Libby Asbestos Superfund Site

Operable Unit 3
2012 Phase V Remedial Investigation
Field Sampling Summary Report

February 2013

MWH

FIELD SAMPLING SUMMARY REPORT

PHASE V REMEDIAL INVESTIGATION
OPERABLE UNIT 3

ACTIVITY-BASED SAMPLING

LIBBY ASBESTOS SUPERFUND SITE

February 2013

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TABLE OF CONTENTS

1.0 PROJECT OVERVIEW 1-1

1.1 Background Summary 1-1

1.1.1 Phase I Remedial Investigation 1-2

1.1.2 Phase II Remedial Investigation 1-3

1.1.3 Phase III Remedial Investigation 1-3

1.1.4 2010 Phase IV Remedial Investigation 1-4

1.1.5 2011 Phase IV Part B Remedial Investigation 1-4

1.1.6 2010 Phase V Remedial Investigation 1-5

1.2 Purpose of the Phase V Remedial Investigation 1-5

1.3 Purpose of This Document 1-6

1.4 Project Organization 1-7

1.4.1 Project Management 1-7

1.4.2 Technical Support 1-7

1.4.3 Phase V Field Sampling Activities 1-8

1.4.4 Sample Preparation and Analysis 1-8

1.4.5 Data Management 1-8

2.0 PHASE V RI SAMPLING PROGRAM 2-1

2.1 Summary of the 2012 Phase V Sampling Program 2-1

2.2 Phase V Surface Water and Sediment Sampling and ISCO Flow Monitoring 2-2

2.2.1 Kootenai River Surface Water Sampling Locations 2-2

2.2.2 Kootenai River Sediment Sampling Locations 2-4

2.2.3 Continuous Flow Monitoring (ISCO) 2-5

2.3 2012 Phase V Commercial Logging Sample Locations 2-5

2.3.1 Commercial Logging Bark and Duff Sample Locations 2-6

2.4 ABS Air Sampling Scenario Summaries 2-6

2.4.1 Kootenai River Recreational Visitor ABS Scenario 2-7

2.4.2 Hand-Felling Commercial Logging ABS Scenario 2-7

2.4.3 Hooking and Skidding of Timber Commercial Logging ABS Scenario 2-8

2.4.4 Mechanical Timber Processing Commercial Logging ABS Scenario 2-9

2.4.5 Mill Process Commercial Logging ABS Scenario 2-9

2.4.6 Site Restoration Commercial Logging ABS Scenario 2-10

TABLE OF CONTENTS (cont.)

2.5 Performance of ABS Script 2-10
2.5.1 ABS Participants 2-10
2.5.2 ABS Director 2-11
2.6 Phase V RI Sample Collection Methods 2-11
2.6.1 Surface Water Collection 2-11
2.6.2 Sediment Sample Collection 2-12
2.6.3 Duff and Bark Sample Collection 2-13
2.6.4 ABS Air Sample Collection 2-13
2.6.5 Global Position System Coordinate Collection 2-14
2.7 Phase V Equipment 2-14
2.7.1 Sample Sampling Equipment 2-14
2.7.2 Field Calibration of Air Sampling Pumps 2-15
2.8 Quality Control Samples 2-16
2.8.1 Lot Blanks 2-16
2.8.2 Field Duplicate Samples 2-16
2.8.3 Field Blank Samples 2-16
2.9 Sample Identification, Handling, and Analysis 2-16
2.9.1 Sample Identification 2-16
2.9.2 Sample Chain of Custody and Shipment 2-17
2.9.3 Sample Analysis 2-17
2.10 Health and Safety 2-17

LIST OF TABLES
(Tables follow their respective section)

Table No.	Title
2-1	Phase V Part A Summary of Kootenai River Surface Water, Sediment, and ABS Locations and Samples
2-2	Phase V Part B Commercial Logging ABS Sampling Summary

TABLE OF CONTENTS (cont.)

LIST OF FIGURES
(Figures follow their respective section)

Figure No.	Title
1-1	Location of Mine Site and Preliminary OU3 Study Boundaries
1-2	ISCO and Vermiculite Waste Removal Area
2-1	Kootenai River Sampling and ABS
2-2	Logging ABS Area
2-2	OU 3 Phase V 2012 Stream Flow Data

LIST OF APPENDICES
(Appendices on CD in pocket)

Appendix A	Sampling and Analysis Plans
Appendix B	Field Sample Data Sheet
Appendix C	Field Logbook
Appendix D	Chain-of-Custody
Appendix E	ISCO Flow Data

LIST OF ACRONYMS AND ABBREVIATIONS

ABS	Activity-Based Sampling
AOC	Administrative Order on Consent
CDM	CDM Smith
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminant(s) of concern; chain-of-custody
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
FB	field blank
FD	field duplicate
FSDS	field sample data sheet
FSSR	Field Sampling Summary Report
GPS	global positioning system
HDR	HDR, Inc. (oversight contractor)
HEPA	high-efficiency particulate-air
Index ID	index identification number
ISO	International Organization for Standardization
KDC	Kootenai Development Corporation
LA	Libby Amphibole
L/min	liter per minute
MDEQ	Montana Department of Environmental Quality
MWH	MWH Americas, Inc.
ND	non-detect
OU	Operable Unit
PAPR	powered air-purifying respirator
PPE	personal protective equipment
QATS	Quality Assurance Technical Support
QC	quality control

TABLE OF CONTENTS (cont.)

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SRC	Syracuse Research Corporation
TEM	transmission electron microscopy
USFS	United States Forest Service
VW	Vermiculite Waste

1.0 PROJECT OVERVIEW

1.1 BACKGROUND SUMMARY

The vermiculite deposit at Vermiculite Mountain, six miles northeast of Libby, Montana, contains veins of asbestiform amphibole minerals (e.g., winchite, richterite and tremolite). The asbestiform amphibole minerals that occur at Vermiculite Mountain are collectively termed "Libby Amphibole" (LA) by the U.S. Environmental Protection Agency (EPA). Historic mining, milling, and processing of vermiculite from the former W.R. Grace mine at Vermiculite Mountain released LA fibers to the environment. Long-term exposure to LA fibers associated with the vermiculite is known to have caused adverse health effects in some workers at the mine and processing facilities and EPA suspects others in Libby.

In 2000, EPA began cleanup actions at Libby under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; also known as Superfund) to eliminate sources of LA exposure to residents and workers. Initial efforts were focused mainly on wastes remaining at former vermiculite processing areas. As work progressed, action shifted to cleanup of homes and workplaces in the residential/commercial areas of Libby, designated by EPA as Operable Unit 4 (OU4) of the Libby Asbestos Site.

As part of the Superfund designation of the Libby Asbestos Site, the former mine and environs at Vermiculite Mountain were designated OU3. OU3 includes the property in and around the former vermiculite mine and forest areas surrounding the mine that may have been impacted by releases and subsequent migration of contaminants from the mine. The mine site and the preliminary study area boundary of OU3 are shown on **Figure 1-1**. EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the Remedial Investigation/Feasibility Study (RI/FS) for OU3. This study area boundary may be revised as data are obtained on the nature and extent of environmental contamination, if any, associated with releases that may have occurred from the mine site.

1.1.1 Phase I Remedial Investigation

In September 2007, EPA initiated a RI/FS of OU3 and produced the *Phase I Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site* (OU3 Phase I SAP) to begin the characterization of environmental conditions at OU3. The OU3 Phase I SAP contains information on the history and operations of the former mine and discussions on general site geography, geology, hydrology and other relevant background information. The SAP also contains the preliminary sampling locations and the Standard Operating Procedures (SOPs) that were used as guidance during the OU3 Phase I RI performed in October 2007. Phase I included sampling and analysis of soil, mine wastes, sediment, surface water, and ambient air at the former mine site, and tree bark, duff and mineral soil on the mine site and in surrounding forested areas within an eight-mile radius of the mine site. The field sampling performed as part of the Phase I RI is summarized in the *Phase I Field Sampling Summary Report* (Phase I FSSR), which documents the sampling locations and procedures employed during the Phase I RI at OU3.

Prior to implementing the OU3 Phase I RI, EPA had collected very limited information to evaluate contaminants of potential concern at the former Vermiculite Mountain mine property and potential releases to adjacent forest lands, surface water and groundwater. Areas outside the former mine property are of potential concern because they are used by the public for recreation, by logging companies for timber harvesting, and by wildlife as habitat. Contaminants of potential concern at OU3 include not only LA, but other mining-related contaminants that may have been released to the environment. Therefore, the overall objective of phased-based sampling at OU3 is to collect sufficient information to allow evaluation of risks to humans and ecological receptors from exposure to mining-related releases, and to support the development and evaluation of remedial alternatives to address any unacceptable risks that are identified. This will occur over multiple, phased sampling events; the findings of each phase of sampling will be used to guide subsequent phases of investigation.

Phase I sampling and analysis was intended to provide initial information on the nature and extent of asbestiform LA and non-asbestos contamination, to identify contaminants

of potential concern to be investigated during the RI, and to begin collection of data to establish a study area boundary for subsequent phases of the RI. Phase I was not expected to provide data that would be sufficient to fully characterize the nature and extent of contamination or to support a risk assessment. Rather, the results of Phase I were intended to provide sufficient information so that a more detailed and extensive sampling effort (Phase II) could be designed for implementation during the 2008 field season.

1.1.2 Phase II Remedial Investigation

The Phase II RI was performed from early April through October 2008 and consisted of three parts: Part A (surface water and sediment sampling), Part B (groundwater and ambient air sampling), and Part C (ecological sampling). Part A field sampling was performed in accordance with the *Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part A: Surface Water and Sediment* (Phase IIA SAP). Part B field sampling was performed in accordance with the *Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part B: Ambient Air and Groundwater* (Phase IIB SAP). Part C was performed in accordance with the *Phase II Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site; Part C: Ecological Data* (Phase IIC SAP).

Parts A and B of the Phase II RI focused on mine-site media sampling (surface water, groundwater, sediments and ambient air) to more fully characterize the nature, extent, and seasonal variation of contamination on the former mine property. Field activities performed under Parts A and B of the Phase II SAP are summarized in the *Phase II Field Sampling Summary Report, Parts A and B.* Part C of the Phase II RI included ecological sampling performed in late September and early October 2008, and is summarized in separate documents.

