MONITORING FOR IMPAIRED SEGMENTS 2011-12
EPA TASK ORDER 19

Sampling and Analysis Plan/Quality Assurance Project Plan

Prepared by:

ATKINS
Water Resources Group
820 North Montana Avenue
Helena, MT 59601

Approvals

Jason Gildea, EPA Project Officer	Date
Lisa Kusnierz, EPA TMDL Coordinator	Date
Gary Ingman, Atkins Project Manager	Date
Erich Weber, Atkins Quality Assurance Manager	Date
Linda Himmelbauer, EPA Quality Assurance Officer	Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF APPENDICES

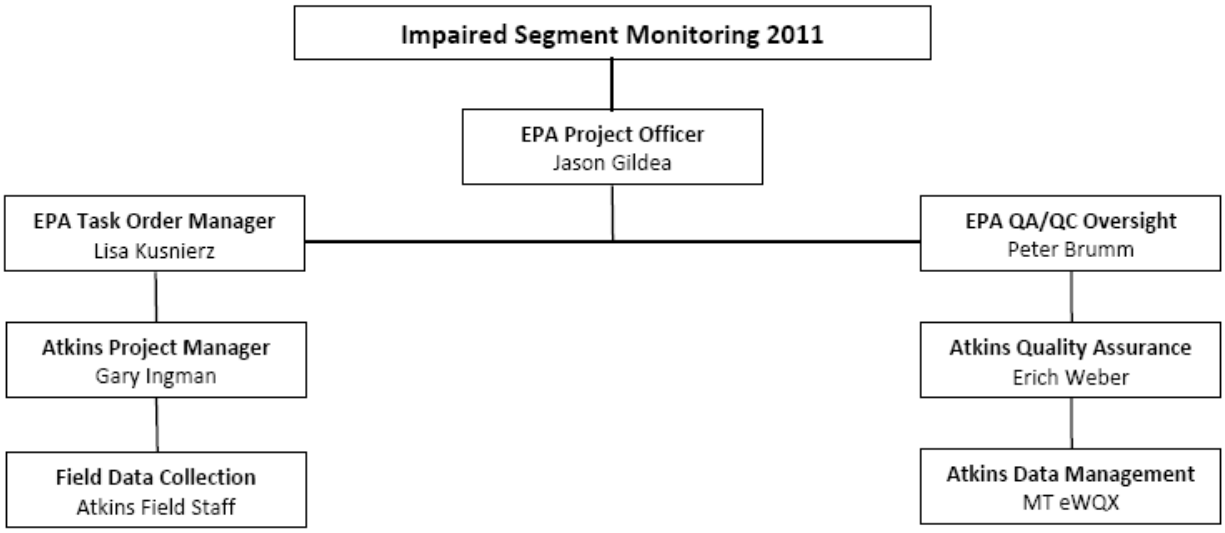
1.0 Distribution List

Name	Title	Organization	Phone	Email
Lisa Kusnierz	Task Order Manager	U.S. EPA	406 457-5001	Kusnierz.Lisa@epamail.epa.gov
Jason Gildea	Project Officer	U.S. EPA	406 457-5028	Gildea.Jason@epamail.epa.gov
Peter Brumm	Project QA Oversight	U.S. EPA	406 457-5029	Brumm.Peter@epamail.epa.gov
Gary Ingman	Project Manager	Atkins	406 495-1377	gary.ingman@atkinsglobal.com
Jeff Dunn	Sr. Watershed Scientist	Atkins	406 587-7275	jeff.dunn@atkinsglobal.com
Erich Weber	Project QA Manager	Atkins	406 495-1377	erich.weber@atkinsglobal.com

2.0 Project Task/Organization

The project team members and roles are shown in **Figure 1** below. Atkins field staff will perform the field preparation and monitoring activities. Energy Laboratories Helena laboratory will analyze the water chemistry samples. Erich Weber with Atkins will prepare an independent QA review with EPA oversight. Following completion of the data review, Atkins will work with EPA to upload all project data to the eWQX database. The EPA task order manager, Tetra Tech task order leader and the Atkins project manager will each retain copies of the official approved Sampling and Analysis Plan/Quality Assurance Project Plan.

Figure 1.



3.0 Project Description

This document constitutes the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for the completion of water quality monitoring activities on selected listed stream segments in the Fisher, Kootenai, Lower Flathead and Thompson TMDL Planning Areas (**Table 1**). EPA is under court order to complete TMDLs for all water body-pollutant combinations (WBPCs) listed as impaired on the 1996 303(d) list and remaining on the 2006 303(d) list by

December 31, 2012. Several of the water bodies within these TPAs have limited data, and TMDLs cannot be completed until such data are obtained. The purpose of this project is to collect data in the selected stream segments to provide sufficient information for TMDL development. The project spans four different TMDL Planning Areas in two major watersheds in northwestern Montana that need additional data collected prior to TMDL development. A combination of metals, nutrients, and/or chlorophyll *a* data will be collected from the subject water bodies, as determined by the specific pollutant impairment listings for each segment. The field work, data quality assurance reviews, and uploading of project data will be completed by Tetra Tech and Atkins.

Table 1. ***Location of impaired stream segments in the Fisher, Kootenai, Lower Flathead and Thompson TMDL Planning Areas.***

TPA	Stream	List ID	Pollutant	CFL
Fisher	FISHER RIVER, the Silver Butte/Pleasant Valley junction to mouth (Kootenai River)	MT76C001_010	Lead	2000
Fisher	RAVEN CREEK, headwaters to mouth (Pleasant Valley Fisher River)	MT76C001_030	Nitrate/Nitrite (Nitrite + Nitrate as N)	2006
Fisher	RAVEN CREEK, headwaters to mouth (Pleasant Valley Fisher River)	MT76C001_030	Phosphorus (Total)	2006
Fisher	RAVEN CREEK, headwaters to mouth (Pleasant Valley Fisher River)	MT76C001_030	Total Kjehldahl Nitrogen (TKN)	2006
Kootenai	BIG CHERRY CREEK, Snowshoe Creek to Mouth (Libby Creek)	MT76D002_050	Zinc	1988
Kootenai	BRISTOW CREEK, the headwaters to mouth at Lake Koocanusa	MT76D002_110	Total Kjehldahl Nitrogen (TKN)	2000
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Cadmium	1992
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Copper	1992
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Lead	1992
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Mercury in Water Column	1992
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Nitrate/Nitrite (Nitrite + Nitrate as N)	2000
Kootenai	LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	Zinc	1992
Kootenai	LIBBY CREEK, from 1 mi above Howard Creek to highway 2 bridge	MT76D002_061	Mercury	1996
Kootenai	SNOWSHOE CREEK, Cabinet Wilderness boundary to mouth (Big Cherry Creek)	MT76D002_040	Cadmium	1988
Kootenai	SNOWSHOE CREEK, Cabinet Wilderness boundary to mouth (Big Cherry Creek)	MT76D002_040	Zinc	1988
Kootenai	STANLEY CREEK, headwater to confluence with Fairway Creek	MT76D002_010	Copper	1988
Kootenai	STANLEY CREEK, headwater to confluence with Fairway Creek	MT76D002_010	Nutrient/Eutrophication Biological Indicators	2000
Lower Flathead	LITTLE BITTERROOT RIVER, Hubbart Reservoir to Flathead Reservation Boundary	MT76L002_060	Nitrate/Nitrite (Nitrite + Nitrate as N)	1988
Lower Flathead	LITTLE BITTERROOT RIVER, Hubbart Reservoir to Flathead Reservation Boundary	MT76L002_060	Phosphorus (Total)	1988
Lower Flathead	LITTLE BITTERROOT RIVER, Hubbart Reservoir to Flathead Reservation Boundary	MT76L002_060	Total Kjehldahl Nitrogen (TKN)	1988
Lower Flathead	SULLIVAN CREEK, headwaters to Flathead Indian Reservation	MT76L002_070	Aluminum	2006
Lower Flathead	SULLIVAN CREEK, headwaters to Flathead Indian Reservation	MT76L002_070	Cadmium	2006
Lower Flathead	SULLIVAN CREEK, headwaters to Flathead Indian Reservation	MT76L002_070	Phosphorus (Total)	1988
Lower Flathead	SULLIVAN CREEK, headwaters to Flathead Indian Reservation	MT76L002_070	Zinc	2006
Thompson	LAZIER CREEK, headwaters to mouth (Thompson River)	MT76N005_060	Nitrate/Nitrite (Nitrite + Nitrate as N)	2006
Thompson	LAZIER CREEK, headwaters to mouth (Thompson River)	MT76N005_060	Phosphorus (Total)	2006
Thompson	LAZIER CREEK, headwaters to mouth (Thompson River)	MT76N005_060	Total Kjehldahl Nitrogen (TKN)	2006
Thompson	LITTLE THOMPSON RIVER, headwaters to mouth (Thompson River), T22N R25W S8	MT76N005_040	Phosphorus (Total)	2006
Thompson	MCGINNIS CREEK, headwaters to mouth (Little Thompson River)	MT76N005_070	Phosphorus (Total)	2006
Thompson	McGREGOR CREEK, McGregor Lake to mouth (Thompson River)	MT76N005_030	Phosphorus (Total)	2006

4.0 Objectives and Design

Under a previous Task Order (#10), a data query of STORET and NWIS was conducted for water bodies listed as impaired on the 1996 303(d) list and remaining on the 2006 303(d); all stream segments within the scope of this project (**Table 1**) were found to have little to no recent data (i.e., within the past 10 years). The objective of sampling efforts described in this SAP/QAPP is to collect water, sediment and/or benthic algae samples for metals, nutrients, and/or chlorophyll *a* analysis from the fourteen stream segments listed in **Table 2** to meet project goals.

The primary goal of this sampling is to obtain data of sufficient quality and quantity as to allow for the assessment of existing conditions within each stream segment, relative to its 303(d)-listed impairment status, and to permit the development of TMDLs where necessary. Data quality goals are established by required reporting limits (RLs) for specific parameters, and the SOPs and schedules for sample collection and analysis specified within this SAP/QAPP. Data quantity goals are established by the number of sampling sites within each stream segment (**Table 2**), the frequency of sampling (**Table 3**) and the list of parameters specified for each sample (**Table 4**).

Table 2. ***Impaired stream segments, segment length and number of monitoring stations for the Fisher, Kootenai, Lower Flathead and Thompson TMDL Planning Areas.***

Stream	Segment ID	Stream Miles	# of Stations	Metals	Nutrients
FISHER RIVER, the Silver Butte/Pleasant Valley junction to mouth (Kootenai River)	MT76C001_010	33.8	5	X	
RAVEN CREEK, headwaters to mouth (Pleasant Valley Fisher River)	MT76C001_030	3.0	3		X
BIG CHERRY CREEK, Snowshoe Creek to Mouth (Libby Creek)	MT76D002_050	13.1	4	X	
BRISTOW CREEK, the headwaters to mouth at Lake Koocanusa	MT76D002_110	6.4	4		X
LAKE CREEK, Bull Lake outlet to mouth (Kootenai River)	MT76D002_070	17.6	5	X	X
LIBBY CREEK, from 1 mi above Howard Creek to highway 2 bridge	MT76D002_061	11.2	3	X	
SNOWSHOE CREEK, Cabinet Wilderness boundary to mouth (Big Cherry Creek)	MT76D002_040	3.6	3	X	
STANLEY CREEK, headwater to confluence with Fairway Creek	MT76D002_010	4.0	3	X	X
LITTLE BITTERROOT RIVER, Hubbart Reservoir to Flathead Reservation Boundary	MT76L002_060	5.2	2		X
SULLIVAN CREEK, headwaters to Flathead Indian Reservation	MT76L002_070	3.9	2	X	X
LAZIER CREEK, headwaters to mouth (Thompson River)	MT76N005_060	7.8	4		X
LITTLE THOMPSON RIVER, headwaters to mouth (Thompson River), T22N R25W S8	MT76N005_040	19.9	5		X
MCGINNIS CREEK, headwaters to mouth (Little Thompson River)	MT76N005_070	5.1	4		X
MCGREGOR CREEK, McGregor Lake to mouth (Thompson River)	MT76N005_030	6.8	4		X

4.1 Study Design

To meet the stated objective and goals, i.e. to collect sufficient water, sediment and/or benthic algae samples for metals, nutrients, and/or chlorophyll *a* analysis to allow for water quality determination and TMDL development within the listed streams, Atkins will conduct synoptic sampling at each of the fifty five stations listed in **Table 5**, following the schedules and parameter lists detailed below.

Synoptic sampling of water for metals analysis will be conducted on the stream segments indicated in **Table 2,** at the sites listed in **Table 5,** during three sampling events: once during summer 2011 low flow conditions, once during spring 2012 high flow conditions, and once during summer 2012 low flow conditions (**Table 3**). Metals parameters are detailed in Section 4.3. Water samples for total suspended solids (TSS) will be collected at all metals sites during all sampling events. In-stream sediment samples for metals analysis will be collected at all metals sites during the summer 2012 low flow sampling event (see Section 4.4). Physical parameters (i.e. water temperature, dissolved oxygen, pH, conductivity and turbidity) will be collected with a field meter at all metals sites during all sampling events.

Synoptic sampling for nutrients will be conducted on the stream segments indicated in **Table 2,** at the sites listed in **Table 5,** during three sampling events: once during summer 2011 low flow conditions, and twice during summer 2012 low flow conditions (**Table 3**). Nutrients parameters are detailed in Section 4.5. Water samples for total suspended solids (TSS) will be collected at all nutrients sites during all sampling events. Physical parameters (i.e. water temperature, dissolved oxygen, pH, conductivity and turbidity) will be collected with a field meter at all nutrients sites. Chlorophyll a sampling will be done in conjunction with nutrient sampling during one sampling event each year. Algae will only be collected for chlorophyll a analysis at each site where algal density is visually estimated to be close to or greater than 50 mg/m2 (see Section 4.6).

Table 3. ***Sampling timeframe for nutrients and metals during 2011 and 2012.***

Sampling Event	Nutrients	Chlorophyll	Metals	Sediment Metals
August/September 2011	X	X	X	
May/June 2012			X	
July-September 2012 (2 runs)	X	X		
	X		X	X

To maintain sample independence, samples from the same site will be collected at least one month apart and sampling sites are spaced at least one mile apart (unless there is a significant source or tributary). Additional details about frequency and seasonality considerations are provided in Sections 4.3-4.9 for each impairment category. The project uses a targeted sampling design with the goal of characterizing existing conditions and bracketing source categories to assist with TMDL development and allocations for each waterbody and associated impairment. Where possible, the results of the data query were used to take advantage of historical sampling sites. Additional sites locations were selected to bracket pollutant sources and changes in land use/land cover. Land ownership and site access were also considered when selecting sample

sites, however, if sites should become inaccessible, Atkins will collect samples at the nearest available location as long as it represents the same sample frame.

Atkins' field monitoring activities will also include field QA/QC measures, including the collection of a minimum of 10% field duplicate and blank samples and strict adherence to methods described in the project SAP/QAPP document. Atkins will contract with Energy Laboratories for analysis of all water quality samples and will arrange for delivery of all samples to the laboratory for analysis within approved holding times and following analytical methods and reporting levels established in the project SAP/QAPP. All information to be collected under this project is deemed critical for project success and a high level of emphasis will be placed on data completeness.

4.2 Stream Monitoring

Atkins will conduct water quality monitoring at each stream segment/station, and collect samples for the parameters required under each impairment category (i.e., metals and/or nutrients), as summarized in **Table 4,** below**.** Sampling protocols for all monitoring activities will follow Montana DEQ's standard operating procedures (SOPs). Physical parameters (i.e. water temperature, dissolved oxygen, pH, conductivity and turbidity) will be collected with a field multimeter (*YSI 556* or *YSI Professional Plus; Hach 2100P*) at all stream sites, and stream flow will be gauged using an electronic current meter (*Marsh McBirney Flo-Mate 2000*™).

Table 4. ***Monitoring parameters for impaired streams.***

Impairment Category	Data Type	Parameters
Metals	Laboratory (all metals in water will be analyzed as Total Recoverable, except aluminum; sediment metals as Total)	Aluminum (dissolved), Arsenic, Cadmium, Chromium, Copper, Iron, Lead, *Mercury (low level), Nickel, Selenium, Silver, Zinc, Hardness, TSS
	Field	pH, specific conductance, water temperature, dissolved oxygen, turbidity, flow
Nutrients	Laboratory	Total Phosphorus, Total Nitrogen (persulfate method), Nitrate + Nitrite, TSS, chlorophyll *a*/AFDW
	Field	pH, specific conductance, water temperature, dissolved oxygen, turbidity, flow

*Low-level mercury will only be analyzed on Lake and Libby creeks.

4.3 Metals

The water sampling regime for metals in impaired streams will be once during summer 2011 low flow conditions, once during spring 2012 high flow conditions, and once during summer 2012 low flow conditions. Parameters to be measured include aluminum, arsenic, cadmium, copper, iron, lead, mercury (low level), nickel, selenium, silver, zinc, water hardness (for computation of aquatic toxicity thresholds), and total suspended solids (TSS). As indicated in **Table 4**, all metals with the exception of aluminum will be analyzed for the total recoverable fractions; aluminum will be analyzed for the dissolved fraction. State water quality standards for all metals of interest except aluminum are based on the total recoverable fraction; the aluminum standard is based on the dissolved fraction. Instantaneous stream flow will be measured at each site to

permit calculation of metals loads, and field parameter measurements listed in **Table 4** will be performed.

