FLATHEAD AND WHITEFISH SAMPLING PROJECT - 2014:

POLYCHLORINATED BIPHENYLS (PCBS) AND MERCURY (HG)

Sampling and Analysis Plan

Prepared for:

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1.0 Introduction and Background Information

Flathead Lake, Whitefish Lake and Whitefish River appear on the 2014 303(d) list as impaired by polychlorinated Biphenyls (PCBs). These PCB impairment listings are included in Attachment B to the proposed Second Amended Judgment in *Friends of the Wild Swan Inc. et al., v. U.S. Environmental Protection Agency, et al. and State of Montana, ex rel. Department of Environmental Quality, et al.* (Case 9:97-cv-00035-DWM). Whitefish Lake and Flathead Lake are also listed as impaired by mercury (Hg). DEQ will monitor for PCBs and Hg during the 2014 field season in these three waterbodies and others throughout the watersheds that contain these waters of concern. Generally, monitoring will occur at locations suspected to be potential areas of PCB contamination based on proximity to potential source areas (e.g., remediation sites or permitted facilities that are thought to have used PCBs in the past). The sampling design also aims to characterize water quality conditions of major tributaries that influence the three waters of concern. Further, several sites will be sampled that may be considered representative of reference condition with respect to PCBs and Hg due to lack of apparent sources.

1.1 Geographic Information

Flathead Lake, Whitefish Lake and Whitefish River are located in northwestern Montana, and the project area described in this document is primarily within Flathead County and a small portion of Lake County. The project area coincides approximately with two fourth-code hydrologic unit codes (HUCs): 1) Flathead Lake (17010210) which includes Flathead Lake, Flathead River and Ashley Creek drainages, and 2) Stillwater (17010208) which includes Whitefish Lake, Whitefish River, and Stillwater River drainages. The project area is bounded on the south by the Flathead Reservation and, to the north, the Montana-Canada border and Glacier National Park. Kalispell and Whitefish are cities located within the project area, as are the Towns of Colombia Falls and Bigfork.

A majority of the project area is within the Northern Rockies Level III ecoregion, and the eastern portion is within the Canadian Rockies ecoregion. As shown in **Table 1.1**, the total extent of the project area is 1,084,656.4 acres or 1,694.8 square miles. This includes all of HUC 17010210 and the portion of HUC 17010208 that does not overlap with the Flathead Reservation. Several sampling locations are located just outside of these HUC boundaries, as shown in **Figure 1.1**.

Table 1.1 – Whitefish-Flathead PCBs and Mercury Monitoring Project Area

HUC	Project Area (MT jurisdiction only)	
	Acres	Square Miles
17010210	498,471.1	778.9
17010208	586,185.30	915.9
Total Project Area	1,084,656.4	1,694.8

Figure 1.1 depicts the project area boundary and the major waterbodies within the project area intended for PCB and Hg monitoring.

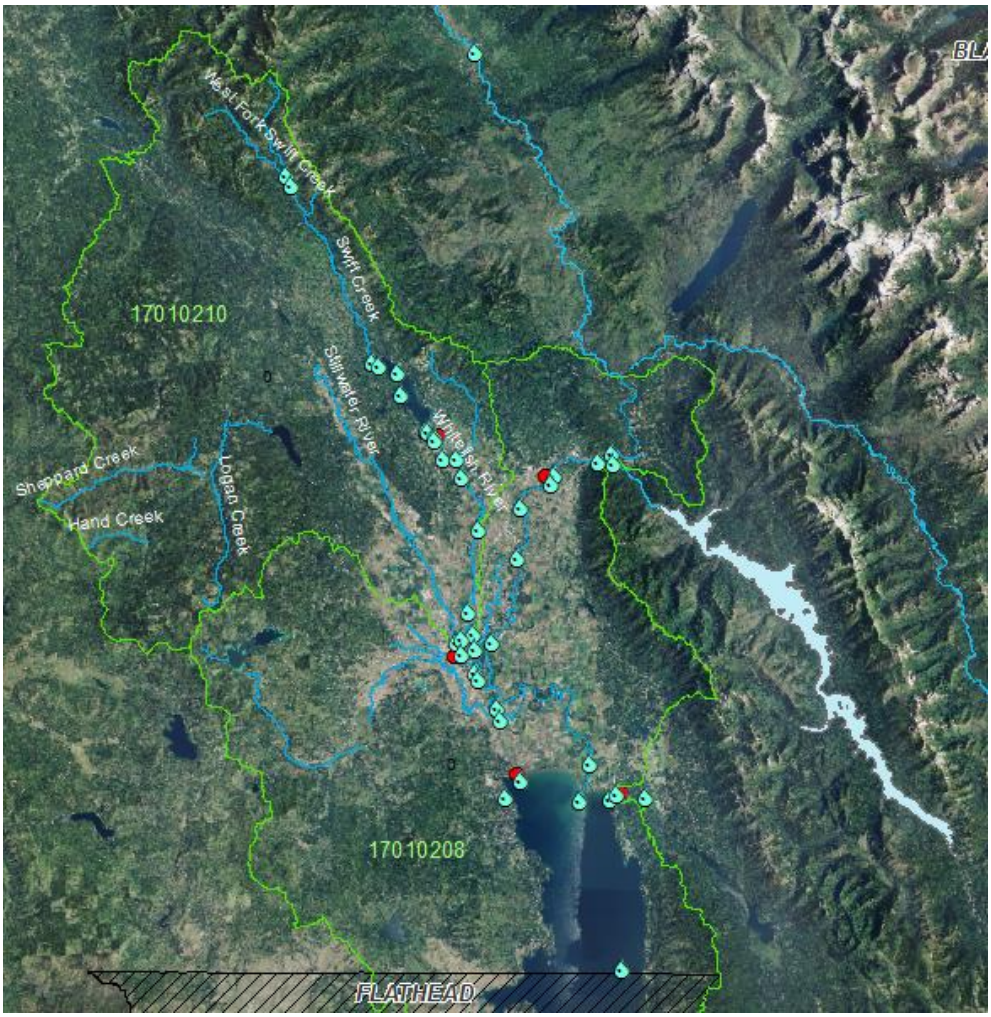

Figure 1.1 – Whitefish-Flathead PCB and Mercury Monitoring Project Area with 2014 Proposed Monitoring Locations

Table 1.2 shows basic summary information about the three assessment units that are waters of concern for PCBs and/or Hg in the project area. The beneficial use classification, ecoregion and HUC are also shown for each.

Table 1.2 – Waters of concern in the Whitefish-Flathead PCB and Mercury Monitoring Project Area

AUID	Waterbody Name	Size	Use Class	Ecoregion	HUC
MT76P004_010	Whitefish Lake	3,317.4 acres	A-1	Northern Rockies	17010210
MT76P003_010	Whitefish River, Whitefish Lake to mouth (Stillwater River)	24.8 miles	B-2	Northern Rockies	17010210
MT76O003_010	Flathead Lake	122,252 acres	A-1	Northern Rockies, Canadian Rockies	17010208

1.2 Impairment Status and Listing History

Table 1.3 summarizes the pollutant impairment listings that appear on the 2014 303(d) list relevant to this project (DEQ 2014). The text below reflects relevant comments in the most recent assessment records for each waterbody.

Whitefish River

Whitefish River was listed for PCBs based on several exceedances of Freshwater Sediment Quality Values and the Lowest Effects Values; the assessment record notes most contaminated sediments occurred near the Burlington Northern freight locomotive fueling area in Whitefish. The current assessment record indicates Aquatic Life as the beneficial use affected by these listings.

Whitefish Lake

Whitefish Lake was listed for PCBs and Hg based on fish consumption advisories. PCBs and Hg were found in lake trout and Hg was found in northern pike. The only PCB concentration found above detection level was 0.069 ug/g in fish from 24.0 to 26.6 inches long; the highest Hg concentration was 0.42 ug/g in lake trout from 24.0 to 26.6 inches long. The advisory limits consumption to one meal/week if fish from this lake is consumed on a regular basis. The current assessment record indicates Aquatic Life as the beneficial use affected by these listings.

Flathead Lake

Flathead Lake was also listed for PCBs and Hg based on fish consumption advisories. Bioaccumulation of Hg and PCBs in fish tissues has resulted in a fish consumption advisory, but no aquatic life standards were exceeded, and Hg and PCBs were not detected in sediments. Hg and PCBs were found in lake trout, and Hg was found in Lake Whitefish. The highest PCB level was 0.38 ug/g in fish between 32.2 and 38.3 inches and the highest Hg level was 0.91 ug/g in fish between 32.2 and 38.3 inches. The advisory limits consumption to one meal/month if fish from this lake is consumed on a regular basis. The current assessment record indicates Aquatic Life as the beneficial use affected by these listings.

Table 1.3 – Flathead Lake, Whitefish Lake and Whitefish River Assessment Units and their 303(d) listings Relevant to this Project

Waterbody Name	Relevant 2014 303(d) Impairment Listings	CFL	Sources that appear with impairment in assessment record
Whitefish Lake	274-Mercury	2000	Source Unknown
	348-Polychlorinated biphenyls	2000	Source Unknown
Whitefish River, Whitefish Lake to mouth (Stillwater River)	473-PCB in Water Column	2000	Industrial Point Source Discharge
			Silviculture Activities
Flathead Lake	348-Polychlorinated biphenyls; 274-Mercury	2000	Atmospheric Deposition - Nitrogen
			Impacts from Hydrostructure Flow Regulation/modification
			Municipal Point Source Discharges
			Silviculture Harvesting
			Upstream Impoundments (e.g., Pl-566 NRCS Structures)
			Source Unknown
			Unspecified Urban Stormwater

1.3 Scope and Purpose

This document presents a plan for completing PCB and Hg monitoring in the Whitefish-Flathead project area during the 2014 field season. **Table 1.4** shows the waterbody segments within the project area to be sampled during the 2014 field season. The parameters to be monitored on each of these waters are also shown. Fourteen waterbody segments will be monitored for PCBs and Hg during the 2014 field season. Sediment monitoring will be conducted in both lakes and rivers, and macroinvertebrate tissue monitoring will be conducted on rivers. A complete list of proposed sites can be found in **Attachment A**.

