SAMPLING AND ANALYSIS PLAN/
QUALITY ASSURANCE PROJECT PLAN
OPERABLE UNIT 3, LIBBY ASBESTOS SUPERFUND SITE

Wildfire Contingency Monitoring Plan

Revision 1 – August 2013

Prepared by:

U.S. Environmental Protection Agency
Region 8
Denver, CO

With Technical Assistance from:

CDM Federal Programs Corporation
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A1. TITLE AND APPROVAL SHEET

Libby OU3 Sampling and Analysis Plan/Quality Assurance Project Plan: Wildfire Contingency Air Monitoring Plan

REVISION LOG:

Revision #	Revision Date	Description
0	08/07/12	---
1	08/28/13	Annual update of document (notable changes are listed): • Added Phase IV-A opportunistic ABS for monitoring exposure to pilots (Script 5B) and to ground-based firefighters (IV-A Addendum). • Updated organizational chart. • Modified sample collection interval and frequency for mobile air samples. • Decreased the target flow rates to reduce potential for filter overloading. • Revised TEM analytical requirements for all air samples to utilize low magnification/PCME only counting rules. • Revised inputs used to determine TEM analytical requirements. • Added instructions on field and analytical data management procedures in the event of a "wildfire with potential" that initiates the *Libby Action Response Plan*. • Remove the requirement to collect field duplicates; change the evaluation of laboratory recount/repreparation analyses to be *post hoc*. • Add Table B-1 to summarize the sampling design and establish sampling priority. • Changed applicable air sample collection SOP. • Added collection of ash material post-fire.

APPROVALS:

Christina Progess
EPA Region 8, Remedial Project Manager, Libby OU3
Date: 9/4/13

Thomas Cook
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Date: 9/9/13

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Date: 9/4/13

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A2. TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

***The most recent versions of field SOPs, FSDSs, and COC forms are provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3). The most recent versions of laboratory and data verification/validation SOPs are provided electronically in the Libby Lab eRoom (https://team.cdm.com/eRoom/mt/LibbyLab).*

LIST OF ACRONYMS AND ABBREVIATIONS

95UCL	95% Upper Confidence Limit
ABS	Activity-based Sampling
AHERA	Asbestos Hazard Emergency Response Act
ASTM	American Society for Testing and Materials
AOC	Administrative Order on Consent
CB&I	CB&I Federal Services, LLC
cc	cubic centimeters
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHISQ	Chi-squared
CI	Confidence Interval
COC	Chain-of-Custody
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EDS	energy dispersive spectroscopy
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
f/cc	fibers per cubic centimeter
F1	Fixed Station 1
F2	Fixed Station 2
F3	Fixed Station 3
FSDS	Field Sample Data Sheets
FSRZ	Fire Suppression Restriction Zone
FTL	Field Team Leader
FTP	File Transfer Protocol
g	gram
GSA	General Services Administration
GO	Grid Openings
GPS	Global Positioning System
HASP	Health and Safety Plan
HQ	Hazard Quotient
H&S	Health and Safety
ID	identification number
IDW	Investigative-derived Waste
ISO	International Organization for Standardization
IUR	Inhalation Unit Risk
KDC	Kootenai Development Corporation
L/min	liters per minute

LA	Libby amphibole
LARP	Libby Action Response Plan
LC	laboratory coordinator
MCE	Mixed Cellulose Ester
MDEQ	Montana Department of Environmental Quality
mm	millimeter
N	number of asbestos fibers
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU3	Operable Unit 3
PCM	Phase Contrast Microscopy
PCME	Phase Contrast Microscopy Equivalent
pdf	portable document format
PLM	Polarized Light Microscopy
PLM-VE	PLM-visual area estimation
PLM-Grav	PLM-gravimetric reduction
PRI-ER	Project Resources, Inc. and Environmental Restoration
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
RBC	Risk-Based Concentration
Remedium	Remedium Group, Inc.
RfC	Reference Concentration
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROM	Record of Modification
RPM	Remedial Project Manager
SAED	Selected Area Electron Diffraction
SAP	Sampling and Analysis Plan
Site	Libby Asbestos Superfund Site
SOP	Standard Operating Procedure
SRM	standard reference material
s/cc	structures per cubic centimeter
STEL	Short Term Exposure Limit
TAS	Target Analytical Sensitivity

TEM	Transmission Electron Microscopy
TWA	Time-Weighted Average
TWF	Time-Weighting Factor
µm	micrometer
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
UV	ultraviolet

A Project Management

A3. DISTRIBUTION LIST

This document describes data collection efforts that will be conducted as part of the remedial investigation (RI) for Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site (Site) to monitor asbestos concentrations in air during authentic forest fires within OU3. This document contains the elements required for both a sampling and analysis plan (SAP) and quality assurance project plan (QAPP).

Copies of this completed/signed SAP/QAPP should be distributed to:

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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, SAP/QAPP development, field sampling support, on-site field coordination, analytical support, data management, and quality assurance for this project.

A4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 is Christina Progess, EPA Region 8. Ms. Progess is the principal data user and decision-maker for Superfund activities within OU3.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The interim MDEQ Project Managers for OU3 are Larry Scusa and Carolyn Rutland. The EPA will consult with MDEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, and applicable guidance in conducting Superfund activities within OU3.

The U.S. Forest Service (USFS) is the land management agency for over 20,000 acres within OU3. As such, the USFS is a support agency for this site. The USFS Project Coordinator is Nancy Rusho. The EPA will consult with the USFS while operating on the USFS managed land.

The EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC) for performance of a Remedial Investigation/Feasibility Study (RI/FS) at OU3 of the Libby Asbestos Site. Under the terms of the AOC, W.R. Grace & Co.-Conn. and KDC will implement the activities described in this document, under EPA supervision. The designated Project Coordinator for Respondents W.R. Grace & Co.-Conn. and KDC is Robert Medler of Remedium Group, Inc. (Remedium). He is assisted by Robert Marriam of Remedium.

A4.2 SAP/QAPP Development

The *Wildfire Contingency Monitoring Plan* was originally included as Attachment D to the Phase IV Part A SAP (EPA 2010a). This document was developed to update the original monitoring plan and create a stand-alone SAP/QAPP for this sampling effort. This document also incorporates other opportunistic aspects of the Phase IV Part A sampling design in the event of an actual wildfire in OU3 – i.e., air monitoring of exposures to pilots during an aerial attack on a wildfire (Script 5b; EPA 2010a), activity-based sampling (ABS) conducted near ground-based firefighters during a wildfire (Phase IV-A Addendum; EPA 2011a). **Revision 1 of this document consolidates and supersedes these original wildfire sampling plans into a single, governing SAP/QAPP.**

This SAP/QAPP was developed by CDM Federal Programs Corporation (CDM Smith) at the direction of and with oversight by the EPA under the EPA Region 8 General Services Administration (GSA) Contract No. EP-S8-11-02. This SAP/QAPP contains all the elements required for both a field sampling plan and QAPP and has been developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001) and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006).

Copies of this SAP/QAPP will be distributed to the individuals above by CDM Smith, either in hard copy or in electronic format (as indicated in Section A3). The CDM Smith Project Manager (or their designee) is responsible for maintaining the SAP/QAPP and will distribute updated copies each time a document revision occurs. A copy of the final, signed SAP/QAPP (and any subsequent revisions) will also be posted to the OU3 website[1] and the OU3 eRoom[2].

[1] http://cbec.srcinc.com/libby/
[2] https://team.cdm.com/eRoom/mt/LibbyOU3

A4.3 Field Sampling Support

All field collection activities described in this SAP/QAPP will be performed by Remedium and their contractors, in strict accordance with this SAP/QAPP. Remedium will be supported in this field work by Chapman Construction, Inc.

A4.4 On-Site Field Coordination

Access to the mine and other areas of OU3 *via* Rainy Creek Road is currently restricted and is controlled by the EPA. The point of contact for access to the mine is the U.S. Army Corps of Engineers (USACE) contractor, Project Resources, Inc. and Environmental Restoration (PRI-ER):

- USACE office (406-293-3567)
- Jeremy Ayala – USACE Construction Control Representative (402-594-1239)
- Mark Buss – USACE Construction Control Representative (402-250-3112)
- Harvey Fowler – PRI-ER Superintendant (406-291-7994)

A4.5 Analytical Support

All samples collected as part of this project for asbestos analysis will be sent for preparation and/or analysis to laboratories that meet the Libby-specific laboratory criteria that have been established for the project. These criteria are specified in **Appendix E**. Remedium may choose whether asbestos analytical laboratory services are procured directly or if services will be provided *via* EPA.

A4.6 Data Management

Administration of the master database for OU3 will be performed by EPA contractors. The primary database administrator will be Lynn Woodbury of CDM Smith. She (or her designee) will be responsible for sample tracking, uploading new data, performing data verification and error checks to identify incorrect, inconsistent, or missing data, and ensuring that all data are corrected as needed. When the OU3 database has been populated, verified, and validated, relevant asbestos data may be transferred into a Libby Asbestos Superfund Site database, as directed by the EPA for final storage.

A4.7 Quality Assurance

There is no one individual designated as the EPA Quality Assurance Manager (QAM) for the Libby project. Rather, the Region 8 quality assurance (QA) program has delegated authority to the EPA RPMs. This means that the EPA RPMs have the ability to review and approve governing investigation documents developed by CDM Smith under the EPA Region 8 General

GSA contract. Thus, it is the responsibility of the EPA RPM for OU3, who is independent of the entities planning and obtaining the data, to ensure that this SAP/QAPP has been prepared in accordance with the EPA QA guidelines and requirements. The EPA RPM is also responsible for managing and overseeing all aspects of the quality assurance/quality control (QA/QC) program for OU3. In this regard, the EPA RPM is supported by the EPA Quality Assurance Technical Support (QATS) contractor, CB&I Federal Services, LLC (CB&I). The QATS contractor will evaluate and monitor laboratory QA/QC sampling and is responsible for performing annual audits of each analytical laboratory and validating laboratory data packages. In addition, HDR Engineering, Inc. has been contracted by the EPA to provide oversight of field sampling and data collection activities.

A5. PROBLEM DEFINITION/BACKGROUND

A5.1 Site Background

Libby is a community in northwestern Montana that is located near a large open-pit vermiculite mine. Vermiculite from the mine at Libby is known to contain amphibole asbestos that includes several different mineralogical classifications, including richterite, winchite, tremolite, and possibly actinolite (Meeker *et al.* 2003). For the purposes of EPA investigations at the Libby Asbestos Superfund Site, this mixture is referred to as Libby amphibole (LA).

Historic mining, milling, and processing of vermiculite at the site are known to have caused releases of LA associated with vermiculite to the environment. Inhalation of LA associated with the vermiculite is known to have caused a range of adverse health effects in exposed humans, including workers at the mine and processing facilities (Amandus and Wheeler 1987, McDonald *et al.* 1986, McDonald *et al.* 2004, Sullivan 2007, Rohs *et al.* 2007, Larson *et al.* 2010, 2012a, 2012b), as well as residents of Libby (Peipins *et al.* 2003). Based on these adverse effects, the EPA listed the Libby Asbestos Superfund Site on the National Priorities List in October 2002. Starting in 2000, the EPA began taking a range of cleanup actions at the site to eliminate sources of LA exposure to area residents and workers using CERCLA (or Superfund) authority.

The EPA has designated a number of operable units for the Site due to its size and complexity. This document focuses on investigations at OU3. OU3 includes the property in and around the former vermiculite mine and certain areas surrounding the mine that have been impacted by releases and subsequent migration of hazardous substances and/or pollutants or contaminants from the mine. **Figure A-2** shows the location of the mine and the preliminary study area boundary for OU3. The EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the RI/FS for OU3. This study area boundary may be revised as data are obtained during the RI for OU3 on the nature and extent of environmental contamination associated with releases that may have occurred from the mine site. The final boundary of OU3 will be defined by the final EPA-approved RI/FS.

The EPA is concerned with environmental contamination in OU3 because the area could be used by humans for a variety of activities, including recreational activities (e.g., hiking), wood gathering by local residents, commercial logging, and, in the case of USFS employees, land management and fire-fighting activities. The area is also habitat for a wide range of ecological receptors (both aquatic and terrestrial). This SAP focuses on the potential exposures of firefighters, residents, and workers to LA as a result of a forest fire within OU3.

The EPA is currently engaged in a RI to collect data needed to evaluate potential risks to people and ecological receptors that may be exposed to LA or other mining related contaminants in OU3 of the Libby Asbestos Superfund site. The RI is being planned and implemented in phases. Each phase of the RI has been planned by the EPA with input from EPA risk assessors, toxicologists, environmental scientists, and risk managers. The EPA also seeks and considers input from the State and all other concerned parties, including the U.S. Fish and Wildlife Service, the USFS, W.R. Grace & Co.-Conn., and KDC.

A5.2 Reasons for this Project

Studies performed to date as part of the RI for OU3 have shown that soil, tree bark, and duff (i.e., organic litter and debris on the forest floor) in the vicinity of the former vermiculite mine have been impacted by historic releases of LA (EPA 2008a, EPA 2009). It has been documented that inhalation of LA associated with the vermiculite may cause a range of adverse health effects in some exposed humans. Forest fires that occur within contaminated areas of OU3 may result in the release of LA fibers into air although the magnitude of the release is unknown. The release of LA fibers to air as a result of a forest fire could expose firefighters and individuals in surrounding areas downwind of the fire.

Smoke is a mixture of heated particles and gases and it is impossible to predict the exact composition of smoke produced by a forest fire. The products (e.g., trees, brush, grasses, duff) being burned, the temperature of the fire, and the amount of oxygen available to the fire, all make a difference in the type of smoke produced. Small particles of soot and ash from a fire may continue to be deposited on an area for many days. Also, depending on atmospheric conditions, the area of pollution may extend beyond the range of the fire. At present, no data are available on the concentration of LA fibers that may be released during a forest fire within OU3. In addition, available data are not adequate to support reliable quantitative estimation of the air concentrations of asbestos fibers that may occur as a result of a forest fire in OU3. Thus, measured data are needed to provide information on the magnitude of potential exposure to LA for individuals (e.g., firefighters, residents and workers in Libby) exposed to smoke from a forest fire within OU3.

The purpose of this document is to present a plan for establishing air monitoring during an authentic forest fire in OU3, as well as ash sample collection following an authentic forest fire. This document includes a plan for collecting air samples that will provide preliminary

information on the levels of LA in ambient area that may occur in the surrounding community during forest fires in OU3. It includes a plan for collecting air samples that will provide information on the levels of LA near ground-based firefighters responding to the wildfire and pilots providing aerial support during fire suppression activities. It also includes a plan for the collection of ash material from the burn area following the wildfire to provide information on LA levels in ash.

The primary purpose of these air sampling efforts is to provide measured data to support long-term estimates of exposure and risk from inhalation of LA-contaminated smoke from forest fires within OU3. However, these data may also be used to inform the general public and the USFS of air impacts from forest fires within OU3 and to provide information to assist in emergency response measures.

A5.3 Applicable Criteria and Action Limits

At present, there are no criteria or action limits that apply specifically to individuals potentially exposed to LA in smoke from forest fires or in ash.

Criteria for exposure of workers to asbestos in workplace air have been established by the Occupational Safety and Health Administration (OSHA). The short-term (30-minute) exposure limit (STEL) is 1.0 fibers per cubic centimeter (f/cc), and the 8-hour time-weighted average (TWA) exposure limit is 0.1 f/cc. Both asbestos exposure limits are expressed in terms of phase contrast microscopy (PCM) fibers (OSHA 2002); however, the PCM method does not distinguish between asbestos and non-asbestos fibers.

At the Libby Site, the EPA has developed action levels and cleanup criteria for LA that are applicable to emergency response actions performed at residential/commercial properties (EPA 2003). However, these criteria are not applicable to locations outside of the Site. In addition, final action levels for the Site will not be developed until completion of the RI/FS and the publication of the record of decision. Thus, there are no LA-specific criteria or action limits that apply to this sampling program.

A6. PROJECT DESCRIPTION

A6.1 Project Summary

This document provides an opportunistic sampling plan for collecting three different types of air monitoring samples during an authentic forest fire in OU3:

1. Ambient air data to evaluate potential exposure to LA in smoke and fallout in surrounding areas and in the Libby community. Ambient air samples will be collected at three stationary stations and one mobile sampling station if a forest fire occurs in OU3 (see Section B1.1 for station locations).

2. ABS air data to evaluate potential firefighter exposure to LA in smoke and as a result of soil and duff disturbances during wildfire suppression activities. ABS air samples will be collected near firefighters that are responding to a forest fire in OU3.
3. Air data to evaluate potential pilot exposure to LA in smoke during an aerial attack on a wildfire. Air samples will be collected from inside the cockpit of the air support craft.

This document also provides a plan for the collection of ash material from the burn area following an authentic forest fire in OU3 to inform discussions about potential burn area mitigation measures following a fire.

Basic tasks that are required to implement this investigation are described in greater detail in subsequent sections of this SAP/QAPP.

A6.2 Work Schedule

Because the goal of the study is to collect samples during and after an authentic forest fire in OU3, there are no established temporal bounds. That is, samples will be collected whenever a forest fire occurs in OU3. Based on USFS records, fires are most likely to occur during the dry summer months (typically July, August, and September).