1.1.3 Phase III Remedial Investigation

The Phase III RI at OU3 began in early June 2009. Activity-based air sampling (ABS)

was conducted in accordance with the *Remedial Investigation for Operable Unit 3, Libby Asbestos Superfund Site Phase III Sampling and Analysis Plan* (Phase III SAP), as amended by field modifications issued by EPA. ABS activities during Phase III focused on simulating the activities of recreational visitors to the forest lands in the vicinity of the former mine. The ABS scripts included ATV riding, hiking, fire-pit preparation, wood gathering, and building and moving about a campfire. Field activities performed under Phase III SAP are summarized in the *Phase III Field Sampling Summary Report* (Phase III FSSR). Ecological sampling performed at OU3 during the 2009 field season is discussed in a separate document.

1.1.4 2010 Phase IV Remedial Investigation

The 2010 Phase IV RI began in June 2010 with site selection and U.S. Forest Service (USFS) approval of trees to be harvested during ABS. ABS was conducted in accordance with the *Remedial Investigation for Operable Unit 3, Libby Asbestos Superfund Site Phase IV Sampling and Analysis Plan* (Phase IV SAP). The 2010 Phase IV focused on sampling potential exposures of forest users and USFS personnel downwind (northeast) of the former mine operations. The 2010 Phase IV ABS activities included timber harvesting, limbing and cutting felled trees into fireplace lengths, trail clearing and thinning, tree thinning, timber inspection, fireline cutting by both hand and machine and shed elk horn hunting along Rainy Creek. Field activities performed under Phase IV SAP are summarized in the 2010 *Phase IV Field Sampling Summary Report* (Phase IV FSSR). Ecological sampling performed at OU3 during the 2010 field season is discussed in a separate document.

1.1.5 2011 Phase IV Part B Remedial Investigation

The Phase IV RI continued during the 2011 field season. Sampling performed during the 2011 Phase IV Part B was conducted in accordance with the *Phase IV Sampling and Analysis Plan Part B: 2011 Surface Water Study (Phase IV Part B SAP*, dated April 4, 2011, *SOP 3A (Rev.0) Water Sampling with Syringe Filters*, dated March 18, 2011, and other applicable SOPs. Tasks performed in 2011, under Phase IV Part B, included syringe-surface water sampling as well as annual ISCO surface water monitoring to

further evaluate LA concentrations in surface water and to support the ecological risk assessment and characterize fish habitat. ABS performed during the 2011 Phase IV Part B is summarized in the 2011 *Phase IV Part B Field Sampling Summary Report*.

1.1.6 2012 Phase V Remedial Investigation

Phase V of the RI was performed during the 2012 field season (April through September). Tasks performed in 2012 under Phase V included sampling along the Kootenai River to evaluate potential asbestos loading from Rainy Creek to the Kootenai River and ABS air sampling to evaluate exposure to recreational users (e.g., river guide/fishing). In addition, ABS was performed within OU 3 located on Kootenai Development Company land (a restricted area) to evaluate potential asbestos exposures from simulated commercial logging at OU 3. This study area represents the high end of the exposures that may occur from commercial logging. Bark and duff samples and ABS air sampling for specific logging activities (i.e., hand-felling, hooking and skidding, mechanical processing, site restoration, and milling processes) was performed.

Field activities and sampling were executed following the protocols established in the *Sampling and Analysis Plan / Quality Assurance Project Plan Operable Unit 3, Libby Asbestos Superfund Site, Phase V, Part A: Kootenai River Surface Water, Sediment, and Activity-Based Sampling (Revision 2)*, hereafter referred to as the *Phase V Part A Kootenai SAP* and the *Sampling and Analysis Plan / Quality Assurance Project Plan Operable Unit 3, Libby Asbestos Superfund Site, 2012 Commercial Logging Activity-Based Sampling (Revision 0)*, hereafter referred to as the *Phase V Logging SAP*. The Phase V Part A Kootenai SAP and the Phase V Logging SAP are included in Appendix A of this FSSR. In addition, protocols established in other SOPs were followed as applicable.

1.2 PURPOSE OF THE PHASE V REMEDIAL INVESTIGATION

The purpose of the Phase V RI is to further characterize the nature and extent of LA in surface water and sediments within the Kootenai River, to collect activity-based air samples under a recreational user scenario at popular recreational locations along the

Kootenai River, and to collect data on potential inhalation exposures of LA resulting from simulated commercial logging activities. Data generated during Phase V ABS will be used in human health risk assessments.

In addition to the 2012 field activities specifically related to Kootenai River surface water and sediment sampling and Kootenai River and Logging ABS activities, annual monitoring of the Rainy Creek watershed was performed with ISCO samplers and soil sampling and removal of vermiculite waste (VW) was performed near the amphitheater. Refer to **Figure 1-2** for ISCO locations and the general area of the VW Removal Action. ISCO is described in Section 2.2.3 and the VW Removal Action will be summarized separately following completion of the Removal Action, which is anticipated to be completed in 2013.

1.3 PURPOSE OF THIS DOCUMENT

This 2012 Phase V FSSR is a summary of site activities performed in support of the RI/FS at OU3 during the 2012 field season (April through September 2012). OU3 includes the property at and around the former vermiculite mine at Vermiculite Mountain potentially impacted by releases and subsequent migration of hazardous substances from the mine site and former mine operations (the preliminary boundaries of OU3 are depicted on **Figure 1-1** of this document). The final boundaries of OU3 had not been defined prior to 2012 Phase V field sampling. Final boundaries for OU3 will be based primarily upon the extent of contamination associated with releases from the former mine, as determined by analytical results for samples collected during Phases I, II, III, IV, and V, and any subsequent phases of the RI. The final boundary of OU3 will be defined in the final EPA-approved RI/FS report. The RI Report will contain all analytical results, interpretations and conclusions for the OU3 Remedial Investigation.

This FSSR provides a summary of sampling activities, locations and methods employed during the 2012 Phase V RI at OU3. Analytical results for samples collected during the Phase V RI are not presented in this document; analytical data and interpretations are summarized as part of Sampling and Analysis Plans (SAPs), which heretofore have been prepared by EPA for implementation during each field season or phase of work.

1.4 PROJECT ORGANIZATION

1.4.1 Project Management

EPA is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 remedial investigations addressed in this report is Ms. Christina Progess of EPA Region 8. Ms. Progess is a 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 MDEQ Project Manager for OU3 is Mr. John Podolinski. EPA consults with MDEQ as provided for by CERCLA, the National Contingency Plan, and applicable guidance in conducting Superfund activities at OU3.

EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC). Under the terms of the AOC, the Respondents implemented the Phase I, Phase II, Phase III, Phase IV, and Phase V SAPs at OU3. The designated Project Coordinator for the Respondents is Mr. Robert Medler of Remedium Group, Inc., a subsidiary of W.R. Grace & Co.-Conn.

1.4.2 Technical Support

EPA was supported in this project by contractors, including:

- CDM Smith (CDM) assisted in development of the *Phase V Part A, Kootenai SAP* and the *Phase V Logging SAP*.
- Syracuse Research Corporation (SRC) assisted in development of the *Phase V Part A, Kootenai SAP* and the *Phase V Logging SAP* and will assist in the evaluation and interpretation of the Phase V analytical data.
- HDR, Inc. provided periodic field oversight of Phase V activities on behalf of EPA to ensure that field activities were performed in accordance with the project SAPs, SOPs and Modifications.

- Shaw Environmental, Inc. (Shaw), supports the EPA and serves as the Quality Assurance Technical Support (QATS) contractor.

1.4.3 Phase V Field Sampling Activities

The 2012 Phase V field sampling activities were performed by W.R. Grace & Co.-Conn. and KDC with support from MWH and CCI, in accordance with the *Phase V Part A, Kootenai SAP*, the *Phase V Logging SAP*, and other applicable SOPs. The *Phase V Part A, Kootenai SAP* and the *Phase V Logging SAP* are included in Appendix A of this FSSR.

Individuals responsible for implementation of the OU3 2012 Phase V field sampling program are listed below:

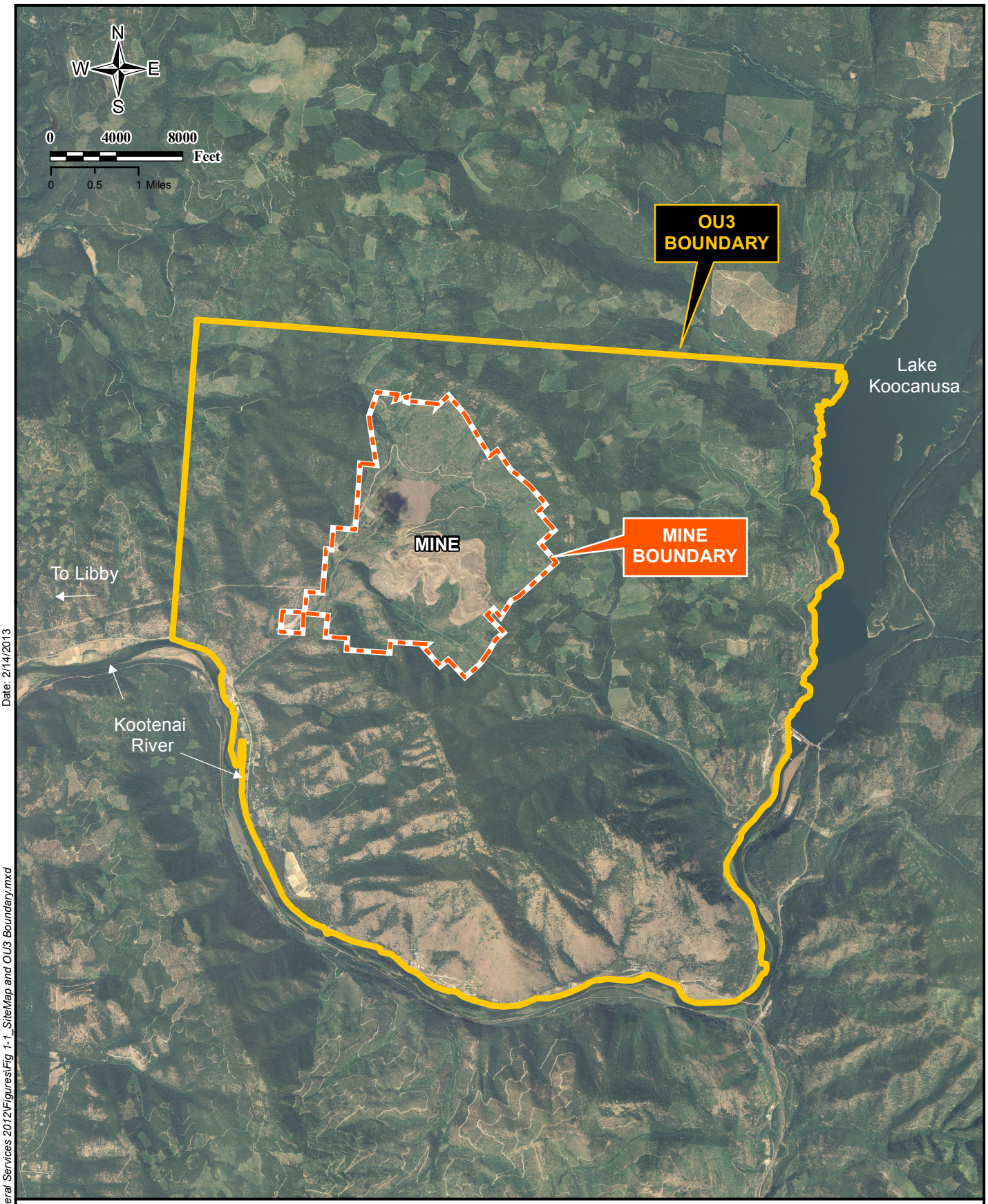
- MWH Project Manager/Field Supervisor: John Garr
- MWH Field quality control (QC)/Health and Safety Officer: Kaitlin Barklow
- MWH Quality Assurance Officer: Mike DeDen
- CCI Point-of-Contact: Mike Chapman

