

**Table 2-1**  
**Climate Data for Libby NE Ranger Station (245015)**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	31.6	40.1	50.1	61.7	71.1	78.4	87.9	86.8	75	59	40.5	32.1	59.5
Average Min. Temperature (F)	15.7	19.1	24.4	30.2	36.9	43.3	46.2	44.5	38.4	32.3	25.5	18.9	31.3
Average Total Precipitation (in.)	2.03	1.39	1.31	1.01	1.39	1.59	0.87	0.94	1.18	1.56	2.26	2.3	17.84
Average Total SnowFall (in.)	17.4	7.6	3.9	0.3	0	0	0	0	0	0.5	6.5	17.8	54
Average Snow Depth (in.)	9	9	4	0	0	0	0	0	0	0	2	5	2

Source: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mtlibb>

**Table 2-2  
Stream Use Classifications**

Stream/Segment	Classification/Uses
Rainy Creek drainage upstream of the W.R. Grace Company water supply intake	A-1. Suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and fur bearers; and agricultural and industrial water supply.
Rainy Creek (mainstem) from the W.R. Grace Company water supply intake to the Kootenai River	C-1. Suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
Kootenai River	B-1. Suitable for drinking, culinary and food processing purposes; propagation of salmonid fishes and associated aquatic life, waterfowl and fur bearers; and agricultural and industrial and industrial water supply.

**Table 3-1  
Asbestos Results for Soil Samples within OU3**

Location	Sampling Date	Sample Description	PLM NIOSH 9002 Analytical Results Tremolite-Actinolite Area Fraction (%)
Rainy Creek Rd	12/11/99 - 12/12/99	52 surface (0-6") along the road	20 samples were non-detect; 30 samples were <1%; 2 samples with detectable levels ranging from 3% to 5%
	9/8/00	5 surface (0-6") from driveway	2 samples were non-detect; 1 sample was <1%; 2 samples with detectable levels at 2%
	4/5/01 - 4/6/01	9 surface (0-6") 5 sub-surface (6-12") 17 sub-surface (12"+)	4 samples were non-detect; 16 samples were <1%; 11 samples with detectable levels ranging from 2% to 8%
	10/9/01	4 surface (0-6") from the amphitheater	4 samples with detectable levels ranging from 2% to 7%
Forest Service Rd	7/17/03 - 7/22/03	4 surface (0-6")	4 samples were non-detect
Highway 37 N (Right of Way)	9/16/03 - 9/18/03	48 surface (0-6") *	8 samples were non-detect; 37 samples with trace levels; 3 samples were <1%
	5/23/05	12 surface (0-6")	1 sample was non-detect; 11 samples were <1%
	7/11/05	1 surface (0-6")	1 sample was non-detect
Carney Creek Logging Area	3/9/00	15 surface (0-6")	3 samples were non-detect; 11 samples were <1%; 1 sample with detectable levels at 1%
USFS Logging Site Above Amphitheater	3/10/00	5 surface (0-6")	5 samples were <1%

\* Results based on PLM-VE mass fraction (%)

Based on samples in Libby2DB designated as OU3 (download date: July 5, 2007).

**TABLE 3-2  
SURFACE WATER ASBESTOS RESULTS IN THE LIBBY 2 DATABASE**

Sample Date	Sample ID	Location Description	Analysis Date	Sensitivity (ml) <sup>-1</sup>	LA Structures > 10 um		Total LA Structures	
					Count	Conc (s/mL)	Count	Conc (s/mL)
8/13/2001	1R-05337	Rainy Creek (Upper Reach) above upper pond	8/15/2001	104	0	< 104	0	< 104
	1R-05339	Zonolite Mountain -- Sleuce gate structure @ upper tailings pond	8/15/2001	207	0	< 207	0	< 207
	1R-06024	Zonolite Mountain -- Lower tailings pond @ water intake	8/15/2001	1,036	0	< 1036	0	< 1036
	1R-06026	Zonolite Mountain -- "Darwin Spring" @ upper decon	8/15/2001	104	0	< 104	0	< 104
	1R-06027	Rainy Creek (Lower Reach) catch basin	8/15/2001	414	18	7,459	18	7,459
5/16/2003	CS-11785	Zonolite Mountain -- Main discharge from upper tailings pond	5/20/2003	219	0	< 219	1	219
	CS-11786	Zonolite Mountain -- Confluence from discharge of upper tailings pond	5/20/2003	219	0	< 219	1	219
	CS-11787	Zonolite Mountain -- Stream located above lower tailings pond	5/20/2003	219	3	658	43	9,438
	CS-11788	Zonolite Mountain -- Main discharge from lower tailings pond	5/21/2003	439	3	1,317	16	7,024

Based on Libby 2DB download performed 7/5/07

**TABLE 3-3**  
**Non-Asbestos Results for Surface Water Samples in the Libby 2 Database**

INDEX ID	SAMPLE DATE	SAMPLE LOCATION DESCRIPTION
1R-05329	2-Aug-01	Rainy Creek Rd, Vermiculite Mine -- Lower pond
1R-05330	2-Aug-01	Rainy Creek Rd, Vermiculite Mine -- Upper pond

INDEX ID		<b>1R-05329</b>	<b>1R-05330</b>
LAB SAMPLE ID		912533-001	912533-002
PARAMETER	UNITS		
<b>INORGANICS</b>			
Antimony	ug/L	<50	<50
Arsenic	ug/L	<5	<5
Beryllium	ug/L	<10	<10
Cadmium	ug/L	<5	<5
Chromium	ug/L	<10	<10
Copper	ug/L	< 10	< 10
Lead	ug/L	< 50	< 50
Mercury	ug/L	< 0.5	< 0.5
Nickel	ug/L	< 25	< 25
Selenium	ug/L	< 5	< 5
Silver	ug/L	< 10	< 10
Thallium	ug/L	< 5	< 5
Zinc	ug/L	< 50	< 50
Cyanide, total	mg/L	< 0.01	< 0.01
<b>TOTAL PETROLEUM HYDROCARBONS (TPH)</b>			
TPH-DIESEL	ug/L	< 100	< 100
TPH-GASOLINE	ug/L	< 100	< 100
<b>ORGANOCHLORINE PESTICIDES</b>			
4,4'-DDD	ug/L	< 0.099	< 0.098
4,4'-DDE	ug/L	< 0.099	< 0.098
4,4'-DDT	ug/L	< 0.099	< 0.098
Aldrin	ug/L	< 0.050	< 0.049
alpha-BHC	ug/L	< 0.050	< 0.049
alpha-Chlordane	ug/L	< 0.050	< 0.049
beta-BHC	ug/L	< 0.050	< 0.049
delta-BHC	ug/L	< 0.050	< 0.049
Dieldrin	ug/L	< 0.099	< 0.098
Endosulfan I	ug/L	< 0.050	< 0.049
Endosulfan II	ug/L	< 0.099	< 0.098
Endosulfan sulfate	ug/L	< 0.099	< 0.098
Endrin	ug/L	< 0.099	< 0.098
Endrin aldehyde	ug/L	< 0.099	< 0.098
Endrin ketone	ug/L	< 0.099	< 0.098
gamma-BHC (Lindane)	ug/L	< 0.050	< 0.049
gamma-Chlordane	ug/L	< 0.050	< 0.049
Heptachlor	ug/L	< 0.050	< 0.049
Heptachlor epoxide	ug/L	< 0.050	< 0.049
Methoxychlor	ug/L	< 0.50	< 0.49
Toxaphene	ug/L	< 5.0	< 4.9
<b>POLYCHLORINATED BIPHENYLS (PCBs)</b>			
Aroclor 1016	ug/L	< 0.99	< 0.98
Aroclor 1221	ug/L	< 0.99	< 0.98
Aroclor 1232	ug/L	< 0.99	< 0.98
Aroclor 1242	ug/L	< 0.99	< 0.98
Aroclor 1248	ug/L	< 0.99	< 0.98
Aroclor 1254	ug/L	< 0.99	< 0.98

**TABLE 3-3**  
**Non-Asbestos Results for Surface Water Samples in the Libby 2 Database**

INDEX ID	SAMPLE DATE	SAMPLE LOCATION DESCRIPTION
1R-05329	2-Aug-01	Rainy Creek Rd, Vermiculite Mine -- Lower pond
1R-05330	2-Aug-01	Rainy Creek Rd, Vermiculite Mine -- Upper pond

INDEX ID		<b>1R-05329</b>	<b>1R-05330</b>
LAB SAMPLE ID		912533-001	912533-002
PARAMETER	UNITS		
Aroclor 1260	ug/L	< 0.99	< 0.98
<b>VOLATILE ORGANIC CHEMICALS (VOCs)</b>			
1,1,1-Trichloroethane	ug/L	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	ug/L	< 1.0	< 1.0
1,1,2-Trichloroethane	ug/L	< 1.0	< 1.0
1,1-Dichloroethane	ug/L	< 1.0	< 1.0
1,1-Dichloroethene	ug/L	< 1.0	< 1.0
1,2-Dichloroethane	ug/L	< 1.0	< 1.0
1,2-Dichloroethene,	ug/L	< 2.0	< 2.0
1,2-Dichloropropane	ug/L	< 1.0	< 1.0
2-Butanone	ug/L	< 5.0	< 5.0
2-Hexanone	ug/L	< 5.0	< 5.0
4-Methyl-2-pentanone	ug/L	< 5.0	< 5.0
Acetone	ug/L	< 5.0	< 5.0
Benzene	ug/L	< 1.0	< 1.0
Bromodichloromethane	ug/L	< 1.0	< 1.0
Bromoform	ug/L	< 1.0	< 1.0
Bromomethane	ug/L	< 2.0	< 2.0
Carbon disulfide	ug/L	< 1.0	< 1.0
Carbon tetrachloride	ug/L	< 1.0	< 1.0
Chlorobenzene	ug/L	< 1.0	< 1.0
Chlorodibromomethane	ug/L	< 1.0	< 1.0
Chloroethane	ug/L	< 2.0	< 2.0
Chloroform	ug/L	< 1.0	< 1.0
Chloromethane	ug/L	< 2.0	< 2.0
cis-1,3-Dichloropropene	ug/L	< 1.0	< 1.0
Ethylbenzene	ug/L	< 1.0	< 1.0
Methylene chloride	ug/L	< 1.0	< 1.0
Styrene	ug/L	< 1.0	< 1.0
Tetrachloroethene	ug/L	< 1.0	< 1.0
Toluene	ug/L	< 1.0	< 1.0
trans-1,3-Dichloropropene	ug/L	< 1.0	< 1.0
Trichloroethene	ug/L	< 1.0	< 1.0
Vinyl chloride	ug/L	< 2.0	< 2.0
Xylene, total	ug/L	< 3.0	< 3.0