A6.3 Locations to be Studied

Locations where air sampling activities may be performed are described in detail in Section B1.1. If there is a fire in OU3, three fixed ambient air monitoring stations located at the camping area at McGillivray Access, the CDM Smith office in Libby, and the USFS Canoe Gulch Ranger Station along Highway 37, and at one mobile air monitoring station deployed downwind of the fire (see **Figure A-2**) will be sampled. An air monitoring device will also be placed in the cockpit of a responding air support craft. In addition, field sampling personnel will deploy in OU3 with responding firefighters to collect ABS air samples near authentic fire suppression activities. Following the wildfire, field sampling personnel will return to the burn area to collect ash samples.

A6.4 Resources and Time Constraints

The greatest time constraint is that sampling activities must be conducted during a forest fire under uncontrolled conditions. Depending on the duration of the forest fire, stationary and mobile air monitors may be limited by the time and volume of air required to collect representative air samples. Depending upon the timing and size of the fire, there may be limited personnel available to support the collection of wildfire monitoring samples. Importantly, sampling may be limited by safety concerns for sampling personnel.

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 the types of analyses to be performed. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a field sampling program will be adequate to support reliable site-specific risk management decision-making (EPA 2001, 2006).

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

A7.2 Performance Criteria

The range of LA concentrations that could occur in air during a forest fire in OU3 is not known. However, it is possible to estimate the concentration levels that correspond to a level of human health concern. These calculations are provided in Appendix A. The analytical requirements for LA measurements in air as established in Section B4 ensure concentrations will be reliably detected and quantified if present at levels of concern (based on a long-term exposure scenario).

Likewise, the range of LA concentration in ash that could occur following a forest fire in OU3 is not known. There is no level of potential concern that can be derived for ash. Therefore, analytical requirements for ash will utilize preparation and analysis procedures and sensitivity requirements established in other ash sampling programs at the Libby Site to ensure comparability with other ash results.

A7.3 Precision

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

Recount and repreparation analyses will be performed as part of the transmission electron microscopy (TEM) analysis (see Section B5.2.3). These analyses will provide information on analysis reproducibility and precision (both inter- and intra-laboratory).

A7.4 Bias/Accuracy and Representativeness

There is no established set of reference materials or spiked standards that can be used to assess accuracy of TEM analyses of LA in air or ash. Results for field blanks and laboratory blanks (see Section B5) will be utilized to ensure that air sample results are not biased as a consequence of cross-contamination due to field sampling procedures or preparation and analysis methods.

It is expected that LA levels in air may vary widely as a function of location and meteorological conditions. Stationary ambient air monitoring locations selected for evaluation in this study are intended to be representative of what may occur in the surrounding community during a fire in OU3 and a mobile ambient air sampling location is intended to represent the high-end of what may occur. The measured levels of LA in ambient air from the mobile location may be biased high for residents and workers in the Libby community.

Air monitoring results from these ambient air locations may not necessarily be representative of active, ground-based firefighters in the field or for pilots in air support craft. Therefore, potential exposure for these two groups of receptors is evaluated with ABS and by placing monitors inside aircraft.

A7.5 Completeness

Target completeness for this project is 100% for all air samples collected. If any air monitoring samples are not collected, or if LA analysis is not completed successfully, data may not be adequate to support risk management decision-making.

Target completeness is also 100% for all ash samples collected; these samples are not critical for the purposes of supporting risk management decision-making, but are useful in providing data that can be used to inform discussions about burn area mitigation measures following a forest fire in OU3.

A7.6 Comparability

The data generated during this study will be obtained using sample collection, preparation, and analysis methods for measuring LA in air and ash used previously at OU3. The use of consistent methods will yield data that are comparable to previous results of LA analyses in air and ash.

A7.7 Method Sensitivity

The method sensitivity (analytical sensitivity) needed for the analysis of LA in air and ash 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 OSHA 40-hour health and safety training, and respiratory protection training as required by 29 Code of Federal Regulations (CFR) 1910.134. Individuals must also have asbestos awareness training, as required by 29 CFR 1910.1001, as well as training in sample collection techniques and use of personal protective equipment. All training documentation will be stored in the appropriate field office. It is the responsibility of the field health and safety (H&S) manager to ensure that all training documentation is up-to-date and on-file for each field team member.

It is the responsibility of Remedium, or their contractors, to ensure that sampling is conducted in accordance with the project *Health and Safety Plan* (HASP) and to maintain appropriate documentation of training by active field personnel.

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

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- Required quality control (QC) measures
- Health and safety requirements

It is the responsibility of each field team member to review and understand all applicable governing documents associated with this sampling program.

A8.2 Laboratory

A8.2.1 Certifications

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

Copies of recent proficiency examinations from NVLAP or an equivalent program, as well as certifications from other state and local agencies, are maintained by each participating analytical laboratory. Copies of all proficiency examinations and certifications are also maintained by the laboratory coordinator (LC).

Each laboratory working on the Libby project is also required to pass an on-site EPA laboratory audit. The details of this EPA audit are discussed in Section C1.1.2. 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 possibly other certifying bodies for methods and parameters that may also be of interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

A8.2.2 Laboratory Team Training/Mentoring Program

Training/Mentoring

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The program includes training provided by the QATS contractor and/or senior personnel from other Libby team laboratories. The training/mentoring 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 mentoring process also includes a general EPA audit, which is performed by the QATS contractor, to determine the general capabilities of the laboratory, the adequacy of facilities and instrumentation, and evaluate of the laboratory quality management system. The mentor will also review the analysis of at least one proficiency demonstration sample for each analytical method with the trainee laboratory.

Once the laboratory has satisfactorily completed the training/mentoring program, they can begin to support the analysis of Libby field samples. Initially, all submitted analytical results will undergo a detailed data verification and validation review (see Section D2). The frequency of these reviews can be reduced if no issues are identified. The QATS contractor may also perform a subsequent EPA audit to evaluate analyses of Libby field samples.

Site-Specific Reference Materials

Because LA is not a common form of asbestos, the U.S. Geological Survey (USGS) prepared site-specific reference materials using LA collected at the Libby mine site (EPA 2008b). Upon entry into the Libby program, each laboratory is provided samples of these LA reference materials. Each laboratory is required to analyze multiple LA structures present in these samples by TEM in order to become familiar with the physical and chemical appearance of LA and to establish a reference library of LA energy dispersive spectroscopy (EDS) spectra. These laboratory-specific and instrument-specific LA reference spectra (EPA 2008c) serve to guide the classification of asbestos structures observed in Libby field samples during TEM analysis.

Regular Technical Discussions

Ongoing 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 laboratories. Other experts (e.g., 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 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 Johnson 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 evaluation on the LA-specific reference materials provided during the initial training program to aide in LA mineralogy recognition and definition (similar to EPA 2008c). 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 B5.2.3). 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 Documentation

Field teams will record sample information on the most current version of the Site-specific field sample data sheets (FSDSs)[3] (see **Appendix C**). Section B3.1 provides detailed information on the sample documentation requirements for samples collected as part of this study. In brief, the FSDS forms document the unique sample identification (ID) number assigned to every sample collected as part of this program. In addition, the FSDSs provide information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blanks). The field teams will also record information related to sample collection in a field logbook.

A9.2 Laboratory

All analytical data for asbestos generated in the analytical laboratory will be documented on Site-specific laboratory bench sheets. Section B4.3 provides detailed information on the requirements for laboratory documentation and records. In brief, the data recorded on the bench sheets are entered into a Site-specific electronic data deliverable (EDD) template

[3] The most recent versions of these FSDS form templates are available in the OU3 eRoom.

spreadsheet developed for recording TEM results[4]. It is the responsibility of each laboratory to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures. Upon completion of the appropriate analyses, the EDD spreadsheets, along with scanned copies of all analytical laboratory data packages, will be posted to the OU3 eRoom.

A9.3 Record of Modification

It is the responsibility of the field team and laboratory staff to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures. Significant deviations (i.e., those that impact or have the potential to impact investigation objectives) from this SAP/QAPP, or any procedures referenced herein governing sample handling, will be discussed with the EPA RPM (or their designee) prior to implementation. Such deviations will be recorded on a Record of Modification (ROM) form. Sections B5.1.2 and B5.2.2 provide detailed information on the procedures for preparing and submitting ROMs by field and analytical laboratory personnel, respectively.

[4] The most recent version of the TEM EDDs is provided in the Libby Lab eRoom.

B Data Generation and Acquisition

B1. STUDY DESIGN

B1.1 Air Sampling

Forest fires may occur at any location in the forested area of OU3. Available data on levels of LA measured in tree bark, soil, and duff indicate that, in general, the levels of LA tend to decrease with distance away from the center of the mine (EPA 2010a). Based on data obtained by EPA on environmental levels of LA contamination in duff, bark, and soil around the mine, the USFS has established a Fire Suppression Restriction Zone (FSRZ), which is currently defined as the OU3 boundary, as shown in **Figure B-1**. This is an area inside of which the USFS has determined that ground-based firefighters must wear respiratory protection when attacking fires.

As noted above, there are three different air monitoring efforts that will occur in the event of a wildfire within OU3. **Table B-1** provides an overview of the study design for the OU3 wildfire contingency air monitoring plan. Each of these air monitoring programs is described in greater detail below. Air sample collection methods are discussed in Section B2.1.

Ambient Air Monitoring

During a fire in OU3, ambient air monitoring will be performed at three fixed stations and one mobile station. **Figure B-1** shows the location of stationary air monitors and presents the general area identified for conducting mobile ambient air sampling activities. Each of these stations is described in more detail below.

Fixed Station 1 (F1): Based on meteorological data collected at the mine site, the predominant wind direction at OU3 is to the north-northeast (see **Figure B-2**). This means that smoke and LA released from fires in OU3 is most likely to be transported in that direction. It is believed that levels of environmental LA contamination are likely to be highest in areas that are north-northeast of the mine. Consequently, sampling air/smoke from fires that occur within several miles of the mine in the north-northeast direction is especially important. Under current conditions, most of the land north and east of the former mine is owned by the USFS or by logging companies and human occupancy in this area is sparse. Based on this, during a fire event, one monitoring station will be established at a location in the downwind direction, west of Lake Koocanusa within the camping area at McGillivray Access.

Fixed Station 2 (F2): Because Libby is the location of the highest population density near the mine, a second air monitor will be established on the east side of the town of Libby to provide information on exposure levels to this population. The location of this monitor will be at the CDM Smith office (60 Port Boulevard).

Fixed Station 3 (F3): A third monitoring station will be established along Highway 37 at the USFS Canoe Gulch Ranger Station. This location was chosen based on its proximity to OU3 and the fact that people routinely occupy the station during work hours.

Mobile Station: In addition to the three stationary monitors at fixed locations, a fourth monitor will be deployed to an area downwind of the fire. The monitor will be transported to the collection site by truck. The sampling location and distance from the fire will depend on the conditions of the fire. The actual location selected for the mobile sampler will depend upon the ease of access for the truck hauling the sample equipment and safety concerns for sampling personnel. Although details may vary, it is envisioned that the monitor will be placed on a tripod in the back of the truck. During sample collection, the coordinates of the monitor will be recorded. This information will be used later, in combination with data on the fire location, to establish the distance and direction of the monitor relative to the fire. The wind direction and speed at the sampling location should also be monitored.

Aircraft Cockpit Monitoring

When an aerial response to an authentic wildfire in OU3 is called for, the field team (Remedium contractors) will deploy to the airfield to perform all necessary activities associated with calibrating and activating the pump and collecting the cockpit air samples. The air sampling cassette will be positioned to sample cockpit air, but will be located in a position that does not interfere with the pilot's vision or ability to operate the aircraft. It is understood that, in some cases, the pilot may be required to begin flights before this can be achieved. In this event, the pump will be activated during the first available time when the aircraft returns to base between trips to the fire.

AIR SAMPLING MUST NOT IMPEDE OR INTERFERE WITH THE ABILITY OF THE PILOT TO COMPLETE APPROPRIATE FIRE SUPPRESSION ACTIVITIES.

Firefighter ABS

When ground-based firefighters respond to an authentic wildfire in OU3, the field team (Remedium contractors) will deploy two or more individuals with proper health and safety training to the area of the fire. Once at the fire location, these individuals will promptly check with USFS firefighter personnel to determine if it safe for them to remain near the fire area. If so, each individual will utilize a personal air sampler to collect air samples in the immediate vicinity of the USFS firefighting team.

Note: Placing monitors on USFS firefighters would constitute use of human test subjects and would require lengthy review and approval by an institutional review board before it could be achieved. In addition, placing monitors on USFS personnel could interfere with their ability to fight fires safely. Therefore, use of monitors worn by USFS personnel is not considered to be appropriate.

CONTRACTORS MUST NOT IMPEDE OR INTERFERE WITH THE ABILITY OF THE FIREFIGHTER TO COMPLETE APPROPRIATE FIRE SUPPRESSION ACTIVITIES.

In addition, ABS sampling will occur only when it is safe to do so. If unsafe conditions arise, Remedium contractors shall immediately leave the area of the fire.

Air Sampling Priority

Because there are several air sampling efforts that may be triggered during a wildfire in OU3, if there are limitations in the number of field sampling personnel that can respond, the following sampling priorities are established:

1. Fixed station F2 at the CDM Smith field office
2. Aircraft cockpit monitoring
3. Closest fixed station to the fire (i.e., F1 or F3)
4. Firefighter ABS
5. Mobile monitoring location
6. Remaining fixed station (i.e., F1 or F3)

B1.2 Ash Sampling

Trial burn experiments in wood stoves (Ward *et. al* 2009) and in test burn chambers (EPA 2012) indicate that the majority of LA fibers are retained in the ash when wood and duff materials are burned under experimental conditions. Thus, it is possible that the resulting ash from a wildfire event in OU3 could contain concentrated levels of LA and act as a potential source material. Following a wildfire event in OU3, once it is safe to return to the burn area, field personnel will collect ash material from the ground surface to provide measured data on the LA levels in ash. Ash sample collection methods are discussed in Section B2.2.

B1.3 Sample Collection Strategy

Forest fires in OU3 that disturb contaminated environmental media may release LA to air. This is of concern because people may inhale LA fibers, thereby increasing the risk of adverse health effects. The human populations of potential concern for this investigation are: 1) area residents and workers in the Libby community exposed to smoke from a forest fire in OU3 and 2) firefighters performing wildfire suppression activities (both ground-based and aerial support). The data needed to evaluate exposure consists of measurements or estimates of LA concentration [expressed in units of structures per cubic centimeter (s/cc) in breathing zone air] of people being evaluated.

The sample strategy for this investigation is direct measurement. In this approach, samples of air are collected during forest fires that occur in OU3 and these samples are analyzed for LA. The chief advantage of this approach is that the data are inherently realistic and representative. The chief disadvantage is that fires occur at random times and in random locations, so collection of the data is difficult to plan and implement. In addition, there is an inherent hazard to people who are in close proximity to any uncontrolled wildfire in OU3.

Because the goal of the study is to monitor air during forest fires, there are no established temporal bounds. That is, samples will be collected whenever significant forest fires occur in OU3. Air sampling will not occur except during times that a fire is burning in OU3. [Note: This may include any controlled burns conducted by the USFS in OU3, as may be appropriate.]

Notification that a fire is occurring in OU3 will be provided to the field team by the USFS as soon as possible after a fire is known to be occurring. If smoke is blowing toward Libby, the field crews will then activate the sampling efforts detailed in this SAP/QAPP as soon as possible after notification. The individuals to be contacted in the event of a fire within OU3 include:

Mike Chapman	Christina Progess
Chapman Construction, Inc.	EPA, Region 8, Libby OU3 RPM
Cell: 406-293-1983	Cell: 303-520-5205
chapman@montanasky.net	progess.christina@epa.gov

Because the occurrence of fires is random, the number of fires occurring in any one fire season cannot be controlled or predicted. Therefore, depending on the LA concentration levels observed and the locations of fires that occur, it may be necessary to operate this program for two or more years until sufficient data are obtained to provide a reliable basis for long-term decision-making. The need for continued sampling will be determined periodically based on a review of data obtained to date.

B1.4 Study Variables

The level of LA in ambient air resulting from forest fires and firefighting activities can depend on factors that may vary quickly during a fire (e.g., wind speed, wind direction, temperature, soil moisture, humidity, etc.). As noted previously, fires occur generally in the drier months of the year (typically July, August, and September) when temperatures are higher, and soil moisture and humidity are low.

Air monitoring should be performed under conditions that have a high probability of resulting in measureable air concentrations of LA. To ensure that sampling conditions are generally favorable towards the detection of LA fibers, sample locations have been placed in areas where

the greatest probability of detecting LA released as a result of a forest fire may occur, as well as areas that would be representative of residential exposures.

B1.5 Critical Measurements

The critical measurements for this project are measurements of the concentration of LA in air during a forest fire at locations representative of areas of potential exposure and at areas that are anticipated to have higher levels of LA contamination due to the prevalent wind direction. Although ash sample collection will also be performed for this project, these samples, while informative, are not critical to risk management decision-making.

The analysis of LA may be achieved using several different types of microscopes, but the EPA generally recommends using TEM because this analytical method has the ability to clearly distinguish asbestos from non-asbestos structures, and to classify different types of asbestos (i.e., LA, chrysotile). In addition, analysis by TEM allows for the estimation of PCM-equivalent[5] (PCME) concentrations, which is the air concentration metric necessary to estimate exposure and risks.

