency Response Act (AHERA) with site-specific modifications AS_{PCM}: 1 f/cc AS^{1}_{TEM}: ~0.005 s/cc Minimum Volume: 25 L/sample Collect: 8-hour TWA; 30-minute STEL excursion sample	TWA: 0.1 PCME f/cc STEL: 1.0 f/cc	If sample results exceed the action level or samples are overloaded, engineering controls, work practices, and/or PPE will be evaluated by the removal contractor and presented to a USACE representative. In addition, the sample may be analyzed by TEM AHERA (using indirect preparation methods if necessary) for confirmation of LA for informational purposes only. Collect additional air samples as deemed necessary. If the sample is not overloaded and the results are detected below the worker safety limits, take no action.
Are levels of LA and non-LA constituents above action levels?	Groundwater Samples	Analysis: TEM-ISO with site-specific modifications AS for asbestos of 0.2 MFL. See Table B-5 for requirements for non-asbestos analytes. Collect 1 field sample per well.	MCL for asbestos (7 MFL for structures longer than 10 µm). Exceedance of Montana Groundwater Quality Standard.	Any sample result exceeding the action level will be reported to EPA for further reporting to the appropriate representatives of Lincoln County as well as to the Montana Department of Environmental Quality. Additional samples shall be collected as deemed necessary. If the sample results are below the action level, take no action

LA – Libby Amphibole asbestos
TEM AHERA – transmission electron microscopy Asbestos Hazard Emergency Response Act
AS – analytical sensitivity
s/cc – structures per cubic centimeter
PCM – phase-contrast microscopy
NIOSH – National Institute for Occupational Safety and Health
TWA – time-weighted average
MFL – million fibers per liter
STEL – short-term exposure limit
µm – micrometers

Specific data validation processes ensure that analytical data used for decisions are within acceptable limits. All the information and data gathered during this evaluation will be checked to ensure they are usable for their intended purposes. An evaluation of analytical control limits and of the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters will be performed. If significant issues with the data are found, data results will be discussed with the EPA RPM. The EPA RPM will then decide if the issues discovered could cause them to make an incorrect decision. Using this approach, the probability of making an incorrect decision (i.e., either a false negative or positive) based on the information collected is considered small.

A7.3 Precision

For asbestos, 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 point 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 to 10 structures per sample, with counts of 20 to 25 structures per sample being optimal.

In addition, laboratory QC measurements (both inter- and intra-laboratory) will provide information on analysis reproducibility and precision. This laboratory QC consists of recount and re-preparation analyses for transmission electron microscopy (TEM) analysis (see Section B4 for TEM analytical requirements).

For non-asbestos parameters in groundwater samples, analytical precision of a measurement is an expression of mutual agreement among individual measurements of the same parameter taken under prescribed similar conditions. Precision is expressed in terms of relative percent difference (RPD). RPD is calculated as follows:

$$RPD = (S-D)/(S+D)/2) * 100$$

Where: S = Sample result
D = Duplicate result

During groundwater sampling, field duplicate samples will be collected to provide a measure of the contribution to overall variability of field-related sources. Non-asbestos analytical data will be evaluated for precision by laboratory duplicates, matrix spikes/matrix spike duplicates (MS/MSDs), and laboratory control sample/laboratory control sample duplicates, as applicable.

A7.4 Accuracy/Bias and Representativeness

To the extent feasible, samples will be collected and analyzed in accordance with procedures that have been employed for previous (and planned future) air and groundwater sampling

efforts at the Site. This will ensure that the results of this study are representative and appropriate for comparison to other data sets.

For non-asbestos parameters, accuracy is quantitative and usually expressed as the percent recovery (%R) of a sample result. %R is calculated as follows:

$$\%R = SSR - SR / SA * 100$$

Where: SSR = Spiked sample result
SR = Sample result
SA = Actual spike concentration

Ideally, it is desirable that the reported concentration equals the actual concentration present in the sample. Non-asbestos chemical analytical data will be evaluated for accuracy using MS/MSD samples, calibration recoveries, interference check sample recoveries, and inductively coupled plasma serial dilution results, as applicable.

For asbestos, analytical results for field duplicates can be compared to the original parent field sample using the Poisson ratio test using a 90% confidence interval (Nelson 1982). Because field duplicate samples are expected to have inherent variability that is random and may be either small or large, typically, there is no quantitative requirement for the agreement of field duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability.

Representativeness expresses the degree to which sample data accurately and precisely represent (a) a characteristic of a population, (b) parameter variations at a sampling point, and/or (c) an environmental condition. Representativeness is most concerned with the proper design of the sampling plan and the absence of cross-contamination. Representativeness is a consideration that will be employed during all sample location and collection efforts and will be assessed qualitatively by reviewing field procedures and actual sampling locations versus planned locations. It will be quantitatively assessed by evaluating blank samples, both field blanks and laboratory blanks.

A7.5 Completeness

Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Evaluating the PARCC parameters will assess usability. Those data that are evaluated and need no qualification, or are qualified as estimated data, are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. For this investigation, a completeness goal of 100 percent is desired for all analytical data. Completeness is calculated using the following equation:

$$\text{Completeness} = DO/DP * 100$$

Where: DO = Amount of usable data obtained

DP = Predicted amount of usable data

If any samples are not collected, or if any analysis is not completed successfully, this could result in that portion of the study providing no useful information. In this event, additional sampling may be needed to support EPA and USACE decision-making.

A7.6 Comparability

The data generated during this study will be obtained using standard analytical methods that have been utilized previously at the Site, and will yield data that are comparable to previous analyses of air and groundwater samples.

A7.7 Method Sensitivity

The method sensitivity (analytical sensitivity [AS]) and reporting limits required for the analysis of Landfill air and groundwater samples 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 any field work, any new sampling team member must complete the following, at a minimum:

Table A-2: Field Training Requirements

Training Requirement	Documentation Specifying Training Requirement Completion
Read and understand the governing Accident Prevention Plan (APP) (CDM Smith 2013)	APP signature sheet
Attend an orientation session with the field H&S Manager	Orientation session attendance sheet
Complete Occupational Safety and Health Administration (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 asbestos awareness training, as required by 29 Code of Federal Regulations (CFR) 1910.1001	Training certificate

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

Prior to beginning field sampling activities, a field planning meeting (FPM) 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 all applicable governing documents associated with this sampling program, including this QAPP, all associated standard operating procedures (SOPs) (see **Appendix A**), and the APP (CDM Smith 2013).

A8.2 Laboratory

A8.2.1 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project, regardless of analysis type, are subject to national, local, and project-specific certifications and requirements. Each asbestos 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 TEM. 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 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 as well as the LC. Many of the laboratories also maintain certifications from other state and local agencies.

Each asbestos laboratory working on the Libby project is required to pass a minimum of one onsite EPA laboratory audit. The details of this EPA audit are discussed in Sections B5.2.4 and B5.3.3. The LC also reserves the right to conduct any 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 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.

Laboratories utilized for non-asbestos analysis are certified by the National Environmental Laboratory Accreditation Program (NELAP) or a NELAP-recognized accrediting authority for the parameters of interest by the methods specified in their laboratory subcontract with the A&E, as applicable. This includes requirements for successfully analyzing proficiency testing or performance evaluation samples. Laboratories subcontracted to the A&E are required to maintain applicable program certifications throughout the duration of the subcontract period.

A8.2.2 Laboratory Team Training/Mentoring Program

Initial Mentoring

The orientation program to help new asbestos 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 asbestos laboratories are required to participate in this program. The training program includes a rigorous 2- to 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 Libby site. The mentor will also review the analysis of at least one sample by each type of analytical method with the trainee laboratory.

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 any technical or procedural issues that may arise, a regular teleconference is held between the EPA, their contractors, and each of the participating asbestos laboratories. Other experts (e.g., U.S. Geological Society [USGS]) are invited to participate when needed. These calls cover all 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 asbestos laboratory team training has been the participation in technical conferences. The first of these technical conferences was hosted by USGS in Denver, Colorado, in February 2001, and was followed by another held in December 2002. The Libby laboratory team has also convened on multiple occasions at the American Society for Testing and Materials (ASTM) Johnston Conference in Burlington, Vermont, including in July 2002, July 2005, July 2008, and July 2011, and at the Michael E. Beard Asbestos Conference in January 2010 and January 2013. In addition, members of the Libby laboratory team attended an EPA workshop to develop a method to determine whether LA is present in a sample of vermiculite attic insulation held in February 2004 in Alexandria, Virginia. These conferences enable the Libby laboratory and technical team members to have an on-going 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 TEM analysts for the Libby project undergo extensive training to understand TEM theory and the application of standard laboratory procedures and methodologies. The training is typically performed by a combination of personnel, including the Laboratory Manager, the laboratory QAM, and senior TEM analysts.

In addition to the standard TEM training requirements, trainees involved with the Libby project must familiarize themselves with Site-specific method deviations, project-specific documents, and visual references. Standard samples that are often used during TEM training include known pure (traceable) samples of chrysotile, amosite, crocidolite, tremolite, actinolite and anthophyllite, as well as fibrous non-asbestos minerals such as vermiculite, gypsum, antigorite, kaolinite, and sepiolite. New TEM analysts on the Libby project are also required to perform an *EDS Spectra Characterization Study* (EPA 2008) on the LA-specific reference materials provided during the initial training program to aide in LA mineralogy recognition and definition. Satisfactory completion of each of these tasks must be approved by a senior TEM analyst. All TEM analysts are also trained in the Site-specific laboratory QA/QC program requirements for TEM (see Section B5.2.4). The entire program is discussed to ensure understanding of requirements and responsibilities. In addition, analysts are trained in the project-specific reporting requirements and data reporting tools utilized in transmitting results. Upon completion of training, the TEM analyst is enrolled as an active participant in the Libby laboratory program.

A training checklist or logbook is used to assure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all TEM 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 at the A&E's project office in Libby, MT in accordance with contract and project-specific requirements. Field documentation is discussed in detail in Section B3. Field data management, including publishing data to Scribe, is discussed in detail in Section B10.1.

A9.2 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. Non-asbestos analytical data will be reported in a comprehensive data package and associated EDD, which will be stored on a secure project server by the A&E. Section B4 provides detailed information on the requirements for laboratory documentation and records. Laboratory data management is discussed in detail in Section B10.2.

A9.3 Logbooks and Records of Modification

It is the responsibility of field 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 program objectives) from this QAPP, or any 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[3]. Sections B5.1.3 and B5.2.2 provide detailed information on the procedures for preparing and submitting ROMs by field and analytical laboratory personnel, respectively.

[3] The current version of the field ROM form is provided in the Libby Field eRoom; the current version of the laboratory ROM form is provided in the Libby Lab eRoom.

B. Data Generation/Acquisition

B1. Study Design

B1.1 Locations

The Site location is shown in **Figure B-1.**

Figure B-2 identifies the Lincoln County Class IV Asbestos Landfill and locations of the groundwater wells.

B1.2 Sampling Design

The following provides an overview of the Landfill sampling program that will be conducted. Detailed information on sampling procedures and methods are presented in Section B2.

B1.3 Study Variables

The total number of air sampling events is dependent upon the frequency and length of Landfill dumping events. The time period required to perform each sampling effort is ultimately determined by the extent of removal actions that require disposal at the Landfill (e.g., interior demolitions, building demolitions). Groundwater sampling will be performed semi-annually in June in December. Each sampling event is anticipated to take 1 to 2 days to complete; sample quantities are discussed in Section B2.

B1.4 Critical Measurements

The goals of this sampling program are detailed in Section A5.2. These goals will be accomplished through sampling and analysis of LA in air and groundwater, and volatiles, hydrocarbons, dissolved metals, cyanide, and water quality parameters in groundwater.

B1.5 Data Reduction and Interpretation

As mentioned, data collected as part of Landfill sampling are intended to be used to support Landfill-specific engineering control decisions and evaluate impacts to groundwater quality from Landfill operations. Data will be evaluated on a sample-by-sample basis. Acceptance criteria are discussed in Section D.1.

B2. Sampling Methods

This section summarizes field activities that will be performed by A&E staff in support of the Landfill sampling program. This section also provides brief summaries of SOPs, which include project-specific modifications where applicable and project-specific details not discussed in the

SOPs. For comprehensive information, field personnel will refer to the general and project-specific SOPs included in **Appendix A**. The Libby Asbestos Project CAPP (CDM Smith 2011), or most recent version, and the A&E's APP (CDM Smith 2013), or most recent version, should be consulted to determine H&S protocols for performing the site work required by this QAPP. SOP revisions are not expected during the period of performance of this QAPP, however, in the event an SOP needs to be modified, the change will be documented using a ROM Form[4] and the ROM will be appended to each copy of the QAPP and distributed to all personnel utilizing this QAPP. For reference, a log of field ROMs is maintained by the project QAM at the A&E Libby project office.