**TABLE 3-4  
SEDIMENT ASBESTOS RESULTS IN THE LIBBY 2 DATABASE**

Sample Date	Sample ID	Location Description	Analysis Method	Area Fraction (%)		
				Tremolite-Actinolite	Other Amphibole	Chrysotile
8/13/2001	1R-06025	Lower tailings pond at water intake	PLM NIOSH 9002	<b>ND</b>	<b>ND</b>	<b>ND</b>
	1R-05338	Rainy Creek above upper pond	PLM NIOSH 9002	<b>ND</b>	<b>ND</b>	<b>ND</b>
	1R-05340	Upper tailings pond at sleuce gate structure	PLM NIOSH 9002	<b>2</b>	<b>ND</b>	<b>ND</b>

Based on Libby 2DB download performed 7/5/07

**Table 3-5  
Asbestos Data from Tree Bark**

<b>Sample Point</b>	<b>Location, Description</b>	<b>Type of Tree</b>	<b>Amphibole Loading (fiber/cm<sup>2</sup>)</b>
*Location 1, Sample 1A	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	100 million
*Location 1, Sample 1B	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Lodgepole pine	260 million
*Location 1, Sample 1D	Approx. 100 yards from the former pump house site at the W. R. Grace Vermiculite Mine.	Larch	40 million
*Location 2	4 mile mark (from bottom of Rainy Creek Rd). Immediately outside of the mine property.	Lodgepole pine	110 million
Location 3, Sample 3B	Approx. 20 yards from the decontamination trailer and access gate for Rainy Creek Rd.	Ponderosa pine	14 million
Location 3, Sample 3C	Approx. 20 yards from the decontamination trailer and access gate for Rainy Creek Rd.	Lodgepole pine	54 million

\*Location 1 and 2 samples were collected within the EPA restricted area surrounding the mine site.

Source: Ward et al. (2006)

**Table 3-6  
Summary of Worker Air Samples from OU3**

Location	Activity Description	Sampling Date	LA Detection Frequency	Average Sensitivity (cc) <sup>-1</sup>	Range of LA Detects (s/cc)
Zonolite Mountain	4 samples from site visit	4/26/01	3/4 (75%)	0.0333	0.0631 - 0.147
Forest Service Rd	5 samples excavating logging road	7/29/03 - 7/30/03	0/5 (0%)	0.0300	NA
Rainy Creek Rd	31 samples for driver	5/2/01	1/2 (50%)	0.0529	0.00195
		8/12/02 - 8/26/02	8/9 (89%)	0.0300	0.0147 - 0.824
		7/14/03 - 7/28/03	5/6 (83%)	0.0173	0.151 - 1.30
		6/1/06 - 9/7/06	7/11 (64%)	0.0706	0.0730 - 1.52
		6/1/07	3/3 (100%)	0.0374	0.0470 - 1.53
	22 samples for excavator	5/4/01 - 5/17/01	6/9 (67%)	0.0259	0.0038 - 0.0978
		8/8/02 - 8/15/02	6/7 (86%)	0.0251	0.0352 - 0.245
		9/4/03 - 10/2/03	3/3 (100%)	0.0492	0.0465 - 6.66
		4/20/04	0/3 (0%)	0.0227	NA
	2 samples for foreman	10/22/02 - 10/28/02	0/2 (0%)	0.0894	NA
	12 samples for grader	4/26/01 - 5/15/01	5/7 (71%)	0.0405	0.0113 - 0.154
		8/7/02 - 8/16/02	4/5 (80%)	0.0766	0.0660 - 3.55
	58 samples for laborer	8/7/02 - 9/7/02	25/36 (69%)	0.0351	0.00820 - 4.04
		7/16/03 - 8/19/03	7/7 (100%)	0.0388	0.0719 - 5.37
		4/20/04	0/3 (0%)	0.0612	NA
		7/27/05 - 10/13/06	4/12 (33%)	0.122	0.133 - 0.508
47 samples for decon activities	8/12/02 - 10/28/02	40/47 (85%)	0.025348426	0.010 - 1.49	

NA = not applicable

Based on samples in Libby2DB designated as OU3 (download date: July 5, 2007).

**Table 3-7  
Summary of Stationary Air Samples from OU3**

<b>Location</b>	<b>Location Description</b>	<b>Sampling Date</b>	<b>LA Detection Frequency</b>	<b>Average Sensitivity (cc)<sup>-1</sup></b>	<b>Range of LA Detects (s/cc)</b>
Zonolite Mountain	83 samples from mine roads and near source areas	5/22/00 - 10/4/00	25/83 (30%)	0.0014	0.00110 - 0.00227
Rainy Creek Rd	104 samples along roadway	3/11/00 - 12/2/00	67/190 (38%)	0.0031	0.000426 - 0.045
	150 samples along roadway	5/4/01 - 9/8/01	81/150 (54%)	0.0022	0.00117 - 0.222
	2 samples downwind of lawn mowing near trace amount	7/11/05	0/2 (0%)	0.00092	NA
Highway 37 N (Right of Way)	10 samples at S of intersection of Pipe Creek Rd & Highway 37 N	5/23/05	0/10 (0%)	0.0042	NA
	2 samples during lawn mowing	7/11/05	0/2 (0%)	0.00092	NA

NA = not applicable

Based on samples in Libby2DB designated as OU3 (download date: July 5, 2007).

**Table 3-8**  
**Aquatic Invertebrate Species Collected from EMAP Sampling Location in Kootenai River (August 2002)**

PHYLUM	CLASS	ORDER	FAMILY	GENUS	SPECIES	ABUND.			
ANNELIDA	HIRUDINEA	RHYNCHOBDELLIDA	PISCICOLIDAE	NA	NA	1			
	OLIGOCHAETA	NA	NA	NA	NA	59			
ARTHROPODA	ARACHNIDA	TROMBIDIFORMES	HYGROBATIDAE	HYGROBATES	NA	1			
			TORRENTICOLIDAE	TORRENTICOLA	NA	3			
	INSECTA	DIPTERA	CHIRONOMIDAE	NA	NA	NA	8		
				CRICOTOPUS	BICINCTUS	NA	20		
				CRICOTOPUS	NA	NA	17		
				CRYPTOCHIRONOMUS	NA	NA	1		
				DICROTENDIPES	NA	NA	3		
				EUKIEFFERIELLA	NA	NA	8		
				MICROPSECTRA	NA	NA	16		
				NA	NA	NA	85		
				PAGASTIA	NA	NA	10		
				PARACHIRONOMUS	NA	NA	7		
				PARAKIEFFERIELLA	NA	NA	4		
				NA	NA	NA	1		
				PHAENOPSECTRA	NA	NA	57		
				POTTHASTIA	GAEDII	NA	2		
				POTTHASTIA	LONGIMANA	NA	7		
				PROCLADIUS	NA	NA	1		
				PSECTROCLADIUS	NA	NA	1		
				SYNORTHOCLADIUS	NA	NA	7		
				TANYTARSUS	NA	NA	73		
				THIENEMANNIMYIA	NA	NA	7		
				TVETENIA	DISCOLORIPES	NA	17		
				TIPULIDAE	TIPULA	NA	NA	1	
				EPHEMEROPTERA	BAETIDAE	BAETIS	NA	NA	10
						BAETIS	TRICAUDATUS	NA	17
						EPHEMERELLIDAE	DRUNELLA	GRANDIS	1
						EPHEMERELLA	NA	NA	13
						SERRATELLA	TIBIALIS	NA	2
SIPHONURIDAE	NA	NA	NA	1					
HEMIPTERA	CORIXIDAE	NA	NA	NA	18				
TRICHOPTERA	HYDROPTILIDAE	HYDROPTILA	NA	NA	3				
	LEPTOCERIDAE	MYSTACIDES	ALAFIMBRIATA	NA	1				
		OECETIS	NA	NA	1				
	LIMNAPHILIDAE	NA	NA	NA	1				
	PSYCHOGLYPHA	NA	NA	NA	1				
OSTRACODA	NA	NA	NA	NA	1				
COELENTERATA	HYDROZOA	HYDROIDA	HYDRIDAE	HYDRA	NA	12			
MOLLUSCA	GASTROPODA	BASOMMATOPHORA	LYMNAEIDAE	NA	NA	1			
			LYMNAEIDAE	STAGNICOLA	NA	2			
			PHYSIDAE	PHYSA	NA	7			
NEMATODA	NA	NA	NA	NA	NA	2			

**Table 3-9**  
**Fish Species Collected from EMAP Sampling Location**  
**in Kootenai River (August 2002)**

<b>Common Name</b>	<b>Genus</b>	<b>Species</b>	<b>Abundance</b>
Longnose Dace	<i>Catostomus</i>	<i>catostomus</i>	24
Largescale Sucker	<i>Catostomus</i>	<i>macrocheilus</i>	21
Slimy Sculpin	<i>Cottus</i>	<i>cognatus</i>	1
Torrent Sculpin	<i>Cottus</i>	<i>rhotheus</i>	2
Cutthroat trout	<i>Oncorhynchus</i>	<i>clarki</i>	4
Rainbow trout	<i>Oncorhynchus</i>	<i>mykiss</i>	39
Sockeye Salmon	<i>Oncorhynchus</i>	<i>nerka</i>	17
Mountain Whitefish	<i>Prosopium</i>	<i>williamsoni</i>	587
Longnose Dace	<i>Rhinichthys</i>	<i>cataractae</i>	1
Redside Shiner	<i>Richardsonius</i>	<i>balteatus</i>	9
Bull Trout	<i>Salvelinus</i>	<i>confluentus</i>	1