4.4 Sediment

In-stream sediment samples for metals analysis will be collected at all metals sites during the second summer 2012 monitoring event. Instantaneous stream flow will be measured for each stream site to allow calculation of sediment loads, and field parameter measurements listed in **Table 4** will be performed in conjunction with concurrent water sampling.

4.5 Nutrients

Nutrient sampling will occur during low flow conditions in late summer, once in 2011 and twice in 2012, during the time that in-stream nutrient concentrations are most likely to affect beneficial uses. Parameters to be measured at all nutrient sites include total phosphorus, total persulfate nitrogen, nitrate plus nitrite nitrogen, and total suspended solids (TSS). Instantaneous stream flow will be measured at each site to permit calculation of nutrient loads, and field parameter measurements listed in **Table 4** will be performed.

4.6 Chlorophyll *a*

Sampling of periphyton (benthic algae) for chlorophyll ***a*** and ash-free dry weight analysis will occur during the one summer monitoring events in 2011, as well as during one of the two summer monitoring events in 2012, at all nutrient sites where sufficient algal growth is present. Algae will be collected only at sites where the chlorophyll concentration is visually estimated to be at least 50 mg/m^2, following protocols established in Montana DEQ's chlorophyll SOP.

4.9 Sampling Sites

Sampling sites within each of the impaired stream segments were chosen based on consideration of the following factors:

- Ability to bracket known sources (i.e., upstream and downstream of abandoned mines, agricultural runoff, point source discharges, eroding streambanks and other sediment inputs, etc.)
- Previous monitoring at the site by federal or state agencies.
- Site access (Atkins will contact all relevant landowners to obtain permission for sampling at all sites. Alternate sites may be needed if access is denied).

Lat/long coordinates of sampling sites will be determined by GPS (NAD 83) and recorded on site visit forms. Sites selected for monitoring are listed in **Table 5,** and are shown on photo overlay maps for each of the impaired stream segments in **Attachment 1**.

Table 5. ***Impaired stream segment sample locations.***

Water Body	Site ID	Description	Parameters	Latitude	Longitude
Fisher River	FR-257	at mouth (Kootenai River)	TSS, Metals	48.36125	-115.31914
Fisher River	FR-261	below Wolf Creek	TSS, Metals	48.24346	-115.29167
Fisher River	FR-262	above Wolf Creek	TSS, Metals	48.21657	-115.27231
Fisher River	FR-263	below McKillop Creek	TSS, Metals	48.16536	-115.29517
Fisher River	FR-267	at Hwy 2 crossing	TSS, Metals	48.07030	-115.37467
Wolf Creek	WLFC	near mouth (Fisher River)	TSS, Metals	48.23336	-115.28439
Raven Creek	RAVN-03	near mouth at McGinnis Creek Road	TSS, Nutrients	48.04395	-115.28514
Raven Creek	RAVN-02	at power line corridor crossing	TSS, Nutrients	48.05217	-115.29300
Raven Creek	RAVN-01	at upper road crossing	TSS, Nutrients	48.06050	-115.30410
Big Cherry Creek	BCCa	at Hwy 2 crossing	TSS, Metals	48.35260	-115.52624
Big Cherry Creek	BCC-284	below Granite Creek	TSS, Metals	48.32785	-115.52928
Big Cherry Creek	BCC-285	below Smearl Cr. at FR 278 crossing	TSS, Metals	48.24620	-115.54934
Big Cherry Creek	BCC-287	below Snowshoe Creek	TSS, Metals	48.23154	-115.56283
Granite Creek	GRNC	near mouth	TSS, Metals	48.30632	-115.54320
Bristow Creek	BRST-04	at FR 228 crossing near mouth	TSS, Nutrients	48.54420	-115.29293
Bristow Creek	BRST-03	lower-middle site	TSS, Nutrients	48.54540	-115.31722
Bristow Creek	BRST-02	upper-middle site (at mile marker 5)	TSS, Nutrients	48.55780	-115.36759
Bristow Creek	BRST-01	below North and South Forks	TSS, Nutrients	48.56200	-115.40060
Lake Creek	LKC-276	above Hwy 2 near mouth (Kootenai River)	TSS, Metals, Nutrients	48.44694	-115.87737
Lake Creek	LKC-278	at Lake Creek Rd. crossing above Falls Cr.	TSS, Metals, Nutrients	48.39893	-115.84552
Lake Creek	LKC-279	at Chase Cutoff crossing	TSS, Metals, Nutrients	48.38121	-115.85915
Lake Creek	LKCa	at Cotten residence (end Shining Mtns. Trail)	TSS, Metals, Nutrients	48.33305	-115.85919
Lake Creek	LKC-280	at Troy Mine Road crossing	TSS, Metals, Nutrients	48.30420	-115.86563
Falls Creek	FLC-01	near mouth (Lake Creek)	TSS, Metals, Nutrients	48.41171	-115.85304
Keeler Creek	KeelC-1	at Lake Creek Road crossing	TSS, Metals, Nutrients	48.35661	-115.85996
Libby Creek	LBYC-275	at Hwy 2 crossing	TSS, Metals	48.22437	-115.47820
Libby Creek	LBYC	below Hoodoo Creek	TSS, Metals	48.21487	-115.47972
Libby Creek	LBYC-273	below Ramsey Creek	TSS, Metals	48.14416	-115.52972
Libby Creek	LBYC-274	below Howard Creek	TSS, Metals	48.11763	-115.54862
Snowshoe Creek	SNSCc	near mouth	TSS, Metals	48.21353	-115.59825
Snowshoe Creek	SNSCb	below Snowshoe Mine	TSS, Metals	48.20298	-115.64771
Snowshoe Creek	SNSCa	above Snowshoe Mine	TSS, Metals	48.20305	-115.64765
Stanley Creek	SC-2 (281)	below Fairway Creek at Troy Mine Rd.	TSS, Metals, Nutrients	48.28109	-115.89346
Stanley Creek	SC-1	below Troy Mine	TSS, Metals, Nutrients	48.26000	-115.89580
Little Bitterroot R.	LBRR-289	below Hubbart Reservoir	TSS, Nutrients	47.92111	-114.72537
Little Bitterroot R.	LBRR-299	below Clear Creek	TSS, Nutrients	47.90029	-114.70259
Sullivan Creek	SLVNC-02	above Salish-Kootenai Res. boundary	TSS, Metals, Nutrients	47.89972	-114.58090
Sullivan Creek	SLVNC-01	at Flathead Mine Road crossing	TSS, Metals, Nutrients	47.90916	-114.59592
Lazier Creek	LZRC-253	near mouth	TSS, Nutrients	47.91031	-115.05254
Lazier Creek	LZRC-254	below Whitney Creek (lower-middle)	TSS, Nutrients	47.91384	-115.08787
Lazier Creek	LZRC-255	upper-middle site	TSS, Nutrients	47.90598	-115.10946
Lazier Creek	LZRC-256	upper site	TSS, Nutrients	47.89359	-115.11858
Little Thompson R.	LTLRR-240	near mouth (Thompson river)	TSS, Nutrients	47.72885	-115.02789
Little Thompson R.	LTLTR-244	above Mudd Creek	TSS, Nutrients	47.68238	-114.97362
Little Thompson R.	LTLTR-246	above North Fork	TSS, Nutrients	47.67661	-114.92036
Little Thompson R.	LTLTR-250	above McGinnis Creek	TSS, Nutrients	47.68232	-114.83048
Little Thompson R.	LTLTR-Nan	above Nancy Creek	TSS, Nutrients	47.70867	-114.77731
McGinnis Creek	MCGC-238	near mouth (Little Thompson River)	TSS, Nutrients	47.67504	-114.82426
McGinnis Creek	MCGC-233	lower-middle site	TSS, Nutrients	47.66484	-114.80656
McGinnis Creek	MCGC-235	upper-middle site	TSS, Nutrients	47.65567	-114.79368
McGinnis Creek	MCGC-234	upper site (middle fork)	TSS, Nutrients	47.64094	-114.78295
McGregor Creek	MGRC-247	at Thompson River Road crossing	TSS, Nutrients	48.02160	-114.99066
McGregor Creek	MGRC-251	below Twin Creek	TSS, Nutrients	48.02629	-114.96527
McGregor Creek	MGRC-249	1.5 mile below McGregor Lake at Hwy 2	TSS, Nutrients	48.03236	-114.93233
McGregor Creek	MGCa	at McGregor Lake outlet	TSS, Nutrients	48.03371	-114.90500

5.0 Training Requirements/Certifications

All field monitoring activities will be performed by senior Atkins staff with extensive prior water quality monitoring field experience and training. Field staff will include Jeff Dunn, Gary Ingman and Erich Weber. Field methods described in this project SAP/QAPP document or referenced in other documents will be jointly reviewed in the office by all field staff prior to initiating field monitoring activities. This will include field meter calibration and operation; stream discharge measurement; collection, field filtration, preservation and transport of water samples; and field note taking and site documentation. The Atkins Project Manager will be responsible for assuring that any training/certification necessary for Atkins field staff to properly conduct monitoring activities is satisfied. Documentation of training/certifications for all Atkins field staff will be maintained in the project file.

One or more field audits will be performed by U.S. EPA project staff during completion of the monitoring activities by Atkins staff. The audits will address site selection, field measurements, sample collection, filtration and preservation, and record keeping.

6.0 Documentation and Records

The Atkins project manager will be responsible for hand delivering a copy of the final approved QA Project Plan to project team members listed in Section 1.0. Revisions to the QAPP will be drafted by the Atkins quality assurance officer and approved by the Atkins project manager. The Atkins quality assurance officer will save the revised QAPP document in electronic file form, and will be responsible for distributing electronic copies in pdf format to all team members. Field site visit forms will be completed on-site by field personnel prior to leaving each field monitoring location. Site visit forms, discharge measurement field forms, field photographs and photo logs will be compiled by field personnel and delivered to the Atkins quality assurance officer upon return to the office. The Atkins quality assurance officer will perform the required quality assurance reviews on the field data and prepare the project data deliverables.

Table 6 lists who should receive project data in what format. All original site visit forms, field notes, field photos and photo logs, flow gauging field forms, and hard copy laboratory reports will be provided to the EPA task order manager upon completion of the project. EPA will archive all project information for reference purposes. Backup copies of the above will be maintained by the Atkins project manager in Atkins project files for a period of three years, and archived electronically beyond that for an indefinite period of time. Electronic copies of project data will be formatted for inputting to the eWQX database, with verification of uploads provided to the EPA task order manager upon completion.

Table 6. ***Repository for Project Data Records.***

Data Report	Original (hard copy) to:	Copy or pdf to:	EDD to:
Field Data Sheets	EPA TO Manager	TetraTech TO Leader, Atkins Project Manager	EPA
Field Photos and Logs	EPA TO Manager	TetraTech TO Leader, Atkins Project Manager	EPA
Field Notes	EPA TO Manager	TetraTech TO Leader, Atkins Project Manager	EPA
Laboratory Reports	EPA TO Manager	TetraTech TO Leader, Atkins Project Manager	WQX, EPA, DEQ
Data QA/QC Review Forms	EPA TO Manager	TetraTech TO Leader, Atkins Project Manager	EPA, DEQ

7.0 Field Sampling Methods

7.1 Stream Sites

Monitoring will be done in accordance with the MDEQ's Field Procedures Manual which is available on the internet at: http://deq.mt.gov/wqinfo/qaprogram/PDF/SOPs/WQPBWQM-020.pdf (DEQ, 2012). Grab samples of stream water for all parameters will be collected directly into the required bottle, with the exception of dissolved aluminum which will require filtration in the field (See **Appendix A**, **Analyte Checklist** for this information). Bottles shall be rinsed three times with native water prior to sampling. Samples will be collected in a well-mixed portion of each stream, or, if the stream has ceased flowing (intermittent), the sample will be collected at the surface in a pool without disturbing the sediments. During sampling, the sample bottle opening should face upstream and should be drawn through the water column once, carefully avoiding disturbance of bottom sediments.

For dissolved aluminum samples, aliquots of stream water for filtration will be drawn from approximately 0.25 m below the stream surface using a 60 mL disposable polyethylene syringe that has been rinsed three times with stream water. The syringe will be connected by a Luer fitting to a disposable polypropylene inline disc filter containing a 0.45 µm PES membrane and glass fiber prefilter. The filter will be purged with approximately 50 mL of sample water and the sample bottle rinsed three times with filtrate prior to collection of the filtered sample.

Water samples for low-level mercury analysis will be grabbed directly from a representative point in-stream, strictly following DEQ clean hands/dirty hands protocols, using a clean, tightly capped 100 mL glass bottle to which the necessary aliquot of HCl preservative has been added in the lab. The capped bottle be wholly submerged in the stream, opened, completely filled (eliminating all air bubbles) and recapped while under water.

Water samples for metals analysis (total recoverable and dissolved) and nutrients analysis (total phosphorous and nitrate + nitrite) will be preserved in the field. All water samples for metals, nutrients and suspended sediment analysis, as well as stream sediment samples for metals analysis, will be transported on ice in secure coolers and delivered to the lab within the required holding times. Samples will be analyzed for parameters listed in **Tables 7 and 8**.

7.2 Metals

The suite of metals to be analyzed for this project is listed in **Table 7**. Grab samples of water for total recoverable (TR) metals and TSS analysis, plus a filtered sample for dissolved aluminum analysis, will be collected at all metals sites. In-stream sediment samples for total metals analysis (**Table 7)** will be collected in pre-cleaned 1L glass jars following DEQ protocols and analyzed according to approved methods included in Appendix A. Total hardness will be calculated with calcium and magnesium values determined from the total recoverable metals sample.

- Total recoverable metals samples will be preserved by acidifying to a pH of less than 2 with pre-measured aliquots of concentrated nitric acid (HNO_3) contained in disposable

poly vials. Samples for dissolved aluminum will be field-filtered with a Whatman 0.45 µm PES membrane filter, then acidified to a pH of less than 2 with concentrated HNO_3.

- For low-level mercury (Hg) sampling by analytical method 245.7, both a trip blank and field blank are required for each sampling event. The sample collection method that applies for low-level Hg is described in **Appendix C**. Glass sample bottles for low-level mercury will contain pre-measured aliquots of HCl preservative, as delivery of unpreserved samples to the laboratory within 24 hours of collection is impractical.
- Stream-bottom sediment samples for total metals analysis do not require field preservation, but will be transported to the laboratory on ice.

All sample containers will be properly labeled as to site, collection time, date, and parameters analyzed. After collection, water samples will be placed in labeled gallon ziplock bags and stored in coolers. Unpreserved metals and TSS samples will be chilled to between 2°C and 6°C on ice for transport to the lab. Additional details regarding the analytes, collection bottles, and preservation methods are contained in **Appendix A, Analyte Checklist**. The site names on the sample labels must correspond to the site names provided in this SAP (**Table 5**).

Table 7. ***Analyte suite for metals.***

Water Column		In-Stream Sediment
Metals	**Other**	**Metals**
Aluminum, Dissolved	Total Hardness	Aluminum, Total
Arsenic, Total Recoverable	TSS	Arsenic, Total
Cadmium, Total Recoverable		Cadmium, Total
Copper, Total Recoverable		Copper, Total
Iron, Total Recoverable		Iron, Total
Lead, Total Recoverable		Lead, Total
Mercury (low level), Total		Selenium, Total
Selenium, Total Recoverable		Zinc, Total
Zinc, Total Recoverable		

7.3 Nutrients

The suite of nutrients to be analyzed for this project is listed in **Table 8**. Two bottles will be required to collect water samples for the identified analytes at each nutrient site:

- TP, NO_{2+3}: preserved with sulfuric acid; chilled on ice to 4^oC +/- 2^oC
- TPN, TSS: no preservative; chilled on ice to 4^oC +/- 2^oC

Total phosphorus (TP) and nitrate plus nitrite nitrogen (NO_{3+2}) samples will be will be preserved by acidifying to a pH of less than 2 with pre-measured aliquots of concentrated 1+1 sulfuric acid (H_2SO_4) contained in disposable poly vials. No preservatives are required for total persulfate nitrogen (TPN) or total suspended solids (TSS) samples.

All sample containers will be properly labeled as to site, collection time, date, and parameters analyzed. After collection, water samples will be placed in labeled gallon ziplock bags and stored on ice in coolers. Nutrient and TSS samples will be chilled to between 2°C and 6°C and for transport to the lab. Additional details regarding the analytes, collection bottles, and preservation methods are contained in **Appendix A, Analyte Checklist**. The site names on the sample labels must correspond to the site names provided in this SAP (**Table 5**).

Table 8. ***Analyte suite for nutrients.***

Water Column	
Nutrients	**Other**
Total Phosphorus (TP as P)	TSS
Total Nitrogen, Persulfate Method (TPN as N)	
Nitrate + Nitrite (NO_{3+2} as N)	

7.4 Chlorophyll and Ash-Free Dry Weight

Benthic algae (periphyton) samples for chlorophyll-a and ash-free dry weight analysis will be collected following the SOP: *Sample Collection and Laboratory Analysis of Chlorophyll-a*, available online at: http://deq.mt.gov/wqinfo/QAProgram/PDF/SOP%20WQPBWQM-011v4_final.pdf. The SOP provides directions on how to set up the sampling reach; the methods for template, core, and hoop sampling techniques; sample preservation; site visit form completion; COC submittal; and calculation of reach weighted averages.

