SUN RIVER WATERSHED GROUP

Volunteer Water Quality Monitoring Project: Nutrient Trend Monitoring on the Sun River and Tributaries

Sampling and Analysis Plan

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Sun River Watershed Group
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Approved by:

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ACRONYMS

BMP	Best Management Practice (?)
DEQ	Department of Environmental Quality
DQI	Data Quality Indicator
EDD	Electronic Data Deliverable
HDPE	High-Density Polyethylene
HUC	Hydrological Unit Code
MDL	Method Detection Limit
MSUEWQ	Montana State University Extension Water Quality
MT-eWQX	Montana EquIS Water Quality Exchange (also known as EQuIS)
NO_{2+3}	Iron (III) Nitrite
SC	Specific Conductance
SOP	Standard Operating Procedure
SRWG	Sun River Watershed Group
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TPN	Total Persulfate Nitrogen
TSS	Total Suspended Solids
WRP	Watershed Restoration Plan

1.0 INTRODUCTION

1.1 BACKGROUND

In the late 1990s and 2000, the Montana Department of Environmental Quality (DEQ) assessed water quality in the Sun River Watershed and identified several waterbodies were impaired (i.e., not meeting water quality standards) for various pollutants and habitat alterations. An additional impairment was identified in 2011. These impairments are summarized in **Appendix A**, with the most common being nutrients, sediment and temperature.

In 2004, DEQ developed a document titled "Water Quality Restoration Plan and Total Maximum Daily Loads for the Sun River Planning Area" (DEQ 2004). A total maximum daily load (TMDL) is a calculation of the maximum amount of a pollutant a river, stream or lake can receive and still support all designated beneficial uses. The TMDL document characterized pollution sources and provides restoration and monitoring recommendations as a framework for improving water quality to address several of the impaired waters in the watershed.

The Sun River Watershed Group (SRWG) is a nonprofit organization that works collaboratively to restore and protect the resources of the Sun River watershed and its communities. In 2013, with support from DEQ, SRWG developed a Sun River Watershed Restoration Plan (WRP). This WRP overviews actions planned by SRWG to address water quality and water quantity concerns in the Sun River Watershed. SRWG has developed a 10-year Strategic Plan (SRWG 2019) that describes the organization's strategic mission, goals, and objectives. These documents will be updated as needed. The waterbodies and water quality concerns currently addressed in the WRP are:

- Sun River, Gibson Dam to Vaughn: sediment, temperature, seasonal dewatering, and riparian vegetation
- Sun River, Vaughn to mouth: nutrients, sediment and TSS
- Muddy Creek: nutrients, sediment and TSS
- Freezeout Lake: salinity and selenium

SRWG's strategic goals as identified in the 2019 SRWG strategic plan include:

- Improve water quality by reducing sediment, nutrients, and temperature
- Ensure stream flows are adequate in all seasons to support multiple uses
- Promote healthy fish and wildlife habitat
- Control noxious weeds and reduce infestations
- Restore hydrologic processes such as floodplain connectivity and river migration
- Foster collaboration across watershed stakeholders
- Provide community education about watershed issues and solutions

This Sampling and Analysis Plan provides a framework for SRWG to address the concerns identified in the WRP and TMDL while furthering SRWG's mission and goals.

1.2 PROJECT AREA OVERVIEW

The Sun River Watershed is a sub-basin of the Missouri-Sun-Smith basin, located in north-central Montana (Hydrological Unit Code (HUC) 10030104) (**Figure 1**). From its headwaters in the Rocky Mountains, the Sun River flows east for approximately 97.4 miles to the town of Great Falls where it empties into the Missouri River. The Sun River between the Gibson Reservoir and its confluence with the Missouri is heavily influenced by agricultural uses. Flows are altered for irrigation and water quality is impacted by roads, ranches, and farming activity.