**TABLE 5-1 OVERVIEW OF PHASE I SAMPLING  
Operable Unit 3 - Libby Mine Site**

Medium	General Location	Sampling Locations	Sample Analyses													
			Libby Amphibole (LA)			Metals	Other Inorganic + Major Ions (f)	VPH/EPH	TSS, TDS	DOC	PCB	Pesticides/Herbicides	SVOC	VOC	Rads	Cyanide
			PLM-VE	TEM-ISO 10312	TEM-EPA 100.2 modified											
<b>Mine waste</b>	Mined area	13 grab samples of mine waste rock 8 grab samples from rock outcrop 8 grab samples from cover materials 6 composites from tailings areas	X			X	X	X (g)			X (a)	X (a)	X (a)	X (a)		X (a)
<b>Roadway materials</b>	Rainy Creek Road	3 grab samples from unpaved roadway	X			X	X	X			X					
<b>Surface water &amp; Sediment</b>	Rainy Creek	2 upstream, 6 downstream	X (sed.)		X (sw)	X	X	X	X	X	X (b,c,d)	X (b,c,d)	X (b,c)	X (b,c)	X (b)	X (b,c)
	Site Ponds	1 tailings impoundment, 2 toe drain, 1 mill pond	X (sed.)		X (sw)	X	X	X	X	X	X (b,c)	X (b,c)	X (b,c)	X (b,c)	X (b)	X (b,c)
	Fleetwood Creek	2 stations	X (sed.)		X (sw)	X	X	X	X	X						
	Carney Creek	2 stations	X (sed.)		X (sw)	X	X	X	X	X						
<b>On-site seeps/springs</b>	Mined area	7 springs	X (sed.)		X (sw)	X	X	X	X	X						
<b>On-site groundwater</b>	Mined area	All functional wells (h)			X	X	X	X	X						X (e)	X
<b>Ambient air</b>	Around mined area	2 rings, 4 stations each (low flow: 2 L/min, long duration: 5 days)		X												
<b>Tree bark</b>	Forest around mined area	7 transects, 8-10 samples each		X												
<b>Forest soil</b>	Forest around mined area	7 transects, 8-10 samples each	X													

VPH/EPH = volatile and extractable petroleum hydrocarbons

PCB = polychlorinated biphenyls

SVOC = semi-volatile organic compounds

VOC = volatile organic compounds

Rads = gross alpha and beta

DOC = Dissolved organic carbon

TSS = Total Suspended Solids

TDS = Total Dissolved Solids

(a) Analyses to be performed for tailings from impoundment (MW-4 and MW-5).

(b) Analyses to be performed for surface water from tailings impoundment toe drain (TP-TOE1) and lower Rainy Creek below Carney Creek (LRC-2)

(c) Analyses to be performed for sediment from below tailings impoundment (TP-TOE2) and lower Rainy Creek (LRC-2).

(d) Analysis will be performed for sediment from lower Rainy Creek (LRC-1 through LRC-6)

(e) Analysis will include radium and uranium.

(f) See Tables 6-1 through 6-6 for details on specific analytes.

(g) Outcrop samples will not be analyzed for VPH/EPH.

(h) Will be determined during MWH site survey.

**Table 5-2. Mine Waste Sampling Locations**

<b>Station ID</b>	<b>Description</b>
MW-1	Rainy Creek road material
MW-2	Rainy Creek road material
MW-3	Rainy Creek road material
MW-4	Tailings Impoundment
MW-5	Tailings Impoundment
MW-6	Coarse Tailings Disposal Area
MW-7	Coarse Tailings Disposal Area
MW-8	Coarse Tailings Disposal Area
MW-9	Coarse Tailings Disposal Area
MW-10	Cover Material
MW-11	Cover Material
MW-12	Cover Material
MW-13	Cover Material
MW-14	Waste Rock Pile (central)
MW-15	Waste Rock Pile (west)
MW-16	Waste Rock Pile (west)
MW-17	Waste Rock Pile (central)
MW-18	Waste Rock Pile (central)
MW-19	Waste Rock Pile (east)
MW-20	Waste Rock Pile (east)
MW-21	Cover Material
MW-22	Cover Material
MW-23	Cover Material
MW-24	Cover Material
MW-25	Outcrop
MW-26	Waste Rock Pile (west)
MW-27	Waste Rock Pile (west)
MW-28	Waste Rock Pile (west)
MW-29	Waste Rock Pile (west)
MW-30	Waste Rock Pile (east)
MW-31	Outcrop
MW-32	Waste Rock Pile (east)
MW-33	Outcrop
MW-34	Outcrop
MW-35	Outcrop
MW-36	Outcrop
MW-37	Outcrop
MW-38	Outcrop

Notes: See Figure 5-1 for a map of locations.

**Table 5-3**  
**Surface Water/Sediment Sampling Locations**

<b>Station ID</b>	<b>Description</b>
URC-1	Upper Rainy Creek above Mine Area
URC-2	Upper Rainy Creek above Mine Area
LRC-1	Lower Rainy Creek above confluence with Carney Creek
LRC-2	Lower Rainy Creek below confluence with Carney Creek
LRC-3	Lower Rainy Creek
LRC-4	Lower Rainy Creek
LRC-5	Lower Rainy Creek
LRC-6	Lower Rainy Creek just above confluence with the Kootenai River
FC-1	Fleetwood Creek above Mine Area
FC-2	Fleetwood Creek above Tailings Impoundment
FC UPPERPOND	Fleetwood Creek Upper Pond
TP	Tailings Impoundment
TP-TOE1	Toe drain of impoundment
TP-TOE2	Toe drain flow to Rainy Creek below diversion
MP	Mill Pond
CC-1	Carney Creek
CC-2	Carney Creek just above confluence with Rainy Creek
CCS-1	Spring from base of west waste rock pile
CCS-6	Spring below west waste rock pile
CCS-8	Spring below west waste rock pile
CCS-9	Spring discharging to lower Carney Creek
CCS-11	Spring below central waste rock pile
CCS-14	Spring between central and east waste rock piles
CCS-16	Spring below east waste rock pile

**Table 5-4  
Soil/Tree Bark Sampling Locations**

Transect ID	Description
SL15 <sup>1</sup>	30 degrees counterclockwise from approximate primary downwind direction. Sample at half-mile intervals along 8-mile transect (16 samples).
SL45	Approximate downwind direction. Sample at half-mile intervals along 8-mile transect (16 samples)
SL75	30 degrees clockwise from approximate primary downwind direction. Sample at half-mile intervals along 8-mile transect (12 samples <sup>2</sup> ).
SL135	Across-gradient from primary downwind direction. Sample at half-mile intervals along 4-mile transect (8 samples)
SL195	Generally upwind of mine area/possibly downwind from Screening Plant. Sample at half-mile intervals along 6-mile transect (10 samples <sup>2</sup> ).
SL255	Approximate upwind direction from mine area. Sample at half-mile intervals along 6-mile transect (11 samples <sup>2</sup> )
SL315	Across-gradient from primary downwind direction. Sample at half-mile intervals along 4-mile transect (8 samples).

Notes:

1. “15” refers to degrees from due north.
2. Some sample locations eliminated due to mine waste and Kootenai River.

**Table 5-5**  
**Air Monitoring Locations**

Station ID	Description
A-1	North of mine area.
A-2	Northeast of mine area (general downwind direction).
A-3	East of mine area
A-4	Adjacent to coarse tailings disposal area (general downwind direction).
A-5	Adjacent to central portion of mine area (general downwind direction).
A-6	Adjacent to southern portion of mine area (general downwind direction).
A-7	Southwest of mine area (generally upwind direction).
A-8	Adjacent to mine waste areas (general upwind direction).

**Table 5-6. Sample Containers, Preservation and Handling Requirements, and Holding Times for Solid Sample Matrices**

Container Description	Analyses	Method	Preservation and Handling	Extraction/Analysis Holding Times
<b>Soil and Sediment</b>				
8-oz 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/ASAM10-3.2	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 glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Petroleum Hydrocarbons (VPH)	MADEP-VPH-04-1.1	Cool 4°C	28 days
4-oz wide-mouth amber glass jar with Teflon-lined screw cap	Extractable Petroleum Hydrocarbons (EPH)	MADEP-EPH-04-1	Cool 4°C	14 days
4-oz glass jar	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	14 days/40 days
8-oz 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 8082	Cool 4°C	14 days/40 days
10-mL glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Organic Compounds (VOCs) (a)	EPA 8260B	Cool 4°C	14 days
4-oz amber glass jar with Teflon-lined screw cap	Semi-volatile Organic Compounds (SVOCs) (a)	EPA 8270C	Cool 4°C	14 days/40 days
500 g in Ziploc bag (soil) or 1-L HDPE container (sediment)	Asbestos	<u>PLM-Grav</u> : SRC-LIBBY-01 (Rev. 2) <u>PLM-VE</u> : SRC-LIBBY-03 (Rev. 2)	None	None
8-oz glass jar	<i>[Archive sample]</i>		Cool 4°C	--
<b>Tree Bark</b>				
Sample in Ziploc bag	Asbestos	TEM-ISO10312 (b)	None	None
<b>Organic Debris Material</b>				
Sample in Ziploc bag	Asbestos	TEM-ISO10312 (b)	None	None

(a) CLP analyte list

(b) with Libby-specific modifications

**Table 5-7. Sample Containers, Preservation and Handling Requirements, and Holding Times for Aqueous Sample Matrices**

Container Description	Analyses	Method	Preservation and Handling	Extraction/ Analysis Holding Times
250-mL plastic (pre-preserved with HNO <sub>3</sub> )	TAL Metals+Boron (Total)	6010/6020 and EPA 200 series methods (a)	Cool 4°C; HNO <sub>3</sub> , pH<2	180 days
	Mercury	7470A/ EPA 245.1	Cool 4°C	28 days
250-mL plastic filtration container	TAL Metals+Boron (Dissolved), Hardness	6010/6020 and EPA 200 series methods (a)	Cool 4°C; HNO <sub>3</sub> (preserve sample in field after filtering)	180 days
1-L amber glass	Dissolved Organic Carbon (DOC)	9060/ EPA 415.1	Cool 4°C; H <sub>3</sub> PO <sub>4</sub> (preserve sample in field after filtering)	28 days
500-mL plastic (pre-preserved with H <sub>2</sub> SO <sub>4</sub> )	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	EPA 353.2, 350.1/350.2, 351.2	Cool 4°C; H <sub>2</sub> SO <sub>4</sub> , pH<2	28 days
	Orthophosphate	EPA 365.2	Cool 4°C; H <sub>2</sub> SO <sub>4</sub> , pH<2	28 days
3 x 40-mL amber glass vial with Teflon-lined screw cap (pre-preserved with HCl)	Volatile Petroleum Hydrocarbons (VPH)	MA-DEP VPH modified	HCl to pH <2 Cool 4°C	14 days
2 x 1-L amber glass bottle with Teflon-lined screw cap (pre-preserved with H <sub>2</sub> SO <sub>4</sub> )	Extractable Petroleum Hydrocarbons (EPH)	MA-DEP EPH modified	H <sub>2</sub> SO <sub>4</sub> to pH <2, Cool 4°C	14/40 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
2 x 1-L amber glass (b)	Semi-volatile Organic Compounds (SVOCs) (c)	EPA 8270C	Cool 4°C	7 days/40 days
3 x 40 mL vials; no headspace (pre-preserved with HCl)	Volatile Organic Compounds (VOCs) (c)	EPA 8260B	Cool 4°C; HCl pH<2	14 days
1-L plastic (pre-preserved with HNO <sub>3</sub> )	Radiochemistry (gross alpha and gross beta)	EPA 900.0	Cool 4°C; HNO <sub>3</sub>	None
	Radium, Uranium	EPA 900.3, EPA 200 series (a)	Cool 4°C; HNO <sub>3</sub>	180 days
500-mL plastic (pre-preserved with NaOH)	Cyanide	EPA 335.4	Cool 4°C; NaOH, pH>12	14 days
1 L HDPE container	Asbestos	EPA 100.2 modified (d)	Cool 4°C	Filtered within 48 hours