The chlorophyll-a section of the site visit form will be filled out in its entirety, including the collection method for each transect. For any transects that are not sampled, an "X" will be put on the site visit form. "Composite" must be specified on the chain of custody forms so the laboratory will properly process the samples. Samples will not be composited in the field.

For each sampling event and respective sample site that chlorophyll-a is required, photographs will be taken regardless of whether or not the site is determined to have considerable algal growth. The photos will later be used to compare and evaluate the congruency of the apparent visual algal growth condition in the stream to the laboratory analytical result. All photographs will be recorded in a photo log and will include:

- Picture #
- Site ID
- Date and time
- Transect letter for substrate photos or transect boundaries for reach photos
- Visual growth estimates for substrate photos.

Photos will be taken in the same manner as those contained in **Appendix F, Chlorophyll-a Photo Packet**. A polarized lens will be used where necessary to reduce glare, as glary photos are of limited use. Factors reducing substrate visibility, such as turbidity, should be noted in the

photo log and on the site visit form. File naming will follow DEQ Network Folder and File Management Directive & Protocols provided in Water Quality Planning Bureau (WQPBDMSPOL-04).

Reach photos will be taken for both sites that are sampled and those that are not. A minimum of three reach photos will be taken to provide an overview of chlorophyll growth within the sampling frame. The substrate condition should be clearly visible in the foreground of the picture. Photos must mimic those in **Appendix F**. Preferably, the minimum three photos will be taken between transects A&D, E&G, and H&K. For larger rivers where 11 algae samples are collected along a single transect, a photograph to characterize the substrate will be taken across the stream from the end of the transect. In addition, reach photos will be taken looking upstream and downstream of the transect.

A substrate photo will be taken at each transect sample location illustrating the 1m x 1m area from which the sample is collected. This photo will be taken prior to collecting the sample. If substrate is poorly visible in the picture, collect five representative rocks from the site and photograph at close range if the substrate permits (i.e. small boulders, cobble, or gravel).

Each individual collected sample will also be photographed:

- Template: Scraped rocks may be collected and photographed together.
- Hoop: Both the hoop and collected algae must be present in the photo.
- Core: No photograph necessary. Substrate pictures of core sample locations will suffice.

Visual estimates of chlorophyll-a concentration of all individual samples, including core samples, will be recorded in the photo log. For sampling sites where chlorophyll-a is not collected (sites determined not to have considerable algal growth, i.e <50 mg/m^2 estimated chlorophyll-a), substrate photos will be taken at the same locations as the reach photos (i.e. a minimum of three photos). If substrate is poorly visible in the picture, collect five representative rocks from the site and photograph at close range if the substrate permits (i.e. small boulders, cobble, or gravel).

7.6 Discharge

Stream discharge data will be collected at all water quality monitoring sites using a *Marsh McBirney Flo-Mate 2000*™ current velocity meter in accordance with MDEQ's Field Procedures Manual (DEQ, 2005a). A stream discharge field form will be completed for each site and used to record interval width, depth and water velocity measurements collected across a stream transect. If extreme high flow events cause dangerous conditions for discharge monitoring, discharge via the float method may occur. Extreme low flow sampling (<1.5" deep channel) may also necessitate the use estimating flow using a float method. This method must be indicated on both the site form and the discharge field form, and documented with a photograph of the measurement location.

Discharge via the Float Method

Find a reach of stream that is linear/straight, as well as uniform in width and depth; a glide is preferred. This will assure that laminar flow is achieved to the greatest extent possible. Determine mean wetted width by visual estimation of three transects. Measure or pace off the distance twice the mean wetted width (in feet) along the bank and mark each end by driving a stake or piece of rebar into the ground at the high water line. If a length twice the wetted width cannot be achieved, mark the distance of the mean wetted width instead. Record the measured distance on the discharge form, as well as a description of each stake's location. Note landmarks and make a sketch if necessary to help identify stake locations in the event that they are no longer in place for the low flow event. Photograph both stakes to record not only their location along the stream bank, but also the water level.

Toss an orange or block of wood (or other item heavy enough to stay in and move consistently with the main current, and also harmless to wildlife and water quality) into the middle of the stream above the upstream marker of the measured reach. Begin timing when the object passes the upstream marker. Count (with a watch or stopwatch) the seconds it takes the orange to reach the downstream marker. The object must stay in the main current. If it does not, repeat the measurement. Complete three measurable floats. Record the data on the site visit form and the discharge form. For extreme low flow monitoring a small section of a twig can be used.

High or low flow width and depth will be measured at one or two representative transects within the marked distance during the July/August low flow sampling event, using the same method employed to measure discharge with a Marsh McBirney meter by setting up a cross section. The stakes or rebar will be used as a bench mark to measure the wetted width and depth if it is during high flow. Record this information on the discharge form. Remove the stakes upon completion.

Calculations:
Mean width x mean depth = cross-sectional area (ft^2)
Convert stick float time to ft/second (i.e., 26 ft/15 sec = 1.7 ft/sec)
Determine CFS (a x b)

Measurement and Estimation of Small Discharge Volumes

Volumetric measurements (bucket and stopwatch) should be used if possible where discharges come from a pipe and no other way of metering will succeed. If bucket counts are not feasible for pipes, the pipe diameter, depth of water to bottom of pipe and estimated velocity of discharge will be recorded and discharge will be calculated from this information. Visual discharge estimates in natural channels can be provided if field measures are not feasible via any other method. Justification for using the visual estimate must be clearly articulated in field notes. Visually estimated discharge must be based upon documented average width, depth, and velocity (see twig method above, if feasible). Estimated average width, depth, and velocity MUST be documented in field notes.

7.7 Other Data

A site visit form will be completed for each site that includes the site coordinates, time, weather, and any other observations, as well as physical parameter measurements and sample collection information. Separate site visit forms will also be completed for each set of duplicate and blank samples, with unique site visit IDs and location IDs applied to both, indicating the sample is either a duplicate or a blank.

Physical parameters (i.e. water temperature, dissolved oxygen, pH, conductivity and turbidity) will be collected in the field with a *YSI 556* or *YSI Professional Plus* multimeter and a *Hach 2100P* turbidity meter in accordance with MDEQ's Field Procedures Manual (DEQ, 2005a). The field meters and velocity meter will be calibrated prior to each use, and every other day in the field, according to their respective operation manuals. The GPS coordinate system datum will be NAD 1983 State Plane Montana, in decimal degrees to at least the fourth decimal. All data and information for this project must meet other data reporting requirements identified in the project task order. Data formats identified in the task order will be used for TMDL related data analysis.

Pictures will be taken at each sampling location during the sampling event to document the general sample location. Pictures that document the sample site location do not need to be retaken for each sampling event, unless the sample location changes or an additional site is added. All pictures will be documented on field forms with the following information recorded:

Picture number, if taken on a digital camera
Date/time
Stream name
Sample site ID
Directional reference (facing upstream or downstream and N, S, E, W)

7.8 Corrective Actions

The Atkins Project Manager will serve as the POC responsible for determining and/or authorizing necessary corrective actions if problems are encountered with any sampling methods. Field personnel will report problems immediately to the Atkins Project Manager, who will determine necessary corrective actions. If the Project Manager can't be reached, field personnel will document the problem and any corrective actions taken in written comments on site visit forms and associated field notebooks, in sufficient detail to permit review at a later date. A description of problems pertaining to sampling methods, including corrective actions, with will be included in monitoring summary reports prepared by the Atkins Project Manager.

8.0 Sample Handling and Laboratory Analytical Procedures

Sample handling procedures will follow DEQ standard operating procedures as defined in DEQ guidance, *Sampling and Water Quality Assessment of Streams and Rivers in Montana, 2005: Quality Assurance Project Plan (QAPP)* (DEQ, 2005b), available online at: http://deq.mt.gov/wqinfo/qaprogram/PDF/SOPs/WQPBQAP-02.pdf.

Immediately following collection, samples for metals, nutrients and TSS will be preserved and/or placed on ice as required by SOPs, and all samples will be stored in a secure cooler. Standard DEQ Water Quality Planning Bureau Site Visit Forms (Appendix D) will be used to document and track all samples collected for this project, including any problem arising with samples between the time of collection and delivery to the analytical laboratory. Samples will be submitted to the analytical laboratory (Energy Labs in Helena or Billings) by either field personnel or shipping firm. Samples will be accompanied by an Energy Labs Chain of Custody and Analytical Request Record (Appendix D), which will contain identical information to that found on the Site Visit Form, including: sample ID, sampling date and time, and analyses requested. Custody of all samples will be maintained by the field personnel responsible for their collection. If field personnel must be away from the immediate vicinity, sample coolers will be secured in a locked vehicle, motel room or office storage area at all times. If samples are to be shipped to the laboratory, field personnel will complete and sign an Energy Labs custody seal label for each sample cooler, and complete and sign the appropriate section of the COC/ Analytical Request Record form to relinquish sample custody to FedEx or other shipping firm. The form (in a sealed zip-lock bag) will be placed in the cooler with the sample containers and ice (in separate sealed zip-lock bags), a custody seal and shipping label affixed to the cooler lid, and several wraps of duct tape applied around the cooler to secure the lid and seal label. The condition of samples and coolers upon delivery, and any problems identified and corrective actions undertaken will be noted on the COC/ Analytical Request Record by the laboratory personnel receiving custody of the samples.

Appendix A, Analyte Checklist, contains a table with the collection container, preservative, analytical method, required reporting limit, and holding time for each analyte. Method detection limits (MDL) and analyte reporting limits (RL) are contained in Energy Labs data reports. The lab must use "J value" reporting for results between the RL and the MDL. Jon Hager, manager of the Energy Laboratories in Helena, will be the point of contact for corrective actions regarding any problems with laboratory handling and analysis of samples. Required sample holding times and associated laboratory analysis turn-around times are defined in Appendix A. As no hazardous sample material will be collected under this SAP, no special disposal measures will be necessary for any water sample volume remaining after analysis. Sample disposal procedures are described in Energy Laboratories Quality Assurance Program manual (Chapter 6, page 13) for the Helena laboratory, available online at: http://www.energylab.com/asp/Certifications/files/362009_12_QAManual_2009_BW.pdf.

9.0 Quality Assurance and Quality Control Requirements

The number of random field duplicate samples and field blank samples (not trip blanks) will equal at least 10% of all samples collected during each sampling trip. A separate site visit form will be completed for each field duplicate sample and field blank sample. Duplicate measurements of physical parameters will be collected along with field duplicate samples. A trip blank prepared by the analytical laboratory (Energy Labs) will be submitted with water samples for total mercury analysis.

Data quality objectives (DQOs) are the quantitative and qualitative criteria established for a sampling design in order to meet the project's objectives. Data quality indicators (DQIs) are quantitative criteria established for the data acquired within this design to assure it is of sufficient quality for its intended use. Descriptions of data qualifiers and common QC terms and acronyms are included in **Appendix B, QA/QC Checklist**. Atkins will complete the QA checklist as part of the data deliverables. A review and summary report of data quality also will be prepared by Atkins utilizing the data quality indicators defined in sub-sections 9.1 through 9.6, in order to determine any necessary corrective actions and document their application.

9.1 Representativeness

Representativeness refers to the extent to which measurements represent an environmental condition in time and space. This is a judgmental sampling design using the following rationale:

Spatial representation:

Sampling sites were chosen to represent the potential of landscape characteristics and land use/land cover influences existing in the watershed to influence pollutant concentrations in the listed waters, as well as the contribution of major tributaries. Sampling sites were identified by both assessment of aerial images, by reviewing past data collection efforts on these stream segments, and by considering potential pollution sources and land ownership and uses.

Temporal representation:

Two time periods (low summer flow and high spring runoff flow) will be used to represent water quality conditions for the selected stream segments. These data will be added onto previously collected data for data analysis.

9.2 Comparability

Comparability is the applicability of the project's data to the project's decision rule. The decision rules used for this project are the acute and chronic aquatic life criteria for metals, and the human health/drinking water standards listed in Department Circular DEQ-7. All methods selected conform to the requirement listed in footnotes 3, 4, 9, 12, 19, and 29 of DEQ-7.

9.3 Completeness

Completeness is a measure of the amount of data prescribed for assessment activities and the usable data actually collected, expressed as a percentage.

Completeness as % = (No. Valid Data Points or Samples / Total # Data Points or Samples) x 100

The overall project goal is 95% completeness. Sites lost due to inaccessibility will reduce the total number of sites in the equation but not the completeness goal. Although, alternative sites will be considered if original site access cannot be obtained. Most data with B and J flags will not affect completeness, although some may. If flagged data is not fully useful to the project and the flag was caused by field or laboratory error which could have been prevented by following standard procedures, it will be counted against completeness. If any listed stream has less than

50% of its planned sites sampled due to accessibility issues, the project conclusions will note this fact and account for the increased uncertainty in the TMDLs margin of safety. An assessment of completeness, and what circumstances contributed to incomplete project results will be compiled during the project report.

9.4 Sensitivity

Sensitivity refers to the limit of a measurement to reliably detect a characteristic of a sample. For analytical methods, sensitivity is expressed as the method detection limit (MDL). Laboratories must determine their MDL's annually and routinely check each method's ability to achieve this level of sensitivity using negative controls (e.g., Method Blanks, Continuing Calibration Blanks, and Laboratory Reagent Blanks).

Sensitivity quality controls for all laboratory methods will follow the frequency and criteria specified in the analytical method or as described in the Laboratory's Quality Assurance Plan (LQAP).

The criteria used to assess field method sensitivity for water and sediment samples shall be:

- Field method controls (Field Blank) < Reporting Limit in **Appendix B**

Frequency of de-ionized water field blank samples will be 10% of samples collected in the field.

Corrective Action: If analytical method controls fail the specified limit, check with the laboratory manager (Jon Hager) to see how they addressed the non-conformance and qualify data as necessary. If Field Blanks fail, qualify all associated project data < 10x the detected value with B flags.

9.5 Precision

Precision refers to the degree of agreement among repeated measurements of the same characteristic. This project will rely on analytical and field duplicates to assess precision based on their relative percent difference (RPD).

$$\text{RPD as \%} = ((D1 - D2)/((D1 + D2)/2)) \times 100$$

Where:
D1 is first replicate result
D2 is second replicate result

Lab precision (laboratory duplicates)
Precision quality control for all laboratory methods will follow the frequency specified in the analytical method or as described in the LQAP. The criteria used to assess analytical method precision shall be:

- Water samples: 20 % RPD for duplicate results > 5 times the reporting limit
- Sediment samples: 35% RPD for duplicate results > 5 times the reporting limit

Overall precision (field duplicates)
Frequency of field co-located duplicates will be 10% of samples collected in the field. The criteria used to assess overall precision shall be:

- Water samples: 25 % RPD for duplicate results > 5 times the RL
- Sediment samples: 40% RPD for duplicate results > 5 times the RL

Corrective Action: If laboratory duplicates fail this limit, check with the laboratory manager (Jon Hager) to see how they addressed or qualified the data and add additional qualifiers and notes as needed. If the field duplicates fail this limit, qualify all associated with a "J".

9.6 Bias and Accuracy

Bias is systematic nonrandom error from the true value. In this context, it is an extension of the representativeness concept applied to an individual sample. Bias can occur either at sample collection or during measurement.

Accuracy is the combination of high precision and low bias. Accuracy of individual measurements will be assessed by reviewing the analytical method controls (i.e. Laboratory Control Sample, Continuing Calibration Verification, Laboratory Fortified Blank, Standard Reference Material) and the analytical batch controls (i.e. Matrix Spike and Matrix Spike Duplicate). The criteria used for this assessment will be the limits that the laboratory has developed through control charting of each method's performance or based on individual method requirements. Method QC descriptions are contained in **Table B-2 in Appendix B.**

Corrective Action: For any QC value outside of the recovery range, check with the laboratory manager (Jon Hager) to see how they addressed the non-conformance and qualify data as necessary.

10.0 Instrument/Equipment Maintenance and Calibration

A *Hach 2100P* portable turbidity meter, *Marsh-McBirney FlowMate 2000* electronic flow meter, and *YSI Professional Plus* and *YSI Model 556 MPS* field multi-meters will be maintained by the Atkins quality assurance officer for use during this project. A maintenance and calibration log book will be kept with each meter and maintained by the Atkins quality assurance officer. The meters will be calibrated prior to each monitoring event and every other day during an event following the manufacturer's instructions and, in the case of the field multi-meters, using approved, non-expired calibration standards. Calibration documentation will be recorded in the meter log books. Calibration procedures and calibration standards are described in the manufacturer's manuals, and are kept with each instrument and in the Atkins Helena office field staging room. Instrument manuals are also available online at each manufacturer's web site (Appendix E). Atkins field staff will notify the Atkins quality assurance officer of any instrument malfunctions or calibration failures in a timely fashion to allow for prompt repairs and/or replacement prior to the next field monitoring event. A record of all problems, corrective actions, repairs and maintenance will be kept in the field meter log book. The Atkins quality

assurance officer will attend to all field meters during the off season, conduct periodic battery and calibration checks, and make arrangements for any required repairs and maintenance.

11.0 Inspection and Acceptance Requirements for Supplies

Extra buffers and calibration standards are ordered periodically by the Atkins quality assurance coordinator from a familiar supplier (generally Cole Parmer) before supplies on hand expire or are depleted, and each shipment is inspected upon arrival for correctness and condition. The supplier will be notified if damaged or expired containers are received and replacements requested. Buffers and calibration standards will be marked with the date received and the manufacturer's expiration date noted, and will be routinely inspected by the quality assurance coordinator prior to their use for instrument calibration to ensure they have not expired.