B1.6 Data Reduction and Interpretation

Air Samples

Air samples collected in the field will be used to prepare grids for TEM examination (see Section B4). From this examination, the total number of PCME LA structures observed is recorded and the air concentration is calculated as follows:

$$Cair = (N \cdot EFA) / (GOx \cdot Ago \cdot V \cdot 1000 \cdot f)$$

where:

Cair	= Air concentration (structures per cubic centimeter of air [s/cc])
N	= Number of PCME LA structures observed (structures)
EFA	= Effective filter area (mm^2)
GOx	= Number of grid openings examined
Ago	= Area of a grid opening (mm^2)
V	= Sample air volume (L)
1000	= L/cc (conversion factor in liters per cubic centimeter)
f	= Indirect preparation dilution factor (assumed to be 1 for direct preparation)

[5] PCME structures have a length greater than 5 micrometers (µm), width greater than or equal to 0.25 µm, and aspect ratio greater than or equal to 3:1.

Data for PCME LA concentrations in air will be used to evaluate potential human health risks from forest fires in OU3 and to provide information for emergency response activities.

Ash Samples

Ash samples collected in the field will be used to prepare grids for TEM examination (see Section B4). From this examination, the total number of LA structures observed is recorded and the ash concentration is calculated as follows:

$$Cash = (N \cdot EFA) / (GOx \cdot Ago \cdot M \cdot f)$$

where:

Cash = Ash concentration (structures per gram of ash [s/g])
N = Number of total LA structures observed (structures)
EFA = Effective filter area (mm^2)
GOx = Number of grid openings examined
Ago = Area of a grid opening (mm^2)
M = Mass of ash (g)
f = Indirect preparation dilution factor

B2. SAMPLING METHODS

B2.1 Air Sample Collection

All air samples will be collected in basic accordance with standard operating procedure (SOP) EPA-LIBBY-2010-10, *Air Sample Collection* (see **Appendix B**). Each air sample will be collected using a stationary air monitor (e.g., fixed monitoring locations) or personal air monitor (e.g., firefighter ABS, cockpit samples).

Pumps may be either battery-powered or provided with 110 volt power from a reliable source. Air sampling cassettes will utilize a 25-millimeter (mm) diameter mixed cellulose ester (MCE) with a pore size of 0.8-micrometers (µm). Target pump rates will be 2.0 liters per minute (L/min).

Each air sampling pump will be calibrated at the start of each sampling event using the primary calibrator (BIOS Drycal). Calibration will be considered complete when the measured flow is within ± 5% of the target flow (2.0 L/min), as determined by the mean of three measurements. Each BIOS Drycal used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag.

Ambient Air Monitoring

For the three fixed air monitoring stations, each sample will be collected over a time period of about 24 hours. Sample collection will be repeated for 24-hour intervals as long as smoke from the fire continues to reach the community.

For the mobile air monitor, the sampling time depends on the level of smoke reaching the sampling station, as well as on the speed that the fire is moving. Assuming that there are no safety concerns, the sampling duration for the mobile monitor samples shall be about 4 hours, depending on smoke level. The frequency of sample collection from the mobile air monitor will depend upon wildfire conditions and duration, with a general goal of collecting 1-2 mobile air samples per day, up to about 8-10 mobile air samples per wildfire event.

In all cases, it is critical that mobile station sampling be performed in a way that does not endanger that health or safety of the sampling personnel. If conditions are considered to be potentially unsafe, the sampler should evacuate the area immediately.

Pump flow rates should be checked regularly throughout the collection period and filter cassettes should be changed if flow rates become impacted due to overloading of particulates on the filter. Any changes in flow rate during sample collection should be recorded on the FSDS form.

Aircraft Cockpit Monitoring

A battery-powered air sampling pump will be placed in the cockpit of the air support craft. The monitoring cassette will be attached to the pump *via* a plastic tube that is affixed at a height that is representative of the pilot breathing zone. The breathing zone can be visualized as a hemisphere approximately 6 to 9 inches around an individual's face. The top cover from the cowl extension on the sampling cassette shall be removed ("open-face") and the cassette oriented face down.

The number of cockpit air samples that may be collected will depend upon the frequency and duration of wildfires in OU3. The goal will be to collect two cockpit air sample per wildfire event, with each sample representative of one full "re-fueling cycle" (i.e., sampling collection begins when the aircraft takes off and ends when the aircraft has landed for re-fueling).

Firefighter ABS

As noted above, all personal ABS air samples will be collected by Remedium contractors with proper health and safety training. This includes training with regard to asbestos risks, as well as risks associated with firefighting activities.

In general, two contractors shall respond to each fire event. Each contractor shall don and activate their personal air pump after arriving at the scene of the fire. Each contractor shall collect a minimum of three and a maximum of six samples, changing filter cassettes every 60 minutes. This will result in a total of 6-12 ABS samples per wildfire event. The sample collection time and air pump flow rate may be revised as experience is gained on the degree of loading on the ABS filters.

There is no established ABS script to be performed as part of this sampling effort. The goal is to sample air that is very similar to the air being breathed by the USFS firefighting personnel. Thus, contractors should simply follow and stand near USFS firefighters as they conduct any fire suppression activities, seeking to position themselves in air that is similar to the air being breathed by the firefighters.

B2.2 Ash Sample Collection

There is no existing SOP for the collection of ash material. Once the burn area is safe to enter after the wildfire, the ash should be collected manually using a trowel, in basic accordance with OU3 SOP No. 1, *Soil Sampling for Non-Volatile Organic Compound Analysis* (see **Appendix B**). In brief, enough ash material should be collected from the ground surface (approximately 0-1 inches) to fill a lidded 5-gallon container. Material should be collected from a minimum of 30 sampling points across the burn area.

After collection, the contents of the container can be homogenized by rolling the closed container back and forth on the ground. After homogenization, an aliquot of approximately 50 grams of ash will be removed from the container and placed into a zip-top bag for analysis of LA by TEM (see Section B4). The remaining ash material should be archived in the 5-gallon container for possible future use in ABS or additional TEM analysis. Ash sample information will be recorded on the "soil-like" FSDS form (see **Appendix C**).

B2.3 Global Positioning System Coordinate Collection

Global positioning system (GPS) coordinates are already available for the stationary air monitoring locations, thus it is not necessary to record GPS coordinates unless these locations change. GPS coordinates should be obtained for the various mobile air monitoring locations to provide the spatial extent of the sampling area evaluated in the air monitoring event during a forest fire.

Because of the opportunistic nature of this investigation, the exact locations sample collection within OU3 could vary from wildfire to wildfire. Ground-based field teams will record GPS coordinates of the approximate locations of the firefighter ABS locations and ash collection locations. Recording GPS coordinates for the aircraft flight paths is not necessary.

GPS location coordinates will be collected in general accordance with OU3-specific SOP No. 11, *GPS Data Collection* (see **Appendix B**). Field crews will download the electronic records at the end of each wildfire event. At the completion of each wildfire event, the GPS data will be utilized to create maps of the locations that were evaluated for each wildfire.

B2.4 Equipment Decontamination

Decontamination of non-disposable sampling equipment will be conducted in basic accordance with the procedures specified in OU3-specific SOP No. 7, *Equipment Decontamination* (see **Appendix B**). Materials used in the decontamination process will be disposed of as investigation-derived waste (IDW) as described below.

B2.5 Handling Investigation-derived Waste

Any disposable equipment or other IDW will be handled in basic accordance with the procedures specified in OU3-specific SOP No. 12, *IDW Management* (see **Appendix B**). In brief, IDW will be double bagged in clear heavy-weight trash bags with 'IDW' written, in large letters at least 3 inches high, in indelible ink on at least two sides of the outer bag. All IDW generated during this sampling program will enter the waste stream at the local class IV asbestos landfill.

B3. SAMPLE HANDLING AND CUSTODY

B3.1 Sample Documentation

B3.1.1 Field Sample Data Sheets and Logbooks

All necessary information associated with samples from each fire event shall be recorded using the most current version of the OU3-specific FSDS form for each type of sample (see **Appendix C**) in accordance with the procedures specified in OU3-specific SOP No. 9, *Field Documentation* (see **Appendix B**), with the following investigation-specific modification:

- Use of container labels is not required for labeling collected air or ash samples.
- The Field Sample/Data Manager is not required to perform data entry of field information (i.e., FSDS, chain-of-custody [COC]) into the field-specific OU3 database; this task will be completed by the OU3 Data Manager (CDM Smith).
- The field team will provide copies of all field documentation (i.e., FSDS, field logbooks, COC) to the CDM Smith field office in Libby at the end of each sampling day. CDM Smith staff posted scanned copies of all field documentation to the OU3 eRoom on a daily basis.

Key data items recorded on the FSDS include the following:

- Name or initials of the person collection the samples
- GPS coordinates for sampling location (if appropriate)

- The unique 5-digit sequential ID number that is assigned to each sample.
- The start date/time and stop date/time for each air sample. If flow rates require adjustment during sample collection, the date/time of flow adjustments should also be recorded.
- Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank).
- The measured flow rate at the start and end of sample collection, as well as the flow rates during any interim flow checks.
- Any other information needed to evaluate the reliability and representativeness of the collected samples.

Each field sampling team will also maintain a field logbook. The logbook shall record all potentially relevant information on sampling activities and conditions that are not otherwise captured on the FSDS form. The field logbook is an accounting of activities at the Site and will duly note problems or deviations from the governing SAP/QAPP or SOPs. Separate field logbooks will be kept for each study and the cover of each field logbook will clearly indicate the name of the associated study. Field logbooks will be completed prior to leaving a sampling location. Field logbooks will be checked for completeness on a daily basis by the field team leader (FTL) (or their designee). When incorrect field logbook completion procedures are discovered during these checks, the errors will be discussed with the author of the entry and corrected. Erroneous information recorded in a field logbook will be corrected with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

Examples of the type of information to be captured in the field logbook include:

- Names of team members
- Guidance document title, date, and revision (if applicable)
- Date
- Fire event information:
    - A description of the fire location
    - A description of the nature of the fire (e.g., size, intensity, type of material burning, etc.)
    - A description of meteorological conditions (e.g., wind speed and direction, behavior of the smoke plume)
- Weather conditions
- Field sketches
- Address or physical description of the location relative to permanent landmarks
- Number and type of samples collected
- Any special circumstances that influenced sample collection
- Any deviations from sampling SOPs

B3.1.2 Photographic and Video Documentation

Photographs will be taken to document representative examples of sampling locations and site conditions during air sampling activities, and at any other location the field sampling personnel determine necessary, using a digital camera. As appropriate, digital video may be captured to document representative examples of smoke movement during air sampling. During a fire sampling event photographs or video should be taken from locations 360° surrounding the sample location (e.g. north, south, east, and west) and the direction of each photograph should be recorded. Electronic copies of all digital photographs and video will be posted at the end of the wildfire event to the OU3 eRoom. The file name should include the corresponding sampling location and/or sample number and the photograph date (e.g., ABS_SM-00002_9-15-12).

B3.2 Sample Labeling and Identification

Samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. For air samples, one sample label will be placed on the sampling cassette, one sample label will be affixed to the inside of the plastic bag used to hold the sampling cassette during transport. In addition, the sample ID number will also be written on the outside of the plastic bag. For ash samples, one sample ID label will be placed on the 5-gallon bucket and a second (unique) sample ID label will be placed on the outside of the zip-top bag of the ash aliquot removed for TEM analysis.

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

SM-#####

where:

SM- = A sample ID prefix to identify samples collected under this SAP/QAPP

= A sequential five-digit number

B3.3 Field Sample Custody

Field sample custody will follow the requirements specified in OU3-specific SOP No. 9 (see **Appendix B**). In brief, all teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. All samples and FSDSs will be relinquished by field staff to the field sample coordinator, the analytical laboratory, or a designated secure sample storage location at the end of each day.

B3.4 Chain of Custody

The COC record 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 and to identify the type of analysis requested. A completed COC form specific to the Libby OU3 sampling is required to accompany each shipment of samples. Sample custody will be maintained until final disposition of the samples by the laboratory and acceptance of analytical results by the EPA.

OU3-specific COC forms can be obtained from the OU3 eRoom (an example of this form is provided in **Appendix D**). In brief, the field sample coordinator will prepare a hard copy COC form using the 3-page carbon copy forms developed specifically for use in this investigation. One copy of the COC will be retained by the field sample coordinator and the other two copies (including the original) of the COC will accompany the sample shipment. All required paper work, including sample container labels, COC forms, custody seals and shipping forms will be fully completed in indelible ink (or printed from a computer) prior to shipping of the samples to the laboratory. Each COC form will include signatures of the appropriate individuals indicated on the form. In addition, the air volume for each sample should be recorded on the COC form. Shipping to the appropriate laboratory from the field will occur through overnight delivery. All samples that may require special handling by laboratory personnel to prevent potential exposure to LA or other hazardous substances will be clearly labeled.

If any errors are found on a COC after shipment, the hard copy of the COC retained by the field sample coordinator will be corrected and a corrected COC will be provided to the LC for distribution to the appropriate laboratory. All corrections to the COC form will be initialed and dated by the person making the corrections.

B3.5 Sample Packaging and Shipping

Samples will be packaged and shipped in basic accordance with the procedures specified in OU3-specific SOP No. 8, *Sample Handling and Shipping* (see **Appendix B**). The LC will instruct the field sample coordinator as to the appropriate laboratory for each sample shipment. For the purposes of this wildfire monitoring plan, it is anticipated that all samples will be hand-delivered to the EMSL Analytical, Inc. laboratory in Libby. If directed by the LC, samples may be shipped *via* an overnight delivery service to an alternate laboratory. For samples requiring shipment, prior to sealing the shipping container, the field sample coordinator will complete the bottom of the COC record and retain the bottom copy of the COC record for the project record.

B3.6 Holding Times

In general, there are no holding time requirements for asbestos. Thus, there are no holding time requirements for the air or ash samples collected as part of this sampling investigation.

B3.7 Archival and Final Disposition

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

B4. ANALYTICAL METHODS

This section discusses the analytical methods and requirements for samples collected in support of the ambient air sampling program during a forest fire. This section includes detailed information on the analysis of air as well as the data reporting requirements, sample holding times, and custody procedures.

An analytical requirements summary sheet (**OU3FIRE-0813**), which details the specific preparation and analytical requirements associated with this sampling program, is provided in **Appendix F**. The analytical requirements summary sheet will be reviewed and approved by all participating laboratories in this sampling program prior to any sample handling. The appropriate analytical requirements summary sheet identifier and media code (i.e., OU3FIRE-0713, Media Code A) will be included on each COC.

B4.1 Analysis of LA in Air Samples

The DQOs for the air sampling efforts during an OU3 forest fire (see **Appendix A**) provide detailed information on the sample preparation, analysis method, counting rules, and stopping rules for air samples. All air samples collected during forest fires in OU3 will be analyzed by TEM using International Organization for Standardization (ISO) Method 10312:1995(E) (ISO 1995). Analysis requirements for the TEM analysis are summarized below.

B4.1.1 Sample Preparation

The air sample filter will be used to prepare a minimum of three grids using the grid preparation techniques described in Section 9.3 of ISO 10312. If the filter is deemed to be overloaded (i.e., > 25% particulate loading on the filter), an indirect preparation without ashing[6] may be performed in accordance with the procedures in Libby-specific SOP EPA-LIBBY-08, *Indirect Preparation of Air and Dust Samples for Analysis by TEM* (see **Appendix B**), as modified by

[6] The filter ashing requirement has been removed for this study to reduce preparation time in the event that indirect preparation is necessary.

Libby-specific laboratory modification[7] #LB-000091. The resulting secondary filter will be used to prepare a minimum of three grids using the grid preparation techniques described in Section 9.3 of ISO 10312.

B4.1.2 Counting Rules

Prepared grids will be submitted for asbestos analysis using TEM ISO 10312 counting and recording rules in basic accordance with Annex E and the Libby-specific laboratory modifications #LB-000016, LB-000029, LB-000055, LB-000066, LB-000067, LB-000085, and LB-000091. In brief, grids will be examined by TEM under low magnification (~5,000x), recording only those structures that meet PCME counting rules. All amphibole structures that have appropriate selected area electron diffraction (SAED) patterns and EDS spectra, and having length > 5 µm, width ≥ 0.25 µm, and an aspect ratio (length:width) ≥ 3:1, should be recorded. Detailed structure results for each grid opening (GO) and structure examined should be recorded on the benchsheet and entered into the Site-specific TEM EDD spreadsheet developed for reporting air sample results. If observed, chrysotile structures should be recorded using the same procedures described above, but structure recording may stop after 25 chrysotile structures have been observed.

B4.1.3 Stopping Rules

Appendix A provides detailed information on the derivation of the stopping rules for air field samples analyzed by TEM. The stopping rules are as follows:

1. Examine a minimum of two GOs from each of two grids.
2. Continue examining GOs until one of the following is achieved:
    a. The target analytical sensitivity is achieved:
        - Ambient air monitoring – 0.0026 cc^{-1}
        - Firefighter ABS – 0.0027 cc^{-1}
        - Aircraft cockpit monitoring – 0.0088 cc^{-1}
    b. 25 PCME LA structures are observed
    c. A total filter area of 5.0 mm^2 has been examined (approximately 500 GOs)

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

[7] Copies of all Libby-specific laboratory modifications are located on the Libby Lab eRoom.