(a) 200 series methods: 200.7, 200.8

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

(c) CLP analyte list

(d) with Libby-specific modifications

TABLE 6-1

Analyses of Mine Waste and Road-Bed Samples for Non-Asbestos Parameters

Parameter	EPA Analytical Method Reference Number	Target MDL (1) (mg/Kg)	Required PQL (2) (mg/Kg)	Soil Ecotox Benchmarks (mg/Kg)	Human Health RBCs (3) (mg/Kg)
<b>Target Analyte List Metals/Metalloids (4)</b>					
Air dry; sieve to less than 2 mm	ASA No.9, 15-4.2.2	---	---	---	---
	USDA No.1, 1972				
Digestion Procedure	3050	---	---	---	---
Aluminum	6010/6020	1	7821	---	7821
Antimony	6010/6020	0.01	0.27	0.27	3.13
Arsenic	6010/6020	0.1	4.26	18	4.26(c)
Barium	6010/6020	0.1	330	330	1564.3
Beryllium	6010/6020	0.05	10	10	15.64
Boron	6010/6020	1	1,564	---	1564.3
Cadmium	6010/6020	0.01	0.36	0.36	7.82
Chromium	6010/6020	0.1	0.4	0.4	23.5
Cobalt	6010/6020	0.02	13	13	---
Copper	6010/6020	0.5	28	28	312.9
Iron	6010/6020	1	5,475	---	5475
Lead	6010/6020	0.5	11	11	40
Manganese	6010/6020	0.07	220	220	1095
Mercury	7471A	0.01	0.1	0.1	---
Nickel	6010/6020	0.02	38	38	156.4
Selenium	6010/6020	0.02	0.52	0.52	39.11
Silver	6010/6020	0.02	2	2	39.11
Thallium	6010/6020	0.10	0.55	1	0.55
Vanadium	6010/6020	0.4	2	2	7.82
Zinc	6010/6020	1	42	42	2346.4
<b>Other Inorganic Parameters</b>					
paste pH	9045	---	---	---	---
Fluoride	300.0	0.016	469	---	469.3
Total phosphorus, as P	365.1	2	5	---	---
Percent Solids	USDA No. 26	0.10%	---	---	---
<b>Organic Compounds</b>					
Volatile Petroleum Hydrocarbons	MADEP-VPH-04-1.1 (5)	1	2	---	---
Extractable Petroleum Hydrocarbons	MADEP-EPH-04-1.1 (5)	2	10	---	---
PCB Aroclors (6)	8082	0.007	0.02	0.02	3.49(c)

Notes:

- MDL = method detection limit.
- PQL = Practical Quantitation Limit. Required PQLs are maximum quantitation limits based on comparison to Soil Toxicity Benchmarks for Terrestrial Receptors (Attachment B) and EPA Region 3 Human Health Risk-Based Concentrations for Residential Soil, when available. PQLs given for parameters without risk-based criteria are from Energy Labs, Inc., Helena, MT.
- EPA Region 3 Residential Soil Human Health RBCs at HQ = 0.1 for non-cancer risk and 10-5 risk level for cancer. Cancer RBCs are indicated with (c).
- Laboratory analyses for metals to be conducted on the size fraction less than 2 mm.
- Massachusetts Department of Environmental Quality Methods ([http://www.mass.gov/dep/cleanup/laws/vph\\_eph.htm#ana](http://www.mass.gov/dep/cleanup/laws/vph_eph.htm#ana))
- Total PCBs and 7 Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260) analyzed in road-bed samples only.

TABLE 6-2

## Analyses of Surface Water for Non-Asbestos Parameters

Parameter	EPA Analytical Method Reference Number	Target MDL (1) (ug/L)	Required PQL (2) (ug/L)	National Recommended Water Quality Criteria (3) (ug/L)
<b>Field Measurements</b>				
Discharge (where flowing water present)	field flow meter	---	---	---
Temperature	YSI Model 5563 field meter or equivalent	---	+/-1°C	---
pH		---	+/- 0.1 pH unit	---
Specific conductance		---	10 µmhos	---
Dissolved oxygen	YSI 55 probe or equivalent	---	1 mg/L	---
Turbidity	HF Scientific Model DRT-15C field probe	---	5 NTU	---
<b>Target Analyte List Metals/Metalloids (4)</b>				
Aluminum	200.7/200.8	0.2	87	87
Antimony	200.7/200.8	0.05	5	---
Arsenic	200.7/200.8	0.02	150	150 (6,7)
Barium	200.7/200.8	0.02	5,000	5,000 (8)
Beryllium	200.7/200.8	0.02	0.50	---
Boron	200.7/200.8	5	10	---
Cadmium	200.7/200.8	0.004	0.09	0.09 (7,9)
Calcium	200.7/200.8	100	1,000	---
Chromium	200.7/200.8	1	11	10.6 (7, 10)
Cobalt	200.7/200.8	0.09	10	---
Copper	200.7/200.8	0.5	2.74	2.74 (7,9)
Iron	200.7/200.8	5	1,000	1,000
Lead	200.7/200.8	0.02	0.54	0.54 (7,9)
Magnesium	200.7/200.8	100	1,000	---
Manganese	200.7/200.8	0.02	1	---
Mercury	245.1	0.02	0.65	0.65
Nickel	200.7/200.8	0.02	16	16.1 (7,9)
Potassium	200.7/200.8	100	1,000	---
Selenium	200.7/200.8	0.02	5	5 (11)
Silver	200.7/200.8	0.05	0.03	0.03 (8)
Sodium	200.7/200.8	100	1,000	---
Thallium	200.7/200.8	0.2	100	---
Vanadium	200.7/200.8	1	10	---
Zinc	200.7/200.8	1	36	36 (7,9)
<b>Organic Compounds</b>				
Volatile Petroleum Hydrocarbons	MADEP-VPH-04-1.1 (5)	70	300	---
Extractable Petroleum Hydrocarbons	MADEP-EPH-04-1.1 (5)	70	300	---
<b>Anions</b>				
Alkalinity (bicarbonate and carbonate)	SM 2320B	2000	4000	---
Fluoride	300.0	16	50	---
Chloride	300.0	1	10	---
Nitrate, as N	353.2	9.5	10	---
Nitrite, as N	353.2	7.5	10	---
Ammonia nitrogen	350.3/350.1	28	100	---
Total Kjeldahl Nitrogen	351.2	100	500	---
Orthophosphate, as P	365.1	2	10	---
Sulfate	300.0	70	100	---
<b>Other</b>				
Hardness	200.7 -calc	100	1000	---
Dissolved organic carbon	415.1 modified/9060	100	100	---
Total Dissolved Solids (TDS)	SM 2540C	1000	10000	---
Total Suspended Solids (TSS)	SM 2540D	0	10000	---

## Notes:

- MDL = method detection limit.
- PQL = practical quantitation limit. Required PQLs are maximum quantitation limits based on comparison to Surface Water Aquatic Benchmarks (Attachment B) and National Recommended Water Quality Criteria, when available. PQLs given for parameters without Benchmarks or Water Quality Criteria are from Energy Labs, Inc., Helena, MT.
- National Recommended Water Quality Criteria, freshwater, chronic (<http://www.epa.gov/waterscience/criteria/wqcriteria.html>). See Attachment B.
- Both filtered and unfiltered samples will be submitted for metals analyses
- Massachusetts Department of Environmental Quality Methods ([http://www.mass.gov/dep/cleanup/laws/vph\\_eph.htm#ana](http://www.mass.gov/dep/cleanup/laws/vph_eph.htm#ana)).
- NAWQC derived from data for As 3+, but applied here to total arsenic.
- NAWQC expressed in terms of the dissolved fraction.
- Only acute NAWQC available; chronic NAWQC = acute NAWQC/10.
- Metal toxicity is hardness-dependent; values shown are calculated based on a hardness of 25 mg/L
- Based on NAWQC for Chromium VI.
- NAWQC expressed in terms of total recoverable fraction.

TABLE 6-3

Analyses of Sediment Samples for Non-Asbestos Parameters

Parameter	EPA Analytical Method Reference Number	Target MDL (mg/kg) (1)	Required PQL (mg/kg) (2)	Sediment Ecotox Benchmarks (mg/Kg)	Human Health RBCs (3) (mg/Kg)
<b>Field Parameters (4)</b>					
Temperature	YSI Model 5563 field meter or equivalent	---	+/-1°C	---	---
pH		---	+/- 0.1 pH unit	---	---
Specific conductance		---	10 umho	---	---
<b>Target Analyte List Metals/Metalloids</b>					
Digestion Procedure	3050	---	---	---	---
Aluminum	6010/6020	1	7,821	25,519	7821
Antimony	6010/6020	0.01	2	2	3.13
Arsenic	6010/6020	0.1	4.26	9.8	4.26(c)
Barium	6010/6020	0.1	1,564	---	1564.3
Beryllium	6010/6020	0.05	15.64	---	15.64
Boron	6010/6020	1	1,564	---	1564.3
Cadmium	6010/6020	0.01	1.0	1	7.82
Chromium	6010/6020	0.1	23.5	43	23.5
Cobalt	6010/6020	0.02	---	---	---
Copper	6010/6020	0.5	32	32	312.9
Iron	6010/6020	1	5,475	188,400	5475
Lead	6010/6020	0.5	36	36	40
Manganese	6010/6020	0.07	631	631	1095
Mercury	7471A	0.01	0.18	0.18	---
Nickel	6010/6020	0.02	23	23	156.4
Selenium	6010/6020	0.02	39	---	39.11
Silver	6010/6020	0.02	1	1	39.11
Thallium	6010/6020	0.10	0.55	---	0.55
Vanadium	6010/6020	0.4	7	---	7.82
Zinc	6010/6020	1	121	121	2346.4
<b>Other Inorganic Parameters</b>					
Fluoride	300.0	0.016	469	---	469.3
Total organic carbon	EPA 415.1 or 9060	200	1000	---	---
Total phosphorus, as P	365.1	2.0	5	---	---
Percent Solids	USDA No. 26	0.10%	---	---	---
<b>Organic Compounds</b>					
Volatile Petroleum Hydrocarbons	MADEP-VPH-04-1.1 (5)	1	2	---	---
Extractable Petroleum Hydrocarbons	MADEP-EPH-04-1.1 (5)	2	10	---	---