12.0 Data Analysis, Record Keeping, and Reporting Requirements

12.1 QC Review and Documentation

A review of all field and analytical data, including all items on the QC Checklist in **Appendix B,** will be conducted by Atkins following receipt of the laboratory data package[1]**.** A QA/QC Review and Summary report will be prepared to evaluate all water quality data collected under this SAP against the criteria listed in **Section 9.0**. This report will review and summarize results of field and laboratory quality control samples, audit information, corrective actions taken, and the overall results of sampling and analytical activities with respect to compliance with SAP provisions. The primary focus of the data quality review will be to assess the effects that any deviations from approved procedures may have had on the project objectives and credibility of this data for decision making purposes. The goal for project completeness will be reviewed, and detailed summaries provided of any conditions contributing to a failure to meet that goal. Data qualifiers to be assigned to data that do not meet these target quality control criteria are provided in **Appendix B (Table B-1),** and will be included in both the hardcopy and electronic forms of the data.

12.2 Data Management

A standard DEQ-style Site Visit Form will be properly completed for each sampling site at the time of sample collection. Blank forms can be found on DEQ's Data Management website at: http://deq.mt.gov/wqinfo/datamgmt/MTEWQX.mcpx , under "Additional Information" in the right-hand side bar. Field data recorded on the Site Visit Forms will be entered into and saved in Excel spreadsheet format. Energy Laboratories analysis reports will be kept in hard copy and electronic (pdf) formats and as lab-generated Excel spreadsheets containing analyses results. Field and laboratory data will be managed in spreadsheet or database table format compatible with the MT-eWQX database. Data tables will be maintained and managed in record format, retaining the unaltered field-recorded metadata and laboratory analyses results reported in

[1] An Energy Laboratories data package includes Laboratory Analytical Reports for each sample, in electronic (.pdf) and hardcopy formats and including QC summary and completed chain of custody, and the electronic data deliverable (EDD) files in MT-eWQX-compliant, Excel spreadsheet format.

electronic data deliverable (EDD) form. EPA will review the QA/QC Review and Summary report prepare under **Section 12.1**; following approval by the EPA Task Order Project Manager, data will be formatted for final submission to MT-eWQX and entry into the database.

All monitoring data will be entered into a Montana DEQ's MT-eWQX EDD spreadsheet format, validated using Electronic Data Processor (EDP) data management software, and uploaded into EPA's Water Quality Exchange (WQX) National Warehouse database via the MT-eWQX portal. Formatting requirements for data entry into MT-eWQX EDD are specified in the MT-eWQX Guidance Manual (MT-eWQX Guidance Manual) found on the Montana EQuIS Water Quality Exchange webpage: http://deq.mt.gov/wqinfo/datamgmt/MTEWQX.mcpx. Data management tools, including the EDP application and instructions for submittal of validated EDD to the MT-eWQX system also can be found on the above website. All data will be submitted under the EPA Region 8 Organization ID for Montana: R8MONTWQ. MT-eWQX Valid Values for Organization ID MTWTRSHD_WQX, which also apply to R8MONTWQ, and can be found in Appendix A of the MT-eWQX Guidance Manual. Atkins will receive verification from the DEQ system administrator of a successful data upload to MT-eWQX.

Field notes, stream flow measurement forms, and digital photos will be processed by field staff with attention to QA/QC procedures and the requirements set forth in the project's Scope of Work. Original copies of all project forms and reports will be submitted to the EPA Task Order Manager upon the completion of this project, following the Scope of Work deliverable dates.

13.0 Assessments, Response Actions and Status Reports

An assessment of each monitoring effort included within this SAP/QAPP will be conducted immediately prior to initiation of field work, and again following completion of field activities. Assessments will consist of a review of monitoring requirements contained in the Scope of Work, and the specific sampling protocols detailed in the SAP, for each TMDL Planning Area. The goal of these assessments will be to assure completeness and quality of monitoring activities, sample collection, sample processing and analysis, and data handling. When multiple visits to monitoring locations are specified in the SOW within a single monitoring season, an interim assessment of the previous monitoring effort will be conducted prior to initiating the next visit. The Atkins Project Manager will conduct all assessments, with the direct participation of field and lab personnel involved in sample collection and analysis.

Any problems, omissions, or modifications identified through the post-monitoring assessment will be documented, and significant issues brought to the attention of the Atkins Project Officer and EPA Task Order Manager. Corrective actions, if applicable, will be addressed by the Atkins Project Manager, and documented in the project files following their implementation.

Status reports will be prepared by Atkins field personnel following completion of field work on each monitoring activity, and provided to the Atkins Project Manager for the development of QA assessments.

14.0 Data Review, Verification, and Validation

Sub-sections 9.1 through 9.6 of Section 9.0, Quality Assurance and Quality Control Requirements, contain data quality objectives (DQOs), quantitative and qualitative criteria established in order to meet the project's objectives, and data quality indicators (DQIs), quantitative criteria established for the data acquired to assure it is of sufficient quality for its intended use. These include representativeness, comparability, completeness, sensitivity, precision, and bias and accuracy.

All field data, chain of custody information, instrument calibration logs, and laboratory analysis results will be reviewed and verified following the criteria defined in Section 9, and reiterated above. The designated Atkins Quality Assurance person will be responsible for conducting all data reviews, verifying whether or not criteria are met, and validating the appropriateness of data for their intended uses. Any data that fail to meet established criteria will be qualified with appropriate comments in the MT-eWQX EDD spreadsheets, or flagged as specified by standard laboratory practice.

15.0 Schedule for Completion

The 2011 monitoring will be completed by September 30, 2011, and the 2012 monitoring by September 30, 2012. Reporting will be fully completed by January 31, 2013.

16.0 References

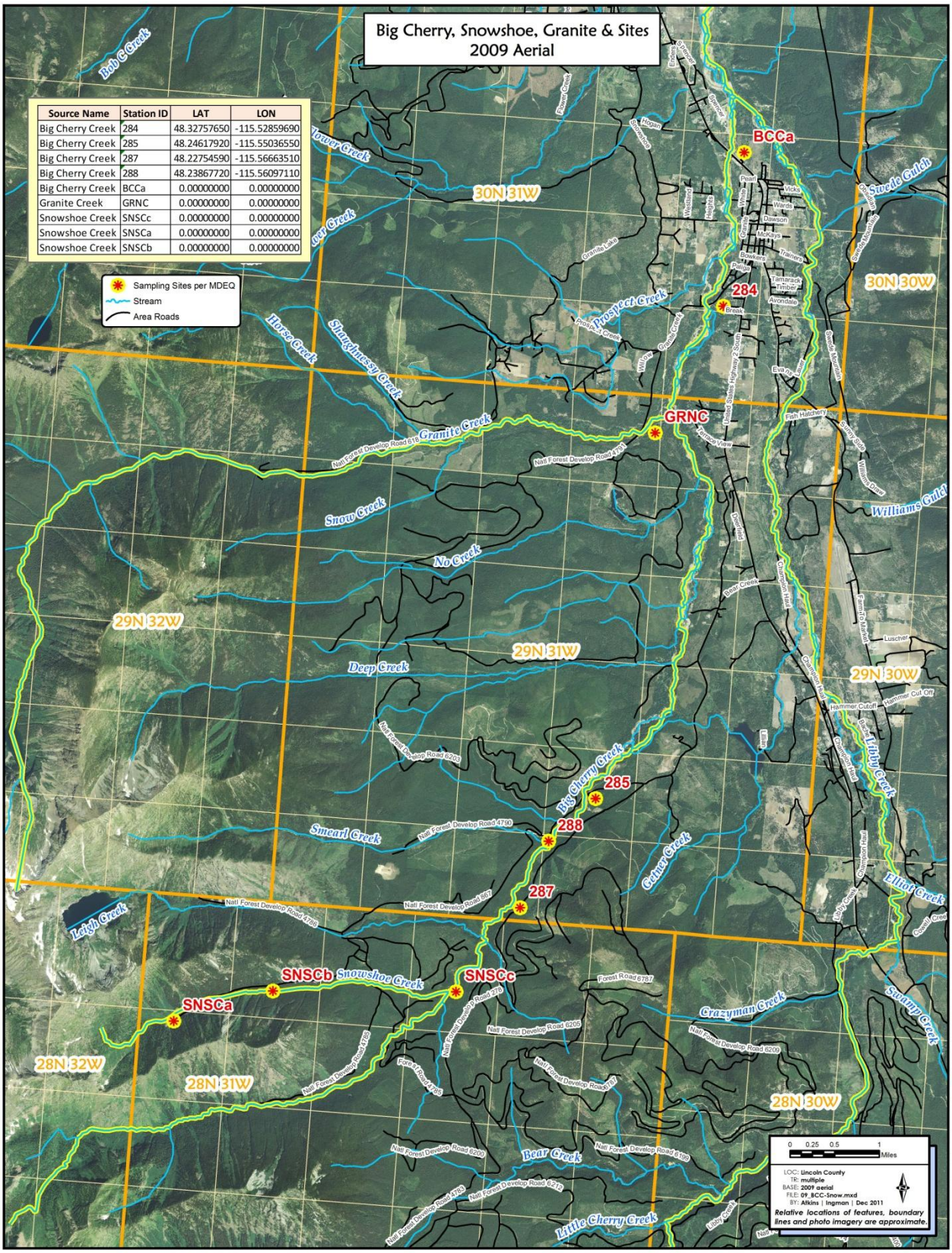
Montana Department of Environmental Quality. 2012. Water Quality Planning Bureau Field Procedures Manual For Water Quality Assessment Monitoring Version 3.0. Helena, MT: Montana Dept. of Environmental Quality. *Available at* http://deq.mt.gov/wqinfo/qaprogram/PDF/SOPs/WQPBWQM-020.pdf

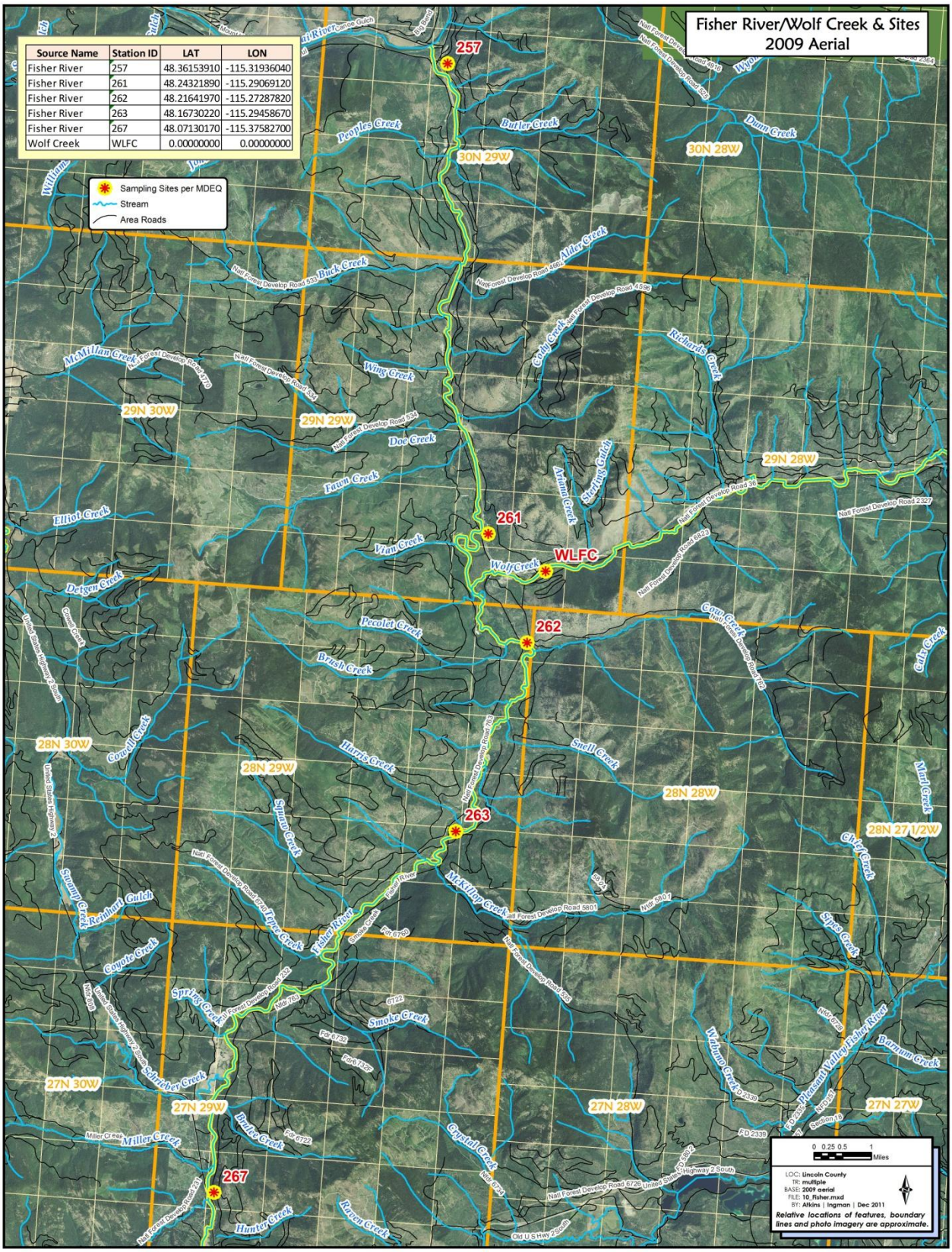
DEQ. 2005b. Quality Assurance Project Plan (QAPP) Sampling and Water Quality Assessment of Streams and Rivers in Montana, 2005. *Available at:* http://www.deq.mt.gov/wqinfo/qaprogram/PDF/WQPBQAP-02.pdf

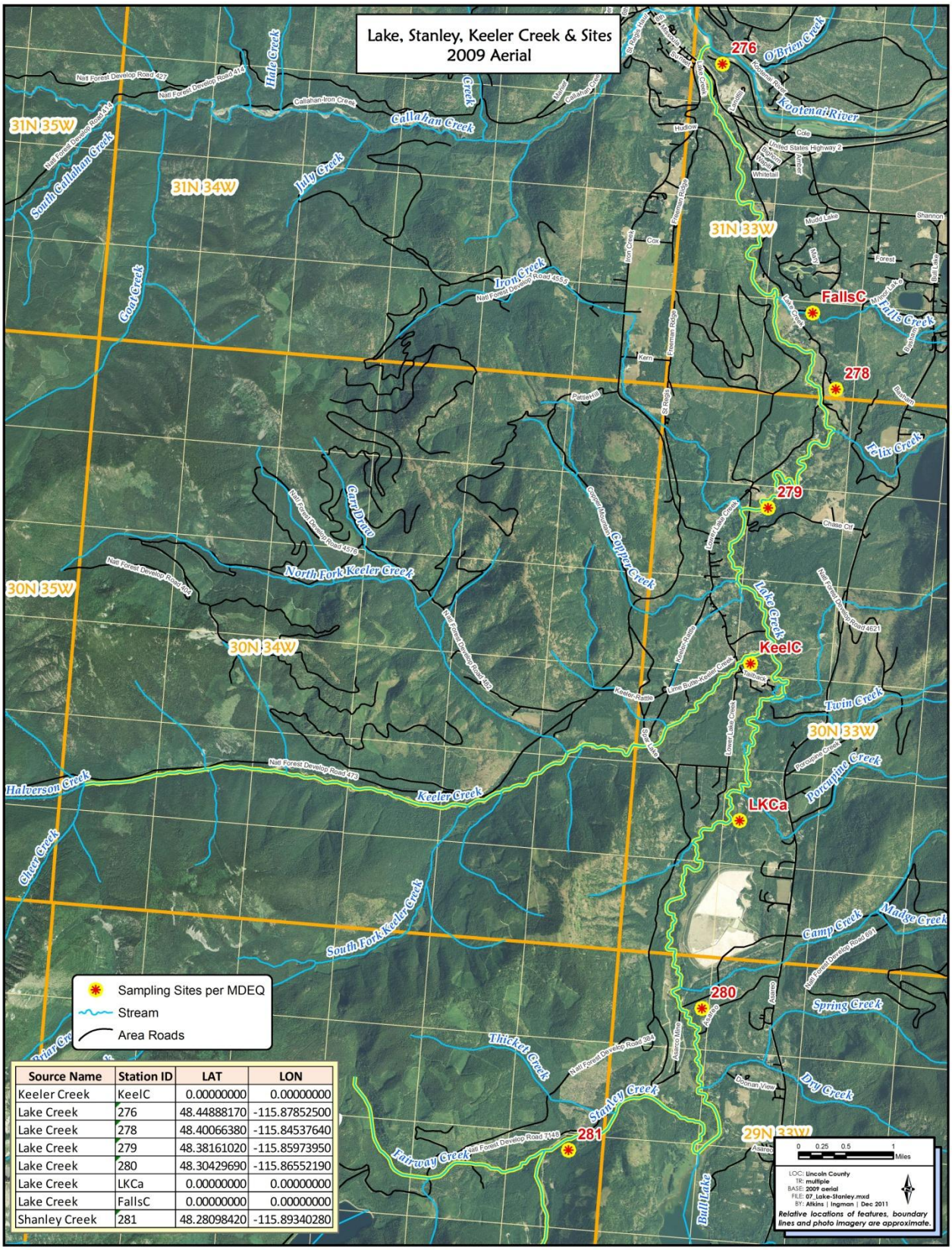
DEQ. 2008. Sample Collection and Laboratory Analysis of Chlorophyll-a Standard Operating Procedure. Montana Dept. of Environmental Quality, WQPBWQM-011, revision 4. June 5, 2008. *Available at* http://deq.mt.gov/wqinfo/QAProgram/PDF/SOP%20WQPBWQM-011v4_final.pdf

Attachment 1.