1.4.4 Sample Preparation and Analysis

All samples collected as part of the OU3 2012 Phase V RI were submitted to an EPA-selected/approved laboratory for preparation and/or analysis.

1.4.5 Data Management

Administration of the OU3 master database is performed by EPA contractors. The primary database administrator is Lynn Woodbury of SRC. Ms. Woodbury is responsible for sample tracking, uploading new data, performing error checks to identify inconsistent or missing data, and ensuring that all questionable data are checked and corrected, as needed. When the OU3 database has been populated, checked, and validated, relevant data from the Phase V RI will be transferred into the Libby2 database for final storage.



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LIBBY ASBESTOS SUPERFUND SITE

LOCATION OF MINE SITE AND PRELIMINARY OU3 STUDY BOUNDARIES

FIGURE 1-1

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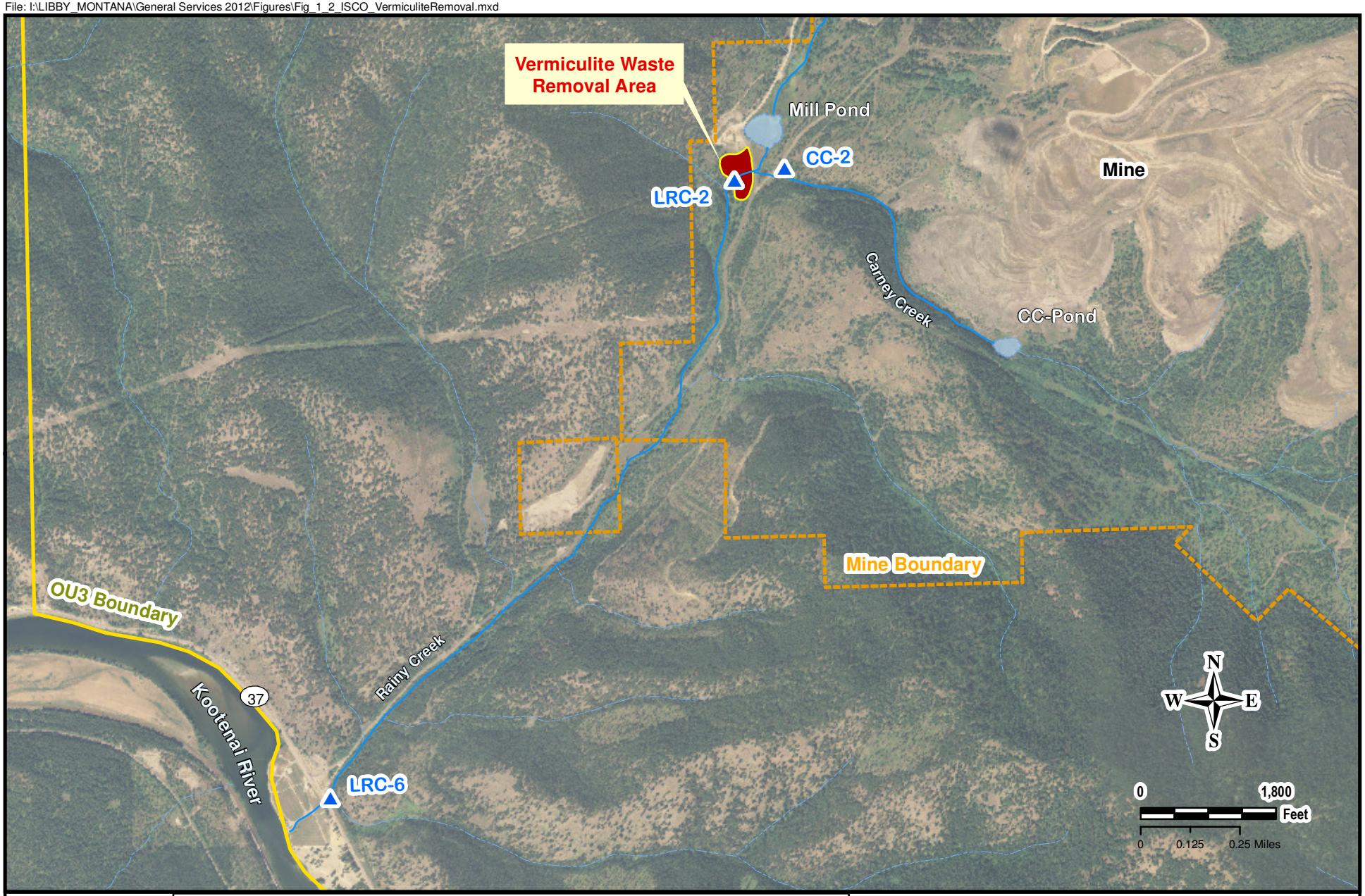

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EXPLANATION

- Creek
- Intermittent streams
- ISCO Locations
- Ponds
- Vermiculite Waste Removal Area

LIBBY ASBESTOS SUPERFUND SITE

ISCO and VERMICULITE WASTE REMOVAL AREA

FIGURE 1-2

2.0 PHASE V RI SAMPLING PROGRAM

2.1 SUMMARY OF THE 2012 PHASE V SAMPLING PROGRAM

Phase V of the RI was performed during the 2012 field season (April through September). Tasks performed in 2012 under Phase V included sampling along the Kootenai River to evaluate potential asbestos loading from Rainy Creek to the Kootenai River and ABS air sampling to evaluate exposure to recreational users (e.g., river guide/fishing). Bark and duff and ABS air sampling performed during simulated commercial logging activities (i.e., hand-felling, hooking and skidding, mechanical processing, site restoration, and milling processes) also was performed to evaluate potential asbestos exposures.

Field activities and sampling were executed following the protocols established in the *Phase V Part A, Kootenai SAP* and the *Phase V Logging SAP*, included in Appendix A of this FSSR. In addition, protocols established in other SOPs were followed as applicable. Appendices B though D provide copies of the Phase V field sampling data sheet (FSDS), field notes, and chain-of-custody (COC) forms.

The objectives of OU 3 Phase V sampling and analysis program were to provide information to better characterize levels of LA in the Kootenai River and to identify LA concentrations that recreational users (e.g., fishermen) along the Kootenai River could be exposed to while visiting the river; and to provide information regarding exposure during simulated commercial timber harvesting activities within the high end of exposure.

In order to obtain the appropriate data, location specific surface water and sediment samples were collected along the Kootenai River and bark and duff samples were collected from the simulated commercial logging area located on Kootenai Development Company property (a restricted area). In addition, activity-based personal air samples were collected under various scenarios from a frequently visited sand bar within the Kootenai River channel and also during the simulated commercial logging activities at the area located on Kootenai Development Company property (a restricted area). Kootenai River sample locations (i.e., surface water, sediment, and ABS) are depicted on

Figure 2-1 and the area where the simulated commercial logging ABS was performed and bark and duff sampling locations are depicted on **Figure 2-2**.

2.2 PHASE V SURFACE WATER AND SEDIMENT SAMPLING AND ISCO MONITORING

Data quality objectives (DQOs) for the Phase V Kootenai River sampling are fully described in the *Phase V Part A, Kootenai SAP* (Appendix A). As presented in the SAP, the purposes of the Phase V Part A, RI at the Kootenai River are as follows:

> "measured data are needed to allow the EPA to determine if concentrations of LA in Kootenai River surface water are above a level of human health concern. Furthermore, if the levels of LA are above a level of human health concern, data are needed to determine whether the concentrations of LA in the surface water are attributable to the Rainy Creek drainage and for what distance downstream these affects can be seen."

In summary, while data collected, prior to Phase V, is available to allow for evaluation of risk from surface water within the Kootenai River, the data has limitations. For example, previous surface water data was collected during low flow conditions rather than during high flow conditions when loading of LA from Rainy Creek to the Kootenai River is suspected to be higher. In addition, samples collected during the Phase II Part A RI were not treated with ozone or ultraviolet light prior to filtration, potentially allowing fibers to clump and adhere to the walls of sample containers, and the sample results could be biased low. Lastly, previous sampling efforts were limited to locations immediately upstream and downstream of the Kootenai River/Rainy Creek confluence. Therefore, as presented in the *Phase V Part A, Kootenai SAP* the following sample collection efforts were performed. The Kootenai ABS program is described in Section 2.4.