All field activities will be performed in accordance with this Landfill QAPP. The current versions of the following procedures will be employed:

Table B-1: List of Standard Operating Procedures for Sample Collection

Procedure Number	Title
(none)	Title 40 CFR, Appendix A to Subpart E of Part 763—Interim Transmission Electron Microscopy Analytical Methods—Mandatory and Non-mandatory—and Mandatory Section to Determine Completion of Response Actions
(none)	Title 29 CFR, Part 1926.1101, Sampling and Analysis – Non-mandatory, Air Monitoring Frequencies - Appendix B
EPA-LIBBY-2012-01, Revision 1	Field Logbook Content and Control
EPA-LIBBY-2012-02, Revision 0	Photographic Documentation of Field Activities
EPA-LIBBY-2012-03, Revision 0	Control of Measurement and Test Equipment
EPA-LIBBY-2012-04, Revision 0	Field Equipment Decontamination
EPA-LIBBY-2012-05, Revision 0	Handling Investigation-derived Waste (IDW)
EPA-LIBBY-2012-06, Revision 0	Sample Custody
EPA-LIBBY-2012-07, Revision 0	Packaging and Shipping Environmental Samples
CDM-LIBBY-03, Revision 7	Completion of Field Sample Data Sheets (FSDS)
CDM-LIBBY-14, Revision 1	Stationary Air Sample Collection
CDM Smith SOP 1-6, Revision 8	Groundwater Level Measurement
CDM Smith SOP 1-12, Revision 1	Low-Stress (Low-Flow) Groundwater Sampling
CDM Smith SOP 4-3, Revision 6	Well development and Purging
ER8-LIBBY-01, Revision 0	Libby Chain of Custody Documentation

The following sections summarize field activities that will be performed during the implementation of the sampling efforts described in this QAPP. Because perimeter air sampling locations and the personnel to be sampled are variable, and groundwater sampling wells are permanent, the collection of Global Positioning System coordinates will not be required for Landfill operations sampling.

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

[4] The current version of the field ROM form is provided in the Libby Field eRoom; the current version of the laboratory ROM form is provided in the Libby Lab eRoom.

B2.1 Field Preparation

B2.1.1 Field Team Training

As discussed in Section A8.1, prior to conducting Landfill sampling activities, field staff must read and understand the procedures outlined in this QAPP and applicable H&S documents, and be certified and trained to work at the Site. Documentation of trainings/certifications will be stored at the A&E's Libby project office.

B2.1.2 Field Planning Meeting (Readiness Review)

Prior to beginning field activities, a FPM will be conducted by the A&E Field Team Leader (FTL). The FPM will be attended by A&E field team members conducting the work as well as an A&E QA staff member and H&S staff member. The FPM agenda, prepared by the FTL using a standard form developed by the A&E, will be reviewed and approved by the attending QA and H&S staff prior to the FPM. The FPM will briefly discuss and clarify:

- Documents governing fieldwork that must be onsite
- Any 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 field QC measures
- Required field audits or surveillances
- Health and safety 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 A**). The following equipment is required for sampling activities conducted under this QAPP:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card, as appropriate
- Rotameter
- Low-volume (battery powered) air sampling pumps
- Air sample media: 25 millimeter (mm) diameter mixed cellulose ester (MCE) filter cassettes with 0.8 micrometer (µm) filter pore size
- Sample paperwork and sample tags/labels
- Custody seals
- Plastic zipper-top bags
- Bladder pumps
- Polyethylene (poly) tubing
- Graduated cylinder
- Water level indicator
- ASTM water
- Deionized water

- Multi-meter capable of reading dissolved oxygen, temperature, conductivity, salinity, pH, oxygen reduction potential
- Turbidity meter
- Compressed gas (N^2 size K tank)
- Bladder pump controller
- Crescent wrench
- 5-gallon buckets
- Sampling containers (glass and poly)
- Field filter with a pore size of 0.45µm
- PPE as required by the CAPP and A&E APP

B2.2 Perimeter Air Samples

This section describes the sampling rationale, methods, and procedures that will be used to collect perimeter air samples.

B2.2.1 Perimeter Air Sample Rationale

Perimeter air samples are collected to determine the effectiveness of work practices and engineering controls at preventing offsite migration of airborne LA during Landfill operations.

During the disposal of LA-contaminated source materials from response actions, the downwind boundary of the exclusion zone will be monitored for LA emissions by the collection of perimeter air samples at the Landfill zone boundary. The location of the perimeter air samples placed along the Landfill boundary will be determined by field sampling personnel based on wind direction in the field and in accordance with **Table B-2**. Sample collection will cease once Landfill operations are complete for each day of Landfill work. Data from these perimeter air samples will be compared against the project-specific action levels stated in **Table B-4** to evaluate Landfill work practices and engineering controls.

B2.2.2 Perimeter Air Sampling Methods

All perimeter air samples will be collected in general accordance with the project-specific SOP CDM-LIBBY-14, *Stationary Air Sample Collection* (**Appendix A**). Each perimeter air sample will be collected at a rate of 1.0 to 10.0 liters per minute (L/min) and have a minimum volume of 1,200 liters. The flow rate will be set depending upon the type of sampling pump used (i.e., high versus low volume) and expected duration of the sampling period. Perimeter air samples will be analyzed by TEM as defined in the Asbestos Hazard Emergency Act (AHERA) (EPA 1987),

as discussed in B4.1.1. Landfill perimeter air samples will be collected in accordance with **Table B-1**.

Table B-2: Selecting Air Sample Locations

Sample Station	Sample Numbers	Rationale
Upwind/Background	Collect a minimum of two simultaneous upwind/background samples 30 feet apart from the prevailing wind-lines.	Establish background levels.
Downwind	Collect a minimum of three sample stations in a 180-degree arc downwind from the Landfill.	Indicates if asbestos is leaving the Landfill. *Special attention will be paid to the downwind sample locations.*

Samples will be collected on a 25-mm, 0.8 µm MCE filter. Air sampling pumps will be calibrated before and after each sampling event in accordance with CDM-LIBBY-14, by use of a primary standard calibration device (e.g., Dry-Cal) or a properly calibrated secondary standard calibration device (e.g., rotameter). Other pertinent personal air sample collection procedures such as labeling, documentation, and custody are described in Section B3.

B2.3 Personal Air Sampling

This section describes the sampling rationale, methods, and procedures that will be used to collect personal air samples.

B2.3.1 Personal Air Sampling Rationale

During Landfill activities, personal air samples are collected to determine if the respiratory protection used by personnel conducting Landfill activities continues to be adequate to protect worker health. Sampling frequencies for personal air samples were established using task-based personal air sampling data collected during the 2014 field season in Libby.

For Landfill activities, personal air samples are collected on personnel performing the following activities: vermiculite insulation disposal, demolition debris disposal, and haul truck drivers. Task-based air monitoring frequency for the project is summarized in **Appendix B**.

B2.3.2 Personal Air Sampling Methods

Personal air samples will be collected in accordance with OSHA Standard 29 CFR 1926.1101, *Sampling and Analysis – Non-mandatory*, Appendix B (OSHA 1995), provided in **Appendix A** of this document, without modification. In general, personal air sampling will consist of collecting, at a minimum, one time-weighted average (TWA) sample and one short-term exposure limit (STEL) (i.e., one 30-minute excursion) sample per task. The overall intent of personal air sampling is to collect samples which are representative of an 8-hour workday. It may be necessary to collect multiple TWA samples for a task if the task may result in the overloading of air sample filters from particulates.

Samples will be collected on a 25-mm, 0.8 µm MCE filter. Air sampling pumps will be calibrated before and after each sampling event in accordance with CDM-LIBBY-14, by use of a primary

standard calibration device (e.g., Dry-Cal) or a properly calibrated secondary standard calibration device (e.g., rotameter). Other pertinent personal air sample collection procedures such as labeling, documentation, and custody are described in Section B3.

B2.4 Groundwater Sampling

This section describes the sampling rationale, methods, and procedures that will be used to collect groundwater samples. Groundwater samples are water samples collected at fixed locations of permanent wells using the low-flow method to meet project-specific goals.

B2.4.1 Groundwater Sampling Rationale

Groundwater samples are collected semi-annually to monitor potential offsite migration of LA and other parameters in groundwater that may result from Landfill operations and to determine if levels exceed acceptable levels. One monitoring well is installed up gradient (CDM-MW-7) and one monitoring well is installed down gradient (CDM-MW-8) of the Landfill. The locations of the monitoring wells are shown on **Figure B-2.** The monitoring wells were advanced 259 feet below ground surface (bgs) and 239 feet bgs, respectively. Previous investigative reports indicate that the regional aquifer is located at a depth greater than 300 feet below ground surface (bgs), while a perched aquifer was identified in the vicinity of the Landfill at a depth of 150 to 200 feet bgs. Monitoring wells CDM-MW-7 and CDM-MW-8 were installed within the perched aquifer.

B2.4.2 Groundwater Sampling Methods

The A&E will sample monitoring wells CDM-MW-7 and CDM-MW-8 semi-annually in June and December. This ensures collection during low and high groundwater periods and also coincides with the county's landfill monitoring well sampling schedule. All groundwater samples will be collected in accordance with CDM Smith SOP 1-6, *Groundwater Level Measurement*; 1-12, *Low Stress (Low Flow) Groundwater Sampling*; and 4-3, *Well Development and Purging* (see **Appendix A)**.

A dedicated bladder pump or equivalent will be employed for purging and sampling using low-flow groundwater purging and sampling techniques. Prior to purging, groundwater depth will be measured to the nearest 0.01 foot using a water level indicator. The monitoring wells will be purged at a rate of 100 to 500 milliliters per minute using dedicated Teflon tubing. During purging, field parameters (temperature, dissolved oxygen, pH, specific conductance, and turbidity) will be measured and recorded. Purging will be considered complete when field parameters stabilize within 10% for three consecutive readings or until three monitoring well pore volumes are purged. Purged water will be handled in accordance with SOP EPA-Libby-2012-05, *Handling IDW* (see **Appendix A)**.

Samples will be collected in laboratory-supplied bottles with appropriate preservative and placed in a chilled container immediately after sampling as detailed in Table B-3 below. For asbestos, headspace should be left in the container to ensure there is ample room at the top of the bottle for ozone/ultraviolet treatment. Samples will be packaged and shipped to the appropriate laboratory in accordance with SOP EPA-Libby-2012-07, *Packaging and Shipping* and EPA-Libby-2012-06, *Sample Custody* (see **Appendix A)**.

Asbestos groundwater samples will be submitted to an ESAT-contracted laboratory as designated by the LC. For environmental parameters, groundwater samples will be submitted to an A&E-contracted laboratory. Due to holding times, the samples will be shipped on ice via overnight carrier; therefore, the A&E's groundwater sampling FTL and sample coordination staff will coordinate to ensure that sample collection and shipping occurs early or mid-week.

Once received and evaluated (approximately 6 – 8 weeks following sample collection), groundwater sample results will be reported by the A&E to the EPA, USACE, DEQ, and Lincoln County in the form of an event-specific summary report. The DEQ may revise sampling frequencies and/or parameters at their discretion.

Table B-3: Groundwater Sampling Parameters

Dissolved Metals (filter in field)		EPA Methods	Preser-vative	Bottle Size	Holding Times
Antimony Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper	Iron Lead Mercury Nickel Selenium Silver Thallium Vanadium Zinc	200.7; 245.1 for Mercury	HNO_3	(1) 250-ml poly	6 months; 28 days for Mercury
Cyanide		9010C/9012B	NaOH	(1) 250-ml poly	14 days
Volatile Organic Compounds		**EPA Methods**	**Preser-vative**	**Bottle Size**	**Holding Times**
Acetone Acrylonitrile Benzene Bromochloromethane Bromodichloromethane Bromoform Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroethane Chloroform Chlorodibromomethane Dichlorodifluoromethane 1,2-Dibromo-3-chloropropane (DBCP) 1,2-Dibromoethane(EDB) 1,2-Dichlorobenzene 1,4-Dichlorobenzene trans-1,4-Dichloro-2-butene 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene trans-1,2- Dichloroethylene 1,2-Dichloropropane cis-1,3-Dichloropropene	trans-1,3-Dichloropropene Ethylbenzene 2-Hexanone(Methyl butyl ketone) Methyl bromide (Bromomethane) Methyl chloride(Chloromethane) Methylene bromide(Dibromomethane) Methylene chloride Methyl ethyl ketone (MEK) Methyl iodide (Iodomethane) 4-Methyl-2-pentanone(Methyl isobutyl ketone) Styrene 1,1,1,2-Tetrachloroethane 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethene Trichlorofluoromethane 1,2,3-Trichloropropane Vinyl acetate Vinyl chloride Xylenes	8260B	HCl	(2) 40-ml VOA vials	14 days
Other		**EPA Methods**	**Preser-vative**	**Bottle Size**	**Holding Times**
Chloride (Cl) Nitrite+Nitrate (as N) Sulfate (SO_4)		4500 Cl-E EPA 353.2 4500-SO_4 E	none	(1) 500-ml poly	28 days
Chemical Oxygen Demand (COD)		EPA 410.4	H_2SO_4	(1) 250-ml poly	28 days
Asbestos		TEM-ISo*	none	(1) 1-liter poly	48 hours
pH Specific Conductance		Horiba Horiba	none	none	in field in field
Volatile Petroleum Hydrocarbon (VPH)**		MADEP Method VPH-04-1.1	HCl	(2) 40-ml VOA vials	14 days
Extractable Petroleum Hydrocarbon (EPH)**		MADEP Method EPH-04-1	HCl	(2) 1-liter amber glass	14 days

*With applicable project-specific laboratory modifications.