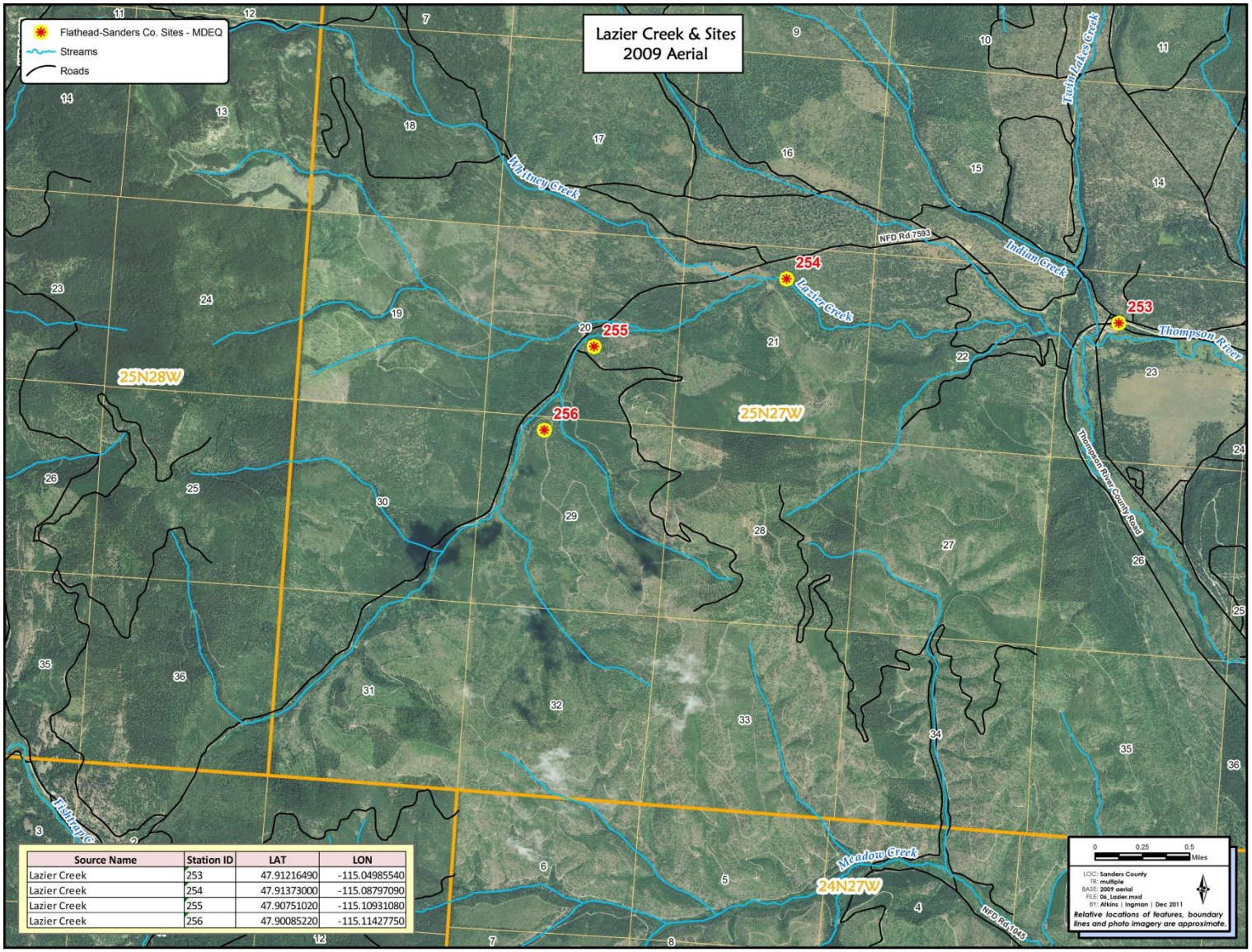
Maps of Sampling Site Locations for Impaired Segments Monitoring


Big Cherry, Snowshoe, Granite & Sites
2009 Aerial
Source Name | Station ID | LAT | LON
Big Cherry Creek | 284 | 48.32757650 | -115.52859690
Big Cherry Creek | 285 | 48.24617920 | -115.55036550
Big Cherry Creek | 287 | 48.22754590 | -115.56663510
Big Cherry Creek | 288 | 48.23867720 | -115.56097110
Big Cherry Creek | BCCa | 0.00000000 | 0.00000000
Granite Creek | GRNC | 0.00000000 | 0.00000000
Snowshoe Creek | SNSCc | 0.00000000 | 0.00000000
Snowshoe Creek | SNSCa | 0.00000000 | 0.00000000
Snowshoe Creek | SNSCb | 0.00000000 | 0.00000000
Sampling Sites per MDEQ
Stream
Area Roads
BCCa
284
GRNC
285
288
287
SNSCb
SNSCc
SNSCa
Bob C Creek
Prospect Creek
Granite Creek
Snow Creek
No Creek
Deep Creek
Smearl Creek
Big Cherry Creek
Geiger Creek
Leigh Creek
Snowshoe Creek
Crazyman Creek
Bear Creek
Little Cherry Creek
Libby Creek
Elliot Creek
Swede Gulch
Williams Gulch
30N 31W
30N 30W
29N 32W
29N 31W
29N 30W
28N 32W
28N 31W
28N 30W
0 0.25 0.5 1 Miles
LOC: Lincoln County
TF: multiple
BASE: 2009 aerial
FILE: 09_BCC-Snow.mxd
BY: Atkins | Ingman | Dec 2011
Relative locations of features, boundary lines and photo imagery are approximate.

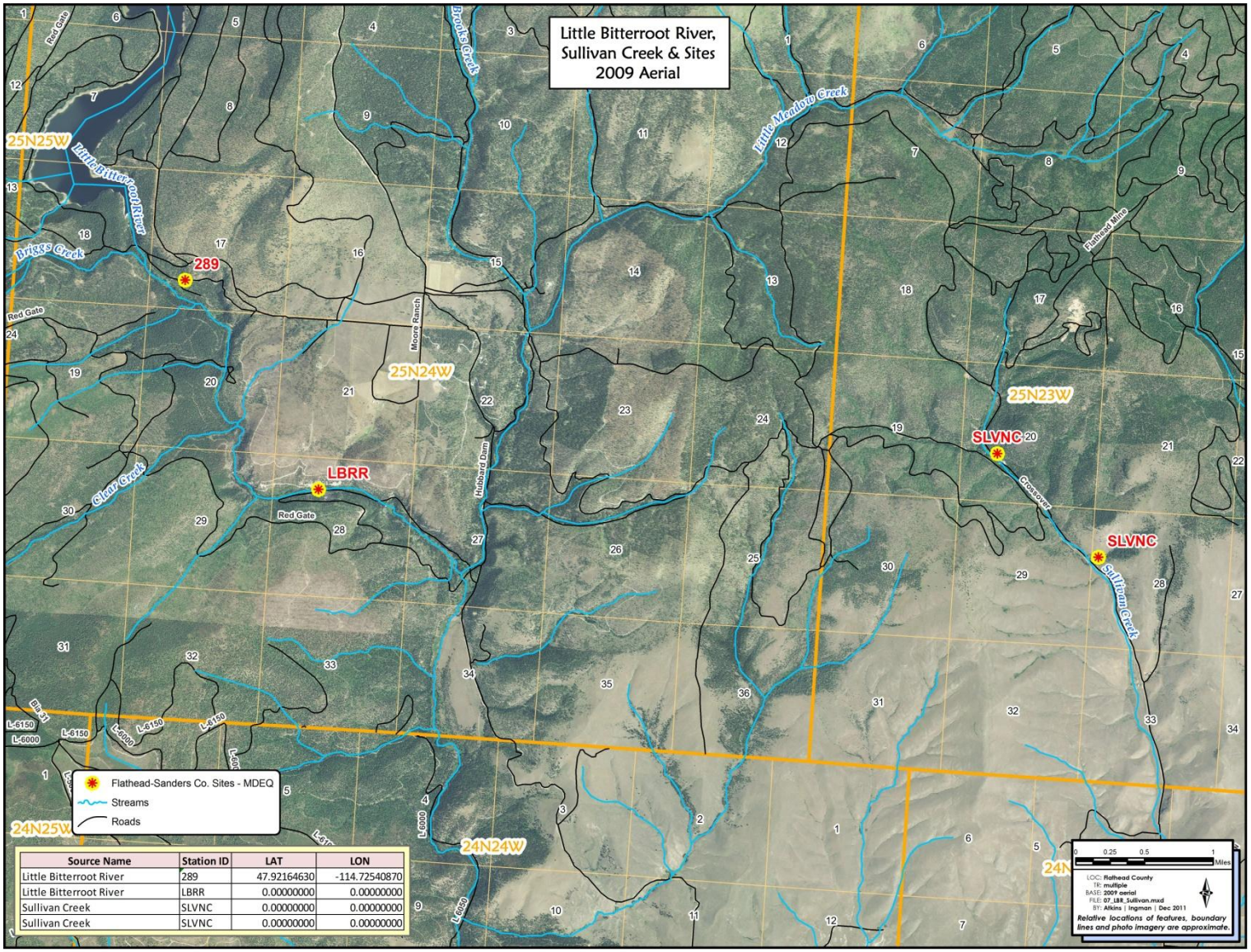

Fisher River/Wolf Creek & Sites
2009 Aerial
Source Name | Station ID | LAT | LON
Fisher River | 257 | 48.36153910 | -115.31936040
Fisher River | 261 | 48.24321890 | -115.29069120
Fisher River | 262 | 48.21641970 | -115.27287820
Fisher River | 263 | 48.16730220 | -115.29458670
Fisher River | 267 | 48.07130170 | -115.37582700
Wolf Creek | WLFC | 0.00000000 | 0.00000000
Sampling Sites per MDEQ
Stream
Area Roads
257
261
WLFC
262
263
267
30N 29W
30N 28W
29N 30W
29N 29W
29N 28W
28N 30W
28N 29W
28N 28W
28N 27 1/2W
27N 30W
27N 29W
27N 28W
27N 27W
Peoples Creek
Butler Creek
Dunn Creek
Williams
Buck Creek
Alder Creek
McMillan Creek
Wing Creek
Richards Creek
Doe Creek
Fagon Creek
Elliot Creek
Wolf Creek
Detgen Creek
Pecolet Creek
Brush Creek
Cow Creek
Coyote Creek
Hunts Creek
Snell Creek
Squaw Creek
Marl Creek
Reinhart Gulch
Fisher River
McKillop Creek
Spring Creek
Smoke Creek
Schreiber Creek
Miller Creek
Crystal Creek
Hunter Creek
Raven Creek
Barnum Creek
Pleasant Valley
0 0.25 0.5 1 Miles
LOC: Lincoln County
TR: multiple
BASE: 2009 aerial
FILE: 10_fisher.mxd
BY: Atkins | Ingman | Dec 2011
Relative locations of features, boundary lines and photo imagery are approximate.



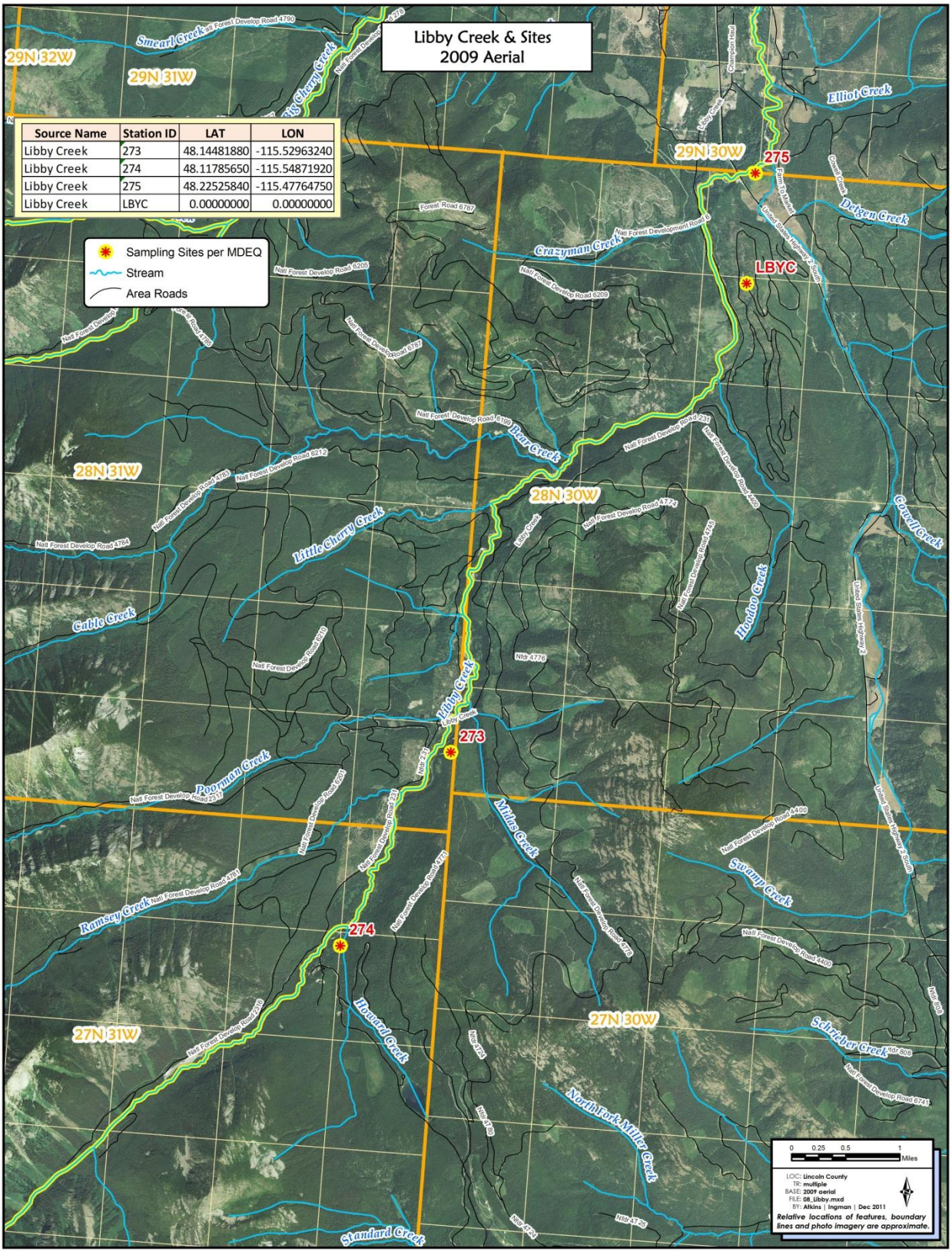
Source Name	Station ID	LAT	LON
Keeler Creek	KeelC	0.00000000	0.00000000
Lake Creek	276	48.44888170	-115.87852500
Lake Creek	278	48.40066380	-115.84537640
Lake Creek	279	48.38161020	-115.85973950
Lake Creek	280	48.30429690	-115.86552190
Lake Creek	LKCa	0.00000000	0.00000000
Lake Creek	FallsC	0.00000000	0.00000000
Shanley Creek	281	48.28098420	-115.89340280