Table 1.4 – Waterbodies to be Sampled for PCBs and Mercury in the Whitefish-Flathead Project Area during the 2014 Field Season

Waterbody Name	AUID	HUC	Size (miles or acres)	Use Class
SWIFT CREEK, headwaters (East and West Forks) to mouth (Whitefish Lake)	MT76P003_020	17010210	17.28	A-1
EAST FORK SWIFT CREEK, headwaters to mouth (Swift Creek)	MT76P003_030	17010210	9.18	A-1
WEST FORK SWIFT CREEK, headwaters to mouth (Swift Creek)	MT76P003_040	17010210	9.53	A-1
WHITEFISH LAKE	MT76P004_010	17010210	3317.4	A-1
WHITEFISH RIVER, Whitefish Lake to mouth (Stillwater River)	MT76P003_010	17010210	24.8	B-2
HASKILL CREEK Haskill Basin Pond to mouth (Whitefish River)	MT76P003_070	17010210	8.43	A-1
STILLWATER RIVER, Logan Creek to mouth	MT76P001_010	17010210	45.61	B-2
STILLWATER SLOUGH, headwaters (Woodland Park) to mouth (Stillwater River)	MT76P001_070	17010210	2.49	B-1
FLATHEAD RIVER, headwaters to Flathead Lake	MT76O001_010	17010208	53.71	B-1
SOUTH FORK FLATHEAD RIVER, Hungry Horse Dam to mouth	MT76J001_010	17010209[a]	5.31	B-1
ASHLEY CREEK, Kalispell airport road to mouth (Flathead River)	MT76O002_030	17010208	13.17	C-2
FLATHEAD LAKE	MT76O003_010	17010208	122252	A-1
SWAN RIVER, Swan Lake to mouth (Flathead Lake)	MT76K001_010	17010211[a]	15.08	B-1
NORTH FORK FLATHEAD RIVER, Canadian Border to Mouth	MT76Q001_010	17010206[a]	57.93	A-1

[a] These three waters lie outside the HUC boundaries for 17010210 and 17010208 within which a majority of the project area is contained; the monitoring sites on these waters are close to the HUC boundaries.

2.0 Objectives and Design

2.1 Project Objectives

The primary objective of this project is to conduct synoptic PCB and Hg monitoring in Flathead Lake, Whitefish Lake and Whitefish River to describe existing condition of PCB contamination and Hg. Targeted PCB monitoring in additional surface waters throughout these watersheds will also be conducted as a screening tool to help identify potential sources of contamination. Laboratory analyses are unable to attain low enough reporting/detection limits for PCBs in the water column to analyze data against Montana's numeric water quality standards for PCBs, precluding the usefulness of collecting water samples. Therefore, sediment, macroinvertebrate tissue and fish tissue samples are planned for this screening project to better understand the presence, potential source areas and bioaccumulation potential in these waters.

The goals of this monitoring project are as follows:

1. Collect benthic sediment samples in lakes and rivers indicated in **Table 1.4** for analysis of PCB Aroclors, total organic carbon (TOC), particle size, percent moisture and Hg.
2. Collect macroinvertebrate samples in rivers indicated in **Table 1.4** for analysis of PCB Aroclors, percent moisture and Hg.
3. Measure flow on wadeable streams (not lakes or large rivers with gage stations)

PCB and Hg analysis of fish tissue from Whitefish Lake and Flathead Lake will also be conducted in conjunction with this project. Fish sample collection will be conducted by Montana Department of Fish, Wildlife and Parks and fish sample analysis will be completed by Energy Laboratories, Inc., via EPA's Order No EP-14-8-000009 (requisition/reference no. PR-R8-14-00140).

Data collected under this SAP will be used by DEQ and EPA in meeting a court-ordered requirement to "prepare and submit to Plaintiffs a report describing the results of EPA's monitoring and assessment work on the additional 12 waterbodies listed in Attachment B to the proposed Second Amended Judgment…" in *Friends of the Wild Swan Inc. et al., v. U.S. Environmental Protection Agency, et al. and State of Montana, ex rel. Department of Environmental Quality, et al.* (Case 9:97-cv-00035-DWM). This report will document the scope and basis for the PCB project, data gaps, monitoring efforts, preliminary results and future steps to be taken.

2.2 Sampling Timeframe

Unusually high flows can wash out, redistribute, or bury sediment deposits; whenever possible, sediment sampling will be delayed following major discharge events (e.g., runoff conditions, storm events) to allow fresh sediment to deposit. Further, sampling for bed sediment and tissues during summer or autumn low-flow conditions is recommended to provide maximum direct access to the stream bed and to minimize seasonal streamflow variability (USGS 1994). As such, sediment and macroinvertebrate samples collection will occur during two sampling events in the 2014 summer field season, in August and September.

Lake sampling will be targeted to the August sampling event when weather conditions are expected to be most stable and to allow for completion in September in case of weather or equipment delays.

As described in the QAPP (USEPA 2014), fish tissue monitoring will occur between April and June, 2014.

2.3 Selection of Sites

The three waterbodies that are identified in Attachment B of the TMDL court order specified the minimum scope of this monitoring project. Additional surface waters were identified that have a substantial influence on the water quality of the three impaired waters (i.e., major tributaries). In addition, several waters in the region which do not have any apparent link to potential PCB sources were chosen for monitoring to represent reference conditions with respect to PCB contamination.

Specific site locations within the streams listed in **Table 1.4** (see **Attachment A**) were identified using GIS, topographic maps, and existing monitoring site locations in EPA's STORET database. To identify specific sampling locations, first research was conducted to identify common uses and sources of PCBs; these are summarized in **Attachment B**. This list of common PCB sources was then compared to DEQ's records of permitted facilities and remediation sites in the project area. Facilities or sites that can be considered potential sources of PCB contamination were identified and mapped. The types of facilities that exist in the Whitefish-Flathead PCB and Hg Monitoring Project Area that were considered as

potential PCB sources based on the source assessment in **Attachment B** are summarized in **Attachment C**. Specific site locations were chosen on all waters indicated in **Table 1.4** based on proximity to these facilities and sites.

Lake sampling sites are generally located: 1) in bays where the depositional zones from major tributaries are situated, 2) at sites representative of the deepest regions of the lake where deposition and settling over time has occurred and, where applicable, 3) near regions of the shoreline where PCB contamination is known to have existed in the past.

River (and stream), sampling sites are generally located upstream and downstream of the known or suspected mixing zone of facilities or sites that are potential PCB sources. Where long reaches of rivers did not appear to have any potential PCB sources, consideration was given to relatively even spacing of sampling locations for screening and overall characterization of the waterbody's condition. Public access points along rivers were also considered when choosing sampling sites. For the potential reference sites on rivers, sites were situated upstream from any suspected near-site PCB contamination sources (i.e., excluding aerial deposition).

A complete list of the proposed lake and river segments and proposed monitoring sites in the Whitefish-Flathead Project Area in 2014 can be found in **Attachment A**. One visit will be made to each site during the 2014 field season. These sites are proposed locations and changes may be made based on land access or other unforeseen problems. **Attachment A** also summarizes the sampling needs per site visit to each of these waterbodies.

3.0 Field Sampling Methods

3.1 Sampling Design for Collecting Sediment in Lakes

As described in **Section 2.3**, regions of the lakes were selected for monitoring based on professional judgment and prior information about proximity to suspected or potential sources of PCB contamination (i.e., judgmental sampling design). Within each monitoring region (e.g., bays, remediation sites, deep lake), a systematic random grid sampling design will be used to guide sample collection (USEPA 2002, USFWS 2014).

The size of the lake sediment sampling grid superimposed over a proposed sampling locale will be scaled to the relative size of the depositional area the screening is intended to capture; this approach is intended to accommodate the fact that some regions of the lake selected for sampling are *larger* (e.g., depositional area of large tributaries cover a broad area, or deepest regions of lakes shown on bathymetric maps cover a broad area) or *smaller* (e.g., depositional areas of smaller tributaries are confined to narrow bays such that use of a larger grid size would result in much of the grid area being over dry land rather than immersed). The grid specifications are provided in **Table 3.1**. The grid size intended to be used per proposed lake monitoring site location is indicated in **Table 3.2**.

Table 3.1 – Specifications for small and large grids used for sediment sampling in lakes.

Grid Category	Total Grid Length (m)	Length per Plot (m)	Total Grid Area (m^2)	Total Grid Area (km^2)

Small	300	60	90,000	90
Medium	600	120	360,000	360
Large	1,200	240	1,440,000	1,440
Extra large	2,400	480	5,760,000	5,760

Table 3.2 – Grid sizes used per proposed lake sampling location on Whitefish and Flathead Lakes

Waterbody	Site Description	Latitude	Longitude	Grid Size
Flathead Lake	mid-lake deep (above Flathead Reservation boundary)	47.8906	-114.0673	600 m
	near Swan River inflow	48.0572	-114.0842	1,200 m
	near Flathead River inflow between Somers and Bigfork	48.0558	-114.1298	2,400 m
	Somers Bay near BN Somers remediation site and storage pond	48.0748	-114.2171	1,200 m
	near Salmon Hatchery	48.0587	-114.2393	300 m
Flathead Lake/Bigfork Bay	near marina with concentrated boat activity; swan river influence	48.0617	-114.0759	300 m
Whitefish Lake	near Swift Creek inflow	48.4802	-114.4240	600 m
	mid-lake deep	48.4731	-114.3964	300 m
	bay near BN Derailment remediation site on west shore	48.4514	-114.3914	300 m
	near outflow to Whitefish River	48.4174	-114.3553	600 m

The total area of each grid will be divided into 25 plots of equal area (**Figure 3.1**). Grid area was determined using GIS measuring tools to approximate the dimensions of the depositional areas characteristic of the potential PCB sources which led each proposed lake region to be selected for monitoring. Each grid is positioned North-South and will encompass the targeted depositional area.