2.2.1 Kootenai River Surface Water Sample Locations

As described in the *Phase V Part A, Kootenai SAP*, relative loading from Rainy Creek to the Kootenai River is variable and dependent upon numerous factors. Sample locations and sample frequency were selected to correspond to the time when Rainy Creek is contributing the greatest loading to the Kootenai River (during spring run-off). In

addition, samples were collected during low flow conditions (September) for comparison. The locations listed below and depicted on **Figure 2-1** were selected:

- LRC-6: from the established sampling location.
- UKR-0: from the north bank of the Kootenai River, immediately upstream of the confluence of Rainy Creek and the Kootenai River.
- UKR-1: from the north bank of the Kootenai River, approximately three miles upstream of the confluence of Rainy Creek and the Kootenai River.
- UKR-2/3 (synonymous locations):
- UKR-3: from the north bank of the Kootenai River, near the confluence of the Fisher River and the Kootenai River.
- KR-1: from the north bank of the Kootenai River immediately downstream of the confluence of Rainy Creek and the Kootenai River.
- KR-4: from the north bank of the Kootenai River approximately ½ mile downstream of the confluence of Rainy Creek and the Kootenai River.
- KR-5: from the north bank of the Kootenai River approximately ¾ mile downstream of the confluence of Rainy Creek and the Kootenai River.
- KR-14 (with Transect): from the north bank of the Kootenai River approximately one mile downstream of the confluence of Rainy Creek and the Kootenai River. In addition river channel samples were collected from a transect of the river at this location.
- KR-15: from the north bank of the Kootenai River approximately 2¼ miles downstream of the confluence of Rainy Creek and the Kootenai River.
- KR-16 (with Transect): from the north bank of the Kootenai River near the town of Libby, just east of the confluence of Libby Creek and the Kootenai River. In addition river channel samples were collected from a transect of the river at this location.

Surface water grab samples were collected from locations KR-1, KR-4, KR-5, UKR-0, and LRC-6 over an eight week period from late April through mid-June 2012, at a frequency of one sample per week (**Table 2-1**). The sample timeframe was designed to span the seasonal high-flow conditions from Rainy Creek to the Kootenai River. One set

of surface water grab samples and surface water transect samples also was collected from the locations in September 2012 to evaluate low-flow conditions.

In addition to the weekly samples listed above, additional locations were sampled once in late May and once in September 2012 during high and low flow periods, respectively. Those locations included; KR-14 with river transect samples, KR-15, KR-16 with river transect samples, UKR-1, and UKR-2/3. Location UKR-2 is synonymous with UKR-3 and has been collectively referred to as UKR-2/3. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.2.2 Kootenai River Sediment Sample Locations

As described in the *Phase V Part A Kootenai SAP*, sediment sample locations were selected in areas frequented by recreational visitors along the Kootenai River. In September 2012, 30-point composite sediment samples were collected from four locations, listed below and depicted on **Figure 2-1**.

- KR-20: located on an exposed sand bar island approximately ½ mile downstream of the confluence of Rainy Creek and the Kootenai River.
- KR-21: located on an exposed sand bar near the town of Libby approximately ½ mile upstream of the confluence of Libby Creek and the Kootenai River.
- LK-1: Located on the west bank of Lake Koocanusa at McGillivary Beach. The actual sample location is farther north than the location depicted in the *Phase V Part A Kootenai SAP*.
- LK-2: Located on the east bank of Lake Koocanusa, near the Lake Koocanusa Marina Boat Launch. The actual sample location is farther north than the location depicted in the *Phase V Part A, Kootenai SAP*.

Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.2.3 Continuous Flow Monitoring (ISCO)

Annual stream flow records were collected using ISCO automated flow recorders installed at LRC-06, LRC-02 and CC-02 during the freeze-free part of the year (from April through November). The flow records are presented in graphical form on **Figure 2-3** and in Excel format in Appendix E (on CD in pocket). The data collected at LRC-06 was monitored to ensure that the surface water samples were representative of high flow conditions within Rainy Creek.

2.3 2012 PHASE V COMMERCIAL LOGGING SAMPLE LOCATIONS

Data collected from 2006 through 2009 at the Vermiculite Mountain mine site meteorological station indicate the predominant wind direction in the OU3 area is to the northeast. Therefore, the simulated commercial logging sample locations/area (refer to **Figure 2-2**) selected by EPA for the 2012 Commercial Logging ABS program generally coincide in areas which are representative of high potential LA exposure [e.g., in downwind areas located on the Kootenai Development Company property (a restricted area) where high concentrations of LA have been reported in tree bark and duff]. This location selection method is assumed to overestimate rather than underestimate risk (*Phase V Logging SAP*).

In general, commercial logging activities include numerous operations which can occur over a large area. Therefore, bark and duff samples were collected from representative trees through the commercial logging area prior to the simulated commercial logging ABS. Commercial logging ABS was performed under actual logging conditions by field personnel familiar and experienced with commercial timber harvesting using commercial logging equipment. The types of commercial logging ABS scenarios (i.e., script components) performed include hand-felling, hooking and skidding of felled trees, mechanical processing of felled trees, chipping (representative of off-site milling), and site restoration. ABS procedures and scenarios are further presented in Sections 2.4. Bark and duff sample locations and collection procedures are discussed in Section 2.3.1.

2.3.1 Commercial Logging Bark and Duff Sample Locations

As described in the *2012 Phase V Logging SAP*, once the logging ABS area (i.e., logging area) was identified, representative bark and duff sample locations were selected from individual tress spatially dispersed throughout the logging ABS footprint. A total of 25 initial bark and duff sample locations (representative trees) were selected. However, as prescribed, the 25 initial sample locations were composited into five multi-point bark and five multi-point duff samples as described below and detailed in **Table 2-2**:

- CL-A; composited from tree locations CL-A_1, CL-A_2, CL-A_3, CL-A_4, and CL-A_5
- CL-B; composited from tree locations CL-B_1, CL-B_2, CL-B_3, CL-B_4, and CL-B_5
- CL-C; composited from tree locations CL-C_1, CL-C_2, CL-C_3, CL-C_4, and CL-C_5
- CL-D; composited from tree locations CL-D_1, CL-D_2, CL-D_3, CL-D_4, and CL-D_5
- CL-E; composited from tree locations CL-E_1, CL-E_2, CL-E_3, CL-E_4, and CL-E_5

Bark and duff samples were collected following SOP EPA-LIBBY-2012-12, *Sampling and Analysis of Tree Bark for Asbestos* and SOP EPA-LIBBY-2012-11, *Sampling and Analysis of Duff for Asbestos*.

2.4 ABS SCENARIO SUMMARIES

As previously discussed, the presence of potential LA concentrations encountered by recreational visitors to areas of the Kootenai River and to commercial logging personnel within the Kootenai Development Company property (a restricted area).had not been evaluated. Therefore, various ABS scenarios were performed to provide representative air data. The activities chosen for ABS during the Phase V RI were intended to represent those performed by recreational users to the Kootenai River and commercial logging personnel on the Kootenai Development Company property (a restricted area). The details and durations of the original script components are contained in the respective final SAPs. Copies of the respective SAPs/QAPP are provided in Appendix A (on CD in pocket).

ABS activities were performed by one or two CCI employees ("participants"), who were designated "Person 1" and "Person 2." As appropriate, the ABS participant was fitted with two air-sampling pumps and sampling cassettes for each activity. One pump was set to draw air through the cassette at 4 liters per minute (L/min), and the other as set to pump at 2 L/min. The laboratory was instructed to analyze the 4 L/min sample collected by Person 1 if the inner surface of the cassette cowling was free of dust and the filter was not overloaded. If the 4 L/min cassette worn by Person 1 was determined by the laboratory to be overloaded, the 2 L/min cassette worn by Person 1 was selected for analysis. If the Person 1, 2 L/min cassette was overloaded, that sample would be analyzed by indirect methods.

2.4.1 Kootenai River Recreational Visitor ABS Scenario

As described in the *Phase V Part A, Kootenai SAP*, ABS air sampling was performed under a recreational visitor scenario within a highly frequented sand bar downstream of the Rainy Creek/Kootenai River confluence (refer to **Figure 2-1**) and one representative air sample was collected as described below:

- KR-20; from the sand bar located downstream of the Rainy Creek/Kootenai River confluence (refer to **Figure 2-1**)

The ABS air sample was collected in September 2012 during historically low-flow conditions within the Kootenai River (**Table 2-1**). The ABS script was designed to simulate an adult person landing a boat on the sand bar, walking around and/or fishing from the sand bar, and departing the area by boat. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.4.2 Hand-Felling Commercial Logging ABS Scenario

As described in the *Phase V Logging SAP*, the felling of timber is the process of severing the tree from the stump, using a handheld chainsaw, and placing it on the ground. Hand-felling is a traditional method used by skilled logging personnel, herein referred to as a sawyer, utilizing a handheld chain saw to cut the timber. 24-inch and 30-inch chainsaws

were used to fell approximately 100 Douglas fir and other trees with a minimum eight-inch diameter. Three representative hand-felling ABS samples (high/low volume) were collected by Person 1 (i.e., sawyer) during the scenario.

- CL-30050/CL-30051 (120 minutes duration)
- CL-30053/CL-30054 (120 minutes duration)
- CL-30055/CL-30056 (60-minute duration)

The ABS air samples were collected on 4 September 2012 (Table 2-1). The sawyer donned two pumps, allowing for the collection of a high and low volume sample, with the filter sited in the breathing zone. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.4.3 Hooking and Skidding of Timber Commercial Logging ABS Scenario

As described in the *Phase V Logging SAP*, during the hooking and skidding of timber scenario, felled trees were dragged across the ground surface to a centralized location (the landing area) for further processing or transportation. The felled trees were moved using a cable skidder, which required an operator to get off the machine to manually attach cables (or chokers) to the felled trees. The activity of attaching cables/chokers to trees/logs is commonly referred to as "hooking." Five representative hooking and skidding ABS samples (high/low volume) were collected by Person 1 (i.e., skidder) during the scenario.

- CL-30057/CL-30058 (120 minutes duration)
- CL-30060/CL-30061 (120 minutes duration)
- CL-30062/CL-30063 (120-minute duration)
- CL-30064/CL-30065 (105 minutes duration)
- CL-30066/CL-30067 (125-minute duration)

The ABS air samples were collected on 5 and 6 September 2012 (**Table 2-1**). The skidder operator donned two pumps, allowing for the collection of a high and low volume sample, with the filter sited in the breathing zone. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.4.4 Mechanical Timber Processing Commercial Logging ABS Scenario

As described in the *Phase V Logging SAP*, mechanical timber processing is the act of de-limbing (cutting limbs from the tree) and cutting the tree into the desired length and width. Although mechanical processors vary, most utilize an excavator-type machine which can mechanically strip limbs from the tree and cuts the trunk into desired lengths. Mechanical processors most often have enclosed cabs in which the operator is stationed during processing activities. One representative mechanical processing ABS sample (high/low volume) was collected by Person 1 (i.e., operator) during the scenario.