**As stated in Montana Department of Environmental Quality Technical Guidance Document #7, effective October 15, 1999, Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) analyses were replaced with VPH and EPH analyses, respectively. The Libby project instituted this change as of the June 2008 bi-annual sampling event.

B3. 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 SOPs and project-specific procedures when applicable. If a sampling location becomes inaccessible for any reason (e.g., due to inclement weather, biological hazards, other H&S concerns), the EPA/USACE will be notified promptly in order to discuss a resolution or obtain a directive to proceed. All site accessibility issues, resolutions, and directives will be detailed in the field logbook as appropriate.

B3.1 Equipment Decontamination

Decontamination of air and groundwater sampling equipment (e.g., air sampling pumps, groundwater sampling equipment not dedicated to a specific well) will be conducted in accordance with SOP EPA-LIBBY-2012-04, *Field Equipment Decontamination* (see **Appendix A**) with the following modification:

- **Section 4 – Required Equipment:** Plastic sheeting will not be used during decontamination procedures.

Materials used in the decontamination process will be disposed of as investigation-derived waste (IDW) as described below.

B3.2 Investigation-derived Waste

IDW at each sampling location 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 A**). 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 will remain in the custody of the field team until it can be entered into the waste stream at the Landfill.

B3.3 Field Sample Data Sheets

The FSDS is a pre-numbered (i.e., controlled) record of specifics and will be completed for each sample and/or vermiculite inspection in accordance with SOP CDM-LIBBY-2012-03, *FSDS Guidance* (**Appendix A**). The FSDS number (located in the upper right-hand corner) will be referenced in the field logbook for each sample collected. Completed FSDSs are used to directly enter information into the project database and to connect sample analysis results to the sample collected. Completed FSDSs (as well as unused FSDSs) will be maintained by A&E administrative staff at the Libby project office.

B3.4 Field Logbooks

Documentation of field activities conducted under this QAPP will be recorded in field logbooks maintained specifically for this sampling program. Field logbooks will be completed in accordance with EPA-LIBBY-2012-01, *Field Logbook Content and Control* (see **Appendix A**). Logbooks are maintained by A&E administrative staff at the Libby project office and are assigned unique identification numbers (i.e., controlled) for reference on FSDSs.

A new logbook page will be completed for each Landfill sampling event. The header information will include the address and Property Identifier (ID) (i.e., AD number). Field staff will also use the logbook to duly note problems or deviations from the governing plans and observations that may affect the quality or usability of the data being collected. When closing out a logbook page with lineout and signature, the author will also print his/her name underneath the signature. Upon completion of a logbook, A&E administrative staff will scan and electronically store the file on the project server. Completed hardcopy logbooks will be filed in numerical order in the A&E Libby project office. Notations on the following will be recorded daily:

- Project name
- Date
- Author
- Title of guidance document (this QAPP)
- Property address
- Purpose
- Personnel onsite/site activities
- Weather
- PPE
- Specific sampling locations within property (e.g., CDM-MW-08)
- FSDS sample and/or location IDs
- Time and to whom samples were relinquished
- Any other events of interest, particularly, those that may impact sample results (e.g., the presence of equipment exhaust near VOC sample containers)

B3.5 Sample Labeling and Identification

A unique alphanumeric code, or sample number, will identify each sample collected under this QAPP. The coding system will provide a tracking record to allow for retrieval of information about a particular sample throughout the sample's life cycle.

Sample numbers are controlled to prevent duplication in assigning sample numbers and prevent transcription errors in the documentation process. As such, unique, sequentially numbered pre-printed sample labels and corresponding sign-out sheets will be maintained by A&E administrative staff at the Libby project office. Sample labels will be signed out by field staff prior to sample collection in the field.

Landfill sample numbers will have the following format:

LC-#####

Where:

LC = alpha-numeric number indicating that samples have been collected in accordance with this QAPP

= A unique, sequential five-digit number

Pre-printed adhesive sample labels will be affixed to both the air cassette and the sample bag for air samples, and to the sample container itself for groundwater samples. Sample number labels will be used in accordance with EPA-LIBBY-06, *Sample Custody* (see **Appendix A**).

B3.6 Photographic Documentation

Photographs will be taken at the discretion of sampling staff to document sampling locations, site conditions/activities occurring during sampling activities, and any other conditions that may impact sample data. Photographs will be taken with a digital camera in accordance with SOP EPA-LIBBY-2012-02, *Photographic Documentation of Field Activities* (see **Appendix A**). Digital photographs will be maintained electronically at the A&E's office in Libby on a project server. Logbook notes will not be used to describe the photographs, nor will photographic logs be maintained.

Photograph file names will have the following format:

Address_Event Type_Date_(#)

Where:

Address = the address of the Landfill

Event Type = Type of activity being photographed (e.g., air monitoring, groundwater sampling)

Date = photograph date, formatted as MM-DD-YY

B3.7 Modifications to and Deviations from Governing Documents

Logbook entries will be completed in accordance with SOP EPA-LIBBY-2012-01, *Field Logbook Content and Control* (see **Appendix A**). For the logbooks, a single strikeout initial and date is required for all changes. The correct information should be entered in close proximity to the erroneous entry. These procedures will also be followed for the correction of any field form.

All major deviations (i.e., those impacting or having the potential to impact data quality/usability) from this document will be recorded using the appropriate Libby Asbestos Project ROM form[5]. Any minor deviations that do not impact project DQOs will be documented in the logbook.

B3.8 Sample Custody

Sample custody and documentation will follow the requirements specified in EPA-LIBBY-2012-06, *Sample Custody* (see **Appendix A**), and project-specific guidance for the completion of FSDSs and production of chain-of-custody (COC) forms per the EPA's project data requirements.

Samplers will securely place a custody seal on individual asbestos, for environmental water samples, only the sample cooler and bag lining the cooler will be custody sealed.

All samples and FSDSs will be kept under strict custody and relinquished by A&E staff to the A&E sample coordinator or designated secure sample location at the end of each day. Upon completion of the FSDS by the sampler and a subsequent QC check by an independent field team member (i.e., not sample coordination staff), the sample coordinator will use the FSDS to generate a COC form. The COC form is employed as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A completed COC form is required to accompany each shipment of samples. A two-page carbon copy COC will be generated from the electronic COC. The field sample coordinator will retain one hard copy of the COC for the project file; the other hard copy of the COC will accompany the sample shipment.

If samples are being transferred or shipped, the sample coordinator will verify that all samples are accounted for on the COC form and will hand-deliver or ship samples as appropriate. If any errors are found on the COC form after delivery/shipment, the hard copy maintained by the sample coordinator in Libby will be corrected by the sample coordinator with a single strikeout, initial, and date. The corrected copy will then be faxed or emailed to the LC and analytical laboratory and the information updated in all appropriate data management systems.

[5] The current version of the field ROM form is provided in the Libby Field eRoom.

A&E administrative staff will be responsible for managing FSDSs after use by the sample coordinator, and the sample coordinator will maintain COC forms. All forms will be maintained at the A&E's Libby project office.

B3.9 Sample Packaging and Shipping

Samples collected under this QAPP and being analyzed for asbestos will be packaged and shipped in accordance with EPA-LIBBY-2012-07, *Packaging and Shipping of Environmental Samples* (see **Appendix A**).

Custody seals will be placed on each sample and on at least two sides of the shipping container. All samples will be picked up by a delivery service courier or directly shipped by a delivery service to the laboratories, as necessary.

B4. Analytical Methods and Operations

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

B4.1 Analytical Methods and Turnaround Times

The following sections describe the analytical methods for each media type sampled. Turn-around times will be based on project needs and specified on each submitted COC record.

An analytical requirements summary sheet (see **Appendix C**) specific to specific to asbestos samples will be distributed by the LC, and reviewed and approved by all participating laboratories prior to any sample handling of asbestos samples.

B4.1.1 Air Samples

Perimeter (and personal, as may be required) air samples will be analyzed by TEM AHERA in accordance with 40 CFR Chapter 1, Part 763, Subpart E, Appendix A, *Interim Transmission Electron Microscopy Analytical Methods – Mandatory and Non-mandatory – and Mandatory Section to Determine Completion of Response Actions*. All project-specific laboratory modifications to the TEM AHERA method will be applied. The standard turnaround time for perimeter air sample results is one day unless otherwise requested on the COC.

The laboratory will attempt to achieve the method AS of 0.005 s/cc using direct sample preparation techniques and will employ project-specific stopping rules as documented in Laboratory Modification #LB-000017 unless other direction is provided. Users of the data should be aware that because of the project-specific stopping rule, reported sensitivities may be higher than the method AS. In the event that an air sample is determined to be overloaded by the analyst, the laboratory will contact either the A&E sample coordinator or FTL to report the issue (the LC will also be included in correspondence). When necessary, the analyst will

proceed with analysis using the indirect sample preparation method, EPA-LIBBY-08 (EPA 2007).

Personal air samples will be analyzed by PCM by NIOSH (1994a) with applicable project-specific laboratory modifications. If PCM results exceed the TWA and or STEL action levels defined in 29 CFR 1926.1101, the sample may be analyzed by TEM AHERA (EPA 1987), with applicable project-specific laboratory modifications, to determine if the fibers detected are asbestos structures. TEM analysis will be requested at the discretion of the A&E H&S Manager or designee and approved by the EPA/USACE.

B4.1.2 Asbestos Groundwater Samples

Unless otherwise directed by the LC, groundwater samples will be analyzed for asbestos by EMSL Analytical, Inc. in Cinnaminson, NJ. Contact information for this laboratory is as follows:

Name	Analysis	Contact	Phone	Address	City	State	Zip	Contact email
EMSL04	TEM-ISO	Steven Seigel	(856) 303-2555	200 Route 130 North	Cinnaminson	NJ	08077	sseigel@emsl.com

B4.1.2.1 Sample Preparation

All groundwater samples should be prepared for asbestos analysis in basic accordance with the techniques in EPA Method 100.2, as modified by Libby Laboratory Modification[6] LB-000020A. In brief, all groundwater samples will be prepared using an ozone/ultraviolet treatment that oxidizes organic matter that is present in the water or on the walls of the bottle, destroying the material that causes clumping and binding of asbestos structures. Following treatment, an aliquot of water (generally about 50 milliliters) will be filtered through a 25-millimeter diameter polycarbonate filter with a pore size of 0.1 µm with a mixed cellulose ester filter (0.45 µm pore size) used as a support filter.

B4.1.2.2 Analysis Method

Approximately one quarter of the filter will be used to prepare a minimum of three grids using the grid preparation techniques described in Section 9.3 of ISO 10312:1995(E). Grids will be examined by TEM in basic accordance with the recording procedures described in ISO 10312:1995(E), as modified by the most recent versions of Libby Laboratory Modifications LB-000016, LB-000029, LB-000066, LB-000067, and LB-000085.

[6] Copies of all Libby Laboratory Modifications are available in the Libby Lab eRoom.

B4.1.2.3 Counting Rules

All structures with fibrous morphology, an x-ray diffraction pattern consistent with amphibole asbestos, a energy dispersive spectrum consistent with LA, length greater than or equal to 0.5 µm, and an aspect ratio (length:width) greater than or equal to 3:1 will be counted and recorded. These counting rules will enable the calculation of water concentrations based on both total LA and LA structures longer than 10 µm. If observed, chrysotile structures will be recorded, but chrysotile structure counting may stop after 25 structures have been recorded.

B4.1.2.4 Target Analytical Sensitivity

The level of analytical sensitivity needed to ensure that analysis of groundwater samples will be adequate is derived by finding the concentration of LA in groundwater that might be of potential concern, and then ensuring that if a groundwater sample were encountered that had a true concentration equal to that level of concern, it would be quantified with reasonable accuracy. As noted previously, the human health MCL for asbestos in drinking water is 7 MFL and is based on fibers longer than 10 µm in length. Thus, for the purposes of planning this sampling effort, the analytical requirements for LA measurements were derived such that concentrations of LA in groundwater will be reliably detected and quantified if present at levels of 7 MFL (7,000,000 f/L).

The target analytical sensitivity (TAS) is determined by dividing the target concentration by the target number of structures to be observed during the analysis of a sample with a true concentration equal to the target concentration:

TAS = Target Conc / Target Count

The target count is determined by specifying a minimum detection frequency required during the analysis of samples at the target concentration. This probability of detection is given by:

Probability of detection = 1 – Poisson (0,Target Count)

Assuming a minimum detection frequency of 95 percent, the target count is 3 fibers. Based on this, the TAS would need to be at least:

TAS = (7,000,000 f/L) / (3 fibers) = 2,333,333 L^{-1}

Recognizing that previous groundwater samples invoked a TAS of 0.2 MFL, and that is lower than the TAS derived above, for the purposes if this QAPP a TAS of 0.2 MFL will be retained.