Each plot defined by the grid will be assigned a number (1 through 25, left to right, top to bottom; **Figure 3.1**). Some portion of grids may overlap onto dry land; each plot within a grid will be characterized as to whether or not it is immersed during the sampling season, and plots whose center falls entirely or mostly on land will be eliminated (**Figure 3.2**). The remaining immersed plots will be sampled using random number generation to define five plots per grid, as shown in **Figure 3.1**. These plots will define the area from which samples will be collected. As detailed in **Section 3.2**, one sediment grab sample will be collected from each of the five plots; these sub-samples will be composited for the final sample. Five sub-samples will adequately provide a physical average of surface sediment concentrations over a reasonable area and provide enough material for analysis (Wash. Dept. of Ecology 2003, 2014, USGS 1994, ORSANCO 2002).

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Figure 3.1 – Example of numbering scheme and random number generator used to sample plots within grid.

Figure 3.2 – Example of small and large grid placement and plot selection

3.2 Lake Sediment Sample Collection Protocol

The field crew will navigate via boat to the center of each of the plots chosen via random number generation; allowing reasonable variability in location given GPS accuracy and wind conditions.

3.2.1 Document the Site

Upon arrival at the designated sampling location (center of plot), deploy the anchor setting on the trolling motor. Check the GPS occasionally throughout the sampling process to ensure that the boat remains as near to the designated plot center that GPS accuracy and wind conditions allow.

Record site identifier information on the Site Visit Form, including site name, plot number, latitude, longitude, and water depth.

Use the digital camera to take site photographs, at a minimum, facing North, East, South and West. Record the pertinent photo information on the Photo Form.

3.2.2 Deploy the Grab Sampler

Near the center of each of the five plots identified via random number generation, collect one surficial sediment sample using a standard stainless steel Ponar clamshell-style grab sampler (ORSANCO 2002, USEPA 2013, Wash. Dept. of Ecology 2003, Puget Sound Water Quality Action Team 1997).

- Attach the Ponar using rope to the winch. Secure the jaws of the Ponar open and fit the spring-loaded pin in place. Lower the Ponar to allow contact with the lake bed to trigger the Ponar jaw closure.
- The Ponar should penetrate at least 6-10 centimeters. Sediment grab samples for PCB and Hg analysis will target the 0-10 centimeter depth considered to be the biologically active zone (Ohio EPA 2001).
- Once the Ponar has come into contact with the lake bed and you are confident that the device clamped shut and contains a sediment sample, use the winch to retrieve the Ponar. Take care to lower and retrieve the Ponar at a slow and even pace to avoid the loss of fine sediment due to “blow-out” when the dredge strikes the bottom and “wash-out” during dredge retrieval (ORSANCO 2002).
- Bring the Ponar into the boat, detach the Ponar from the winch and place it in a broad-bottomed, shallow stainless steel pan.

Following collection of each sediment grab, remove the stainless steel screens from the Ponar and evaluate the sample for acceptability. A grab will be considered acceptable if it is not underfilled, overlaying water is present but is not overly turbid, the sediment surface appears intact, and the grab reached the desired sediment depth (Ohio EPA 2001).

Once a grab is deemed acceptable,

- Pour overlying water off the sample.
- Record a brief description of the sample (e.g., color, texture, odor, organic matter content, presence of biota or foreign matter) on the Lake Site Visit Form comments field.

3.2.3 Collect the Sub-Samples

Remove equal volumes of sediment from each of the five grabs collected (one per five chosen plots within the grid) to form one composite sample:

- After recording physical measurements, use a stainless steel spoon to remove sediment from the Ponar.
- Collect sediment from the top 2-5 centimeters of the grab (Wash. Dept. of Ecology 2003, 2007, 2011, ORSANCO 2002, USGS 1994), representing the ongoing fish exposure medium (Wash. Dept. of Ecology 2003).
- Do not retain debris on the sediment surface or sediments that have been in contact with the metal sides of the grab sampler for analysis (Wash. Dept. of Ecology 2003, USGS 1994).
- Place the sample collected from each of the five grabs into a stainless steel bowl. A total volume of approximately 1.5 L of wet sediment from the five plots is desired (USGS 1994).
- Store this sample on ice (< 6degC) between sampling efforts at each plot.

3.2.4 Composite and Sieve the Sub-Samples

Once all five plots within the grid have been sampled and before transfer to the sample jars, use a stainless steel spoon to homogenize by stirring the composite sample to a uniform consistency and color (ORSANCO 2002, USEPA 2003, Wash. Dept. of Ecology 2007, 2014, Puget Sound Water Quality Action Team 1997).

To increase the probability of detecting trace elements and to enhance the comparability of data among sites, bed-sediment samples should be sieved and the fine-grained fraction analyzed for the contaminants of interest. For trace elements (Hg), the silt-clay fraction smaller than 63 micron should be saved for analysis. For organic contaminants including PCBs, the sand and silt-clay fraction smaller than 2.0 mm should be saved for analysis (USGS 1994).

Sieve and collect the Hg sample:

Prior to collecting the final Hg sample in the field, use a Buchner funnel to remove particles larger than 60-micron:

- Place the Teflon 60-micron mesh sieve between the two pieces of the Buchner funnel. Place the end of the funnel in the 120 mL (4 oz.) wide-mouth glass sample bottle.
- Use a non-metallic spoon or turkey baster to scoop sediment from the homogenized composite mixture onto the sieve in the funnel. Scoop enough sediment so the sieve is completely covered.
- If necessary to pass sediments through the mesh, use the spoon or turkey baster to add minimal amounts of ambient stream water over the sediment in the funnel (ORSANCO 2002). Stir the water and sediment in the funnel to create fine sediment slurry, being cautious not to damage the mesh. Allow the slurry to filter into the sample bottle. Use a minimal amount of water, only as needed. The Hg analysis will require 50 g wet weight (approx. 10 g dry weight) of sieved sediment (equivalent to approximately 2 ounces or 60 ml).
- Tighten cap on bottle and label with activity ID, waterbody name, sample type, collection date and collector's name.
- Store samples completely surrounded with ice in a cooler at < 6degC until delivery to the laboratory for analysis.

Sieve and collect the PCB sample:
Prior to collecting the PCB and TOC sample in the field, use a stainless steel sieve (U.S. standard #10) to remove particles larger than 2mm:

- Agitate and stir with a stainless steel spoon and use the stainless steel spoon to add minimal additions of site native water only as needed to sieve the composite, homogenized sediment sample (from the stainless steel bowl) into a stainless steel bucket (ORSANCO 2002).
- Once sieved, use a stainless steel spoon and stainless steel funnel to transfer sieved sediments into a 1 liter (approx. 32 oz.) glass jar with a Teflon lid liner (ORSANCO 2002, Wash. Dept. of Ecology 2007, 2014). It is preferable to fill the 1L jar if there is sufficient sample to do so; the lab needs a minimum of 250-300 grams of wet sample for these three analyses (approximately 8oz. jar full).
- Tighten cap on jar and label with activity ID, waterbody name, sample type, collection date and collector's name.
- Store samples completely surrounded with ice in a cooler at < 6degC until delivery to the laboratory for analysis.

3.2.5 Decontamination of Lake Sediment Equipment

To avoid cross-contamination between sample sites, all collection equipment and supplies that may come into contact with the sample should be cleaned prior to use. A tiered approach to decontamination will be used in which a more thorough cleaning procedure is conducted before moving to a different sampling location (grid) and a less-thorough procedure before moving on to a different plot within the same grid.

Between sub-sample collections at plots within the same grid, clean all collection equipment used to collect sediment and obtain PCB sample (e.g., Ponar grab sampler, pans, spoons, scoops and compositing trays) that may come into contact with the sample prior to use as follows:

1. Scrub with a brush and phosphate-free Alconox or Liquinox Soap
2. Thoroughly rinse with in situ (site native) water
3. Perform secondary rinse with ASTM (distilled) water
4. Allow to air dry

Thoroughly rinse all equipment used for Hg sieving and sample collection (i.e., Buchner funnel, mesh, and spoon or turkey baster) with dilute nitric acid (5%). Rinse equipment again with distilled water after acid wash is complete.

Once all sub-sampling within a grid is complete, clean all collection equipment used to collect sediment and obtain PCB sample (e.g., Ponar grab sampler, pans, spoons, scoops and compositing trays) that may come into contact with the sample prior to use as follows:

1. Scrub with a brush and phosphate-free Alconox or Liquinox Soap
2. Thoroughly rinse with in situ (site native) water
3. Perform secondary rinse with ASTM (distilled) water
4. Perform tertiary rinse using certified ACS HPLC grade hexane. Decontamination with solvents should always be performed on an open deck of a vessel or outdoors if on land. All solvent and acid rinses should be followed by thorough rinses with analyte-free water. All decontamination fluids that include solvents or acid rinses should be properly contained and not allowed to enter

the environment. Evaporation of small amounts of residual solvent into the air is acceptable (Puget Sound Water Quality Action Team 1997, ORSANCO 2002, Ohio EPA 2001).
5. Perform final rinse with ASTM (distilled) water
6. Allow to air dry
7. Wrap cleaned, decontaminated, and dried equipment in aluminum foil or seal in recloseable plastic bags during transport to the next grid.

Thoroughly rinse all equipment used for Hg sieving and sample collection (i.e., Buchner funnel, mesh, and spoon or turkey baster) with dilute nitric acid (5%). Rinse equipment again with distilled water after acid wash is complete.

3.3 Sampling Design and Collection Protocol for Sediment in Rivers and Streams

As described in **Section 3.1**, regions of the rivers were selected for monitoring based on professional judgment and prior information about proximity to suspected or potential sources of PCB contamination (i.e., judgmental sampling design). Within each river region selected for monitoring (e.g., downstream from remediation sites or permitted facilities that are potential PCB sources, below major tributaries, near mouths of major tributaries), a sampling frame will be used to guide sample collection.

3.3.1 Document the Site

Upon arrival at the designated sampling location (proposed lat/longs), verify access to near-shore sediment depositional zones. If the site is deemed acceptable, record site identifier information on field form, including site name, plot number, and latitude/longitude. A site is considered acceptable if at least five depositional zones of fine sediment are accessible in water < 0.5 m deep within 50-m upstream and downstream of the site.

Use the digital camera to take site photographs, at a minimum, across channel, facing upstream and facing downstream. Record the pertinent photo information on a Photo Form.