For lot blanks and field blanks, the TEM analyst should examine an area of 0.1 mm^2 (approximately 10 GOs) and stop. Blanks should be analyzed under high magnification (~20,000x), recording all asbestos structures ≥ 0.5 µm in length and an aspect ratio ≥ 3:1.

B4.2 Analysis of LA in Ash Samples

B4.2.1 Sample Preparation

Ash samples will be prepared and analyzed using procedures similar to those specified in Section 6.2 of SOP EPA-LIBBY-2012-11, *Sampling and Analysis of Duff for Asbestos* (see **Appendix B**). In brief, an aliquot of the ash material will be acidified, suspended in water, and filtered. A total of three replicate filters will be created and analyzed for each ash sample using additional aliquots of the ash residue. Each 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).

B4.2.2 Analysis Method and Counting Rules

Grids will be examined by TEM using high magnification (~20,000x) in basic accordance with the recording procedures described in ISO 10312:1995(E), as modified by SOP EPA-LIBBY-2012-11 and the most recent versions of Libby Laboratory Modifications LB-000016, LB-000029, LB-000066, LB-000067, LB-000085, and LB-000091. In brief, all fibrous amphibole structures that have appropriate SAED patterns and EDS spectra, and having length ≥ 0.5 um and an aspect ratio (length: width) ≥ 3:1, will be recorded. If observed, chrysotile structures should be recorded using the same procedures described above, but structure recording may stop after 25 chrysotile structures have been observed.

Stopping Rules

The stopping rules for the TEM analysis of ash materials are as follows:

1. Examine a minimum of two GOs from each of two grids.
2. Continue examining GOs until one of the following is achieved:
    a. The target analytical sensitivity (1E+07 per gram, dry weight [g^{-1}]) is achieved.
    b. 50 LA structures have been observed.
    c. A total filter area of 1.0 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.

B4.3 Data Reporting

In the field, sample details and COC information will be documented on hard copy FSDS forms, field logbooks, and COC forms. Remedium's field contractor will deliver copies of all FSDS forms, field logbooks, and COC forms to the CDM Smith field office in Libby at the end of each sampling day. CDM Smith staff will scan and post field documentation in an Adobe Acrobat® portable document format (pdf) to the Libby OU3 eRoom on a daily basis. This eRoom has controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names for scanned documents will include the sample date in the format MMDDYY to facilitate document organization (e.g., "FSDS_083109.pdf").

TEM results for air will be reported and results transmitted (including the detailed raw structure data from the TEM analysis) within 24 hours of sample receipt by the laboratory. If a 24-hour turn-around is not possible (e.g., in the event that the filter requires indirect preparation), the laboratory should notify the LC and the EPA RPM. All TEM results will be submitted using the most recent version of the TEM EDDs[8] in use at the Libby site. Standard project data reporting requirements will be met for this dataset.

Upon completion of the appropriate analyses, EDDs will be posted to the Libby OU3 eRoom within the appropriate turn-around time. Files should be posted to the folder titled "Wildfire Contingency Plan". Hard copies of all analytical laboratory data packages will be scanned and posted as a pdf file to the Libby OU3 eRoom. File names for scanned analytical laboratory data packages will include the laboratory name and the job number to facilitate document organization (e.g., LabX_12345-A.pdf). If the analytical laboratory data package is revised, this should be denoted with a suffix in the file name (e.g., LabX_12345-A_Rev1.pdf). All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA.

*****IN THE EVENT OF A WILDFIRE WITH POTENTIAL*****

If the wildfire is deemed to be a "fire with potential" and the *Libby Action Response Plan* (LARP) is initiated, copies of FSDS forms and COC forms should be delivered to the CDM Smith field office in Libby, Montana (60 Port Blvd, Suite 201, Attn: Diane Rode) at the end of each sampling day for data entry into the Libby Scribe project. Upon completion of the analysis, the analytical laboratory will post EDDs to the Libby Laboratory file transfer protocol (FTP) site (which is managed and maintained by EPA's Environmental Services Assistance Team) in the designated "Fire" folders.

[8] The most current version of all EDDs are provided in the Libby Lab eRoom.

B4.4 Analytical Turn-around Time

As noted above, TEM results for all air samples will be reported and results transmitted within 24 hours of sample receipt by the laboratory, unless otherwise specified by the LC. If a 24-hour turn-around is not feasible (e.g., if an indirect preparation is necessary), results should be provided as soon as possible. The LC and the EPA RPM should be immediately notified of any turn-around time delays.

Turn-around times of 1-2 weeks are acceptable for ash samples, but this may be revised as determined necessary by the EPA.

B4.5 Custody Procedures

Specific laboratory custody procedures are provided in each laboratory's *Quality Assurance Management Plan*, which have been independently reviewed at the time of laboratory procurement. While specific laboratory sample custody procedures may differ between laboratories, the basic laboratory sample custody process is described briefly below.

Upon receipt at the facility, 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 coordinator will sign the COC record and maintain a copy for their project files.

Depending upon the laboratory-specific tracking procedures, the laboratory sample coordinator may assign a unique laboratory identification number to each sample on the COC. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the responsibility of the laboratory manager to ensure that internal logbooks and records are maintained throughout sample preparation, analysis, and data reporting.

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. The following sections describe each of the components of the field QA/QC program implemented at the Site.

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 the wildfire monitoring effort. Additional information on field training requirements is provided in Section A8.1.

B5.1.2 Modification Documentation

Minor deviations (i.e., those that will not impact data quality or usability) encountered in day-to-day field work will be noted in the field logbook. Major deviations from this SAP/QAPP that modify the sampling approach and associated guidance documents will be recorded on a field ROM form (see **Appendix G**). Field ROMs will be completed by the FTL, or by assigned field or technical staff. Each completed ROM is assigned a unique number that is specific to each investigation (e.g., Wildfire LFM-OU3-01) by the EPA RPM or their delegate. Once a form is prepared, it is submitted to the EPA RPM for review and approval. Copies of approved field ROMs are available in the OU3 eRoom and are posted to the OU3 website.

B5.1.3 Field QC Samples

Two types of field QC samples will be collected as part of the air sampling portion of this program – lot blanks and field blanks. No field QC samples are required for ash samples.

Lot Blanks

Lot blanks are collected to ensure air samples for asbestos analysis are collected on asbestos-free filters. This will be accomplished by selecting two lot blanks at random from the group of cassettes (manufactured lot) to be used for collection of air samples. It is the responsibility of the FTL to submit the appropriate number of lot blanks to the laboratory prior to cassette use in the field. Each lot blank will be analyzed for asbestos by TEM analysis as described above (see Section B4.1). Lot blank results will be reviewed by the FTL before any cassette in the lot is used for sample collection. The entire batch of cassettes will be rejected if any asbestos is detected on either lot blank. Once the lot is confirmed to be asbestos free (i.e., asbestos is not detected on either lot blanks), that lot may be placed into use for sampling. Only filter lots with acceptable lot blank results are placed into use for the air sampling effort.

Field Blanks

Field blanks are collected to evaluate potential contamination introduced during sample collection, shipping and handling, or analysis. It is the responsibility of each field team to collect the appropriate number of field blanks. A field blank for air shall be prepared by removing the sampling cassette from the box, opening the cassette to the air in the area where the investigative samples will be taken for about 30 seconds, then closing the cassette and

packaging for shipment and analysis. Field blanks will be collected at a rate of one field blank for every two days of sampling that occurs. The field blanks are analyzed for asbestos by TEM analysis as described above (see Section B4.1).

Field blank results will be reviewed by the FTL (or their designee) at the time of data reporting. If any asbestos is observed on a field blank, the FTL will notify the field teams and/or laboratory manager to take appropriate measures (e.g., re-training on sample collection and analysis procedures) 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. Any assigned qualifiers will be included when results are reported.

B5.2 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 sampling program will be provided a copy of and will adhere to the requirements of this SAP/QAPP. Samples collected under this SAP/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

When changes or revisions are needed to improve or document specifics about analytical methods or procedures used by the laboratory, these changes are documented using a laboratory ROM form (see **Appendix G**). The laboratory ROM form provides a standardized format for tracking procedural changes in sample analysis and allows project managers to assess potential impacts on the quality of the data being collected. Laboratory ROMs will be completed by the appropriate laboratory or technical staff. Once a form is prepared, it is submitted to the EPA RPM and the LC for review and approval. Copies of approved laboratory ROMs are available in the Libby Lab eRoom.

B5.2.3 Laboratory QC Analyses

The Libby-specific QC requirements for TEM analyses of asbestos are patterned after the requirements set forth by NVLAP. In brief, there are three types of laboratory-based QC analyses that are performed for TEM – laboratory blanks, recounts, and repreparations. Detailed information on the Libby-specific requirements for each type of TEM QC analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in the most recent version of Libby Laboratory Modification LB-000029, with the following investigation-specific modifications:

- Recount and repreparation analyses for this investigation will be selected *post hoc* by EPA. The LC will provide the list of selected samples for recount and repreparation analysis to the laboratory manager.

In addition to laboratory blanks, as appropriate, the laboratories may also evaluate drying blank samples per Libby-specific laboratory modification #LB-000055. Based on observations from long-duration sampling events (i.e., 24-hour samples), moisture inside the sample cassettes due to meteorological conditions (e.g., rain, fog) can promote biological growth on air filters. The occurrence of biological growth can interfere with direct sample preparation methods. As a result, when filter conditions warrant, the laboratory may oven-dry the sets of sample cassettes prior to preparation for analysis. A drying blank is a filter that is dried in the same oven at the same time as the field sample lot. Drying blanks are used to determine if the drying process is a potential source of contamination to field samples. The drying blanks are analyzed for asbestos by the same method that is used for field blanks and lot blanks.

B6/B7. EQUIPMENT MAINTENANCE AND INSTRUMENT CALIBRATION

B6/B7.1 Field Equipment

B6/B7.1.1 Field Equipment Maintenance

All field equipment (e.g., GPS units, sampling pumps) should be maintained and calibrated in basic accordance with manufacturer specifications. When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled "out of order" and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as "out of order" will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the "out of order" equipment. This may include having appropriately trained field team members complete the repair or shipping the malfunctioning equipment to the manufacturer. Field team members will have access to basic tools required to make field acceptable repairs. This will ensure timely repair of any "out of order" equipment.

B6/B7.1.2 Air Sampling Pump Calibration

As noted previously, each air sampling pump will be calibrated at the start of the sampling period each day using the primary calibrator (BIOS Drycal). For pre-sampling purposes, calibration will be considered complete when the measured flow is within ±5% of the target flow, as determined by the mean of three measurements. Each BIOS Drycal used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag.

B6/B7.2 Laboratory Instruments

The laboratory manager is responsible for ensuring that all laboratory instruments used for this project are maintained and calibrated in accordance with the manufacturer's instructions. If any deficiencies in instrument function are identified, all analyses shall be halted until the deficiency is corrected. The laboratory shall maintain a logbook 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 Supplies

In advance of field activities, the FTL will check the field equipment/supply inventory and procure any additional equipment and supplies that are needed. The FTL will also ensure any in-house measurement and test equipment used to collect data/samples as part of this SAP/QAPP is in good, working order, and any procured equipment is acceptance tested prior to use. Any items that the FTL determines unacceptable will be removed from inventory and repaired or replaced as necessary.

Because fires occur at random times and response to a fire event must be immediate, all preparations for air sampling must be completed in advance of fire events. This shall include preparing and having ready for immediate use the following items:

- Air pumps and primary calibrator (BIOS Drycal). Each air sampling pump used for this investigation shall be maintained to ensure the battery is fully charged. The pump shall be checked weekly, each time calibrating to a flow rate of 2 L/min. Documentation of the calibration events shall be maintained in a logbook.

- Filter cassettes. A supply of filter cassettes (minimum of 40) shall be maintained in plastic zip-top bags ready for immediate use. Note that cassettes shall not be considered for field use until a lot blank has been analyzed and determined to be free of fibers.

- Field Documentation Supplies. All supplies needed to document sampling at a fire event shall be prepared ahead of time and be ready for use. This shall include one clipboard per field person. Each clipboard shall include the following:
    - A minimum of three FSDS sheets
    - A minimum of 40 self-adhesive sample ID labels (3 labels per sample)
    - One indelible pen

- Safety equipment. All safety equipment (e.g., hard hat, respiratory protection, Nomax personal protective equipment, water bottles, flashlight, first aid kit, etc.) shall be prepared and located in a readily accessible area for immediate use.

- Anemometer and compass. Each team shall take a hand-held anemometer and a compass to each fire event to help collect data on wind speed and direction. These shall be prepared and placed in a plastic zip-top bag that is ready for immediate use.

- GPS unit. See Section B2.3 for the placement and use of the GPS units.

B8.2 Laboratory Supplies

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 laboratory blank samples (see Section B5).

B9. NON-DIRECT MEASUREMENTS

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

B10. DATA MANAGEMENT

All data generated as part of this wildfire contingency monitoring plan will be maintained in an OU3-specific Microsoft Access® database in accordance with the OU3-specific data management procedures specified below. The following sections provide a brief overview of the roles and responsibilities for data management and a summary of the data storage requirements for the OU3 project.

B10.1 Roles and Responsibilities

B10.1.1 Field Personnel

Remedium's field contractor will perform all sample collection in accordance with this SAP/QAPP. In the field, sample details will be documented on hard copy media-specific FSDS

forms and in field logbooks. COC information will be documented on hard copy forms.

Because of the opportunistic nature of this sampling program, entry of FSDS forms and COC information into the master OU3 project database will be completed by the OU3 Data Manager (CDM Smith) on a daily basis when sampling is occurring. The field teams are responsible for providing copies of all FSDS forms, COC forms, and field logbooks to the CDM Smith field office in Libby at the end of each sampling day. CDM Smith staff are responsible for scanning and posting (as a pdf) all field documentation to the OU3 eRoom on a daily basis when sampling is occurring.

The OU3 eRoom has controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names for scanned FSDS forms, COC forms, and field logbooks will include the sample date in the format YYYYMMDD to facilitate document organization (e.g., FSDS_20110412.pdf). Electronic copies of all digital photographs and videos will also be posted weekly to the OU3 eRoom.

*****IN THE EVENT OF A WILDFIRE WITH POTENTIAL*****

If the wildfire is deemed to be a "fire with potential" and the *LARP* is initiated, copies of FSDS forms and COC forms should be delivered to the CDM Smith field office in Libby, Montana (60 Port Blvd, Suite 201, Attn: Diane Rode) at the end of each sampling day for data entry into the Libby Scribe project.

B10.1.2 Laboratory Personnel

Each of the laboratories performing asbestos analyses for this investigation are required to utilize all applicable Libby-specific Microsoft Excel® EDD spreadsheets for asbestos data recording and electronic submittals. Upon completion of the appropriate analyses, EDDs and scanned copies of all analytical laboratory data packages will be posted to the OU3 eRoom.

*****IN THE EVENT OF A WILDFIRE WITH POTENTIAL*****

If the wildfire is deemed to be a "fire with potential" and the *LARP* is initiated, upon completion of the analysis, the analytical laboratory will post EDDs to the Libby Laboratory FTP site (which is managed and maintained by EPA's Environmental Services Assistance Team) in the designated "Fire" folders. The EDDs will be uploaded into the Libby Scribe project.

B10.1.3 Database Administrators

Day-to-day operations of the master OU3 project database will be under the control of EPA contractors. The primary database administrator (CDM Smith) will be responsible for sample tracking, entering new field data, uploading new analytical data, performing error checks, and making any necessary data corrections. New records will be added to the master OU3 project database within an appropriate time period of data receipt.

B10.2 Master OU3 Project Database

The master OU3 project database is a relational Microsoft Access® database developed specifically for OU3. The *Libby OU3 Database User's Guide* provides an overview of the master OU3 project database structure and content. The most recent version of this *User's Guide* is provided on the OU3 website.

The master OU3 project database is kept on the CDM Smith server in Denver, Colorado. Incremental backups of the master OU3 project database are performed daily Monday through Friday, and a full backup is performed each Saturday.

*****IN THE EVENT OF A WILDFIRE WITH POTENTIAL*****

If the wildfire is deemed to be a "fire with potential" and the *LARP* is initiated, it is the responsibility of the OU3 Data Manager to ensure field sample information and analytical results that are in the fire-specific Libby Scribe projects are also transferred to the master OU3 project database that is maintained by CDM Smith.

B10.3 Data Reporting

Field summary reports are prepared by Remedium's field contractor. These reports will summarize field collection activities, the number and types of samples collected, as well as any deviations from the governing SAP/QAPP or SOPs. (These field summary reports will not include any analytical results.)

Tabular analytical results summaries are provided by CDM Smith to the EPA RPM on an investigation-specific basis and will be summarized in the *OU3 Data Summary Report* (currently in preparation). The EPA RPM will be responsible for disseminating information regarding sampling and analysis results associated with this wildfire contingency monitoring plan.

B10.4 Data Storage

All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA RPM. At the termination of this project, all original data records will be provided to the EPA RPM for incorporation into the Site project files.