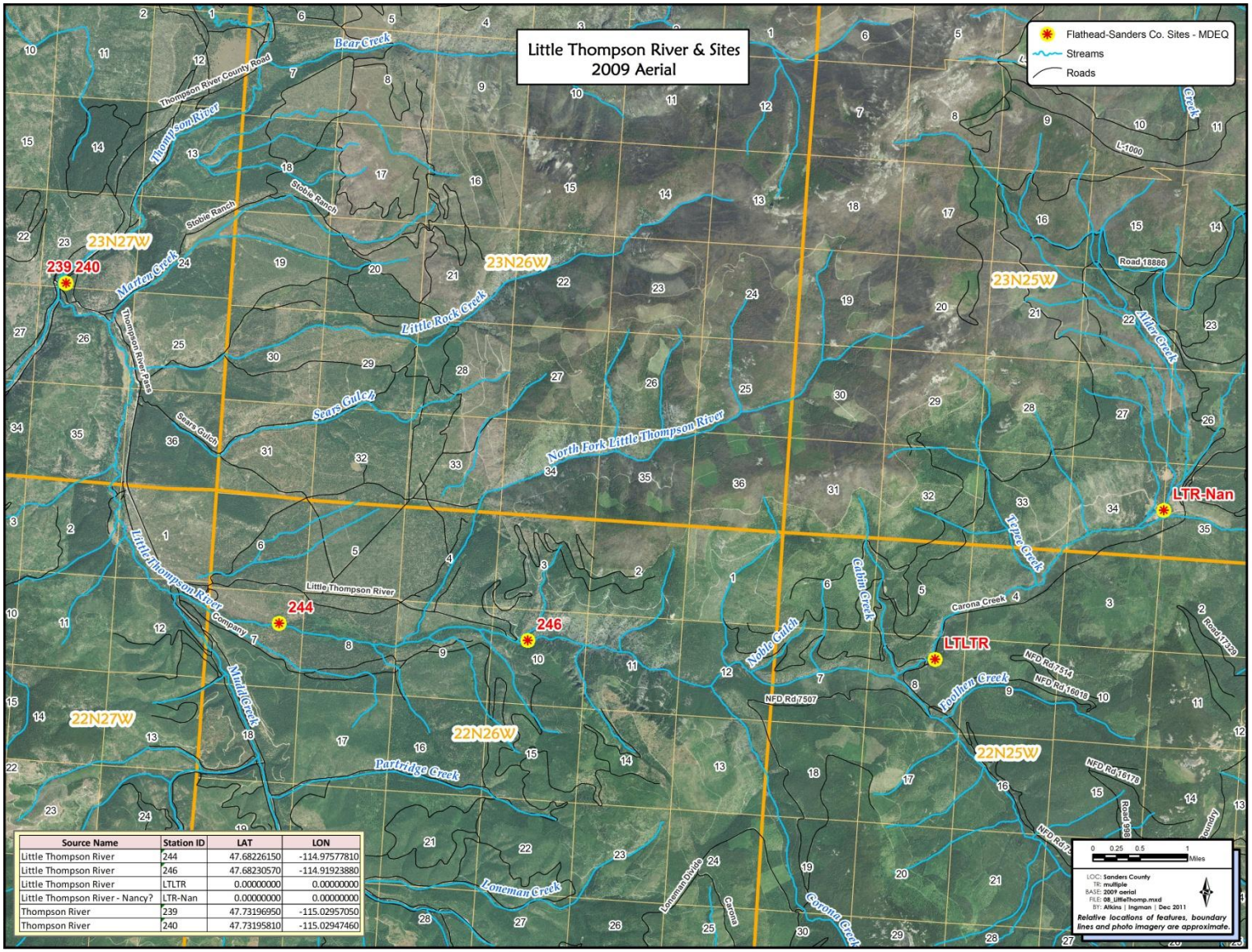


Source Name	Station ID	LAT	LON
Lazier Creek	253	47.91216490	-115.04985540
Lazier Creek	254	47.91373000	-115.08797090
Lazier Creek	255	47.90751020	-115.10931080
Lazier Creek	256	47.90085220	-115.11427750

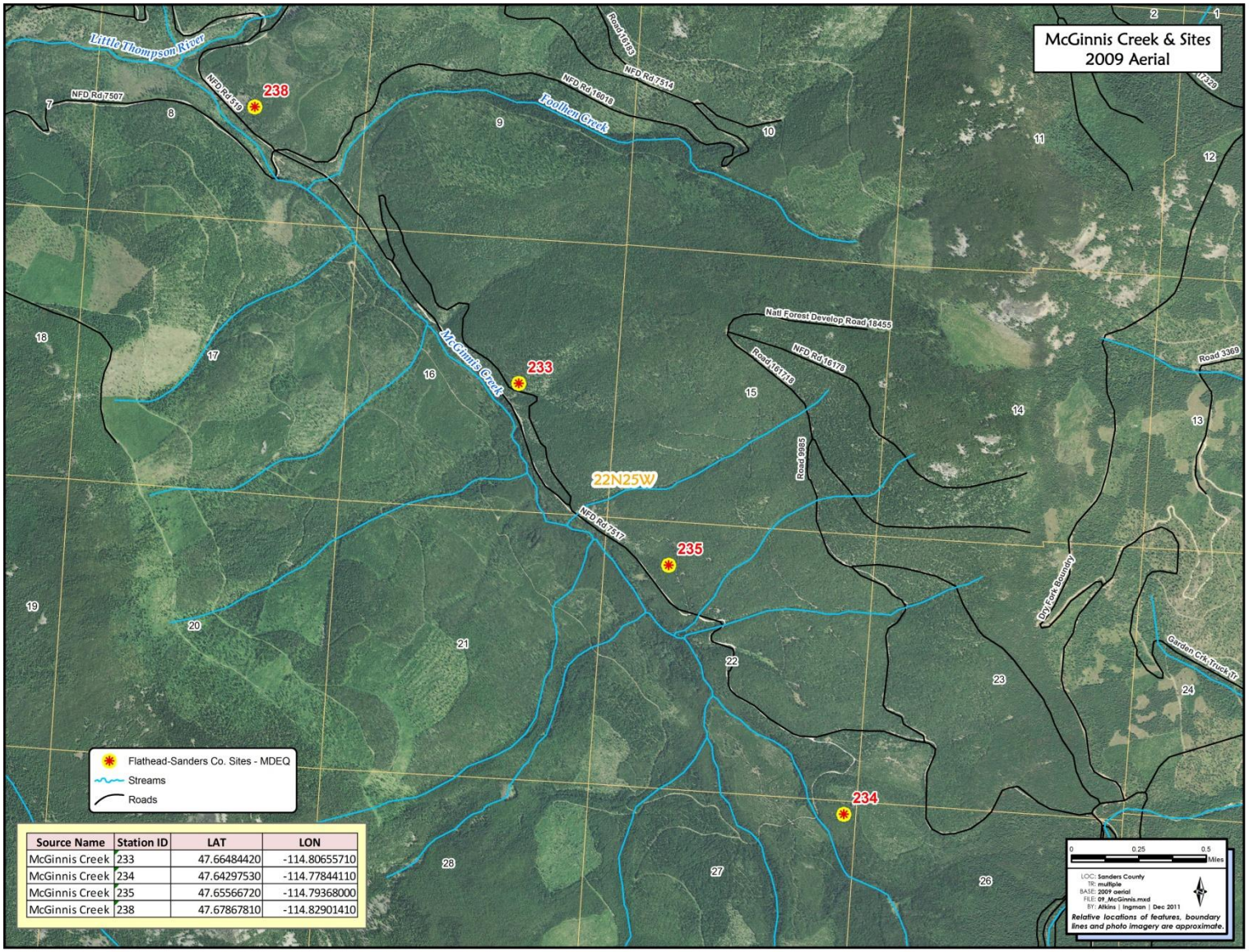


Source Name	Station ID	LAT	LON
Little Bitterroot River	289	47.92164630	-114.72540870
Little Bitterroot River	LBRR	0.00000000	0.00000000
Sullivan Creek	SLVNC	0.00000000	0.00000000
Sullivan Creek	SLVNC	0.00000000	0.00000000

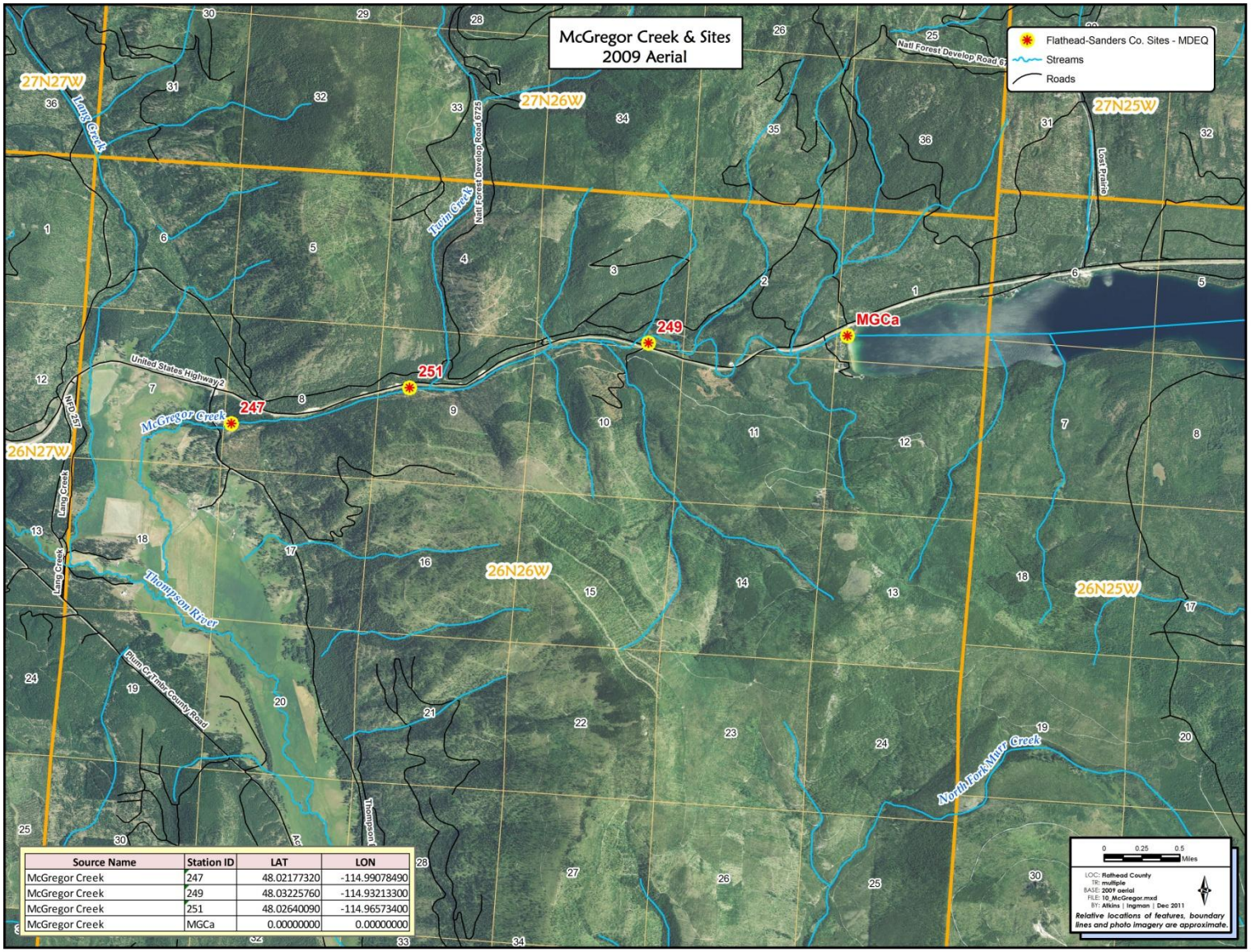

Libby Creek & Sites
2009 Aerial
Source Name | Station ID | LAT | LON
Libby Creek | 273 | 48.14481880 | -115.52963240
Libby Creek | 274 | 48.11785650 | -115.54871920
Libby Creek | 275 | 48.22525840 | -115.47764750
Libby Creek | LBYC | 0.00000000 | 0.00000000
Sampling Sites per MDEQ
Stream
Area Roads
29N 32W
29N 31W
29N 30W
28N 31W
28N 30W
27N 31W
27N 30W
275
LBYC
273
274
Smeari Creek
Elliot Creek
Delgen Creek
Crazyman Creek
Bear Creek
Little Cherry Creek
Cable Creek
Libby Creek
Poorman Creek
Ramsey Creek
Howard Creek
Miles Creek
Swamp Creek
Hoodoo Creek
Gravel Creek
Schreiber Creek
North Fork Miller Creek
Standard Creek
0 0.25 0.5 1 Miles
LOC: Lincoln County
TR: multiple
BASE: 2009 aerial
FILE: 08_Libby.mxd
BY: Atkins | Ingman | Dec 2011
Relative locations of features, boundary lines and photo imagery are approximate.



Source Name	Station ID	LAT	LON
Little Thompson River	244	47.68226150	-114.97577810
Little Thompson River	246	47.68230570	-114.91923880
Little Thompson River	LTLTR	0.00000000	0.00000000
Little Thompson River - Nancy?	LTR-Nan	0.00000000	0.00000000
Thompson River	239	47.73196950	-115.02957050
Thompson River	240	47.73195810	-115.02947460



Source Name	Station ID	LAT	LON
McGinnis Creek	233	47.66484420	-114.80655710
McGinnis Creek	234	47.64297530	-114.77844110
McGinnis Creek	235	47.65566720	-114.79368000
McGinnis Creek	238	47.67867810	-114.82901410



Source Name	Station ID	LAT	LON
McGregor Creek	247	48.02177320	-114.99078490
McGregor Creek	249	48.03225760	-114.93213300
McGregor Creek	251	48.02640090	-114.96573400
McGregor Creek	MGCa	0.00000000	0.00000000

Appendix A

Analyte Checklist

Appendix A. Analyte Checklist

Parameter	Preferred Method	Alternate Method	Required Reporting Limit (RL) µg/L	Method Detection Limit (MDL) µg/L	Holding Time Days	Bottle	Preservative
Water Sample - Common Ions and Physical Parameters							
Total Suspended Solids (TSS)	A2540 D		4000	3000	7	500 ml HDPE	≤ 6°C
Water Sample - Nutrients							
Total Persulfate Nitrogen (TPN)	A 4500-N C	A4500-N B	50	20	30	250ml HDPE	≤ 6°C
Total Phosphorus as P (TP)	EPA 365.1	A4500-P F	5	0.9	28	250ml HDPE	H2SO4 to pH < 2, 4°C +/- 2°C
Nitrate-Nitrite as N (NO3+2)	EPA 353.2	A4500-NO3 F	10	0.9			
Substrate Sample - Chlorophyll-a							
Chlorophyll-a	A 10200 H		0.1 mg/m^2	0.1 mg/m^2	21(pH≥7)/ASAP(pH<7)	Filter	Freeze; See Note 1
Ash Free Dry Weight (AFDW)	A 10300 C (5)		0.01 g /m^2	0.01 g /m^2	N/A	N/A	N/A
Water Sample - Dissolved Metals (0.45 µm filtered)							
Aluminum	EPA 200.7	EPA 200.8	30	2	180	250 ml HDPE	HNO3 to pH < 2
Water Sample - Total Recoverable Metals							
Total Recoverable Metals Digestion	EPA 200.2	APHA3030F (b)	N/A	N/A	180	500 ml HDPE/ 250 ml HDPE	HNO_3 to pH < 2
Arsenic	EPA 200.8		3	0.03			
Cadmium	EPA 200.8		0.08	0.01			
Calcium	EPA 200.7		1000	3			
Chromium	EPA 200.8		1	0.06			
Copper	EPA 200.8	EPA 200.7	1	0.03			
Iron	EPA 200.7		50	0.2			
Lead	EPA 200.8		0.5	0.01			
Magnesium	EPA 200.7		1000	0.7			
Selenium	EPA 200.8		5	0.04			
Silver	EPA 200.8		5	0.03			
Zinc	EPA 200.7		10	0.3			
Water Sample – Total Metals							
Mercury, ultra low level; see Note 2	EPA 245.7		0.005	.0006	28	100mL Glass	0.5 ml 12N HCl
Water Sample – Calculated Result							
Total Hardness as $CaCO_3$	A2340 B (Calc)	EPA 130.1	N/A	N/A	N/A	N/A	N/A

Note 1: Freeze samples only if filtered or hoop samples. Samples requiring filtration shall not be frozen until filtered.
Note 2: For ultra low-level mercury by method 245.7, both a trip blank and field blank are required for each set of samples.

Appendix B

QA/QC Checklist and Data Qualifiers

Quality Control Checklist

___Condition of samples upon receipt
- __Cooler/sample temperature
- __Proper collection containers
- __All containers intact
- __Sample pH of acidified samples <2

___All field documentation complete. If incomplete areas cannot be completed, document the issue.

___Holding times met

___Field duplicates collected at the proper frequency (specified in SAP)

___Field blanks collected at the proper frequency (specified in SAP)

___All sample IDs match those provided in the SAP. Field duplicates are clearly marked on samples and noted as such in lab results.

___Analyses carried out as described within the SAP (e.g. analytical methods, photo documentation, field protocols)

___Reporting detection limit met the project-required detection limit

___All blanks were less than the project-required detection limit

___If any blanks exceeded the project-required detection limit, associated data is flagged (The DEQ PM will set the criteria for determining associated data. Contact the DEQ PM to discuss blank results prior to flagging data)

___Laboratory blanks/duplicates/matrix spikes/lab control samples were analyzed at a 10% frequency

___Laboratory blanks/duplicates/matrix spikes/lab control samples were all within the required control limits defined within the SAP

___Project DQOs and DQIs were met (as described in SAP)

___Cursory review of chlorophyll a photos completed. Photo visual estimates appear to be consistent with laboratory values.

___Completed summary of QC analysis results, issues encountered, and how issues were addressed (corrective action)

Table B-1. Data qualifiers and descriptions.

Result Qualifier	Result Qualifier Description
B	Detection in field and/or trip blank
D	Reporting limit (RL) increased due to sample matrix interference (sample dilution)
H	EPA Holding Time Exceeded
J	Estimated: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
R	Rejected: The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
U	Not Detected: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.
UJ	Not Detected/Estimated: The analyte was not detected at a level greater than or equal to the adjusted CRQL or the reported adjusted CRQL is approximate and may be inaccurate or imprecise.

Laboratory flags should be entered in the Detection Limit Comments and Result Comments fields in STORET. Refer to the SAP for more information on how to qualify associated data.

Table B-2. Quality control terminology and descriptions.

FIELD QC		
Term	**Description**	**Purpose/Usage**
Trip Blanks	Used only for VOC (Volatile Organic Chemicals). Alias VOA (volatile organic analysis)	To determine if cross contamination occurs between samples.
Field Blank	Reagent water exposed to field sampling conditions	Monitors contamination resulting from field activities and or ambient levels of analytes present at time of sampling.
Field Duplicate	Two independent samples taken under the same conditions. For solids; two samples which are co-located (taken side by side.) Water samples would be two independent samples taken at the same location at the same time.	To determine the homogeneity of the samples collected.
Field Replicate	A single sample is obtained, homogenized, then slit into multiple samples	Monitors laboratory precision independent of laboratory operations.
LABORATORY BATCH QC		
Acronym	**Description**	**Definition**
LRB/Method Blank	Laboratory Reagent Blank	An aliquot of reagent water or other blank matrices that are treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, and internal standards that are used with other samples. The LRB is used to determine if method analytes or other interferences are present.