B4.1.2.5 Maximum Number of LA Structures

Ideally, all samples would be examined by TEM until the target analytical sensitivity is achieved. However, for filters that have high asbestos loading, reliable estimates of concentration may be achieved before achieving the target analytical sensitivity. This is because the uncertainty around a TEM estimate of asbestos concentration in a sample is a function of the number of structures observed during the analysis. The confidence interval (CI) around a count of N structures is characterized as a chi-squared (CHISQ) distribution:

$$N_{true} \sim \frac{1}{2} \cdot CHISQ(2 \cdot N_{observed} + 1)$$

As $N_{observed}$ increases, the absolute width of the CI range increases, but the relative uncertainty (expressed as the CI range divided by $N_{observed}$) decreases. This concept is illustrated in **Figure B-4**. The goal is to specify a target N such that the resulting Poisson variability is not a substantial factor in the evaluation of method precision. As shown in **Figure B-3**, above about 25 structures, there is little change in the relative uncertainty. Therefore, the count-based stopping rule for TEM should utilize a maximum structure count of 25 LA structures.

B4.1.2.6 Maximum Area to be Examined

The number of grid openings (GOx) that must be examined by TEM to achieve the TAS is calculated as:

$$GOx = EFA / (TAS \cdot Ago \cdot V)$$

where:

GOx = Number of grid openings
EFA = Effective filter area (assumed to be 1295 mm^2)
TAS = Target analytical sensitivity $(L)^{-1}$
Ago = Grid opening area (assumed to be 0.01 mm^2)
V = Water volume applied to the filter (L)

Assuming that 0.1 L of water is able to be applied to the filter, about 7 grid openings would need to be examined to achieve the TAS. In the event that less water is able to be applied to the filter (due to water turbidity), the number of grid openings that would need to be examined would increase. In order to limit the level of effort (and cost) for any one analysis, the maximum number of grid openings to be examined for this project is 50 grid openings. Assuming that each grid opening has an area of about 0.01 mm^2, this would correspond to a maximum area examined of about 0.5 mm^2.

B4.1.2.7 TEM Stopping Rules

The TEM stopping rules for all water samples from this investigation should be as follows:

1. Count a minimum of two grid openings from each of two grids.
2. Continue counting until one of the following is achieved:
   a. The target analytical sensitivity of 0.2 MFL has been achieved.
   b. 25 LA structures (longer than 10 µm) have been observed.
   c. A total filter area of 0.5 mm^2 has been examined (this is approximately 100 grid openings).

When one of these criteria has been satisfied, complete the examination of the final grid opening and stop.

B4.1.3 Non-Asbestos Groundwater Samples

Groundwater samples will be analyzed for non-asbestos parameters by Shealy Environmental Services, Inc. in West Colombia, SC. Contact information for this laboratory is as follows:

Name	Analysis	Contact	Phone	Address	City	State	Zip	Contact email
Shealy	See table B-6	Nisreen Saikaly	(803) 791-9700	106 Vantage Point Drive	West Columbia	SC	29172	nsaikaly@shealylab.com

Non-asbestos analyses will be performed according to the methods and reporting limits specified in Table B-6.

Table B-6: Groundwater Analytical Methods and Reporting Limits

Organics	Method	RL (µg/L)
Volatiles		
1,1,1,2-tetrachloroethane	SW846 8260B	0.50
1,1,1-trichloroethane	SW846 8260B	0.50
1,1,2,2-tetrachloroethane	SW846 8260B	0.50
1,1,2-trichloroethane	SW846 8260B	0.50
1,1-dichloroethane	SW846 8260B	0.50
1,1-dichloroethene	SW846 8260B	0.50
1,2,3-trichloropropane	SW846 8260B	0.50
1,2-dibromo-3-chloropropane	SW846 8260B	0.50
1,2-dibromoethane	SW846 8260B	0.50
1,2-dichlorobenzene	SW846 8260B	0.50
1,2-dichloroethane	SW846 8260B	0.50
1,2-dichloropropane	SW846 8260B	0.50
1,4-dichlorobenzene	SW846 8260B	0.50
2-butanone	SW846 8260B	10
2-hexanone	SW846 8260B	10
4-methyl-2-pentanone	SW846 8260B	10
acetone	SW846 8260B	10
acrylonitrile	SW846 8260B	5.0
benzene	SW846 8260B	0.50
bromochloromethane	SW846 8260B	0.50
bromodichloromethane	SW846 8260B	0.50
bromoform	SW846 8260B	0.50
bromomethane	SW846 8260B	0.50
carbon disulfide	SW846 8260B	0.50
carbon tetrachloride	SW846 8260B	0.50
chlorobenzene	SW846 8260B	0.50
chloroethane	SW846 8260B	0.50
chloroform	SW846 8260B	0.50
chloromethane	SW846 8260B	0.50
cis-1,2-dichloroethene	SW846 8260B	0.50
cis-1,3-dichloropropene	SW846 8260B	0.50
dibromochloromethane	SW846 8260B	0.50
dibromomethane	SW846 8260B	0.50
dichlorodifluoromethane	SW846 8260B	0.50
ethylbenzene	SW846 8260B	0.50
iodomethane	SW846 8260B	0.50
methylene chloride	SW846 8260B	0.50
styrene	SW846 8260B	0.50
tetrachloroethene	SW846 8260B	0.50
toluene	SW846 8260B	0.50
trans-1,2-dichloroethene	SW846 8260B	0.50
trans-1,3-dichloropropene	SW846 8260B	0.50
trans-1,4-dichloro-2-butene	SW846 8260B	2.0
trichloroethene	SW846 8260B	0.50
trichlorofluoromethane	SW846 8260B	0.50
vinyl acetate	SW846 8260B	1.0
vinyl chloride	SW846 8260B	0.50
xylenes (total)	SW846 8260B	0.50
Hydrocarbons		
VPH C5-C8 aliphatics	MA DEP VPH-04-1.1	30.0
VPH C9-C12 aliphatics	MA DEP VPH-04-1.1	30.0
VPH C9-C10 aromatics	MA DEP VPH-04-1.1	30.0
EPH C9-C18 aliphatics	MA DEP EPH-04-1.1	100.0
EPH C19-C36 aliphatics	MA DEP EPH-04-1.1	100.0
EPH C11-C22 aromatics	MA DEP EPH-04-1.1	100.0

Inorganics	Method	RL (µg/L)
Dissolved Metals		
Antimony	SW846 6020A	2
Arsenic	SW846 6020A	1
Barium	SW846 6020A	10
Beryllium	SW846 6020A	1
Cadmium	SW846 6020A	1
Chromium	SW846 6020A	2
Cobalt	SW846 6020A	1
Copper	SW846 6020A	2
Iron	SW846 6020A	200
Lead	SW846 6020A	1
Nickel	SW846 6020A	1
Selenium	SW846 6020A	5
Silver	SW846 6020A	1
Thallium	SW846 6020A	1
Vanadium	SW846 6020A	5
Zinc	SW846 6020A	2
Mercury	SW846 7470	0.2
Other	**Method**	**RL (µg/L)**
Cyanide	SW846 9010C/9012B	10,000
Chloride	EPA 300.0	1,000
Sulfate	EPA 300.0	1,000
Nitrate + Nitrite	EPA 353.2	50
Chemical Oxygen Demand	SM 5220D	10,000

Definitions:
RL - reporting limit
µg/L - micrograms per liter
VPH - volatile petroleum hydrocarbons
EPH - extractable petroleum hydrocarbons

B4.2 Analytical Data Reports

Asbestos sample processing and analytical data will be delivered to the EPA in accordance with the current version of the *EPA Libby Data Management Plan* (EPA 2013). All asbestos analytical

results will be maintained in EPA's project Scribe database, which is housed on a secure EPA server in Golden, CO.

Non-asbestos analytical data will be reported in accordance with A&E laboratory subcontract requirements, which includes data package submittal (in portable document format) via email to CDM Smith's Project Manager and A&E sample coordinator within the turnaround time requested on the COC (typically 14 to 21 business days) and an EDD in tabular format (e.g., MS Excel). The data package will contain sample results and a summary of laboratory QC results. Raw laboratory QC results may also be requested by the A&E on an as needed basis. The non-asbestos data will be maintained by the A&E on a secure project server.

Data issues or anomalies will be summarized by all laboratories in the data package deliverable. All electronic and hard copy records will be maintained by the analytical laboratory in accordance with their respective contract documents. The analytical data reports may vary by laboratory and analytical method but generally includes a case narrative that briefly describes the number of samples, the analyses, and any analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include copies of the signed COC forms, analytical data summaries, a QC package, and raw data. Raw data is to consist of instrument preparation logs, instrument printouts, and QC sample results including, instrument maintenance records, COC check-in and tracking, raw data instrument print outs of sample results, analysis run logs, and sample preparation logs.

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 for asbestos. 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.

- 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

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 (for asbestos laboratories contracted by ESAT); and by the A&E (for non-asbestos

laboratories contracted by the A&E).

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 any 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 removal action sampling efforts. Additional information on field training requirements is provided in **Section A8.1**.

New personnel will be instructed by an experience A&E staff member and training sessions will be documented in the A&E's Libby project files. It is the A&E's Project Manager (or designee) to ensure that all personnel have completed the required training requirements.

B5.1.2 Document Review

Field personnel submit all records (e.g., FSDS copies, field logbook copies) to the A&E FTL, or designee, for review once sampling activities are complete. The A&E FTL, or designee, is responsible for reviewing these records for completeness.

B5.1.3 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. Any minor deviations (i.e., those that will not impact data quality or usability) will be documented in the field logbooks. Field ROMs are completed by the FTL overseeing the 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 for review and approval. Approved field ROMs are maintained on the A&E's project server. Major changes will require re-approval of the QAPP by the EPA RPM or delegated approving officer.

B5.1.4 Field Surveillances

Field surveillances consist of periodic observations made to evaluate continued adherence to governing documents. It is not anticipated that field surveillance will be performed for landfill operation sampling efforts. However, field surveillances may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies. For work performed under this QAPP, the frequency of field surveillances will be determined by the A&E Project Manager and QA Director, in consultation with the EPA and USACE.

B5.1.5 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. For work performed under this QAPP, the frequency of field audits will be determined by the A&E Project Manager and QA Director, in consultation with the EPA and USACE.

B5.1.6 Field QC Samples

B5.1.6.1 Air Field QC Samples

The field QC samples associated with perimeter and personal air samples are lot blanks and field blanks. These sample types are discussed in this section and summarized in **Table B-4**.

Table B-4: Summary of Field QC Samples for Air

Sample Type	Associated QC Sample	Collection Frequency	Analysis Frequency	Analysis Request[1]	Acceptance Criteria
Perimeter Air and Personal Air	lot blank	1 lot blank per 500 unused sample cassettes[1]	same as collection frequency	TEM AHERA	<1 LA structures per cubic centimeter (s/cc) by TEM AHERA
Perimeter Air	field blank	1 per team per day	1 per team per week	TEM AHERA	<1 LA s/cc by TEM AHERA
Personal Air	field blank	1 per team per day	1 per team per week	PCM; TEM AHERA as requested	<7 f/cc by PCM; <1 LA structures per cubic centimeter (s/cc) by TEM AHERA

[1] Since the same type of cassette is used for all air samples, lot blanks are submitted collectively for these sample types.

LA – Libby Amphibole asbestos
PCM – phase contrast microscopy
f/cc – fibers per cubic centimeter
QC – quality control
TEM – transmission electron microscopy
s/cc – structures per cubic centimeter

Lot Blanks

Lot blanks are prepared by submitting unused cassettes for analyses prior to putting the group (i.e., lot) of cassettes into use. Lot blanks will be collected and analyzed at a frequency of 1 per 500 cassettes from the same lot. Lot blanks will be identified on the COC form so that the analytical laboratory is aware of their use and can immediately notify the appropriate parties if asbestos fibers are detected on the filters. If the lot is proved to be contaminated with one or more LA s/cc by TEM AHERA, then the lot of cassettes will be discarded and a new lot of cassettes will be acceptance tested.

Field Blanks

Each field team collecting air samples will collect one field blank per day of air sampling. Field blanks will be collected for perimeter air samples preferentially; if no perimeter samples are collected for the day, then the field blank will be collected along with personal air samples. The field blank cassettes will come from the same lot as the cassettes used that day for air sample collection. One field blank per field team will be analyzed per week at the discretion of the A&E sample coordinator, whose responsibility it is to submit the appropriate number of field blanks for analysis and ensure field blanks collected by varying teams are selected for analysis. The remainder of the field blanks collected by field teams, but not analyzed, will be submitted to the analytical laboratories marked for archive. The field blank sample results will be reviewed by the sample coordinator in conjunction with the A&E FTL. If the field blank is proved to be contaminated with seven or more fibers per cubic centimeter (f/cc) by PCM or one or more LA s/cc by TEM AHERA, then the FTL will contact appropriate field personnel to determine whether the occurrence displays a trend in poor sample collection technique or is an isolated incident. If field blank contamination appears to be a consistent deficiency at the field level, the

FTL will immediately re-train field staff on proper sample collection. If the field blank contamination appears unrelated to field processes, the LC may request that additional field blanks be analyzed and will discuss any quality issues with the analytical laboratory analyzing the field blanks.