Notes:

- MDL = method detection limit.
- PQL = Practical Quantitation Limit. Required PQLs are maximum quantitation limits based on comparison to Sediment Toxicity Benchmarks for Terrestrial Receptors (Attachment B) and EPA Region 3 Human Health Risk-Based Concentrations for Residential Soil, when available. PQLs given for parameters without risk-based criteria are from Energy Labs, Inc., Helena, MT.
- EPA Region 3 Residential Soil Human Health RBCs at HQ = 0.1 for non-cancer risk and 10-5 risk level for cancer. Cancer RBCs are indicated with (c).
- Field parameters to be measured in water (if any) overlying sediment.
- Massachusetts Department of Environmental Quality Methods ([http://www.mass.gov/dep/cleanup/laws/vph\\_eph.htm#ana](http://www.mass.gov/dep/cleanup/laws/vph_eph.htm#ana)).

TABLE 6-4

**Additional Parameters for Analyses of Surface Water from Impoundment Toe Drain (TP-TOE1) and Lower Rainy Creek (LRC-2)**

Parameter	EPA Analytical Method Reference Number	Target MDL (ug/L) (1)	PQL (ug/L) (2)	National Recommended Water Quality Criteria (ug/L)
<b>PCBs</b>				
Total PCBs	8082	0.18	0.5	0.014 (3)
Aroclor 1016	8082	---	0.5	---
Aroclor 1221	8082	---	0.5	---
Aroclor 1232	8082	---	0.5	---
Aroclor 1242	8082	---	0.5	---
Aroclor 1248	8082	---	0.5	---
Aroclor 1254	8082	0.17	0.5	---
Aroclor 1260	8082	0.09	0.5	---
<b>Chlorinated Pesticides</b>				
Aldrin	8081	0.0098	0.05	3 (4)
alpha-BHC	8081	0.0089	0.05	---
beta-BHC	8081	0.015	0.05	---
delta-BHC	8081	0.011	0.05	---
gamma-BHC, Lindane	8081	0.0077	0.05	---
alpha-Chlordane	8081	0.0089	0.05	---
gamma-Chlordane	8081	0.0103	0.05	---
Chlordane	8081	0.1	0.5	2.4(4)
4,4'-DDD	8081	0.0086	0.05	1.1(4)
4,4'-DDE	8081	0.01	0.05	---
4,4'-DDT	8081	0.012	0.05	---
Dieldrin	8081	0.0073	0.05	0.24(4)
Endosulfan I	8081	0.01	0.05	0.22(4)
Endosulfan II	8081	0.0102	0.05	0.22(4)
Endosulfan Sulfate	8081	0.0088	0.05	---
Endrin	8081	0.0087	0.05	0.086(4)
Endrin Aldehyde	8081	0.0094	0.05	---
Endrin Keton	8081	0.0082	0.05	---
Heptachlor	8081	0.0104	0.05	0.52(4)
Heptachlor Epoxide	8081	0.0089	0.05	0.53(4)
Isodrin	8081	0.0059	0.05	---
Methoxychlor	8081	0.0186	0.05	---
Toxaphene	8081	0.453	5	0.73(4)
<b>Organophosphorous Pesticides</b>				
8141 Method list	8141	0.005-0.02	pending	---
<b>Herbicides</b>				
Dalapon	8151	0.343	2.5	---
2,4-D	8151	0.038	1	---
Dicamba	8151	0.014	0.25	---
Dichloroprop	8151	0.151	1	---
MCPPP	8151	22.57	200	---
MCPA	8151	31.82	200	---
Pentachlorophenol (PCP)	8151	0.018	0.1	13(3)
2,4,5-T	8151	0.015	0.2	---
2,4,5-TP, Silvex	8151	0.011	0.2	---
<b>Radiochemistry</b>				
Gross Alpha	900	3 pCi/L	15 pCi/L	---
Gross Beta	900	3 mrem	15 mrem	---
<b>Volatile and Semi-Volatile Organic Compounds</b>				
CLP TCL VOCs	8260	(5)	(5)	(3,4)
CLP TCL SVOCs	8270	(5)	(5)	(3,4)
<b>Other</b>				
Cyanide, Total	335.4	1	5	5.2(3)

## Notes:

- MDL = method detection limit.
- PQL = practical quantitation limit. PQLs listed are from Energy Labs, Inc., Helena, MT.
- National Recommended Water Quality Criteria, freshwater, chronic (<http://www.epa.gov/waterscience/criteria/wqcriteria.html>)
- National Recommended Water Quality Criteria, freshwater, acute (<http://www.epa.gov/waterscience/criteria/wqcriteria.html>)
- MDL and PQL (as reporting limits) values for VOCs and SVOCs are from EPA 2006, Multi-Media, Multi-Concentration Organics Analytical Service for Superfund (SOM01.1), OSWER Document 540-F-05-008, EPA Publication 9240.1-50FS, January 2006

TABLE 6-5

Additional Parameters for Analyses of Mine Tailings from Impoundment (MW-4 and MW-5) and Sediment from Toe Drain (TP-TOE2) and Lower Rainy Creek (LRC-2)

Parameter	EPA Analytical Method Reference Number	Target MDL (ug/Kg) (1)	PQL (ug/Kg) (2)	Sediment Ecotox Benchmarks (ug/Kg)	Human Health RBCs (3) (ug/Kg)
PCBs (4)	8082	7	33	59.8	3200(c)
<b>Chlorinated Pesticides (4)</b>					
Aldrin	8081	0.28	1.7	150	380(c)
alpha-BHC	8081	0.31	1.7	10000	---
beta-BHC	8081	0.2	1.7	213000	---
delta-BHC	8081	1.1	1.7	---	---
gamma-BHC, Lindane	8081	0.24	1.7	2.4	---
alpha-Chlordane	8081	0.24	1.7	---	---
gamma-Chlordane	8081	0.32	1.7	---	---
Chlordane	8081	2.15	17	3.2	18250(c)
4,4'-DDD	8081	0.29	1.7	4.9	26600(c)
4,4'-DDE	8081	0.27	1.7	3.2	18790(c)
4,4'-DDT	8081	0.24	1.7	4.2	18790(c)
Dieldrin	8081	0.23	1.7	1.9	400(c)
Endosulfan I	8081	0.21	1.7	3.5	---
Endosulfan II	8081	0.29	1.7	3.8	---
Endosulfan Sulfate	8081	0.41	1.7	---	---
Endrin	8081	0.29	1.7	2.2	---
Endrin Aldehyde	8081	0.3	1.7	---	---
Endrin Keton	8081	0.28	1.7	---	---
Heptachlor	8081	0.5	1.7	0.13	1420(c)
Heptachlor Epoxide	8081	2.5	1.7	2.5	700(c)
Isodrin	8081	---	1.7	---	---
Methoxychlor	8081	14.1	1.7	24	---
Toxaphene	8081	31	167	0.42	---
<b>Organophosphorous Pesticides (4)</b>					
8141 Method list	8141	2 to 20	pending	---	---
<b>Herbicides (4)</b>					
Dalapon	8151	27	50	---	234600
2,4-D	8151	0.88	20	---	78200
Dicamba	8151	0.43	5	---	234600
Dichloroprop	8151	7.4	20	---	625700
MCPP	8151	570	4000	---	---
MCPA	8151	400	4000	---	---
Pentachlorophenol (PCP)	8151	1	2	---	53200
2,4,5-T	8151	0.36	4	---	78200
2,4,5-TP, Silvex	8151	1.1	4	---	---
<b>Target Compound List Volatile and Semi-Volatile Organic Compounds</b>					
CLP TCL VOCs	8260	(5)	(5)	Attachment B	refer to EPA Region III RBCs
CLP TCL SVOCs	8270	(5)	(5)		
<b>Other</b>					
Cyanide, Total	9012	1000	5000	---	---

Notes:

1. MDL = method detection limit. All MDLs given for sediment on a dry weight basis.
2. PQL = Practical Quantitation Limit. PQLs listed are from Energy Labs, Inc., Helena, MT.
3. EPA Region 3 Residential Soil Human Health RBCs at HQ = 0.1 for non-cancer risk and 10-5 risk level for cancer. Cancer RBCs are indicated with (c).
4. Analyze sediments from LRC-1, LRC-2, LRC-3, LRC-4, LRC-5, and LRC-6 for these parameters.
5. MDL and PQL (as reporting limits) values for VOCs and SVOCs are from EPA 2006, Multi-Media, Multi-Concentration Organics Analytical Service for Superfund (SOM01.1), OSWER Document 540-F-05-008, EPA Publication 9240.1-50FS, January 2006