3.3.2 Sediment Sampling Frame

Identify the sampling frame from which the sample will be collected. The goal of the sample frame is to gain a representation of the stream segment being considered in the assessment in areas most likely to be influenced by human activities (Kusnierz, *et. al*., 2013). The sampling frame specifications are as follows:

- relatively homogenous to ensure data representativeness
- encompass a reach of river approximately 50 meters up- and downstream from the initial arrival site (~100 m total). A longer sampling frame is acceptable if depositional zones cannot be easily located and access permits (USGS 1994, DEQ 2011a, USFWS 2010).
- depositional zones on both banks will be included within the sampling frame if access allows; if not, collection on one bank is acceptable

3.3.3 Collect the Sub-Samples

Identify at least five depositional zones within the sampling frame at each sampling site.

- Sample Collection Strategy: focuses on obtaining samples of fine-grained surficial sediments from natural depositional zones during low-flow conditions and on compositing samples from several depositional zones within a stream reach. Designed to yield a representative sample of fine-grained surficial bed sediments (USGS 1994).
- Depositional Zones: Locations in streams where the energy regime is low and fine-grained particles accumulate in the stream bed. Depositional zones can cover large areas at some sites and small pockets at other sites. The ideal site-planning procedure is to identify 5 to 10 wadeable depositional zones containing fine-grained particulate matter at each site and to estimate the areal extent of each zone. The goal is to select depositional zones that represent upstream influences and various flow regimes; that is, left bank, right bank, center channel, and different depths of water. This will ensure that the sediment sample represents depositional patterns from various flow regimes and sources within the reach (USGS 1994).

Collect sub-samples of equal volumes of sediment from each of five depositional zones within the sampling frame to form one composite sample:

- Use a stainless steel spoon to remove sediment from the depositional zone and place the sediment in a stainless steel bowl. A total volume of approximately 1.5 L of wet sediment from the five plots is desired (USGS 1994). Compositing will smooth the local scale variability and represent the average contaminant levels present at the site (USGS 1994).
- Collect sediment from the top 2-5 centimeters of the bed surface (USGS 1994, ORSANCO 2002, Wash. Dept. of Ecology 2003, 2007), representing the ongoing fish exposure medium (Wash. Dept. of Ecology 2003).
- Do not retain debris on the sediment surface.
- Sampling depth: Collect sub-samples from the nearshore zone in water less than 0.5 m deep as a safety measure and to minimize loss (wash-out) of surficial fine sediments as the sub-sample is drawn up through the water column (DEQ 2011b, USFWS 2010).
- Sub-sampling: Subsample each depositional zone at a sampling site several times and composite all subsamples collected from depositional zones sampled at the same site. Base the number of samples from each zone on the areal size of each zone (that is, the larger the areal size of the zone, the greater the number of subsamples collected).
- Sampling timing: Unusually high flows can wash out, redistribute, or bury substantial parts of semi- meant deposits; therefore, sampling should be delayed following major discharge to allow fresh sediment to deposit. When sampling for bed sediment and tissues during summer or autumn, low-flow conditions are recommended to provide maximum direct access to the stream bed and to minimize seasonal streamflow variability (USGS 1994).
- Store this sample on ice (< 6degC) between sampling efforts at each depositional zone.

3.3.4 Composite and Sieve the Sub-Samples

To increase the probability of detecting trace elements and to enhance the comparability of data among sites, bed-sediment samples should be sieved and the fine-grained fraction analyzed for the contaminants of interest. For trace elements (Hg), the silt-clay fraction smaller than 60 m should be saved for analysis. For organic contaminants including PCBs, the sand and silt-clay fraction smaller than 2.0 mm should be saved for analysis (USGS 1994).

Once all five depositional zones have been sampled and before transfer to the sample jars, use a stainless steel spoon to homogenize by stirring the composite sample to a uniform consistency and color (ORSANCO 2002, USEPA 2003, Puget Sound Water Quality Action Team 1997, Wash. Dept. of Ecology 2007, 2014).

Sieve and collect the Hg sample:
Prior to collecting the final Hg sample in the field, use a Buchner funnel to remove particles larger than 60-micron:

- Place the Teflon 60-micron mesh sieve between the two pieces of the Buchner funnel. Place the end of the funnel in the 60 mL (4 oz.) glass sample bottle.
- Use a non-metallic spoon or turkey baster to scoop sediment from the homogenized composite mixture onto the sieve in the funnel. Scoop enough sediment so the sieve is completely covered.
- If necessary to pass sediments through the mesh, use the spoon or turkey baster to add minimal amounts of ambient stream water over the sediment in the funnel (ORSANCO 2002). Stir the water and sediment in the funnel, being cautious not to damage the mesh, to create fine sediment slurry. Allow the slurry to filter into the sample bottle. Use a minimal amount of water, only as needed. The Hg analysis will require 50 g (wet weight) (approx. 10 g dry weight) of sieved sediment (equivalent to approximately 2 ounces or 60 ml).
- Tighten cap on bottle and label with activity ID, waterbody name, sample type, collection date and collector's name.
- Store samples completely surrounded with ice in a cooler at <6 degC until delivery to the laboratory for analysis.

Sieve and collect the PCB sample:
Prior to collecting the final PCB and TOC sample in the field, use a stainless steel sieve (U.S. standard #10) to remove particles larger than 2mm:

- Agitate and stir with a stainless steel spoon and use the stainless steel spoon to add minimal additions of site native water only as needed to sieve the composite, homogenized sediment sample (from the stainless steel bowl) into a stainless steel bucket (ORSANCO 2002).
- Once sieved, use a stainless steel spoon and stainless steel funnel to transfer sieved sediments into a 1 liter (approx. 32 oz.) glass jar with a Teflon lid liner (ORSANCO 2002, Wash. Dept. of Ecology 2007, 2014). It is preferable to fill the 1L jar if there is sufficient sample to do so; the lab needs a minimum of 250-300 grams of wet sample for these three analyses (approx. 8oz. jar full).
- Tighten cap on jar and label with activity ID, waterbody name, sample type, collection date and collector's name.

3.3.5 Decontamination of River/Stream Sediment Equipment

To avoid cross-contamination between sample sites, all collection equipment and supplies that may come into contact with the sample should be cleaned prior to use. A tiered approach to decontamination will be used in which a more thorough cleaning procedure is conducted before moving to a different sampling location (sampling frame) and a less-thorough procedure before moving on to a different depositional zone within the same sampling frame.

Between sub-sample collections at plots within the same grid, clean all collection equipment used to collect sediment and obtain PCB sample (e.g., Ponar grab sampler, pans, spoons, scoops and compositing trays) that may come into contact with the sample prior to use as follows:

1. Scrub with a brush and phosphate-free Alconox or Liquinox Soap
2. Thoroughly rinse with in situ (site native) water
3. Perform secondary rinse with ASTM (distilled) water
4. Allow to air dry

Thoroughly rinse all equipment used for Hg sieving and sample collection (i.e., Buchner funnel, mesh, and spoon or turkey baster) with dilute nitric acid (5%). Rinse equipment again with distilled water after acid wash is complete.

Once all sub-sampling within a grid is complete, clean all collection equipment used to collect sediment and obtain PCB sample (e.g., Ponar grab sampler, pans, spoons, scoops and compositing trays) that may come into contact with the sample prior to use as follows:

1. Scrub with a brush and phosphate-free Alconox or Liquinox Soap
2. Thoroughly rinse with in situ (site native) water
3. Perform secondary rinse with ASTM (distilled) water
4. Perform tertiary rinse using using certified ACS HPLC grade hexane (cite Washington Dept. of Ecology). Decontamination with solvents should always be performed on an open deck of a vessel or outdoors if on land. All solvent and acid rinses should be followed by thorough rinses with analyte-free water. All decontamination fluids that include solvents or acid rinses should be properly contained and not allowed to enter the environment. Evaporation of small amounts of residual solvent into the air is acceptable (Puget Sound Water Quality Action Team 1997, ORSANCO 2002, Ohio EPA 2001).
5. Perform final rinse with ASTM (distilled) water
6. Allow to air dry
7. Wrap cleaned, decontaminated, and dried equipment in aluminum foil or seal in recloseable plastic bags during transport to the next grid.

Thoroughly rinse all equipment used for Hg sieving and sample collection (i.e., Buchner funnel, mesh, and spoon or turkey baster) with dilute nitric acid (5%). Rinse equipment again with distilled water after acid wash is complete.

3.4 Sample Collection Protocol for Macroinvertebrates in Rivers and Streams

One composite benthic macroinvertebrate sample will be collected at each river or stream site identified in **Table 1.4**. Macroinvertebrate collection will follow the methods defined in the EPA's rapid bioassessment protocol (Barbour *et al.* 1999); these methods were originally developed for collection of macroinvertebrates for taxonomic identification. This method focuses on a multihabitat scheme designed to sample major habitats in proportional representation within a sampling reach. Benthic macroinvertebrates are collected systematically from all available instream habitats by kicking or jabbing the substrate with a D-frame dip net. A total of 20 jabs/kicks are taken from all major habitat types in the reach resulting in sampling of approximately 3.1 m^2 of habitat (Barbour, *et al.* 1999).

Aspects of the macroinvertebrate collection protocol outlined in this document are also modeled after EPA's Environmental Monitoring and Assessment Protocol (EMAP) reach wide sampling technique (Peck, *et al.,* 2006) and DEQ's Sample Collection, Sorting, Taxonomic Identification, and Analysis of Benthic Macroinvertebrate Communities Standard Operating Procedure (DEQ 2012a).

3.4.1 Macroinvertebrate Sampling Frame

Identify the sampling frame from which the sample will be collected. The goal of the sample frame is to gain a representation of the stream segment being considered in the assessment in areas most likely to be influenced by human activities. The sampling frame used for macroinvertebrate collection will be reasonably equivalent to that used for sediment sampling as described in **Section 3.3.2**. The sampling frame specifications are as follows:

- Relatively homogenous to ensure data representativeness. Whenever possible, the area should be at least 100 m upstream from any road or bridge crossing to minimize its effect on stream velocity, depth and overall habitat quality, and there should be no major tributaries discharging to the stream in the study area.
- Encompasses a reach of river approximately 50 meters up- and downstream from the initial arrival site (~100 m total). A longer sampling frame is acceptable if access permits and is deemed useful to capture additional habitat types.
- Includes macroinvertebrate habitats on both banks within the sampling frame if access allows; if not, collection on one bank is acceptable

3.4.2 Identify habitat types and associated collection techniques

Sample different habitat types (see **Section 3.4.3**) in approximate proportion to their representation of surface area of the total macroinvertebrate habitat in the reach.