C Assessment and Oversight

C1. ASSESSMENT AND RESPONSE ACTIONS

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

C1.1 Assessments

C1.1.1 Field Oversight

Field oversight activities may be conducted by HDR Engineering, Inc. at the request of EPA. However, due to the opportunistic nature of this sampling effort, it may not be possible to perform formal field audits based on safety considerations and the time needed to mobilize non-local oversight support.

Even if a formal field audit cannot be performed, the field QAM will perform periodic field surveillances to evaluate field staff adherence to investigation-specific governing documents. The schedule for performing field surveillances depends on the duration of the investigation, frequency of execution, and magnitude of process changes. Usually, field surveillances are performed at the beginning of a field investigation to ensure that any potential issues are identified and addressed early, thus reducing the potential for data quality issues. Surveillances will be conducted as necessary when field processes are revised or other QA/QC procedures indicates the possibility of deficiencies. When deficiencies are observed during the surveillances, the field QAM will immediately discuss the observation with the field team member and coordinate corrective measures with the FTL, if required. If the observer finds deficiencies across multiple field team members or teams, the FTL will plan and hold a field meeting. At this meeting, the observations made will be discussed and any corrective actions required (e.g., retraining) will be reviewed.

C1.1.2 Laboratory Oversight

Each laboratory working on the Libby project is required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. These audits are performed by EPA personnel (and their contractors), that are external to and independent of, the Libby 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.

External Audits

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

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

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

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

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this 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 should immediately contact the LC and the QATS contractor if any issues are identified during internal audits that may impact data quality for OU3 samples.

C1.2 Response Actions

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or LC). Major corrective actions will be approved by the EPA RPM and the appropriate manager prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation. The EPA RPM for OU3 will be notified when quality problems arise that that cannot be corrected quickly through routine procedures (contact information is provided below):

Christina Progess
U.S. EPA, Region 8
1595 Wynkoop Street
Denver, CO 80202
Tel: (303) 312-6009
Fax: (303) 312-7151
E-mail: progess.christina@epa.gov

In addition, when modifications to this SAP/QAPP are required, either for field or laboratory activities, a ROM must be completed and approved by the EPA RPM prior to implementation (see **Appendix G** for example ROM forms).

C2. REPORTS TO MANAGEMENT

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

D Data Validation and Usability

D1. DATA REVIEW, VERIFICATION AND VALIDATION

D1.1 Data Review

Data review of project data typically occurs at the time of data reporting by the data users and includes cross-checking that sample IDs and sample dates have been reported correctly and that calculated analytical sensitivities or reported values are as expected. If discrepancies are found, the data user will contact the database manager (CDM Smith), who will then notify the appropriate entity (field or laboratory) in order to correct the issue.

D1.2 Criteria for LA Measurement Acceptability

Several factors are considered in determining the acceptability of LA measurements in samples analyzed by TEM. This includes the following:

1. *Evenness of filter loading.* This is evaluated using a chi-square (CHISQ) test, as described in ISO 10312 Annex F2. If a filter fails the CHISQ test for evenness, the result may not be representative of the true concentration in the sample, and the result should be given low confidence.

2. *Results of QC samples.* This includes both field and laboratory QC samples, such as field and laboratory blank samples, as well as various types of recount and repreparation analyses. If significant LA contamination is detected in field or laboratory blanks, all samples prepared on that day should be considered to be potentially biased high. If agreement between original analyses and re-preparation or recount analyses is poor, results for those samples should be given low confidence.

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.

In the field, some data checking of reported sample information on the FSDS forms is performed during the data entry process (i.e., the electronic data entry forms only allow for the input of specific valid values and formats). In the analytical laboratory, data checking of reported TEM results begins with automatic QC checks that have been built into the Libby-

specific EDD spreadsheets. These automated checks help to ensure that field sample information and TEM results in the project databases are accurate and reliable.

In addition to these automated checks, due to the time-critical nature of this sampling program, a real-time cursory review will be performed for all samples of field sample information that is important for the purposes of data interpretation (e.g., pump start/stop times and flows, sample volume estimates, field QC type, station location) in basic accordance with Libby-specific SOP EPA-LIBBY-11, *SOP for FSDS Data Review and Data Entry Verification*. Any field sample information errors identified will be immediately rectified by the field teams and corrected in the project database. Because of the time-sensitive nature of these data and the level of effort needed to perform a formal TEM data verification evaluation, only a cursory review of analytical results will be performed in real-time. All reported analytical results will be reviewed for apparent inconsistencies, unexpected values, and omissions. Any analytical errors identified will be immediately rectified by the laboratory and a corrected EDD will be submitted for upload to the project database. These real-time cursory reviews will be performed by appropriate CDM Smith staff familiar with project-specific data reporting, analytical methods, and investigation requirements.

It is anticipated that 30% of all TEM analytical results will undergo formal data verification at a later date in accordance with Libby-specific SOP EPA-LIBBY-09, *SOP for TEM Data Review and Data Entry Verification*. The data verifier (CDM Smith) 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 OU3 Data Manager. It is the responsibility of the OU3 Data Manager (or their designee) 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 master OU3 project database will track 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. Data validation will be performed by the QATS contractor (CB&I, or their designee), with support from technical support staff that are familiar with project-specific data reporting, analytical methods, and investigation requirements.

As part of the data validation effort, the QATS contractor will review results for all field QC samples and inter- and intra-laboratory QC analyses on a quarterly basis. In addition, the QATS contractor will also perform a formal data validation of the TEM data packages submitted by the laboratory in accordance with Libby-specific SOP QATS-70-095-01, which was developed by

the QATS contractor based on the draft *National Functional Guidelines for Asbestos Data Review* (EPA 2011b). This data validation includes 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
- Inter-laboratory analysis results
- Performance evaluation results
- Instrument checks and calibration results
- Data verification results (i.e., in the event that the verification effort identifies a larger data quality issue)

Because of the serious nature of a fire in OU3 and the high probability of the data being used to make important public health decisions by other agencies, data validation will be performed on 30% of all data packages submitted by the laboratory in support of this project.

Data validation results will be reported in a technical memorandum submitted annually to EPA. This technical memorandum shall detail the validation procedures performed and provide a narrative on the quality assessment for each type of asbestos analysis, including the data qualifiers assigned, and the reason(s) for these qualifiers. The technical memorandum shall detail any deficiencies and required corrective actions.

For OU3 reviews, electronic files summarizing the records that have been validated, the date they were validated, any recommended data qualifiers and their associated reason codes should be posted to the OU3 eRoom. It is the responsibility of the OU3 database manager (CDM Smith) 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 regular data validation efforts, it is the responsibility of the QATS contractor (or their designee) to perform regular evaluations of all blanks, to ensure that any potential contamination issues are quickly identified and resolved. If any blank results are outside the acceptable limits, the QATS contractor should immediately contact the EPA RPM to ensure that appropriate corrective actions are made.

D3. RECONCILIATION WITH USER REQUIREMENTS

Once all samples have been collected and analytical data has been generated, data will be evaluated to determine if study objectives were achieved. It is the responsibility of data users to perform a data usability assessment to ensure that DQOs have been met, and reported investigation results are adequate and appropriate for their intended use. This data usability assessment should utilize results of the data verification and data validation efforts to provide information on overall data quality specific to each investigation.

The data usability assessment should evaluate results with regard to several data usability indicators, including precision, accuracy/ bias, representativeness, comparability, completeness, and whether specified analytic requirements (e.g., sensitivity) were achieved. **Table D-1** provides detailed information for how each of these indicators may be evaluated for the reported asbestos data. The data usability assessment results and conclusions should be included in any investigation-specific data summary reports.

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

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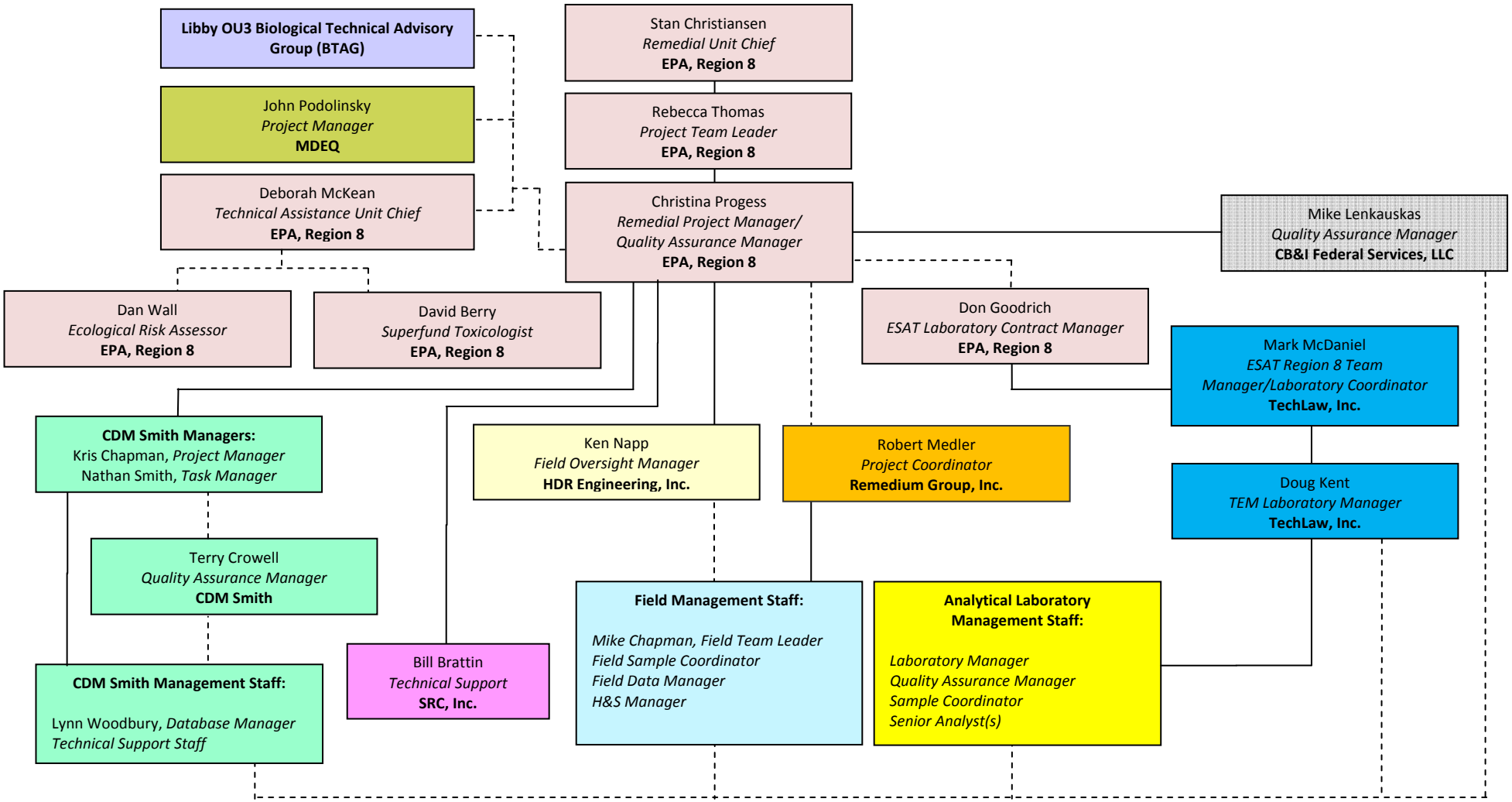

FIGURE A-1. OU3 ORGANIZATIONAL CHART FOR THE LIBBY OU3 WILDFIRE CONTINGENCY MONITORING PLAN

EPA Region 8 Staff
CDM Smith Staff
HDR Staff
SRC Staff
Lines of authority
Remedium Staff
Remedium Subcontractors
OU3 BTAG
TechLaw Subcontractors
Lines of communication
MDEQ Staff
CB&I Staff
TechLaw Staff

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Libby Asbestos Superfund Site
Operable Unit 3 (Study Area)

OU 3 (Study Area) - Mine & Kootenai River

Date: October 7, 2010

Map Projection: UTM, Meters, Zone 11N, NAD83

Data Sources: *Operable Units* - U.S. EPA Region 8 (2010);
Imagery - 1-meter USDA NAIP (2009).

0 1 2 Miles

0 1 2 Kilometers

N

EPA REGION 8 serving the states & tribes of Colorado, Montana, Wyoming, Utah, North Dakota & South Dakota

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OU 3

2

Troy

Kootenai River

OU 3

2

Quartz Creek

Cedar Creek

Pipe Creek Rd

Kootenai River Rd

37

Kootenai River

OU 3

2

Purcell Creek

Flower Creek

Libby

Rainey Creek

OU 3

Lake Koocanusa

37

Kootenai River

2

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Path: \\dengissvr1\LibbyGIS\85158-OU3\3120.001-RA\GIS\MXD\FigB-1_MonitoringLocations.mxd