TABLE 6-6

## Analyses of Groundwater for Non-Asbestos Parameters

Parameter	EPA Analytical Method Reference Number	Target MDL (1) (ug/L)	Required PQL (2) (ug/L)	Groundwater Quality Standard (3) (ug/L)	Human Health RBCs (4) (ug/L)
<b>Field Measurements</b>					
Depth to Water	Water Level Indicator	---	---	---	---
Temperature		---	+/-1°C	---	---
pH	YSI Model 5563 field meter or equivalent	---	+/- 0.1 pH unit	6.5 to 8.5	---
Specific conductance		---	10 µmhos	---	---
Dissolved oxygen	YSI 55 probe or equivalent	---	1 mg/L	---	---
Turbidity	HF Scientific Model DRT-15C field probe or equivalent	---	5 NTU	---	---
<b>Target Analyte List Metals/Metalloids (5)</b>					
Aluminum	200.7/200.8	0.5	87	---	3650
Antimony	200.7/200.8	0.05	6	6	1.46
Arsenic	200.7/200.8	0.1	0.45	50	0.45(c)
Barium	200.7/200.8	0.5	730	2000	730
Beryllium	200.7/200.8	0.02	4	4	7.3
Boron	200.7/200.8	5	730	---	730
Cadmium	200.7/200.8	0.1	1	5	1.83
Calcium, dissolved	200.7/200.8	100	1,000	---	---
Chromium	200.7/200.8	1	10	100	10.95
Cobalt	200.7/200.8	0.2	10	---	---
Copper	200.7/200.8	0.6	146	1300	146
Iron	200.7/200.8	5	300	300	2555
Lead	200.7/200.8	0.2	15	15	---
Magnesium, dissolved	200.7/200.8	100	1,000	---	---
Manganese	200.7/200.8	0.05	50	50	73
Mercury	245.1	0.03	2	2	---
Nickel	200.7/200.8	1	73	100	73
Potassium, dissolved	200.7/200.8	100	1,000	---	---
Selenium	200.7/200.8	0.02	18	50	18.25
Silver	200.7/200.8	0.05	18	100	18.25
Sodium, dissolved	200.7/200.8	100	1,000	---	---
Thallium	200.7/200.8	0.1	0.255	2	0.255
Vanadium	200.7/200.8	1	3.65	---	3.65
Zinc	200.7/200.8	1	1,095	5000	1095
<b>Radiochemistry</b>					
Gross Alpha	900.0	1 pCi/L	15 pCi/L	15 pCi/L	---
Gross Beta	900.0	1 mrem	4 mrem	4 mrem	---
Radium- 226, 228	900.3	1 pCi/L	5 pCi/L	5 pCi/L	---
Uranium, total	200.7/200.8	0.4	30	30	1095
<b>Organic Compounds</b>					
Volatile Petroleum Hydrocarbons	MADEP-VPH-04-1.1 (6)	70	300	---	---
Extractable Petroleum Hydrocarbons	MADEP-EPH-04-1.1 (6)	70	300	---	---
<b>Major Ions</b>					
Fluoride	300.0	16	219	4000	219
Chloride	300.0	5	10	---	---
Nitrate, as N	353.2	9.5	5840	10000	5840
Nitrite, as N	353.2	7.5	365	1000	365
Ammonia nitrogen	350.3/350.1	28	20.9	---	20.9
Orthophosphate, as P	365.1	2	10	---	---
Alkalinity (carbonate and bicarbonate)	SM 2320B	2000	4000	---	---
Sulfate	300.0	70	500000	500000	---
<b>Other</b>					
Cyanide, Total	335.4	1	200	200	---
Total Dissolved Solids (TDS)	SM 2540C	1000	500000	500000	---
Total Suspended Solids (TSS)	SM 2540D	0	500000	500000	---

## Notes:

- MDL = method detection limit.
- PQL = practical quantitation limit. Required PQLs are maximum quantitation limits based on comparison to groundwater quality standards and human-health risk-based concentrations for tap water, if available. PQLs given for parameters without regulatory or risk-based criteria are from Energy Labs, Inc., Helena, MT.
- MCLs from Montana DEQ 1999, Public Water Supply Section, Community Summary: Drinking Water Regulations for Community Public Water Supplies, September, 1999, and current EPA Drinking Water Standards (primary and secondary)
- EPA Region 3 Tap Water Human Health RBCs at HQ = 0.1 for non-cancer risk and 10-5 risk level for cancer. Cancer RBCs are indicated with (c).
- Analyze for total metals concentrations, except where noted.
- Massachusetts Department of Environmental Quality Methods ([http://www.mass.gov/dep/cleanup/laws/vph\\_eph.htm#ana](http://www.mass.gov/dep/cleanup/laws/vph_eph.htm#ana)).

**Table 7-1. Summary of Field Quality Control Samples**

Field QC Sample Type	Applicable Sample Media	Minimum Collection Frequency	Analyses to be Performed	Acceptance Criteria	Corrective Action
Lot Blank	Air	5 per cassette lot	TEM	No asbestos structures detected	Discard entire lot
Field Blank	Air	1 per sampling team per day	TEM	No LA structures detected	Assign qualifier to analyte(s) in field samples associated with field blank (same day, same team)
	Water	1 per 10 field samples (10%)	TEM	No LA structures detected	
Metals, Anions, VPH, EPH, DOC (SW only)			Non-detect (<MDL) for all target analytes		
Trip Blank	Water	1 per cooler of samples for VOC and VPH analyses	SW 8260 or MA-DEP-VPH (a)	Non-detect (<MDL) for all target analytes	Assign qualifier to analyte(s) in field samples associated with trip blank (same cooler)
	Solid Media		SW 8260 or MA-DEP-VPH (a)	Non-detect (<PQL) for all target analytes	
Equipment Rinsate Blank	Water	1 per sampling team per day	TEM	No LA structures detected	Assign qualifier to analyte(s) in field samples associated with field blank (same day, same team)
			Metals, Anions, VPH, EPH, DOC (SW only)	Non-detect (<MDL) for all target analytes	
	Solid Media		TEM	No LA structures detected	
			Metals, Fluoride, Phosphorus, VPH, EPH, PCBs	Non-detect (<MDL) for all target analytes	
Field Duplicate	Air	1 per 10 field samples (10%)	TEM	<5% statistically different	Assign qualifier to analyte(s) in parent field sample
	Water	1 per 10 field samples (10%)	TEM	<5% statistically different	
			Same analyte list as original sample	20% RPD for target analytes	
	Tree Bark	1 per 10 field samples (10%)	TEM	<i>[Not applicable for field duplicates]</i>	<i>[Not applicable for field duplicates]</i>
	Soil/Mine Waste	1 per material type	PLM-VE		
			Same analyte list as original sample		
Sediment and Forested area soils	1 per 10 field samples (10%)	PLM-VE	Same analyte list as original sample		
		Same analyte list as original sample			
Performance Evaluation (PE)	Water	4 PE samples	Inorganic and organic analytes	(b)	Assign qualifier to field samples for analyte(s) outside of acceptance criteria
	Solid Media	4 PE samples	PLM-VE	80% concordance	
		3 PE samples	Inorganic and organic analytes	(b)	