- CL-30069/CL-30070 (120 minutes duration)

The ABS air samples were collected on 6 September 2012 (**Table 2-1**). The processor operator donned two pumps, allowing for the collection of a high and low volume sample, with the filter sited in the breathing zone. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.4.5 Mill Process Commercial Logging ABS Scenario

As described in the *Phase V Logging SAP*, the milling process is the act of removing bark from cut timber and cutting logs to appropriate size and shape for sale. Typically, mill processing is performed at site that is remote from the forest. However, for the ABS scenario, logs were processed (i.e., cut into slabs) and run through a wood-chipper at the onsite logging/landing area to simulate exposures that might occur in an off-site milling operation. Two representative mill processing ABS samples (high/low volume) were collected from stationary locations sites 10 feet (near samples) and 30 feet (far samples) away from the chipper.

- CL-30076/CL-30077 (near sample; 57 minute duration)
- CL-30078/CL-30079 (far sample; 57 minute duration)

The ABS air samples were collected on 10 September 2012 (**Table 2-1**). The sample pumps were placed at established stationary locations, allowing for the collection of a

high and low volume sample, with the filter sited in the breathing zone. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.4.6 Site Restoration Commercial Logging ABS Scenario

As described in the *Phase V Logging SAP*, following commercial timber/logging harvesting operations, site restoration was performed utilizing a bulldozer to remove brush and tree litter from the landing area until the landing area was cleared and the road restored to its original condition. Two representative site restoration ABS samples (high/low volume) were collected by Person 1 (i.e., bulldozer operator) during the scenario.

- CL-30080/CL-30081 (near sample; 60 minute duration)
- CL-30082/CL-30083 (far sample; 60 minute duration)

The ABS air samples were collected on 10 September 2012 (**Table 2-1**). Bulldozer operator donned two pumps, allowing for the collection of a high and low volume sample, with the filter sited in the breathing zone. Copies of the applicable FSDS, field notes, and COCs are included in Appendices B, C, and D respectively.

2.5 PERFORMANCE OF ABS SCRIPT

2.5.1 ABS Participants

The ABS scripts were performed by one team, consisting of two CCI employees (who performed the activities) and one MWH employee (who directed the activities, recorded field data and managed the samples).

ABS (i.e., Kootenai River and commercial logging) was performed only on days when there was no rain, no standing water on the forest and logging roads, and when visible dust was generated by logging equipment (e.g., dragging timber, truck movement, etc.) on the unpaved roads at normal speeds (20 mph or less).

Because participants were actively disturbing potentially contaminated media (i.e., bark and duff, soil/sediment, and vegetation) during performance of the ABS scripts, the ABS participants wore Level C Modified personal protective equipment (PPE) consisting of the following:

- Full-face powered air-purifying respirator (PAPR) fitted with high-efficiency particulate-air (HEPA) filters
- Double-layer Tyvek™ hooded, footed coveralls
- Latex boot covers
- Double-layer nitrile gloves

Respirators were field-decontaminated by a water spray before they were removed. New Tyvek coveralls, latex boot covers and nitrile gloves were donned before each activity. Cutting equipment was also decontaminated before each new activity.

2.5.2 ABS Director

Performance of the ABS script was overseen by an MWH employee ("director") who stayed at a "base station" established upwind of the activity sites on a road within the ABS location. The ABS director used a stopwatch to time each activity and voice/hand signals to communicate changes to the participants. The ABS director was also responsible for calibrating and adjusting the air sampling pumps, recording data on the FSDS and in the logbook (field notes), maintaining the sample COC and managing the sample cassettes.

2.6 PHASE V RI SAMPLE COLLECTION METHODS

2.6.1 Surface Water Collection

Surface water samples were collected using two methods, grab and transect samples. Grab samples were collected from the river bank and transect samples were collected from across the Kootenai River using a flat-bottom boat. Surface water bank samples were collected using direct sampling methods as prescribed in SOP No. *3; Surface Water*

Sampling. The following modifications to SOP were established in the *Phase V Part A, Kootenai SAP:*

- "Measurement of water quality parameters (e.g., pH, specific conductivity, etc.) and stream discharge is not required
- No field filtration of samples will be performed
- Because dedicated sampling equipment is used for each collected water sample, no equipment rinsates are required"

Transect surface water samples were collected in accordance to the procedures established in SOP No. 21; *Discrete-Depth Grab Sampling of Kootenai River Water*. In brief, for each sample, approximately 200-400 mL of water was collected into a 500-mL HDPE wide-mouth container. Headspace was intentionally left in the container to allow for ozonation/ultraviolet treatment and sonication of the sample by the laboratory. Surface water samples were collected moving in a downstream to upstream pattern. At locations were surface water and sediment were collected, the surface water sample was collected before the sediment sample.

2.6.2 Sediment Sample Collection

Sediment samples were collected, handled, and documented in accordance with SOP No. 1; *Soil Sampling for Non-Volatile Organic Compound Analysis.* The following modifications to SOP were established in the *Phase V Part A Kootenai SAP*:

- "It is recognized that this SOP is for soil sampling, but the basic sampling methods are applicable to the collection of exposed sediments
- Each composite sediment sample will be comprised of 30 individual sampling points that are approximately equidistant from each other and representative of the entire recreational area
- At each sampling point, collect approximately 50 grams of material. The total mass of sediment material for the composite sample should fill about 1/3 of a gallon-sized zip-top bag
- The amount of visible vermiculite should be recorded on the FSDS form by field sampling personnel using the principles outlined in SOP CDM-LIBBY-06' *Semi-Quantitative Visual Estimation of Vermiculite in soils at Residential and Commercial Properties*. Visible vermiculite will be noted as a presence or absence (number of visible inspection points with vermiculite present and the number of visible inspection points without vermiculite) rather than as the number of points with low, medium, and high amounts of vermiculite in each inspection point as required by SOP CDM_LIBBY-06."

2.6.3 Bark and Duff Sample Collection

Bark and duff samples were collected following SOP EPA-LIBBY-2012-12, *Sampling and Analysis of Tree Bark for Asbestos* and SOP EPA-LIBBY-2012-11, *Sampling and Analysis of Duff for Asbestos*. The following modifications to the respective SOP were established in the *Phase V Logging SAP*:

- Trees selected for sampling were Douglas fir with a minimum diameter of eight-inches. In the event that the desired trees were not present within the ABS area, larger diameter trees with rough bark were sampled.
- The sampled tree would not need to be located for future sampling, so flagging tape/ID tags were not affixed to the tree. Rather GPS coordinates were collected for each tree location.
- Tree bark samples consisted on a five-tree composite. Decontamination of use of new equipment between trees that were combined into the same, five-tree, composite sample was not required.
- One grab sample from a five-foot radius next to each selected tree was collected to make a five-point composite sample of duff material. Sufficient duff material was collected from each sub-location (i.e., composite aliquot) such that the composite sample filled a one-gallon zip-top bag.

2.6.4 ABS Air Sample Collection

ABS air samples were collected following SOP ABS-LIBBY-OU3, *Activity-Based Sampling for Asbestos*. The ABS participants wore AirChek XR5000™ air-sampling pumps attached to belts worn outside their PPE, affixed to the interior cab of the logging equipment, or set on stationary stands around the perimeter of the respective ABS activity. Tubing from each pump was duct-taped to the back and shoulders of the participant's Tyvek™ coveralls, and or otherwise affixed to equipment such that the sample cassette was sited with the open (intake) end of the cassette cowl aimed downward, within the breathing zone.

Two sampling pumps were used during each specific ABS air sampling activity; a high volume (4-L/min) and a low volume (2-L/min) pump to allow for collection of replicate filters. However, as described in the *Phase V Part A, Kootenai SAP* and the *Phase V Logging SAP*, only one of the two resulting air filters was selected for analysis. Sampling cassette cowl caps remained in-place until the activity began and the pumps were turned

on. During the activity, the ABS director retained the caps and stored them in a closed Ziploc™ plastic bag. When the activity ended, the pumps were turned off and the caps were replaced.

2.6.5 Global Position System Coordinate Collection

GPS coordinates were recorded for each sampling station/location in basic accordance with the procedures specified in SOP No. 11, *GPS Data Collection*. As described in the *Phase V Logging SAP*, because duff samples were collected from the same tree as the bark sample, no Global Positioning System (GPS) coordinates were recorded for the respective duff sample.

2.7 PHASE V RI EQUIPMENT

2.7.1 Sampling Equipment

Sampling equipment and instrumentation used included the following:

- Surface Water Sampling
  - 500-mililiter high density polyethylene (HDPE) wide-mouth bottles
  - Transect stainless steel sample pipe with plug
  - Pre-numbered self-adhesive sample identification labels
- Sediment Sampling
  - Zip-top bags
  - Trowel
  - Pre-numbered self-adhesive sample identification labels
- Bark and Duff Sampling
  - Zip-top bags
  - Cordless drill with dedicated drill bits for each composite
  - Pre-numbered self-adhesive sample identification labels
- ABS Air Sampling
  - Air sampling pump: SKC model AirChek XR5000™ (0.005 – 5.0 L/min)
  - Sample cassette: 25mm 0.8-micron pore size, conductive, cowled MCE cassettes
  - Inert tubing: Tygon™ R-3603 tubing, 1/4” inner diameter and 7/16” outer diameter
  - Primary calibrator: BIOS Intl. DryCal DC-Lite™ model MH (0.2 – 17 LPM)
- Field Documentation
  - Chain of Custody sheets
  - Field logbook and indelible pens/markers
  - GPS Unit
  - Digital Camera with dry-erase placard

- Sample Handling
    - Sample Storage: Vendor-supplied, partitioned filter cassette shipping boxes
    - Sample shipping: Small insulated plastic coolers with integrated handles on top to ensure the container remained upright during shipment to the laboratory
    - Custody seals
    - Shipping labels

2.7.2 Field Calibration of Air Sampling Pumps

A BIOS Intl. DryCal DC-Lite™ model MH air-flow calibrator with a range of 0.2 L/min to 17 L/min was used to calibrate each of the working pumps to set and confirm air sampling pump flow rates in the field. The DC-Lite™ automatically adjusts for temperature and pressure, eliminating the need for manual compensation or correction of flow-rate values.