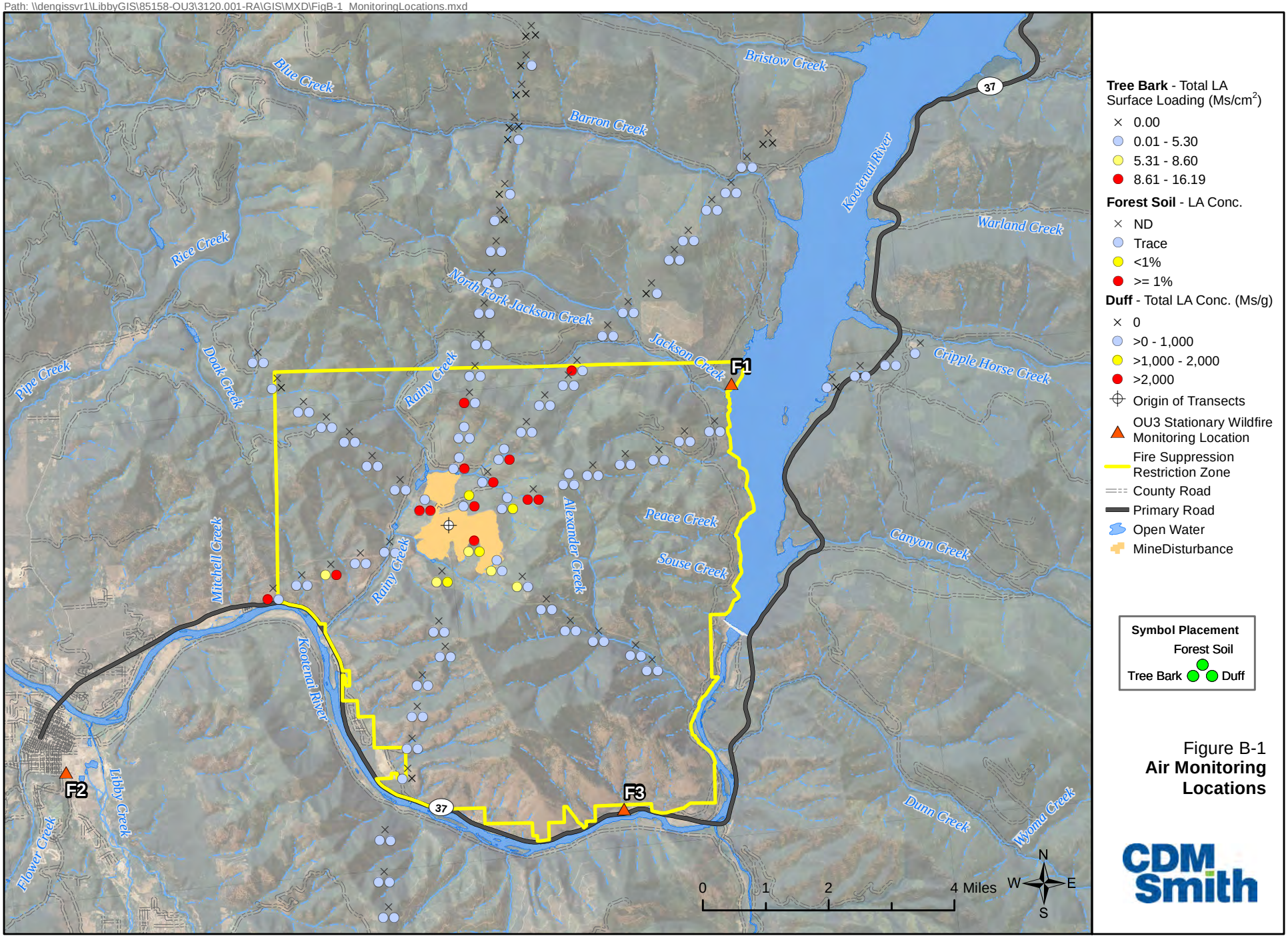

Figure B-1
Air Monitoring Locations

CDM Smith

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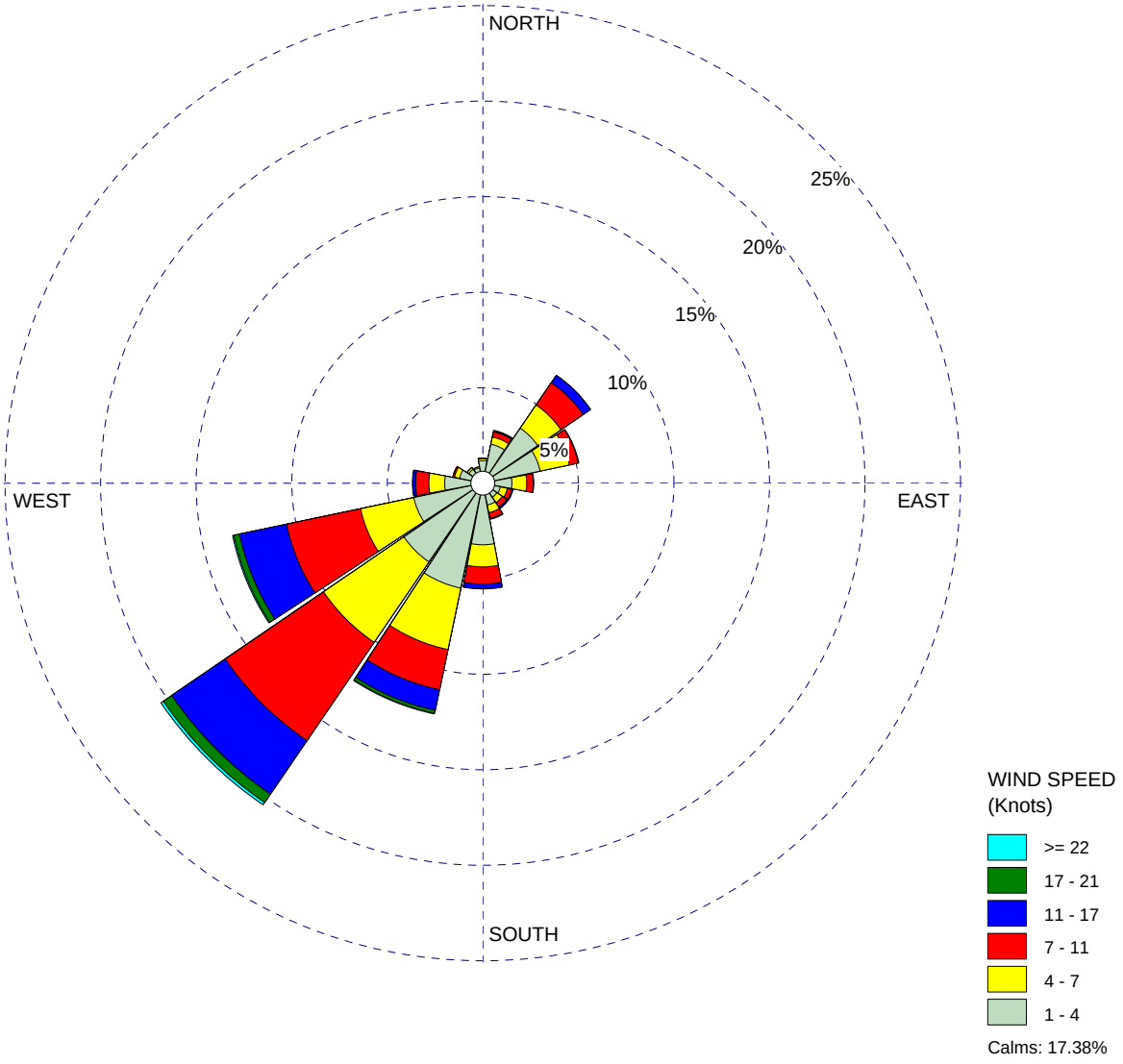
WIND ROSE PLOT:

Figure B-2
WindRose for Zonolite Mountain, Libby, MT

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **Start Date: 1/4/2007 - 00:00** **End Date: 8/20/2013 - 08:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **17.38%**	TOTAL COUNT: **54074 hrs.**	
	AVG. WIND SPEED: **4.67 Knots**	DATE: **8/20/2013**	PROJECT NO.:

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TABLE B-1
OVERVIEW OF THE OU3 WILDFIRE CONTINGENCY MONITORING PLAN STUDY DESIGN AND SAMPLING PRIORITIES

Panel A: Air Samples

Sampling Effort	Priority	Sampling location	Sample collection duration	Target flow rate (L/min)	Sampling frequency	Analysis Method	Analysis TAT**
Ambient Air Monitoring	**3 or 6***	**F1:** McGillivray campground	24-hour	2.0	Continue collection of 24-hour samples for as long as smoke from the fire continues to reach the community	TEM-ISO, low mag/PCME only **[OU3FIRE-0813, Media Code A]**	24-hours
	1	**F2:** CDM Smith field office	24-hour	2.0			
	3 or 6*	**F3:** U.S. Forest Service Canoe Gulch Ranger Station	24-hour	2.0			
	5	**Mobile station:** downwind of fire	4-hour	2.0	1-2 mobile samples per day; 8-10 mobile samples per wildfire event		
Aircraft Cockpit Monitoring	**2**	**Aircraft cockpit**	One full "re-fueling cycle"	2.0	2 samples per wildfire event; each representative of one full "re-fueling cycle"	TEM-ISO, low mag/PCME only **[OU3FIRE-0813, Media Code B]**	24-hours, or ASAP
Firefighter ABS	**4**	**Near ground-based firefighter**	60-minute	2.0	3-6 ABS samples per person (for 2 people) per wildfire event	TEM-ISO, low mag/PCME only **[OU3FIRE-0813, Media Code C]**	24-hours, or ASAP

* Closest fixed station to the fire should be given priority

** TAT may change per direction from the ESAT laboratory coordinator

TABLE B-1 (cont.)
OVERVIEW OF THE OU3 WILDFIRE CONTINGENCY MONITORING PLAN STUDY DESIGN AND SAMPLING PRIORITIES

Panel B: Field Quality Control Samples for Air

Sample Type	Collection frequency	Analysis Method	Analysis TAT
Lot blank	2 blanks per lot; prior to lot use	TEM-ISO, high mag **[OU3FIRE-0813, Media Code D]**	**
Field blank	1 field blank per 2 days of sampling	TEM-ISO, high mag **[OU3FIRE-0813, Media Code D]**	24-hours, or ASAP**

** Per direction from the ESAT laboratory coordinator

Panel C: Ash Samples

Sample Type	Collection frequency	Analysis Method	Analysis TAT
Post-fire Ash	1 5-gallon bucket of ash across the burn area	TEM-ISO, high mag **[OU3FIRE-0813, Media Code E]**	**

** Per direction from the ESAT laboratory coordinator

TABLE D-1
DATA USABILITY INDICATORS FOR ASBESTOS DATASETS

Data Usability Indicator	General Evaluation Method
Precision	Review results for TEM recounts and repreparations to provide information on variability arising from analysis methods. Review results for inter-laboratory analyses to provide information on variability and potential bias between laboratories.
Accuracy/Bias	Calculate the background filter loading rate and use results to assign detect/non-detect in basic accordance with ASTM 6620-00. For air samples, determine the frequency of indirect preparation.
Representativeness	Review relevant field audit report findings and any field/laboratory ROMs for potential data quality issues.
Comparability	Compare the sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Determine the percent of samples that were able to be successfully collected and analyzed (e.g., 99 of 100 samples, 99%).
Sensitivity	Determine the fraction of all analyses that stopped based on the area examined stopping rule (i.e., did not achieve the target sensitivity).

ASTM = American Society of Testing and Materials
LA = Libby amphibole
QATS = Quality Assurance Technical Support
ROM = record of modification
SOP = standard operating procedure
TEM = transmission electron microscopy

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APPENDIX A

DATA QUALITY OBJECTIVES FOR THE OU3 WILDFIRE CONTINGENCY MONITORING PLAN

Data quality objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The following sections implement the seven-step DQO process (EPA 2006) for the wildfire contingency monitoring plan for Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site.

Step 1: State the Problem

The Phase I remedial investigation for OU3 included the collection of data on levels of Libby amphibole (LA) in tree bark, duff, and forest soils within the Kootenai National Forest surrounding the vermiculite mine. The Phase I data indicate that LA was detected by polarized light microscopy (PLM) in soil at distances up to 2 miles from the mine in the downwind direction. LA was detected by transmission electron microscopy (TEM) in samples of tree bark and duff in downwind, cross wind, and upwind directions at distances from 3 to 7.5 miles from the mine. There was general tendency for the highest levels detected in tree bark, duff, and soil samples to occur within about 2 to 3 miles of the mined area.

As stated in the *Framework for Investigating Asbestos-Contaminated Superfund Sites* (EPA 2008d), asbestos fibers in source materials are typically not inherently hazardous, unless the asbestos is released from the source material into air where it can be inhaled. If inhaled, asbestos fibers can increase the risk of developing lung cancer, mesothelioma, pleural fibrosis, and asbestosis. Thus, the evaluation of risks to humans from exposure to asbestos is most reliably achieved by the collection of data on the level of asbestos in breathing zone air. Forest fires may cause the release of LA from tree bark and duff and firefighter suppression efforts could also result in the disturbance of LA in source materials releasing them to the air. Therefore, air monitoring is necessary to evaluate potential human exposures to airborne LA due to wildfires in OU3.

In addition, trial burn experiments in wood stoves (Ward *et. al* 2009) and in test burn chambers (EPA 2012) indicate that the majority of LA fibers are retained in the ash when wood and duff materials are burned under experimental conditions. Thus, it is possible that the resulting ash from a wildfire event in OU3 could contain concentrated levels of LA and also act as a potential source material. Measurements of LA in ash following a wildfire can provide information on whether ash might become a subsequent source of human or ecological exposure.

Step 2: Identify the Goal of the Study

The primary goal of this study is to measure LA concentrations in air during an authentic wildfire in OU3 that may be used to estimate potential exposures to LA from wildfires in OU3.

The EPA will use the exposure assessment in an evaluation of potential long-term risks to human health as part of the human health risk assessment. If risk levels are above a level of potential concern, then response actions may be needed to protect people from unacceptable risks from LA in air that are attributable to wildfires in OU3.

A secondary goal of this study is to measure LA concentrations in ash following a wildfire in OU3 that may be used to provide information on the potential for subsequent exposures to human or ecological receptors. Mitigation measures may be necessary to try to minimize potential affects, depending upon the level of LA in ash.

Step 3: Identify Information Inputs

Air Concentration Data

The principal type of data needed to characterize exposure of individuals to LA in air during a wildfire in OU3 consists of reliable and representative measurements of LA concentrations in air during an authentic wildfire in OU3. Such measurements are obtained by drawing a known volume of air through a filter during a forest fire and measuring the number of LA fibers that become deposited on the filter surface.

There are three different populations that could be exposed to LA during a wildfire in OU3:

- In the event that a wildfire in OU3 generates significant levels of smoke in the Libby community, local residents and workers could be exposed to LA in ambient air.

- If a wildfire in OU3 requires aerial fire suppression support, aircraft pilots could be exposed to LA in smoke above the wildfire.

- If a wildfire in OU3 requires the use of ground-based firefighters, these firefighters could be exposed to LA in smoke, as well as LA in air due to the disturbance of LA-contaminated soil, duff, and tree bark.

The information needed to quantify potential exposures for each population is discussed below.

Ambient Air Exposure Monitoring

Monitoring of ambient air for LA can be achieved by collecting two types of data – stationary air samples in the community of Libby and mobile air samples downwind of the wildfire.

1. Stationary air samples should be collected in and about the community of Libby when smoke from a fire in OU3 is reaching the community. This type of data provides a direct measure of human exposure to LA in smoke. However, collection of these data is

contingent upon the occurrence of a fire in OU3 that generates smoke that reaches the community.

2. Mobile air samples should be collected downwind of the fire (regardless of the direction that smoke is blowing). These data are valuable because the measured levels of LA in smoke can be used to model (predict) the levels of LA that would occur for first responders and firefighters that may be in closer proximity to the fire.

Aircraft Cockpit Exposure Monitoring

The monitoring of potential pilot exposures from exposure to LA should be achieved by collecting air samples that are representative of air within the cockpit of the air support craft that is responding to a wildfire in OU3. This type of data provides a direct measure of potential pilot exposure to LA.

Firefighter Exposure Monitoring

The monitoring of potential firefighter exposures from exposure to LA should be achieved by collecting air samples that are representative of air within the breathing zone of a firefighter that is responding to a wildfire in OU3. This type of data provides a direct measure of potential firefighter exposure to LA.

Ash Concentration Data

Reliable and representative measurements of LA concentrations in ash following a wildfire in OU3 are needed to inform decisions on the need for mitigation measures in the burn area to limit potential LA exposure and migration. Such measurements are obtained by collecting samples of ash from across the burn area following a forest fire and measuring the number of LA fibers that are present in the ash material.

Other Data

In addition to measured air concentrations of LA, data on wind speed and direction are needed in order to help evaluate the collected air data and for use in modeling potential air concentrations in locations that were not sampled.

Because air concentration data will be used to estimate potential exposures and risks to each population, data are also needed on the frequency and duration that each population could be exposed to LA due to a wildfire in OU3. For example, for firefighters, this includes data on the exposure time (hours per day), exposure frequency (days per fire and fires per year), and exposure duration (years) spent as a firefighter in OU3. In order to calculate potential human health risks from inhalation exposures, appropriate toxicity values for both cancer and non-

cancer effects are needed. The toxicity value used to evaluate cancer risk is the inhalation unit risk (IUR), and the toxicity value used to evaluate non-cancer risks is the reference concentration (RfC). EPA has recently released draft LA-specific IUR and RfC values. These values are currently being revised based on comments received during the inter-Agency and external peer review process.

Analysis Method

Air and ash samples should be analyzed for asbestos using TEM, because this analytical method has the ability to distinguish asbestos from non-asbestos and to characterize the type of asbestos present. Because asbestos toxicity depends on the particle size and mineral type, results should include the size attributes (length, width) of each asbestos structure observed, along with the mineral classification (LA, other amphibole, chrysotile). Additionally, based on the observation by Meeker *et al.* (2003) that amphibole structures containing sodium and potassium in the EDS spectra are characteristic of the types of fibers that originated from the vermiculite ore deposit at the Libby mine, the presence/absence of sodium and/or potassium should be recorded for all amphibole structures.

Structure counting and recording rules utilized during the TEM analysis of air samples must allow for the determination of the number of phase contrast microscopy-equivalent (PCME) structures, because this is the required metric of air concentration for the purposes of comparison to the LA-specific toxicity values[9].

Step 4: Define the Bounds of the Study

Spatial Bounds

This sampling plan should only occur in the event of a wildfire within the boundary of OU3 (see **Figure B-1** in the main text). Firefighter and pilot monitoring data should only be collected while responding to forest fires within OU3. Ash samples should only be collected from burn areas located within OU3.

Ambient air monitoring data should be collected from locations surrounding OU3 that have been selected to be representative of areas with a high potential for human exposure to smoke from wildfires within OU3. The strategy for selection of sampling locations is based mainly on selecting areas that would be representative of residential exposure. Stationary air samples should be collected in and about the community of Libby when smoke from a fire in OU3 is

[9] Calculations of human exposure and risk from asbestos in air are expressed in terms of phase contrast microscopy (PCM) s/cc. When analysis is performed by TEM, structures that satisfy PCM counting rules are referred to as PCM-equivalent (PCME) structures. The PCM counting rules include structures with a length > 5 micrometers (µm), a width greater than or equal to (≥) 0.25 µm, and an aspect ratio (length: width) ≥ 3:1.

reaching the community. In addition, mobile air samples should be collected downwind of the fire (regardless of the direction that smoke is blowing).

Temporal Bounds

Because the goal of the study is to monitor air during authentic wildfires, there are no established temporal bounds. That is, samples should be collected whenever significant wildfires occur in OU3. Based on U.S. Forest Service (USFS) records, fires are most likely to occur during the dry summer months (typically July, August, and September). [Note: This may include any controlled burns conducted by the USFS, as may be appropriate.]

Step 5: Define the Analytic Approach

Approach for Air Samples

The primary purpose of this data collection effort is to collect data to inform EPA decision-making about what response actions, if any, are needed to protect human receptors from unacceptable long-term exposures and risks from LA in air resulting from wildfires in OU3. To support this evaluation, air monitoring results will be used to estimate an exposure point concentration (EPC). The EPC will be calculated as the mean concentration, treating non-detect values at zero, as recommended by EPA (2008c). This EPC will be combined with assumptions about exposure frequency and duration and toxicity factors for LA to calculate cancer risks and non-cancer hazard quotients (HQs) that are expected to provide a basis for the EPA to determine, in consultation with Montana Department of Environmental Quality (MDEQ), whether response action is needed within OU3 to protect human health.

Data collected as part of this study may be used by other agencies (e.g., Lincoln County, USFS) to inform decisions and response actions during a wildfire in OU3. In the event of a "wildfire with potential", this data may be used by Lincoln County to determine short-term public health impacts to residents from inhalation of LA-contaminated smoke and take appropriate actions to mitigate these impacts. There are no formally specified criteria or levels of health concern that have been established for the purposes of evaluating potential short-term exposures to LA in ambient air from wildfires.

Risk Calculation Approach

As noted above, the EPA has recently proposed draft LA-specific toxicity values for use in estimating non-cancer HQs and cancer risks from exposures to LA in air. The lifetime RfC_{LA} value is 0.00002 phase contrast microscopy (PCM) structures per cubic centimeter (s/cc) and the lifetime IUR_{LA} value is 0.17 PCM $(s/cc)^{-1}$ (EPA 2011c). The EPA is currently reviewing these values. Basic methods for estimating human health risk from LA in air are provided below.