- For example, if cobble riffles comprise 50% of the habitat in the sampling frame, and snags comprise 20%, then 10 jabs should be taken in riffle areas and 4 jabs should be taken in snag material. The remaining 6 jabs would be taken in any remaining habitat type.
- Habitat types contributing less than 5% of the stable habitat in the sampling frame should not be sampled.

3.4.3 Habitat Types

The following describes habitat types that may be encountered and tips for collecting macroinvertebrate samples in each (Barbour, *et. al*., 1999):

<u>Cobble (hard substrate):</u> Prevalent in riffles (and runs) and often dominant in high-gradient, mountain streams. Sample shallow areas with coarse (mixed gravel, cobble or larger) substrates by holding the bottom of the dip net against the substrate and dislodging organisms by kicking the substrate for 0.5 m upstream of the net.

<u>Snags and other woody debris:</u> Snags and other woody debris that have been submerged for a relatively long period (not recent deadfall) provide excellent colonization habitat. Sample submerged woody debris by jabbing in medium-sized snag material (sticks and branches). The snag habitat may be kicked first to help dislodge organisms, but only after placing the net downstream of the snag. Accumulated woody material in pool areas are considered snag habitat. Large logs should be avoided because they are generally difficult to sample adequately.

<u>Vegetated banks:</u> When lower banks are submerged and have roots and emergent plants associated with them, they are sampled in a fashion similar to snags. Submerged areas of undercut banks are

good habitats to sample. Sample banks with protruding roots and plants by jabbing into the habitat. Bank habitat can be kicked first to help dislodge organisms, but only after placing the net downstream.

Submerged macrophytes: Submerged macrophytes are seasonal in their occurrence and may not be a common feature of many streams, particularly those that are high gradient. Sample aquatic plants that are rooted on the bottom of the stream in deep water by drawing the net through the vegetation from the bottom to the surface of the water (maximum of 0.5 m each jab). In shallow water, sample by numbing or jabbing the net along the bottom in the rooted area, avoiding sediments where possible.

Sand (and other fine sediment): Usually the least productive macroinvertebrate habitat in streams, this habitat may be the most prevalent in some streams. Sample banks of unvegetated or soft soil by bumping the net along the surface of the substrate rather than dragging the net through soft substrates; this reduces the amount of debris in the sample.

3.4.4 Collect the Macroinvertebrate Tissue Sample

Begin sampling at the downstream end of the reach and proceed upstream. Collect a total of 20 jabs or kick samples over the length of the reach:

- A single jab consists of forcefully thrusting the net into a productive habitat for a linear distance of 0.5 m.
- A kick is a stationary sampling accomplished by positioning the net and disturbing the substrate for a distance of 0.5 m upstream of the net. Position a 500um D-frame kick net within the representative habitat type and hold the net vertically upright with the base of the frame in contact with the substrate and the open portion of the net facing into the flow.
- Collect a kick or jab sample at each of 20 sampling locations by first picking up any substrate within a 1ft^2 area in front of the net that is golf ball size or larger and cleaning them off into the net. Then disturb the substrate over the same 1 ft^2 area immediately in front of the net for 30 seconds. Carefully avoid sweeping the substrate and organisms out of the path of flow in front of the net opening while kicking or jabbing. If there is no flow, use your hands or feet to push material into the net. If there is no flow, and the sampling location is full of aquatic vegetation, sweep the net over the 1 ft^2 area while disturbing the substrate.

3.4.5 Sample transfer, preservation, and storage

The jabs/kicks collected from multiple habitats within the sampling frame will be composited to obtain a single sample. Periodically (i.e., after every 3 jabs or kicks, or more often if necessary) rinse and transfer the sample into a container for macroinvertebrate collection, as follows (Barbour, et al. 1999; Bautts *et al*. 2005, Arcadis 2012):

- Rinse the collected material by running clean stream water through the net two to three times.
- Empty the contents of the net into a plastic bucket or shallow-bottomed tray. Remove large debris after rinsing and inspecting it for organisms. Do not spend time inspecting small debris in the field.
- Use forceps to collect macroinvertebrates from the tray and place them into a 4oz. wide-mouth glass sample jar with a Teflon lid. Target organisms used for the PCB tissue analysis will be determined in the field based on size and availability (i.e., larger and/or more common organisms are preferred and multiple species may be combined in a sample to meet mass

requirements as needed). An effort will be made to collect similar types of organisms at each of the three sample locations to ensure data comparability.

- ***The laboratory needs as much sample as possible, at least 50 grams (wet weight) of macroinvertebrates, to report on a dry weight basis.
- Rinse the hand-picked organisms with clean stream water to remove attached sediments.
- Weigh the sample with a battery-powered field balance. Collect a total wet weight of at least 50 g of benthic macroinvertebrates within the sampling frame. ***If at least 50g of insects are not collected from the initial 20 jabs/kicks, additional jabs/kicks will be performed as needed (again in relative proportion to the habitat types available) until the minimum sample size has been achieved.
- Label the sample jar with waterbody name, site visit code, collection date and collector's name.
- Store the sample frozen (on dry ice) at < 0degC.

3.4.6 Describe the habitat types and macroinvertebrates sampled

On the Summary Form, record the following:

1. percentage of each habitat type in the reach
2. dominant species present in the sample
3. conditions of the sampling, e.g., high flows, treacherous rocks, difficult access to stream, or anything that would indicate adverse sampling conditions.

3.4.7 Precautions and Quality Control in the Field

- Take care when looking for suitable sampling sites not to disturb the substrate or habitat in areas where samples might be collected as samples collected in disturbed substrate may not be representative of the community.
- Pack and store collection bottles upright and securely sealed to prevent the loss of during transport or delivery.

3.4.8 Decontamination of Macroinvertebrate Equipment

After sampling has been completed at a given site, all nets, pans, etc. that have come in contact with the sample should be rinsed thoroughly, examined carefully, and picked free of organisms or debris. The equipment should be examined again prior to use at the next sampling site.

3.5 Sample Containers, Preservation and Holding Times

Table 3.2 summarizes the amount of sample, the container, the preservation, storage and holding time for each parameter being analyzed by Energy Laboratory, Inc., including sediment, macroinvertebrate tissue and equipment blanks (rinse water).

Table 3.2 - Sampling Volumes, Containers, Preservation, and Holding Times

Analyte	Sample Size[2]	Container	Preservation	Storage	Holding Time
Sediment [1]					

PCB Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	50 g	1 L (32 oz.) glass widemouth jar w/ Teflon lid liner; fill if possible but 250-300 g (8-10 oz.) minimum[2]	None	Store at <6°C	14 days (Extraction); 40 days (Analysis)
TOC	50 g				14 days
Particle Size	50 g				6 Months
% Moisture	50 g				-
Mercury (Hg)	50 g	120 mL (4 oz.) glass widemouth jar	None	Store at <6°C	28 days
Macroinvertebrate Tissue					
PCB Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	50 g	4 oz. glass widemouth jar w/ Teflon lid liner	None	Freeze (on dry ice)	14 days (Extraction); 40 days (Analysis)
Percent Moisture, PCB					
Sonication Extraction					
Mercury (Hg)	10 g				28 days
Percent Moisture, Hg	10 g				
Water (rinse water for equipment blanks only)					
PCB Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	1 L	1 L (32 oz.) glass	None	Store at <6°C	40 days
Hg	250 mL	250 mL HDPE	Nitric Acid		28 days

[1] Two sample jars will be collected: the first (1L) for PCB, TOC, particle size and % moisture analysis will be sieved to 2mm, and the second (60mL) for Hg will be sieved to 63 micron.

[2] The lab needs 250-300 grams (8 oz. jar) total of sediment as a minimum, which would supply sufficient sample for QC and reruns if necessary. The lab uses 50 grams for PCB, 50 grams for TOC and 50 grams for particle size analysis, but needs extra of each to do QC.

4.0 Sample Handling Procedures

Field samples will be collected and preserved in accordance to **Section 3**. DEQ monitoring crews will be responsible for proper labeling, sample custody documentation and storage in accordance to the specifications in the Field Procedures Manual (DEQ 2012b) and this SAP. Sediment and macroinvertebrate samples will be delivered to Energy Laboratories, Inc. for analysis within the holding time specified in **Table 3.2**.

Sediment samples will be stored completely surrounded with ice in a cooler at < 6 degC until delivery to the laboratory for analysis. Macroinvertebrate samples will be kept in a cooler frozen with dry ice (< 0 degC) until delivery to the laboratory for analysis.

A summary of sample quantity, sample container sizes, preservation and storage specifications can be found in **Section 3.5** in **Table 3.2**.

5.0 Laboratory Analytical Measurements

Sediment and macroinvertebrate samples, as well as water samples serving as equipment blanks (rinse water), will be analyzed using the methods listed in **Table 5.1**. In addition, **Table 5.1** lists the required reporting limits to effectively evaluate the data to meet the project objectives.

Table 5.1 - Analytical Methods and Required Reporting Limits

Analyte	Method	Req. Reporting Limit
Sediment		
PCB Aroclors (1016, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	SW 8082 (Extraction Method 3540 or 3541)	0.017 mg/kg (dry wt.)
PCB Aroclor 1221		0.033 mg/kg (dry wt.)
TOC	ASA29-3	0.02%
Percent Moisture	D2974	0.2 wt%
Particle Size	ASA15-5	1%
Mercury (Hg in solids by CVAA)	7471B (Hg digestion method 7471A)	0.05 mg/Kg (dry wt.)
Macroinvertebrate PCB		
PCB Aroclors (1016, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	SW 8082 (Extraction Method 3540 or 3541)	0.017 mg/kg (dry wt.)
PCB Aroclor 1221		0.033 mg/kg (dry wt.)
Mercury	7471B (primary); 7473 (alternate)[1]	0.05 mg/kg (dry wt.)
Water (rinse water for equipment blanks only)		
PCB Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268)	SW8082	0.5 ug/L
Mercury	241.5	0.005 mg/L

[1] Use method 7471B if sufficient sample size allows; use 7473 (direct analysis without digestion) only if there is insufficient sample for 7471B.

