

FIELD SAMPLING SUMMARY REPORT

**PHASE II REMEDIAL INVESTIGATION
OPERABLE UNIT 3**

PART A: SURFACE WATER AND SEDIMENT SAMPLING

And

PART B: GROUNDWATER AND AMBIENT AIR SAMPLING

LIBBY ASBESTOS SUPERFUND SITE

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LIST OF ACRONYMS

µm	micrometer
AOC	Administrative Order on Consent
BTOC	below top of casing
CDM	Camp Dresser McKee, Inc.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminant(s) of concern; chain-of-custody
DO	dissolved oxygen
DOC	dissolved organic carbon
ELI	Energy Laboratories, Inc.
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbons
FD	field duplicate
FSDS	field sample data sheet
FSSR	Field Sampling Summary Report
GIS	geographic information system
gpm	gallons per minute
GPS	global positioning system
HEPA	high-efficiency particulate air
Index ID	index identification number
KDC	Kootenai Development Corporation
LA	Libby Amphibole
LPM	Liter per minute
MCE	microcellulose ester
MDEQ	Montana Department of Environmental Quality
mL	milliliter
MP	mill pond
MS/DS	matrix spike/matrix spike duplicate
MSI	Meteorological Solutions, Inc.
MWH	MWH Americas, Inc.
ORP	oxidation/reduction potential
OU	Operable Unit

LIST OF ACRONYMS
(continued)

PCB	polychlorinated biphenyls
PE	performance evaluation
PLM-VE	polarized light microscopy and visual estimation
PPE	personal protective equipment
QC	quality control
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SASSD	Suction-assisted sediment sampling device
SOP	Standard Operating Procedure
SRC	Syracuse Research Corporation
SVOC	semi-volatile organic compound
TAL	target analyte list
TCL	target compound list
TDS	total dissolve solids
TEM	transmission electron microscopy
TP	tailings pond
TSS	total suspended solids
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WDC	Water Development Company

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 inhalation of large quantities of LA fibers associated with the vermiculite is known to have caused adverse health effects in some workers at the mine and processing facilities and possibly in 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 was designated OU3. In September 2007, EPA initiated a Remedial Investigation/Feasibility Study (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. 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.

This document is the FSSR for Part A (surface water and sediment sampling) and Part B (groundwater and ambient air sampling) of the Phase II RI activities performed at OU3 from early April through October, 2008. 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*, final version dated May 29, 2008 (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*, final version dated July 2, 2008 (Phase IIB SAP). Part C of the Phase II RI included ecological sampling performed by Parametrix in late September and early October, 2008, and is discussed in a separate document.

1.2 PURPOSE OF THE PHASE II REMEDIAL INVESTIGATION

Prior to implementing the OU3 Phase I RI in October 2007, 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 boundaries 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. The overall objective of 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 Phase II 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, the subject of this document) could be designed for implementation during the 2008 field season.

1.3 PURPOSE OF THIS DOCUMENT

This document is the FSSR for Phase II RI sampling of environmental media in support of the RI/FS at OU3 of the Libby Asbestos Superfund Site. 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 OU3 boundaries are depicted on each Plate in this document). The final boundaries of OU3 had not been defined prior to Phase I RI field sampling in October 2007 or prior to Phase II field activities, which began in April 2008. 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 Phase I, II and any subsequent phases of the RI at OU3.

This FSSR is a summary of sampling activities, locations and methods employed during the Phase II RI at OU3. Analytical results for samples collected during the Phase II RI are not presented in this document; analytical data and interpretations will be 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. Phase II analytical results will be the basis for the data-gathering activities and scope of subsequent phases of RI at OU3. After all RI activities have been completed, a comprehensive RI Report will be prepared. The RI Report will contain all analytical results, interpretations and conclusions for the OU3 Remedial Investigation.

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 is Bonita Lavelle of EPA Region 8. Ms. Lavelle 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 Catherine LeCours. 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 both the Phase I and Phase II SAPs at OU3. The designated Project Coordinator for the Respondents is Robert Medler of Remedium Group, Inc., a subsidiary of W.R. Grace & Co.

1.4.2 Technical Support

EPA was supported in this project by a number of contractors, including:

- Syracuse Research Corporation (SRC) assisted in the development of the Phase II SAP and will assist in the evaluation and interpretation of the Phase II analytical data.
- NewFields Boulder LLC, as a subcontractor to SRC, provided support in developing the SAP and with mapping and other geographic information system (GIS) applications, and will assist in the design and evaluation of the feasibility study.

- U.S. Department of Transportation, John A. Volpe National Transportation Systems Center (Volpe) provided management and coordination of resources for field oversight of sampling activities.
- Camp Dresser McKee, Inc. (CDM) provided on-site support and oversight for field sampling activities.

1.4.3 Field Sampling Activities

Phase II field sampling activities were performed by W.R. Grace & Co.-Conn. and KDC with support from MWH Americas, Inc. (MWH) and Meterological Solutions, Inc. (MSI), in accordance with the Phase II SAPa and field modifications authorized by EPA (see Attachment B of this FSSR). Individuals responsible for implementation of the OU3 Phase II field sampling program are listed below:

- MWH Project Manager/Field Supervisor: John Garr
- MWH Assistant PM/Field quality control (QC) Officer: Mark Rettmann
- MWH Quality Assurance Officer: Stephanie Boehnke
- MSI point-of-contact: William Hauze

1.4.4 EPA Field Oversight Contractor

Ms. Courtney Zamora of Volpe served as on-site point-of-contact for access to the former mine property; Ms. Zamora also coordinated field oversight and auditing for OU3 Phase II sampling. Oversight and auditing of Phase II field sampling was performed by CDM staff.

1.4.5 Sample Preparation and Analysis

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

- All sample analyses for LA were performed by EMSL Analytical, Inc. and Hygiea Analytical Laboratories
- All sample analyses for non-asbestos analytes were performed by Energy Laboratories, Inc. (ELI)
- All soil or soil-like samples to be analyzed for non-volatile analytes were prepared by the CDM Close-Support Facility soil preparation laboratory in Denver, CO, before being submitted for analysis.
- All analytical data validation and verification is to be performed by SRC.

1.4.6 Data Management

Administration of the OU3 master database is performed by EPA contractors SRC and NewFields. The primary database administrator is Lynn Woodbury of SRC. She 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 LA data from the Phase II RI will be transferred into the Libby2 database for final storage.

2.0 SUMMARY OF PHASE II RI SAMPLING ELEMENTS AND OBJECTIVES

The objective for OU3 Phase II sampling and analysis was to provide information to further characterize COC concentrations in on-site media. Media sampled and analyzed during Phase II were divided into the following classes and phases of investigation:

- Surface Water (Phase IIA)
- Sediment (Phase IIA)
- Groundwater (Phase IIB)
- Ambient Air (Phase IIB)
- Biota (Phase IIC)

The following sections of this FSSR are summaries of the experimental design and rationale for each of the sampling elements performed during Phase IIA (surface water and sediment) and Phase IIB (groundwater and ambient air). Details concerning biota sampling (Phase IIC) are presented in a separate document.

2.1 DESCRIPTION OF PHASE IIA: RAINY CREEK WATERSHED MONITORING ELEMENTS

The Phase I investigation of the Rainy Creek watershed was performed in the fall of 2007 to provide an initial characterization of conditions at and surrounding the Libby Mine site. Further characterization of surface water and sediment was performed in 2008 as part of Phase II. This section describes the Phase IIA data collection activities performed to meet data needs for surface water and sediments within the Rainy Creek watershed.

2.1.1 Element 1: Seasonal Surface Water and Sediment Monitoring

To evaluate the assumption that contaminant concentrations vary with stream flow rates in each portion of the Rainy Creek watershed as a function of time of year, the purpose of Element 1 was to measure stream flow and the concentrations of potential contaminants

of concern (COCs) in surface water and sediment at each location previously sampled in Phase I to characterize COC concentrations in surface water and sediment during spring and summer flow conditions. These data will be combined with Phase I data collected during the fall of 2007 to develop an understanding of the seasonal variability in flow and COC concentration patterns across the site, and will form the basis for an initial screening-level assessment of exposure and risk to human and ecological receptors, using comparisons to appropriate risk-based concentrations of COCs in surface water and sediment, when available.

Surface Water Samples

Figure 3-1 identifies the locations where samples of surface water were collected during Element 1 of Phase IIA. These are the same locations where samples were collected during Phase I, and the following additional locations:

- Tailings Pond overflow (TP-overflow). This location was added to characterize the concentration and load of LA and other contaminants that may be released during periods of high flow that over-top the impoundment
- Rainy Creek upstream of the mine-disturbed areas and Rainy Creek Road (URC-1A). This station was added to help define the contribution of LA releases from the road to LA concentrations detected downstream at URC-2
- Pond on Carney Creek (CC-Pond). This station was added because the existence of the pond had not been recognized prior to the Phase I sampling program, and thus, no samples were collected from this pond during Phase I.

Table 3-1 identifies and describes all of the Phase IIA Element 1 surface water monitoring locations. Details on surface water sampling are presented in Section 3 of this FSSR.

Surface water samples were collected from each station once in late spring after peak runoff (from June 23 through July 3, 2008) and once in the summer (from September 8 through September 16, 2008). All Element 1 surface water samples were discrete grab

samples, and were analyzed for asbestos, metals/metalloids, petroleum hydrocarbons, anions, and other water quality parameters. In addition, a broader suite of analyses were performed for samples collected at the Tailings Pond toe drain (TP-TOE1) and Lower Rainy Creek downstream of the confluence with Carney Creek (LRC-2). These locations were selected because they are assumed to have the best potential of characterizing releases from the mine. The additional analyses for surface water at these two locations included PCBs, pesticides, herbicides, gross alpha/gross beta, volatile and semi-volatile organic compounds, and cyanide. The results of these analyses will provide a more comprehensive screen for potential contaminants associated with mine wastes and process chemicals used during mine operations. Details on the specific chemical analyses that were performed for surface water samples are contained in Table 3-1 of this FSSR and are discussed in Section 6 of the Phase IIA SAP.

Water quality data from seep and spring waters will provide information on shallow groundwater quality (i.e., whether contaminants are being released from mine waste piles and disposal areas). These data, along with groundwater sampling data collected as part of Phase IIB, will allow for identification of mine-related contaminants (if any) and, possibly, an assessment of transport pathways.

At locations where flowing water was present, the stream flow rate was measured after the collection of surface water. Details on flow measurement are provided in Section 3.4.2 of this document. Flow data will be used with contaminant concentration data to assess contaminant mass transport along surface water pathways.

Sediment Samples

Sediment samples were collected during Phase IIA Element 1 sampling, once in late spring after peak runoff (from June 23 through July 3, 2008) and once in late summer (from September 8 through September 16, 2008), from the same locations and immediately after collection of surface water samples (see Figure 4-1). The sediment data collected during Phase IIA will be used in conjunction with data collected during Phase I to evaluate contaminant heterogeneity in sediment at each location and to assess seasonal variability in sediment concentrations, if any.

The Phase IIA sediment sampling plan differed from that of Phase I in that the Tailings Pond, Mill Pond and the ponds on Carney Creek and Fleetwood Creek were each sampled by collecting multiple discrete grab samples, rather than one or two composite samples. The purpose of collecting multiple grab samples from these water bodies was to provide information on the spatial variability of COCs within each feature. This is important mainly for evaluating risks to benthic organisms in the ecological risk assessment.

Figure 4-2 shows the locations of 17 sediment sampling locations in the Tailings Pond. These sample locations focused mainly on areas that are always or usually inundated with water, because these areas are most likely to serve as habitat for aquatic receptors. However, five of the Tailings Pond sediment samples were collected from areas that are only occasionally inundated.

At the three other ponds (Mill Pond and the ponds on Carney and Fleetwood creeks), five sediment grab samples were collected from each pond. These sample sets comprised three from around the margins of the pond (at least three feet offshore), and two from near the center of each pond. Detailed procedures for collection of sediment samples associated with this element of Phase IIA are provided in Section 4 of this FSSR.

All Phase IIA Element 1 sediment samples were analyzed for asbestos, metals/metalloids, petroleum hydrocarbons, and total organic carbon. Sediments from lower Rainy Creek and the Tailings Pond toe drain were also analyzed for PCBs to assess the potential effects of use of transformer oil for dust control along the adjacent road. Sediment collected from TP-TOE2 and LRC-2 were also analyzed for pesticides, herbicides, volatile and semi-volatile organic compounds, and cyanide. Details on the specific analyses that were performed for sediment are discussed in Section 4-1 of this FSSR and in Section 6 of the Phase IIA SAP.

2.1.2 Element 2: Spring Runoff Monitoring

The purpose of Element 2 was to monitor stream flow and surface water LA concentration values at 13 selected stations within the Rainy Creek watershed during the

rising and falling limbs of the spring-season snowmelt-runoff hydrograph. These data will be used to track changes in the LA content of water as stream flows first rise in response to snowmelt runoff and then decline as snowmelt ends. Surface water samples were collected once during early spring base-flow conditions (April 7 through April 9, 2008), and weekly thereafter, continuing through the spring high-flow season, and ending approximately 4 weeks after the seasonal peak in flow was observed on Rainy Creek (the eleventh and final weekly round was collected from June 16 through June 18, 2008).

Table 3-2 and Figure 3-2 identify the locations where samples of surface water were collected under Element 2. Surface water samples were collected weekly during the spring runoff season at the following locations:

- Tailings Pond (TP), Tailings Pond toe drain (TP-TOE1), and Tailings Pond overflow (TP-overflow);
- Mill Pond (MP);
- Rainy Creek (URC-1A, URC-2) upstream of the mine-disturbed areas
- Fleetwood Creek (FC-2) and Carney Creek (CC-2) downstream of mine-disturbed areas
- Lower Rainy Creek below the Mill Pond (LRC-1) and below its confluence with Carney Creek (LRC-2, LRC-6)
- Pond on Carney Creek (CC-Pond)
- Pond on Fleetwood Creek (FC-Pond)

All of the locations listed were sampled during the Phase I investigation except for one new station on upper Rainy Creek (URC-1A) and one new station at the pond on lower Carney Creek (CC-Pond).

Element 2 was designed to provide a more detailed set of LA and flow data from a subset of the Element 1 monitoring locations. All but two of the locations (URC-1A and URC-2) selected for Element 2 are downstream of potential primary sources of asbestos,

including mine waste piles and the coarse and fine tailings disposal areas, and downstream of potential secondary sources, including sediments in Mill Pond and sediments deposited along lower Rainy Creek. The additional LA and flow data collected at these locations will be used to evaluate asbestos mass transport via surface water transport pathways under a range of flow conditions. Element 2 surface water samples were analyzed for LA and field water quality parameters, only.

2.1.3 Element 3: Summer and Fall Monitoring

Routine Monitoring

Element 3 was an extension of Element 2 into the summer and early fall, to provide ongoing information on LA concentrations and stream flow rates downstream of asbestos sources within the Rainy Creek watershed. Element 3 sampling locations (see Figure 3-3) are the stations on lower Rainy Creek below Carney Creek (LRC-2; this location receives flow from both the upper and lower portions of the mined area) and lower Rainy Creek near its discharge to the Kootenai River (LRC-6). Element 3 started on June 30, 2008, two weeks after completion of Element 2 and approximately four weeks after the spring snowmelt runoff peak in flow, and continued bi-weekly through September 9, for a total of four rounds (Element 3 surface water sampling was not duplicated when the scheduled sampling round coincided with the more comprehensive Element 1 sampling events in late June and early September, 2008). Element 3 surface water samples were analyzed for LA and field water quality parameters, only. Wherever flowing water was present, stream flow rates were measured after sample collection, to prevent sediments disturbed during flow measurement from contaminating the surface water sample.

The two locations selected for Element 3 both represent points on the potential surface water transport pathway from mine-related sources of asbestos to lower Rainy Creek and the Kootenai River. LRC-2 is downstream of all potential mining-related sources of asbestos and downstream of two ponds that represent potential secondary sources to surface water (Mill Pond and the pond on Carney Creek), and LRC-6 is downstream of all potential primary and secondary asbestos sources, including sediments deposited in the lower Rainy Creek drainage downstream of LRC2.

Storm Event Monitoring

The plan for Element 3 also included sampling and flow measurement triggered by precipitation events that occurred after the spring snowmelt-runoff season. The same two locations, LRC-2 and LRC-6, were to be used for monitoring during storm events. Asbestos concentration values and flow measurements were to be obtained at LRC-2 and LRC-6 to characterize LA transport associated with at least three separate storm/rainfall events within the Rainy Creek drainage and to evaluate the effect of short-term, episodic surface runoff in the mine area, and related increases in local stream flow, on the asbestos content of surface water downstream of the known sources of asbestos.

As detailed in the Phase IIA SAP, storm-event monitoring was to be triggered by storm events sufficient to cause at least a 100% increase in flow within a 24-hour period. As discussed in Section 3.4.2, flow rates at LRC-02 and LRC-06 during Phase IIA never increased sufficiently to trigger storm event sampling, thus, no storm event samples were collected during Phase IIA.

2.1.4 Element 4: Continuous Precipitation and Flow Monitoring

Element 4 consisted of continuous precipitation monitoring using the meteorological station at OU3 and continuous stream flow monitoring on lower Carney Creek and lower Rainy Creek. Flow monitoring was conducted on lower Carney Creek during spring snowmelt runoff and on lower Rainy Creek during the spring snowmelt runoff, summer, and early fall. The purpose of collecting flow data on a continuous basis at these locations was to:

- characterize the spring snow-melt hydrograph while the other elements of the Phase IIA investigation were being implemented;
- track changes in flow in response to local precipitation events; and
- provide detailed flow measurements for use with LA concentration data to characterize asbestos mass loading to Rainy Creek from the mine site and from lower Rainy Creek to the Kootenai River.

Precipitation amounts and durations were recorded using an 8-inch-diameter, heated, tipping-bucket rain gauge installed as part of the meteorological station currently in use at the Libby Mine site. Weather data (precipitation, temperature, barometric pressure, etc.) for the OU3 weather station can be accessed at: http://www.met.utah.edu/cgi-bin/droman/meso_base.cgi?stn=TS659. The purpose of collecting continuous precipitation data was to determine the runoff coefficient as it relates to precipitation intensity/duration curves for the Rainy Creek watershed. Installation and calibration of the precipitation station was performed in accordance with the procedures described in Section 5.3.5 of the Phase IIA SAP and SOP No.17. This equipment was installed in early spring to allow relationships between precipitation and stream flow in Rainy Creek to be evaluated.

After high spring snowmelt runoff flows were measured and evaluated, Parshall flumes were permanently installed in the stream channels at monitoring stations LRC-2, LRC-6, and CC-2 (see Figure 3-4). Stream flow through each of the flumes was monitored and the continuous flow data was recorded using an ISCO 6712 portable sampler equipped with a pressure transducer and data logger installed at each of the Parshall flumes. Installation and calibration of flumes was in accordance with the procedures described in Section 5.3.6 of the Phase IIA SAP and SOP No. 15.

2.1.5 Element 5: Collection of Water for Toxicity Testing

As discussed in Section 4.3.3 of the Phase IIA SAP, one of the most direct methods for evaluating toxicity of site media to ecological receptors is through site-specific toxicity testing. In this approach, test organisms are exposed to site media in the laboratory to determine if the media causes adverse effects on survival, growth and/or reproduction.

A sample of water from the Tailings Pond was collected on April 3, 2008 for use in a “mixing test,” or evaluation of whether LA fibers would remain in suspension in the aquaria intended for use in the fish toxicity tests. The sample consisted of two 10-L polyethylene “cubitainers,” which were iced and shipped by overnight courier to Parametrix in Albany, Oregon for use in fish toxicity testing.

Water samples collected from four stations (TP, MP, FC Pond and URC-02) as part of weekly Element 2 sampling were submitted for rapid-turnaround (24-hour) LA analysis to track the concentrations of LA through the high snowmelt runoff portion of the Rainy Creek hydrograph. At EPA's direction on May 8, 2008, 200-L (20 10-L cubitainers) of water was collected from the Tailings Pond (TP) location and shipped by overnight courier to Parametrix in Albany, Oregon.

2.2 KOOTENAI RIVER SAMPLING

2.2.1 Surface Water

Phase IIA initially included two rounds of surface water sampling from the Kootenai River to assess the effect of Rainy Creek on asbestos levels in the river water. The first sampling event was to occur at approximately the time of maximum flow in Rainy Creek, and the second event was to occur under summer baseflow conditions. Flow in the Kootenai River was in excess of 21,000 cfs during the high-flow stage on Rainy Creek in mid-to-late May 2008; EPA considered river sampling to be too dangerous to attempt, thus only the second of the scheduled sampling events was performed, between August 19 and August 21, 2008.

Sampling stations for the summer event included one location (designated UKR) upstream of the Rainy Creek confluence, three stations (designated KR1, KR2 and KR3) parallel to the northern river bank downstream of the mouth of Rainy Creek, and five stations (designated KR4 to KR8) along a perpendicular transect about 0.5-mile downstream of Rainy Creek. The locations of these stations are shown in Figure 3-5. These locations were selected to provide LA concentration values upstream and downstream of the confluence of Rainy Creek with the Kootenai River, and to include river locations with the greatest potential for elevated asbestos concentrations via deposition of sediments carried by Rainy Creek.

Each river-water sample was collected from a discrete location using a depth-integrated sampler and in accordance with SOP No. 16 (Surface Water Sampling Using Depth-

Integrated Samplers) and the instructions for surface water sampling in Section 5.3.1 of the Phase IIA SAP.

All samples of Kootenai River water were analyzed for LA, only.

2.2.2 Sediment

Sediment samples collected from the Kootenai River included the following:

- One grab sample from a depositional area located along the north bank of the Kootenai upstream of the mouth of Rainy Creek. This will serve as a frame of reference for evaluating downstream samples.
- Three grab samples from depositional areas located along the north bank of the Kootenai downstream of, but within a distance of 0.5-mile downstream from the mouth of Rainy Creek.
- Two locations from the large gravel bar located in the center of the river about 0.5-mile downstream from the mouth of Rainy Creek. One location was on the highest portion on the gravel bar; the other location was at the downstream point of the gravel bar.

Samples of sediment collected from the Kootenai River were analyzed for asbestos, only.

2.3 DESCRIPTION OF PHASE IIB: GROUNDWATER AND AMBIENT AIR SAMPLING

2.3.1 Groundwater Sampling

Because existing wells at OU3 had been inactive and unsecured for as long as 18 years, to obtain groundwater samples representative of formation water quality the wells were rehabilitated by a licensed well service company prior to sampling. Rehabilitation consisted of removing any pumps, drop-pipes and wires from the well, and surging, bailing and pumping each well until field water quality parameters (i.e., temperature, pH,

turbidity and conductivity) stabilized. Additional details on Phase IIB groundwater sampling are contained in Section 5.0 of this FSSR.

2.3.2 Ambient Air Sampling

No fibers were detected in any of the ambient air samples collected from eight stations (A-1 through A-8 on Figure 5-4 of the Phase I SAP) during Phase I sampling in October, 2007. In Phase II, the four sampling stations closest to the mine-disturbed area (A-4, A-5, A-6 and A-8) were retained and four additional close-in stations (A-9 through A-12, see Figure 6-1 of this FSSR) were added.

Eight five-day rounds of ambient air sampling were conducted bi-weekly, from July 7 through October 17, 2008. The sampling followed the same protocol used for Phase I, as outlined in the Phase IIB SAP. The only deviation was that the enclosures that house the air sampling pumps and batteries were modified to improve ventilation of battery acid, which was found to be corroding some of the air pump seals during periods of high temperatures (this was not a problem during Phase I sampling, presumably due to the cooler temperatures in October, 2007). Additional details on Phase IIB ambient air sampling are contained in Section 6.0 of this FSSR.

3.0 SURFACE WATER SAMPLING

3.1 SUMMARY OF PHASE II SURFACE WATER SAMPLING PROGRAM

Phase II RI surface water sampling was performed by three-person teams. Element 1 surface water samples were collected at 30 locations at OU3 (Figure 3-1), including two-depth sampling from two locations at the Upper Tailings Pond. The GPS coordinates of Phase II sampling locations are provided in Attachment A. Element 2 surface water samples were collected from 12 locations (13 when water was flowing through the Tailings Pond spillway, see Figure 3-2). Element 3 surface water samples were collected from stations LRC-06 and LRC-02 (Figure 3-3). Surface water samples were collected from the Kootenai River at nine locations, as depicted on Figure 3-4.

CDM had established sampling locations during site reconnaissance prior to the start of Phase I field sampling. In addition to marking the sample locations with labeled stakes, lath and surveyor's tape, CDM provided global positioning system (GPS) coordinates that MWH entered into GPS units for use in finding the sample locations. The water sampling stations established for Phase I were re-used and several new stations were added for Phase II.

3.2 SURFACE WATER ANALYSES

All Phase II Element 1 surface water samples were submitted for an extensive list of analyses, including:

- Libby amphibole (by transmission electron microscopy)
- Target analyte list (TAL) metals, boron and mercury (total)
- TAL metals, boron and hardness (dissolved)
- dissolved organic carbon
- nitrate, ammonia and Kjeldahl nitrogen
- orthophosphate

- volatile petroleum hydrocarbons (VPH)
- extractable petroleum hydrocarbons (EPH)
- fluoride/chloride/sulfate
- total suspended solids
- nitrite
- total dissolved solids
- alkalinity

A broader suite of analyses were requested for surface water samples collected from two locations: the Tailings Pond toe drain (TP-TOE1) and Lower Rainy Creek downstream of its confluence with Carney Creek (LRC-02). In addition to the analytes listed above, surface water samples from these two locations were also analyzed for polychlorinated biphenyls (PCBs), pesticides, herbicides, gross alpha/gross beta, volatile and semi-volatile organic compounds, and cyanide. Surface water samples collected as part of Element 2, Element 3 and the Kootenai River sampling were analyzed for LA, only. Table 3-1 is a summary of surface water samples collected during the Phase II RI; the table contains the sample identification, index identification, date and time of sample collection, sample type and requested analyses. Scans of the surface water monitoring logbooks, field sample data sheets (FSDS) and photographs are contained in Appendix A.1 (for Element 1), Appendix B (for Element 2), Appendix C (for Element 3) and Appendix D (for Kootenai River water sampling).