(a) depending on analyses requested with associated samples

(b) meet analyte-specific criteria specified by QATS certification program

**Table 7-2. Summary of Laboratory Quality Control Measures, by Analysis**

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
ICP Metals SW-846 6010B (and EPA 200.7 for aqueous samples)	Initial calibration (1 point + blank minimum)	Daily prior to analysis	Correlation coefficient (r) $\geq 0.995$	<ul style="list-style-type: none"> <li>Recalibrate</li> </ul>
	Interference check standard (ICS)	Beginning and end of each analytical run	Results +/- 20% of true value	<ul style="list-style-type: none"> <li>Terminate analysis</li> <li>Recalibrate instrument</li> <li>Reanalyze all samples back to last acceptable ICS</li> </ul>
	Initial calibration verification (ICV)	After calibration, prior to sample analysis	Results <10% from calibration standard	<ul style="list-style-type: none"> <li>Reanalyze ICV</li> <li>Recalibrate, if ICV still out</li> </ul>
	Continuing calibration verification (CCV)	Every 10 samples and end of analytical sequence	Results < 10% from calibration standard	<ul style="list-style-type: none"> <li>Reanalyze affected samples back to the last acceptable CCV</li> </ul>
	Calibration blank - Initial calibration blank (ICB), Continuing calibration blank (CCB)	After initial calibration verification, each subsequent calibration verification, and at the end of the run	<3x the Method detection limit (MDL)	<ul style="list-style-type: none"> <li>Reanalyze blank</li> <li>Clean system</li> <li>Reanalyze all samples back to last acceptable blank</li> </ul>
	Method blank	1 per preparation batch ( $\leq 20$ samples)	< Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze method blank.</li> <li>If fails, analyze a calibration blank</li> <li>Reprep/reanalyze analytical batch as appropriate</li> </ul>
	Matrix spike (MS)	1 per preparation batch ( $\leq 20$ samples)	% Recovery +/-25% of actual value	<ul style="list-style-type: none"> <li>Assess data (4 x rule)</li> <li>If LCS recoveries are within acceptance criteria, then matrix interference may be suspected</li> <li>Reanalyze reprep once if matrix is not a factor</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate (MSD)	1 per preparation batch ( $\leq 20$ samples)	RPD <20%	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory Control Sample (LCS)	1 per preparation batch ( $\leq 20$ samples)	% Recovery +/- 20% of actual value	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Reprep/reanalyze LCS and affected samples</li> <li>Narrate all outliers</li> </ul>
ICP-MS Metals SW-846 6020 (and EPA 200.8 for aqueous samples)	Mass calibration and resolution check ( 4 replicates )	Daily prior to analysis	Mass calibration < 0.1 amu; resolution <0.9 amu at 10% peak height; RSD <5%	<ul style="list-style-type: none"> <li>Recalibrate</li> </ul>
	Initial multipoint calibration (1 point + blank minimum); average of 3 integrations	Daily prior to analysis	None	<ul style="list-style-type: none"> <li>None</li> </ul>
	Initial calibration verification (ICV); mid-level standard second source	After calibration, prior to sample analysis	$\pm 10\%$ from true value	<ul style="list-style-type: none"> <li>Reanalyze ICV</li> <li>Recalibrate, if ICV still out</li> </ul>
	Continuing calibration verification (CCV)	Every 10 samples and end of run sequence	$\pm 10\%$ from true value	<ul style="list-style-type: none"> <li>Reanalyze affected samples back to the last acceptable CCV</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
ICP-MS Metals SW-846 6020 (and EPA 200.8 for aqueous samples)	Interference check solution	At beginning of analytical sequence or once every 12 hours, whichever is more frequent	Recoveries +/- 20% of theoretical value	<ul style="list-style-type: none"> <li>Internal QC review only; flag data to indicate interference</li> </ul>
	Internal Standards	Every CCV, ICB/CCB	Recoveries +/- 20% of initial calibration	<ul style="list-style-type: none"> <li>Recalibrate and verify calibration</li> <li>Reanalyze affected samples</li> </ul>
		Every sample	Recoveries 30-120% for samples	<ul style="list-style-type: none"> <li>Dilute sample 5x and reanalyze</li> <li>Repeat until within limits</li> </ul>
	Calibration blank Initial calibration blank (ICB) Continuing calibration blank (CCB)	After initial calibration and each subsequent calibration verification	< 3 x Method detection limit (MDL)	<ul style="list-style-type: none"> <li>Reanalyze blank</li> <li>Clean system if still out</li> <li>Reanalyze affected samples back to the last acceptable CCB</li> </ul>
	Method blank	1 per preparation batch (≤ 20 samples)	< Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze method blank.</li> <li>If fails, analyze a calibration blank</li> <li>Reprep/reanalyze analytical batch as appropriate</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤ 20 samples)	% Recovery +/- 25% of true value	<ul style="list-style-type: none"> <li>Assess data</li> <li>Reanalyze MS if matrix is not a factor</li> </ul>
	Matrix spike duplicate (MSD) or Matrix duplicate (MD)	1 per preparation batch (≤ 20 samples)	RPD < 20% (for values > 100 x MDL)	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Post-digestion spike addition	As necessary to assess matrix interference	% Recovery +/- 25% of actual value	<ul style="list-style-type: none"> <li>Perform dilution test</li> <li>Or, perform method of standard addition</li> </ul>
	Dilution test	1 per 20 samples	% Recovery +/- 10% of true value	<ul style="list-style-type: none"> <li>Use method of standards addition</li> </ul>
	Laboratory control sample (LCS)	1 per preparation batch (≤ 0 samples)	% Recovery within +/- 20% of true value	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Reprep/reanalyze LCS and affected samples</li> <li>Narrate all outliers</li> </ul>
Mercury SW-846 7470A/7471A	Initial multipoint calibration (3 point + blank minimum)	Daily, prior to analysis	Correlation coefficient (r) ≤ 0.995	<ul style="list-style-type: none"> <li>Recalibrate</li> </ul>
	Initial calibration verification (ICV); mid-level standard	After calibration, prior to sample analysis	± 20% of true value	<ul style="list-style-type: none"> <li>Reanalyze ICV</li> <li>Rerun initial calibration</li> </ul>
	Continuing calibration verification (CCV); mid-level standard	Every 10 samples and at end of analytical sequence	± 20% of true value	<ul style="list-style-type: none"> <li>Reanalyze affected samples back to last acceptable CCV</li> </ul>
	Calibration blank (ICB/CCB)	After calibration, and after each subsequent calibration verification	< Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze blank</li> <li>Clean system if still out</li> <li>Reanalyze affected samples back to last acceptable CCB</li> </ul>
	Method blank	1 per preparation batch (≤ 20 samples)	< Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze method blank.</li> <li>If fails, analyze a calibration blank</li> <li>Reprep/reanalyze analytical batch as appropriate</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
Mercury SW-846 7470A/7471A	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery +/- 25% of true value	<ul style="list-style-type: none"> <li>If LCS recoveries are within acceptance criteria, matrix interference may be suspected</li> <li>Reprep/reanalyze once if problem cannot be attributed to matrix</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate (MSD)	1 per preparation batch (≤20 samples)	RPD < 20%	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory control samples (LCS)	1 per preparation batch (≤20 samples)	%Recovery within +/- 20% of true value	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Reprep/reanalyze LCS and affected samples</li> <li>Narrate all outliers</li> </ul>
SW-846, 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Tune instrument with a 4-bromofluorobenzene standard (BFB)	Every 12 hours	Must meet key ions and ion abundance criteria established by method.	
	Initial multi-point calibration; 5 point minimum. Lowest point at or below PQL. Includes calibration check compounds (CCC) and system performance check compounds (SPCC), and Internal Standards Compounds (IS).	Prior to analysis, and as required	RSD < 30 % for CCC; Average RF ≥ 0.1 for SPCC (≥0.3 for chlorobenzene, 1,1,2,2-Tetrachloroethane) If % RSD < 15% average RF may be used; linear calibration required	<ul style="list-style-type: none"> <li>Evaluate system</li> <li>Repeat calibration</li> </ul>
	Continuing calibration verification (CCV): CCC, SPCC, and IS	Every 12 hours	Percent difference <20% for CCC; RF ≥0.1 for SPCC (≥0.3 for chlorobenzene and 1,1,2,2-Tetrachloroethane).	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze calibration check standard</li> <li>Repeat initial calibration</li> </ul>
	IS	Every sample, method blank, LCS, MS/MSD	Retention time for each internal standard must be within 30 seconds of most recent CCV and the EICP area for all internal standards must be within - 50% to +100% of the most recent CCV.	<ul style="list-style-type: none"> <li>Evaluate system</li> <li>Reanalyze sample once</li> <li>Re-extract/reanalyze sample once</li> <li>If due to media interference report both sets of data</li> <li>Narrate all outliers</li> </ul>
	Method blank	1 per preparation batch (≤20 samples)	< Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze method blank</li> <li>Reanalyze batch</li> </ul>
	Internal standards	Every sample, method blank, LCS, and MS/MSD	Retention time for each internal standard must be within 30 seconds of most recent CCV and the EICP area for all internal standards must be within - 50% to +100% of the most recent CCV	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze samples</li> <li>If still out, report both sets of data</li> <li>Narrate all outliers</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846, 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Surrogate spike	Every sample, method blank, LCS, MS/MSD	No more than one surrogate outside QC acceptance criteria. No surrogate below 10% recovery.	<ul style="list-style-type: none"> <li>• Reanalyze sample once</li> <li>• Re-extract and reanalyze if &gt;1 surrogate outside QC acceptance limits</li> <li>• If still out, report both sets of data</li> <li>• Narrate all outliers</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤20 samples)	Percent recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Assess data (4x rule)</li> <li>• If LCS and surrogate recoveries are within acceptance criteria matrix interferences may be suspected</li> <li>• Reprep/reanalyze once if matrix is not a factor</li> <li>• Narrate all outliers</li> </ul>
	Matrix spike duplicate (MSD) or Matrix Duplicate (MD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Same as MS</li> </ul>
	Laboratory control sample (LCS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Reanalyze LCS</li> <li>• Reprep/reanalyze LCS and all associated samples</li> <li>• Narrate all outliers</li> </ul>
SW-846 8270C Semi-Volatiles by GC/MS	Tune the instrument using a decafluorotriphenylphosine (DFTPP) standard	Every 12 hours	Must meet the ion abundance criteria specified in the Degradation of DDT ≤ 20% Benzidine and PCP present at normal response without excessive tailing	<ul style="list-style-type: none"> <li>• Retune instrument</li> <li>• Repeat standard analysis</li> <li>• Perform injection port, column maintenance as necessary</li> </ul>
	Initial calibration (5 point minimum); includes Calibration Check Compounds (CCC), System Performance Calibration Check (SPCC), and Internal Standard Compounds (IS)	Prior to analysis and as required	% RSD for CCC ≤30%; average RF ≥0.05 for SPCC If % RSD ≤15 % average RF may be used; linear calibration required	<ul style="list-style-type: none"> <li>• Evaluate the system</li> <li>• Repeat calibration</li> </ul>
	Continuing calibration verification (CCV); includes CCC, SPCC, and IS	Every 12 hours	CCV percent difference for CCC ≤30%; RF ≥0.05 for SPCC EICP area of each internal standard - 50% to +100% of all IS areas in most recent CCV. Retention time for each internal standard must be within 30 seconds of most recent CCV	<ul style="list-style-type: none"> <li>• Evaluate system/standard</li> <li>• Reanalyze calibration check standard</li> <li>• Repeat the initial calibration as necessary</li> </ul>
	Method blank	1 per preparation batch (≤20 samples)	<Reporting limit	<ul style="list-style-type: none"> <li>• Reanalyze blank</li> <li>• Reprep/reanalyze blank and all associated samples</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846 8270C Semi-Volatiles by GC/MS	Internal Standard	Every sample, method blank, LCS and MS/MSD	The EICP area for all internal standards must be within -50% and +100% of most recent CCV Retention time for each internal standard must be within 30 seconds of most recent CCV	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze the sample</li> <li>If still out, report both sets of data</li> </ul>
	Surrogate spike	Every sample, method blank, LCS and MS/MSD	No more than one surrogate per fraction outside of acceptance criteria (Refer to Table B1-a) No surrogate below 10% recovery	<ul style="list-style-type: none"> <li>Reanalyze sample once</li> <li>Re-extract and reanalyze if &gt;1 surrogate per fraction outside acceptance limits</li> <li>Narrate all outliers</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Assess data (4x rule)</li> <li>Reanalyze once; if matrix is not a factor</li> <li>If LCS and surrogate recoveries are within acceptance criteria matrix interference maybe suspected</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate (MSD) or Matrix Duplicate (MD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory control sample	1 per preparation batch (≤20 samples)	% Recovery within project QC acceptance criteria for all spiked analytes (Attachment X)	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Re-prep/reanalyze LCS and all associated samples</li> <li>Narrate all outliers</li> </ul>
SW-846 8082 Polychlorinated biphenyls (PCBs) by Gas Chromatography	Initial calibration (5 point minimum) Lowest standard at or below PQL; Expected Aroclors or Aroclor 1016/1260 five-point if unknown with single-point mid-level standards for other Aroclors for pattern recognition and retention times, or	Prior to analysis and as required	RSD <20%, average calibration factor or response factor(a) may be used; linear calibration required	<ul style="list-style-type: none"> <li>Evaluate the system</li> <li>Repeat initial calibration</li> </ul>
	Initial calibration verification (ICV) Mid level standard Expected Aroclors or Aroclor 1016/1260 if unknown	Prior to each 12 hour shift	% Difference ≤15% of expected concentration compared to response from ICAL	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze ICV standard</li> <li>Repeat initial calibration</li> </ul>
	Continuing calibration verification (CCV) Mid level standard Expected Aroclors or Aroclor 1016/1260 if unknown	After every 20 samples and at the end of the analytical sequence	% Difference ≤15% of expected concentration compared to response from ICAL for each bracketing standard	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze CCV and samples back to last acceptable CCV</li> </ul>
	Retention time windows	Established with each new column installation Updated with each daily initial calibration standard	Retention times must be within retention time window established by the daily initial calibration standard Every CCV and every sample	<ul style="list-style-type: none"> <li>Evaluate system/standard; pattern recognition may be sufficient</li> <li>Reanalyze CCV/affected samples</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846 8082 Polychlorinated biphenyls (PCBs) by Gas Chromatography	Method Blank	1 per preparation batch (≤20 samples)	<Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze blank</li> <li>Re-prep/reanalyze blank and associated samples</li> </ul>
	Surrogate spike DCB (for Aroclors) TCMX (for PCB congeners)	Every sample, method blank, LCS and MS/MSD	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Re-extract/reanalyze once</li> <li>If still out, report both sets of data</li> <li>Narrate all outliers</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Assess data (4x rule)</li> <li>If LCS and surrogate recoveries are within acceptance criteria matrix interference maybe suspected</li> <li>Re-extract/reanalyze if matrix is not a factor</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate(MSD) or Matrix duplicate (MD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory control sample(LCS)	1 per preparation batch (≤20 samples)	% Recovery within project QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Re-prep/reanalyze LCS and all associated samples</li> <li>Narrate all outliers</li> </ul>
SW-846 8081A Organochlorine Pesticides by Gas Chromatography	Column Evaluation Mix	Prior to analysis, both initial and daily	Degradation of DDT and Endrin < 15%	<ul style="list-style-type: none"> <li>Evaluate the system</li> <li>Repeat standard</li> </ul>
	Initial calibration (5 point minimum) Lowest at or below PQL Mid level multi-component standards for pattern recognition and retention times	Prior to analysis and as required	RSD < 20%, average CF may be used; linear calibration required	<ul style="list-style-type: none"> <li>Average RSD &lt;20% across all analytes may be used if any analyte fails</li> <li>Evaluate the system</li> <li>Repeat initial calibration</li> </ul>
	Initial calibration verification (ICV) Mid level standard Expected multi-component compounds	Prior to each 12 hour shift	% Difference ≤15% of expected concentration compared to response from ICAL	<ul style="list-style-type: none"> <li>Average % difference ≤15% across all analytes may be used if any analyte fails</li> <li>Evaluate system/standard</li> <li>Reanalyze ICV standard</li> <li>Repeat initial calibration</li> </ul>
	Continuing calibration verification (CCV) Mid level standard Expected multi-component compounds	After every 20 samples and at the end of the analytical sequence	% Difference ≤15% of expected concentration compared to response from ICAL for each bracketing standard	<ul style="list-style-type: none"> <li>Average % difference ≤15% across all analytes may be used if any analyte fails</li> <li>Evaluate system/standard</li> <li>Reanalyze CCV and affected samples</li> <li>For CCV with response &gt; initial calibration response and % difference &gt;15%, samples need not be reanalyzed if no target compounds are detected</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846 8081 Organochlorine Pesticides by Gas Chromatography	Retention time windows	Established with each new column installation Updated with each daily initial calibration standard	Retention times must be within retention time window established by the daily initial calibration standard Every CCV and every sample	<ul style="list-style-type: none"> <li>Evaluate system/standard; pattern recognition may be sufficient for multi-component compounds only</li> <li>Reanalyze CCV/affected samples</li> </ul>
	Method Blank	1 per preparation batch (≤ 20 samples)	<Reporting limit	<ul style="list-style-type: none"> <li>Reanalyze blank</li> <li>Re-prep/reanalyze blank and associated samples</li> </ul>
	Surrogate spike DCB and TCMX	Every sample, method blank, LCS and MS/MSD	% Recovery within QC acceptance criteria (Attachment X). One surrogate must fall within established control limits	<ul style="list-style-type: none"> <li>Re-extract/reanalyze once</li> <li>If still out, report both sets of data</li> <li>Narrate all outliers</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Assess data (4 x rule)</li> <li>If LCS and surrogate recoveries are within acceptance criteria, matrix interference maybe suspected</li> <li>Re-extract/reanalyze once if matrix is not a factor</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate(MSD) or Matrix Duplicate (MD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory control sample (LCS)	1 per preparation batch (≤ 20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Re-prep/reanalyze LCS and all associated samples</li> <li>Narrate all outliers</li> </ul>
SW-846 8141A Organophosphorus Pesticides by Gas Chromatography	Initial calibration (5 point minimum) Lowest at or below reporting limit (RL)	Prior to analysis and as required	If %RSD < 20% average RF may be used If linear regression used $r > 0.995$ or $R^2 > 0.990$ Alternate evaluation: Mean % RSD for all target analytes <20% with no individual compound >40%	<ul style="list-style-type: none"> <li>Average RSD &lt;20% across all analytes may be used if any analyte fails</li> <li>Evaluate the system</li> <li>Repeat initial calibration</li> </ul>
	Initial calibration verification (ICV), second source Mid level standard	Prior to every analytical sequence	% Difference ≤15% of expected concentration compared to response from ICAL	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Reanalyze ICV standard</li> <li>Repeat initial calibration</li> </ul>
	Continuing verification standard (CVS) Mid level standard	After every 10 samples and at the end of the analytical sequence	%D or % Drift >15%	<ul style="list-style-type: none"> <li>Evaluate system/standard</li> <li>Repeat sample analysis to last acceptable CVS</li> </ul>
	Retention time windows	Established with each new column installation Updated with each daily initial calibration standard	Retention times must be within retention time window established by the daily initial calibration standard Every CVS and every sample	<ul style="list-style-type: none"> <li>Evaluate system/standard; pattern recognition may be sufficient for multi-component compounds only</li> <li>Reanalyze CVS/affected samples</li> </ul>
	Target analyte confirmation	All detected analytes	RPD < 40%	<ul style="list-style-type: none"> <li>If greater than 40% qualify data as estimated</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846 8141A Organophosphorus Pesticides by Gas	Method Blank	1 per preparation batch (≤ 20 samples)	< ½ RL	<ul style="list-style-type: none"> <li>• Reanalyze blank</li> <li>• Reprep/reanalyze blank and associated samples</li> </ul>
	Surrogate spike	Every sample, method blank, LCS and MS/MSD	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Reanalyze</li> <li>• Reprep/reanalyze once</li> <li>• If still out, report both sets of data</li> <li>• Narrate all outliers</li> </ul>
	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Reanalyze</li> <li>• Reprep/reanalyze once</li> <li>• If still out, report both sets of data</li> <li>• Narrate all outliers</li> </ul>
	Matrix spike duplicate(MSD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Same as MS</li> </ul>
	Laboratory control sample (LCS)	1 per preparation batch (≤ 20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Reanalyze LCS</li> <li>• Reprep/reanalyze LCS and all associated samples</li> <li>• Narrate all outliers</li> </ul>
SW-846 8151A Organochlorine Herbicides and Pentachlorophenol by Gas Chromatography	Initial calibration (5 point minimum) Lowest point at or below PQL	Prior to analysis and as required	%RSD <20%, average CF may be used; linear calibration required	<ul style="list-style-type: none"> <li>• Average RSD &lt;20% across all analytes may be used if any analytes fail</li> <li>• Evaluate the system</li> <li>• Repeat initial calibration</li> </ul>
	Initial calibration verification (ICV) second source Mid level standard	Prior to each daily analytical sequence	% Difference ≤15% of expected concentration compared to response from ICAL	<ul style="list-style-type: none"> <li>• Average %D ≤15% across all analytes may be used if any analytes fail</li> <li>• Evaluate system/standard</li> <li>• Reanalyze ICV standard</li> <li>• Repeat initial calibration</li> </ul>
	Continuing calibration verification (CCV) Mid level standard	After every 20 samples and at the end of the analytical sequence	% Difference ≤15% of expected concentration compared to response from ICAL for each bracketing standard	<ul style="list-style-type: none"> <li>• Evaluate system/standard</li> <li>• Reanalyze CCV and all samples back to last acceptable CCV</li> </ul>
	Retention time windows	Established with each new column installation Updated with each daily initial calibration standard	Retention times must be within retention time window established by the daily initial calibration standard Every CCV and every sample	<ul style="list-style-type: none"> <li>• Evaluate system/standard;</li> <li>• Reanalyze CCV and affected samples</li> </ul>
	Method blank	1 per preparation batch (≤20 samples)	<Reporting limit	<ul style="list-style-type: none"> <li>• Reanalyze blank</li> <li>• Re-prep/reanalyze blank and all associated samples</li> </ul>
	Surrogate spike DCAA	Every sample, method blank, LCS and MS/MSD	% Recovery within project QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>• Re-extract/reanalyze once</li> <li>• If still out, report both sets of data</li> <li>• Narrate all outliers</li> </ul>