Note: The total PCB concentration in each sediment sample is calculated by summing dry-weight concentrations of all individual Aroclors.

6.0 Quality Assurance and Quality Control Requirements

6.1 Field Quality Control Samples

6.1.1 Field Duplicates

Field duplicates for lake sediment sampling
There will be one duplicate sediment sample collected from each lake (Whitefish and Flathead). One grid will be randomly selected during sampling efforts at each lake. After all sub-samples from the five plots within the grid have been collected, homogenized and sieved, duplicate samples will be collected. To collect duplicate samples, all procedures performed in collecting the routine sample for both PCBs and Hg will be followed and the duplicate samples will be submitted to the analytical laboratory along with routine samples.

Field duplicates for river sediment sampling
There will one duplicate sediment sample collected from each of two randomly-selected river or stream sampling sites. One duplicate will be collected during the August sampling event and the second duplicate will be collected during the September sampling event. After all sub-samples from the five depositional zones within the sampling frame have been collected, homogenized and sieved, duplicate samples will be collected. To collect duplicate samples, all procedures performed in collecting the routine sample for both PCBs and Hg will be followed and the duplicate samples will be submitted to the analytical laboratory along with routine samples.

Field duplicates for river macroinvertebrate sampling
There will be one duplicate macroinvertebrate sample collected during from one randomly-selected sampling site during either the August or September sampling event. To collect duplicate samples, all procedures performed in collecting the routine sample will be followed and the duplicate samples will be submitted to the analytical laboratory along with routine samples. If sufficient macroinvertebrate tissue wet weight is collected in the initial 20 jabs as specified in the collection protocol, the duplicate sample will be collected from these 20 jabs. If the initial 20 jabs yield insufficient macroinvertebrate tissue to collect both the routine and the duplicate sample, additional jabs/kicks will be performed to proportionally represent habitat types in a similar fashion as used for the routine sample.

6.1.2 Field Blanks

The main objective of the blanks is to trace sources of contamination. Sediment sampling generally does not require the use of field blanks. However, the issue of adequate equipment cleanup between samples can be addressed through the use of an equipment blank. Equipment blanks are samples of water that have been used to rinse the sampling equipment.

Two equipment blanks will be collected at randomly selected sampling locations, one during the August sampling event and one during the September sampling event. The equipment blanks are collected after all of the equipment has been cleaned according to the decontamination procedures described in **Section 3.2.7**. To collect the equipment blank, the rinse process of sample collection equipment (including Ponar, compositing trays, spoons, etc.) is repeated and the entire rinse is collected and

submitted as a solution sample to the lab to be analyzed for the same parameter suite used on the sediment samples (including both PCBs and Hg).

Table 6.1 – Summary of field blanks and duplicates for 2014

	August	September
Field Blanks	1 lake	1 river
	1 river	
Field Duplicates	1 river sediment	1 river sediment
	1 river macroinvertebrate	
	1 lake sediment - Whitefish	
	1 lake sediment - Flathead	

7.0 Handling Sampling Records

Site Visit Forms, field forms, and digital photos will be processed by WQPB staff using QA/QC procedures described in the QAPP (DEQ 2005). Analytical laboratories will provide results to DEQ in the required EDD format. DEQ will perform the necessary data evaluations and will manage the data in accordance with the QAPP.

All information associated with fish tissue monitoring will be reviewed and recorded by Montana FWP. Energy Laboratory, Inc. will provide hardcopy analytical reports to the EPA Project Manager for each laboratory data package submittal, and the EPA Project manager will forward the analytical results to the MT DEQ Project Manager, after inspection of the data (USEPA 2014).

The EDD format for all data types must be in accordance with Montana DEQ's eWQX database formatting requirements located at: http://deq.mt.gov/wqinfo/datamgmt/MTEWQX.mcpx. Final analytical reports must conform to DEQ department SOP WQPBDMS-010 Rev. 02, Minimum Reporting Requirements for Analytical Data (Chemistry) for the Water Quality Planning Bureau. This document can be found at: http://deq.mt.gov/wqinfo/QAProgram/default.mcpx. Montana DEQ will be responsible for loading all data collected during this project into their EQuIS database and EPA's online STORET database.

8.0 Schedule

Two sampling events will occur during the 2014 field season: one in early to mid-August and the second in mid- to late-September. This sampling timeframe is expected to minimize impacts from unusually high flows.

Lake sampling will be targeted to the August sampling event when weather conditions are expected to be most stable and to allow for sample completion in September in case of weather or equipment delays.

River and stream sampling for both sediment and macroinvertebrates will occur during both the August and September sampling events. At sites where sediment and macroinvertebrates are both being collected, these sampling efforts will occur simultaneously, although care will be taken to avoid creating disturbances to the water column or substrate upstream of the locations where sediment sample

collection will take place. Likewise, care will be taken to minimize substrate and macroinvertebrate habitat disturbances during sediment collection.

9.0 Project Team and Responsibilities

Montana DEQ's Water Quality Planning Bureau Monitoring and Assessment staff will collect sediment and macroinvertebrate tissue samples from waterbodies within the Whitefish/Flathead PCB and Mercury Project Area at the proposed sites (**Attachment A**).

The Monitoring and Assessment Section will lead the monitoring component. Darrin Kron will oversee the overall monitoring and assessment component. Kathryn Makarowski will lead the sediment and macroinvertebrate monitoring project. Additional Monitoring and Assessment Section staff, including Steve Fernandes and Jessica Clarke, will provide monitoring support in the field. Jason Gildea (EPA) will oversee the overall TMDL activities for this project.

The planning and monitoring team for this project consists of the following individuals representing MT DEQ, US EPA and MT FWP.

Project Partners	**Roles and Responsibilities**
MDEQ	
Darrin Kron, MAS Supervisor	project planning, report review
Katie Makarowski, MAS Project Lead	project planning, field crew, data analysis, report development
Mindy McCarthy, Quality Assurance Officer	project planning, QA/QC oversight, data analysis
Connor Smith, MAS Intern	project planning
Steve Fernandes, MAS	field crew
Jessica Clarke, MAS	field crew
Jolene McQuillan, IMTS	database manager
USEPA	
Jason Gildea, TMDL Program	project planning, FWP contract manager, plaintiff/stakeholder coordination, data analysis, report review
MFWP	
Trevor Selch, Toxicologist/Biologist	fish tissue monitoring
Other Interested Parties & Technical Resources	
DEQ	
Chris Cote, Hazardous Waste Site Cleanup Bureau, Bigfork/Swan PCB Cleanup)	
Jessica Gutting, State Superfund (Whitefish River superfund monitoring)	
EPA	
Peter Brumm, TMDL Program	
David Romero (EPA Emergency Response Program, Whitefish River Cleanup)	
Robert Hagler (Kennedy/Jenks Consultants, EPA contractor, Whitefish River Cleanup)	
FWP	
Mark Deleray, Fish Biologist	
USGS:	

Clint Muhlfeld, Fish Biologist
Joe Giersch, Macroinvertebrate specialist (on Clint's staff)
Dave Naftz, Biochemist; lake sampling
CSKT
Craig Barfoot, Fisheries Biologist
Barry Hansen, Fisheries Biologist
Whitefish Lake Institute
Josh Gubits, Environmental Scientist
Mike Koopal, Executive Director
Flathead Lake Biological Station
TBD

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Attachment A – Proposed Monitoring Locations for 2014

Site Description	Site Rationale	Latitude	Longitude	Sediment	Macro
Swift Creek near mouth; d/s Delray Rd bridge	PCBs coming in from upper basin via Swift Creek?	48.4826	-114.432	x	x
East Fork Swift Creek, near mouth	reference site; no apparent sources upstream	48.6648	-114.558	x	
West For Swift Creek, near mouth	reference site; no apparent sources upstream	48.6544	-114.551	x	
Whitefish Lake near Swift Creek inflow		48.4802	-114.424	x	
Whitefish Lake mid-lake Deep		48.4731	-114.396	x	
Whitefish Lake, Bay near BN Derailment remediation site on weat shore of lake	near BN Derailment remediation site	48.4514	-114.391	x	
Whitefish Lake near outflow point		48.4174	-114.355	x	
Whitefish River, immediately downstream of Whitefish Lake outlet	PCBs transported through Whitefish Lake to Whitefish River?	48.41466	-114.3516	x	x
Whitefish River, in vicinity (due south) of BNSF railyard	near BNSF railyard (remediation site)	48.4121	-114.3447	x	
Whitefish River, Below BN Facility and overpass; at Hwy 93 bridge	within or below boundary of BNSF remediation site	48.4108	-114.3426	x	x
Whitefish River, near (above) Baker Bridge/Baker Park/River Trail Park	below EPA remediation sites	48.4071	-114.3407	x	x
Whitefish River, at Canoe Park near Riverside/Columbia Ave intersection		48.40107	-114.3336	x	
Whitefish River, Whitefish above JP Road Crossing	below point sources, above Haskill cr. Confluence	48.3895	-114.3302	x	x
Whitefish River below bridge on Hwy 40	mid-segment; not near specific point source risk	48.3712	-114.3026	x	x
Whitefish River N of Kalispell on Tetrrault Road N of bridge	mid-segment; not near specific point source risk	48.3197	-114.2785	x	x
Whitefish River below bridge on Reserve Drive	in/near city of Kalispell	48.2404	-114.2924	x	x
Whitefish River near mouth	near mouth, at River Road crossing (better access that pre-existing mouth site?)	48.2187	-114.2859	x	
Haskill Cr. near Voerman Rd road crossing	no obvious sources; major trib influence to Whitefish River	48.3889	-114.3096	x	x
Stillwater river at Lawrence Park	public access; certainly above potential point sources (pole and timber, oil refinery)	48.2112	-114.311	x	
Stillwater River upstream from Whitefish River confluence	also upstream from Kalispell pole and timber, and oil refinery? Or in midst	48.2142	-114.302	x	x
Stillwater River, below Whitefish River and East Spring Creek confluence, at Conrad Road Crossing		48.2035	-114.282	x	x
Stillwater Slough, at mouth	source of PCBs to Stillwater?	48.1806	-114.284	x	x
Stillwater Slough, mid-segment at Dry Bridge Park	source of PCBs to Stillwater?	48.19075	-114.295	x	x
Stillwater Slough, near headwaters	source of PCBs to Stillwater?	48.19964	-114.303	x	
Stillwater River at Leisure Island Park below Slough confluence and approx 3 miles above Stillwater mouth	existing site on Stillwater mainstem; alternative to slough	48.1749	-114.279	x	x
Flathead River, above South Fork Flathead River confluence		48.39455	-114.082	x	x
Flathead River, below South Fork Flathead River confluence - near Hungry Horse	park where you can (south of river) and sample gravel bar	48.3862	-114.103	x	
Flathead River, below CFAC	forest service access via Columbia Falls community garden access	48.37314	-114.168	x	
Flathead River, below CFAC	FWS fish access (Teakettle) site only ~1 mile downriver from previous site	48.3652	-114.171	x	
Flathead River below Columbia Falls WWTP	check mixing zone; sample near these coordinates; on FWP land, but intentially downriver from Kokanee Bend FAS due to WWTP mixing zone	48.34239	-114.217	x	
Flathead River at Pressentine FAS	below Columbia Falls WWTP mixing zone; only sample if previous site near Kokanee Bend FAS is within mixing zone	48.2919	-114.222	x	
Flathead River at Old Steel Bridge FAS	spaces sites more evenly along Flathead River segment	48.2102	-114.257	x	
Flathead River, between Stillwater River and Ashley Creek confluences	only sample if county road right of way on Lower Valley Road	48.14583	-114.251	x	x
Flathead River, near mouth; inflow to Flathead Lake	alternative to site above for access purposes at fishing access instead	48.09219	-114.114	x	