The flow rate of each air-sampling pump was measured, adjusted (if necessary) and recorded at the beginning of each ABS activity, and then re-measured and recorded at the conclusion of each activity. The flow-rate measurement procedure consisted of using the BIOS calibrator connected by eight inches of Tygon™ tubing to a dedicated cassette end cap, which was inserted into the intake (cowl) end of the sampling cassette. The pump was turned on for a brief period and the pump flow rate was adjusted as close to the target flow rate as possible (4.0 L/min, 2.0 L/min or 1.0 L/min, as appropriate), using the flow-rate value indicated by the BIOS calibrator. Dedicated calibration equipment (cassette caps, and Tygon tubing) were stored in a closed Ziploc™ plastic bag when not in use.

The AirChek XR5000™ pumps used in the ABS program are equipped with isothermal flow sensors that measure air flow directly. The pump is electronically controlled to deliver flow to within 5 percent of the flow set-point, and will automatically shut off and display a flow fault if the flow rate cannot be maintained (due to battery failure, crimped air sampling tubing, pump fault, etc.). The Airchek XR5000™ is powered by an internal lithium-ion battery; during periodic battery conditioning run-down, the pumps were observed to run continuously for as long as 96 hours, with no observed variation in flow rate (more than double the running life claimed by the manufacturer).

2.8 QUALITY CONTROL SAMPLES

Three types of field-based QC samples (i.e., lot blanks, field duplicate, and field blank) were collected during the sampling events.

2.8.1 Lot Blanks

Before any air cassettes were used for ABS, the cassette lot was verified to be asbestos-free. This was accomplished by sending two unopened cassettes per lot of cassettes for TEM analysis using ISO 10312 counting protocols, as modified by Libby-specific laboratory modifications.

2.8.2 Field Duplicate Samples

Field duplicate (FD) samples were collected for surface water, sediment, and bark and duff samples. Field duplicate samples were collected at a rate 10% or one FD per 10 environmental samples collected or at a minimum rate of one sample per week. Environmental and QC samples and are summarized in **Table 2-1.**

2.8.3 Field Blank Samples

Field Blank (FB) samples were collected for each of the sample types (i.e., surface water, sediment and ABS air samples). Field blank samples were collected at a rate 10% or one FD per 10 environmental or one per day. Environmental and QC samples and are summarized in **Table 2-1** and **2-2.**

2.9 SAMPLE IDENTIFICATION, HANDLING AND ANALYSIS

2.9.1 Sample Identification

Field data observed during collection of each sample were documented by field personnel on the OU3 Phase V RI-specific FSDS. At the time of collection, each sample was labeled with a unique 5-digit sequential index identification (index ID) number. The index IDs for samples collected as part of the 2012 Phase V RU sampling have a prefix of “CL or P5” (e.g., CL-30001, P5-10000). Information on whether the sample was representative of a field sample or a field-based QC sample (e.g., FD or FB) was

documented on the FSDS and is summarized in **Table 2-1** and **2-2**. Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was unknown to the analytical laboratory.

Field personnel maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in the field logbook. Scans of the logbook and FSDS forms are provided as PDF files in Appendix B and C, respectively (on CD in pocket).

2.9.2 Sample Chain-Of-Custody and Shipment

A chain-of-custody was maintained until final disposition of the samples by the laboratory and acceptance of analytical results. A COC form specific to the Phase V sampling program accompanied every shipment of samples to the analytical laboratory. All corrections to the COC record were initialed and dated by the person who made the corrections. Original COCs accompanied the samples to the laboratory; copies were made and retained to document each change of custody. All samples were sent directly to the analytical laboratory by FedEx priority overnight service. Scans of the COCs are provided as PDF files in Appendix D (on CD in pocket).

2.9.3 Sample Analysis

All samples collected during the Phase V RI were submitted for asbestos analysis using transmission electron microscopy (TEM) in accordance with the International Organization for Standardization (ISO) 10312:1995 method counting protocols, as modified by Libby-specific laboratory modifications. Detailed descriptions of laboratory protocols and analytical methods are provided in the *Phase V Part A Kootenai SAP* and the *Phase V Logging SAP* and associated SOPs.

2.10 HEALTH AND SAFETY

“Tailgate” safety meetings were conducted at the start of work day. Bear deterrent spray, first-aid kits, cooling vests and water were made available for use during project work.

TABLE 2-1
PHASE V PART A
SUMMARY OF KOOTENAI RIVER
SURFACE WATER, SEDIMENT, AND ABS
LOCATIONS AND SAMPLES

Sampling Date	Station ID	Index ID	Sampling Type	Description	Sample Media
4/25/2012	KR-4	P5-10001	Field Blank		Water
4/25/2012	KR-4	P5-10002	normal		Water
4/25/2012	KR-4	P5-10003	Field Duplicate		Water
4/25/2012	KR-1	P5-10004	normal		Water
4/25/2012	UKR-0	P5-10005	normal		Water
4/25/2012	LRC-06	P5-10006	normal		Water
5/2/2012	KR-4	P5-10007	Field Blank		Water
5/2/2012	KR-4	P5-10008	normal		Water
5/2/2012	KR-4	P5-10009	Field Duplicate		Water
5/2/2012	KR-1	P5-10010	normal		Water
5/2/2012	UKR-0	P5-10011	normal		Water
5/2/2012	LRC-06	P5-10012	normal		Water
5/9/2012	KR-5	P5-10013	normal		Water
5/9/2012	KR-4	P5-10014	Field Blank		Water
5/9/2012	KR-4	P5-10015	normal		Water
5/9/2012	KR-4	P5-10016	Field Duplicate		Water
5/9/2012	KR-1	P5-10017	normal		Water
5/9/2012	UKR-0	P5-10018	normal		Water
5/9/2012	LRC-06	P5-10019	normal		Water
5/9/2012	LRC-06	P5-10020	normal		Water
5/9/2012	LRC-06	P5-10021	normal		Water
5/9/2012	LRC-06	P5-10022	normal		Water
5/9/2012	LRC-06	P5-10023	normal		Water
5/9/2012	LRC-06	P5-10024	normal		Water
5/9/2012	LRC-06	P5-10025	normal		Water
5/9/2012	LRC-06	P5-10026	normal		Water
5/9/2012	LRC-06	P5-10027	normal		Water
5/16/2012	KR-5	P5-10028	Field Blank		Water
5/16/2012	KR-5	P5-10029	normal		Water
5/16/2012	KR-4	P5-10030	normal		Water
5/16/2012	KR-4	P5-10031	Field Duplicate		Water
5/16/2012	KR-1	P5-10032	normal		Water
5/16/2012	UKR-0	P5-10033	normal		Water
5/16/2012	LRC-06	P5-10034	normal		Water
5/23/2012	KR-16	P5-10035	normal		Water
5/23/2012	KR-16	P5-10036	Field Blank		Water
5/23/2012	KR-16-trans	P5-10037	normal	KR16 Transect A	Water
5/23/2012	KR-16-trans	P5-10038	normal	KR16 Transect B	Water
5/23/2012	KR-16-trans	P5-10039	normal	KR16 Transect C	Water
5/23/2012	KR-16-trans	P5-10040	normal	KR16 Transect D	Water
5/23/2012	KR-14N	P5-10041	normal		Water
5/23/2012	KR-14-trans	P5-10042	normal	KR14 Transect A	Water
5/23/2012	KR-14-trans	P5-10043	normal	KR14 Transect B	Water
5/23/2012	KR-14-trans	P5-10044	Field Duplicate	KR14 Transect B DUP	Water
5/23/2012	KR-14-trans	P5-10045	normal	KR14 Transect C	Water
5/23/2012	KR-14N	P5-10046	normal	KR14 Transect D	Water
5/23/2012	KR-14N	P5-10047	normal	KR14 Transect E	Water
5/23/2012	KR-15	P5-10048	normal		Water
5/23/2012	KR-5	P5-10049	normal		Water
5/23/2012	KR-5	P5-10050	Field Duplicate		Water
5/23/2012	KR-4	P5-10051	normal		Water
5/23/2012	KR-1	P5-10052	normal		Water
5/23/2012	UKR-0	P5-10053	normal		Water
5/23/2012	UKR-1	P5-10054	normal		Water
5/23/2012	UKR-2	P5-10055	normal		Water
5/23/2012	LRC-06	P5-10056	normal		Water
5/30/2012	KR-5	P5-10057	Field Blank		Water
5/30/2012	KR-5	P5-10058	normal		Water
5/30/2012	KR-4	P5-10059	normal		Water
5/30/2012	KR-4	P5-10060	Field Duplicate		Water
5/30/2012	KR-1	P5-10061	normal		Water
5/30/2012	UKR-0	P5-10062	normal		Water
5/30/2012	LRC-06	P5-10063	normal		Water
6/6/2012	KR-5	P5-10064	Field Blank		Water
6/6/2012	KR-5	P5-10065	normal		Water