3.3 SURFACE-WATER SAMPLING METHODS

3.3.1 Water Sample Collection from Streams and Ponds

Stream water samples were collected from downstream to upstream stations to minimize the effect (e.g., increased turbidity) of sampling activities on the samples collected. To the extent possible, surface water samples from a single stream segment were collected on the same day, to minimize the potential influence of stream flow variations due to

precipitation. Surface water samples were collected by pumping from the source through a peristaltic pump and directly into sample containers.

For filtered samples (to be analyzed for metals only), water from the source was pumped through an in-line 0.45-micrometer (μm) high-capacity filter. Each new in-line filter was purged with approximately 200 milliliters (mL) of sample water before the sample container was filled. A new in-line filter and tubing was used at each sampling location to collect water for analyses of dissolved constituent concentrations. After the filtered samples were collected, the filter was removed and the unfiltered samples were collected.

To minimize volatilization, samples collected for volatile organic compound (VOC) and semi-volatile organic (SVOC) analyses were not run through the drive cam on the peristaltic pump. Water was drawn into the uptake side of the Tygon tubing and held in the tubing by pinching the tubing and turning off the motor. The end of the full tubing was then released, allowing the water to flow back out of the tubing and directly into the labeled sampling containers.

3.3.2 Water Sample Collection from the Kootenai River

Samples of Kootenai River water were collected from shore at shallow (less than 1 foot) nearshore locations KR-1 through KR-4 and UKR (Figure 3-5) by using new tubing attached to a peristaltic pump and following standard surface water sampling procedures. Depth-integrated surface water samples were collected by a two-person team on a personal watercraft (“jet ski”) from five cross-channel locations downstream of the island (locations KR-4 through KR-8, Figure 3-5) by using a 10-lb stainless steel cylindrical weight and stainless steel cable, to which polyethylene tubing was attached with nylon wire-ties. New tubing was used at each sampling point. While the watercraft operator held position under power (facing upstream), the GPS coordinates of the sample location were recorded. With the peristaltic pump off, the channel depth was measured by lowering the steel weight to the bottom, waiting a few seconds to let any disturbed sediment clear, and then turning the pump on. The cable and tubing were hand-retrieved at a constant rate through the river water column and the pumped water was collected in a new, dedicated 2-gallon polyethylene pitcher. Once the full-column sample was

collected, the pitcher was transferred to shore, where field parameters were measured and the sample bottle was filled.

3.3.3 Equipment

- GPS Unit: Garmin Vista Hcx
- Site Vehicle: Polaris Ranger 4x4 2- and 4-passenger all-terrain vehicles
- River Transportation: Polaris SLT-700tm personal watercraft
- Peristaltic Pump: Geotech Geopumptm peristaltic pump. Tygon and silicone tubing were dedicated to each sample location
- Field filter: Geotech 0.45-micron filter. Filters were dedicated to each sample location
- Water-quality meter: Hydrolab Quanta Gtm multifunction water-quality system
- Tape measure: Retractable steel
- Area-velocity flow rate measurement device: Marsh McBirney 2000tm
- Flumes: Baski stainless steel adjustable cutthroat flume, H-flumes, Parshall flumes
- Flow measurement and sampling device installed in H-flumes and Parshall flumes: ISCO model 6712tm portable sampler/data logger
- Flow diversion/dam bags: Polyester fabric tubes filled with clean silica sand
- Level: Aluminum contractor's level
- Sample containers: Provided by the analytical laboratories
- Sample Storage: Plastic cooler containing ice in double Ziploctm bags.
- Clear packaging tape: Scotch brand packaging tape
- Field logbook: "Rite in the Rain" all weather journal 390N

- Pens: “Rite in the Rain” all weather pen #37, various ball point pens, and permanent markers
- Photo identification board: 12”x20” dry erase board
- Camera: Nikon Coolpix L17tm digital camera
- 2-way radios: Kenwood TK-380tm 800/900 MHz (FM-band) radio

3.3.4 Identification of Pre-designated Surface Water Sampling Locations

The surface water sampling team used a GPS unit to find the sampling locations established by CDM, which had been marked with a labeled wooden lath and surveyor’s flagging. To confirm the locations and determine the actual coordinates of the sampling point, the GPS unit was held near the sample location for a short period of time to maximize accuracy and a waypoint was created. The GPS coordinates and elevation of each sampling location were recorded on the FSDS form and in the field logbook. Scans of the surface water sampling field logbook, FSDS and photographs of sampling locations are presented in Appendix A.1 (for Element 1), Appendix B (for Element 2), Appendix C (for Element 3) and Appendix D (for Kootenai River surface water samples).

3.4 FIELD DATA MEASUREMENTS

3.4.1 Water-Quality Parameters

The temperature, pH, specific conductance, dissolved oxygen (DO), oxidation/reduction potential (ORP) and turbidity of surface waters sampled were measured in-stream with a portable integrated field meter and recorded on the FSDS. Table 3-2 is a summary of field-measured water-quality parameters measured during the Phase II RI at OU3.

3.4.2 Stream Flow Rate

At locations with flowing water, stream flow was measured using either a Marsh McBirney electronic flowmeter (for larger channels with simple cross-sections), an H-flume, or a portable cutthroat flume (for smaller channels with low flow rates or irregular

cross-sections). In August, Parshall flumes were permanently installed at stations LRC-06, LRC-02 and CC-02 (Figure 3-4). Table 3-3 is a summary of stream flow measurement data, calculated stream flow rates and method of flow rate measurement employed at each sampling location. Scans of the FSDS and field logbook for stream flow rate measurements are contained in Appendix A.1 (for Element 1), Appendix B (for Element 2) and Appendix C (for Element 3). Figure 3-6 is a graphical compilation of streamflow data collected from all the stations during all the Phase II monitoring elements.

At each stream channel station to be measured, a portable flume was installed in the stream channel and leveled using a standard contractor's level. Sand bags were placed immediately upstream and to the sides of the flume to channel the stream into the flume. Sand bags were also placed at the sides of the flume as needed for stability. The flow was then determined by reading the flow rate indicator marks on the inside of the flume.

In instances where streamflows exceeded the measuring capacity of a portable flume, or where the channel bottom was too wide to use a portable flume, a Marsh McBirney electronic stream flow sensor was lowered into the stream at a minimum of three cross-sectional points, at which the depth of the stream and the stream velocity were observed and recorded. The width of the stream channel was recorded using a tape measure. The stream flow was then calculated using multiple flow observations and the width of the stream channel, in accordance with the area-velocity method. The sample location, time of arrival, time of flow measurement and other observations were recorded on the FSDS form and in the field logbook.

To simplify the stream gauging and reduce the need to repeatedly install the cutthroat flume at each station, H-flumes (a hybrid between a sharp-crested weir and a flume, developed in the mid-1930s by the USDA) were installed in April at nine stations at OU3. However, because the only flow data available for the Rainy Creek drainage were those collected during Phase I sampling in October 2007, it was soon apparent that most of the H-flumes selected were undersized for the very high flow rates that occur during the spring snowmelt period. Thus, flow rates during the high-flow periods were measured primarily with the Marsh McBirney flow meter.

In August 2008, Parshall flumes were permanently installed in concrete at stations LRC-06, LRC-02 and CC-02. The flume sizes at these three stations were selected based on the snowmelt runoff flows observed during spring, 2008. 12-inch Parshalls are installed at stations LRC-06 and LRC-02, and a 9-inch Parshall is installed at station CC-02. A stilling well is attached to each of the flumes to house a pressure transducer for flow rate measurement and recording by an ISCO model 6712 portable sampler/data logger.

3.5 FIELD-BASED QUALITY CONTROL SAMPLES

3.5.1 Blanks

Field Blanks Field blanks for water were prepared by placing an appropriate volume of laboratory-supplied reagent-grade water into a sample container. Field blanks for water were collected at a rate of at least 10% (1 field blank per 10 field samples, or 1 per sample batch, whichever was greater). Field blank samples collected as part of Phase II RI surface water sampling at OU3 are designated “FB” and summarized on Table 3-1.

Trip Blanks During Phase II sampling, one laboratory-prepared trip blank accompanied each cooler of aqueous samples shipped to the laboratory for VOC analysis. Field blank samples collected as part of Phase II RI surface water sampling at OU3 are designated “TB” and summarized on Table 3-1.

3.5.2 Duplicates

Field Duplicates The stations at which surface water field duplicates were collected were randomly selected in the field. Field duplicate samples collected as part of Phase II RI surface water sampling at OU3 are designated “FD” and are summarized on Table 3-1.

3.5.3 Performance Evaluation (PE) Samples

A total of four water PE samples and three soil PE samples containing a range of inorganic and organic analytes were added in random order to the field samples by the

field collection teams. Performance evaluation samples collected as part of Phase II RI surface water sampling at OU3 are designated “PE” and are summarized on Table 3-1.

3.6 SAMPLE HANDLING

3.6.1 Sample Containers

All containers used for the collection of Phase II RI samples were prepared and/or supplied by the analytical laboratories. Table 3-4 is a summary of containers used for surface water.

3.6.2 Sample Preservation and Storage

Table 3-4 describes the sample containers and preservation methods for collection and transport of surface water samples. All containers used for surface water sampling were prepared and supplied by the analytical laboratory. The appropriate preservative required for each analytical method was added to the sample containers by the laboratory prior to sample collection, except for samples which required filtering in the field. Samples scheduled for dissolved metals and dissolved organic carbon (DOC) analyses were first filtered and then preserved in the field with ampules of the appropriate preservative as provided by the analytical laboratory. All surface water samples were stored and shipped in ice-filled coolers to maintain a temperature range between 2 and 6 degrees Celsius until receipt by the laboratory.

3.7 SAMPLE DOCUMENTATION AND IDENTIFICATION

Field data observed during collection of each sample were documented on OU3 Phase II RI-specific FSDS. Any special circumstances that influenced sample collection or resulted in deviations from sampling SOPs were also documented in a field logbook.

At the time of collection, each sample was assigned a unique 5-digit index identification (index ID) number. Sample IDs for all samples collected as part of the Phase II RI bear the prefix of “P2” (e.g., P2-12345). Information on whether the sample is representative

of a field sample or a field-based QC sample (e.g., field blank, field duplicate) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was “blind” to the analytical laboratory.

Each field sampling team 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 surface water sampling logbook and FSDS forms are provided as PDF files in the Appendices, arranged by sampling Element. Photographs of surface water sampling locations are also contained in the Appendices.

3.8 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

Chain-of-custody (COC) was maintained until final disposition of the samples by the laboratories and acceptance of analytical results. A COC form specific to the Phase II OU3 RI sampling program accompanied every shipment of samples to the analytical laboratories. 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 sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Scans of the surface water sample COCs are provided as PDF files in Appendix G.

3.9 SAFETY

All MWH sampling personnel who entered the OU3 site were equipped with Level C personal protective equipment (PPE) consisting of two sets of hooded Tyvek coveralls worn over dedicated site clothing, full-face respirator, nitrile gloves and latex boot covers. Full-face respirators (such as the North 7600 Series) were worn with North P100 high-efficiency particulate air (HEPA) filter cartridges. Gloves were taped at the wrist to each Tyvek suit. Coveralls, gloves, boot covers and cartridges were disposed of after one use.

All equipment transported off site (coolers, shovels, etc.) was decontaminated at the on-site decontamination station by a site-experienced technician. All outbound vehicles that

traveled beyond the decontamination station were decontaminated on site by a site-experienced technician. All sample containers and small equipment (GPS units, radios, etc.) were cleaned by field technicians at the MWH decontamination trailer.

TABLE 3-1.1

SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 1 PHASE IIA
(Page 1 of 2)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	Asbestos (LA - TEM - EPA 100.2 modified)	TAL Metals + Boron (Total) + Mercury	TAL Metals + Boron (Dissolved), Hardness	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	Nitrite	Alkalinity	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Dissolved Organic Carbon (DOC)	Fluoride/Chloride/Sulfate	Orthophosphate	Cyanide	Chlorinated Pesticides	Organophosphate Pesticides	Herbicides	Polychlorinated Biphenyls (PCBs)	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Radiochemistry (gross alpha and gross beta)
LRC-3	Stream	P2-00404	FS	24-Jun-08	1130	X	X	X	X	X	X	X	X	X	X	X	X	X								
LRC-4	Stream	P2-00403	FS	24-Jun-08	945	X	X	X	X	X	X	X	X	X	X	X	X	X								
LRC-5	Stream	P2-00402	FS	24-Jun-08	830	X	X	X	X	X	X	X	X	X	X	X	X	X								
LRC-6	Stream	P2-00401	FS	24-Jun-08	730	X	X	X	X	X	X	X	X	X	X	X	X	X								
FIELDQC		P2-00405	TB	24-Jun-08	800				X																	
FIELDQC		P2-00406	TB	24-Jun-08	800				X																	
FIELDQC		P2-00407	TB	24-Jun-08	800				X																	
FIELDQC		P2-00408	TB	24-Jun-08	800				X																	
CC-2	Stream	P2-00409	FS	25-Jun-08	935	X	X	X	X	X	X	X	X	X	X	X	X	X								
LRC-1	Stream	P2-00410	FS	25-Jun-08	1000	X	X	X	X	X	X	X	X	X	X	X	X	X								
TP-TOE2	Stream	P2-00412	FS	25-Jun-08	1115	X	X	X	X	X	X	X	X	X	X	X	X	X								
MP	Pond	P2-00411	FS	25-Jun-08	1040	X	X	X	X	X	X	X	X	X	X	X	X	X								
FIELDQC		P2-00415	TB	25-Jun-08	730				X																	
FIELDQC		P2-00416	TB	25-Jun-08	730				X																	
FIELDQC		P2-00417	TB	25-Jun-08	730				X																	
FIELDQC		P2-00418	TB	25-Jun-08	730				X																	
URC-1A	Stream	P2-00422	FS	26-Jun-08	1115	X	X	X	X	X	X	X	X	X	X	X	X	X								
URC-2	Stream	P2-00421	FS	26-Jun-08	1020	X	X	X	X	X	X	X	X	X	X	X	X	X								
TP	Pond	P2-00420	FS	26-Jun-08	945	X	X	X	X	X	X	X	X	X	X	X	X	X								
TP-TOE1	Stream	P2-00453	FS,MS,SD	26-Jun-08	815	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
TP-TOE1	Stream	P2-00454	FB	26-Jun-08	825	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
FIELDQC		P2-00423	TB	26-Jun-08	800				X														X			
FIELDQC		P2-00424	TB	26-Jun-08	800				X														X			
FIELDQC		P2-00425	TB	26-Jun-08	800				X																	
FIELDQC		P2-00426	TB	26-Jun-08	800				X																	
FC-POND	Pond	P2-00430	FS	27-Jun-08	945	X	X	X	X	X	X	X	X	X	X	X	X	X								
FC-POND	Pond	P2-00431	FB	27-Jun-08	1000	X	X	X	X	X	X	X	X	X	X	X	X	X								
FC-1	Stream	P2-00432	FS	27-Jun-08	1100	X	X	X	X	X	X	X	X	X	X	X	X	X								
FC-2	Stream	P2-00428	FS	27-Jun-08	900	X	X	X	X	X	X	X	X	X	X	X	X	X								
FC-2	Stream	P2-00429	FD	27-Jun-08	910	X	X	X	X	X	X	X	X	X	X	X	X	X								
URC-1	Stream	P2-00427	FS	27-Jun-08	740	X	X	X	X	X	X	X	X	X	X	X	X	X								
FIELDQC		P2-00433	TB	27-Jun-08	730				X																	
FIELDQC		P2-00434	TB	27-Jun-08	730				X																	
FIELDQC		P2-00435	TB	27-Jun-08	730				X																	
FIELDQC		P2-00436	TB	27-Jun-08	730				X																	
FIELDQC		P2-00437	TB	27-Jun-08	730				X																	
FIELDQC		P2-00438	TB	27-Jun-08	730				X																	
CCS-1	Seep	P2-00443	FS	28-Jun-08	1010	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-6	Seep	P2-00442	FS	28-Jun-08	910	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-8	Seep	P2-00441	FS	28-Jun-08	820	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-16	Seep	P2-00445	FS	28-Jun-08	1310	X	X	X	X	X	X	X	X	X	X	X	X	X								
CC-1	Stream	P2-00444	FS	28-Jun-08	1115	X	X	X	X	X	X	X	X	X	X	X	X	X								
CC-POND	Pond	P2-00439	FS	28-Jun-08	750	X	X	X	X	X	X	X	X	X	X	X	X	X								
CC-POND	Pond	P2-00440	FD	28-Jun-08	800	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-9	Seep	P2-00446	FS	29-Jun-08	805	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-11	Seep	P2-00447	FS	29-Jun-08	915	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-11	Seep	P2-00448	FB	29-Jun-08	925	X	X	X	X	X	X	X	X	X	X	X	X	X								
CCS-14	Seep	P2-00449	FS	29-Jun-08	1015	X	X	X	X	X	X	X	X	X	X	X	X	X								
UTP- Shallow	Pond	P2-00450	FS	29-Jun-08	1130	X	X	X	X	X	X	X	X	X	X	X	X	X								
LRC-2	Stream	P2-00451	FS	25-Jun-08	745	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
LRC-2	Stream	P2-00452	FD	25-Jun-08	800	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
FIELDQC		P2-00413	TB	25-Jun-08	730				X														X			

TABLE 3-1.2

SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA

(Page 1 of 4)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	Analytical Method TEM-ISO10312
CC-2	Stream	P2-00004	FS	7-Apr-08	1500	X
CC-2	Stream	P2-00005	FD	7-Apr-08	1510	X
LRC-1	Stream	P2-00002	FS	7-Apr-08	1330	X
LRC-2	Stream	P2-00003	FS	7-Apr-08	1345	X
MP	Pond	P2-00001	FS	7-Apr-08	1300	X
TP-TOE1	Stream	P2-00006	FS	7-Apr-08	1540	X
TP-TOE1	Stream	P2-00007	FB	7-Apr-08	1600	X
FC-POND	Pond	P2-00009	FS	8-Apr-08	1015	X
FC-2	Stream	P2-00008	FS	8-Apr-08	900	X
LRC-6	Stream	P2-00014	FS	8-Apr-08	1430	X
LRC-6	Stream	P2-00015	FB	8-Apr-08	1445	X
TP	Pond	P2-00012	FS	8-Apr-08	1200	X
TP	Pond	P2-00013	FD	8-Apr-08	1200	X
URC-1A	Stream	P2-00010	FS	8-Apr-08	1100	X
URC-2	Stream	P2-00011	FS	8-Apr-08	1120	X
CC-2	Stream	P2-00024	FS	14-Apr-08	1030	X
FC-POND	Pond	P2-00032	FS	14-Apr-08	1250	X
FC-POND	Pond	P2-00033	FB	14-Apr-08	1300	X
FC-2	Stream	P2-00031	FS	14-Apr-08	1230	X
LRC-1	Stream	P2-00023	FS	14-Apr-08	1010	X
LRC-2	Stream	P2-00025	FS	14-Apr-08	1048	X
LRC-6	Stream	P2-00021	FS	14-Apr-08	900	X
MP	Pond	P2-00022	FS	14-Apr-08	950	X
TP	Pond	P2-00027	FS	14-Apr-08	1130	X
TP-TOE1	Stream	P2-00026	FS	14-Apr-08	1115	X
URC-1A	Stream	P2-00029	FS	14-Apr-08	1210	X
URC-1A	Stream	P2-00030	FD	14-Apr-08	1220	X
URC-2	Stream	P2-00028	FS	14-Apr-08	1150	X
CC-2	Stream	P2-00043	FS	21-Apr-08	1045	X
LRC-1	Stream	P2-00044	FS	21-Apr-08	1105	X
LRC-2	Stream	P2-00042	FS	21-Apr-08	1020	X
LRC-6	Stream	P2-00041	FS	21-Apr-08	900	X
MP	Pond	P2-00045	FS	21-Apr-08	1120	X
TP	Pond	P2-00047	FS	21-Apr-08	1205	X
TP	Pond	P2-00048	FD	21-Apr-08	1210	X
TP	Pond	P2-00049	FB	21-Apr-08	1215	X
TP-TOE1	Stream	P2-00046	FS	21-Apr-08	1140	X
FC-2	Stream	P2-00052	FS	22-Apr-08	1120	X
FC-POND	Pond	P2-00053	FS	22-Apr-08	1200	X
URC-1A	Stream	P2-00051	FS	22-Apr-08	1038	X
URC-2	Stream	P2-00050	FS	22-Apr-08	1005	X
CC-2	Stream	P2-00062	FS	28-Apr-08	1130	X
FC-2	Stream	P2-00070	FS	28-Apr-08	1312	X
FC-POND	Pond	P2-00071	FS	28-Apr-08	1330	X

TABLE 3-1.2

SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA

(Page 2 of 4)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	Analytical Method TEM-ISO10312
LRC-1	Stream	P2-00063	FS	28-Apr-08	1145	X
LRC-2	Stream	P2-00064	FS	28-Apr-08	1158	X
LRC-6	Stream	P2-00061	FS	28-Apr-08	1050	X
MP	Pond	P2-00072	FS	28-Apr-08	1425	X
TP	Pond	P2-00066	FS	28-Apr-08	1227	X
TP	Pond	P2-00067	FD	28-Apr-08	1227	X
TP-TOE1	Stream	P2-00065	FS	28-Apr-08	1211	X
URC-1A	Stream	P2-00069	FS	28-Apr-08	1257	X
URC-2	Stream	P2-00068	FS	28-Apr-08	1243	X
MP	Pond	P2-00203	SP	29-Apr-08	1150	X
MP	Pond	P2-00204	SP	29-Apr-08	1150	X
MP	Pond	P2-00201	FS	29-Apr-08	1145	X
MP	Pond	P2-00202	FD	29-Apr-08	1145	X
TP	Pond	P2-00207	SP	29-Apr-08	1238	X
TP	Pond	P2-00208	SP	29-Apr-08	1238	X
TP	Pond	P2-00205	FS	29-Apr-08	1230	X
TP	Pond	P2-00206	FD	29-Apr-08	1230	X
CC-2	Stream	P2-00083	FS	5-May-08	1305	X
LRC-1	Stream	P2-00084	FS	5-May-08	1330	X
LRC-2	Stream	P2-00082	FS	5-May-08	1155	X
LRC-6	Stream	P2-00081	FS	5-May-08	1100	X
CC-POND	Pond	P2-00085	FS	6-May-08	925	X
FC-POND	Pond	P2-00096	FS	6-May-08	1450	X
MP	Pond	P2-00086	SP	6-May-08	1025	X
MP	Pond	P2-00087	SP	6-May-08	1025	X
MP	Pond	P2-00088	FD	6-May-08	1030	X
TP	Pond	P2-00091	SP	6-May-08	1140	X
TP	Pond	P2-00092	SP	6-May-08	1140	X
TP	Pond	P2-00093	FD	6-May-08	1145	X
TP-TOE1	Stream	P2-00089	FS	6-May-08	1055	X
TP-TOE1	Stream	P2-00090	FB	6-May-08	1110	X
URC-1A	Stream	P2-00095	FS	6-May-08	1335	X
URC-2	Stream	P2-00094	FS	6-May-08	1220	X
FC-2	Stream	P2-00100	FS	7-May-08	1155	X
TP-OVERFLOW	Stream	P2-00098	FS	7-May-08	1040	X
TP-OVERFLOW	Stream	P2-00099	FB	7-May-08	1105	X
CC-2	Stream	P2-00104	FS	12-May-08	1230	X
CC-POND	Pond	P2-00102	FS	12-May-08	1055	X
LRC-1	Stream	P2-00105	FS	12-May-08	1255	X
LRC-1	Stream	P2-00106	FB	12-May-08	1312	X
LRC-2	Stream	P2-00103	FS	12-May-08	1140	X
LRC-6	Stream	P2-00101	FS	12-May-08	945	X
MP	Pond	P2-00107	FS	12-May-08	1350	X
TP-TOE1	Stream	P2-00108	FS	12-May-08	1415	X

TABLE 3-1.2

SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA

(Page 3 of 4)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	Analytical Method TEM-ISO10312
FC-2	Stream	P2-00114	FS	13-May-08	1210	X
TP	Pond	P2-00110	FS	13-May-08	1020	X
TP-OVERFLOW	Stream	P2-00109	FS	13-May-08	930	X
URC-1A	Stream	P2-00113	FS	13-May-08	1115	X
URC-2	Stream	P2-00111	FS	13-May-08	1040	X
URC-2	Stream	P2-00112	FD	13-May-08	1045	X
CC-2	Stream	P2-00304	FS	19-May-08	1145	X
CC-POND	Pond	P2-00302	FS	19-May-08	1025	X
LRC-1	Stream	P2-00305	FS	19-May-08	1159	X
LRC-2	Stream	P2-00303	FS	19-May-08	1105	X
LRC-6	Stream	P2-00301	FS	19-May-08	925	X
MP	Pond	P2-00306	FS	19-May-08	1305	X
MP	Pond	P2-00307	FB	19-May-08	1310	X
FC-2	Stream	P2-00313	FS	20-May-08	1340	X
FC-2	Stream	P2-00314	FD	20-May-08	1345	X
TP	Pond	P2-00310	FS	20-May-08	1145	X
TP-OVERFLOW	Stream	P2-00309	FS	20-May-08	1100	X
TP-TOE1	Stream	P2-00308	FS	20-May-08	925	X
URC-1A	Stream	P2-00312	FS	20-May-08	1305	X
URC-2	Stream	P2-00311	FS	20-May-08	1210	X
CC-2	Stream	P2-00323	FS	26-May-08	1038	X
LRC-1	Stream	P2-00324	FS	26-May-08	1100	X
LRC-2	Stream	P2-00322	FS	26-May-08	955	X
LRC-6	Stream	P2-00321	FS	26-May-08	915	X
MP	Pond	P2-00325	FS	26-May-08	1130	X
TP	Pond	P2-00328	FS	26-May-08	1315	X
TP	Pond	P2-00329	FD	26-May-08	1320	X
TP-OVERFLOW	Stream	P2-00327	FS	26-May-08	1235	X
TP-TOE1	Stream	P2-00326	FS	26-May-08	1155	X
CC-POND	Pond	P2-00330	FS	27-May-08	930	X
FC-2	Stream	P2-00334	FS	27-May-08	1150	X
URC-1A	Stream	P2-00333	FS	27-May-08	1110	X
URC-2	Stream	P2-00331	FS	27-May-08	1025	X
URC-2	Stream	P2-00332	FD	27-May-08	1030	X
CC-2	Stream	P2-00337	FS	2-Jun-08	1135	X
LRC-1	Stream	P2-00338	FS	2-Jun-08	1205	X
LRC-2	Stream	P2-00336	FS	2-Jun-08	1100	X
LRC-6	Stream	P2-00335	FS	2-Jun-08	1000	X
MP	Pond	P2-00339	FS	2-Jun-08	1235	X
TP-OVERFLOW	Stream	P2-00341	FS	2-Jun-08	1345	X
TP-TOE1	Stream	P2-00340	FS	2-Jun-08	1305	X
CC-POND	Pond	P2-00342	FS	3-Jun-08	950	X
FC-2	Stream	P2-00348	FS	3-Jun-08	1240	X
TP	Pond	P2-00343	FS	3-Jun-08	1045	X