B5.1.6.2 Field QC Samples for Groundwater

The field QC samples associated with groundwater consist of field duplicates, field blanks, and trip blanks. These sample types are discussed in this section and summarized in **Table B-5**.

Table B-5: Summary of Field QC Samples for Groundwater

Sample Type	Associated QC Sample	Collection Frequency	Analysis Frequency	Analysis Request	Evaluation Criteria
Asbestos[1]					
Field Sample	Field Blank	1 per event	1 per event	TEM ISO 10312	See Section D
Field Sample	Field Duplicate	1 per event	1 per event	TEM ISO 10312	See Section D
Environmental Parameters[2]					
Field Sample	Field Blank	1 per event	1 per event	See Table B-5	See Section D
Field Sample	Field Duplicate	1 per event	1 per event	See Table B-5	See Section D
Field Sample	Trip Blank[2]	1 per event	1 per event	Volatile organic compounds (see Table B-5)	See Section D

[1]Bottleware used for asbestos samples are certified clean by the manufacturer. Clean certificates are maintained at the A&E project office.
[2]Bottleware used for environmental parameter samples (and trip blanks) are provided by the laboratory performing the analytical parameter analysis.

Field Duplicates

Field duplicates for water are a second 400-mL water sample collected sequentially from the same location as the parent sample. The field duplicate is collected using the same collection technique as the parent sample. Water field duplicate samples will be collected at a rate of 1 field duplicate per event. It is the responsibility of the FTL to ensure that the appropriate number of field duplicates is collected. Each field duplicate is given unique sample number, and field personnel record the Sample number of the associated co located sample in the parent sample number field of the FSDS. The same location is assigned to the field duplicate sample as the parent field sample. Field duplicates will be sent for analysis by the same method as field samples and are blind to the analytical laboratories (i.e., the laboratory cannot distinguish between field samples and field duplicates).

Field duplicate results will be compared to the original parent field sample using the Poisson ratio test using a 90% confidence interval (Nelson 1982). Because field duplicate samples are expected to have inherent variability that is random and may be either small or large, typically, there is no quantitative requirement for the agreement of field duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability.

Field Blank

A field blank is a sample of the same medium as field samples, but which should not contain any contaminant. A field blank for water shall be prepared by placing 400 mL of clean water (e.g., store bought drinking water) into the same type of sample collection container as the field samples. Field blanks will be collected at a frequency of one per event. It is the responsibility of the FTL to ensure that the appropriate number of field blanks is collected. Field blanks will be given a unique sample number and will be specified as a field blank on the FSDS. One field blank per week, chosen at random by the sample coordinator, is analyzed for each investigation. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis.

If any asbestos structures are observed on a field blank, the FTL and/or laboratory manager will be notified and will take appropriate measures to ensure staff are employing proper sample handling techniques. In addition, a qualifier of "FB" will be added to the related field sample results in the project database to denote that the associated field blank had asbestos structures detected.

Trip Blank

The trip blank is used to indicate potential contamination of field samples by VOCs during sample shipping and handling. A trip blank consists of analyte-free laboratory reagent water which accompanies the empty sample bottles to the field and is placed in each cooler containing samples scheduled for VOC analysis. The trip blank is not opened until analysis in the laboratory with the corresponding site samples. One trip blank per event will be prepared to accompany aqueous samples when they are shipped to the laboratory for VOC analysis.

Temperature Indicator

A temperature indicator sample comprised of distilled water will also accompany all shipments (one per cooler) to ensure temperature requirements have been met.

The laboratory will meet the QA/QC requirements of the specified analytical method, including AS, MS/MSDs, surrogate spikes, method blanks, and detection limits. Upon receipt of the analytical results for groundwater field samples, field QC samples, and laboratory QC samples, the data will be evaluated for usability by qualified A&E project staff as discussed in Section D.

Additional field QC samples are not expected to be collected for air or groundwater; however, additional sample volume may be collected for future analysis to satisfy potential project QC

issues, as directed by the EPA Onsite RPM/FTL or USACE Construction Control Representative.

B5.2 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.

B5.2.1 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 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.

B5.2.2 Modification Documentation

For asbestos laboratories, all deviations from project-specific and method analytical guidance documents, or this QAPP, will be recorded on the Libby laboratory ROM form as appropriate. Any deviations that impact, or have the potential to impact, program objectives will be discussed with the Onsite EPA RPM/FTL, USACE Construction Control Representative, and A&E FTL prior to implementation. In addition, the appropriate ROM form will be used to document any 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 Libby Data Management Plan* (EPA 2013).

For non-asbestos laboratories, deviations from required analytical methods are not expected and will generally not be accepted. Section B5.2.3 discusses laboratory non-conformance in more detail.

B5.2.3 Facility Non-conformance

For asbestos analysis, Libby project facilities will immediately notify the LC if major problems occur (e.g., catastrophic equipment failure). The LC will then notify the A&E's sample coordinator of potential impacts to turnaround times. Other non-conformance issues, such as those found during performance evaluations or audits, will be addressed on a case-by-case basis by the EPA's facility audit team.

For non-asbestos samples, laboratories will immediately notify the contracting party's point of contact (typically, the Project Manager) of any sample-related issues. The contracting party's point of contact will make every attempt to work with the laboratory to resolve issues and will report issues to appropriate project personnel.

In either case, the EPA/USACE will be kept informed of any major issues impacting, or potentially impacting, data quality or the schedule to complete sample analysis.

B5.2.4 Laboratory Audits

Each asbestos 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 Libby site. They also provide information on the availability of sufficient laboratory capacity to meet potential testing needs associated with the Site.

<u>External Audits</u>

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 QC, 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 will include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this reported 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.

B5.2.5 Laboratory QC Analyses

General Requirements

Samples collected under this QAPP will be processed and 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. Specific QA/QC procedures are provided in the respective QA management plan or facilities operations plan for each facility that processes or analyzes Site samples.

For each environmental suite sampling event, one field sample will be designated as a MS/MSD as a measure of analytical precision. Field staff will collect the appropriate additional sample volume, per the laboratory-specific requirements, as required for the MS/MSD.

B6/B7. Instrument Maintenance and Calibration

B6/B7.1 Field Equipment

All field equipment (e.g., bladder pumps, multi-meters) will be maintained in basic accordance with manufacturer specifications. Maintenance and calibration of equipment will be done in accordance with EPA-LIBBY-2012-03 and or CDM-LIBBY-09, included in **Appendix A**. 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 FLT 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 ensure timely repair of any "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 related to asbestos analysis are detailed in ISSI-LIBBY-01, EPA-Libby-08, SRC-LIBBY-01, SRC-LIBBY-03, and SRC-LIBBY-05[7]. If any deficiencies in instrument function are identified, all analyses will be halted until the deficiency is corrected. The laboratory will maintain a log that documents all routine maintenance and calibration activities, as well as any 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 A&E FTL, or designee will check the field equipment/supply inventory and procure any additional equipment and supplies that are needed. The A&E FTL or designee will also ensure any in-house measurement and test equipment used to collect data/samples as part of this QAPP is in good, working order, and any procured equipment is acceptance tested prior to use (according to SOP EPA-LIBBY-2012-03, *Control and Measurement and Test Equipment*, **Appendix A**). Any items that the A&E FTL or designee determines 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.

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

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 with this sampling program.

B10. Data Management

The following subsections describe the field and analytical laboratory data management procedures and requirements for this sampling program. These subsections also describe the project databases utilized to manage and report data from this project. 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. Asbestos 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 on a daily basis. It is not until a database has been published via Scribe.NET that it becomes available to external users.

B10.2 Asbestos Laboratory Data Management

The asbestos laboratories utilize several standardized data reporting tools developed specifically for the Libby project to ensure consistency between laboratories in the presentation and submittal of analytical data. In general, a unique Libby-specific EDD has been developed for each asbestos analytical method and each sampling medium. Electronic copies of all current EDD templates are provided in the Libby Lab eRoom.

Once the analytical laboratory has populated the EDD with results, the spreadsheet(s) are transmitted via email to the ESAT TEM Laboratory Manager, the ESAT Project Data Manager, and the FTL (or their designee). Other email recipients may also be 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. 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.

There is currently no Site-specific requirement for the storage of non-asbestos data in the project database.

B10.3 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 asbestos data collected for this project 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., LibbyLab2012.mdb).

B10.4 Data Reporting

Data users can access asbestos 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[8]. The data user

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

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.

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 any 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 for resolution via email (Mosal.Jeffrey@epa.gov). It is the responsibility of the EPA Region 8 Data Manager to notify the appropriate entity (e.g., field staff, analytical laboratory) in order to rectify the issue. A follow-up email will be sent to the party reporting the issue to serve as confirmation that a resolution has been reached and any necessary changes have been made.

CDM Smith will retain reported non-asbestos groundwater data on a secure project server that is backed up routinely. Data users should contact the A&E's Project Manager to request non-asbestos data.

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. Assessment, oversight reports, and response actions are discussed below.

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 (e.g., audits, surveillances) are qualitative checks of different aspects of project work for the use of appropriate QC measures, compliance with specified procedures, and the general function of the QA system. System assessments of field work performed under this QPP will be conducted at the direction of the A&E QA Director, in consultation with the A&E Project Manager and A&E QAM. EPA/USACE will be notified in advance of planned system assessment activities.

During system assessments, the auditor will examine activities and documentation to determine if activities are in conformance with the appropriate QAPP, work plan, and other governing documents. The auditor will document all audit results in a report, and will maintain a list of personnel contacted during the audit. At the completion of the audit, the auditor will present the preliminary results of the audit and encourage rapid correction of any deficiencies. The audit report will detail both proficiencies and deficiencies, and will include any corrective action (and supporting documentation) that was taken to correct the problem.

Project technical/performance assessments are discussed in Sections A8.2 and B5.2.

C1.2 Response Actions

Corrective actions will be required if there are any unresolved deficiencies found in conformance with the QAPP and other governing documents. In this case, the auditor, through a corrective action request (CAR), will request the audited party to take corrective action. When evidence is received that acceptable corrective action has been completed, the A&E's QA Director will issue an audit completion notice to formally close out the audit. The audit completion notice will be distributed to the recipients of the audit report. The QA Director will identify the person responsible for implementing corrective action (often the Project Manager),

set a date on which the response is due, and distribute the CAR. The QA Director will review the CAR response to determine the adequacy of the corrective action. If the stated corrective action taken appears appropriate, the QA Director will examine the objective evidence that the corrective action has been completed. If the evidence provided to the QA Director is acceptable, he/she will sign and date the form. Corrective actions will be implemented on a case-by-case basis to address quality problems.

C2. Reports to Management

QA reports will be provided by the A&E's QAM to the A&E's Program Manager and Project Manager for routine audits or surveillances and whenever quality problems are encountered. The A&E's Program or Project Manager will provide these reports to, or discuss the quality issues with, the EPA/USACE upon request. Weekly reports and change request forms are not required for work performed under this QAPP.

Field sampling staff will note any quality issues on FSDSs or in field log notes as appropriate and bring the issue to the attention of the A&E's QAM or direct supervisor for potential corrective action. Further, the A&E Project Manager will inform the project QAM upon encountering quality issues that cannot be immediately corrected. The project QAM will assist in documenting and resolving the quality issue.

D1. Data Review/Evaluation

D1.1 Data Review

Data review includes cross-checking that sample numbers and sample dates have been reported correctly on the preliminary laboratory report and that specified detection limits/project-specific analytical stopping rules have been achieved. Data evaluation consists of comparing the results to the acceptance criteria provided within this section for each analytical parameter (i.e., DQOs reconciliation). Qualified A&E staff will review and evaluate the results prior to distribution. Results notification is discussed further in Section D3.

D1.1.1 Air Sample Data

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. Data validation efforts for project asbestos data will be scheduled by the EPA through their QATS contractor. If issues/discrepancies are found in non-asbestos data, the data reviewer will contact the CLP Manager (Don Goodrich). For A&E-contracted laboratories, the data reviewer will contact the laboratory directly to resolve any data issues/discrepancies. Outside of data review and verification, no formal data validation is planned for non-asbestos analytical data.

D1.1.2 Groundwater Sample Data

Detected analytes in groundwater samples will be compared to the EPA regional screening levels (RSLs) for groundwater. If measured concentrations are at or below the RSL, the Landfill will be deemed as functioning. If measured concentrations are above the RSL, standard Landfill operations will be reviewed to evaluate potential causes of offsite migration. Because of limitations in the analytical methods selected for use in this QAPP, there will be unavoidable instances where the contract-required quantification limit for a chemical is greater than the screening value, meaning that the method is not adequate to evaluate concentrations relative to the screening levels. If there is information that exists indicating that that chemicals not detected may be present, they should not be eliminated and further testing may be considered. Otherwise, using professional judgment, which considers the entire range of analytes, those chemicals with evaluated results that have not been detected can be eliminated.