LFB/LCS	Laboratory Fortified Blank; Laboratory Control Sample	Reagent water spiked with a known amount of analyte. Ideally treated exactly like a MS/LFM. Control used to determine bias in sample spikes.
MS/LFM	Matrix Spike/Laboratory Fortified Matrix .	An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations
MSD/LFMD	Matrix Spike Duplicate/Laboratory Fortified Matrix Duplicate	Determine method precision in sample concentrations are < 5X the RL.
DUP	Duplicate	Determine method precision in sample concentrations are > 5X the RL.
QCS	Quality Control Sample	A solution of method analytes of known concentrations which is used to fortify an aliquot of reagent water or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check either laboratory or instrument performance
SRM	Standard Reference Material	Primarily used as a QCS to verify instrument calibration.
LABORATORY ANALYSIS QC		
Acronym	**Description**	**Definition**
ICB	Initial Calibration Blank	Monitors instrument drift at low end of cal curve.
CCB	Continuing Calibration Blank	Monitors instrument drift at low end of cal curve.
ICV	Initial Calibration Blank	Monitors instrument drift at a defined concentration near the mid range of cal curve.
CCV	Continuing Calibration Blank	Monitors instrument drift at a defined concentration near the mid range of cal curve.
IPC	Instrument Performance Check	Monitors instrument drift at a defined concentration near the mid range of cal curve.
MS/LFM	Matrix Spike/Laboratory Fortified Matrix .	An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations
MSD/LFMD	Matrix Spike Duplicate/Laboratory Fortified Matrix Duplicate	Determine method precision in sample concentrations are < 5X the RL.
DUP	Duplicate	Determine method precision in sample concentrations are > 5X the RL.

QCS	Quality Control Sample	A solution of method analytes of known concentrations which is used to fortify an aliquot of reagent water or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check either laboratory or instrument performance
SRM	Standard Reference Material	Primarily used as a QCS to verify instrument calibration.
IDL	Instrument detection limit	Signal just above baseline. 3-5x the STD DEV of 7 replicates of a blank. Not used for quantification.
MDL	Method detection limit	Statistical determination of the lowest concentration of an analyte with 95% certainty the analyte is present.
PQL	Practical Quantitation Limit	3-5x the MDL. Lowest level that quantification is determined
RL	Reporting Limit	Value a Laboratory reports results. Usually the PQL.

A completeness assessment table will be provided in any one category of assessment falls under the 95% completeness. Table C-3 is an example of a completeness reveiw table.

Table B-3. Example Completeness Evaluation

	TSS	**TP**	**NH3**	**NO2+ NO3**	**TPN**	**SRP**	**Hard**	**Metals** in combination	**Field measures** in combination	**Field notes** complete	**Discharge**, measured	**Discharge**, estimated		Total #	Total %
Total # of Analytical Tests Requested in SAP	**42**	**33**	**8**	**33**	**33**	**8**	**53**	**389**	**234**	**62**	**58**	**19**		**953**	**100%**
Total # of Analytical Tests Reported	36	29	4	29	29	5	48	346	214	55	39	16		834	88%*
Tests not performed	6	4	4	4	4	3	5	43	20	7	19	3		119	12%*
Total # of Tests H Flagged (counted against completeness)	11	0	0	0	0	0	0	0	0	0	0	0		11	1%**
Total # of Tests J Flagged (not counted against completeness)	5	0	0	0	0	0	0	88	0	0	0	0		93	11%**
Total # of Tests B Flagged (not counted against completeness)	0	0	0	0	0	0	0	0	0	0	0	0		0	0%**
Total # of Tests Useful	25	29	4	29	29	5	48	346	214	55	39	16		834	100%**
Overall Completeness	60%	88%	50%	88%	88%	63%	91%	89%	91%	89%	67%	84%		86%	

* as % of Total # Analytical Tests Requested in SAP; **as % of Total # Analytical Tests Reported

Appendix C

Montana DEQ “low-level” total mercury sampling procedure for wadeable streams

Appendix C
Montana DEQ "low-level" total mercury sampling procedure for wadeable streams

The MT DEQ procedure is based on U.S. E.P.A method 1669: *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (1996). A clean hands/dirty hands sampling technique for low-level mercury is necessary because the analysis has an inherent sensitivity to unintentional sample contamination from sources other than the ambient water being sampled. The procedure requires a two-person sampling team. One person is designated as "dirty hands" and the second person is designated as "clean hands". "Dirty hands" is responsible for all activities that do not involve direct contact with the sample bottles and sample water.

Sampling operations need to minimize the risk of sample contamination by human contact or atmospheric exposure. When multiple sites are scheduled for sampling, the field crew needs to determine the appropriate order for site visits. Sites visit order should not be determined simply through considerations of convenience (i.e. travel distance, proximity to other sample sites). The crew needs to assess two main components in determining sample site order: 1) whether individual sites have differing likelihoods of experiencing contamination; and 2) whether there are certain sites that are suspected to have relatively high levels of mercury in the ambient water since contamination of samples at such sites may pose less of a risk of causing erroneous results than at sites with very low levels of mercury. Sites suspected to have the greatest risk of contamination should be sampled first while sites suspected of having the greatest levels of mercury should be sampled last whenever possible in order to reduce the risk of cross-contamination of samples among sites. Vehicles should be fueled and ice obtained the day prior to the commencement of sampling activities. During a sampling day, "clean hands" must not smoke cigarettes and should not fuel the field vehicle prior to sampling. Hand wipes should be used regularly to clean hands and surfaces such as the vehicle steering wheel. If fuel or ice is needed after sampling activities have begun, it needs to be acquired at the end of the day once sampling for that day has been completed. Whenever possible, the sampling team should approach a site from downwind and downstream to reduce the risk of contamination. The sample bottle must be opened, filled, and closed while submerged in the ambient water to avoid atmospheric contamination. For laboratory preservation of sample, samples need to be delivered to the analyzing lab within 24 hours of sample collection with sufficient time allotted for the lab to meet the 48 hour sample preservation deadline.

Materials:

1. Gloves: Clean, non-talc (i.e. powder-free) polyethylene, latex, vinyl, or PVC; one pair of gloves per site for "dirty hands", two pairs of gloves per site worn by "clean hands". Gloves must be bagged by the analyzing lab or in a clean indoor environment and then stored in a clean cooler. Under no circumstances will non-bagged gloves be stored in the field vehicle, e.g. do not store open boxes of gloves in the vehicle cab, storage space, or in a cooler. The pair of gloves for "dirty hands" is stored separately from the gloves for "clean hands" in a sealed plastic bag. The two pairs of gloves for "clean hands" are double-bagged. The inner gloves for "clean hands" may be wrist-length while the outer gloves must be at least elbow-length. For dexterity purposes, thin outer length gloves are preferable.
2. Sample bottles: borosilicate glass or fluoropolymer bottles; individual bottles are pre-cleaned and double-bagged by the analyzing laboratory.
3. Plastic coolers, hard-sided, clean: for unused sampling equipment, e.g. glove sets, sample bottles, preservatives, glove bag. Store gloves for dirty hands in a separate cooler. Small enough to carry to sample site.
4. Plastic coolers, hard-sided, clean: for completed samples. Small enough to carry to sample site, large enough to house bags of ice and one or more sample bottles.
5. Ice, "wet": Completed samples must never become immersed in ice water. Upon acquisition, the ice must go directly from the store to the sealable bags, to the designated sample cooler. Bags should not be temporarily set

on the ground, on a vehicle, or in a shopping cart. Gloves should be worn whenever placing items into the sample cooler. First, a large garbage bag is placed in the cooler. Second, ice packed in sealable gallon-size plastic bags is placed in the garbage bag, lining the bottom and also the sides of the cooler. Third, a second large garbage bag is placed inside the first garbage bag containing the ice bags- this is the bag that in which completed samples will be placed. Fourth, the inner and outer garbage bags are closed.

6. Chest high waders: optional; worn by "clean hands".
7. Plastic bags, clean: stored in a clean plastic bag within sample supply cooler; zip-type, non-vented, colorless polyethylene.
8. Garbage bags, large, clean: stored in a clean cooler, for lining sample cooler.
9. Garbage bags, small: stored in a plastic bag within the sample supply cooler; for discarding used supplies.
10. Hand-wipes.
11. Paper towels: for drying sample bottles prior to affixing labels; prior to the field trip, the paper towel is placed in a sealable plastic bag in a clean indoor environment.
12. Labeling supplies: labels, clear tape, black sharpies, and pencil.
13. Field forms, clipboard, pencils, erasers, sharpies.
14. GPS unit.
15. Digital camera.
16. Field Blank Supplies: De-ionized water stored in a borosilicate glass or fluoropolymer bottle; additional empty borosilicate glass or fluoropolymer bottle for preparing field blank; individual bottles are pre-cleaned and double-bagged by the analyzing laboratory. These bottles are to be stored in the sample supplies cooler.
17. Glove bag: for preparing field blank
18. "Dry" ice: for inflating the glove bag.
19. Tongs, nonmetallic: for handling dry ice; stored in a clean cooler.

Additional Materials required if field preservation of samples is necessary

1. Glove bags for in situ sample preservation; one glove bag per day of sampling; store in a garbage bag within a plastic cooler
2. Garbage bags, small: stored in a plastic bag within the sample supply cooler; for transporting samples from the site to the vehicle.
3. Plastic bags, clean: for lining the bottom of the glove bag; stored in a clean plastic bag within a clean plastic cooler; zip-type, non-vented, colorless polyethylene.
4. Extra gloves, clean for using the glove bag. Stored in a sealed plastic bag within the cooler containing the glove bags
5. "Dry" ice: for inflating the glove bag.
6. Cooler, small, clean: for storage of dry ice.
7. Tongs, nonmetallic: for handling dry ice; stored in a clean cooler.
8. Trace-pure HCl for preserving samples; double-bagged by lab.

Procedure:

Stage 1: Arrival at the site

- At the vehicle, "dirty hands" puts on a clean pair of gloves. "Clean hands" puts on chest high waders as necessary.

- For lab preservation, carry the sample supply cooler and the completed samples cooler to the sample site. For field preservation, leave the completed sample cooler at the vehicle and instead bring a clean garbage bag (stored within the sample supply cooler) to the sample site. “Dirty hands” also carries the field forms, pencils, GPS unit and camera to the site.

Stage 2: Sampling Preparation

- Upon reaching the water’s edge at the location where the water body will be entered for sample collection, “dirty hands” carries the sample supply cooler to the water’s edge and “clean hands” enters the water.
- Standing at the water’s edge, “dirty hands” opens the cooler, removes the bag of gloves, opens the outer sealed plastic bag containing the gloves and holds the bag open without touching the inside of the outer bag. “Clean hands” reaches into the outer bag, opens the inner plastic bag, extracts, and puts on the inner gloves, followed by the elbow or shoulder length gloves. After this point, if “clean hands” touches anything besides the sample bottle, cap, stream water, paper towel, and sample label (e.g. waders, branches, rocks, etc.), the outer gloves must immediately be removed.
- "Dirty hands" unzips the outer sample bag containing the sample bottle and holds the bag open without touching the inside of the bag. Without removing the inside bag from the outside bag, "clean hands" opens the inside bag containing the sample bottle and removes the bottle, and if possible, reseals the inside bag. "Dirty hands" then reseals the outer bag and returns it to the sampler supply cooler.

Stage 3: Sample Collection

- "Clean hands" wades into the stream and locates the thalweg. Facing directly upstream, the sample bottle is positioned upstream of their standing position. If the stream is not flowing (pool or glide systems), wade the stream carefully to avoid disturbing the sediment. Meanwhile, “dirty hands” will be completing the field form, preparing the sample label, and completing site photographs.
- “Clean hands” submerges the bottle completely beneath the water surface, taking care not to disturb the channel substrate. Once the bottle is completely submerged into the stream flow, “clean hands” unscrews the cap underwater and allows the bottle to fill with water. During filling of the bottle, the cap should remain underwater to minimize atmospheric exposure. The sample bottle is not rinsed with ambient water prior to sample collection.
- The bottle should be filled as completely with water as possible. After the bottle has filled and is still completely underwater, "clean hands" seals the cap on the bottle. In this way, the sample water has never contacted the atmosphere. **REFER TO STAGE 4B FOR INSTRUCTIONS ON SAMPLE BOTTLE FILLING WHEN FIELD PRESERVATION IS NECESSARY.**

Stage 4A: Sample Completion, assuming lab preservation of samples

- “Dirty hands” removes the paper towel bag from the sample supply cooler and opens the plastic bag. While holding the sample bottle, “clean hands” removes the outer sample gloves and then removes a paper towel

and dries the sample bottle. If it is raining and the sample bottle cannot be dried at the stream, the bottle is put into the inner sample bag following the procedure below and is taken to the vehicle where it can be labeled inside the vehicle.

- "Clean hands" moves to the edge of the stream channel.

- "Dirty hands" gives the completed sample label and tape to "clean hands" who affixes the label to the bottle.

- "Dirty hands" removes the sealed sample bag from the cooler, opens the outer sample bag, and holds it open. "Clean hands" opens the inner sample bag removes bottle and submerges bottle into water column. The lid is removed and the bottle is allowed to fill. The cap is replaced while the bottle is submerged. The bottle is removed from the water column then the sample bottle is placed into the inner bag. "Clean hands" reseals the inner bag. "Dirty hands" seals the outer sample bag.

- "Clean hands" opens the completed samples cooler and places the sample bottle inside the inner garbage bag. "Clean hands" closes all garbage bags and closes the samples cooler. "Dirty hands" discards used sample supplies in a small garbage bag.

- Upon reaching the vehicle, the used garbage bag is discarded into a large garbage bag designated for the disposal of used equipment. Gloves can now be removed.

- **NOTE: Samples need to be delivered to the analyzing lab within 24 hours of sample collection with sufficient time allotted for the lab to meet the 48 hour sample preservation deadline.**

Stage 4B: Sample Completion assuming field preservation of samples

- NOTE: FOR FIELD PRESERVATION OF SAMPLES FILL THE SAMPLE BOTTLE WITH AMBIENT WATER TO WITHIN ONE TO TWO CENTIMETERS OF THE TOP INSTEAD OF FILLING THE BOTTLE COMPLETELY.

- After filling the bottle, "clean hands" moves to the edge of the stream channel.

- "Dirty hands" removes the paper towel bag from the sample supply cooler and opens the bag. While holding the sample bottle, "clean hands" removes the outer sample gloves and then removes a paper towel and dries the sample bottle. "Dirty hands" removes the sealed sample bag from the garbage bag, opens the outer sample bag, and holds it open. "Clean hands" opens the inner sample bag. "Clean hands" then places the sample bottle into the inner bag, and reseals the inner bag. "Dirty hands" seals the outer sample bag.

- "Dirty hands" takes two small garbage bags out of the sample supply cooler. "Clean hands" places the sample bottle within one garbage bag while "dirty hands" discards used sample supplies in the second small garbage bag. "Clean hands" carries the completed sample to the vehicle while "dirty hands" carries the rest of the supplies.

- Upon reaching the vehicle, "dirty hands" removes a clean garbage bag from a cooler and places it on a flat surface.

- “Dirty hands” removes the glove bag from a clean cooler and sets them on the garbage bag. “Dirty hands” takes out the bag of extra gloves and opens the bag. “Clean hands” discards their inner gloves and puts on a new pair of gloves.

- “Dirty hands” opens the cooler containing the dry ice. “Dirty hands” removes a piece of dry ice from the small cooler using the tongs. “Clean hands” opens the glove bag and “dirty hands” inserts the ice using the tongs. Once the bag is inflated, “clean hands” opens the glove bag and “dirty hands” removes and discards the remaining dry ice. The tongs are then stored in a clean cooler.

- “Dirty hands” removes the bag of plastic liner bags from a cooler. “Dirty hands” opens the plastic bag containing uncontaminated plastic bags and holds it open. “Clean hands” withdraws a plastic bag, opens the glove bag, and places the liner in the bottom of the glove bag in order to catch any fluid that may spill during the sample preservation. The glove bag is then sealed.

- “Dirty hands” removes the preservative bag from the cooler, opens the outer preservative bag and holds it open while “clean hands” removes the inner bag, opens the glove bag, and places the inner preservative bag inside the glove bag.

- "Dirty hands" opens the outer sample bag and holds it open. "Clean hands" opens the inner sample bag containing the sample bottle and places the bottle inside the glove bag, then seals the glove bag. Clean hands seals the inner sample bag, then “dirty hands” seals the outer sample bag.

- “Clean hands” uses the gloves attached to the glove bag to unscrew the sample bottle, open the inner preservative bag, open the preservative aliquot, pour the preservative into the sample bottle, and reseal the sample bottle. “Clean hands” puts the used aliquot into the inner preservative bag and seals it.

- “Clean hands” then opens the glove bag and removes the sample bottle from the glove bag. Dirty hands” gives the completed sample label and tape to “clean hands” who affixes the label to the bottle. "Dirty hands" opens the outer sample bag and holds it open. "Clean hands" opens the inner sample bag, places the sample bottle into the inner bag, then seals the inner bag. "Dirty hands" seals the outer sample bag.