TABLE 2-1
PHASE V PART A
SUMMARY OF KOOTENAI RIVER
SURFACE WATER, SEDIMENT, AND ABS
LOCATIONS AND SAMPLES

Sampling Date	Station ID	Index ID	Sampling Type	Description	Sample Media
6/6/2012	KR-4	P5-10066	normal		Water
6/6/2012	KR-1	P5-10067	normal		Water
6/6/2012	KR-1	P5-10068	Field Duplicate		Water
6/6/2012	UKR-0	P5-10069	normal		Water
6/6/2012	LRC-06	P5-10070	normal		Water
6/6/2012	KR-5	P5-10071	Field Blank		Water
6/6/2012	KR-5	P5-10072	normal		Water
6/13/2012	KR-4	P5-10073	normal		Water
6/13/2012	KR-4	P5-10074	Field Duplicate		Water
6/13/2012	KR-1	P5-10075	normal		Water
6/13/2012	UKR-0	P5-10076	normal		Water
6/13/2012	LRC-06	P5-10077	normal		Water
9/19/2012	KR-16N	P5-10078	Field Blank		Water
9/19/2012	KR-16N	P5-10079	normal		Water
9/19/2012	KR-16-trans	P5-10080	normal	KR16 Transect A	Water
9/19/2012	KR-16-trans	P5-10081	normal	KR16 Transect B	Water
9/19/2012	KR-16-trans	P5-10082	normal	KR16 Transect C	Water
9/19/2012	KR-16-trans	P5-10083	normal	KR16 Transect D	Water
9/19/2012	KR21	P5-10084	normal		30-point Composite Sediment
9/19/2012	KR-15	P5-10085	normal		Water
9/19/2012	KR-14N	P5-10086	normal		Water
9/19/2012	KR-14N	P5-10087	Field Duplicate		Water
9/19/2012	KR-14-trans	P5-10088	normal	KR14 Transect A	Water
9/19/2012	KR-14-trans	P5-10089	normal	KR14 Transect B	Water
9/19/2012	KR-14-trans	P5-10090	normal	KR16 Transect C	Water
9/19/2012	KR-14-trans	P5-10091	normal	KR16 Transect D	Water
9/19/2012	KR-5	P5-10092	normal		Water
9/19/2012	KR-4	P5-10093	normal		Water
9/19/2012	KR20	P5-10094			30-point Composite Sediment
9/19/2012	KR20	P5-10095	Field Duplicate		30-point Composite Sediment
9/19/2012	KR20	P5-10096	Field Blank	ABS	ABS
9/19/2012	KR20	P5-10097	normal	ABS 4L	ABS
9/19/2012	KR20	P5-10098	normal	ABS 2l	ABS
9/19/2012	KR20	P5-10099	normal	ABS 4L	ABS
9/19/2012	KR20	P5-10100	normal	ABS 2l	ABS
9/19/2012	KR-1	P5-10101	normal		Water
9/19/2012	UKR-0	P5-10102	normal		Water
9/19/2012	UKR-0	P5-10103	Field Duplicate		Water
9/19/2012	UKR-1	P5-10104	normal		Water
9/19/2012	UKR-3	P5-10105	normal	former UKR-2	Water
9/19/2012	LK-1	P5-10106	normal		30-point Composite Sediment
9/19/2012	LK-2	P5-10107	normal		30-point Composite Sediment
9/19/2012	LRC-6	P5-10108	normal		Water

TABLE 2-2
PHASE V PART B
COMMERCIAL LOGGING ABS
SAMPLING SUMMARY

Sampling Date	Sampling Site	Index ID	Sample Type	diameter (inches)
Logging ABS: Pre-ABS duff and Bark Sampling				
8/7/2012	**CL-3-0001, CL-3-0002**			
	CL-3-0001	CL-A1d	5pt Duff Composite	21
	CL-3-0001	CL-A2d	5pt Duff Composite	11.5
	CL-3-0001	CL-A3d	5pt Duff Composite	8.5
	CL-3-0001	CL-A4d	5pt Duff Composite	23.5
	CL-3-0001	CL-A5d	5pt Duff Composite	11.25
	CL-3-0002	CL-A1b	5pt Bark Composite	21
	CL-3-0002	CL-A2b	5pt Bark Composite	11.5
	CL-3-0002	CL-A3b	5pt Bark Composite	8.5
	CL-3-0002	CL-A4b	5pt Bark Composite	23.5
	CL-3-0002	CL-A5b	5pt Bark Composite	11.25
8/7/2012	**CL-3-0003, CL-3-0004**			
	CL-3-0003	CL-B1d	5pt Duff Composite	15.75
	CL-3-0003	CL-B2d	5pt Duff Composite	13.5
	CL-3-0003	CL-B3d	5pt Duff Composite	15
	CL-3-0003	CL-B4d	5pt Duff Composite	11
	CL-3-0003	CL-B5d	5pt Duff Composite	15.5
	CL-3-0004	CL-B1b	5pt Bark Composite	15.75
	CL-3-0004	CL-B2b	5pt Bark Composite	13.5
	CL-3-0004	CL-B3b	5pt Bark Composite	15
	CL-3-0004	CL-B4b	5pt Bark Composite	11
	CL-3-0004	CL-B5b	5pt Bark Composite	15.5
8/7/2012	CL-3-0005	CL-B1d	5pt Duff Composite	15.75
Duplicate	CL-3-0005	CL-B2d	5pt Duff Composite	13.5
	CL-3-0005	CL-B3d	5pt Duff Composite	15
	CL-3-0005	CL-B4d	5pt Duff Composite	11
	CL-3-0005	CL-B5d	5pt Duff Composite	15.5
	CL-3-0006	CL-B1b	5pt Bark Composite	15.75
	CL-3-0006	CL-B2b	5pt Bark Composite	13.5
	CL-3-0006	CL-B3b	5pt Bark Composite	15
	CL-3-0006	CL-B4b	5pt Bark Composite	11
	CL-3-0006	CL-B5b	5pt Bark Composite	15.5
8/7/2012	**CL-3-0007, CL-3-0008**			
	CL-3-0007	CL-C1d	5pt Duff Composite	15
	CL-3-0007	CL-C2d	5pt Duff Composite	12.5
	CL-3-0007	CL-C3d	5pt Duff Composite	15
	CL-3-0007	CL-C4d	5pt Duff Composite	11
	CL-3-0007	CL-C5d	5pt Duff Composite	11
	CL-3-0008	CL-C1b	5pt Bark Composite	15
	CL-3-0008	CL-C2b	5pt Bark Composite	12.5
	CL-3-0008	CL-C3b	5pt Bark Composite	15
	CL-3-0008	CL-C4b	5pt Bark Composite	11
	CL-3-0008	CL-C5b	5pt Bark Composite	11

TABLE 2-2
PHASE V PART B
COMMERCIAL LOGGING ABS
SAMPLING SUMMARY

Sampling Date	Sampling Site	Index ID	Sample Type	diameter (inches)
8/7/2012	**CL-3-0009, CL-3-0010**			
	CL-3-0009	CL-D1d	5pt Duff Composite	11
	CL-3-0009	CL-D2d	5pt Duff Composite	13
	CL-3-0009	CL-D3d	5pt Duff Composite	12.5
	CL-3-0009	CL-D4d	5pt Duff Composite	18
	CL-3-0009	CL-D5d	5pt Duff Composite	17
	CL-3-0010	CL-D1b	5pt Bark Composite	11
	CL-3-0010	CL-D2b	5pt Bark Composite	13
	CL-3-0010	CL-D3b	5pt Bark Composite	12.5
	CL-3-0010	CL-D4b	5pt Bark Composite	18
	CL-3-0010	CL-D5b	5pt Bark Composite	17
8/7/2012	**CL-3-0011, CL-3-0012**			
	CL-3-0011	CL-E1d	5pt Duff Composite	16.5
	CL-3-0011	CL-E2d	5pt Duff Composite	17.5
	CL-3-0011	CL-E3d	5pt Duff Composite	11.5
	CL-3-0011	CL-E4d	5pt Duff Composite	13.5
	CL-3-0011	CL-E5d	5pt Duff Composite	24
	CL-3-0012	CL-E1b	5pt Bark Composite	16.5
	CL-3-0012	CL-E2b	5pt Bark Composite	17.5
	CL-3-0012	CL-E3b	5pt Bark Composite	11.5
	CL-3-0012	CL-E4b	5pt Bark Composite	13.5
	CL-3-0012	CL-E5b	5pt Bark Composite	24

Sampling Date	Sampling Site	4 liter/minute	2 liter/minute	ABS Activity
9/4/2012	Logging Area	CL-30050	CL-30051	Hand-Felling
		CL-30053	CL-30054	Hand-Felling
		CL-30055	CL-30056	Hand-Felling
9/5/2012	Logging Area	CL-30057	CL-30058	Skidding/Hooking
		CL-30060	CL-30061	Skidding/Hooking
		CL-30062	CL-30063	Skidding/Hooking
		CL-30064	CL-30065	Skidding/Hooking
	Field Blank	CL-30059		Skidding/Hooking
9/6/2012	Logging Area	CL-30066	CL-30067	Skidding/Hooking
		CL-30069	CL-30070	Mechanical Processing
	Field Blank	CL-30068		Skidding/Hooking
9/10/2012	Logging Area	CL-30076	CL-30077	Chipping
		CL-30078	CL-30079	Chipping
	Field Blank	CL-30073		Chipping
9/10/2012	Logging Area	CL-30080	CL-30081	Site Restoration
		CL-30082	CL-30083	Site Restoration

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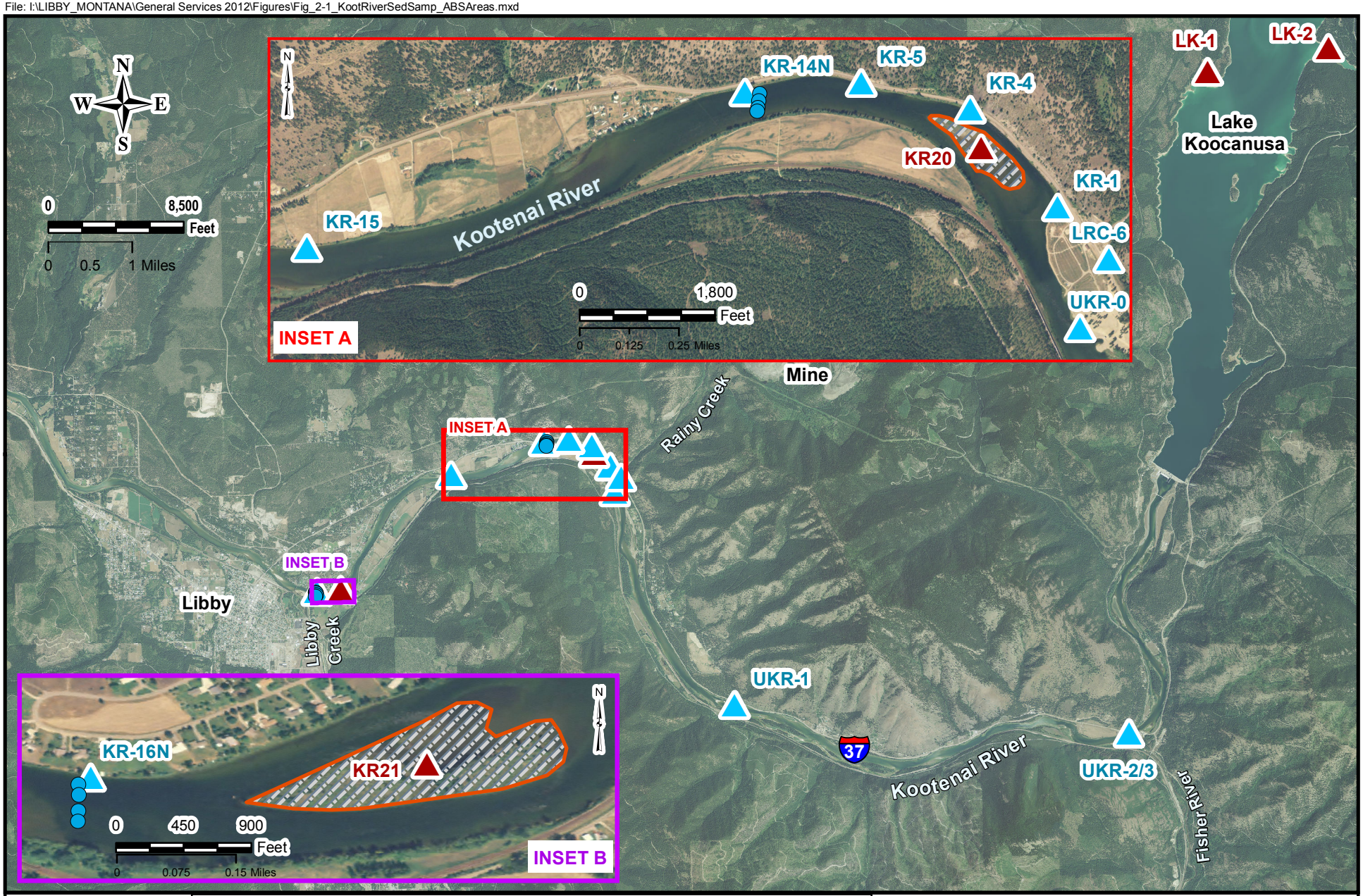