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 asbestos laboratories that utilize the Libby-specific EDD spreadsheets, 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-risk based Libby samples. This data verification process utilizes Site-specific SOPs[9] developed to ensure analytical results and field sample information in the project database is accurate and reliable.

The data verification review ensure that any data reporting issues are identified and rectified to limit any 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.

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. Asbestos data validation will be performed by the QATS contractor, with support from technical support staff that is familiar with project-specific data reporting, analytical methods, and investigation requirements.

Data validation for TEM is performed in accordance with Libby-specific SOPs[10] (QATS-70-094-01, QATS-70-095-01, QATS-70-096-02) which were developed based on the *Draft National*

[9] Site-specific field sample information and data review/data entry verification SOPs are available in the Libby Lab eRoom.
[10] Libby-specific SOPs are available in the Libby Lab eRoom.

Functional Guidelines (NFG) for Asbestos Data Review (EPA 2011b), and should include an assessment of the following:

- Internal and external field audit/surveillance reports
- Field ROMs
- Field QC sample results
- Internal and external laboratory audit reports
- Laboratory contamination monitoring results
- Laboratory ROMs
- Internal laboratory QC analysis results (this includes all soil preparation, TEM laboratory QC analysis results)
- Inter-laboratory analysis results
- PE results
- Instrument checks and calibration results
- Data verification results (i.e., in the event that the verification effort identifies a larger data quality issue)

A comprehensive asbestos data validation effort will be completed annually and results will be reported in an annual addendum to the *Quality Assurance and Quality Control Summary Report for the Libby Asbestos Superfund Site* (CDM Smith 2012). This addendum will detail the validation procedures performed and provide a narrative on the quality assessment for each type of analysis (TEM), including the data qualifiers assigned, and the reason(s) for these qualifiers. The technical memorandum will detail any deficiencies and required corrective actions and is provided to the ESAT Team manager.

This addendum should include a summary of any data qualifiers that are to be added to the project database to denote when results do not meet NFG guidelines and/or project-specific acceptance criteria. This addendum should also include recommendations for Site QA/QC program changes to address any data quality issues.

The data validator will complete and submit a Data Management Request form for each data validation effort to the ESAT project data manager. An electronic copy of this form is provided in the Libby Lab eRoom. This form will include a summary of the records that have been validated, the date they were validated, any recommended data qualifiers, and their associated reason codes.

It is the responsibility of the ESAT Team 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.

In addition to performing quarterly data validation efforts, it is the responsibility of the QATS contractor (or designee) to perform a regular evaluation of all field blanks to ensure that any potential contamination issues are quickly identified and resolved. If any blank results are outside the acceptable limits (see **Table B-1**), the QATS contractor should immediately contact the appropriate field Quality Assurance Manager to ensure that corrective actions are made.

Data validation of non-asbestos data is not required for data collected as part of this QAPP. The data will be evaluated for acceptable quality control and documentation.

D3. Reconciliation with User Requirements

As Landfill air and groundwater sample results are received, data will be evaluated to determine if the QAPP-specific DQOs were achieved. This is typically performed by the A&E's FTL (or other qualified A&E staff) whose responsibility it is ensure reported results are adequate and appropriate for their intended use. To the extent possible, this data usability assessment will utilize results of any data verification, data validation, and data evaluation efforts to provide information on overall data quality.

As discussed in Section A7, 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 data. Data usability conclusions will be included in the EPA/USACE event-specific summary reports.

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

Table D-1: Evaluation Methods for Assessing Data Usability

Data Usability Indicator	Evaluation Method
Precision	Sampling – For non-asbestos, calculate RPD for field duplicate samples to measure the contribution of field-related sources to overall variability. For asbestos, analytical results for field duplicates can be compared to the original parent field sample using the Poisson ratio test using a 90% confidence interval (Nelson 1982). Asbestos – Review findings from the Libby Site-wide QA/QC report (prepared annually) specific to laboratory QC samples (e.g., inter- and intra-laboratory analyses) to evaluate variability and potential bias between laboratories. Environmental Parameters – Calculate RPD for laboratory QC samples (e.g., laboratory duplicates, MS/MSD samples) to measure variability arising from laboratory procedures and analysis methods.
Accuracy/Bias and Representativeness	Asbestos – Calculate the background filter loading rate and use results to assign detect/non-detect in basic accordance with ASTM 6620-00. Review findings from the Libby Site-wide QA/QC report (prepared annually) specific to laboratory QC samples (e.g., inter- and intra-laboratory analyses) to evaluate variability and potential bias between laboratories. Environmental Parameters – Calculate %R to measure laboratory quantitation capabilities (e.g., MS/MSD samples, calibration recoveries, interference check sample recoveries). Review relevant audit or surveillance report findings and any ROMs for potential data quality issues.
Comparability	Compare sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Calculate % completeness to determine if additional sampling and/or analysis may be required.
Sensitivity	Asbestos – Determine the fraction of all analyses that stopped based for reasons other than achieving the target sensitivity (i.e., LA structure count). Environmental Parameters – Review results to ensure method-specific reporting limits were achieved by the laboratory.

RPD – relative percent difference
TEM – transmission electron microscopy
ASTM – American Society of Testing and Materials
SOP – standard operating procedure
ROM – record of modification
% – percent
%R – percent recovery
LA – Libby Amphibole asbestos

D4. Final Reporting

Following each semi-annual groundwater monitoring event, the A&E will prepare a report summarizing the event-specific groundwater sample data collected. The A&E's Project Manager (or designee) will distribute the semi-annual groundwater report to the parties listed in Section A3 (Distribution List).

No formalized reporting of air sample data collected under this QAPP is planned, however, sample result summaries or a formal report may be produced by the A&E at the direction of the EPA and USACE.

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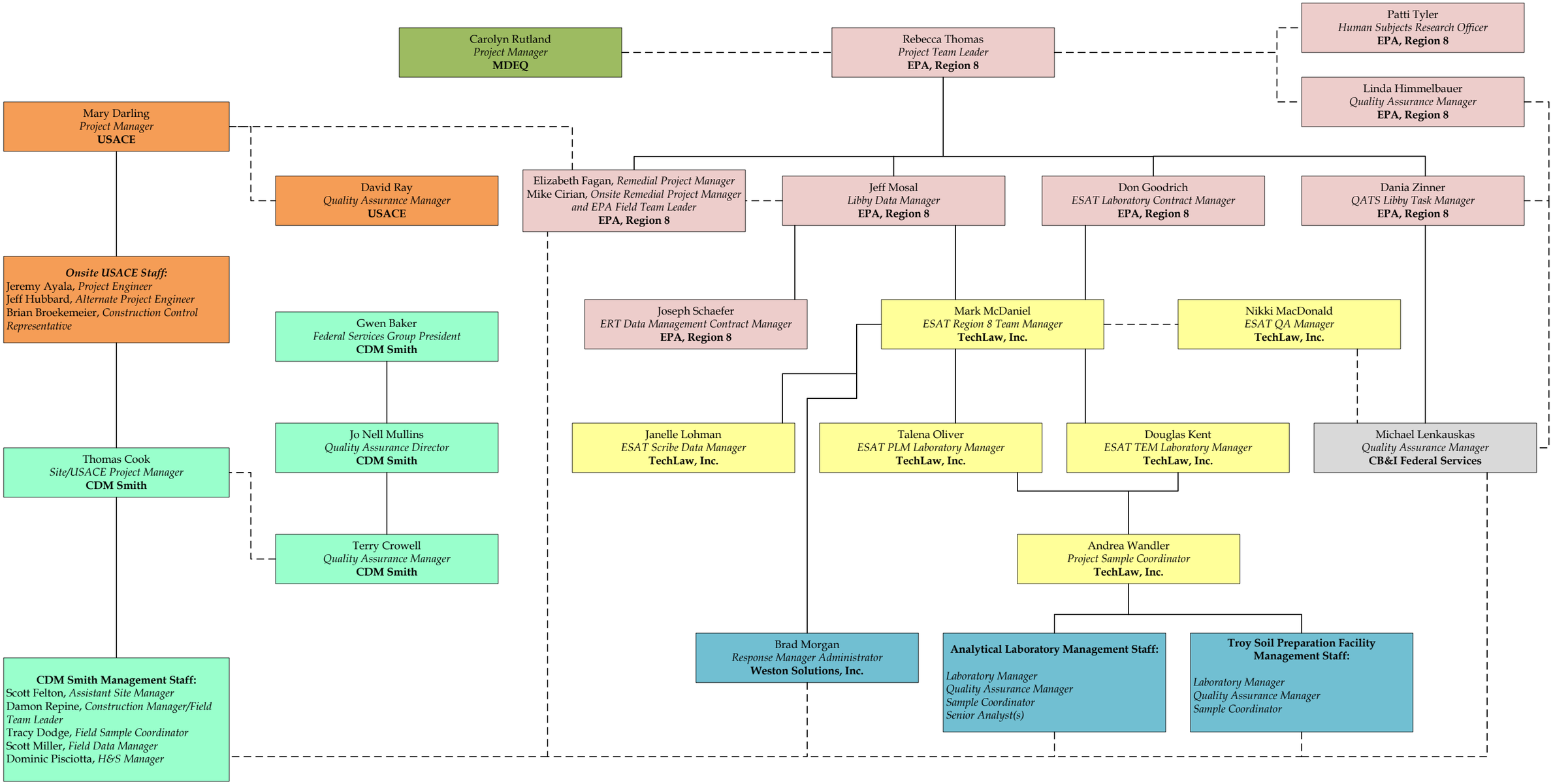


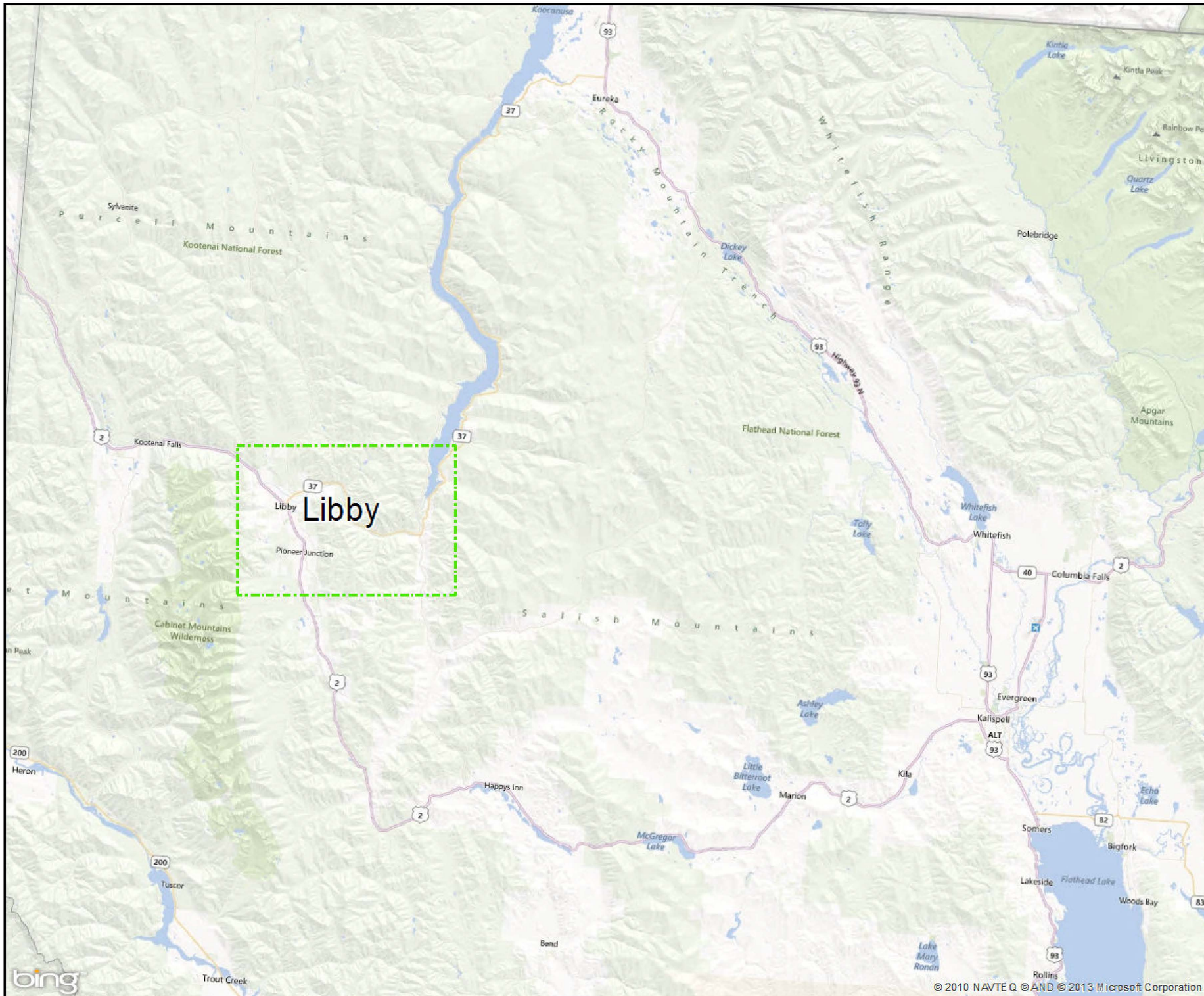
Figure A-1

Organizational Chart for Landfill Sampling
Libby Asbestos Site
Lincoln County, Montana