Estimation of Cancer Risk

The basic equation for estimating cancer risk from LA using the LA-specific IUR value is as follows:

$$Risk = EPC * TWF_c * IUR_{LA}$$

where:

Risk = Lifetime excess risk of developing cancer (lung cancer or mesothelioma) as a consequence of site-related LA exposure.

EPC = Exposure point concentration of LA in air (PCM or PCM-equivalent [PCME] s/cc). The EPC is an estimate of the long-term average concentration of LA in inhaled air for the specific activity being assessed.

TWF_c = Time-weighting factor for cancer. The value of the TWF term ranges from zero to one, and describes the average fraction of a lifetime during which exposure occurs from the specific activity being assessed:

$$TWF = ET/24 * EF/365 * ED/70$$

where:

ET = Average exposure time (hrs/day)
EF = Average exposure frequency (days/year)
ED = Exposure duration (years)

IUR_{LA}= LA-specific lifetime inhalation unit risk (LA PCM s/cc)$^{-1}$

Estimation of Non-Cancer Hazard Quotient

The basic equation for characterizing non-cancer risk from LA using the LA-specific RfC value is as follows:

$$HQ = EPC * TWF_{nc} / RfC_{LA}$$

where:

HQ = Hazard quotient for non-cancer effects from site-related LA exposure

EPC = Exposure point concentration of LA in air (PCM or PCME s/cc)

TWF_{nc} = Time-weighting factor for non-cancer . Because the RfC incorporates a lag of 10 years, the duration of a lifetime is assumed to be 60 rather than the usual 70 years which is calculated as:

TWF = ET/24 * EF/365 * ED/60

where:

ET = Average exposure time (hrs/day)

EF = Average exposure frequency (days/year)

ED = Exposure duration (years)

RFC_{LA} = LA-specific lifetime reference concentration (LA PCM s/cc)

Decision Rule

The EPA guidance provided in Office of Solid Waste and Emergency Response (OSWER) Directive #9355.0-30, "*Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*" (EPA 1991) indicates that if the cumulative cancer risk to an individual based on reasonable maximum exposure (RME) is less than 1E-04 and the non-cancer HQ is less than 1, then remedial action is generally not warranted unless there are adverse environmental impacts. The guidance also states that a risk manager may decide that a risk level lower than 1E-04 is unacceptable and that remedial action is warranted where there are uncertainties in the risk assessment results.

Approach for Ash Samples

As noted above, a secondary goal of this study is to measure LA concentrations in ash following a wildfire in OU3 that may be used to provide information on the potential for subsequent exposures to human or ecological receptors. If LA concentrations in ash are high, then mitigation measures may be necessary to try to minimize potential affects. There are no established thresholds for LA levels in ash that can be used to determine the need for mitigation. It is anticipated that LA levels in ash will be compared to levels measured in ash and soil at other Site locations to help inform decision-making.

Step 6: Specify Performance Criteria

In making decisions about the risks to humans, two types of decision errors are possible:

- A *false negative decision error* would occur if a risk manager decides that exposure to LA is not of health concern, when in fact it is of concern.

- A *false positive decision error* would occur if a risk manager decides that exposure to LA is above a level of concern, when in fact it is not.

The EPA is most concerned about guarding against the occurrence of false negative decision errors, since an error of this type may leave humans exposed to unacceptable levels of LA. To minimize chances of underestimating the true amount of exposure and risk, the EPA generally recommends that risk estimations be based on the 95 percent upper confidence limit (95UCL) of the sample mean (EPA 1992). Use of the 95UCL in risk calculations limits the probability of a false negative decision error to no more than 5 percent. To support this approach, the EPA has developed a software application (ProUCL) to assist with the calculation of 95UCL values (EPA 2010b). However, equations and functions in ProUCL are not designed for asbestos datasets and application of ProUCL to asbestos datasets is not recommended (EPA 2008c). Because the 95UCL cannot presently be calculated with confidence, EPCs will be based on the sample arithmetic mean only, as recommended by EPA (2008c). This means that resulting risk estimates may be either higher or lower than true values, and this will be identified as a source of uncertainty in the risk assessment.

The EPA is also concerned with the probability of making false positive decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. The risk of false positive decision errors can be minimized by increasing the number of samples. However, due to the opportunistic nature of this sampling program, the number of samples that will be collected cannot be controlled and will depend upon the frequency and duration of authentic wildfires in OU3. The goal should be to collect multiple air samples during each wildfire event and to monitor air concentrations over multiple wildfire events to ensure long-term representativeness.

Step 7: Develop the Plan for Obtaining Data

A detailed study design for the collection of samples for the OU3 wildfire contingency monitoring plan is provided in Section B1 of this SAP/QAPP. Key features of this study design are discussed below.

<u>Selection of Stationary Air Sampling Locations</u>

The ambient air monitoring plan includes the collection of ambient air samples at several fixed stationary air monitoring stations surrounding OU3. These fixed stationary air monitoring stations are located at the camping area at McGillivray Access, the Libby CDM Smith office, and at the U.S. Forest Service Canoe Gulch Ranger Station along Highway 37. In addition, one mobile air monitoring station will be deployed downwind of the fire. Air sampling at the three

fixed monitoring stations will not occur except during times that a fire is burning in OU3, and smoke from the fire is reaching the vicinity of one or more of the fixed monitors. If deemed necessary to support risk management decisions, additional air monitoring locations may be warranted.

Optimizing the Sample Collection Strategy

Key variables that may be adjusted during collection of air samples are sampling duration and pump flow rate. The product of these two variables determines the amount of air drawn through the filter, which in turn is an important factor in the analytical cost and feasibility of achieving the target analytical sensitivity (TAS). In general, longer sampling times are preferred over shorter sampling times because a) longer time intervals are more likely to yield representative measures of the average concentration (as opposed to short-term fluctuations), and b) longer collection times are associated with higher volumes, which makes it easier to achieve the TAS. Likewise, higher flow rates are generally preferred over lower flow rates because high flow results in high volumes drawn through the filter over shorter sampling times.

However, there is a limit to how much air can be drawn through a filter. In cases where the air being sampled contains a significant level of airborne particulates, it is possible that particulate loading on the filter could influence the ability to maintain the optimal flow rate. To minimize this possibility, pump flow rates should be checked regularly throughout the collection period and filter cassettes should be changed if flow rates become impacted.

Analytical Requirements for Air Samples

In general, three alternative stopping rules are specified for TEM analyses to ensure resulting data are adequate:

1. The TAS to be achieved
2. A maximum number of asbestos structures to be counted
3. A maximum area of filter to be examined

The basis for each of these values for this study is presented below.

Target Analytical Sensitivity

The level of analytical sensitivity needed to ensure that analysis of air samples will be adequate is derived by finding the concentration of LA in air that might be of potential concern, and then ensuring that if an air sample were encountered that had a true concentration equal to that level of concern, it would be quantified with reasonable accuracy. This process is implemented below:

Step 1. Calculation of Risk-Based Concentrations

Cancer. The basic equation for calculating the risk-based concentration (RBC) for cancer is:

$$RBC(cancer) = Maximum\ Acceptable\ Cancer\ Risk\ /\ (TWF_c * IUR_{LA})$$

For cancer, the maximum acceptable risk is a risk management decision. For the purposes of calculating an adequate TAS, a value of 1E-05 is assumed.

The exposure parameters needed to calculate time-weighting factor (TWF) are not known with certainty, so the following exposure parameters were selected based on professional judgment with input from USFS:

Population	Exposure Time (hours/day)	Exposure Frequency (days/year)	Exposure Duration (years)	TWF_c	TWF_{nc}
Libby community	24	3[b]	46[d]	0.0054	0.0063
Firefighters	13[a]	10[c]	25[e]	0.0053	0.0062
Pilots	4	10[c]	25	0.0016	0.0019

[a] Based on USFS data: 13-hour shift (9 hours on fireline, 4 hours in camp)
[b] Assumption: 3 days/year where smoke from a fire in OU3 reaches the community
[c] Assumption: 5 fires/year in OU3 with each fire lasting 2 days
[d] Based on EPA Exposure Factors Handbook (Table 16-90): 95th percentile = 46 years
[e] Based on USFS input: firefighter working lifetime = 25 years

Based on these exposure parameters, the RBCs for cancer are:

- Libby community (ambient air): 0.011 PCME s/cc
- Firefighters: 0.011 PCME s/cc
- Pilots: 0.036 PCME s/cc

Non-Cancer. The basic equation for calculating the RBC for non-cancer effects is:

$$RBC(non\text{-}cancer) = (Maximum\ Acceptable\ HQ * RfC_{LA}) / TWF_{nc}$$

For non-cancer, the maximum acceptable HQ is 1. For the purposes of deriving analytical requirements, an RfC value of 0.00005 PCM s/cc is used[10]. Based on the exposure parameters presented above, the RBCs for non-cancer are:

[10] It is recognized that this RfC differs from the proposed draft value, but this value is used to limit analytic effort while the LA-specific toxicity values are being reviewed. Once the LA-specific RfC value is finalized, the achieved analytical sensitivities will be reviewed to ensure resulting data are adequate to support decision-making.

- Libby community (ambient air): 0.0079 PCME s/cc
- Firefighters: 0.0081 PCME s/cc
- Pilots: 0.026 PCME s/cc

Because the non-cancer RBCs are lower than the cancer RBCs, the non-cancer RBCs are used to derive the TAS. ***It is important to note that these RBCs are based on a long-term chronic exposure scenario, <u>not</u> an acute scenario.***

<u>Step 2: Determining the Target Analytical Sensitivity</u>

The TAS is determined by dividing the RBC by the target number of asbestos structures to be observed during the analysis of a sample with a true concentration equal to the RBC:

TAS = RBC / Target Count

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

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

Assuming a minimum detection frequency of 95%, the target count is 3 PCME LA structures. Based on this, the TAS for each type of air sample is as follows:

- Libby community (ambient air): 0.0026 cc^{-1}
- Firefighters: 0.0027 cc^{-1}
- Pilots: 0.0088 cc^{-1}

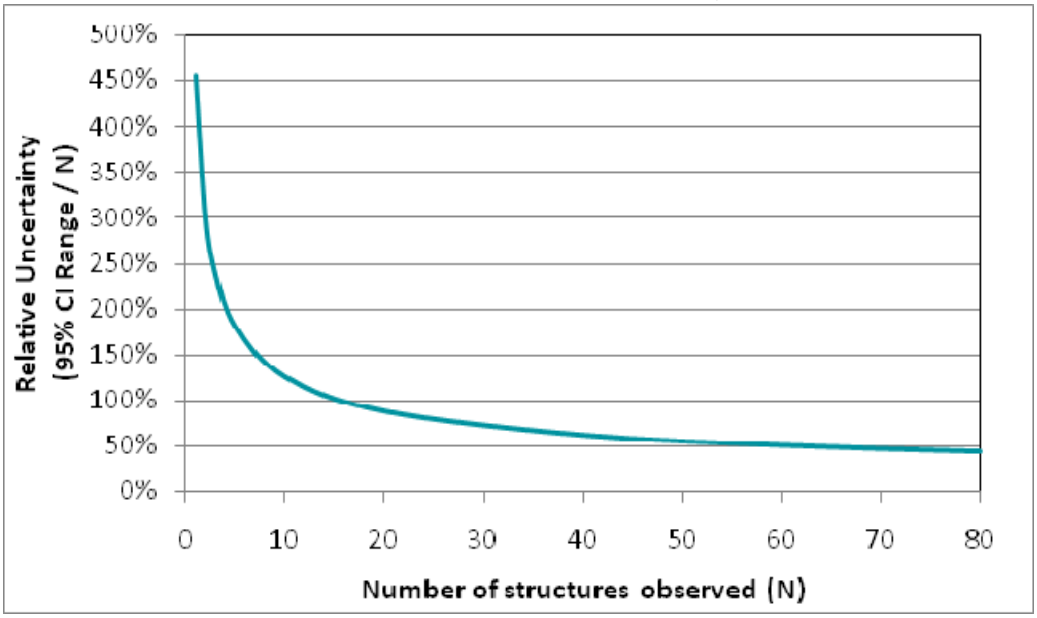
Maximum Number of LA Structures

Ideally, all samples would be examined by TEM until the TAS is achieved. However, for filters that have high asbestos loading, reliable estimates of concentration may be achieved before achieving the TAS. 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 95% Poisson confidence interval (CI) around a count of N structures is computed as follows:

Lower bound (2.5%) = ½ * CHIINV(0.975, 2 * $N_{observed}$ + 1)
Upper bound (97.5%) = ½ * CHIINV(0.025, 2 * $N_{observed}$ + 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 the figure below.

Relationship Between the Number of Structures Observed and Relative Uncertainty



CI = confidence interval

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 the figure, 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 PCME LA structures.

Maximum Area to be Examined

The number of grid openings that must be examined (GOx) to achieve the TAS in an air sample is calculated as:

$$GOx = EFA / (TAS \cdot Ago \cdot V \cdot 1000 \cdot f)$$

where:

EFA = Effective filter area (assumed to be 385 mm^2)
TAS = Target analytical sensitivity $(cc)^{-1}$
Ago = Grid opening area (assumed to be 0.01 mm^2)
V = Sample air volume (L)
1000 = L/cc (conversion factor in L/cc)
f = Indirect preparation dilution factor (assumed to be 1 for direct preparation)

As shown, if an indirect preparation is necessary, the GOx is inversely proportional to the dilution needed (i.e., an f-factor of 0.1 will increase the GOx by a factor of 10). If the f-factor is very small, it is possible that the GOx to achieve the TAS may be cost or time prohibitive. In

order to limit the maximum effort expended on any one sample, a maximum filter area examined of 5.0 mm^2 is identified for this project. Assuming that each grid opening has an area of about 0.01 mm^2, this would correspond to about 500 grid openings.

Summary of TEM Stopping Rules

The TEM stopping rules for air samples should be as follows:

1. Examine a minimum of two grid openings from each of two grids.
2. Continue examining grid openings until one of the following is achieved:
    a. The TAS is achieved:
        - Libby community (ambient air): 0.0026 cc^{-1}
        - Firefighters: 0.00278 cc^{-1}
        - Pilots: 0.0088 cc^{-1}
    b. 25 PCME LA structures have been observed.
    c. A total filter area of 5.0 mm^2 has been examined.

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

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APPENDIX B

STANDARD OPERATING PROCEDURES (SOPs)

Panel A: Field SOPs[a]

SOP ID	SOP Description
OU3 SOP No. 1	Soil Sampling for Non-Volatile Chemicals
OU3 SOP No. 7	Equipment Decontamination
OU3 SOP No. 8	Sample Handling and Shipping
OU3 SOP No. 9	Field Documentation
OU3 SOP No. 11	GPS Data Collection
OU3 SOP No. 12	Investigation Derived Waste (IDW) Management
EPA-LIBBY-2012-10	Air Sample Collection

Panel B: Laboratory SOPs[b]

SOP ID	SOP Description
EPA-LIBBY-08	Indirect Preparation of Samples for TEM Analysis
EPA-LIBBY-2012-11	Sampling and Analysis of Duff for Asbestos

Panel C: Data Verification/Validation SOPs[a]

SOP ID	SOP Description
EPA-LIBBY-09	TEM Data Review and Data Entry Verification
EPA-LIBBY-11	FSDS Data Review and Data Entry Verification
QATS-70-095-01	Validation of Libby TEM Data Deliverables

[a] The most recent versions of all field SOPs are provided electronically in the OU3 eRoom *(https://team.cdm.com/eRoom/mt/LibbyOU3)*.

[b] The most recent versions of all laboratory and data verification/validation SOPs are provided electronically in the Libby Lab eRoom *(https://team.cdm.com/eRoom/mt/LibbyLab)*.

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APPENDIX C

FIELD SAMPLE DATA SHEET (FSDS)**

***The most recent versions of FSDS forms are provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3).*

LIBBY OU3 FIELD SAMPLE DATA SHEET (FSDS)

FIREFIGHTER PERSONAL AIR MONITORING

Location Comments: _____

_____

_____

Sampling Date (mm/dd/yy): _____ Sampler Initials: _____

Pump ID: _____ Target Flow Rate: _____L/min

GPS Coordinates: X coord: _____ Y coord:_____ Elevation:_____m

Data Item	Cassette 1	Cassette 1	Cassette 1
Index ID	*[affix label here]*	*[affix label here]*	*[affix label here]*
Start Time (hh:mm)			
Stop Time (hh:mm)			
Pump fault?	Yes No	Yes No	Yes No
Sample Air Volume (L)			
Sample Comments			

Data Item	Cassette 4	Cassette 5	Cassette 6
Index ID	*[affix label here]*	*[affix label here]*	*[affix label here]*
Start Time (hh:mm)			
Stop Time (hh:mm)			
Pump fault?	Yes No	Yes No	Yes No
Sample Air Volume (L)			
Sample Comments			

Note: Sample Air Volume does not need to be completed in the field.