MWH

EXPLANATION

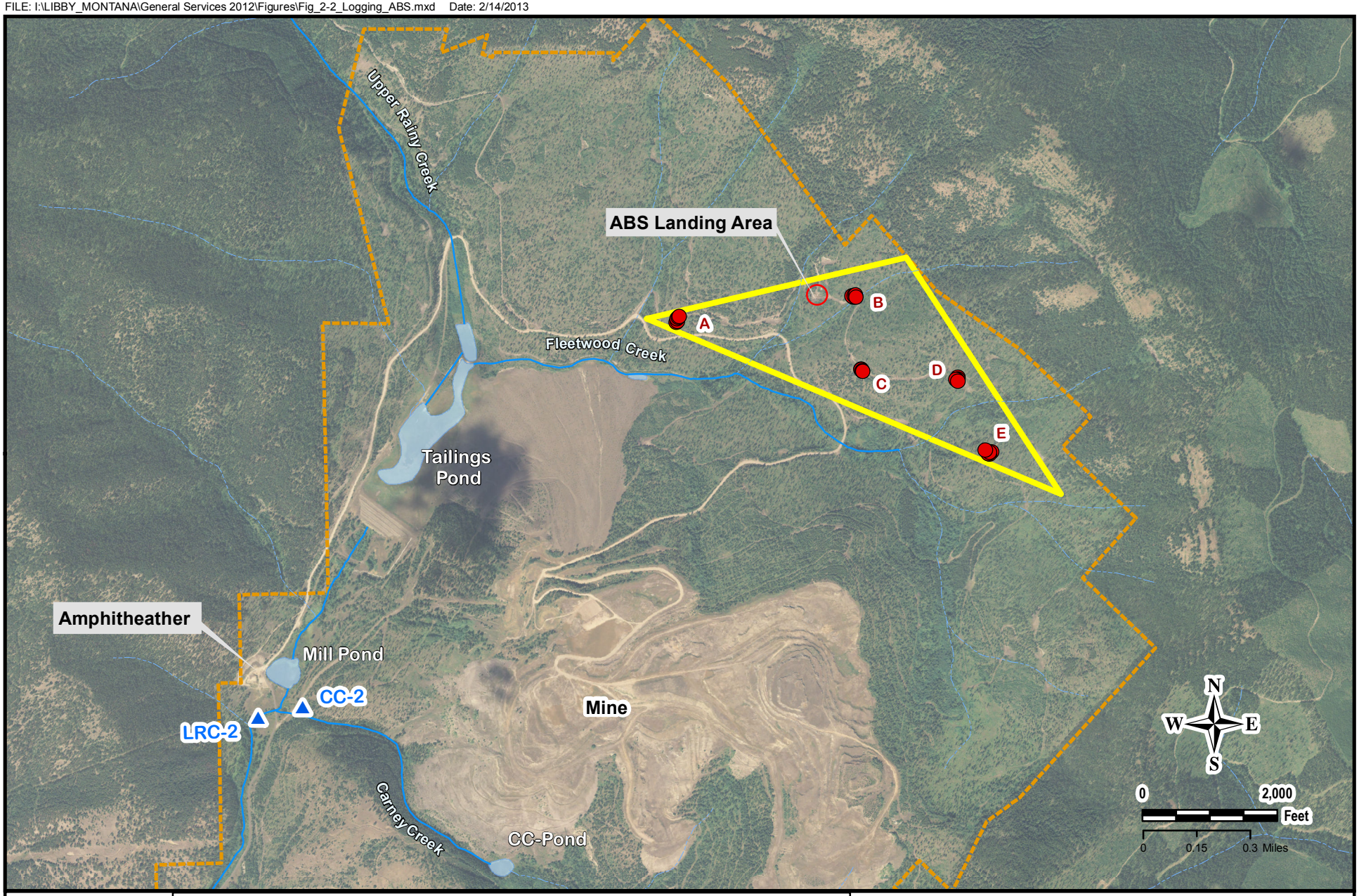
- Surface Water Sample
- Transect Surface Water Sample
- Sediment 30-Point Composite Sample
- ABS Areas

LIBBY ASBESTOS SUPERFUND SITE

Kootenai River Sampling and ABS

FIGURE 2-1

FILE: I:\LIBBY_MONTANA\General Services 2012\Figures\Fig_2-2_Logging_ABS.mxd Date: 2/14/2013



MWH

EXPLANATION

Creek
Intermittent streams
ISCO Locations
Ponds
Bark and Duff Sample Area
Logging ABS Activities Area

LIBBY ASBESTOS SUPERFUND SITE

LOGGING ABS AREA

FIGURE 2-2

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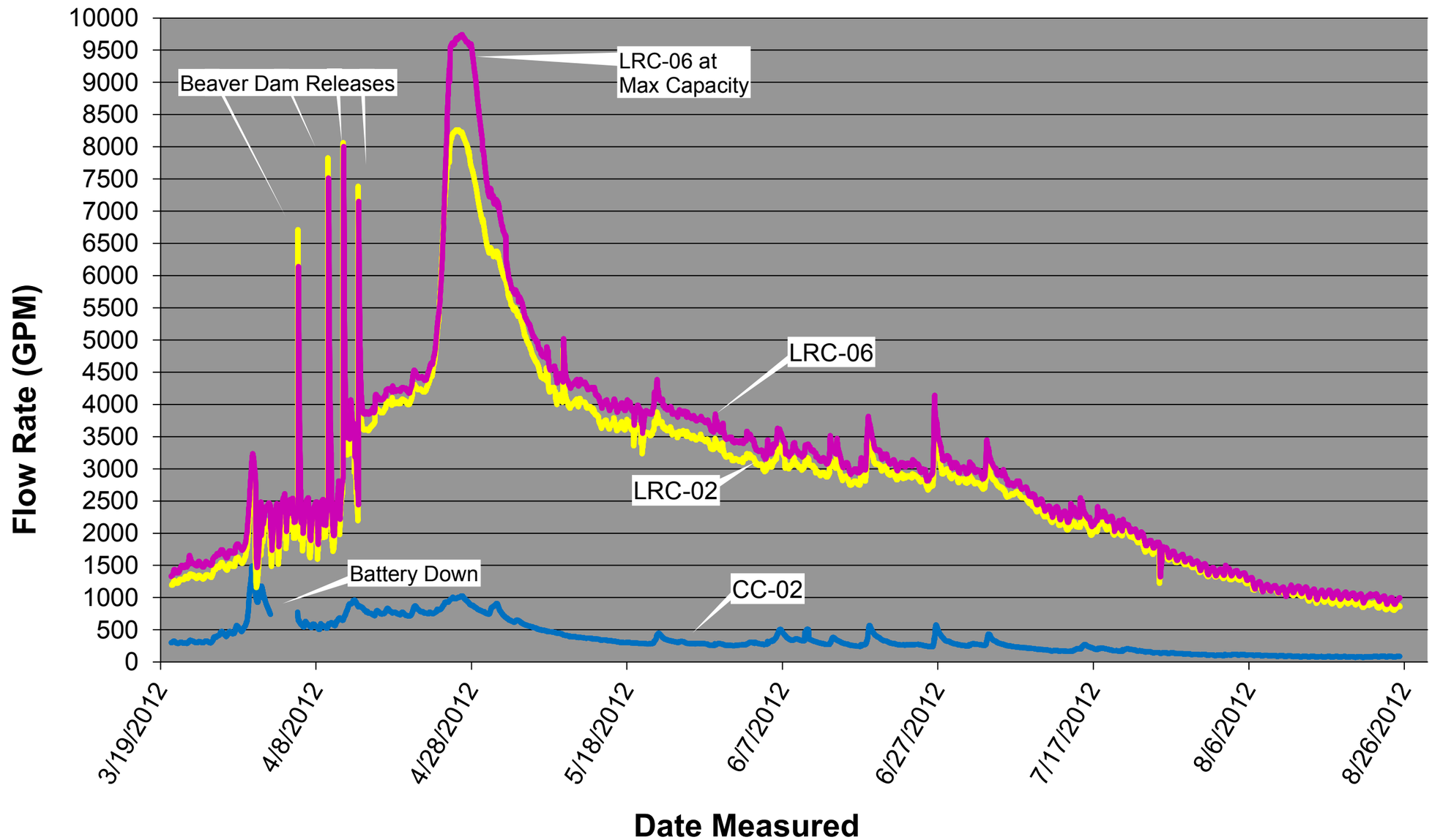

MWH

EXPLANATION

Flow Stations

CC-02

LRC-02

LRC-06

LIBBY ASBESTOS SUPERFUND SITE

OU3 Phase V 2012

Stream Flow Data

FIGURE 2-3