TABLE 3-1.2

**SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA
(Page 4 of 4)**

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	Analytical Method TEM-ISO10312
TP	Pond	P2-00344	FB	3-Jun-08	1050	X
URC-1A	Stream	P2-00346	FS	3-Jun-08	1200	X
URC-1A	Stream	P2-00347	FD	3-Jun-08	1205	X
URC-2	Stream	P2-00345	FS	3-Jun-08	1120	X
CC-2	Stream	P2-00351	FS	9-Jun-08	1020	X
CC-2	Stream	P2-00352	FD	9-Jun-08	1025	X
LRC-1	Stream	P2-00353	FS	9-Jun-08	1045	X
LRC-2	Stream	P2-00350	FS	9-Jun-08	945	X
LRC-6	Stream	P2-00349	FS	9-Jun-08	915	X
MP	Pond	P2-00354	FS	9-Jun-08	1115	X
TP	Pond	P2-00357	FS	9-Jun-08	1240	X
TP	Pond	P2-00358	FB	9-Jun-08	1245	X
TP-OVERFLOW	Stream	P2-00356	FS	9-Jun-08	1215	X
TP-TOE1	Stream	P2-00355	FS	9-Jun-08	1135	X
CC-POND	Pond	P2-00359	FS	10-Jun-08	1000	X
FC-2	Stream	P2-00362	FS	10-Jun-08	1225	X
URC-1A	Stream	P2-00361	FS	10-Jun-08	1150	X
URC-2	Stream	P2-00360	FS	10-Jun-08	1110	X
CC-2	Stream	P2-00365	FS	16-Jun-08	1125	X
LRC-1	Stream	P2-00366	FS	16-Jun-08	1155	X
LRC-2	Stream	P2-00364	FS	16-Jun-08	1050	X
LRC-6	Stream	P2-00363	FS	16-Jun-08	1010	X
MP	Pond	P2-00367	FS	16-Jun-08	1225	X
MP	Pond	P2-00368	FB	16-Jun-08	1230	X
TP	Pond	P2-00372	FS	16-Jun-08	1355	X
TP-OVERFLOW	Stream	P2-00371	FS	16-Jun-08	1330	X
TP-TOE1	Stream	P2-00369	FS	16-Jun-08	1250	X
TP-TOE1	Stream	P2-00370	FD	16-Jun-08	1255	X
CC-POND	Pond	P2-00373	FS	17-Jun-08	900	X
FC-2	Stream	P2-00376	FS	17-Jun-08	1120	X
URC-1A	Stream	P2-00375	FS	17-Jun-08	1035	X
URC-2	Stream	P2-00374	FS	17-Jun-08	1005	X

TABLE 3-1.3**SUMMARY OF SURFACE WATER SAMPLES COLLECTED DURING ELEMENT 3 PHASE IIA**

Station ID	Index ID	Sample Type	Sample Date	Sample Time	Analytical Method TEM-ISO10312
CC-2	P2-00460	FS	30-Jun-08	840	X
LRC-2	P2-00459	FS	30-Jun-08	815	X
LRC-6	P2-00458	FS	30-Jun-08	0735	X
LRC-2	P2-00802	FS	15-Jul-08	1055	X
LRC-2	P2-00803	FD	15-Jul-08	1100	X
LRC-6	P2-00800	FS	15-Jul-08	955	X
LRC-6	P2-00801	FB	15-Jul-08	1005	X
LRC-2	P2-00807	FS	18-Aug-08	1045	X
LRC-6	P2-00806	FS	18-Aug-08	1000	X
LRC-6	P2-00804	FS	29-Jul-08	900	X
LRC-2	P2-00805	FS	29-Jul-08	1000	X

TABLE 3-1.4**SUMMARY OF SURFACE WATER SAMPLES COLLECTED FROM THE
KOOTENAI RIVER DURING PHASE IIA**

Station ID	Index ID	Sample Type	Sample Date	Sample Time	Matrix	Analytical Method TEM-ISO10312
KR-1	P2-00847	FS	19-Aug-08	1640	SW	X
KR-1	P2-00848	FD	19-Aug-08	1645	SW	X
KR-2	P2-00846	FS	19-Aug-08	1620	SW	X
KR-3	P2-00845	FS	19-Aug-08	1600	SW	X
KR-4	P2-00840	FS	19-Aug-08	1415	SW	X
KR-5	P2-00841	FS	19-Aug-08	1440	SW	X
KR-6	P2-00842	FS	19-Aug-08	1505	SW	X
KR-7	P2-00843	FS	19-Aug-08	1515	SW	X
KR-8	P2-00844	FS	19-Aug-08	1540	SW	X
UKR	P2-00849	FS	19-Aug-08	1725	SW	X
UKR	P2-00850	FB	19-Aug-08	1740	SW	X

TABLE 3-2.1

**SUMMARY OF FIELD PARAMETERS FOR SURFACE WATER
COLLECTED DURING ELEMENT 1 PHASE IIA**

(Page 1 of 2)

Station ID	Sample Type	Sample Date	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
LRC-3	FS	24-Jun-08	14.56	8.12	0.514	7.87	79	14.6
LRC-4	FS	24-Jun-08	13.83	8.55	0.514	8.14	65	7.3
LRC-5	FS	24-Jun-08	13.48	8.65	0.513	8.06	88	0
LRC-6	FS	24-Jun-08	12.94	8.73	0.508	8.32	37	0
CC-2	FS	25-Jun-08	9.84	8.37	0.63	8.68	99	13.4
LRC-1	FS	25-Jun-08	14.93	7.74	0.487	8.92	127	0
MP	FS	25-Jun-08	15.28	7.31	0.487	10.63	135	1.8
TP-TOE2	FS	25-Jun-08	9.91	7.13	0.51	7.21	133	15.5
TP	FS	26-Jun-08	20.64	8.12	0.148	9.06	103	11.6
TP-TOE1	FS	26-Jun-08	9.67	6.71	0.463	6.22	146	31.5
URC-1A	FS	26-Jun-08	7.83	8.35	0.221	12.92	77	36
URC-2	FS	26-Jun-08	7.69	8.03	0.292	10.23	106	32.7
FC-1	FS	27-Jun-08	8.06	9.81	0.249	10.62	137	6.5
FC-2	FS	27-Jun-08	8.43	9.25	0.513	12.37	109	4.4
FC-POND	FS	27-Jun-08	20.14	8.89	0.412	10.62	123	3.7
URC-1	FS	27-Jun-08	8.52	8.11	0.317	11.89	160	2
CC-1	FS	28-Jun-08	9.46	8.17	0.584	8.17	160	7.2
CC-POND	FS	28-Jun-08	17.86	8.03	0.507	9.62	108	1.9
CCS-1	FS	28-Jun-08	11.31	8	0.772	5.97	162	18.4
CCS-16	FS	28-Jun-08	13.3	8.37	0.913	6.8	156	4.8
CCS-6	FS	28-Jun-08	11.68	5.97	0.845	7.47	140	3.1
CCS-8	FS	28-Jun-08	12.61	8.63	0.81	9.94	155	1.5
CCS-11	FS	29-Jun-08	9.14	8.28	0.668	3.9	124	7.3
CCS-14	FS	29-Jun-08	10.92	8.55	0.596	7.82	141	11.5
CCS-9	FS	29-Jun-08	8.36	7.67	0.778	5.58	170	1.9
UTP	FS	29-Jun-08	11.84	8.45	0.295	12.22	137	0.4
UTP	FS	29-Jun-08	14.73	8.79	0.305	12.22	134	0.4
CC-2	FS	30-Jun-08	11.04	8.51	0.669	10.71	92	4.7
LRC-2	FS	30-Jun-08	17.27	8.18	0.495	8.98	88	1.3
LRC-6	FS	30-Jun-08	13.96	7.9	0.528	9.95	69	3.9
LRC-2	FS	1-Jul-08	18	7.92	0.415	6.97	94	1.7
LRC-2	FS	9-Sep-08	14.47	8.58	0.476	9.61	32	3.6
LRC-3	FS	9-Sep-08	10.86	8.14	0.545	9.26	58	1.3
LRC-4	FS	9-Sep-08	9.93	8.31	0.544	5.56	82	1.4
LRC-5	FS	9-Sep-08	9.29	8.36	0.538	6.11	48	4.5
LRC-6	FS	9-Sep-08	8.85	7.86	5.4	5.81	141	1.9
CC-2	FS	10-Sep-08	7.97	8.47	0.677	7.68	89	4.4
LRC-1	FS	10-Sep-08	13.59	8.03	0.445	5.63	114	1.1
MP	FS	10-Sep-08	14.38	8.05	0.427	11.13	67	0.8
TP-TOE1	FS	10-Sep-08	10.33	7.67	0.566	6.35	59	3.6
TP-TOE1	FS	10-Sep-08	10.33	7.67	0.566	6.35	59	3.6
TP-TOE1	FS	10-Sep-08	10.33	7.67	0.566	6.35	59	3.6
TP-TOE2	FS	10-Sep-08	9.76	7.59	0.604	15.93	75	0.2
TP	FS	11-Sep-08	9.88	7.12	0.245	5.27	183	7.3

TABLE 3-2.1

**SUMMARY OF FIELD PARAMETERS FOR SURFACE WATER
COLLECTED DURING ELEMENT 1 PHASE IIA**

(Page 2 of 2)

Station ID	Sample Type	Sample Date	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
URC-1	FS	11-Sep-08	6.66	8.28	0.345	9.97	62	0.5
URC-1A	FS	11-Sep-08	6.57	7.9	0.373	6.57	85	0.3
URC-2	FS	11-Sep-08	6.12	7.88	0.371	9.6	102	0.8
CCS-11	FS	12-Sep-08	16.3	7.48	0.659	4.19	118	3.9
CCS-11	FS	12-Sep-08	16.3	7.48	0.659	4.19	118	3.9
CCS-14	FS	12-Sep-08	16.71	6.87	0.624	5.47	121	8
CCS-14	FS	12-Sep-08	16.71	6.87	0.624	5.47	121	8
FC-1	FS	12-Sep-08	12.15	8.19	0.503	5.12	96	8.6
FC-1	FS	12-Sep-08	12.15	8.19	0.503	5.12	96	8.6
FC-2	FS	12-Sep-08	9.35	7.81	0.493	5.62	69	7
FC-2	FS	12-Sep-08	9.35	7.81	0.493	5.62	69	7
FC-POND	FS	12-Sep-08	16.36	8.15	0.356	5.32	74	77.4
UTP-D	FS	12-Sep-08	14.12	7.2	0.321	5.39	100	7.7
UTP-S	FS	12-Sep-08	14.8	7.83	0.311	6.41	110	3.1
CC-POND	FS	13-Sep-08	14.44	7.64	0.588	6.14	97	1.6
CCS-1	FS	13-Sep-08	11.13	7.55	0.744	6.38	82	6.8
CCS-6	FS	13-Sep-08	9.18	7.65	0.783	6.4	82	7.3
CCS-8	FS	13-Sep-08	12.16	7.64	0.81	4.97	94	0.6
CCS-9	FS	13-Sep-08	8.52	6.87	0.741	7.28	129	1.2
CC-1	FS	14-Sep-08	6.62	7.85	0.58	7.9	153	0.6
CCS-16	FS	14-Sep-08	10.53	7.43	0.853	7.54	64	3.7

TABLE 3-2.2

**FIELD PARAMETERS FOR SURFACE WATER
SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA
(Page 1 of 3)**

Station ID	Sample Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
MP	7-Apr-08	1300	7.03	7.34	0.66	13	113	29
LRC-1	7-Apr-08	1330	7.37	7.97	0.649	12.28	105	9.5
LRC-2	7-Apr-08	1345	6.72	8.26	0.651	11.39	83	8.4
CC-2	7-Apr-08	1500	3.22	8.25	0.666	11.95	88	10.5
TP-TOE1	7-Apr-08	1540	9.06	7.06	0.764	6.1	126	0
FC-2	8-Apr-08	900	1.51	7.45	0.506	14	81	7.8
FC-POND	8-Apr-08	1015	0.29	8.34	0.514	7.85	99	8.5
URC-1A	8-Apr-08	1100	3.68	8.02	0.366	108.3	72	4.9
URC-2	8-Apr-08	1120	3.73	7.97	0.366	11.45	79	5.2
TP	8-Apr-08	1200	2.07	8.37	0.112	10.02	76	10.5
LRC-6	8-Apr-08	1430	5.67	7.91	0.604	11.86	90	8.6
LRC-6	14-Apr-08	900	6.35	6.57	0.604	11.56	104	10.9
MP	14-Apr-08	950	9.97	7.48	0.646	11.06	127	32.5
LRC-1	14-Apr-08	1010	10.25	7.79	0.647	11.04	63	8
CC-2	14-Apr-08	1030	2.48	8.24	0.6	15.08	43	66.2
LRC-2	14-Apr-08	1048	6.77	8.15	0.628	10.93	37	11.2
TP-TOE1	14-Apr-08	1115	8.6	7.7	0.773	6.37	80	4.5
TP	14-Apr-08	1130	9.91	8.06	0.218	9.32	8	35.1
URC-2	14-Apr-08	1150	2.45	7.4	0.339	13.27	114	10.2
URC-1A	14-Apr-08	1210	2.69	7.95	0.343	11.47	54	8.4
FC-2	14-Apr-08	1230	3.11	8.02	0.482	11.63	47	16.3
FC-POND	14-Apr-08	1250	3.15	8.2	0.473	9.07	69	10.2
LRC-6	21-Apr-08	900	2.88	8.48	0.599	12.07	109	14.3
LRC-2	21-Apr-08	1020	4.95	8.33	0.621	11.31	106	15.6
CC-2	21-Apr-08	1045	1.99	8.34	0.564	11.94	150	14.9
LRC-1	21-Apr-08	1105	6.77	8.17	0.654	11.36	127	14.8
MP	21-Apr-08	1120	6.79	8.1	0.659	11.04	131	11.5
TP-TOE1	21-Apr-08	1140	8.65	7.79	0.762	5.63	159	7.2
TP	21-Apr-08	1205	5.62	8.21	0.322	10.82	124	14.7
URC-2	22-Apr-08	1005	2.34	8.96	0.347	11.88	98	10.2
URC-1A	22-Apr-08	1038	2.54	8.22	0.349	11.62	111	12.5
FC-2	22-Apr-08	1120	3.15	8.32	0.49	14.74	93	15.8
FC-POND	22-Apr-08	1200	5.69	7.91	0.49	10.93	113	12.4
LRC-6	28-Apr-08	1044	6.08	8.52	0.599	11.53	42	10.6
CC-2	28-Apr-08	1130	4.41	8.83	0.547	11.9	51	40.9
LRC-1	28-Apr-08	1145	10.23	8.44	0.653	12.55	57	40.5
LRC-2	28-Apr-08	1158	8.6	8.5	0.617	11.97	52	8.8
TP-TOE1	28-Apr-08	1211	8.99	7.96	0.709	6.16	85	36.2
TP	28-Apr-08	1227	11.25	7.98	0.329	12.27	31	7
URC-2	28-Apr-08	1243	3.97	8.64	0.342	14.09	49	33.8
URC-1A	28-Apr-08	1257	4	8.6	0.342	14.36	51	8.8
FC-2	28-Apr-08	1312	6.87	8.47	0.471	12.87	46	21.5
FC-POND	28-Apr-08	1330	10.52	8.43	0.491	8.43	57	8.9
MP	28-Apr-08	1425	12.17	8.47	0.642	12.95	42	65.2

TABLE 3-2.2

**FIELD PARAMETERS FOR SURFACE WATER
 SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA
 (Page 2 of 3)**

Station ID	Sample Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
MP	29-Apr-08	1152	10.77	7.24	0.658	12.2	103	87.4
TP	29-Apr-08	1253	11.37	5.9	0.34	11.58	112	82.3
LRC-6	5-May-08	1100	8.87	7.64	0.582	9.1	199	40.6
LRC-2	5-May-08	1155	10.75	7.79	0.589	9.22	165	61.5
CC-2	5-May-08	1305	8.24	7.97	0.505	9.15	166	64
LRC-1	5-May-08	1330	12.4	7.65	0.633	11.29	186	77.7
CC-POND	6-May-08	925	7.89	6.84	0.393	8.68	271	50.3
MP	6-May-08	1035	11.92	7.17	0.617	11.46	202	22.1
TP-TOE1	6-May-08	1055	9.16	6.9	0.648	4.8	180	46.8
TP	6-May-08	1155	13.43	7.51	0.343	8.33	166	44.4
URC-2	6-May-08	1220	4.59	7.98	0.245	10.34	165	89.4
URC-1A	6-May-08	1335	4.67	8.27	0.244	10.26	118	82.5
FC-POND	6-May-08	1450	13.72	7.74	0.485	9.4	166	61.6
TP-OVERFLOW	7-May-08	1040	12.15	7.52	0.357	8.16	213	6.6
FC-2	7-May-08	1155	6.52	8.47	0.453	10.81	158	109
LRC-6	12-May-08	945	9.36	8.7	0.509	6.38	260	26.1
CC-POND	12-May-08	1055	8.06	8.07	0.354	5.95	291	8.3
LRC-2	12-May-08	1140	10.1	8.12	0.508	6.81	301	12.6
CC-2	12-May-08	1230	8.36	6.68	0.415	6.69	254	26.7
LRC-1	12-May-08	1255	10.59	7.95	0.524	7.78	285	20.4
MP	12-May-08	1350	10.97	7.72	0.524	7.74	280	19.6
TP-TOE1	12-May-08	1415	9.12	7.33	0.606	3.94	282	16.4
TP-OVERFLOW	13-May-08	930	9.9	7.55	0.293	6.08	290	11.4
TP	13-May-08	1020	10.03	8.08	0.264	7.06	301	6.7
URC-2	13-May-08	1050	4.13	8.28	0.224	7.23	295	14
URC-1A	13-May-08	1115	4.18	8.29	0.223	7.53	275	13.1
FC-2	13-May-08	1210	6.08	8.36	0.446	8	294	20.9
LRC-6	19-May-08	930	13.46	8.54	0.483	6.46	266	17.6
CC-POND	19-May-08	1030	13.23	7.89	0.355	6.6	288	10.4
LRC-2	19-May-08	1108	14.05	7.86	0.477	6.89	274	18.6
CC-2	19-May-08	1147	12.8	8.3	0.427	6.89	236	26.5
LRC-1	19-May-08	1210	13.98	7.84	0.484	7.43	272	30.4
MP	19-May-08	1305	14.82	7.4	0.485	7.14	314	15.6
TP-TOE1	20-May-08	945	9.22	6.78	0.562	5.48	283	32.6
TP-OVERFLOW	20-May-08	1104	16.08	6.84	0.253	9.76	299	12.2
TP	20-May-08	1156	15.35	7.3	0.228	10.78	297	0
URC-2	20-May-08	1215	6.99	7.29	0.178	11.43	287	26.8
URC-1A	20-May-08	1310	7.14	7.3	0.177	11.51	290	22.2
FC-2	20-May-08	1350	8.77	7.83	0.465	10.64	280	15.4
LRC-6	26-May-08	920	10.21	8.15	0.479	10.36	109	11.1
LRC-2	26-May-08	1000	10.95	7.92	0.474	10.74	124	0.2
CC-2	26-May-08	1045	10.15	8.36	0.443	11.04	92	20.9
LRC-1	26-May-08	1105	11.38	7.85	0.475	11.85	107	14.8

TABLE 3-2.2

**FIELD PARAMETERS FOR SURFACE WATER
 SAMPLES COLLECTED DURING ELEMENT 2 PHASE IIA
 (Page 3 of 3)**

Station ID	Sample Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
MP	26-May-08	1135	11.71	7.75	0.475	12.57	111	22.1
TP-TOE1	26-May-08	1157	9.47	7.38	0.483	6.48	114	24.9
TP-OVERFLOW	26-May-08	1240	13.47	7.96	0.221	10.84	96	7.6
TP	26-May-08	1322	13.14	8.08	0.207	11.57	105	22.9
CC-POND	27-May-08	936	11.48	6.61	0.366	9.45	146	33
URC-2	27-May-08	1033	6.37	7.82	0.216	11.33	106	25.9
URC-1A	27-May-08	1115	6.41	7.81	0.215	10.95	117	22
FC-2	27-May-08	1153	8.2	8.43	0.463	10.71	85	28.9
LRC-6	2-Jun-08	1010	12.04	8.24	0.483	10.25	55	9.6
LRC-2	2-Jun-08	1105	12.83	7.99	0.469	10.24	80	8.8
CC-2	2-Jun-08	1140	11.36	8.11	0.508	9.76	74	10.2
LRC-1	2-Jun-08	1215	12.57	7.85	0.473	11.48	92	4.4
MP	2-Jun-08	1250	13.34	7.73	0.466	13.18	140	0
TP-TOE1	2-Jun-08	1310	9.81	7.12	0.441	6.87	148	14.5
TP-OVERFLOW	2-Jun-08	1434	16.52	7.44	0.236	9.28	75	22.1
CC-POND	3-Jun-08	1000	13.32	6.07	0.421	7.2	214	21
TP	3-Jun-08	1106	15.95	7.83	0.212	8.05	189	0
URC-2	3-Jun-08	1128	6.96	7.86	0.252	8.64	177	18.6
URC-1A	3-Jun-08	1212	7.07	8.07	0.253	8.37	173	24.3
FC-2	3-Jun-08	1246	9.37	8.26	0.481	8.25	161	27.8
LRC-6	9-Jun-08	920	10.47	8.34	0.496	7.94	104	0
LRC-2	9-Jun-08	950	11.87	7.99	0.479	8.04	124	6
CC-2	9-Jun-08	1025	9.36	8.28	0.548	7.64	108	12
LRC-1	9-Jun-08	1050	11.97	7.9	0.474	8.32	115	11.4
MP	9-Jun-08	1120	12.07	7.67	0.474	8.69	112	6.4
TP-TOE1	9-Jun-08	1137	9.82	7.37	0.453	4.36	118	0
TP-OVERFLOW	9-Jun-08	1218	12.42	7.87	0.262	7.66	87	0
TP	9-Jun-08	1247	14.38	8.25	0.201	8.49	74	0
CC-POND	10-Jun-08	1005	11.15	7.21	0.463	7.29	94	0
URC-2	10-Jun-08	1115	5.41	7.86	0.271	8.8	109	0
URC-1A	10-Jun-08	1155	5.35	7.9	0.271	9.19	109	0
FC-2	10-Jun-08	1230	5.54	8.3	0.479	8.33	78	0
LRC-6	16-Jun-08	1015	10.88	7.6	0.508	7.93	167	13
LRC-2	16-Jun-08	1051	13.86	8.07	0.483	8.17	148	14.3
CC-2	16-Jun-08	1127	10.34	8.5	0.578	7.6	99	33.6
LRC-1	16-Jun-08	1200	14.2	8.01	0.475	9.04	120	45.1
MP	16-Jun-08	1230	15.23	7.98	0.473	8.03	110	19.9
TP-TOE1	16-Jun-08	1300	10	7.7	0.457	6.41	129	29.6
TP-OVERFLOW	16-Jun-08	1333	20.14	8.29	0.237	7.63	82	23.1
TP	16-Jun-08	1357	19.31	8.82	0.19	9.48	64	57.2
CC-POND	17-Jun-08	905	15.14	7.19	0.466	7.39	165	4.5
URC-2	17-Jun-08	1007	6.94	8.11	0.288	8.87	134	16.7
URC-1A	17-Jun-08	1040	7.06	7.96	0.287	8.67	146	17.5
FC-2	17-Jun-08	1125	9	8.33	0.488	8.49	95	36.1

TABLE 3-2.3**FIELD PARAMETERS FOR SAMPLES COLLECTED DURING
ELEMENT 3 PHASE IIA**

Station ID	Sample Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
CC-2	30-Jun-08	845	11.04	8.51	0.669	10.71	92	4.7
LRC-2	30-Jun-08	820	17.27	8.18	0.495	8.98	88	1.3
LRC-6	30-Jun-08	740	13.96	7.9	0.528	9.95	69	3.9
LRC-2	15-Jul-08	NA	NA	NA	NA	NA	NA	NA
LRC-6	15-Jul-08	NA	NA	NA	NA	NA	NA	NA
LRC-2	29-Jul-08	1005	17.2	8.6	0.549	8.71	160	1.5
LRC-6	29-Jul-08	906	11.16	8.92	0.566	10.61	160	2.7
LRC-2	18-Aug-08	1050	18.68	8.42	0.524	9.24	138	0.5
LRC-6	18-Aug-08	1015	12.2	8.23	0.563	10.36	152	3