CDM Smith

Revision 1 - 12/10/13

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



Approximate Site Boundary

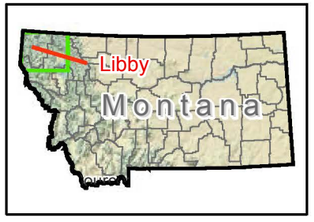


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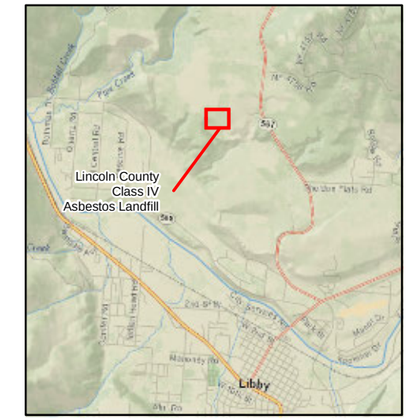
Figure B-2
Lincoln County
Class IV Asbestos Landfill
Site Map



Base Map Reference: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Esri, HERE, DeLorme, TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

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CDM Smith

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Appendix A
Standard Operating Procedures

Lincoln County Class IV Asbestos Landfill
Quality Assurance Project Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0

1/16/2015

Project Period: 03/30/2014 to 03/28/2015
Contract No.: W9128F-11-D-0023
Task Order No.: 0007

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
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
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 CHAIN OF CUSTODY DOCUMENTATION

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ESAT Region 8

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TABLE OF CONTENTS

1.0 PURPOSE 3
2.0 SCOPE AND APPLICABILITY 3
3.0 SUMMARY OF PROCEDURE 3
4.0 ACRONYMS 3
5.0 GENERAL COC INFORMATION 3
6.0 RECEIVING A COC 5
7.0 RELINQUISHING A COC 6
8.0 REQUESTING CHANGES TO A COC 7
9.0 DOCUMENTING CHANGES TO A COC 8
10.0 COC ARCHIVE AND STORAGE 9
11.0 SUPPORTING DOCUMENTATION 10
12.0 REFERENCES 10

Attachment 1: Example corrected COC

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a traceable and consistent process for the handling of Chain of Custody (COC) forms. Information from these COC forms is managed in Scribe, an online software program accessible by personnel within the United States Environmental Protection Agency (EPA), as well as approved EPA contractors. Scribe houses data in multiple databases from all aspects of the Libby Asbestos Superfund Site (referred to as the Libby Site from this point forward), and it is necessary that the information on a COC form matches the information in Scribe. This SOP focuses on how to properly document changes or corrections made to a COC or record additional information on a COC.

2.0 SCOPE AND APPLICABILITY

This SOP is specifically intended for application at the Libby Site by sampling agencies, preparation facilities and analytical laboratories associated with the Libby Site. This SOP is applicable during the entire life-span of a sample. The procedures for handling, relinquishing, receiving, and storing COCs for the Libby Site are described.

3.0 SUMMARY OF PROCEDURE

Sample collection agencies and the Sample Preparation Facility (SPF) create an electronic field sample data sheet (eFSDS), an electronic COC (eCOC) and an original hardcopy COC (referred to as the original COC), of which the original COC will accompany the specified samples for the remainder of their life-span. Data from these COCs is maintained in Scribe, which is updated throughout a samples life-span with additional information. Any modification to samples or their COC must be properly documented by hand on the original COC, and this information must be communicated to the appropriate agencies to ensure that the modification is made in all applicable databases.

4.0 ACRONYMS

COC	Chain of Custody
eCOC	Electronic Chain of Custody
EDD	Electronic Data Deliverable
eFSDS	Electronic Field Sample Data Sheet
EPA	United States Environmental Protection Agency
LIMS	Laboratory Information Management System
SOP	Standard Operating Procedure
SPF	Sample Preparation Facility
TAT	Turnaround Time
TEM	Transmission Electron Microscopy

5.0 GENERAL COC INFORMATION

5.1 A COC establishes a traceable, legal record of the possession of samples from the moment the original COC is generated until the samples are disposed of. For this reason, the original COC must accompany the samples at all times. All actions involving a sample

(e.g. removal from one COC to another, re-labeling or re-numbering of a sample) must be recorded on the original COC.

5.2 The Libby Site is an ongoing project that is constantly evolving and changing. Thousands of samples have been collected and are retained indefinitely until their disposal is approved by the EPA. As a result, it is vital that the samples are tracked properly, beginning with the original COC.

5.3 Sampling agencies maintain applicable field databases from which they create original COCs. Some of these samples require preparation to create new samples for analysis. In these cases, the original COC accompanies the original field samples, along with an eFSDS, to the SPF. An eFSDS contains information necessary to create new COCs in Scribe. Once processed, the SPF will create new COC forms from the SPF database. These SPF COC forms are the original COC for these new samples.

5.4 An eCOC is exported from the field or SPF database and is delivered via email to the receiving agency (with the exception of samples that need preparation at the SPF). An eCOC contains all of the sample-specific data that is found within the main body of the original COC.

5.4.1 The purpose of the eCOC is two-fold: to expedite the sample receipt process and to reduce the frequency of data entry errors.
5.4.2 An eCOC is used in addition to the original COC; it does not replace the original COC.
5.4.3 Analytical laboratories are not required to use eCOCs; however, if they wish to use them, they must be provided with the samples.
5.4.4 If an error is found within an eCOC, and that error is not on the original COC, this error must be communicated to the agency that created it to allow the error to be corrected in the applicable database from which it came (this communication may be written or verbal; written communication is not required since the original COC is correct, and the only correction would be to the database from which the eCOC was generated).

5.5 There may be instances when the original COC contains an error or discrepancy that is discovered at some point after the samples are relinquished from the sampling agencies or SPF.

5.5.1 In order to prevent the propogation of the error into the sample analytical results and Scribe, and to rectify the discrepancy, both errors and discrepancies must be communicated between the relinquishing and receiving agencies.
5.5.2 All changes to a COC must be communicated in writing (see Section 8.0).

5.6 Information collected during the entire life-span of a sample is maintained in applicable Scribe databases, and it is important that these databases match the data contained within the original COC.

5.6.1 Most errors on a COC originate in the database from which they are created, and these electronic discrepancies must be addressed as soon as possible.

5.6.2 If the discrepanices are not addressed electronically when they are first discovered, they will need to be addressed at some point in the future, which may cause Electronic Data Deliverable (EDD) and/or Analytical Test Report corrections to be issued (potentially from multiple analytical laboratories), and multiple databases may need to be updated by multiple agencies.

5.7 Analytical laboratories should not use their internal COCs when relinquishing samples to another agency (for exceptions, see Section 7.4). All of the data on each COC is tracked in Scribe, and when a laboratory uses an internal COC, there is no record of that COC in Scribe, and no correlating location for the analytical results within the applicable Scribe databases. When the databases are compared, this lack of correlation will cause problems for the data user.

6.0 RECEIVING A COC

6.1 Upon receipt of samples, the receiving agency will perform, at a minimum, the following sample receiving procedures.

6.1.1 Verify the integrity of the shipping container. If it was damaged during transit and is not the original container, this must be noted on the COC (this may be evident by the taping of the orignal shipping label to the new container, or a new label that is not generated by the relinquisher).

6.1.2 If the samples have not yet been analyzed, verify that a custody seal is present either on each sample or on the master COC bag, and that the seal is not broken. The presence of an unbroken custody seal indicates that the sample contents have not been modified or tampered with.

6.1.2.1 If the seal is broken, it must be noted on the COC, added to the Analytical Test Report Case Narrative and added to the analysis comment field(s) in the EDD.

6.1.2.2 If samples were mistakenly sent to the wrong analytical laboratory, it is possible that the custody seal on the master bag was broken in order to review the COC. If this is the case, it is not necessary to make a notation on the COC; however, the laboratory should attach a new custody seal to the master bag, and then forward the samples to the correct laboratory.

6.1.3 Verify that the sample numbers and tags written on the individual sample bags match those listed on the COC. If the labels on the inner sample bag match the COC, but those on the outer sample bag do not, it is sufficient to correct by hand the outer sample bag label without making a notation of it on the COC. However, if the inner sample bag does not match the COC, then procedures in Sections 8.0 and 9.0 must be followed.

6.1.4 Verify that the Analyses and Turnaround Time (TAT) requested on the COC are what was expected before the samples were shipped. If the TAT is not what was agreed upon before the shipment was made, contact the Sample Coordinator at the SPF for further instructions.

6.1.5 Verify that samples were received on the expected date. If samples are received on a date later than expected, notify the Sample Coordinator at the SPF so that shipping costs may be adjusted/refunded between the SPF and freight agency. The SPF Sample Coordinator must be notified regardless of which agency the

samples are received from.

6.2 All discrepancies must be recorded on the original COC with the initials and date of the individual making the notation. Also, all discrepancies must be communicated either verbally or in writing to the relinquishing agency. If it is determined that there is an error on the COC or sample bags that needs to be corrected, the relinquishing agency must communicate that change in writing to the receiving agency (see Section 8.0).

6.2.1 For procedures on documenting changes to a COC, see Section 9.0.

6.2.2 Once the dicrepancies are resolved, it is important that the resolution be communicated in writing to all agencies involved with the samples up to that point to ensure that the data is consistent within all applicable Scribe databases, as well as the analysis paper trail.

6.2.3 It is important that the eCOC be modified as well if it will be used during sample receipt procedures. However, if samples have already been received and the data entered into a Laboratory Information Management Sysytem (LIMS), it is not necessary to update the eCOC unless it is being retained by the analytical laboratory.

6.3 Once all the information on the COC forms and samples has been verified, and all discrepancies noted, the individual receiving the samples must complete the bottom section of the COC form with their signature, their agency/lab ID (e.g., ESATR8), date and time of sample receipt, and condition of samples upon receipt. All written requests for changes to the COC must be received before the samples are processed any further.

6.4 For all other sample receiving procedures not specified in this SOP, laboratories should reference their internal SOPs.

7.0 RELINQUISHING A COC

7.1 Each agency is responsible for ensuring the accuracy of the COC and the associated samples in their custody. The agency with custody is always required to confirm that the samples within their custody match the COC. This must be completed prior to relinquishing or immediately after receiving a COC regardless of how many times a COC has been relinquished or received previously.

7.2 Typically, the agency receiving samples will make a copy (electronic and/or hardcopy) of the COC for their records. This may be done after the COC is signed as received, after any changes are made to the COC, and again after the COC is signed as relinquished.

7.2.1 Any copy that is made must be marked “Copy of COC” at the top middle of the copy.

7.2.2 Each agency should reference their own internal SOPs for direction on when to make copies of COCs, as well as procedures to follow when relinquishing samples.

7.3 When a COC and its associated samples are reliquished to another location, only the original COC should accompany the samples (see Section 9.4 for exceptions).

7.3.1 In the case of a carbon copy COC, the top white paper is the original that stays with the samples, and all others are the copies which do not accompany the samples.

7.3.2 Corrected COC copies emailed to the relinquishing agency, or any copies made while in the relinquishing agency's custody, are to be retained by that agency and should not be shipped with the samples.

7.4 For Transmission Electron Microscopy (TEM) interlaboratory analyses, new COCs will be created and emailed to the relinquishing laboratory for the specific interlaboratory samples only. Only the grid boxes for those specific samples will be relinquished and sent to the analytcial laboratory.

7.4.1 After the interlaboratory analysis is complete, the interlaboratory COC and its associated grids will be relinquished and returned to the originating laboratory.

7.4.2 Once received at the original location, the grids from the interlaboratory COC will be returned to the original COC sample grid box.

7.4.3 When the original COC and samples are shipped to another location, the grids will be retained by the analytical laboratory along with the interlaboratory COC. A copy of the interlaboratory COC should not accompany the original COC.

8.0 REQUESTING CHANGES TO A COC

8.1 When a change needs to be made to a COC, the request for the change must be made in writing. This written request of a change must be received before samples move beyond initial sample receipt procedures (e.g. before samples are logged into a LIMS, before sample analysis commences).

8.2 The most efficient written communication is for the relinquishing agency to correct, by hand, their copy of the COC, and email this to the receiving agency. This is the only COC that should be emailed to the receiving agency for the correction. Once the database from which the COC was created is updated, a new, corrected COC should not be emailed to the receiving agency. For procedures on documenting changes to a COC, see Section 9.0.

8.2.1 While emailing a corrected COC copy is the most efficient way to communicate the request, it is not required. The relinquishing agency may choose to write out the request in the body of an email, and this may serve as the written request.

8.2.2 If an email is written to request a change, this email must follow the procedures outlined in the remainder of this section.