Analytical Method <sup>(a)</sup>	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW-846 8151A Organochlorine Herbicides and Pentachlorophenol by Gas Chromatography	Matrix spike (MS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Assess data (4x rule)</li> <li>If LCS and surrogate recoveries are within acceptance criteria, matrix interference maybe suspected</li> <li>Re-exact/reanalyze once if matrix is not a factor</li> <li>Narrate all outliers</li> </ul>
	Matrix spike duplicate (MSD) or Matrix duplicate (MD)	1 per preparation batch (≤20 samples)	% Recovery and/or RPD within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Same as MS</li> </ul>
	Laboratory control sample (LCS)	1 per preparation batch (≤20 samples)	% Recovery within QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Reanalyze LCS</li> <li>Re-prep/reanalyze LCS and all associated samples</li> <li>Narrate all outliers</li> </ul>
Total Cyanide SW-846 9012B	Initial calibration curve (six standards and a calibration blank)	Initial daily calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	<ul style="list-style-type: none"> <li>Correct problem then repeat initial calibration</li> </ul>
	Distilled standards (one high and one low)	Once per initial calibration	Cyanide within ±10% of true value	<ul style="list-style-type: none"> <li>Correct problem then repeat distilled standards</li> </ul>
	Second-source calibration verification	One per preparation batch (<20 samples)	Cyanide within ±15% of expected value	<ul style="list-style-type: none"> <li>Correct problem then repeat initial calibration</li> </ul>
	Method blank	One per analytical batch	No analytes detected ≥ Reporting Limit	<ul style="list-style-type: none"> <li>Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank</li> </ul>
	LCS for all analytes	One per preparation batch (<20 samples)	QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>Correct problem then reanalyze</li> <li>If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch</li> </ul>
	MS/MSD	One per preparation batch (<20 samples)	QC acceptance criteria (Attachment X)	<ul style="list-style-type: none"> <li>None</li> </ul>
Gross Alpha and Gross Beta SW-846-9310	Initial calibration with standard reference materials	Daily before sample analysis	Analytical method control limits	<ul style="list-style-type: none"> <li>Correct problem and repeat calibration</li> </ul>
	Method Blank	One per analytical batch	No analytes detected ≥ Reporting Limit	<ul style="list-style-type: none"> <li>Identify and reduce contamination then reanalyze</li> </ul>
	Analytical Duplicate	One per analytical batch	RPD < 20	<ul style="list-style-type: none"> <li>Evaluated problem and correct the reanalyze</li> </ul>
	Spiked Sample or standard reference material	One per analytical batch	80-120% recovery	<ul style="list-style-type: none"> <li>Evaluated problem and correct the reanalyze</li> </ul>

EICP Extracted ion current profile  
QC Quality control  
RF Response factor  
RSD Relative standard deviation