TABLE 3-2.4**FIELD PARAMETERS FOR SURFACE WATER SAMPLES COLLECTED
FROM THE KOOTENAI RIVER DURING PHASE IIA**

Station ID	Sample Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)
KR-1	19-Aug-08	1700	15.16	7.24	0.242	7.86	200	2
KR-2	19-Aug-08	1626	14.52	7.32	0.243	8.43	197	2.2
KR-3	19-Aug-08	1609	14.86	7.17	0.242	8.7	189	2.1
KR-4	19-Aug-08	1430	13.99	8.57	0.243	8.66	126	2.3
KR-5	19-Aug-08	1455	14.15	8.33	0.244	8.56	136	1.6
KR-6	19-Aug-08	1510	14.18	8.2	0.241	8.52	144	1.6
KR-7	19-Aug-08	1523	14.02	8.11	0.24	8.73	150	2.6
KR-8	19-Aug-08	1550	15.02	7.25	0.243	8.7	163	10.4
UKR	19-Aug-08	1735	15.23	7.69	0.241	8.79	173	1.8

TABLE 3-2.5**SUMMARY OF FIELD PARAMETERS FOR GROUNDWATER SAMPLES COLLECTED DURING PHASE II**

Station ID	Sample Date	Sample Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation/Reduction Potential (mV)	Turbidity (NTU)	Volume Evacuated (gal)	Flow Rate (gal/ min)
Well C	22-Jul-08	1501	10.06	7.89	0.465	5.76	170	1	10.8	0.3
Well D	23-Jul-08	1508	11.05	9.79	0	2.31	155	149	45	0.75
Well E	23-Jul-08	1711	11.31	8.13	0.813	6.33	161	4.3	11	0.5
Well H	24-Jul-08	801	13.61	7.21	0.336	7.86	193	739	1	0
Well A	24-Jul-08	955	9.23	9.55	0.661	1.61	25	2000	25	0
Well C	29-Sep-08	1405	10.21	7.1	0.618	3.29	79	1.8	6	0.3
Well A	30-Sep-08	1205	8.95	6.71	0.456	6.63	-50	41.3	5	0
Well E	30-Sep-08	1345	13.58	7.77	0.783	2.61	-98	15.9	8.75	0.25
Well D	30-Sep-08	1610	10.65	8.5	0.375	0.41	-218	66.7	6	0.3

TABLE 3-3.1

SURFACE WATER FLOW RECORD FOR ELEMENT 1 PHASE II A SAMPLES

(Page 1 of 1)

Station ID	Sample Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method	Volumetric Method
LRC-6	24-Jun-08	755		1302	X		
LRC-5	24-Jun-08	845	2.39	1073		X	
LRC-4	24-Jun-08	1010	2.37	1064		X	
LRC-3	24-Jun-08	1145	2.85	1279		X	
LRC-2	25-Jun-08	900	2.52	1131		X	
CC-2	25-Jun-08	950		82.13	X		
LRC-1	25-Jun-08	1010	1.95	875		X	
TP-TOE2	25-Jun-08	1130	2.55	1145		X	
TP-TOE1	26-Jun-08	920	2.52	1131		X	
URC-2	26-Jun-08	1040	0.8	359		X	
URC-1A	26-Jun-08	1128	0.86	386		X	
URC-1	27-Jun-08	855	0.62	278		X	
FC-2	27-Jun-08	920		51.12	X		
FC-1	27-Jun-08	1110	0.07	31		X	
CCS-8	28-Jun-08	840		NM			
CCS-6	28-Jun-08	930		0.753			X
CCS-1	28-Jun-08	1030		0.521			X
CC-1	28-Jun-08	1150		29.49			X
CCS-16	28-Jun-08	1325		0.332			X
CCS-11	29-Jun-08	933		NM			
CCS-14	29-Jun-08	1030		0.789			X
CCS-9	29-Jun-08	1145		120 *	X		
LRC-6	9-Sep-08	914		445	X		
LRC-5	9-Sep-08	1010	0.52	233		X	
LRC-4	9-Sep-08	1048	0.9	404		X	
LRC-3	9-Sep-08	1139	0.79	355		X	
LRC-2	9-Sep-08	1320		301.9	X		
CC-2	10-Sep-08	907		53.75	X		
LRC-1	10-Sep-08	948	0.64	287		X	
TP-TOE2	10-Sep-08	1115	0.64	287		X	
TP-TOE1	10-Sep-08	1315		248.6	X		
URC-2	11-Sep-08	1025	0.1	45		X	
URC-1A	11-Sep-08	1108	0.15	67		X	
URC-1	11-Sep-08	1205	0.06	27		X	
FC-2	12-Sep-08	1150					
FC-1	12-Sep-08	1320	0.06	27		X	
CCS-11	12-Sep-08	1435		NM			
CCS-14	12-Sep-08	1515		0.526			X
CCS-9	13-Sep-08	930		14.18			X
CCS-8	13-Sep-08	1129		NM			
CCS-6	13-Sep-08	1218		0.211			X
CCS-1	13-Sep-08	1255		1.16			X
CC-1	14-Sep-08	1030		11.63			X
CCS-16	14-Sep-08	1140		0.28			X

* Full Carney Creek stream flow inadvertently measured; actual flow estimated to be 14 gal/min

TABLE 3-3.2

SURFACE WATER FLOW RECORD FOR ELEMENT 2 PHASE IIA SAMPLES

(Page 1 of 3)

Station ID	Sample Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method
			DISCHARGE_CFS	WQ_FLOW gpm		
LRC-6	7-Apr-08	1200		1350	X	
LRC-2	7-Apr-08	1300		596	X	
CC-2	7-Apr-08	1400		171	X	
FC-2	8-Apr-08	1030		139	X	
URC-2	8-Apr-08	1115		160	X	
URC-1A	8-Apr-08	1130		149	X	
TP-TOE1	8-Apr-08	1230		456	X	
LRC-1	8-Apr-08	1300		533	X	
LRC-1	14-Apr-08	1020		494	X	
CC-2	14-Apr-08	1054		368	X	
LRC-2	14-Apr-08	1112		1067	X	
FC-2	14-Apr-08	1145		534	X	
URC-1A	14-Apr-08	1210		803	X	
URC-2	14-Apr-08	1235		728	X	
TP-TOE1	14-Apr-08	1310		438	X	
LRC-6	14-Apr-08	1405		1231	X	
LRC-6	21-Apr-08	930		821	X	
LRC-2	21-Apr-08	1014		723	X	
CC-2	21-Apr-08	1034		249	X	
LRC-1	21-Apr-08	1056		492	X	
TP-TOE1	21-Apr-08	1137		494	X	
URC-2	22-Apr-08	1012		456	X	
URC-1A	22-Apr-08	1102		319	X	
FC-2	22-Apr-08	1139		220	X	
TP-TOE1	23-Apr-08	1010		506	X	
LRC-6	28-Apr-08	1044		1055	X	
CC-2	28-Apr-08	1130		322	X	
LRC-1	28-Apr-08	1145		601	X	
LRC-2	28-Apr-08	1158		973	X	
TP-TOE1	28-Apr-08	1211		583	X	
URC-2	28-Apr-08	1243		1266	X	
URC-1A	28-Apr-08	1257		1164	X	
FC-2	28-Apr-08	1312		554	X	
URC-2	30-Apr-08	915		1266	X	
URC-1A	30-Apr-08	930		1164	X	
FC-2	30-Apr-08	1010		554	X	
LRC-6	5-May-08	1045		1328	X	
CC-2	5-May-08	1305		408	X	
LRC-1	5-May-08	1335		799	X	
TP-TOE1	6-May-08	1100		799	X	
URC-2	6-May-08	1245	7.31			X
URC-1A	6-May-08	1405	9.98			X

TABLE 3-3.2

SURFACE WATER FLOW RECORD FOR ELEMENT 2 PHASE IIA SAMPLES

(Page 2 of 3)

Station ID	Sample Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method
			DISCHARGE_CFS	WQ_FLOW gpm		
LRC-2	7-May-08	1000	3.59	1610		X
TP-OVERFLOW	7-May-08	1055		661	X	
FC-2	7-May-08	1225	0.9	405		X
LRC-6	12-May-08	955		2697	X	
LRC-2	12-May-08	1150	5.88	2639		X
CC-2	12-May-08	1235		395	X	
LRC-1	12-May-08	1315	5.12	2298		X
TP-TOE1	12-May-08	1435	3.4	1525		X
TP-OVERFLOW	13-May-08	950		1067		X
URC-2	13-May-08	1100	6.1	2738		X
URC-1A	13-May-08	1125	5.97	2680		X
FC-2	13-May-08	1220	0.69	310		X
LRC-6	19-May-08	930		3218	X	
LRC-2	19-May-08	1115	7.69	3452		X
CC-2	19-May-08	1150		322	X	
LRC-1	19-May-08	1215	6.42	2882		X
TP-TOE1	20-May-08	950	5.09	2285		X
TP-OVERFLOW	20-May-08	1112		1333	X	
URC-2	20-May-08	1222	8.43	3784		X
URC-1A	20-May-08	1315	7.95	3568		X
FC-2	20-May-08	1355	0.41	184		X
LRC-6	26-May-08	930		3128	X	
LRC-2	26-May-08	1005	6.78	3043		X
CC-2	26-May-08	1038		279	X	
LRC-1	26-May-08	1110	6.13	2752		X
TP-TOE1	26-May-08	1200	5.47	2455		X
TP-OVERFLOW	26-May-08	1245		368	X	
URC-2	27-May-08	1035	4.24	1903		X
URC-1A	27-May-08	1118	3.53	1584		X
FC-2	27-May-08	1155		156	X	
LRC-6	2-Jun-08	1010		2347	X	
LRC-2	2-Jun-08	1110	4.5	2020		X
CC-2	2-Jun-08	1140		156	X	
LRC-1	2-Jun-08	1220	4.33	1944		X
TP-TOE1	2-Jun-08	1315	3.73	1674		X
TP-OVERFLOW	2-Jun-08	1440		87	X	
URC-2	3-Jun-08	1134	2.18	979		X
URC-1A	3-Jun-08	1215	2.09	938		X
FC-2	3-Jun-08	1250		122	X	
LRC-6	9-Jun-08	920		2127	X	
LRC-2	9-Jun-08	955	3.69	1656		X

TABLE 3-3.2

**SURFACE WATER FLOW RECORD FOR ELEMENT 2 PHASE IIA SAMPLES
(Page 3 of 3)**

Station ID	Sample Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method
			DISCHARGE_CFS	WQ_FLOW gpm		
CC-2	9-Jun-08	1025		156	X	
LRC-1	9-Jun-08	1055	3.28	1472		X
TP-TOE1	9-Jun-08	1148	2.92	1311		X
TP-OVERFLOW	9-Jun-08	1220		17.28	X	
URC-2	10-Jun-08	1125	2.37	1064		X
URC-1A	10-Jun-08	1200	2.31	1037		X
FC-2	10-Jun-08	1235		163	X	
LRC-6	16-Jun-08	1018		1696	X	
LRC-2	16-Jun-08	1055	3.15	1414		X
CC-2	16-Jun-08	1130		122	X	
LRC-1	16-Jun-08	1205	2.65	1189		X
TP-TOE1	16-Jun-08	1305	3.38	1517		X
TP-OVERFLOW	16-Jun-08	1333		12	X	
URC-2	17-Jun-08	1010	1.41	633		X
URC-1A	17-Jun-08	1047	1.21	543		X
FC-2	17-Jun-08	1130	0.217	97		X

TABLE 3-3.3**SURFACE WATER FLOW RECORD FOR ELEMENT 3 PHASE IIA SAMPLES**

Station ID	Sample Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method
			Discharge (cfs)	Flow (gpm)		
CC-2	30-Jun-08	848		67.77	X	
LRC-2	30-Jun-08	823		884	X	
LRC-6	30-Jun-08	745		1077	X	
LRC-2	15-Jul-08	1105		434.9	X	
LRC-6	15-Jul-08	1012		637.3	X	
LRC-2	29-Jul-08	1008		194.8	X	
LRC-6	29-Jul-08	910		395.8	X	
LRC-2	18-Aug-08	1055		0	X	
LRC-6	18-Aug-08	1017		411.6	X	

TABLE 3-4

SAMPLE CONTAINERS, PRESERVATION METHOD AND HOLDING TIME REQUIREMENTS FOR SURFACE WATER SAMPLES

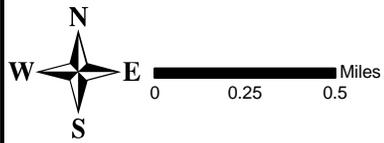
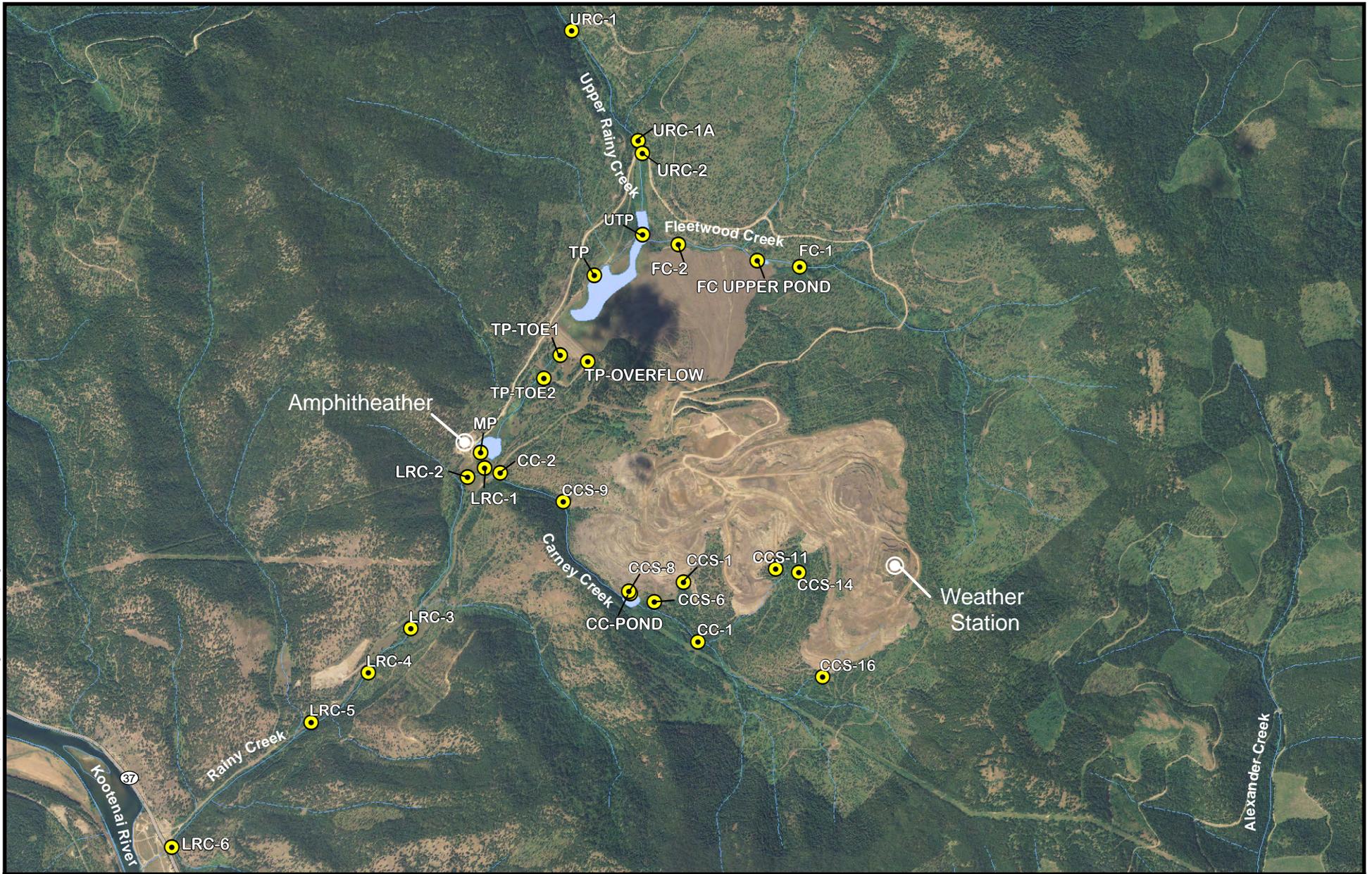
Container Description	Analyses	Method	Preservation and Holding Time	Extraction/ Analysis Holding Time
250-mL plastic (pre-preserved with HNO ₃)	TAL Metals+Boron (Total)	6010/6020 and EPA 200 Series methods (a)	Cool 4°C; HNO ₃ pH < 2	180 days
	Mercury	7470A/ EPA 245.1	Cool 4°C	28 days
250-mL plastic (Filtered)	TAL Metals+Boron (Dissolved), Hardness	6010/6020 and EPA 200 Series methods (a)	Cool 4°C; HNO ₃ (preserve sample in field after filtering)	180 days
1-L amber glass (Filtered)	Dissolved Organic Carbon (DOC)	9060/ EPA 415.1	Cool 4°C; H ₃ PO ₄ (preserve sample in field after filtering)	28 days
500-mL plastic (preserved with H ₂ SO ₄)	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	EPA 353.2, 350.1/350.2, 351.2	Cool 4°C; H ₂ SO ₄ pH < 2	28 days
	Organophosphate	EPA 365.2	Cool 4°C; H ₂ SO ₄ pH < 2	28 days
3 X 40-mL amber glass vial (preserved with HCl)	Volatile Petroleum Hydrocarbons (VPH)	MA-DEP VPH modified	Cool 4°C; HCl pH < 2	14 days
2 X 1-L amber glass bottle (preserved with H ₂ SO ₄)	Extractable Petroleum Hydrocarbons (EPH)	MA-DEP VPH modified	Cool 4°C; H ₂ SO ₄ pH < 2	14 days/40 days
1-L Plastic	Fluoride, Chloride, Sulfate	EPA 300.0	Cool 4°C	28 days
	Total Suspended Solids (TSS)	Standard Methods 2540D	Cool 4°C	7 days
	Nitrite	EPA 353.2	Cool 4°C	48 Hours
	Total Dissolved Solids (TDS)	Standard Methods 2540C	Cool 4°C	7 days
	Alkalinity	Standard Methods 2320B	Cool 4°C	14 days
2 X 1-L amber glass	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	40 days
2 X 1-L amber glass	Chlorinated Pesticides	EPA 8081	Cool 4°C	7 days/40 days
	Polychlorinated Biphenyls (PCBs)	EPA 8082	Cool 4°C	7 days/40 days
2 X 1-L amber glass	Herbicides	EPA 8151	Cool 4°C	7 days/40 days
3 X 40-mL amber glass vial (pre-preserved with HCl)	Volatile Organic Chemicals (VOCs) (c)	EPA 8260 B	Cool 4°C; HCl pH < 2	14 days
2 X 1-L amber glass (b)	Semivolatile Organic Chemicals (SVOCs) (c)	EPA 8270C	Cool 4°C	7 days/40 days
1-mL plastic (pre-preserved with HNO ₃)	Radiochemistry (gross alpha and gross beta)	EPA 900.0	Cool 4°C; HNO ₃	None
500-mL plastic (pre-preserved with NaOH)	Cyanide	EPA 335.4	Cool 4°C; NaOH pH > 12	14 days
1-L HDPE container	Asbestos	ISO 10312 (d)	Cool 4°C	Filtered within 48 hours

(a) 200 series methods: 200.7, 200.8

(b) 2 additional 1-L amber glass containers for MS/MSD

(c) CLP analyte list

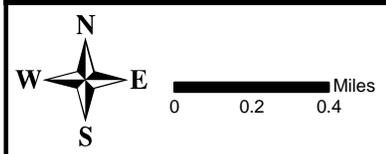
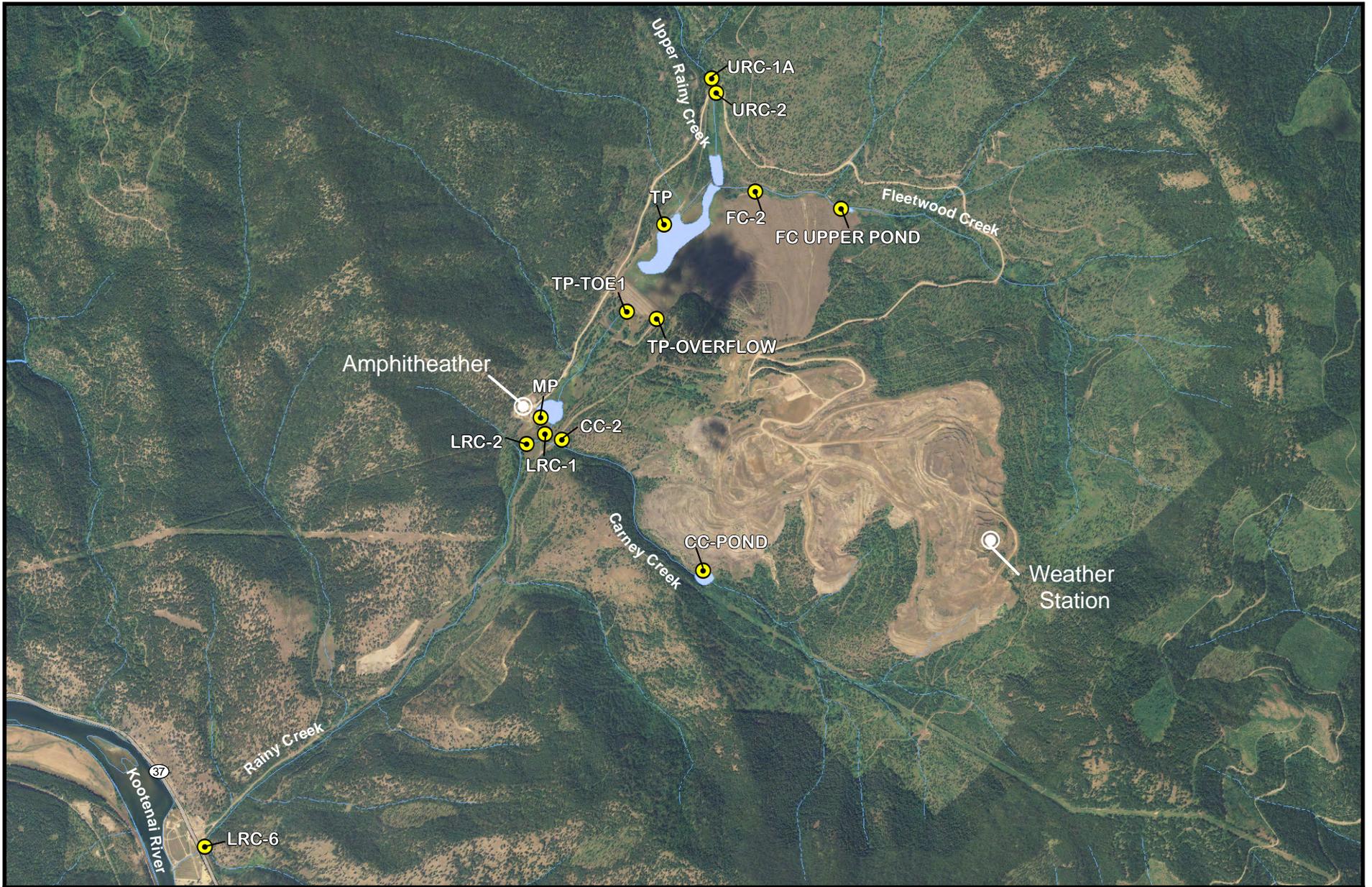
(d) With Libby-specific modifications



LEGEND	
Creeks/River outline	Water Sample Locations
Intermittent Streams	Ponds

Figure 3-1
Element I Surface Water Monitoring Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION

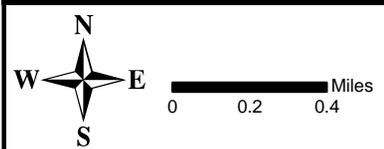
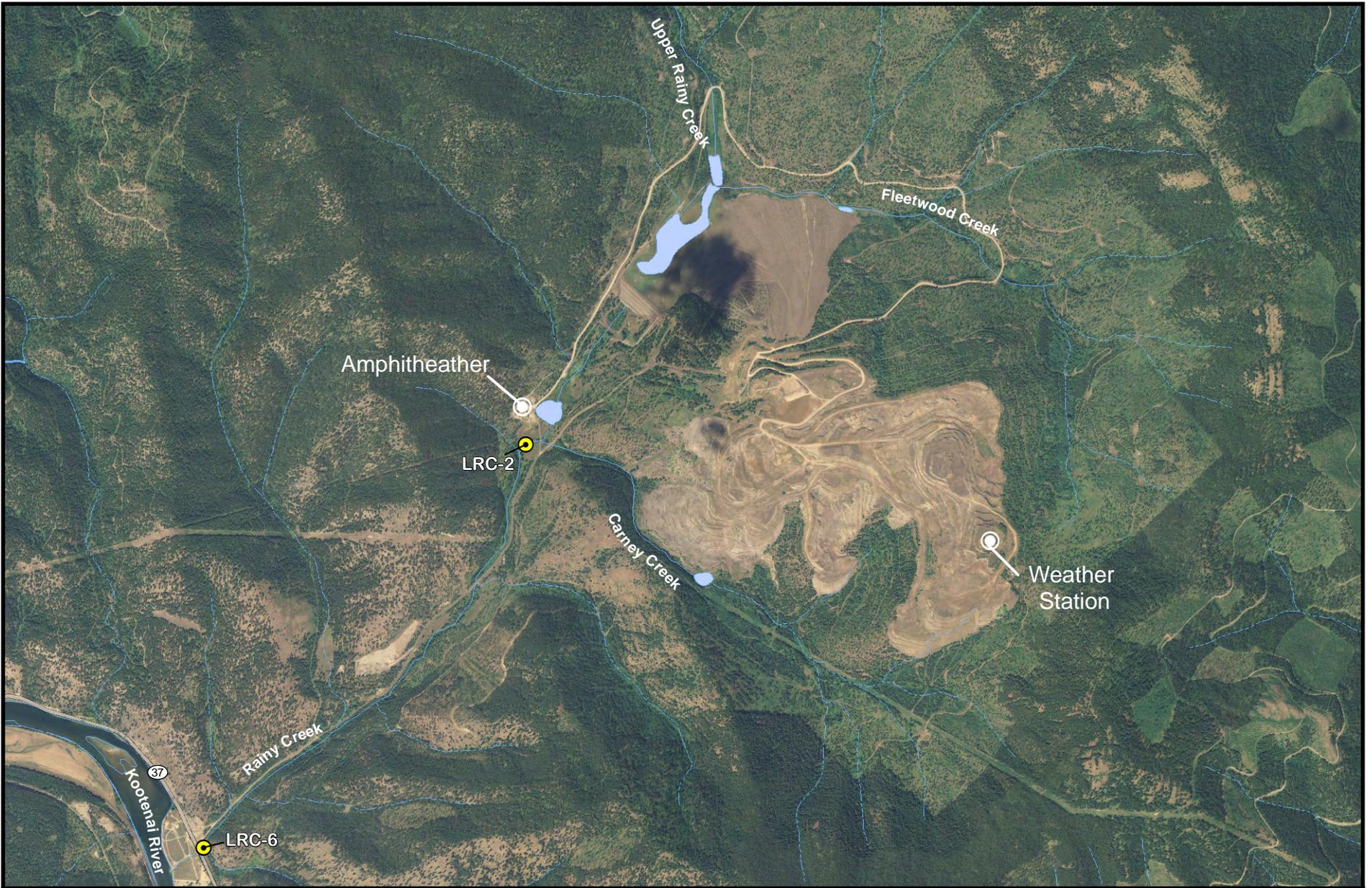