South Fork Flathead River, near mouth, below Hungry Horse Dam site	park & sample on north side of river?	48.3846	-114.079	x	x
Ashley Creek near mouth	potential source for Flathead River? Road crossing access?	48.13546	-114.245	x	x
Ashley Creek, at Begg Park	potential source for Flathead River?	48.17661	-114.313	x	x
Flathead Lake, mid-lake deep (not in Flathead Reservation)	based on bathymetric map	47.89058	-114.067	x	
Flathead Lake, near Swan River inflow	consider sampling in Swan River bay near Bigfork or volunteer site at wayfarers S.P.?	48.05722	-114.084	x	
Flathead Lake, Somers Bay alternate	Somers bay near BN Somers remediation site and storage pond?	48.0748	-114.217	x	
Flathead Lake, Flathead River inflow between Somers and Bigfork	near Flathead River inflow; sample in grid around this inflow?	48.0558	-114.1298	x	
Flathead Lake Salmon Hatchery	sample outfall?	48.0587	-114.239	x	
Bigfork Harbor	near marina; concentrated boat activity; swan river influence via power station	48.0617	-114.076	x	
Bigfork Bay near power station?	in bay area near bridge and hydroelec station?	48.059291	-114.072322	x	
Swan River	about 0.5 mile below bridge on Swan River Nature Trail; above Bigfork Dam diversion and wild mile	48.0595	-114.034	x	
North Fork Flathead River	reference site; no apparent sources upstream; near Bowman Lake Rd. crossing & Polebridge	48.7826	-114.282	x	

Specific Lake Monitoring locations – Coordinates of Grid Sub-Samples

Waterbody	Site Description	Latitude	Longitude	Grid Size	Plot #	Plot Latitude	Plot Longitude
Flathead Lake	mid-lake deep (above Flathead Reservation boundary)	47.89058	-114.067	600 m	6	47.891838	114.070592
					13	47.890462	114.067501
					17	47.889523	114.068925
					19	47.889377	114.066148
					22	47.888454	114.068925
	near Swan River inflow	48.05722	-114.084	1200 m	4	48.060123	114.083960
					7	48.058965	114.089027
					14	48.056974	114.083960
					17	48.055370	114.088938
					18	48.055192	114.085916
	near Flathead River inflow between Somers and Bigfork	48.0558	-114.1298	2400 m	2	48.062128	114.135537
					8	48.059074	114.129809
					13	48.055719	114.129938
					17	48.052750	114.135794
					18	48.051976	114.129552
	Somers Bay near BN Somers remediation site and storage pond	48.0748	-114.217	1200 m	4	48.077402	114.214657
					13	48.074516	114.217019
					18	48.072917	114.217050
					20	48.073020	114.212295
					21	48.071317	114.221744
	near Salmon Hatchery	48.0587	-114.239	300 m	9	48.059081	114.238835

					12	48.058648	114.239899
					13	48.058628	114.239265
					24	48.057961	114.238791
					25	48.057961	114.238267
Flathead Lake/ Bigfork Bay	near marina with concentrated boat activity; swan river influence	48.0617	-114.076	300 m	4	48.062386	114.075290
					6	48.062048	114.076966
					9	48.062061	114.075277
					12	48.061718	114.076433
					14	48.061609	114.075407
Whitefish Lake	near Swift Creek inflow	48.4802	-114.424	600 m	4	48.481633	114.421015
					9	48.480959	114.421005
					11	48.480137	114.424327
					18	48.475909	114.422412
					25	48.478686	114.420175
	mid-lake deep	48.4731	-114.396	300 m	11	48.472957	114.397496
					13	48.473026	114.396507
					15	48.472957	114.395162
					23	48.472319	114.396411
					25	48.472296	114.395387
	bay near BN Derailment remediation site on west shore	48.4514	-114.391	300 m	8	48.451783	114.391196
					12	48.451380	114.391663
					14	48.451386	114.390560
					18	48.451020	114.391270
					22	48.450635	114.391775
	near outflow to Whitefish River	48.4174	-114.355	600 m	4	48.418855	114.354314
					7	48.418112	114.356577
					9	48.418146	114.354465
					14	48.417403	114.354502
					15	48.417278	114.353145

Attachment B – Common Sources of PCBs

Primary Applications of PCBs (Oregon DEQ 2003)	
Dielectric fluids and transformers	Used as insulating material, coolant, and for fire-resistant properties. Potential sources would be facilities which used, stored, and serviced electrical equipment and which used significant amounts of electricity. These facilities could include, but are not limited to: Electrical transmission and distribution facilities; electrical equipment maintenance facilities and salvage yards; rail yards; and manufacturing facilities (sawmills, pulp and paper mills, chemical manufacturing, shipyards, primary and secondary metals smelting and refining, etc.)
Capacitors	Present in industrial facilities, industrial machinery both fixed and mobile, and consumer products. Includes larger power-factor correction capacitors associated with transformers, manufacturing facilities, and commercial buildings (usually near high power-usage equipment such as computer rooms and heating and cooling units); and smaller electric motor-start capacitors used in industrial equipment and appliances such as hair dryers, air conditioners, refrigerators, power tools, and submersible well pumps. Also includes capacitors used in appliances and electronics such as televisions and microwave ovens.
Fluorescent light ballasts	PCB-containing capacitors were used in fluorescent light ballasts. PCB-containing asphaltic resin (potting material) was also utilized as insulating material for some ballasts.
Electromagnets	Oil-cooled electromagnets are constructed with coils immersed in transformer oil to prevent over-heating and shorting. Used in cranes for picking up metal and for metal separation in recycling operations (metal scrap yards, tire shredding, concrete crushing, slag operations, etc.).
Miscellaneous electrical equipment	Switches, voltage regulators, circuit breakers, reclosers, rectifiers, and some oilcooled electric motors.
Heat transfer systems	Where oil is circulated through a non-contact system as a heat transfer medium for heating, cooling, and maintaining uniform temperature throughout a system or manufacturing process. Wide variety of applications in manufacturing industries including high-tech, asphalt, pulp and paper, metal products such as steel tubing and die casting, adhesives, chemicals, food processing, paint & coatings, textiles, etc.
Hydraulic fluid	Any application of hydraulic oil such as industrial equipment and machinery, commercial equipment, automotive brake fluid, etc.
Plasticizers	Used in polyvinyl chloride plastic, neoprene, chlorinated rubbers, laminating adhesives, sealants and caulking, joint compounds (concrete), etc.
Lubricants	Cutting oils, compressors, electrical equipment, oil-impregnated gaskets and filters; also currently present in low concentrations in recycled oil. Also used in vacuum pumps at high tech and electronics manufacturing facilities, research labs, and wastewater treatment plants.

Other Applications of PCBs	
Dust Control (Dedusting Agent)	Present in dust control formulations, and used oil historically used for dust suppression.
Pesticides	As an extender to extend the life of pesticides.
Fire retardants	Coatings on ceiling tiles, and textiles including ironing boards and yarn.
Paints, coatings	As plasticizers in paint, corrosion resistant paints for various applications including military/navy ships, corrosion resistant epoxy resins on metal surfaces, film casting solutions for electrical coatings, varnish, lacquers, and waterproofing coatings for various applications.
Carbonless copy paper	Used as an ink pigment carrier (microencapsulation of dye); when the top sheet was pressed down, ink and PCB oil were transferred to the copy.
Printing Inks	Ink for newsprint and as a dye carrier; also used as a solvent for deinking newsprint for recycling.
Investing casting waxes	Used as wax extenders.
Wood treatment	May be present as an impurity in pentachlorophenol (Warrington, 1996).

PCB Sources In Waste Materials And Recycling Operations (Oregon DEQ 2003)	
Material or Operation	**Comments**
Scrap metal recycling	Transformer shell salvaging; heat transfer and hydraulic equipment; and fluff (shredder waste from cars and appliances including upholstery, padding and insulation). Also present in non-ferrous metal salvaging as parts from PCB containing electrical equipment, and oil & grease insulated electrical cable.
Auto salvage yards, auto crushing	Hydraulic fluid, brake fluid, recycled oil, capacitors, and oil-filled electrical equipment such as some ignition coils.
Repair activities	Shipyards (electrical equipment, hydraulic oil, paint, etc.), locomotive repair, heavy equipment repair facilities, auto repair, repair of manufacturing equipment, etc.
Used oil	May be present in used oil from various sources including auto salvage yards, automotive and heavy equipment repair shops, hydraulic equipment repair, industrial machinery repair, etc. Because some PCBs have been mixed with used oil, some recycled oils currently in circulation may contain PCBs at concentrations generally < 50 ppm. PCBs may also be present where used oil has been used for dust suppression/road oiling, weed control, and energy recovery.
Recycled paper	Paper may contain PCBs where carbonless copy paper has been used in recycling. However, PCB concentrations have decreased over time as the volume of unrecycled carbonless copy paper is reduced. Recycled paper containing PCBs has historically been used for food packaging (CWC, 1997). PCB concentrations in food packaging are restricted to 10 ppm unless an impermeable barrier is present between the packaging and food product (FDA, 2003).