- “Dirty hands” places the sample bag containing the completed sample into the cooler containing the ice.

- “Clean hands” extracts the used preservative and liner bag from the glove bag and gives them to “dirty hands” who discards them in a garbage bag designated for the disposal of used equipment. “Dirty hands” also discards the used gloves and paper towels into the garbage bag. “Clean hands” deflates the glove bag and stores it in a clean garbage bag. Gloves can now be removed.

QA/QC Procedure

- For every field trip, one field blank and one field duplicate must be prepared.

- The duplicate sample may be performed at any sample site during the field trip.

Field Blank Requirements for Low-Level Total Hg Sampling

Per the *Guidance for Implementation and Use of EPA Method 1631 for the Determination of Low-Level Mercury*, EPA Method 1631 requires collection of a field blank at a 10% frequency. To meet Method requirements, a field blank should be collected for low-level Hg samples. Although a grab sample for the DEQ method does not allow the sample to be exposed to atmosphere and there is no filtering or sampling equipment involved, there are other processes during the sampling and analysis process (including storage, transport, preservation and analysis) that could potentially introduce contamination.

Collecting a field blank (lab preserved method):

1. An empty sample bottle for the field blank should be requested from the analyzing laboratory when the sampling kit is requested. A separate sample bottle filled with mercury-free reagent water will be used to collect the field blank. The bottle containing reagent water needs to be double-bagged by the lab. These will be shipped to the field in the sample bottle cooler and treated as a sample in most respects.

2. "Dirty hands" puts on a clean pair of gloves stored in sealed plastic bag in a sample supplies cooler and then removes a clean garbage bag from a supplies cooler and places it on a flat surface.

3. "Dirty hands" removes a glove bag from a sample supplies cooler and sets them on the garbage bag. "Dirty hands" takes out the bag of extra gloves and opens the bag. "Clean hands" reaches in and puts on a pair of gloves.

4. Dirty hands" opens the cooler containing the dry ice. "Dirty hands" removes a piece of dry ice from the small cooler using the tongs. "Clean hands" opens the glove bag and "dirty hands" inserts the ice using the tongs. Once the bag is inflated, "clean hands" opens the glove bag and "dirty hands" removes and discards the remaining dry ice. The tongs are then stored in a clean cooler.

5. Dirty hands" removes the bag of plastic liner bags from a cooler. "Dirty hands" opens the plastic bag containing uncontaminated plastic bags and holds it open. "Clean hands" withdraws a plastic bag, opens the glove bag, and places the liner in the bottom of the glove bag in order to catch any fluid that may spill during the sample preservation. The glove bag is then sealed by "dirty hands".

6. "Dirty hands" removes the bag containing the bottle with reagent water from the cooler, opens the outer bag and holds it open while "clean hands" removes the inner bag, opens it and removes the reagent bottle. "Dirty hands" opens the glove bag. "Clean hands" places the reagent bottle inside the glove bag. "Dirty hands" then seals the glove bag.

7. Dirty hands" removes a double-bagged sample bottle from a sample supplies cooler, opens the outer sample bag and holds it open. "Clean hands" removes the inner sample bag containing the sample bottle. "Dirty hands" opens the glove bag and "clean hands" opens the inner bag and places sample bottle inside the glove bag. "Dirty hands" then seals the glove bag. "Clean hands" re-seals the inner bag. "Dirty hands" holds open the outer bag and "clean hands" puts the sealed inner bag into the outer bag. "Dirty hands" then reseals the outer bag. "Dirty hands" prepares the sample bottle label.

8. "Clean hands" uses the gloves attached to the glove bag to unscrew the cap on the sample bottle and sets the cap to one side of the glove bag. "Clean hands" uses the attached gloves to unscrew the cap on the reagent bottle and sets its cap to an opposite side of the glove bag. "Clean hands" pours the reagent water into the sample bottle and then screws the cap back onto the sample bottle.

9. “Clean hands” then opens the glove bag and removes the sample bottle from the glove bag. “Dirty hands” gives the completed sample label and tape to “clean hands” who affixes the label to the bottle. "Dirty hands" opens the outer sample bag and holds it open. "Clean hands" opens the inner sample bag, places the sample bottle into the inner bag, then seals the inner bag. "Dirty hands" seals the outer sample bag. “Dirty hands” places the sample bag containing the completed field blank sample into the cooler containing the ice.

10. “Clean hands” extracts the liner bag from the glove bag and gives them to “dirty hands” who discards them in a garbage bag designated for the disposal of used equipment. “Clean hands” deflates the glove bag and stores it in a clean garbage bag in a clean cooler. Gloves can now be removed.

Appendix D

Examples of Site Visit and Chain of Custody Forms

Place Site Visit Label Here

Site Visit Form
(One Station per page)

Project ID: ____________________

Date: ______________ **Time:** ____________ **Personnel:** ______________________________

Waterbody: ______________________________________ Location: ______________________

Station ID: ________________ Visit #: ________ HUC: ________________ County: ______________

Latitude: __ __ . __ __ __ __ Longitude: __ __ __ . __ __ __ __ Lat/Long Verified? ☐ By:

Elevation: ______________ ft m Geo Method: **GPS** Other:__________ Datum: NAD27 **NAD83** WGS84

Samples Collected:		**Sample ID** (Provide for all samples):	**Sample Collection Information/Preservation:**
Water	☐		GRAB EWI
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Analysis:			Preserved: HNO_3 H_2SO_4 H_3PO_4 HCL Ice Frozen None
Sediment	☐		SED-1
Analysis:			Preserved: None Other:
Analysis:			Preserved: None Other:
Chlorophyll a	☐		Sample Method: C=Core H=Hoop T=Template N=None
Composite at Lab	☐		Sample Location: R=Right C=Center L=Left
Transect: A__-__ B__-__ C__-__ D__-__ E__-__			F__-__ G__-__ H__-__ I__-__ J__-__ K__-__
Phytoplankton	☐		D1 Filtered:________mL D2 Filtered:________mL
Algae	☐		PERI-1-MOD OTHER:
Macroinvert.	☐		MAC-R-500 HESS OTHER:
Collection Reach Length (m):			# of Jars: | Mesh Size: 500 OTHER:

Field Measurements:		Time: am pm	**Field Assessments:**
Water Temp: °C °F		Air Temp: °C °F	Macroinvertebrate Assessment ☐
Bar. Pressure: mm/Hg		SC: umho/cm	Habitat Assessment: Reach ☐ Site ☐ EMAP ☐
pH:	DO: mg/L	Flow: cfs	Substrate: Pebble Count ☐ Percent Fines ☐ RSI ☐
Flow Comments: Dry Bed ☐ No Measurable Flow ☐			Channel Cross-Section ☐ Photographs ☐
Flow Method: Meter ☐ Float ☐ Gage ☐ Visual Est. ☐			Data Logger: Temperature ☐ YSI ☐ TruTrack ☐
Turbidity: Clear ☐ Slight ☐ Turbid ☐ Opaque ☐			Data Logger: Weather Station ☐ AquaRod ☐

Site Visit Comments:	Total Site Length = _____m Average Wetted Width = _____m Transect Length = _____m

Chemistry Lab Information:		
Lab Samples Submitted to:	Account #:	Term Contract Number:
Contact Name & Phone:		EDD ☒ Format: MT-eWQX Compatible
1) Relinquished By & Date/Time:	1) Shipped By: Hand ☐ FedEx/UPS ☐ USPS ☐	1) Received By & Date/Time:
2) Relinquished By & Date/Time:	2) Shipped By: Hand ☐ FedEx/UPS ☐ USPS ☐	2) Received By & Date/Time:

Lab Use Only - Delivery Temperature: Wet Ice______°C Dry Ice______°C

Rev. 3/23/2010

Site Visit Form Instructions

1. Place a Site Visit Code label in the upper left corner (ONLY 1 SITE VISIT CODE PER FORM).
2. Place a Trip Label in the upper right corner. (Covering Project ID and Trip ID with label is alright.)
3. **Project ID**: If you do not have a Trip Label, enter the Project ID assigned by Data Management. If Project ID is not assigned, leave blank for Water Quality Database Manager.
4. **Trip ID:** If you do not have a Trip Label, enter the Trip ID assigned by Data Management. If Trip ID is not assigned, leave blank for Water Quality Database Manager.
5. **Date/Time**: Enter the date and time of the station visit.
6. **Personnel**: Enter the first and last name(s) of the personnel conducting field activities.
7. **Waterbody**: Enter the name of the waterbody such as "Missouri River".
8. **Location**: Description of sample location such as "upstream from bridge on Forest Service road 100". For confidentiality please DO NOT use proper names of people in the location field.
9. **Station ID**: If you have a Trip Label, enter the established ID. If there is no ID on the Trip Label, leave the field blank and Data Management will generate a Station ID when the SVF is submitted.
10. **Visit #**: Enter "1" if this is a new station. Leave blank if visit number is unknown.
11. **HUC**: If you do not have a Trip Label, enter the fourth code (8 digit) HUC the station falls within.
12. **County**: If you do not have a Trip Label, enter the county in which the station falls within.
13. **Lat/Long**: Latitude and Longitudes should be obtained in decimal degrees using a GPS unit reading **NAD83** whenever possible. If a lat/long is obtained by another method, the datum and method must be recorded in the Site Visit Comments.
14. **Lat/Long Verified**: Latitudes and Longitudes should be verified immediately upon return from the field. Verify by plotting on a paper map or using a mapping website. Once the lat/long has been verified check the Verified box and enter initials after "By".
    - Do not make minor adjustments to measured values during verification; they are assumed to be correct within the limitations of the measurement system.
    - Gross errors should be corrected as follows: 1) Draw a single line through the erroneous value(s) and initial. Do not erase the original reading. 2) Write the corrected value in the comment field along with the method and datum used to derive the corrected value.
15. **Elevation**: Record elevation collected by GPS and circle the GPS datum used. If elevation is obtained by another method, the datum and method must be recorded in the Site Visit Comments.
16. **Samples Collected**: Check the box next to each activity that is collected during the station visit.
17. **Sample ID**: Write the Sample ID (Site Visit Code-sample identifier) for all of the samples collected.
18. **Sample Collection Procedure**: Circle the appropriate Sample Collection Procedure ID.
    - For each Chlorophyll a transect, record the sample collection method in the first space provided and the sample location in the second space provided (example: A: T - R).
    - For Phytoplankton, record the volume filtered for each sample collected.
19. **Analysis Requested**: Record the requested laboratory analysis for each chemistry sample and circle the preservative used.
20. **Field Measurements**: Record your field measurements in the spaces provided.
21. **Field Assessments**: Check the boxes next to each type of field assessment completed.
22. **Site Visit Comments**: Record general comments about the station visit, samples, and field measurements.
23. **Chemistry Lab Information**: If chemistry lab samples were taken, complete this section.
    - Lab Samples Submitted to: Enter name of laboratory where samples will be sent.
    - Account #: Enter account number at laboratory where samples will be sent.
    - Date Submitted: Record date the samples were received by the laboratory.
    - Sign and date the form each time the samples change possession.

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page _____ of _____

PLEASE PRINT (Provide as much information as possible.)

Company Name:	Project Name, PWS, Permit, Etc.	Sample Origin State:	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address:	Contact Name: Phone/Fax:	Email:	Sampler: (Please Print)
Invoice Address:	Invoice Contact & Phone:	Purchase Order:	Quote/Bottle Order:

Special Report/Formats:

☐ DW ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP **Format:**_____
☐ State: _____ ☐ LEVEL IV
☐ Other: _____ ☐ NELAC

ANALYSIS REQUESTED

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids
Vegetation Bioassay Other
DW - Drinking Water

SEE ATTACHED

Standard Turnaround (TAT)

R U S H

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by:

Cooler ID(s):

Receipt Temp _____ °C

On Ice: Y N

Custody Seal
On Bottle Y N
On Cooler Y N

Intact Y N

Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: _____ Lab Disposal: _____			**Received by Laboratory:**	Date/Time:	Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Appendix E

Internet Links to On-Line Field Equipment Manuals

Appendix E. Links to On-Line Field Equipment Manuals

Field Meter	Maintenance/Calibration User Manual Hyperlink
Hach 2100P Portable Turbidity Meter	http://www.hach.com/fmmimghach?/CODE%3A4650088-2008-0416048%7C1
Marsh-McBirney Model 2000 Flo-Mate	http://www.marsh-mcbirney.com/manuals/Model_2000_Manual.pdf?_sm_au_=iVVkRNsF7sdsBHBk
YSI Model 556 Multiparameter Field Meter	http://www.ysi.com/media/pdfs/655279-YSI-556-Operations-Manual-RevD.pdf
YSI Professional Plus Multiparameter Field Meter	http://www.ysi.com/media/pdfs/605596-YSI-ProPlus-User-Manual-RevD.pdf

Appendix F

Chlorophyll *a* Photo Packet

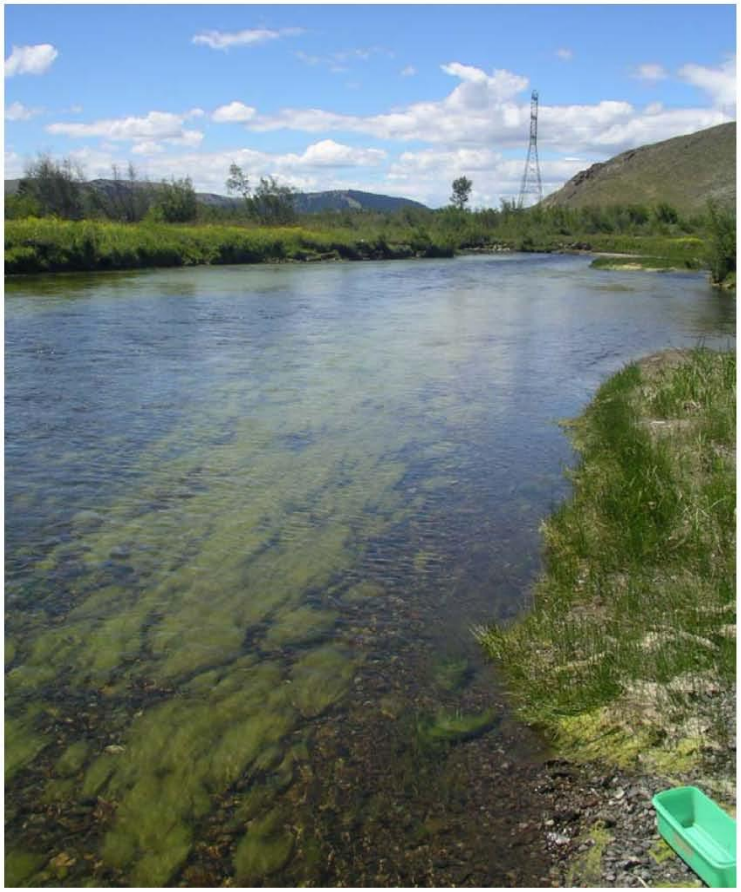
Appendix F – Chlorophyll a Photo Packet

REACH PHOTO: 10 mg/m2

REACH PHOTO: 38 mg/m2

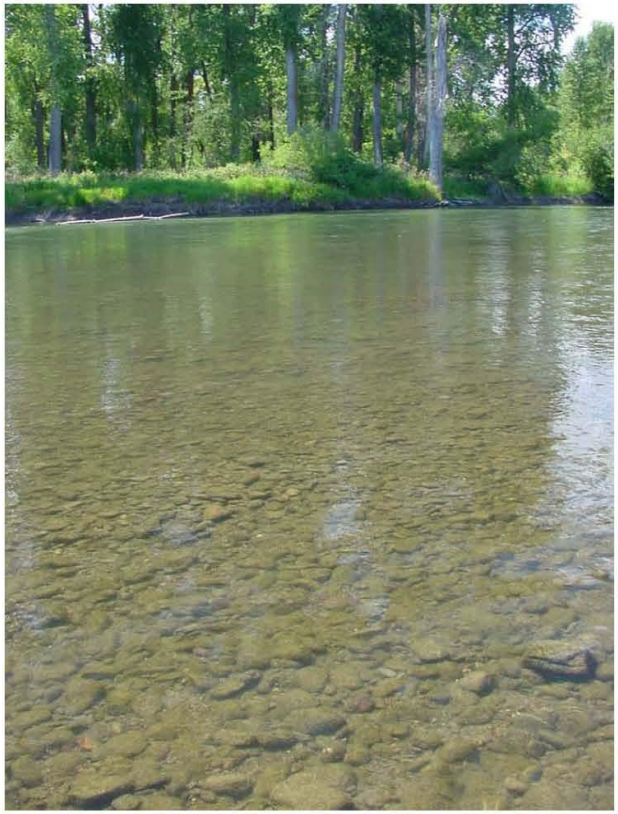
Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample

REACH PHOTO: 44 mg/m2



REACH PHOTO: 96 mg/m2

Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample



REACH PHOTO: 152 mg/m2

REACH PHOTO: 154 mg/m2

Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample

SUBSTRATE PHOTO: 15mg/m2

SUBSTRATE PHOTO: 23mg/m2

Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample

SUBSTRATE PHOTO: 44 mg/m2

SUBSTRATE PHOTO: 60 mg/m2

Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample

SUBSTRATE PHOTO: 106 mg/m2

SUBSTRATE PHOTO: 137 mg/m2

Collect chlorophyll at sites where growth is estimated to be >50 mg/m2. If in doubt, collect a sample