8.3 If the SPF initially received the samples and then shipped them to an analytical laboratory, the SPF will make the correction on their COC copy, as well as forward the email to the appropriate laboratory so that the correction may be transferred to the original COC.

8.4 Once emailed, the receiving agency will transfer these changes by hand to the original COC (see Section 9.0). The received written request must be printed to hardcopy, initaled and dated to acknowledge it was read and received, labeled with the applicable laboratory

job number, and included in the Analytical Test Report behind the original COC.

8.5 The written request must be filed and saved with the other records retained for that specific COC for an indefinite amount of time, until otherwise directed by the EPA. These records must be made available to any other agency that requests them.

9.0 DOCUMENTING CHANGES TO A COC

9.1 Any time a change needs to be made to a COC, specific procedures must be followed to ensure that all information regarding the change is recorded and consistent. Standard laboratory practices regarding errors and corrections have been modified to accommodate the frequent change of hands for a given COC.

9.2 When information presented on a COC is incorrect, a single line is drawn through it, and the correct information is hand-written next to it, followed by the first initial, last name and agency of the individual requesting the change (if relevant), then the initials and date of the individual hand-writing the change (e.g., ~~2D-00111~~ 2D-00222 per A. Wandler, ESATR8, *DK 03/12/13*).

9.2.1 If the individual recording the change on a COC is the same individual requesting the change, it is not necessary for that individual to record their first initial, last name and agency. They are only required to record the change with their initials and date.

9.2.2 For corrected copy COC written requests, the individual requesting the change is the individual whose initials and date are recorded on the COC copy. This may be different than the individual that actually emails the COC copy as a written request to the receiving laboratory.

9.2.3 For written requests in the body of an email, the individual requesting the change is the individual that sent the email.

9.3 When information needs to be added to a COC, the same procedures in Section 9.2 are followed, except that nothing needs to be crossed out. If the additional information applies all pages of a COC (e.g., master bag custody seal is not present), it should be added to the last page only (the last page typically has more free space than the preceding pages). If the additional information applies to a specific sample, it should be added to the page containing that sample only.

9.3.1 Additional information on a COC should be recorded in open or blank areas, such as a Comments field, below the complete list of samples, or at the bottom of the COC below the signature fields.

9.3.2 If information is added near the margins of a COC, any copies or scans made must clearly show this information.

9.4 When specific samples need to be removed from one COC and added to another COC, the following procedures must be followed.

9.4.1 If the samples being removed from a COC will be shipped to another location before being added to another COC, a copy of the original COC must accompany

them.

9.4.1.1 Make a copy of the original COC before recording any comments and before relinquishment. At the top middle of the COC, write "Copy of COC".

9.4.1.2 On the copy COC, circle the sample numbers being removed. Record a comment indicating that the samples are being removed from the COC and shipped to another location, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date (e.g., "Samples shipped to Troy SPF, removed from this COC and transferred to COC XX-XXXX per A. Wandler, ESATR8, *NM 03/27/13*").

9.4.1.3 At the bottom of the copy COC, indicate the number of samples being shipped and relinquish the COC with a signature and date.

9.4.1.4 On the original COC (which is retained by the relinquishing agency), cross out with a single line the sample numbers being removed. Record a comment indicating that the samples are being removed from the COC, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date.

9.4.2 If the samples being removed from one COC are added to another COC before shipment, only the COC they are added to must accompany them.

9.4.2.1 The original COC should have the sample numbers being removed crossed out with a single line.

9.4.2.2 Record a comment indicating that the samples are being removed from the COC, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date.

9.4.3 If the samples are being added to an existing COC, the sample information should be recorded on the COC as additional information (see Section 9.3).

9.4.4 The COC (either new or exisiting) the samples are added to does not require any notations referring to the sample's original COC; notations will already be made on the original COC, as well as in Scribe.

10.0 COC ARCHIVE AND STORAGE

10.1 Samples that are processed at the SPF are split into multiple fractions, and the fractions that are not shipped to an analytical laboratory for analysis are stored in an EPA-approved archive facility.

10.1.1 These fractions are assigned to an archive COC, which is printed and kept with the samples in storage bins. This COC is not signed as relinquished or received because the samples are not relinquished to another agency. However, an initial and date of the individual verifiying the COC and its contents must be recorded in

the bottom right corner of the archive COC.

10.1.2 If a sample on an archive COC needs to be shipped to an analytcial laboratory, it will be removed from the archive COC with a notation stating what sample is being removed, which COC that sample is being transferred to and the recorders initials and date (see Section 9.4).

10.2 When samples are shipped to an EPA-approved archive facility for storage, samples will be received following procedures described in Section 6.0. The original COC will remain with the samples in the storage bin, and a copy of the COC will be maintained by the SPF Sample Coordinator.

10.3 For proper legal management of samples, it is important that the original COC be well documented (as necessary) and that the original COC remain the only copy that stays with the samples.

10.4 Prior to the implementation of this SOP, a COC may have been copied multiple times, each copy containing different added information, and all copies kept with the samples.

10.4.1 These COC copies will remain with the samples, be organized in descending order with the most recent copy placed on top, and stapled together.

10.4.2 If one of these COC needs to be relinquished or modified, only the top (most recent) copy will be signed or modified, but the stack will remain intact unless otherwise directed by the EPA.

11.0 SUPPORTING DOCUMENTATION

The following is a list of documents that agencies should refer to in conjunction with this SOP:

Data Management Plan (posted on Libby e-Room)
Site-Wide Quality Assurance Reference Document (posted on Libby e-Room)
Agency-specific SOPs regarding sample receipt procedures

12.0 REFERENCES

There are no references for this SOP. The information contained within this SOP is based on verbal and written communication between the EPA and Libby contractors.

ATTACHMENT 1

Example Corrected COC

A130158

Send To:
Lab: ESATR8
Lab Address: 16194 W. 45th Drive
Lab_Address2: Golden, CO 80403

From: ESAT Region 8/TechLaw _ CHAIN OF CUSTODY
TroyPrepLabLibby/MT
NoSamples: 6
RevisionNo

No: 13-1143
Lab Contact: Talena Oliver
Lab Phone: (303) 312-7083
DateShipped: 5/13/2013

Lab #	Sample #	Tag	Collected	Analyses	Matrix	COCTurnaround	COCTurnaroundUnits
	4G-00929	FG1	5/9/2013	PLM-VE	Soil	5	Days
	4G-00930	FG4	5/9/2013	PLM-VE	Soil	5	Days
	4G-00931	FG2	5/9/2013	PLM-VE	Soil	5	Days
	4G-00932	FG3	5/9/2013	PLM-VE	Soil	5	Days
	4G-00933	FG1	5/9/2013	PLM-VE	Soil	5	Days
	~~4G-01259~~ 4G-01261	FG4	5/13/2013	PLM-VE	Soil	5	Days
	per A. Wandler, ESATR8, to 05/14/13						
	Sample bags for 4G-00929 labeled "FG2"; relabeled "FG1" per A. Wandler, ESATR8, to 05/14/13						
	Custody Seal labeled "13-1143_C" to 05/14/13						

Special Instructions: SAP Analytical Summary # OU4GI0410 - Rev 3	SAMPLES TRANSFERRED FROM
	CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
6	Andrea Wandler ESAT	05/13/13	ESATR8 Talena Oliver	Acceptable 05/14/13	1130						

Appendix B
Air Monitoring Frequencies

Lincoln County Class IV Asbestos Landfill
Quality Assurance Project Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0

1/16/2015

Project Period: 03/30/2014 to 03/28/2015
Contract No.: W9128F-11-D-0023
Task Order No.: 0007

Air Monitoring Frequencies

The Following table shows frequencies for project task based air monitoring performed by the TPIC. Frequencies may be added, adjusted, or removed upon consultation and approved by the EPA when project tasks or responsibilities change.

Air Monitoring Frequencies

		PCM	***TEM AHERA***
Landfill Asbestos Cell			
Personal:	Laborer	Daily	
	Operator	Daily	
	Roll off Truck Driver	Daily	
Clean Room:			1/Event or Week
Perimeter of Exclusion Zones:			1/Month

PCM = Phase contrast microscopy, Method NIOSH 7400
AHERA = Asbestos Hazard Emergency Response Act
TEM =Transmission electron microscopy, Method EPA 40 CFR Part 763 Final Rule

Appendix C
Analytical Requirements Summary Sheet (LCLGW-1214_Rev1)

Lincoln County Class IV Asbestos Landfill
Quality Assurance Project Plan
Libby Asbestos Superfund Site
Libby, Montana

Revision 0

1/16/2015

Project Period: 03/30/2014 to 03/28/2015
Contract No.: W9128F-11-D-0023
Task Order No.: 0007

QAPP ANALYTICAL SUMMARY # LCLGW-1214
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

Title: Lincoln County Class IV Asbestos Landfill Quality Assurance Project Plan, Libby Asbestos Superfund Site

SAP Date (Revision): December 5, 2014 (Revision 0)

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Sampling Program Overview: The objective of the landfill sampling program is to monitor perimeter and personal air during project operations and groundwater during low and high groundwater periods within the perched aquifer using wells located at the Lincoln County Landfill. Two wells, CDM-MW-7 and CDM-MW-8, are sampled during each semi-annual event. Perimeter air is sampled once per month while in operation and personal air is monitored daily during operations. Field and laboratory quality control samples are also prescribed in the QAPP.

Sample ID Prefix: LC-

Medium-Specific TEM/PCM Preparation and Analytical Requirements for Field Samples:

Medium Code	Medium, Sample Type	Preparation Details[a]				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					
A	Water	Yes	No	Yes (a)	Yes	TEM – ISO Method 10312	All asbestos [b]; L: ≥ 0.5 µm [c] AR: ≥ 3:1	Count a minimum of 2 grid openings in 2 grids, then continue counting until one is achieved: i) Achieved sensitivity of 200,000 L^{-1} is reached ii) 25 LA structures (longer than 10 µm) are recorded (finish GO where 25th structure is found) iii) A filter area of 0.5 mm^2 has been examined	LB-000016, LB-000020, LB-000029, LB-000066, LB-000067, LB-000085

Medium Code	Medium, Sample Type	Preparation Details[a]				Analysis Details			Applicable Laboratory Modifications (most current version)
		Investi-gative?	Indirect Prep?		Filter Archi ve?	Method (s)	Recording Rules	Analytical Sensitivity/Prioritized Stopping Rules	
			With Ashing	Without Ashing					
B	Stationary Air (Perimeter)	No	No	Yes[d]	Yes	TEM–AHERA	All asbestos[b]; L: ≥ 0.5µm AR: ≥ 5:1	Examine a minimum of 2 GOs in each of 2 grids. Continue examining GOs until one is achieved: i) Target sensitivity of 0.005 cc^{-1} is achieved, or ii) 25 LA structures are recorded (finish GO where 25th LA found) iii) 0.1 mm^2 of filter area has been examined	LB-000029, LB-000031, LB-000067, LB-000085, LB-000091
C	Health and Safety Personal Air	No	No	Yes[d]	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: See Media Code B	For PCM: LB-000015 For AHERA: LB-000029, LB-000031, LB-000067, LB-000085, LB-000091

[a] Sample and filter preparation should be performed in basic accordance with EPA Method 100.2 (as modified by the most recent version of LB-000020). Grid preparation should be performed in basic accordance with Section 9.3 of ISO 10312:1995(E).
[b] Recording of chrysotile can stop after 25 chrysotile structures have been recorded (finish GO where 25th chrysotile found).
[c] Length requirement as modified by LB-000020.
[d] If filter is overloaded with particulate material (>25%) or unevenly loaded on filter, see most current version of EPA-LIBBY-08 for indirect preparation details.

TEM/PCM Preparation and Analytical Requirements for Field Quality Control Samples:

Medium Code	Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications (most current version)
		Indirect Prep?		Archive?	Method	Recording Rules	Stopping Rules	
		With Ashing	Without Ashing					
D	Lot Blank	No	No	Yes	TEM – AHERA	All asbestos; L: ≥ 0.5µm AR: ≥ 5:1	Examine 0.1 mm^2 of filter area	LB-000029, LB-000031, LB-000067, LB-000085
E	Field Blank	No	No	Yes	PCM – NIOSH 7400, Issue 2 TEM – AHERA	For PCM: NIOSH 7400, "A" rules For AHERA: All asbestos; L: ≥ 0.5µm 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: Examine 0.1 mm^2 of filter area	For PCM: LB-000015 For AHERA: LB-000029, LB-000031, LB-000067, LB-000085

Laboratory QC Sample Frequencies:

TEM [f]:

Lab Blank – 4%
Filtration Blank – 2%
Recount Same – 1%
Recount Different – 3%
Verified Analysis – 1%
Repreparation – 1%

[f] See the most recent version of LB-000029 for selection procedure and QC acceptance criteria

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	12/19/11	N/A
1	12/05/14	Document change in title of governing document, addition of perimeter and personal air to analytical requirements

Analytical Laboratory Review Sign-off:

All laboratories signed the original version of this analytical summary sheet (Rev. 0); this revision (Rev. 1) did not require another signature process.