Effluent	PCBs may be in wastewaters from manufacturing facilities and equipment such as chemical and pesticide facilities, pulp and paper mills, cooling waters from vacuum pumps and electric power generation facilities where leaks have occurred, and condensate from vacuum pumps and natural gas pipelines. Significant cleanup activities have been performed at natural gas pipeline compressor stations from discharges of condensate to ground and storm drainage systems (DOJ, 2002).
Asphalt roofing materials, tar paper, and roofing felt	Anticipated at generally very low concentrations where used oil containing PCBs has been used in asphalt mix.
Building demolition	Electrical equipment, joint caulking, oil & grease insulated cable, surface coatings as flame retardant and waterproofing.
Dredge spoils	From areas where contaminated sediments are present.
Landfills	Municipal and industrial solid waste; virtually all potential sources could be present, including waste materials and soils from remediation sites.
Wastewater treatment plant sludge	Derived from atmospheric deposition and stormwater, water supply systems, leaks and spills, leaching from coatings and plastics containing PCBs, PCBs in food and human waste.

(ATSDR 2000, Oregon DEQ 1997, EIP Associates 1997, UNEP 1999)

Attachment C – Potential Sources in Project Area Considered in Site Selection Process

Potential Sources in Flathead/Whitefish (*Sources of PCBs that may persist in the environment that were manufactured and distributed prior to the ban in 1977*)
BNSF railyard Superfund site;1989 train derailment and resulting oil spill in Whitefish Lake
Power stations; transformers (e.g., Contamination from the past is scheduled for cleanup on the Swan River in Bigfork. The Bigfork hydroelectric power plant sits along the edge of the river where it empties into Bigfork Bay, and then on into Flathead Lake. PCB's originally from electrical transmitters long since removed from the property are being blamed as the source. Cleanup has already taken place where the transmitters were sitting, but PCB's were found in the soil along the shoreline next to the plant.). PCBs were used to cool electrical transformers. Bigfork PacifiCorps Transformer Yard via Voluntary Cleanup and Redevelopment Act (VCRA) project http://deq.mt.gov/StateSuperfund/vcra.mcpx
scrap yards, recycling centers, esp. for electronics
WWTPs
fish hatcheries (reference Big Spring)
Wood treatment facilities - e.g., Jason: Superfund folks thought that the old Burlington Northern Tie Treatment Plant at Somers might have historically been a source of PCBs in the basin. http://www.epa.gov/superfund/sites/npl/nar873.htm
Potential Sources in Flathead/Whitefish *(Sources of PCBs that may remain in the environment that are currently authorized by EPA for continued manufacturing or use under TSCA)*
Railroad transformers
Natural gas pipelines
Hydraulic systems
Mining equipment
Potential Sources in Flathead/Whitefish *(Sources of PCBs that may persist in the environment that are contained within recycled products manufactured prior to TSCA ban in 1977)*
Scrap metal recycling
Auto salvage yards, auto crushing
Repair activities
Used oil
Recycled paper
Effluent; wastewaters from chemical and pesticide facilities, pulp and paper mills, cooling waters from vacuum pumps and electric power generation facilities
Asphalt roofing materials, tar paper, and roofing felt
Building demolition
Dredge spoils

Landfills
Wastewater treatment plant sludge
Other potential Sources in Flathead/Whitefish
Glacial meltwater
Aerial deposition - e.g., Columbia Falls smelter: Remedial activities that have occurred on the Site include addressing a transformer fire in the rectifier yard that occurred on September 10, 1991. The transformer held approximately 10,000 gallons of dielectric fluid that contain approximately 207 parts per million (ppm) polychlorinated biphenyls (PCBs). Approximately 4,000 gallons spilled into the containment basin and the explosion resulted in the contamination of an approximate 4,000 to 5,000 square-foot area. According to the Remedial Activities Report by Olympus Environmental, Inc. (April 14, 1992) the spill area soils and structures were remediated to acceptable levels and no further cleanup was recommended by the EPA. In 1994 two capacitors in the West Rectifier Yard Capacitor Bank exploded contaminating steel holding frames and soil with 3 to 4 gallons of pure PCBs. According to CFAC's October, 1994 Storm Water Pollution Prevention Plan (SWPPP) the surrounding capacitors, framing, and soils were removed and disposed of in a certified Toxic Substances Control Act (TSCA) landfill, and the area cleared for operational use.

Attachment D - Equipment List

Lakes

Lake Boat
Boat oil
Long, heavy-duty extension cord for charging boat batteries
Trolling motor with remote for anchor setting
Life jackets
First aid kit
Tool kit
Batteries for boat (capstan winch, fish finder & trolling motor)
Batteries for camera, GPS, trolling motor remote control
Fish finder (for depth)
Lake Site Visit Forms /Site Visit Codes
Summary forms (to record individual plot coordinates and sub-sample descriptions)
GPS
Compass
Photo Forms
Camera
Ponar clamshell
Spare ponar and/or Ekman
Cable/rope to attach ponar to winch
5 gallon bucket for coiling rope into
5 gallon bucket with lid for garbage
Secure knot or clips to connect ponar to rope
Winch (capstan)
Broad-bottomed shallow stainless steel pan to put the ponar into once retrieved
Stainless steel spoons (large and small) for scooping sediment out of ponar and homogenizing
2 Large stainless steel pails or bowls (one for compositing, one to sieve into; must fit in a cooler on ice)
Large plastic spoon for scooping Hg sediment sample
Turkey baster for adding small amounts of water when sieving Hg
Buchner funnel with 63-micron mesh for Hg sieving
Stainless steel 2 mm sieve for PCB sample (US Standard #10)
4 oz. glass jars for Hg samples
1 L glass/Teflon sample jars
Hg sample labels
PCB sample labels (with TOC, particle size and % moisture)
Tape strips
Large cooler (for regular ice)
Large cooler (for sample bottles & supplies)
Garbage bags (large and small)
Dry bags for sensitive equipment
Sample site visit form with parameters filled out
Scrub brush, toothbrushes and thin scrubbing pads for cleaning ponar and PCB equipment
phosphate-free Alconox or Liquinox Soap (1% solution)
tarp/liner for boat surface where decon will take place
water sample bottles & preservatives for blanks (1 L glass for PCB, 250 mL HDPE with nitric acid for Hg)

carboys of DI water for cleaning/rinsing
1 L HDPE bottles for DI water use
squirt bottles for Liquinox solution
squirt bottle for DI water
certified ACS HPLC grade hexane
squirt bottle for hexane solution
1 L HDPE bottle for hexane storage on boat
appropriate bucket for storing hexane wastewater (new, empty paint cans)
dilute 5% nitric acid for rinsing Hg equipment
squirt bottle for 5% nitric acid
latex gloves for use during decontamination
paper towels
Plastic tubs with lids for storing PCB equipment and Hg equipment during transport
regular ice
work gloves for handling rope during ponar deployment/retrieval
bubble wrap & sleeves (or tape) for protecting sample bottles in cooler
Hexane MSDS (material safety data sheet)

Rivers/Streams
River Site Visit Forms/Site Visit Codes
Summary forms (to record sub-sample descriptions)
Rangefinder for defining sampling reach length
Flow meter & wading rod
Bank pins
Meter tapes
Flow forms
GPS
Batteries for camera, GPS
Photo Forms
Camera
Stainless steel spoons (large and small) for scooping sediment and homogenizing
2 Large stainless steel pails or bowls (one for compositing, one to sieve into; must fit in a cooler on ice)
Large plastic spoon for scooping Hg sediment sample
Turkey baster for adding small amts of water when sieving Hg
Buchner funnel with 63-micron mesh for Hg sieving
Stainless steel 2 mm sieve for PCB sample (US Standard #10)
4 oz. glass jars for Hg samples
1 L glass/Teflon sample jars
Hg sample labels
PCB sample labels (with TOC, particle size and % moisture)
Tape strips
Large cooler (for regular ice)
Extra-large cooler (for longer-term sample storage on regular ice)
Large cooler (for sample bottles & supplies)
Garbage bags (large and small)
Dry bags for sensitive equipment
Sample site visit form with parameters filled out
Scrub brush, toothbrushes and thin scrubbing pads for cleaning ponar and PCB equipment

phosphate-free Alconox or Liquinox Soap (1% solution)
water sample bottles for blanks
carboys of DI water for cleaning/rinsing
squirt bottle for Liquinox solution
squirt bottle for DI water
certified ACS HPLC grade hexane
squirt bottle for hexane solution
1 L HDPE bottle for hexane storage
appropriate bucket for storing hexane wastewater (new, empty paint cans)
dilute 5% nitric acid for rinsing Hg equipment
latex gloves for use during decontamination
paper towels
plastic tubs with lids for storing PCB equipment and Hg equipment during transport
regular ice
waders
bubble wrap & sleeves (or tape) for protecting sample bottles in cooler
Hexane MSDS (material safety data sheet)

Macroinvertebrates
2 D-frame dip nets & handles
2 Plastic or metal shallow-bottomed white or clear trays for dumping macroinvertebrate sub-samples
Small pail for temporarily holding extra-large macroinvertebrates or collecting rinse water
500 um sieve for rinsing material if needed
Medium, extra-insulated cooler (for dry ice)
Dry ice
Forceps
Battery-powered field balance (scale)
Batteries for camera, GPS and field balance (scale)
4 oz. wide-mouth glass sample jars
Summary Form (for recording overall community composition comments)
Macroinverterbate identification key/guide book
Macroinvertebrate tissue sample labels

Other
Gazetteer
Site list with coordinates