LEGEND	
Creeks/River outline	Water Sample Locations
Intermittent Streams	Ponds

Figure 3-2
Element 2 Surface Water Monitoring Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION

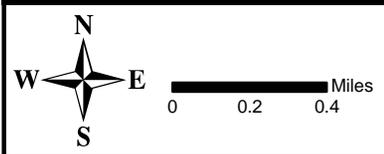
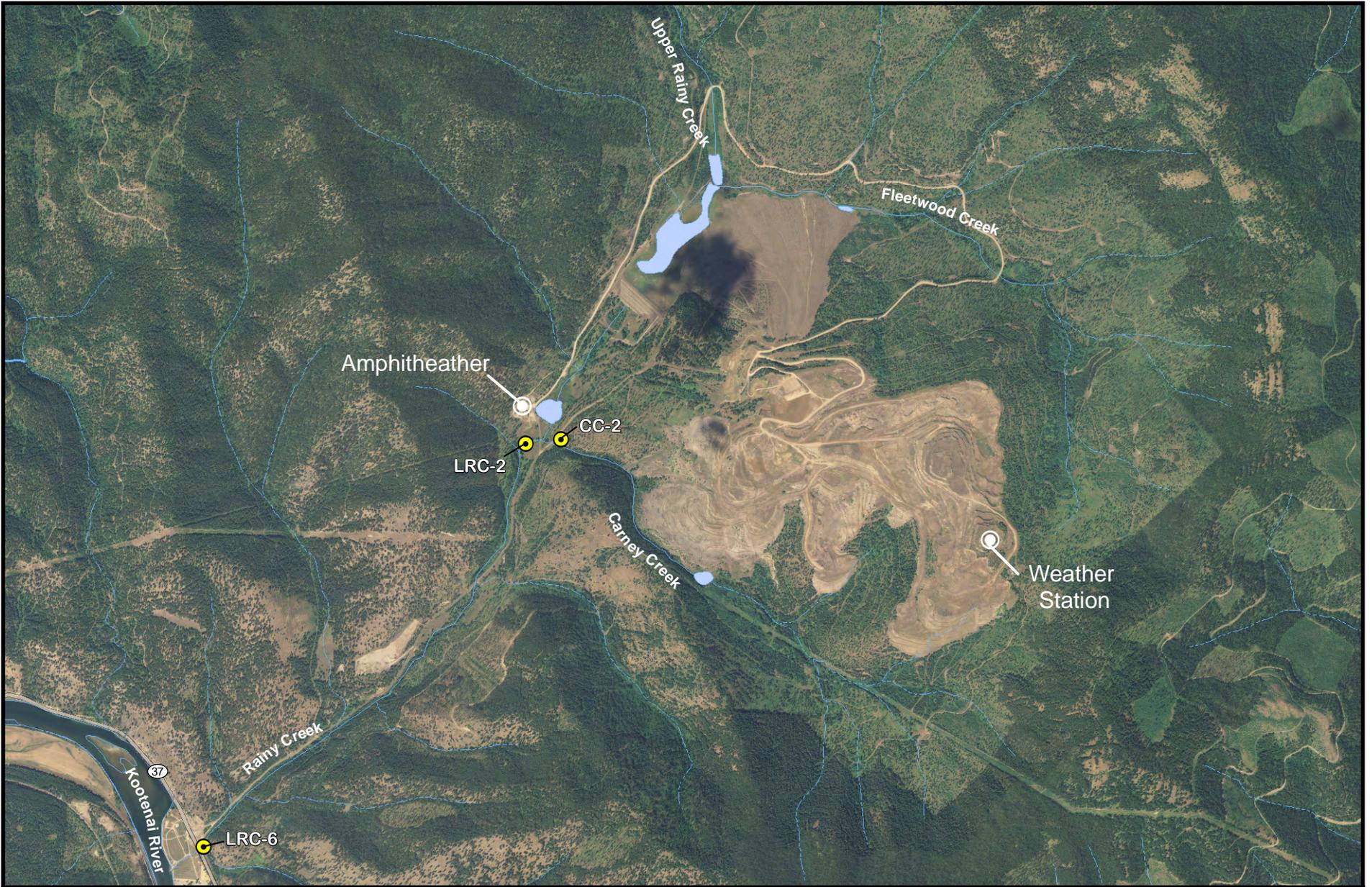




LEGEND	
	Creeks/River outline
	Intermittent Streams
	Water Sample Locations
	Ponds

Figure 3-3
Element 3 Surface Water Monitoring Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION



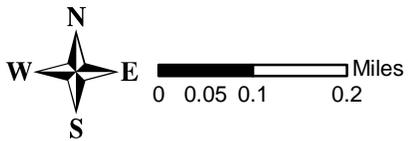
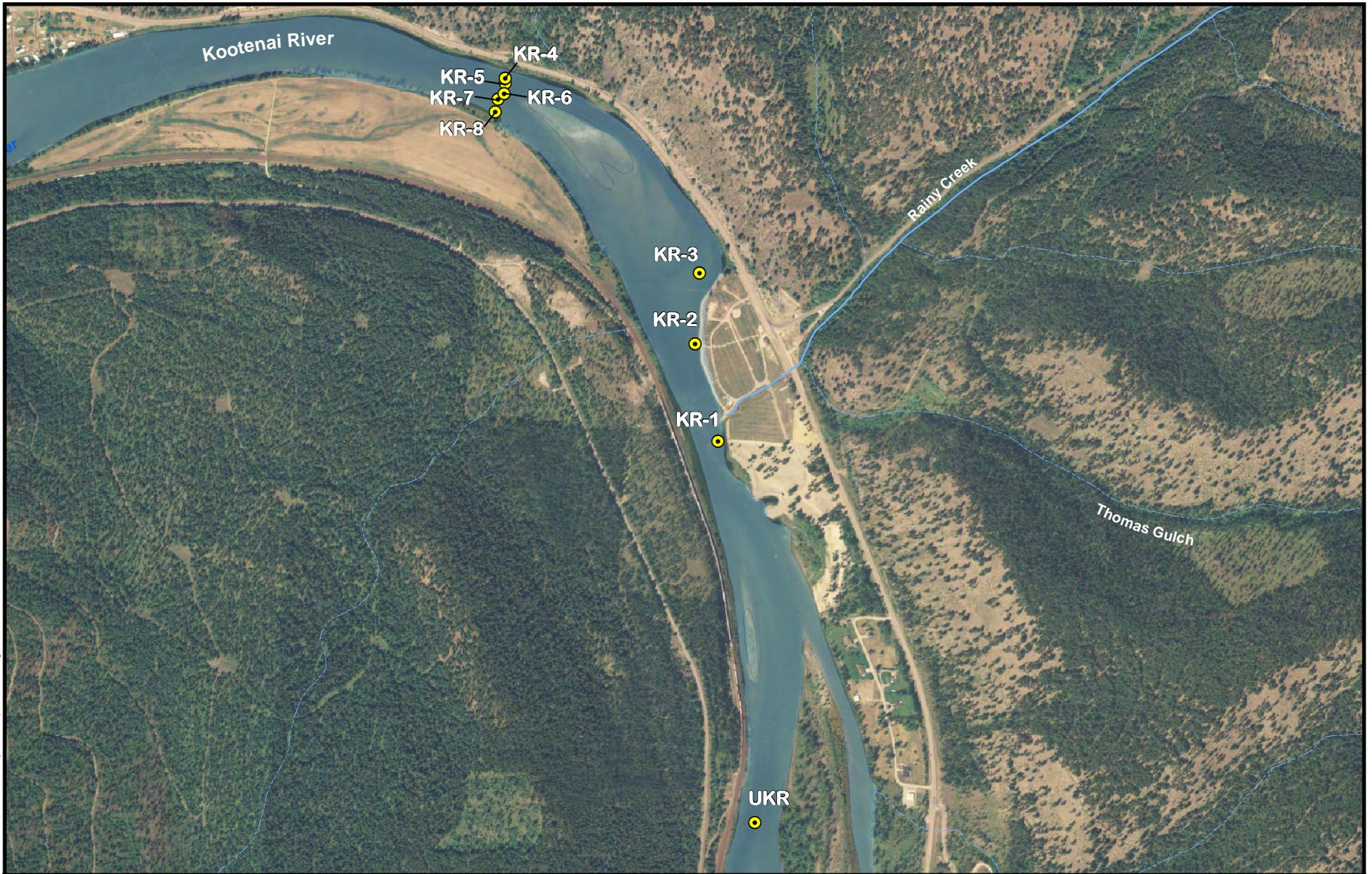


LEGEND	
Creeks/River outline	Water Sample Locations
Intermittent Streams	Ponds

Figure 3-4
Element 4 Stream Flow Monitoring Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION



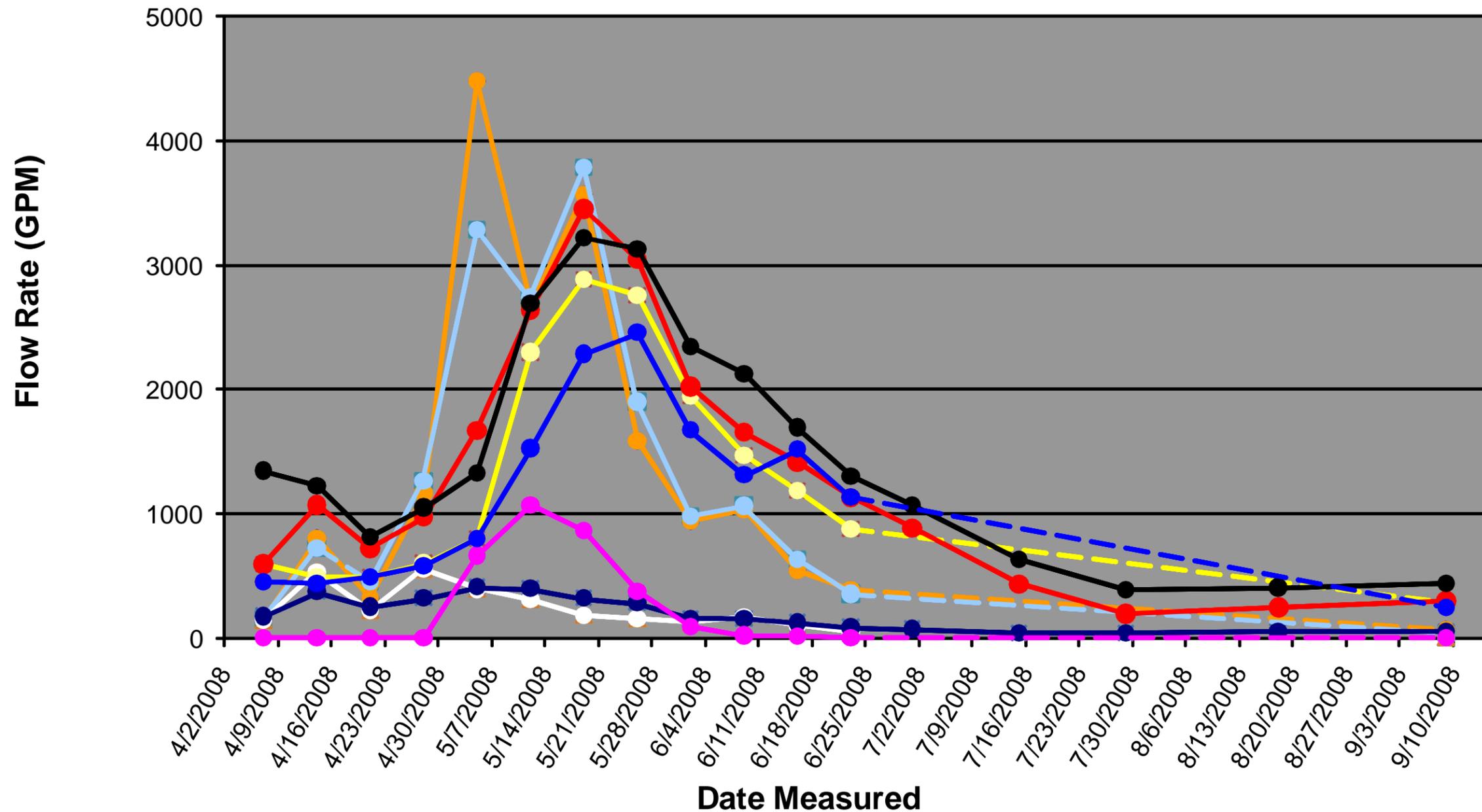
File: W:\WR_Graced\1006439 WR_Grace Libby MT Sep 07\GIS\Figure3-5KootWaterLocs.mxd



LEGEND	
	River
	Creeks
	Intermittent Streams
	Water Sample Locations

Figure 3-5
Kootenai River Surface Water Sampling Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION





File: W:\WR Grace\1005439 WR Grace Libby MT Sep 07\GIS\FigureXXStreamFlowData.mxd

LEGEND

Flow Stations	URC-1A	URC-02	FC-02	CC-02	LRC-01
	LRC-02	LRC-06	TP-Overflow	TP-TOE1	

Note: Dashed lines indicate flow measurements were not scheduled at the station between Element 1 monitoring rounds.

Figure 3-6
OU3 Phase II Stream Flow Data
 LIBBY ASBESTOS SUPERFUND SITE
 OU3 PHASE II REMEDIAL INVESTIGATION



4.0 SEDIMENT SAMPLING

4.1 SUMMARY OF THE PHASE II SEDIMENT SAMPLING PROGRAM

Phase II RI sediment sampling was performed by three-person teams. Sediment samples were collected at 60 locations at OU3 during two rounds of Element 1 sampling (the sediment sampling locations are shown on Figure 4-1). The GPS coordinates of Phase II sampling locations are provided in Attachment A. Sediment samples were collected at all of the surface water locations, and the Phase I sediment sampling program was expanded for Phase II to include multiple discrete samples from Mill Pond (five samples), Carney Pond (five samples), Fleetwood Pond (five samples), the Tailings Pond (15 samples) and the Upper Tailings Pond (two samples).

CDM had established most of the sediment (and co-located surface water) sampling locations during site reconnaissance prior to the start of the Phase I field sampling in October, 2007. In addition to marking the sample locations with labeled stakes, lath and surveyor's tape, CDM provided GPS coordinates that MWH entered into handheld GPS units for use in finding the sample locations. The pond sediment locations sampled for the expanded Phase II program were established by MWH in the field; the direction given by EPA in the Phase IIA SAP was to select locations that were (roughly) evenly-spaced, with three near-shore samples and two near-center samples from Carney, Mill and Fleetwood ponds. At the Tailings Pond, five samples were collected from "occasionally-inundated" locations, ten samples were collected from the inundated portion of the main body of the pond, and two samples were collected from the deeper Upper Tailings Pond (see Figure 4-2).

4.1.1 Rainy Creek Watershed (On-site) Sediment Analyses

Sediment samples were submitted for the following analyses:

- Libby amphibole (by polarized light microscopy)
- TAL metals and boron

- mercury
- total organic carbon
- paste pH
- fluoride and total phosphorous
- VPH
- EPH

In addition to the analytes listed above, sediment samples from LRC-02 (lower Rainy Creek downstream of its confluence with Carney Creek) and from TP-TOE1 (the Tailings Pond toe drain) were also submitted for analysis for polychlorinated biphenyls (PCBs; to assess effects of the potential use of transformer oil for dust control along adjacent roads), cyanide, organophosphate pesticides, and volatile and semi-volatile organic compounds. Table 4-1 is a summary of sediment samples collected during the Phase II RI; the table contains the sample identification, index identification, date and time of sample collection, sample type and requested analyses.

4.1.2 Kootenai River Sediment Analyses

Sediment samples collected from the channel bottom and submerged banks of the Kootenai River on August 19 and 20, 2008 were analyzed only for LA by polarized light microscopy.

4.2 SEDIMENT SAMPLING METHODS

4.2.1 Sample Collection From Streams and Occasionally-inundated Pond Areas

One composite sediment sample was collected from each designated sediment sampling station. Each sediment sample consisted of a composite of five grab samples collected from low-energy (i.e., depositional) portions of the stream channel that were submerged at the time of sampling. The five grab samples were collected over a reach within 75 feet upstream or 75 feet downstream of the specified station.

To minimize channel disturbance and turbidity, the sediment sampling team collected at a particular sample location only after the surface water sampling team had collected the surface water sample. Samples were collected using a 500-ml swing sampler (a small polyethylene cup at the end of an extendable pole) or a decontaminated stainless steel trowel or spoon. Excess water was decanted from sediment collected in the swing sampler before it was transferred to a 1-gallon Ziploc™ bag for homogenizing and transfer into labeled sample containers. Sediment samples for VOC and SVOC analyses were collected from the homogenizing bag with an EasyDraw™ syringe sampler (supplied by the analytical laboratory).

The sealed sample containers were immediately placed on ice for storage. The time of arrival, time of sample collection, sample location, and other data were recorded on FSDS forms and in the logbook. Element 1 sediment sampling logbook and FSDS scans are contained in Appendix A.2 (on CD in pocket). The photo identification board was labeled with the date, time and sample location and held near the sample location to be photographed (see Appendix A.2).

4.2.2 Collection of Sediment From Ponds

Portions of the Tailings Pond and Mill, Carney and Fleetwood ponds have thick aquatic vegetation and despite numerous attempts, conventional sediment sampling equipment (e.g., dredges, cups on extendable poles, split-spoon samplers and bucket augers) was unsuccessful in collecting sufficient sediment volume for the required analyses. To obtain sediment samples from the pond bottoms, a suction-assisted sediment sampling device (SASSD) was fabricated in the field from materials that are readily available at most hardware stores and operated by a peristaltic pump. In brief, the SASSD uses 1-inch-diameter PVC pipe to extend a 2-inch-diameter, 12-inch-long PVC sampling head into the pond bottom. The peristaltic pump is used to create suction, which retains a core of sediment and a minimal amount of vegetation. The sediment-filled sampling head is brought to the surface, the pump is reversed, and the sediment core is discharged into a sample mixing container. Details on the fabrication, operation and maintenance of the SASSD are provided in SOP 18.

4.2.3 Collection of Sediment From the Kootenai River

Sediment samples from the submerged banks of the Kootenai River were collected at the same locations as surface-water samples KR-1 through KR-3 and UKR-1 (Figure 4-3). The sediment samples were collected with new stainless steel hand trowels from low-energy depositional portions of the bank submerged beneath about one foot of water.

The Phase II SAP called for sediment samples to be collected from two borings into a gravel-bar island approximately 0.5-mile downstream from the mouth of Rainy Creek (Figure 4-3). Borings were attempted with a hand-driven bucket auger, but could not be advanced into the bar, which consists of tightly packed clast-supported gravel and cobbles in a sandy matrix. To collect samples for LA analysis, a stainless steel shovel was used to hand excavate small pits to a depth of one foot. The clasts were removed by nitrile-gloved hand and the matrix was collected and placed in sample containers.

4.2.4 Equipment

- GPS Unit: Garmin Vista Hcx™
- Site Vehicle: Polaris Ranger™ 4x4 2-passenger ATV
- River transportation: Polaris SLT-700™ personal watercraft
- Sampling devices: Stainless steel spoons and trowels, polyethylene cups, bucket auger, suction-assisted sediment sampling device
- Sampling device (for VOCs and SVOCs): EasyDraw™ syringe sampler (manufactured by En Novative Technologies, Inc.)
- Tape measure: Retractable steel
- Supplied sample containers: Provided by analytical laboratories
- Sample storage: Plastic cooler containing ice in double wrapped Ziploc™ bags.
- Clear packaging tape: Scotch-brand packaging tape.

- Field logbook: “Rite in the Rain” all weather journal 390N
- Pens: “Rite in the Rain” all weather pen #37, various ball point pens and permanent markers
- Photo identification board: 12”x20” dry erase board with permanent team identification.
- Camera: Nikon Coolpix™ L17 digital camera
- 2-way radios: Kenwood TK-380™ 800/900 MHz (FM-band)

4.3 IDENTIFICATION OF PRE-DESIGNATED SEDIMENT SAMPLING LOCATIONS

All Phase I sediment sampling locations were established by CDM and marked with a labeled wooden stake and surveyor’s flagging. CDM also provided GPS locations for all of the Phase I sampling locations. Phase II sampling was performed at each of the Phase I locations, and additional Phase II locations were selected in the field by MWH. To record the sampling locations, a GPS unit was held near the sample location for a short period of time to maximize accuracy and a waypoint was created. The GPS coordinates, elevation and accuracy of each were recorded on the FSDS form.

4.4 FIELD-BASED QUALITY CONTROL SAMPLES

4.4.1 Blanks

Trip Blanks During Phase II sampling, one laboratory-prepared trip blank accompanied each cooler of sediment samples shipped to the laboratory for VOC analysis. One trip blank per cooler also accompanied sediment samples shipped for analysis of EPH and VPH. Trip blank samples collected as part of Phase II RI sampling at OU3 are designated “TB” and summarized on Table 4-1.

4.4.2 Duplicates

Field Duplicates The stations at which field duplicate sediment samples were collected were selected randomly in the field by MWH. Field duplicate samples collected as part of Phase II RI sediment sampling at OU3 are designated “FD” and are summarized on Table 4-1.

4.4.3 Performance Evaluation (PE) Samples

A total of three soil PE samples containing a range of inorganic and organic analytes were added in random order to the field samples by the field collection teams. Performance evaluation samples collected as part of Phase II RI sediment sampling at OU3 are designated “PE” and are summarized on Table 4-1.

4.5 SAMPLE HANDLING

4.5.1 Sample Containers

All containers used for the collection of Phase II RI samples were prepared and/or supplied by the analytical laboratories. Table 4-2 is a summary of containers used for sediment samples.

4.5.2 Sample Preservation and Storage

Sediment samples collected for analysis of VPH and target compound list (TCL) VOCs were preserved in the field with methanol, as specified by EPA SW-846 Method 5035. All samples were kept on ice in coolers until they were received by the laboratories.

4.6 SAMPLE DOCUMENTATION AND IDENTIFICATION

Data regarding each sample collected were documented on OU3 Phase II RI-specific FSDS. Any special circumstances that influenced sample collection or resulted in deviations from sampling SOPs were documented in the field logbook.

At the time of collection, each sample was assigned a unique 5-digit index identification (index ID) number. Sample IDs for all samples collected as part of the Phase II RI bear the prefix of “P2” (e.g., P2-12345). Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate) 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.

Each field sampling team 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 sediment sampling logbook and FSDS are provided as PDF files in Appendix A.2. Photographs of sediment sampling locations are also contained in Appendix A.2.

4.7 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

COC was maintained until final disposition of the samples by the laboratories and acceptance of analytical results. A COC form specific to the Phase II OU3 RI sampling program accompanied every shipment of samples to the analytical laboratories. 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, and copies were made and retained to document each change of custody. All samples sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Sediment samples that required preparation at the CDM close support sample preparation laboratory in Denver, Colorado were shipped there by FedEx priority overnight service. Scans of the sediment sample COCs are provided as PDF files in Appendix G.

4.8 SAFETY

All MWH sampling personnel who entered the OU3 site were equipped with Level C PPE consisting of two sets of hooded Tyvek coveralls worn over dedicated site clothing, full-face respirator, nitrile gloves and latex boot covers. Full-face respirators such as the North 7600 Series were worn with North P100 HEPA filter cartridges. Gloves were taped at the wrist to each Tyvek suit. Coveralls, gloves, boot covers and cartridges were

disposed of after one use. The dedicated clothing was re-used until the project was completed, at which point it was discarded.

All equipment transported off site (coolers, shovels, etc.) was decontaminated at the on-site decontamination station by a site-experienced technician. All outbound vehicles that traveled beyond the decontamination station were decontaminated on site by a site-experienced technician. All sample containers and small equipment (GPS units, radios, etc.) were cleaned by field technicians at the MWH decontamination trailer.