For Data Entry Completion (Provide Initials)	Completed by:	QC by:

Sheet No.: AA2-_____

LIBBY OU3 FIELD SAMPLE DATA SHEET (FSDS) rev2
STATIONARY AMBIENT AIR MONITOR

☐ Check box if GPS information has been recorded previously

Field Logbook No: _____ Page No: _____

Station ID: _____ Station Comments: _____

GPS Coordinate System: UTM Zone 11 North, NAD83 datum, meters

X coord: _____ Y coord: _____ Elevation: _____m

Sampling Team: _____ Sampler Initials: _____

Data Item	Cassette 1	Cassette 2	Cassette 3
Index ID	*AFFIX LABEL HERE*	*AFFIX LABEL HERE*	*AFFIX LABEL HERE*
Sample Height (ft)			
Location Description			
Field QC Type (circle)	FS-(field sample) FB-(field blank) FD-(field dup) For FD, Parent ID: _____	FS-(field sample) FB-(field blank) FD-(field dup) For FD, Parent ID: _____	FS-(field sample) FB-(field blank) FD-(field dup) For FD, Parent ID: _____
Matrix Type	Outdoor	Outdoor	Outdoor
Flow Meter Type	Rotameter	Rotameter	Rotameter
Archive blank (circle)	Yes No	Yes No	Yes No
Pump ID Number			
Flow Meter ID Number			
Start Date (mm/dd/yy)			
Start Time (hh:mm)			
Start Counter			
Daily Flow Check: Record time (hh:mm) and flow rate (L/min) in fields provided	Check1 / Time / Flow Check2 Check3 Check4	Check1 / Time / Flow Check2 Check3 Check4	Check1 / Time / Flow Check2 Check3 Check4
Stop Date (mm/dd/yy)			
Stop Time (hh:mm)			
Stop Counter			
Pump fault? (circle)	Yes No	Yes No	Yes No
Stop Flow (L/min)			
Field Comments Cassette Lot Number: _____			
Entered By (Provide initials):		**Validated By (Provide initials):**	

For Data Entry Completion (Provide Initials)	Completed by:	QC by:

Sheet No.: SM- _____

LIBBY OU3 FIELD SAMPLE DATA SHEET (FSDS) rev2
SOIL-LIKE MATERIALS

Field Logbook No: _____ Page No: _____

Station ID: _____ Sampling Date: _____

GPS Coordinate System: UTM Zone 11 North, NAD83 datum, meters

Sampling Team: _____ Sampler Initials: _____

Station Comments: _____

Data Item	Sample 1	Sample 2	Sample 3
Index ID	*AFFIX LABEL HERE*	*AFFIX LABEL HERE*	*AFFIX LABEL HERE*
Matrix (circle one):	Surface Soil Tailings Waste Rock Roadway Other _____	Surface Soil Tailings Waste Rock Roadway Other _____	Surface Soil Tailings Waste Rock Roadway Other _____
Sample Time (hh:mm)			
Sample Type (circle one):	Grab Composite # of Comp: _____	Grab Composite # of Comp: _____	Grab Composite # of Comp: _____
Sample Depth	Start Depth (in): _____ End Depth (in): _____	Start Depth (in): _____ End Depth (in): _____	Start Depth (in): _____ End Depth (in): _____
Field QC Type (circle one):	FS (field sample) FD (field duplicate) For FD, Parent ID: _____ TB (trip blank) Cooler:_____ PE (perf. eval.) ID:_____	FS (field sample) FD (field duplicate) For FD, Parent ID: _____ TB (trip blank) Cooler:_____ PE (perf. eval.) ID:_____	FS (field sample) FD (field duplicate) For FD, Parent ID: _____ TB (trip blank) Cooler:_____ PE (perf. eval.) ID:_____
Transect Start Location or Grab Sample Location	X coord:_____m Y coord:_____m Elevation:_____m	X coord:_____m Y coord:_____m Elevation:_____m	X coord:_____m Y coord:_____m Elevation:_____m
Transect End Location	X coord:_____m Y coord:_____m Elevation:_____m	X coord:_____m Y coord:_____m Elevation:_____m	X coord:_____m Y coord:_____m Elevation:_____m
Field Comments:			
Cooler:			
Entered by (Provide initials):		**Validated by (Provide initials):**	

For Data Entry Completion (Provide Initials)	Completed by	QC by

APPENDIX D

CHAIN OF CUSTODY (COC) FORM**

***The most recent version of the COC form is provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3).*

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LIBBY OU3 – CHAIN-OF-CUSTODY RECORD/REQUEST FOR ANALYSIS

COC No. ________________

PAGE: _______ OF: _______

ENTERED BY (Signature): ______________________________ PROJECT MANAGER: __________________________________ DATE: ____________________

METHOD OF SHIPMENT: ______________________________ CARRIER/WAYBILL NO.: ________________ DESTINATION: ______________________________

SAMPLES							ANALYSIS REQUEST																												
							Asbestos			Non-Asbestos (a)																									
Index ID	Date	Time	Media*	Air Volume (L) or Tree Bark Sample Area (cm^2)	Filtered	Archive	TEM-ISO 10312 (b,c)	PLM (d)		TAL Metals+Boron	Mercury	TOC	DOC	Paste pH	Fluoride	Chloride, Sulfate	Total Phosphorus	Cyanide	VPH	EPH	OPP Pesticides	Chlorinated Pesticides	Herbicides	PCBs	SVOCs	VOCs	TDS, TSS, Nitrite, Alkalinity	Ammonia, Nitrate, TKN	Orthophosphate	Radiochemistry	Radium, Uranium	Hardness			Age core (e)	Remarks

	TOTAL NUMBER OF CONTAINERS	LABORATORY COMMENTS/CONDITION OF SAMPLES	Cooler Temp:

RELINQUISHED BY:			DATE	TIME	RECEIVED BY:		
SIGNATURE	PRINTED NAME	COMPANY			SIGNATURE	PRINTED NAME	COMPANY

** Media: AQ - Aqueous SO – Solid A –Air BK – Tree Bark DB – Organic Debris (Duff) TC – Tree Age Core MT – Mammal Tissue*

Notes --

(a) Method, container, and preservation details are provided in the attached tables

(b) With Libby-specific modifications. See applicable O3 SAP for counting and stopping rules

(c) See applicable SAP for details on preparation methods.

(d) Preparation by ISSI-LIBBY-01 and analysis by SRC-LIBBY-01 (PLM-Grav) and SRC-LIBBY-03 (PLM-VE)

(e) In accordance with procedures in Phipps (1985).

DISTRIBUTION: PINK: Field Copy YELLOW: Laboratory Copy WHITE: Return to Originator

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APPENDIX E

ASBESTOS LABORATORY ACCEPTANCE CRITERIA FOR LIBBY ASBESTOS SUPERFUND SITE

MINIMUM LABORATORY ACCEPTANCE CRITERIA

1. Must be certified by the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of asbestos by polarized light microscopy (PLM)[11] and/or transmission electron microscopy (TEM)[12].

2. Must have a laboratory-specific Quality Management Plan and all relevant standard operating procedures (SOPs) in place for asbestos environmental sample processing and analysis.

3. Must have multiple experienced analysts on staff capable of running polarized light microscopy (PLM) visual area estimation methods [National Institute of Occupational Safety and Health (NIOSH) 9002, U.S. Environmental Protection Agency (EPA) 600] and/or TEM methods [International Organization for Standardization (ISO) 10312, ISO 13794, Asbestos Hazard Emergency Response Act (AHERA), American Society for Testing and Materials (ASTM) 5755, EPA Method 100.2] (a minimum of 2 analysts within each laboratory are needed to assess within-laboratory reproducibility). Must have documentation in place demonstrating all analysts work experience and training related to analyses performed.

4. Must be familiar with standard TEM and PLM preparation methods. TEM laboratories must have ability to perform indirect preparation and ashing (for the analysis of air, dust, other media) and/or ozonation/ultraviolet (UV)/sonication treatment (for the analysis water). PLM laboratories must have the ability to dry samples (for PLM-NIOSH 9002 analysis). If the PLM laboratory wishes to perform soil sample preparation in support of the Libby-specific PLM methods (i.e., PLM-visual area estimation (PLM-VE) and PLM-Gravimetric reduction (PLM-Grav), the laboratory must have the ability to sieve and grind soil samples in accordance with the Libby-specific preparation method.

> Note: Not all laboratory facilities need to have all preparation capabilities; media analysis could be segregated based on facility capability (i.e. one laboratory does water, another does soil, etc.).

5. TEM laboratories must have Energy Dispersive Spectroscopy (EDS) and Selected Area Electron Diffraction (SAED) capability incorporated into their microscope(s).

6. Must participate in monthly EPA laboratory calls for the Libby project.

7. Must participate in inter-laboratory analyses with other Libby project laboratories.

8. Must participate in annual EPA (quality assurance technical support [QATS]) audits and in other laboratory and/or data audits if data quality issues arise, as deemed appropriate by EPA.

9. Must be capable of using Libby-specific bench sheets to record observations and utilizing Libby-specific electronic data deliverables (EDDs) to report analytical results.

10. Must have the capacity to meet the required delivery schedules and turn-around times.

11. Must designate laboratory primary and secondary points of contact for discussion of EPA/laboratory issues.

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[11] http://www.nist.gov/nvlap/upload/NIST-HB-150-3-2006-1.pdf
[12] http://www.nist.gov/nvlap/upload/NIST-HB-150-13-2006-1.pdf

EPA APPROVAL PROCESS

1. Once potential laboratories are identified that meet the minimum acceptance criteria, they must show proficiency in analysis of NIST/NVLAP performance evaluation samples and inter-laboratory samples (standard PLM visual area estimation and TEM only, no Libby-specific method modifications and requirements).

2. If proficiency is documented, an EPA (QATS) audit will be performed.

3. If any deficiencies found during the audit are sufficiently resolved to EPA's satisfaction, then project-specific mentoring will be conducted to ensure laboratories are proficient in the Libby-specific methods, modifications, and requirements.

4. Once a laboratory has passed all of these steps, EPA will approve the use of the laboratory and documentation to this effect will be sent to the laboratory. Samples can then be sent to the laboratory for analysis.

APPENDIX F

ANALYTICAL REQUIREMENTS SUMMARY SHEET**

[OU3FIRE-0813]

***The most recent version of the Analytical Requirements Summary Sheet is available on the Libby Lab eRoom (https://team.cdm.com/eRoom/mt/LibbyLab)*

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SAP ANALYTICAL SUMMARY # OU3FIRE-0813
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS

SAP Title: Wildfire Contingency Air Monitoring Plan, Operable Unit 3, Libby Asbestos Superfund Site

SAP Date/Revision: August 2013 (Revision 1)

EPA Technical Advisor: Christina Progess (303-312-6009, progess.christina@epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: The purpose of this study is to collect opportunistic samples of air during authentic wildfires that occur in OU3. 24-hour samples will be collected from each of three stationary air monitors and 4-hour samples will be collected from a mobile monitor placed downwind of the fire for the duration of the wildfire event. In addition, samples will be collected from inside air support craft and near ground-based firefighters responding to a wildfire in OU3. All samples will be analyzed by TEM under low magnification; results should be reported within 24-hours of sample receipt (or ASAP, unless instructed otherwise by the laboratory coordinator). Samples of ash from the burn area will be collected following the fire and analyzed by TEM.

Index ID Prefix: SM-xxxxx

TEM Preparation and Analytical Requirements for Air Samples [a]:

Medium Code	Medium	Preparation Details [b]				Analysis Details			Applicable Laboratory Modifications (current version of)
		Investi-gative?	Indirect Prep?		Filter Archive?	Method	Recording Rules	Analytical Sensitivity/ Stopping Rules	
			With Ashing	Without Ashing					
A	Ambient Air	Yes	No	Yes	Yes	TEM – Modified ISO 10312, Annex E *(Low Mag, 5,000X)*	All PCME asbestos [c]; L: > 5 µm W: ≥ 0.25 µm AR: ≥ 3:1	Count a minimum of 2 grid openings in 2 grids, then continue counting until one is achieved: i) target sensitivity is achieved [d] ii) 25 PCME LA structures are recorded iii) A total filter area of 5.0 mm^2 has been examined (approx. 500 GOs)	LB-000016, LB-000029, LB-000055, LB-000066, LB-000067, LB-000085, LB-000091
B	Cockpit Air								
C	Fire-fighter, ABS Air								

[a] Sample results need to be submitted within 24 hours of sample receipt (or ASAP if 24-hour turnaround time cannot be met).
[b] Grid preparation should be performed in basic accordance with Section 9.3 of ISO 10312:1995(E). If necessary, samples may be prepared indirectly without ashing in accordance with SOP EPA-LIBBY-08, as modified by LB-000091.
[c] If observed, chrysotile structures should be recorded, but chrysotile structure counting may stop after 25 structures have been recorded.

[d] Target analytical sensitivity:
Code A, Ambient Air – 0.0026 cc^{-1}
Code B, Cockpit Air – 0.0088 cc^{-1}
Code C, Firefighter ABS Air – 0.0027 cc^{-1}

TEM Preparation and Analytical Requirements for Air Field Quality Control Samples:

Medium Code	Medium, Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications (current version of)
		Indirect Prep?		Archive?	Method	Recording Rules	Stopping Rules	
		With Ashing	Without Ashing					
D	Air, lot & field blanks	No	No	Yes	TEM – ISO 10312	All asbestos; L: ≥ 0.5 µm AR: ≥ 3:1	Examine 0.1 mm^2 of filter area.	LB-000016, LB-000029, LB-000066, LB-000067, LB-000085

TEM Preparation and Analytical Requirements for Ash Samples:

Medium Code	Medium	Preparation Details [e]				Analysis Details			Applicable Laboratory Modifications (current version of)
		Investi-gative?	Indirect Prep?		Filter Archive?	Method	Recording Rules	Analytical Sensitivity/ Prioritized Stopping Rules	
			With Ashing	Without Ashing					
E	Ash	Yes	No	Yes	Yes	TEM – Modified ISO 10312 (see Section 6.2.3 of SOP EPA-LIBBY-2012-11)	All asbestos; L: ≥ 0.5 µm AR: ≥ 3:1	Count a minimum of 2 grid openings in 2 grids, then continue counting until one is achieved: i) sensitivity of 1E+07 g^{-1} is achieved ii) 50 LA structures are recorded iii) 1.0 mm^2 of filter has been examined	LB-000016, LB-000029, LB-000066, LB-000067, LB-000085

[e] Prepare samples in accordance with the procedures in SOP EPA-LIBBY-2012-11 (see Section 6). A total of three replicate filters will be created and analyzed for each ash sample using separate aliquots of the ash residue. Any remaining ash material should be archived for possible future analysis.

Laboratory Quality Control Sample Frequencies:

TEM: Laboratory and drying blanks should be prepared in accordance with LB-000029 and LB-000055, respectively. Recount and repreparation analyses will be selected by EPA on a *post hoc* basis.

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	8/27/13	--

Analytical Laboratory Review Sign-off:

☐ EMSL – Libby [sign & date: _____] ☒ ESAT [sign & date: _Douglas_Kent_30_August_2013__]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]

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APPENDIX G

RECORD OF MODIFICATION FORMS

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FIELD MODIFICATION APPROVAL FORM
LFM-OU3-xx
Libby OU3 Wildfire Contingency Air Monitoring Plan (Rev 1)

Requested by: _____ Date: _____

Description of Deviation:

_____
_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

_____
_____
_____
_____

_____ _____
Christina Progess, EPA RPM Date

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Request for Modification
to
Laboratory Activities
LB-0000XX

Instructions to Requester: E-mail form to contacts at bottom of form for review and approval.
All Labs Applicable Forms – copies to: EPA LC, QATS contractor, All Project Labs
Individual Labs Applicable Forms – copies to: EPA LC, QATS contractor, Initiating Lab

Method (circle all applicable): TEM-AHERA TEM-ISO 10312 PCM-NIOSH 7400
EPA/600/R-93/116 ASTM 5755 TEM 100.2 SRC-LIBBY-03
SRC-LIBBY-01 NIOSH 9002 Other:_____

Requester:_____ Title: _____
Company: _____ Date: _____

Original Requester: _____ Original Request Date: _____
[only applicable if modification is a revision of an earlier modification]

Description of Modification:
_____

Reason for Modification:
_____

Potential Implications of this Modification:
_____

Laboratory Applicability (circle one): **All** **Individual(s)** _____

This laboratory modification is (circle one): **NEW** **APPENDS to** _____ **SUPERCEDES** _____

Duration of Modification (circle one):
Temporary Date(s): _____
Analytical Batch ID: _____
Temporary Modification Forms – Attach legible copies of approved form with all associated raw data packages

Permanent (Complete Proposed Modification Section) Effective Date: _____
Permanent Modification Forms – Maintain legible copies of approved form in a binder that can be accessed by analysts.

Proposed Modification to Method (attach additional sheets if necessary; state section and page numbers of method when applicable):
_____

REFERENCES

Data Quality Indicator (circle one) – Please reference definitions below for direction on selecting data quality indicators:

Not Applicable **Reject** **Low Bias** **Estimate** **High Bias** **No Bias**

DATA QUALITY INDICATOR DEFINITIONS:

Reject - Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

Low Bias - Samples associated with this modification form are useable, but results are likely to be biased low. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated low.

Estimate - Samples associated with this modification form are useable, but results should be considered approximations. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimates.

High Bias - Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias - Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

Technical Review: _____ Date: _____
(Laboratory Manager or designate)

Project Review and Approval: _____ Date: _____
(USEPA: Project Manager or designate)

Approved By: _____ Date: _____
(USEPA: Technical Assistance Unit Chief or designate)