TABLE 4-1.2**SUMMARY OF SEDIMENT SAMPLES COLLECTED FROM THE KOOTENAI RIVER DURING PHASE IIA**

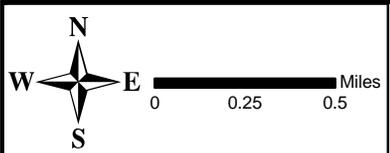
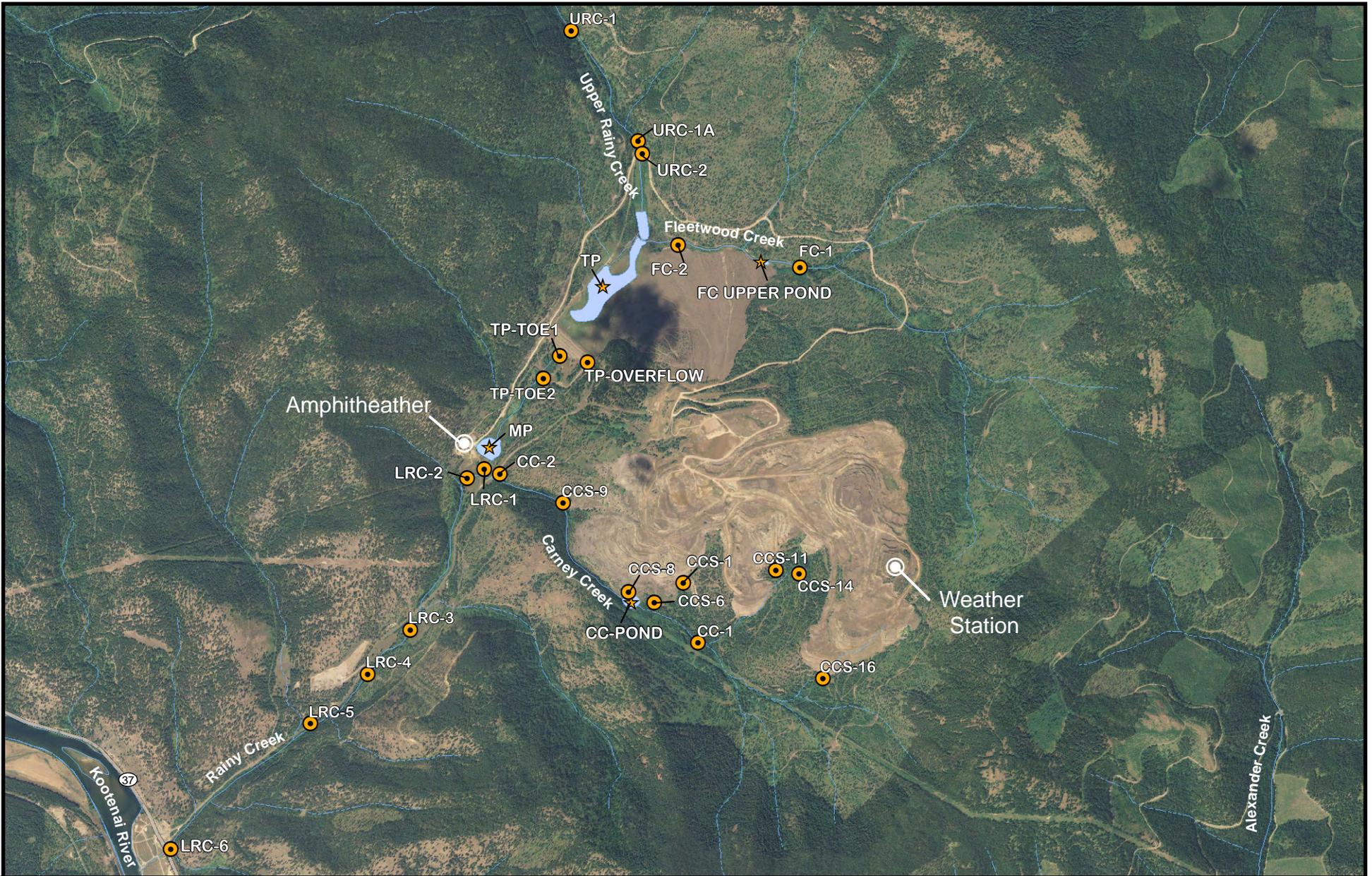
Station ID	Index ID	Sample Type	Sample Date	Sample Time	Matrix	Analytical Method TEM-ISO10312
KR-9	P2-00860	FS	20-Aug-08	1135	SE	X
KR-10	P2-00861	FS	20-Aug-08	1240	SE	X
KR-11	P2-00862	FS	20-Aug-08	1340	SE	X
KR-12	P2-00863	FS	20-Aug-08	1350	SE	X
KR-13	P2-00864	FS	20-Aug-08	1415	SE	X
KR-13	P2-00865	FD	20-Aug-08	1420	SE	X
UKR-2	P2-00866	FS	20-Aug-08	1425	SE	X

TABLE 4-2

**SAMPLE CONTAINERS, PRESERVATION METHOD AND HOLDING TIME
REQUIREMENTS FOR SEDIMENT SAMPLES**

Container Description	Analyses	Method	Preservation and Holding Time	Extraction/ Analysis Holding Time
8-ounce glass jar	TAL Metals+Boron	EPA 6010/6020	Cool 4°C	180 days
	Mercury	EPA 7471A	Cool 4°C	28 days
	Total Organic Carbon (TOC)	EPA 9060/415.1	Cool 4°C protect from sunlight and atmospheric oxygen	28 days
	Paste pH	EPA 9045D/ ASTM 10-3.2	Cool 4°C	14 days
	Fluoride	EPA 300.0/ SM4500-F-C	Cool 4°C	14 days
	Total phosphorus	EPA 365.1	Cool 4°C	28 days
	Cyanide	EPA 9012	Cool 4°C	14 days
10-mL amber glass vial (preserved with methanol)	Volatile Petroleum Hydrocarbons (VPH)	MADEP-VPH-04-1.1	Cool 4°C	28 days
4-ounce wide mouth amber glass jar	Extractable Petroleum Hydrocarbons (EPH)	MADEP-EPH-04-1	Cool 4°C	14 days
4-ounce glass jar	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	14 days/40 days
8-ounce wide mouth amber glass jar	Chlorinated Pesticides	EPA 8081	Cool 4°C	14 days/40 days
	Herbicides	EPA 8151	Cool 4°C	14 days/40 days
	Polychlorinated Biphenyls (PCBs)	EPA 8020	Cool 4°C	14 days/40 days
10-mL amber glass vial (preserved with methanol)	Volatile Organic Chemicals (VOCs) (a)	EPA 8260B	Cool 4°C CH ₃ OH	14 days
4-ounce wide mouth amber glass jar	Semivolatile Organic Chemicals (SVOCs) (a)	EPA 8270C	Cool 4°C	14 days/40 days
1-L HDPE container (sediment)	Asbestos	<u>PLM-Grav: SRC-LIBBY-01 (Rev. 2)</u> <u>PLM-VE: SRC-LIBBY-03 (Rev. 2)</u>	None	None

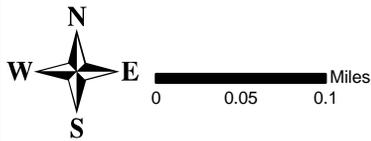
(a) CLP analyte list



LEGEND	
 Ponds	 Sediment Locations
 Creeks/River outline	 Ponds with several Sediment Locations
 Intermittent Streams	

Figure 4-1
Element I Sediment Sampling Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION





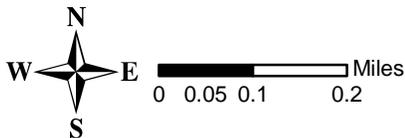
LEGEND

-  Ponds
-  Creeks/River outline
-  Intermittent Streams
-  Tailings Pond (TP) Sediment Locations

Figure 4-2
Element I Sediment Sampling
Locations at Tailings Pond

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LEGEND	
	River
	Creeks
	Intermittent Streams
	Sediment Locations

Figure 4-3
Kootenai River Sediment Sampling Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION



5.0 GROUNDWATER SAMPLING

OU3 Phase IIB groundwater well rehabilitation and redevelopment was performed in July, 2008 and two rounds of groundwater sampling were performed in July and September, 2008. Groundwater samples were collected from five existing wells at the site, as agreed upon with EPA. The locations of the wells are shown on Figure 5-1. The GPS coordinates of Phase II sampling locations are presented in Attachment A. Well rehabilitation, well redevelopment and groundwater sampling were completed at the following locations:

- Well A is located next to the remnants of a log cabin, in the bottom of the Carney Creek drainage, upstream of the Carney Pond, at the base of the fine tailings pile, about 2,500 feet east and upstream from Rainy Creek.
- Well C is located in an open grassy area about 1,000 feet downstream from the tailings dam and west of Rainy Creek.
- Well D is located near the former mill. Well D was housed inside a 10-foot-square, 8-foot-tall, metal shed-roof building on a 10-inch-thick concrete slab. Prior to well redevelopment the metal shed was demolished and removed.
- Well E is located along a haul road near the center of the mine in an open flat area.
- Well H is located on a haul road about halfway up the slope east of Rainy Creek below the former mill area.

5.1 SUMMARY OF GROUNDWATER WELLS AND SAMPLING PROGRAM

Groundwater samples were collected during both sampling events using a 2-inch or 3-inch Grundfos™ pump and dedicated tubing. The initial groundwater sampling event was completed by MWH personnel with assistance from Water Development Company (WDC) in July, 2008 after the completion of well rehabilitation and redevelopment. The second groundwater sampling event was completed by MWH personnel in September, 2008.

Between wells, the Grundfos™ pumps were decontaminated following the manufacturer's and project-specific guidelines. Decontamination procedures included thoroughly cleaning the inside and outside of the pump with an Alconox™ wash followed by a triple-rinse of distilled water. During decontamination, the Alconox™ wash and the distilled water was pumped through the Grundfos™ pump. During well redevelopment and rehabilitation, the Grundfos™ pumps were taken apart and cleaned with Alconox™ and a triple distilled water rinse. Dedicated tubing was used at each well, thus, decontamination of the tubing was not needed. Decontamination water was disposed of at the Amphitheater. The Grundfos™ pumps were powered by a portable gasoline powered generator and flow rates were adjusted using a portable controller. During groundwater sampling the generator was placed downwind of the well to prevent exhaust from compromising the sample quality. The groundwater sampling and low-flow sampling criteria were performed following the guidelines in SOP 6.

5.1.1 Well A

Groundwater samples were collected from this well on July 24 and September 30, 2008. As observed during well redevelopment, Well A has a very slow groundwater recharge rate. During both sampling events prior to groundwater sampling, the well was bailed dry and allowed to recharge for 24 hours before the groundwater sample was collected to ensure representative formation water had entered the well. The groundwater was purged and sampled using low-flow sampling methods using a 2-inch Grundfos™ pump, however, due to the lack of water in the well the flow rate could not be accurately determined. On July 22, 2008, prior to bailing the well dry, the static water level was measured at 3.81 feet below top of casing (BTOC). On September 29, 2008 the static water level was measured at 2.41 feet BTOC.

5.1.2 Well C

Groundwater samples were collected from this well on July 22 and September 29, 2008 using a 2-inch Grundfos™ pump and dedicated tubing. During both sampling events, groundwater sampling was performed using the low-flow methods. For the July 22 sampling event the flow rate was 0.25 gallons per minute (gpm) and a total purge volume

of 10.8 gallons. For the September 29, 2008 sampling event the flow rate was 0.3 gpm, with a total purge volume of 6.0 gallons. During both sampling events, the pump inlet was set at about 5 feet from the bottom of the well. The static water level was measured at 24.81 feet BTOC on July 22 and at 26.09 feet BTOC on September 29, 2008.

5.1.3 Well D

During both sampling events, groundwater sampling was completed using low-flow purging. Groundwater samples were collected from this well on July 23, 2008 using a 3-inch Grundfos™ pump and dedicated tubing and the pump inlet at 357 feet BTOC. For the July 23, 2008 sampling event the flow rate was 0.75 gpm, with a total purge volume of 45 gallons. For the September 30, 2008 event, groundwater samples were collected using 2-inch Grundfos™ pump and dedicated tubing and the pump inlet at about 300 feet BTOC, which was the maximum depth that a 2-inch Grundfos™ pump and pump water. On 30 September, 2008 the flow rate was 0.3 gpm, with a total purge volume of 6 gallons. Prior to purging Well D on September 30, 2008, about 210 gallons were purged from the well at a flow rate of 3.5 gpm to ensure that representative formation water had entered the well. The static water level was measured at 243.51 feet BTOC on July 23 and at 245.92 feet BTOC on September 30, 2008.

5.1.4 Well E

Groundwater samples were collected from Well E on July 23 and September 30, 2008 using a 2-inch Grundfos™ pump and dedicated tubing. During both sampling events, groundwater sampling was completed using low-flow methods. For the July 23, 2008 sampling event the flow rate was 0.5 gpm, with a total purge volume of 11 gallons. For the September 30, 2008 sampling event the flow rate was 0.25 gpm, with a total purge volume of 8.75 gallons. During both sampling events, the pump inlet was set at about 242 feet BTOC, near the middle of the well screen. The static water level was measured at 174.61 feet BTOC on July 23 and at 193.06 feet BTOC on September 30, 2008.

5.1.5 Well H

Groundwater samples were collected from this well only on July 24, 2008. During the September, 2008 sampling event the well was dry and could not be sampled. For the July 24, 2008 sampling event a 2-inch Grundfos™ pump and dedicated tubing was used. Prior to groundwater sampling, the well was bailed dry and allowed to recharge for about 24 hours before the groundwater sample was collected to ensure that representative formation water had entered the well. The groundwater was sampled using low-flow sampling methods, but due to the slow recharge rate of the well, the flow rate could not be accurately determined. On July 24, 2008 the static water level was measured at 61.93 feet BTOC.

5.2 GROUNDWATER WELL REHABILITATION AND REDEVELOPMENT

Well rehabilitation and re-development was performed by WDC under the direction of an onsite MWH geologist. WDC provided a Montana Licensed Well Driller and a helper for the project. Equipment used on site by WDC was a Pulsar P12000™ well service and work-over rig mounted on a one-ton truck. Well rehabilitation consisted of the removal of obstructions, pumps and drop pipe (if present) from the well. Well redevelopment was completed to improve the condition of the well by removing sediment and fouling from the well casing and screen and to break up any mineral buildup in the screened interval. An initial specific capacity test was completed prior to any redevelopment. Wells were swabbed with a tight fitting brush used to dislodge fouling and sediment within the well screen. Sediment and other debris were removed from the well using a bailer. A second specific capacity test was completed to evaluate any changes in recharge rate between the initial specific capacity test and the second. During the specific capacity tests, the pump inlet was placed near the center of the screen. In wells where the depth of the screened interval was unknown, the pump inlet was placed about five feet up from the bottom of the well. Variations in well conditions and construction, some redevelopment procedures were modified in the field, as discussed below.

5.2.1 Well A

No records exist of the construction details of Well A. The surface completion consists of an open 6-inch diameter metal pipe with 0.39 feet of stickup above ground surface. Because the well construction details are unknown and given the apparent old age of the well, it is possible that it does not to have a well screen and is constructed with an open-ended pipe. The initial static water level was measured at 3.81 feet BTOC and the total depth of the well was measured at 42.04 feet BTOC prior to well redevelopment on July 22, 2008. Well A was bailed dry after removing about 50 gallons of very turbid groundwater with abundant organic material. The well was bailed dry a second time on July 23, 2008. Groundwater in the well had recharged to 36.81 feet BTOC (about 4 feet) in a 24-hour time period. During well rehabilitation and redevelopment activities about 75 gallons of groundwater were purged from the well

5.2.2 Well C

No records exist of the construction details of Well C. The surface completion consisted of a 10-inch diameter steel casing, an elbow hanging on the wellhead, and wires that were used to power an electric submersible pump. Attached to the elbow was 3-inch diameter steel drop pipe and pump. The pump and drop pipe were pulled from the well with a winch line attached to the mast of the well service rig. Pipe joints were unthreaded where possible and cut with a torch where they could not be unthreaded. The 10-inch diameter metal casing has a stickup of 1.86 feet above ground surface. On July 19, 2008 the initial static water level was measured at 23.89 feet BTOC and the total depth of the well was measured at 77.24 feet BTOC. A pre-redevelopment specific capacity test was completed prior to swabbing, bailing and pumping. Pumping was completed using a 3-inch Grundfos™ pump. A post-redevelopment specific capacity test was completed with a final pumping rate of 17.6 gpm and a drawdown of 1.03 feet. Well C recovered to static water level within 10 minutes.

5.2.3 Well D

Prior to well redevelopment, the metal pumphouse was removed. The 10-inch-diameter steel well casing is housed within a 5-foot-diameter corrugated galvanized culvert pipe that extends about 2 feet above the concrete slab floor. According to well construction records, the well is constructed of 10-inch diameter steel with an 8-inch steel screen from 345 to 385 feet below ground surface. A Berkley™ electric submersible pump and 336 feet of steel drop pipe were removed from the well prior to redevelopment. On July 19, 2008 static water was measured at 243.88 feet BTOC prior to pulling the pump from the well. On July 20, 2008 static water was measured at 243.98 feet BTOC and the total depth of the well was measured at about 378 feet, with a very soft well bottom which suggested sediment was in the bottom of the well. A pre-redevelopment specific capacity test was performed using a 3-inch Grundfos™ with a pumping rate of about 12 gpm and a drawdown of 2.21 feet. The well was swabbed and bailed for about an hour and about 1 foot of material was bailed from the well. The material removed from the well appeared to have been rock cuttings generated during drilling of the bedrock formation.

The Montana Well Log Report for Well D indicates that gravel or other filter pack material was not used around the well screen and there is no mention in the report that an end cap was installed at the bottom of the well. During bailing, formation and/or cuttings were observed in material brought up by the bailer, indicating that sediment was coming into the well either through the well screen, a break in the casing, or from the bottom of the well. WDC recommended that bailing activities be stopped because additional sediment would probably continue to come into the well and increase the turbidity of groundwater in the well.

A post-redevelopment specific capacity test was performed using a 3-inch Grundfos™ at a pumping rate of about 12 gpm and a drawdown of 2.33 feet. The static water level in Well D recovered within ten minutes.

5.2.4 Well E

Well E is a 2-inch Schedule 80 PVC well screened from 235 to 250 feet below ground surface. On July 21, 2008 static water was measured at 173.88 feet BTOC and the total depth of the well was measured at 251.50 feet BTOC. A bend in the well casing at about 177 feet BTOC prevented swabbing or bailing of the well. A small 2-inch Grundfos™ pump was installed in the well with the pump inlet in the middle of the well screen and one specific capacity test was performed. The specific capacity test was completed after about 1.5 hours with a maximum drawdown of 22.38 feet at a flow rate of 2 gpm. The static water level in the well recovered after 6 minutes.

5.2.5 Well H

Well H is a 2-inch Schedule 80 PVC well screened from 60 to 70 feet below ground surface. On July 21, 2008 static water was measured at 51.73 feet BTOC and the total depth of the well was measured at 71.12 feet BTOC. The well was bailed dry and groundwater recharged 3.93 feet in half an hour. The well was bailed dry a second time on July 21, 2008 and the groundwater was slightly turbid with a trace of sediment.

5.3 GROUNDWATER ANALYSES

Groundwater samples were analyzed for TAL metals (plus boron), mercury, fluoride, chloride, sulfate, cyanide, VPH, EPH, total dissolved solids (TDS), total suspended solids (TSS), nitrate, alkalinity, nitrate, radiochemistry, hardness and dissolved TAL metals.

5.4 GROUNDWATER SAMPLING

5.4.1 Sample Collection

Groundwater samples were collected from five wells (Well A, C, D, E and H). To minimize the turbidity in the wells, low-flow sampling techniques were used during both of the 2008 groundwater sampling events.

For groundwater samples requiring filtering in the field, water from the well was pumped through an in-line 0.45 µm high-capacity filter. Each in-line filter was purged with about 200 mL of groundwater before the sample container was filled. Groundwater was pumped through the filter using a peristaltic pump with dedicated filter and tubing. All unfiltered groundwater samples were collected from the discharge tubing attached to the submersible pump.

5.4.2 Equipment

Equipment used during groundwater sampling and well rehabilitation and well redevelopment included the following:

- GPS Unit: Garmin Vista Hcx™
- Site Vehicle: Kubota 4X4 RVT™ 2-passenger all-terrain vehicle
- Grunfos™ Submersible Pump: Geotech Environmental rental pump. Each well had dedicated braided polyethylene tubing stored inside of the well between groundwater sampling events
- Water-quality meter: Hydrolab Quanta™ G multifunction water-quality system with a flow-through cell
- Peristaltic Pump: Geotech Environmental rental pump. Disposable tygon and silicone tubing for each groundwater sampling location
- Field Filter: Geotech Environmental 0.45-micron filter. New, dedicated filters were used at each groundwater sampling location
- Water-level meter: Insitu™ 500-foot meter. The water-level meter was decontaminated using Alconox™ wash and a triple rinse of distilled water between wells
- Sample Containers: Provided by the analytical laboratories, Energy Labs and EMSL

- Sample Storage: Laboratory-provided plastic cooler containing wet ice in double-wrapped Ziploc™ bags
- Packaging tape: Packaging tape included strapping tape, duct tape and clear packaging tape for securing coolers, securing drain plugs and covering custody seals
- Field logbook: “Rite in the Rain” all-weather journal #390N. A journal was dedicated to groundwater sampling, well rehabilitation and well redevelopment activities
- Pens: “Rite in the Rain” all-weather pen #37, various ball point pens, and permanent markers.
- Photo identification board: 12”x20” dry erase board
- Camera: Nikon Coolpix L17™ digital camera
- 2-way radio: Kenwood TK-380™ 800/900 MHz (FM-band) radio
- Pulsar P12000™ Well Service and Work-over rig: Operated by WDC. Rig included a mast with hoist/winch lines, electric generator, bailers, swabbing equipment, portable steam cleaner and drop pipe for 3-inch Grundfos™ pump.

5.5 FIELD-BASED QUALITY CONTROL SAMPLES

5.5.1 Blanks

Field Blanks Field blanks for groundwater were prepared by placing an appropriate volume of distilled water into the laboratory-supplied sample container. One field blank for groundwater was collected during each groundwater sampling event. For the July 23, 2008 groundwater sampling event, the field blank was collected from Well D. For the September 30, 2008 groundwater sampling event, the field blank was collected from Well E. Field blanks were designated “FB” and are summarized on Table 5-2.

Trip Blanks Trip blanks are laboratory-prepared samples that were included in each sample cooler shipped to the laboratory. Each trip blank was analyzed by the laboratory for volatile organic compounds (VOC) and VPH analyses. Trip blank samples were designated “TB” and are summarized on Table 5-2.

Equipment Blanks Equipment blanks for groundwater were prepared by rinsing the decontaminated submersible Grundfos™ pump with an appropriate volume of distilled water and collecting the rinsate in the laboratory-supplied sample container. One equipment blank for groundwater was collected during each groundwater sampling event. For the July 22, 2008 groundwater sampling round, the equipment blank was collected from Well C. For the 30 September 30, 2008 groundwater sampling round, the equipment blank was collected from Well E. Equipment blanks were designated “EB” and are summarized on Table 5-2.

5.5.2 Duplicates

Field Duplicates Field duplicates or field splits are groundwater duplicates sampled at the same time as the normal groundwater sample. For the July 23, 2008 groundwater sampling event, the field duplicate was collected from Well C. For the September 30, 2008 groundwater sampling event, the field blank was collected from Well A. Field duplicates were designated “SP” and are summarized on Table 5-2.

Matrix Spike/Matrix Spike Duplicates Matrix spike/matrix spike duplicates (MS/MSD) are groundwater duplicates collected at the same time as the normal groundwater sample and are used for laboratory quality control. For the July 23, 2008 groundwater sampling event, the MS/MSD was collected from Well E. For the September 29, 2008 groundwater sampling event, the MS/MSD was collected from Well C. MS/MSD samples were designated “MS/MSD” and are summarized on Table 5-2.

5.6 SAMPLE HANDLING

5.6.1 Sample Containers

All sample containers were prepared and/or supplied by the analytical laboratories. Table 5-4 is a summary of containers used for groundwater sampling.

5.6.2 Sample Preservation and Storage

Table 5-4 is a summary of preservatives used for groundwater sampling. After the groundwater samples were collected, the sample containers were immediately placed on ice and secured within a cooler for storage prior to shipping or delivery to the laboratories.

5.7 SAMPLE DOCUMENTATION AND IDENTIFICATION

At the time of groundwater sample collection, each sample was assigned a unique 6-digit index identification (index ID) number. Sample IDs for all groundwater samples collected as part of the OU3 Phase IIB Groundwater Wells and Sampling Program have the prefix of “P2” (e.g., P2-00795). Information on whether the groundwater sample is representative of a field sample or a field based QC sample (e.g. field blank, equipment blank, field duplicate or MS/MSD) was documented on the FSDS, but not on the chain-of-custody, to ensure that the sample type was submitted “blind” to the analytical laboratory.

The groundwater sampling team maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in the logbook. Scans of the logbook and FSDS are provided as PDF files in Appendix E. Photographs of the groundwater sampling are also contained in Appendix E.

5.8 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

COC was maintained until final disposition of the groundwater samples by the laboratories and acceptance of the analytical results. A COC form specific to the OU3 Phase IIB Groundwater Wells and Sampling Program accompanied every shipment of samples to the analytical laboratories. All corrections to the COC record were initialed and dated by the person who made the corrections. Original COCs accompanied the samples to the laboratories and copies were made and retained to document each COC. All groundwater samples sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Groundwater samples that required delivery to the EMSL laboratory in Libby, Montana were hand-delivered by MWH personnel. Scans of the groundwater sample COCs are provided as PDF files in Appendix G.

5.9 SAFETY

All MWH and WDC on-site personnel were equipped with Level C PPE consisting of two sets of hooded Tyvek coveralls worn over dedicated site clothing, full-face respirator, double nitrile gloves and latex boot covers. Full-face respirators were worn with HEPA filter cartridges. The first layer of nitrile gloves was taped at the wrist of the inner layer of the Tyvek coveralls. Tyvek coveralls, gloves and boot covers were disposed of after each use. The HEPA filter cartridges were checked daily and were replaced as needed. Dedicated clothing was reused until the project work was completed, at which point it was disposed of.

All equipment transported off site (coolers, tools, meter boxes, etc.) was decontaminated at the on-site decontamination station by a site-experienced technician. All outbound vehicles (WDC work-over rig and the site vehicle) that traveled beyond the on-site decontamination station were decontaminated by a site-experienced technician. All groundwater sample containers and small equipment (GPS unit, radio, cameras, etc.) were cleaned by a field technician at the MWH decontamination trailer.

Site-specific tailgate health and safety meetings were held daily prior to the start of work at OU3. The daily meetings covered specific tasks that were to be completed on that

particular day. The tailgate meetings were conducted by competent MWH personnel and were attended by WDC, other MWH personnel and site technicians.

TABLE 5-1**LIBBY ASBESTOS SUPERFUND SITE OU3 WELL SUMMARY**

Well ID	Well Location	Easting/ Northing	Elevation (m AMSL)	Well Diameter	Material	Total Depth of Well	Well Screen
Well A	In the Carney Creek Drainage upstream of the pond at the base of the fine tailings pile.	617269/5364977	1032	6-inch	steel	42.04 BTOC	Unknown, if any.
Well C	In an open grassy area about 1,000 feet downstream from the tailings dam and west of Carney Creek	616243/5366266	848	10-inch	steel	77.24 BTOC	Unknown, if any.
Well D	Near the former mill	617150/5365992	1176	10-inch	steel	378 BTOC	345 - 385
Well E	Along a haul road near the center of the mine in an open flat area.	617426/5365832	1181	2-inch	PVC	251.5 BTOC	234.5 – 249.5
Well H	Along a haul road about halfway up the slope east of Rainy Creek below the former mill area.	616717/5365994	1027	2-inch	PVC	71.12 BTOC	59 - 69

BTOC = Below Top of Casing

PVC = Polyvinyl Chloride

TABLE 5-3**SUMMARY OF FIELD PARAMETERS FOR GROUNDWATER**

Well ID	Date	Temperature (C°)	pH	Specific Cond (mS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Flow Rate (gpm)	Total Volume Purged (gallons)
Well A	7/23/08	9.23	9.55	0.661	25	1.61	2000+	NA	25
	9/30/08	8.95	6.71	0.45	-50	6.63	41.3	NA	5
Well C	7/22/08	10.06	7.89	0.465	170	5.76	1.0	0.3	10.8
	9/29/08	10.21	7.10	0.618	79	3.29	1.8	0.3	6.0
Well D	7/23/08	11.05	9.79	0.133(a)	155	2.31	149	0.75	45
	9/30/08	10.65	8.50	0.375	-218	0.41	66.7	0.3	6.0
Well E	7/23/08	11.31	8.13	0.813	161	6.33	4.3	0.5	11.0
	9/30/08	13.58	7.77	0.783	-98	2.61	15.9	0.25	8.75
Well H	7/24/08	13.61	7.21	0.336	193	7.86	739	NA	NA
	9/29/08	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY

(a) = Specific Conductivity Meter was not reading correctly. Reading was the last Specific Conductivity reading before meter started reporting a value of 0.000 mS/cm.

NA = A flow rate could not be accurately determined due to lack of groundwater in well at time of sampling.

DRY = Well H was dry during the September 2008 sampling event and could not be sampled.

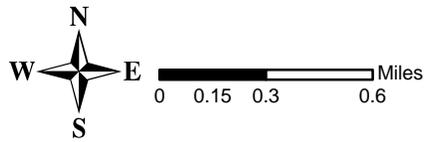
TABLE 5-4

**SAMPLE CONTAINERS, PRESERVATION METHOD AND HOLDING TIME
REQUIREMENTS FOR GROUNDWATER SAMPLES**

Container Description	Analyses	Method	Preservation and Holding Time	Extraction/ Analysis Holding Time
50-mL plastic (pre-preserved with NHO_3)	TAL Metals+Boron (Total)	6010B/6020 and EPA 200 Series methods (a)	Cool 4°C; HNO_3 pH < 2	180 days
	Mercury	747A/ EPA 245.1		28 days
250-mL plastic (Filtered)	TAL Metals+Boron (Dissolved), Hardness	6010B/6020 and EPA 200 Series methods (a)	Cool 4°C; HNO_3 (preserve sample in field after filtering)	180 days
500-mL plastic (pre-preserved with H_2SO_4)	Nitrate	EPA 353.2	Cool 4°C; H_2SO_4 pH < 2	28 days
3 X 40-mL amber glass vial (preserved with HCl)	Volatile Petroleum Hydrocarbons (VPH)	MA-DEP VPH modified	Cool 4°C; HCl pH < 2	14 days
2 X 1-L amber glass bottle (preserved with H_2SO_4)	Extractable Petroleum Hydrocarbons (EPH)	SW8015M (e) MA-DEP VPH modified	Cool 4°C; H_2SO_4 pH < 2	14 days/40 days
1-L Plastic	Fluoride, Chloride, Sulfate	EPA 300.0	Cool 4°C	28 days
	Total Suspended Solids (TSS)	Standard Methods 2540D	Cool 4°C	7 days
	Nitrite	EPA 353.2	Cool 4°C	48 Hours
	Total Dissolved Solids (TDS)	Standard Methods 2540CD	Cool 4°C	7 days
	Alkalinity	Standard Methods 2320B	Cool 4°C	14 days
1-mL plastic (pre-preserved with NHO_3)	Radiochemistry (gross alpha and gross beta)	EPA 900.0	Cool 4°C; HNO_3	None
500-mL plastic (pre-preserved with NaOH)	Cyanide	EPA 335.4	Cool 4°C; HNO_3 pH < 2	14 days
1-L HDPE container	Asbestos	ISO 10312 (b)	Cool 4°C	Filtered within 48 hours

(a) 200 series methods: 200.7, 200.8

(b) With Libby-specific modifications



LEGEND

- Ponds
- Streams/River outline
- Intermittent Streams
- Well Locations
Note: Faded wells not sampled
- Former Mine Property

Figure 5-1
Well Locations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION



6.0 AMBIENT AIR SAMPLING

6.1 SUMMARY OF THE PHASE II AMBIENT AIR SAMPLING PROGRAM

The basic design for ambient air sampling performed during the Phase I RI consisted of eight stations (A-1 through A-8; see Plate 7-1 of the Phase I FSSR) arranged in two roughly concentric, partial rings around the mine. The inner ring was close to the boundary of the disturbed area of the mine site, and the outer ring was close to the perimeter of the former mine property boundary. Four rounds of five-day sampling periods were performed between October 2 and October 22, 2007. All of the Phase I samples were non-detect for LA, but there were many rain and snow storms during the sampling period.

In Phase II, stations A-4, A-5, A-6 and A-8 were retained and new stations A-9 through A-12 were added (Figure 6-1). The GPS coordinates of Phase II sampling locations are provided in Attachment A. As shown on Figure 6-1, the new Phase II stations were closer to the mine-disturbed areas than the four Phase I stations that they replaced, thus, the Phase II air sampling arrangement provided tighter and more complete coverage of mine-disturbed areas in both the upwind and downwind directions. Eight bi-weekly rounds of five-day ambient air samples were collected from the eight monitoring stations between July 7 and October 17, 2008.

6.2 ANALYSES

All ambient air samples were submitted for LA analysis by transmission electron microscopy (TEM), using ISO10312(a) counting protocols, as modified by Libby-specific laboratory modifications (discussed in the Phase IIB SAP).

6.3 SAMPLING EQUIPMENT

Ambient air samples were collected and equipment was calibrated in accordance with SOP AMBLIBBY-OU3 of the Phase I SAP. Because the objective of the sampling effort was to estimate long-term average concentration values, all ambient air samples were

collected using low-flow (2 liters per minute; liter per minute [LPM]) stationary air monitors over an extended period of time (five days).

Samples were collected using 25-mm diameter, 0.8- μ m pore size microcellulose ester (MCE) filter cassettes. This filter type allows for the collection of samples without excessive backpressure. All samples were collected at a height approximately six feet above ground level.

- Sampling pump: SKC AirChek 2000™ programmable sample pump
- Power supply: Energizer deep-cycle 29HM battery
- Pump housing: Stanley weatherproof storage container, lined with 2-inch-thick styrofoam
- Stand: T-bar steel fencepost with PVC hook extension. The PVC extension positioned the cassette downward, six inches away from the fencepost and at a height of six feet
- Inert tubing: 10-foot section of Tygon brand R-3603 tubing, 1/4" inner diameter and 7/16" outer diameter
- Rotameter: Dwyer VFB-65 rotameter with calibrated graduations within 5% accuracy of expected flow rate
- Field logbook: "Rite in the Rain" all-weather journal 390N
- Plastic bags: Ziploc™ 1-quart freezer bags
- Clear packaging tape: Scotch brand packaging tape
- Pen: "Rite in the Rain" all weather pen #37
- Electronic calibrator: BIOS Drycal Defender 520™, S/N 111363, Cert #101416, Calibration date 05/08/07 (due 05/08/08)

6.4 LOCATION AND IDENTIFICATION OF AMBIENT AIR SAMPLES

The ambient air sampling at OU3 was performed by Meteorological Solutions Inc. of Salt Lake City, Utah. The sampling protocol was performed by a two-person team at the eight locations depicted on Figure 6-1. All sampling stations were identically constructed, equipped, and maintained. Samples were collected during eight bi-weekly sampling periods, each sampling period being five days (120 hours) with a flow rate of 2 LPM; the design air volume to be sampled during each five-day sampling period was 14,400 liters. Due to pump faults and flow-rate variance, the actual volumes sampled during each period ranged from 2,830 liters to 14,663 liters, averaging 13,456 liters (see Table 6-1).

6.5 CALIBRATION OF EQUIPMENT

6.5.1 Calibration of Rotameter with an Electronic Calibrator

The BIOS calibrator automatically adjusts for temperature and pressure, eliminating any further calculations. The calibration train for the rotameter was set up using the train described in EPA SOP #2015 Figure 4. The rotameter was held vertically, allowing the sampling pump to send a flow through the rotameter and BIOS meter. The rotameter was set at various flow rates to obtain a range of readings for flow rate calibration.

6.5.2 Calibration of Sampling Pump

All pumps were calibrated at the beginning of each sampling period using the calibration train as described in EPA SOP #2015 Figure 5 to the desired flow of 2.0 LPM. The calibration procedure included connecting the rotameter to the cassette using an 8-inch-long section of Tygon tubing and the cassette cap. The flow was recorded and the pump was adjusted to achieve a 1.9 LPM rotameter reading (using the center of the ball), which verified a true 2.0 LPM flow as determined by the electronic calibrator. The dedicated calibration equipment (cassette cap and Tygon tubing) were stored in a plastic bag on site.

6.6 SAMPLING PROTOCOL

The sample cassette was attached to the PVC pole extension facing down within the 45-degree limit at the desired height of six feet above the ground. At the end of each sampling period the cassette was rotated to face upward, the pump was stopped and the cap was placed on the cassette. Sample cassettes were placed in Ziploc™ freezer bags and labeled. Field blanks were collected daily at random sites.

6.6.1 Pump Failure Procedures

The SOP included in the Phase I SAP was changed during the Phase I kick-off meeting due to a change requiring continuous sampling regardless of pump fault. The procedure required that, upon arrival at a site that had a pump failure, the time of observed fault was noted. The “as found” flow rate was indicated as 0 LPM. The internal history of the pump was downloaded and the pump was restarted and adjusted to 2.0 LPM flow. When a pump faulted a second time, the above procedure was repeated and sampling continued. This amended procedure was followed during the Phase IIB ambient air sampling in 2008.

6.7 QUALITY CONTROL SAMPLES

6.7.1 Lot Blanks

Before any air cassettes were used for asbestos sampling, the lot was verified to be asbestos-free. This was accomplished by sending five blanks per lot of cassettes for TEM analysis using ISO 10312 counting protocols, as modified by Libby-specific laboratory modifications (discussed in the SAP).

6.7.2 Field Blanks

A field blank for ambient air was prepared by removing the sampling cassette from the box, opening the cassette to the air in the area where the investigative samples were to be taken, then closing the cassette and packaging for shipment and analysis. Field blanks for

ambient air were collected at a rate of one each day that ambient air sampling occurred. Field blanks are designated “FB” on Table 6-1.

6.7.3 Field Duplicates

Ambient air field duplicate samples (designated “FD”) are summarized on Table 6-1. Field duplicates were prepared at a rate of 20% (1 field duplicate per sampling period).

6.8 SAMPLE HANDLING

At the time of collection, each sample was labeled with a unique 5-digit sequential index identification (index ID) number. The index ID for all samples collected as part of Phase II sampling have a prefix of “P2” (e.g., P2-12345). Information on whether the sample was representative of a field sample or a field-based QC sample (e.g., field blank) was documented on the FSDS, but this information was not included on the chain-of-custody, to ensure that the sample type was submitted “blind” to the analytical laboratory.

The air sampling team maintained a field logbook with sequentially-numbered, non-removable pages. All potentially relevant information on sampling activities and conditions that were not otherwise recorded on the FSDS forms were recorded in the field logbook. Scans of the ambient air sampling field logbook, FSDS, and photographs are contained in Appendix F (on CD in pocket).

6.9 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

A COC form specific to OU3 Phase II RI sampling accompanied every shipment of samples to the analytical laboratory. The purposes of the COC form are to establish the documentation necessary to trace sample possession from the time of collection to final disposal, and to identify the type of analysis requested. All corrections to the COC record were initialed and dated by the person who made the corrections. Each COC form included signatures of the appropriate individuals indicated on the form. The original COCs accompany the samples to the laboratory and copies documenting each custody

change were retained and will be kept on file. One copy of the COC was kept by field personnel. Scans of COCs are provided in PDF format in Appendix G (on CD in pocket).

TABLE 6-1

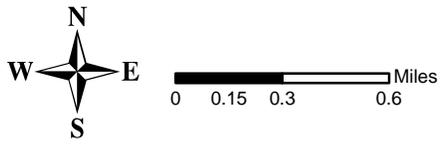
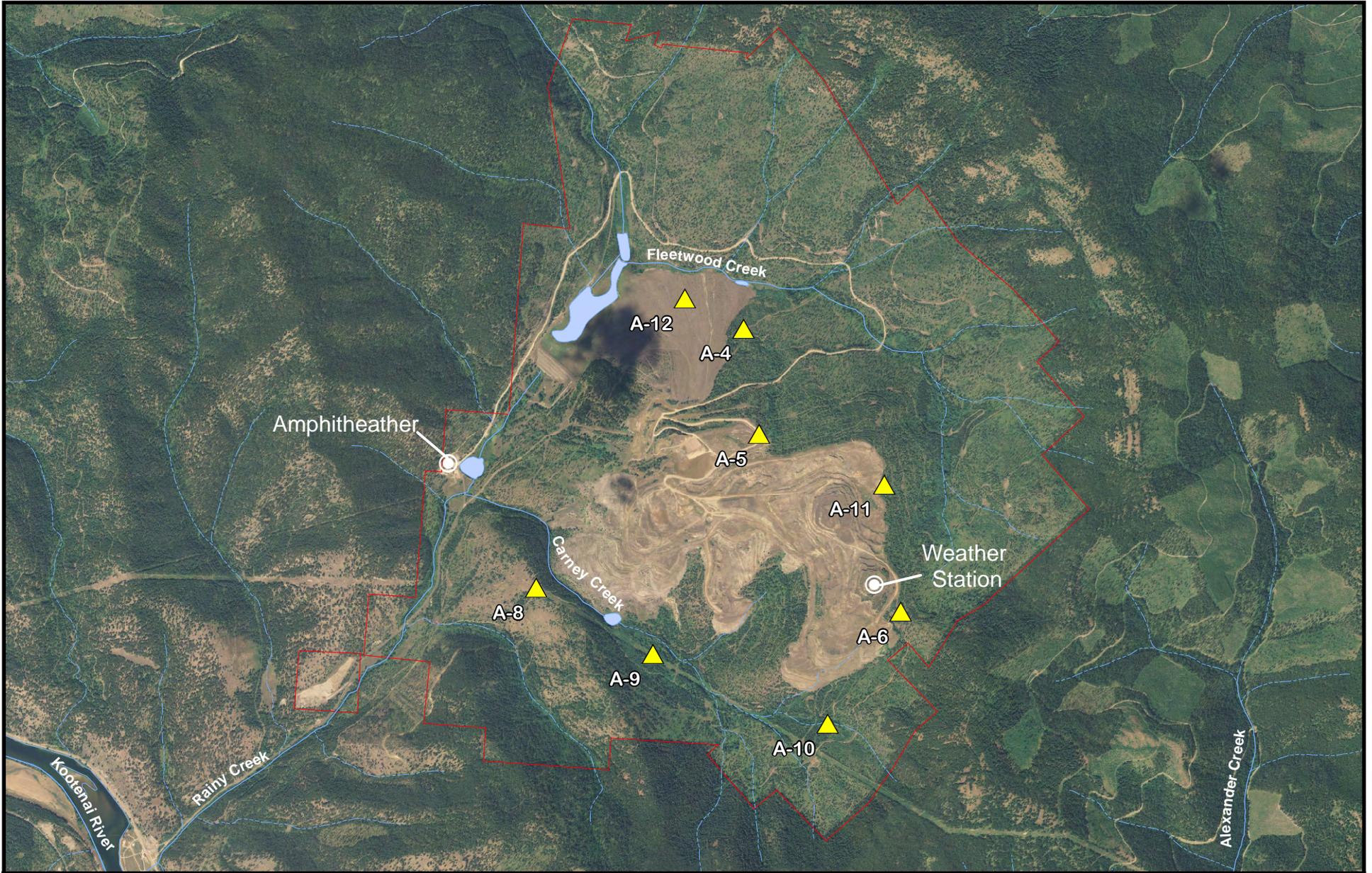
SUMMARY OF AMBIENT AIR SAMPLES COLLECTED DURING PHASE IIB
(Page 1 of 2)

Station ID	Index ID	Sample Type	Start Date	Start Time	End Date	End Time	Total Sample Volume (L)	Analytical Method TEM-ISO10312 (a)
A-4	P2-00608	FS	7/7/2008	845	7/12/2008	736	14154	X
A-5	P2-00607	FS	7/7/2008	840	7/12/2008	733	14231	X
A-5	P2-00611	AB	7/8/2008	812	NA	NA	0	X
A-6	P2-00605	FS	7/7/2008	815	7/12/2008	713	14240	X
A-6	P2-00612	AB	7/9/2008	721	NA	NA	0	X
A-8	P2-00600	FS	7/7/2008	715	7/8/2008	650	2830	X
A-8	P2-00610	FS	7/8/2008	700	7/12/2008	630	11436	X
A-8	P2-00601	FD	7/7/2008	715	7/12/2008	635	12952	X
A-9	P2-00602	FS	7/7/2008	735	7/12/2008	642	14350	X
A-9	P2-00603	FB	7/7/2008	736	NA	NA	0	X
A-10	P2-00604	FS	7/7/2008	755	7/12/2008	656	14254	X
A-11	P2-00606	FS	7/7/2008	820	7/12/2008	717	14253	X
A-12	P2-00609	FS	7/7/2008	900	7/12/2008	745	14229	X
A-12	P2-00613	AB	7/10/2008	812	NA	NA	0	X
A-4	P2-00621	FS	7/20/2008	915	7/25/2008	740	14227	X
A-5	P2-00620	FS	7/20/2008	900	7/25/2008	735	14230	X
A-6	P2-00618	FS	7/20/2008	835	7/25/2008	715	14240	X
A-8	P2-00614	FS	7/20/2008	800	7/25/2008	640	14096	X
A-9	P2-00615	FS	7/20/2008	815	7/23/2008	810	8101	X
A-9	P2-00616	FD	7/20/2008	815	7/25/2008	650	14194	X
A-10	P2-00617	FS	7/20/2008	825	7/25/2008	655	9978	X
A-11	P2-00619	FS	7/20/2008	845	7/25/2008	725	12843	X
A-12	P2-00622	FS	7/20/2008	920	7/25/2008	755	14216	X
A-12	P2-00623	FB	7/24/2008	900	NA	NA	0	X
A-4	P2-00632	FS	8/5/2008	805	8/10/2008	750	14039	X
A-5	P2-00631	FS	8/5/2008	800	8/6/2008	820	6740	X
A-5	P2-00634	FS	8/6/2008	820	8/10/2008	745	11450	X
A-6	P2-00629	FS	8/5/2008	730	8/10/2008	725	14396	X
A-8	P2-00625	FS	8/5/2008	640	8/10/2008	645	12650	X
A-9	P2-00626	FS	8/5/2008	645	8/10/2008	700	14430	X
A-10	P2-00627	FS	8/5/2008	650	8/10/2008	710	14663	X
A-10	P2-00628	FD	8/5/2008	655	8/10/2008	710	14388	X
A-11	P2-00630	FS	8/5/2008	745	8/10/2008	735	14449	X
A-12	P2-00633	FS	8/5/2008	815	8/10/2008	755	14326	X
A-12	P2-00635	FB	8/10/2008	755	NA	NA	0	X
A-4	P2-00643	FS	8/17/2008	1015	8/22/2008	850	14230	X
A-5	P2-00642	FS	8/17/2008	1010	8/22/2008	845	14230	X
A-5	P2-00645	FB	8/22/2008	845	NA	NA	0	X
A-6	P2-00639	FS	8/17/2008	950	8/22/2008	825	12781	X
A-6	P2-00640	FD	8/17/2008	950	8/22/2008	825	14196	X
A-8	P2-00636	FS	8/17/2008	900	8/22/2008	745	14199	X
A-9	P2-00637	FS	8/17/2008	920	8/22/2008	800	14233	X
A-10	P2-00638	FS	8/17/2008	935	8/22/2008	815	14221	X
A-11	P2-00641	FS	8/17/2008	1005	8/22/2008	840	14230	X
A-12	P2-00644	FS	8/17/2008	1020	8/22/2008	855	14190	X
A-4	P2-00653	FS	8/31/2008	755	9/5/2008	720	14345	X
A-4	P2-00655	FB	9/3/2008	830	NA	NA	0	X
A-5	P2-00652	FS	8/31/2008	745	9/3/2008	820	8184	X
A-5	P2-00656	FS	9/3/2008	820	9/5/2008	715	5680	X
A-6	P2-00649	FS	8/31/2008	730	9/5/2008	700	14413	X

TABLE 6-1

SUMMARY OF AMBIENT AIR SAMPLES COLLECTED DURING PHASE IIB
(Page 2 of 2)

Station ID	Index ID	Sample Type	Start Date	Start Time	End Date	End Time	Total Sample Volume (L)	Analytical Method TEM-ISO10312 (a)
A-8	P2-00646	FS	8/31/2008	650	9/5/2008	630	14360	X
A-9	P2-00647	FS	8/31/2008	700	9/5/2008	645	14328	X
A-10	P2-00648	FS	8/31/2008	710	9/5/2008	655	14392	X
A-11	P2-00650	FS	8/31/2008	740	9/5/2008	705	14330	X
A-11	P2-00651	FD	8/31/2008	740	9/5/2008	705	14330	X
A-12	P2-00654	FS	8/31/2008	805	9/5/2008	725	14320	X
A-4	P2-00664	FS	9/14/2008	835	9/19/2008	825	14416	X
A-4	P2-00666	FB	9/19/2008	825	NA	NA	0	X
A-5	P2-00662	FS	9/14/2008	825	9/19/2008	815	14489	X
A-5	P2-00663	FD	9/14/2008	825	9/19/2008	815	14460	X
A-6	P2-00660	FS	9/14/2008	810	9/19/2008	800	12503	X
A-8	P2-00657	FS	9/14/2008	735	9/19/2008	730	14390	X
A-9	P2-00658	FS	9/14/2008	750	9/19/2008	740	14523	X
A-10	P2-00659	FS	9/14/2008	805	9/19/2008	750	11406	X
A-11	P2-00661	FS	9/14/2008	820	9/19/2008	810	14452	X
A-12	P2-00665	FS	9/14/2008	845	9/19/2008	830	14406	X
A-4	P2-00674	FS	9/28/2008	1030	10/3/2008	840	14214	X
A-4	P2-00675	FD	9/28/2008	1030	10/3/2008	840	14180	X
A-5	P2-00673	FS	9/28/2008	1015	10/3/2008	835	14171	X
A-6	P2-00671	FS	9/28/2008	945	10/3/2008	825	14226	X
A-8	P2-00668	FS	9/28/2008	900	10/3/2008	755	14270	X
A-8	P2-00677	FB	9/28/2008	755	NA	NA	0	X
A-9	P2-00669	FS	9/28/2008	920	10/3/2008	800	12840	X
A-10	P2-00670	FS	9/28/2008	935	10/3/2008	815	14240	X
A-11	P2-00672	FS	9/28/2008	950	10/3/2008	830	14240	X
A-12	P2-00676	FS	9/28/2008	1040	10/3/2008	850	14180	X
A-4	P2-00686	FS	10/12/2008	940	10/17/2008	910	14340	X
A-5	P2-00685	FS	10/12/2008	930	10/17/2008	905	14350	X
A-6	P2-00683	FS	10/12/2008	905	10/17/2008	850	14370	X
A-8	P2-00680	FS	10/12/2008	845	10/17/2008	830	14391	X
A-9	P2-00681	FS	10/12/2008	850	10/17/2008	835	14370	X
A-10	P2-00682	FS	10/12/2008	855	10/17/2008	845	14380	X
A-10	P2-00689	FB	10/15/2008	900	NA	NA	0	X
A-11	P2-00684	FS	10/12/2008	920	10/17/2008	900	14360	X
A-12	P2-00687	FS	10/12/2008	945	10/17/2008	920	12876	X
A-12	P2-00688	FD	10/12/2008	945	10/17/2008	920	14350	X



LEGEND	
Ponds	Air Locations
Creeks/River outline	Former Mine Property
Intermittent Streams	

Figure 6-1
Phase II Ambient Air Sampling Stations
LIBBY ASBESTOS SUPERFUND SITE
OU3 PHASE II REMEDIAL INVESTIGATION



ATTACHMENT A

GPS COORDINATES OF PHASE II SAMPLING LOCATIONS

ATTACHMENT A

GLOBAL POSITIONING SYSTEM (GPS) COORDINATES FOR SAMPLE LOCATIONS

(Page 1 of 2)

Station ID	Description	WGS84 (meters)	
		NORTHING	EASTING
A-4	Air Sample	5366962	617624
A-5	Air Sample	5366300	617788
A-6	Air Sample	5365260	618795
A-8	Air Sample	5365187	616467
A-9	Air Sample	5364838	617249
A-10	Air Sample	5364504	618399
A-11	Air Sample	5366058	618613
A-12	Air Sample	5367116	617234
CC-1	Carney Creek	5364814	617418
CC-2	Carney Creek	5365755	616074
CC-POND	Carney Creek Pond	5365076	616964
CC-POND-1	Carney Creek Pond	5365062	617007
CC-POND-2	Carney Creek Pond	5365015	616936
CC-POND-3	Carney Creek Pond	5365027	617001
CC-POND-4	Carney Creek Pond	5365003	616978
CC-POND-5	Carney Creek Pond	5365033	616967
CCS-1	Carney Creek Seeps	5365180	617290
CCS-6	Carney Creek Seeps	5365039	617121
CCS-8	Carney Creek Seeps	5365090	616954
CCS-9	Carney Creek Seeps	5365611	616488
CCS-11	Carney Creek Seeps	5365318	617864
CCS-14	Carney Creek Seeps	5365310	618011
CCS-16	Carney Creek Seeps	5364666	618224
FC-1	Fleetwood Creek	5367232	617831
FC-2	Fleetwood Creek	5367298	617054
FC-POND	Fleetwood Creek Pond; called FC UPPER POND during Phase I	5367247	617559
FC-POND-1	Fleetwood Creek Pond	5367243	617558
FC-POND-2	Fleetwood Creek Pond	5367233	617611
FC-POND-3	Fleetwood Creek Pond	5367262	617579
FC-POND-4	Fleetwood Creek Pond	5367236	617615
FC-POND-5	Fleetwood Creek Pond	5367239	617586
LRC-1	Lower Rainy Creek	5365777	615974
LRC-2	Lower Rainy Creek	5365708	615872
LRC-3	Lower Rainy Creek	5364722	615607
LRC-4	Lower Rainy Creek	5364418	615366
LRC-5	Lower Rainy Creek	5364074	615037
LRC-6	Lower Rainy Creek	5363200	614236
URC-1	Upper Rainy Creek	5368580	616254
URC-1A	Upper Rainy Creek	5367930	616739
URC-2	Upper Rainy Creek	5367850	616774
MP	Mill Pond	5365871	615939
MP-1	Mill Pond	5365882	615991
MP-2	Mill Pond	5365912	615993
MP-3	Mill Pond	5365908	615918
MP-4	Mill Pond	5365944	616047

ATTACHMENT A

GLOBAL POSITIONING SYSTEM (GPS) COORDINATES FOR SAMPLE LOCATIONS

(Page 2 of 2)

Station ID	Description	WGS84 (meters)	
		NORTHING	EASTING
MP-5	Mill Pond	5365866	616042
TP-OVERFLOW	Tailings Pond Drainages	5366508	616556
TP-TOE1	Tailings Pond Drainages	5366530	616379
TP-TOE2	Tailings Pond Drainages	5366378	616289
UTP	Upper Tailings Pond	5367337	616824
TP	Tailings Pond	5367056	616545
TP-1	Tailings Pond	5366676	616569
TP-2	Tailings Pond	5366769	616421
TP-3	Tailings Pond	5366814	616686
TP-4	Tailings Pond	5366870	616497
TP-5	Tailings Pond	5366983	616759
TP-6	Tailings Pond	5366873	616555
TP-7	Tailings Pond	5366920	616574
TP-8	Tailings Pond	5367009	616531
TP-9	Tailings Pond	5367007	616662
TP-10	Tailings Pond	5367048	616627
TP-11	Tailings Pond	5367107	616598
TP-12	Tailings Pond	5367058	616699
TP-13	Tailings Pond	5367095	616770
TP-14	Tailings Pond	5367211	616782
TP-15	Tailings Pond	5367291	616808
TP-16	Tailings Pond	5367370	616835
TP-17	Tailings Pond	5367430	616810
KR-1	Kootenai River (surface water)	5362997	614054
KR-2	Kootenai River (surface water)	5363229	613976
KR-3	Kootenai River (surface water)	5363400	613970
KR-4	Kootenai River (surface water)	5363827	613455
KR-5	Kootenai River (surface water)	5363815	613456
KR-6	Kootenai River (surface water)	5363790	613455
KR-7	Kootenai River (surface water)	5363774	613442
KR-8	Kootenai River (surface water)	5363744	613439
UKR	Upper Kootenai River (surface water)	5362084	614232
KR-9	Kootenai River (sediment)	5363772	613505
KR-10	Kootenai River (sediment)	5363761	613543
KR-11	Kootenai River (sediment)	5363428	614032
KR-12	Kootenai River (sediment)	5363218	613986
KR-13	Kootenai River (sediment)	5363040	614056
UKR-2	Upper Kootenai River (sediment)	5362074	614284
Well A	CCC Well in Carney Creek drainage	5364966	617266
Well C	In clearing across small creek south of tailings dam	5366263	616244
Well D	In pumphouse east of tailings pond	5365992	617146
Well E	MW-1, just off road, east of pumphouse	5365835	617431
Well H	West of mine	5365995	616721

ATTACHMENT B
FIELD MODIFICATION APPROVAL FORMS

FIELD MODIFICATION APPROVAL FORM
LFM-OU3- 1
Libby OU3 Phase II Sampling & Analysis Plan

Requested by: Bonnie Lavelle, EPA Remedial Project Manager

Date: May 9, 2008

Description of Deviation:

This field modification applies only to Element 2, Spring Runoff Monitoring, only during the time period when surface water samples are collected for rapid turn around laboratory analysis and only to samples from the following stations:

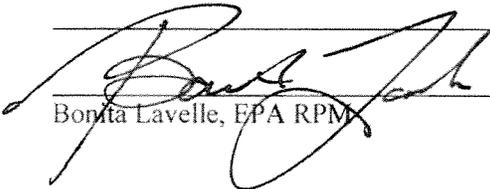
- Tailings Impoundment (TP)
- Mill pond (MP)

Field quality control samples will be increased to one duplicate and one split sample at each of these two stations for each weekly sampling event. Field quality control samples will be submitted for rapid turn around time analysis. Once water has been collected to support the toxicity test described in Element 5, this field modification no longer applies.

The attached revised Field Sample Data Sheet will be used to identify quality control samples.

- 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:


Bonnie Lavelle, EPA RPM

5/9/08
Date

LIBBY OU3 PHASE 2 FIELD SAMPLE DATA SHEET (FSDS) rev2 SURFACE WATER AND SEDIMENT

Field Logbook No: _____ Page No: _____
Station ID: _____ **Station Type (circle one):** Stream Pond Seep **Sampling Date:** _____
GPS Coordinate System: UTM Zone 11 North, WGS84 datum, meters
X coord: _____ **m** **Y coord:** _____ **m**
Elevation Coordinate System: WGS84, meters **Elevation:** _____ **m**
Sampling Team: MWH **Sampler Initials:** _____
Station Comments: _____

WATER QUALITY PARAMETERS

Time (hh:mm)	Temp. (°C)	pH	Specific Conductance (mS/cm)		Diss. O ₂ (mg/L)	ORP (mV)	Turbidity (NTU)	Sampling Depth (ft)	Total Depth (ft)	Discharge (cfs)
			@ Field Temp	@ 25°C						

Water Quality Comments:

SURFACE WATER AND SEDIMENT SAMPLES

Data Item	Sample 1	Sample 2	Sample 3
Index ID (place pre-printed label in field provided)			
Media (circle one):	Surface Water Sediment	Surface Water Sediment	Surface Water Sediment
Field QC Type (circle one):	FS (field sample) FD (field duplicate) SP (field split) For FD/SP, Parent ID: _____ EB (equip blank) FB (field blank) TB (trip blank) Cooler: _____ PE (perf. eval.) ID: _____	FS (field sample) FD (field duplicate) SP (field split) For FD/SP, Parent ID: _____ EB (equip blank) FB (field blank) TB (trip blank) Cooler: _____ PE (perf. eval.) ID: _____	FS (field sample) FD (field duplicate) SP (field split) For FD/SP, Parent ID: _____ EB (equip blank) FB (field blank) TB (trip blank) Cooler: _____ PE (perf. eval.) ID: _____
Archive Blank (circle)	Yes No	Yes No	Yes No
Sample Time (hh:mm)			
For Sediment:			
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 Comments:			
Cooler:			
Entered by (Provide initials):		Validated by (Provide initials):	

FIELD MODIFICATION APPROVAL FORM

LFM-OU3-02

Libby OU3 Phase II Sampling & Analysis Plan

Requested by: Lynn Woodbury Date: 6-19-2008

Description of Deviation:

Stopping Rule Modification –

The TEM stopping rules for water analyses as presented in Section 6.1.1 of the Phase IIA Sampling and Analysis Plan (Rev1) will be modified based on laboratory input to allow for faster analysis completion. In brief, the maximum LA structures stopping rule is reduced from 50 structures to 25 structures.

Stopping rules are modified as follows:

1. Calculate the number of GOs needed to achieve the target sensitivity.
2. If the target sensitivity can be achieved by counting 50 or fewer GOs, count until the target sensitivity is achieved, or until 25 LA structures are observed. If 25 LA structures are observed, finish counting the GO containing the 25th structure, then stop.
3. If the target sensitivity requires more than 50 GOs, count until 50 GOs are counted, or until 25 LA structures are observed. If 25 LA structures are observed, finish counting the GO containing the 25th structure, then stop.

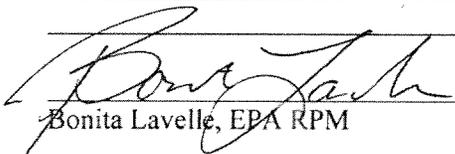
Clarification of Water Sample Preparation Methods –

For each water sample that will be analyzed by TEM, prepare three filters by applying volumes of 100 mL, 50 mL, and 25 mL. Select the filter from the dilution series yielding the largest possible application volume which does not violate the criteria for an overloaded sample (> 20 structures per GO). If TEM examination of the 25 mL aliquot is deemed overloaded, the laboratory may proceed to prepare a 10 ml aliquot dilution. Based on preliminary observation of the 10 ml filter, if it appears that this filter remains overloaded, take 10 ml of the remaining volume and dilute to 100 ml. From this secondary dilution, prepare a second series of filters using 50 ml, 25 ml, and 10 ml (corresponding to 5 ml, 2.5 ml, and 1 ml of the original suspension).

EPA Region 8 has reviewed this field modification and 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:


Bonita Lavelle, EPA RPM

6/19/08
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-03
Libby OU3 Phase II Sampling & Analysis Plan

Requested by: Lynn Woodbury Date: 6-19-2008

Description of Deviation:

Per the teleconference on June 19, 2008, the following changes were made to the Phase IIA SAP (Rev1):

Additional sediment sample collection in ponds – In addition to the Element 1 sediment samples specified in Section 5.1.1 of the Phase IIA SAP (Rev1), a single dredge sediment sample will be collected from each pond (MP, FC-Pond, CC-Pond) and the tailings impoundment (TP) in order to investigate potential differences in collection methods (i.e., scoops vs. dredge). The dredge sample will be collected using an Eckman or petite ponar dredge and will be co-located with one of the sediment samples collected using scoops. As necessary, to meet sample mass requirements, multiple dredge “pulls” will be performed from the same area (within approximately a 5 foot radius). The dredge “pulls” will be collected in a plastic bag or bucket and homogenized. Dredge samples will be identified as a separate “field sample” and assigned a unique sample identifier (Index ID) on the Sediment FSDS form. The comments field on the Sediment FSDS form should indicate that the sample was collected using a dredge, as well as the identifier for the co-located scoop sample. Dredge samples will be analyzed for asbestos by PLM only.

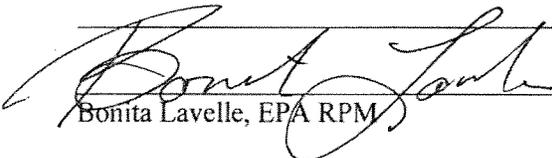
Prioritization of sediment analyses in samples with limited mass – In cases where field conditions (e.g., cobble substrate) do not allow the collection of sufficient sediment mass to perform all analyses specified in Table 6-2 of the Phase IIA SAP, analyses should be prioritized as follows:

- Asbestos – PLM
- Metals (including sediment quality parameters such as TOC, anions)
- EPH/VPH
- Other organic analyses (e.g., PCBs, pesticides, herbicides, SVOCs, VOCs)

EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

6/19/08
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-04
Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: Lynn Woodbury Date: 7-7-2008

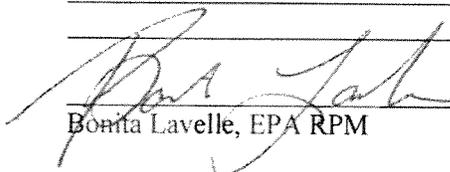
Description of Deviation:

The performance evaluation (PE) samples for non-asbestos analysis from the QATS contractor are provided as vial aliquots which require laboratory preparation (dilution) that cannot be performed in the field. In the August 2008 sampling event for Element 1, PE samples for non-asbestos analysis will be sent directly from the QATS contractor to the non-asbestos analytical laboratory (i.e., will not be inserted into the sample train by the field team). While this will effectively "un-blind" the PE samples to the analytical laboratory, the nominal levels in these samples are still unknown. Transmittal of the PE samples directly to the analytical laboratory will also alleviate FedEx shipment issues due to hazardous materials handling protocols.

EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

7/15/08

Date

FIELD MODIFICATION APPROVAL FORM

LFM-OU3-05

Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC) Date: 09/03/08

Description of Deviation:

PLM Quality Control Samples:

- 1) **Selection of laboratory duplicate samples for asbestos analysis by PLM** – As defined in the Phase II (Part A) SAP (Section 8.3.2), a *laboratory duplicate* for PLM-VE is a soil sample slide that is prepared and analyzed by a different analyst than the analyst who performed the initial analysis. These samples are to be prepared at a rate of 10%. As written, the SAP does not specify how these samples will be selected. This modification specifies that the selection of samples for laboratory duplicate analysis will be performed by SRC based on the results of the original analyses. Selections will be made to include samples from all solid media and, to the extent possible, will include samples from each PLM-VE bin (Bin A, Bin B1, Bin B2, and Bin C). The acceptance criterion for laboratory duplicate analyses remains the same as specified in the Phase II (Part A) SAP (Section 8.3.2).

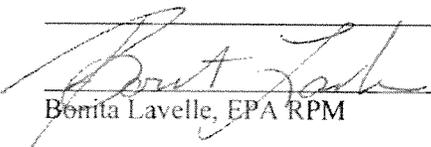
- 2) **Addition of Interlab Samples for Asbestos analysis by PLM** – An *interlab* (IL) sample is a re-preparation of a soil sample slide by a different laboratory than the laboratory that performed the initial analysis. As written, the SAP does not require PLM-VE interlab samples. This modification adds a requirement that all samples selected for laboratory duplicate analysis will also be submitted for interlab analysis. The identity of the laboratory to perform the analysis on the interlab samples will be specified by EPA. The acceptance criterion for interlab analyses is the same as that specified for laboratory duplicates in the Phase II (Part A) SAP (Section 8.3.2).

Additional PLM Asbestos Laboratory:

An additional laboratory has been subcontracted by Remedium to provide asbestos PLM analysis support for OU3. Hygeia Laboratories, Inc. in Sierra Madre, CA will provide PLM analysis of sediment samples collected as part of the Phase II (Part A) SAP. In addition, this laboratory will serve as the interlab for sediment samples analyzed by EMSL as part of Phase I. The verification rate of PLM data from Hygeia will be initially increased to 50% to ensure analytical results meet project data quality requirements. Once it has been determined that initial results meet data quality requirements, asbestos data verification will continue in accordance with the Phase II (Part A) SAP (Section 11.1).

- EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

9/3/08

Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-06
Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC) Date: 07/15/08

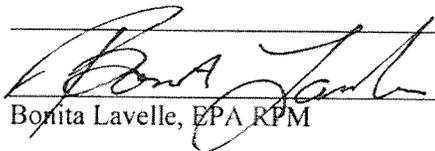
Description of Deviation:

- This field modification is to define the sampling dates for the Kootenai River Monitoring as specified in Section 5.2 of the Phase IIA Sampling and Analysis Plan (Rev1). The sampling will begin for surface water and sediment on the Kootenai River the week of August 18, 2008. In addition, surface water sampling for Element 3 (specified in Section 5.1.3) will coincide with the Kootenai River sampling in order to facilitate a comparison of loading/concentration between lower Rainy Creek (station LRC-6) and the Kootenai River.
- Surface water and sediment sampling will begin for Element 1 (specified in Section 5.1.1) the week of September 1, 2008.

EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

7/15/08

Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-07
Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: John Garr, MWH Americas, Inc. Date: 07/17/08

Description of Deviation:

This field modification applies to the Phase IIA Sampling and Analysis Plan (Rev1), specifically the OU3 SOP 8 (Rev. 0), Sample Handling and Shipping.

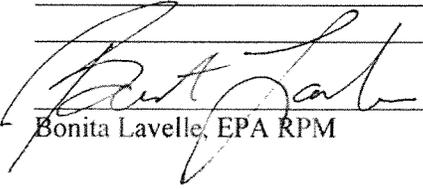
In order to prevent the opening of sediment sample containers during transit, the following corrective action should be implemented:

1. Re-tighten all lids on receipt from the field. Ensure that any sediment or other residue is wiped off the lid and neck of the container and that the outside of the container is dry.
2. Use a minimum of two wraps of electrical tape around the cap and neck of each container. Wrap tightly, counter-clockwise (as looking down at top of cap) to seal the cap to the bottle.
3. Seal each sample container in a Ziploc bag with air removed.
4. Pack double-bagged ice into cooler voids and between the containers to prevent jostling or movement of the containers during shipping. Bubble-wrap alone is not sufficient to prevent the sediment containers from colliding during transit. Although ice is not required for preservation of these samples, the mass of the ice should help dampen vibration and prevent movement and collision between the sample containers.

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:



Bonita Lavelle, EPA RPM

Date 8/8/08

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-08
Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC) Date: 09/15/08

Description of Deviation:

Total Extractable Petroleum Hydrocarbon (EPH) Analyses:

The Montana Department of Environmental Quality (MDEQ) screening limits for total EPH have been revised^[a]. Section 6.2 in the Phase II (Part A) SAP will be revised as follows (changes noted in **bold**):

Section 6.2.1, Water – All surface water samples will be analyzed for total EPH using method SW8015M. If the total EPH concentration is greater than **500 ug/L**, the water sample will be analyzed for specific EPH compounds (C9-C18 aliphatics, C19-C36 aliphatics, and C11-C22 aromatics) using method MADEP-EPH-04-1.1 and PAHs^[b].

Section 6.2.2, Sediment – All sediment samples will be analyzed for total EPH using method SW8015M. If the total EPH concentration is greater than **200 mg/kg**, the sediment sample will be analyzed for the specific EPH compounds using method MADEP-EPH-04-1.1 and PAHs noted above.

^[a] Associated MDEQ weblinks:

<http://www.deq.state.mt.us/rem/hwc/rbca/NewRBCA7-2007/revGWRBSLs10-07.pdf>

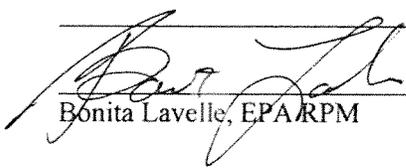
<http://www.deq.state.mt.us/rem/hwc/rbca/NewRBCA7-2007/revSurfSoilRBSLs10-07.pdf>

^[b] PAH analyte list: acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, and pyrene

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:



Bonita Lavelle, EPA/RPM

9/15/08

Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-09
Libby OU3 Phase IIA Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC) Date: 09/15/08

Description of Deviation:

Increase of PLM Laboratory Duplicate/Interlab Rate:

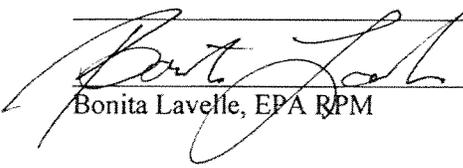
The frequency of laboratory duplicates/interlabs for sediment samples collected under the Phase IIA will be increased from 10% to 15%. The specifications for selection of laboratory duplicate samples and interlab samples described in the September 3, 2008 LFM-OU3-05 for the Phase IIA Sampling and Analysis Plan remain unchanged.



EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

9/15/08
Date

FIELD MODIFICATION APPROVAL FORM

LFM-OU3-10

Libby OU3 Phase II Sampling & Analysis Plan

Part A: Surface Water and Sediment

Requested by: EPA

Date: November 7, 2008

Description of Modification:

The following additional asbestos analyses of water samples will be performed as part of the surface water toxicity study described in Section 7 of the Phase IIA SAP. Select the following water samples currently being held at the testing laboratory, Parametrix:

- D1-C2-New
- D1-C2-Old
- D1-C4-New
- D1-C4-Old

Ship the samples under chain of custody to the following laboratory:

EMSL Analytical, Inc.
159 Pasadena Avenue
South Pasadena, CA 91030
Phone number: 1-800-303-0047

The laboratory will analyze each sample sequentially, as follows:

Step 1.

Gently swirl the bottle by hand to suspend any loose material in the bottle. Do not shake vigorously. Withdraw 40 mL and apply to an MCE filter for asbestos analysis using TEM.

Step 2.

Withdraw a second 40 mL aliquot and place in a clean 100 mL beaker. Sonicate for 15 minutes. The purpose is to disrupt and disperse any fibers that are in suspension but are clumped together. Apply to an MCE filter for TEM analysis.

Step 3.

Add about 80-100 mL of a fluid containing 0.1 M NaCl + 0.1 M Graham's salt (sodium hexametaphosphate) to restore the sample volume to its original level. Use a rubber policeman to scrape down the sides of the bottle. Treat the sample bottle with sonication, ozone, and UV light in accord with EPA Method 100.1 Step 6.2. The intent of this treatment is to release and oxidize any microbial growth that may be present on the walls of bottle that may have trapped LA fibers. After treatment, filter the entire sample onto an MCE filter for TEM analysis.

Step 4. [Note: Step 4 will not be implemented initially, but may be implemented after data from steps 1-3 are received. EPA will inform the laboratory if the analysis is determined to be necessary.]

Cut the bottle open using a sharp knife. Remove a piece of the bottle about 1 cm² and submit this for examination by SEM to determine if any remaining fibers are adhering to the wall of the bottle.

COUNTING AND STOPPING RULES

Analyze each TEM sample using the same counting rules and stopping rules as designated for the original samples. In brief, counting is done in basic accord with ISO 10312, except that the minimum aspect ratio is 3:1 rather than 5:1. Count each sample until one of the following rules is achieved:

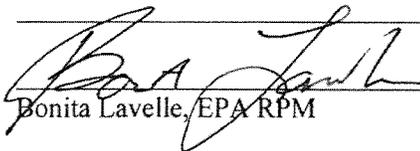
- the target analytical sensitivity (0.05 MFL) is achieved
- a total of 25 LA structures are counted
- a total of 50 grid openings are evaluated

When one of these rules is satisfied, finish the last grid opening and stop.

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:



Bonita Lavelle, EPA RPM

11/7/08

Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-01
Libby OU3 Phase IIB Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC) Date: 07/15/08

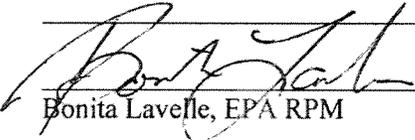
Description of Deviation:

The mid-summer monitoring event for groundwater specified in Section 4.3.3 of the Phase IIB Sampling and Analysis Plan (Rev 0) has been changed from the week of August 18, 2008 to the week of July 14, 2008 (i.e., this monitoring event will no longer coincide with surface water sampling conducted as part of Element 1 as specified in Section 5.1.1 of the Phase IIA Sampling and Analysis Plan (Rev1)).

EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

7/15/08
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-02
Libby OU3 Phase IIB Sampling & Analysis Plan

Requested by: Syracuse Research Corporation (SRC)

Date: 09/15/08

Description of Deviation:

Total Extractable Petroleum Hydrocarbon (EPH) Analyses:

The Montana Department of Environmental Quality (MDEQ) screening limits for total EPH have been revised^[a]. Section 6.2 in the Phase II (Part B) SAP will be revised as follows (changes noted in **bold**):

Section 6.2.1, Groundwater – All groundwater samples will be analyzed for total EPH using method SW8015M. If the total EPH concentration is greater than **500 ug/L**, the water sample will be analyzed for specific EPH compounds (C9-C18 aliphatics, C19-C36 aliphatics, and C11-C22 aromatics) using method MADEP-EPH-04-1.1 and PAHs^[b].

^[a] Associated MDEQ weblinks:

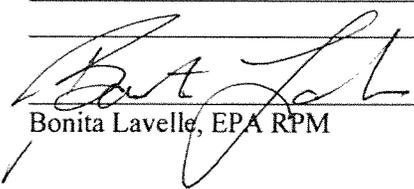
<http://www.deq.state.mt.us/rem/hwc/rbca/NewRBCA7-2007/revGWRBSLs10-07.pdf>

^[b] PAH analyte list: acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, and pyrene

EPA Region 8 has reviewed this field modification and 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:



Bonita Lavelle, EPA RPM

9/15/08

Date