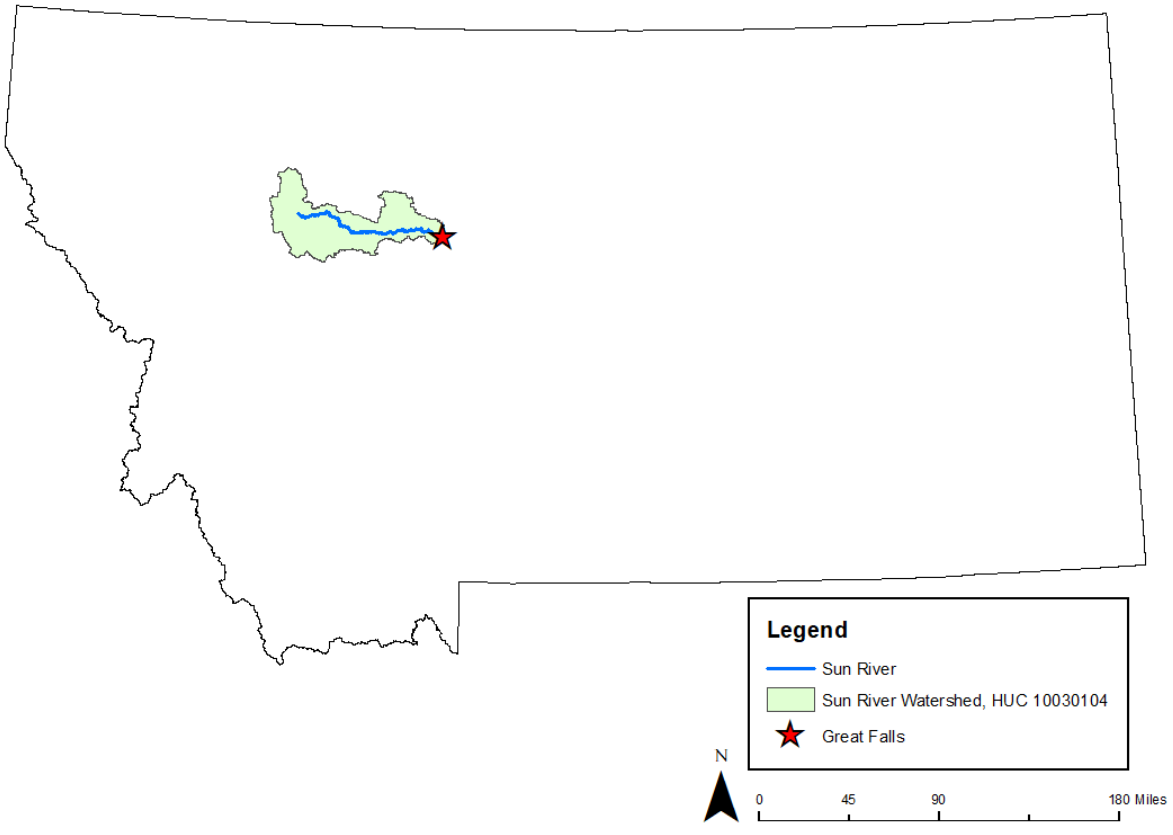

Figure 1. Sun River Watershed Map

Water quality impairments for waterbodies in the Sun River watershed identified by Montana DEQ are summarized in **Appendix A** and include nutrient, sediment, temperature, salinity, selenium and other habitat-related impairment causes.

1.3 PROJECT OVERVIEW

For approximately 20 years, the SRWG has collected water quality data from multiple sites on the Sun River and several of its tributaries. Most of this data was collected by Rai Hahn, a local teacher and community member who graciously volunteered his time, often engaging local community students in collecting the data and teaching them about the importance of watershed health. The SRWG is now transitioning the monitoring program to incorporate others in the data collection process.

In 2009, Adam Sigler with the Montana State University Extension Water Quality (MSUEWQ) Program assisted SRWG with compiling a report to summarize the SRWG's water quality data collected from 2004 to 2009. Highlights from that report include:

- **Salinity**: Salinity, measured via specific conductivity, decreased between 2004 and 2009. At Augusta, the Sun River had very low salinity, but levels increased downstream and reached levels nearly three times higher at the confluence with the Missouri. All three tributaries (Muddy Creek, Mill Coulee, and Big Coulee) are measurable sources of salinity, although salinity was typically below thresholds established in the 2004 TMDL. Areas where salinity in tributaries does exceed thresholds are primarily from seepage and groundwater rather than irrigation return flows.
- **Nutrients**: Total nitrogen (TN) decreased consistently between 2004 and 2009, although many individual TN concentrations exceeded the 2004 TMDL target and TN appears to be heavily influenced by tributary inflows. Nitrate+nitrite (NO_{2+3}) increased between Augusta and Great Falls and all three tributaries (Muddy Creek, Mill Coulee, and Big Coulee) appeared to be significant sources. Total Phosphorus (TP) concentrations increased especially between Sun River at Augusta and Sun River near Vaughn/Great Falls.

- **Total suspended solids (TSS)**: TSS increased significantly in the Sun River between Augusta and Great Falls. TSS concentrations in Mill Coulee decreased while TSS concentrations in Big Coulee increased.

In 2019, MSUEWQ again assisted SRWG with analysis of their nutrient data (MSUEWQ 2019). Using data from 2001 to 2016, a statistical nutrient trend analysis was performed to determine whether significant increases or decreases in nutrients were seen at each site during different seasons (high flow, growing season, and base flow). Comparisons were also made between nutrient concentrations and Montana's numeric nutrient criteria (DEQ 2014). This analysis indicated a significant decrease in total nitrogen at Big Coulee Creek, significant decreases in total phosphorus at Adobe Creek and Sun River at Great Falls, and no significant trends for nitrate.

2.0 OBJECTIVES AND SAMPLING DESIGN

Continuing data collection to expand this long-term nutrient dataset will enable to SRWG to periodically run statistical trend analyses to track change over time in nutrient concentrations at study sites. This will enable SRWG to gage whether activities in the watershed are positively or negatively impacting nutrient conditions and measure progress toward meeting water quality goals expressed in the WRP (e.g., numeric water quality standards, TMDL targets).

Furthermore, tracking other water quality parameters (e.g., specific conductivity, TSS), especially those associated with water quality impairments, will help the SRWG evaluate progress towards meeting water quality goals through time.

2.1 PROJECT GOALS AND OBJECTIVES

Goals, monitoring objectives, and intended data analyses are summarized in **Table 1**.

Table 1. Project Goals, Questions, Objectives and Analyses

Goal	Question	Objective	Data Analysis
Measure progress towards goals set in the 2004 TMDL and 2013 Watershed Restoration Plan.	Is the water quality in the Sun River waterbodies improving and trending towards the standards and goals set in the TMDL and Watershed Restoration Plans?	Collect monthly nutrient samples in April through October each year at seven sites across the watershed to assess trends over time and concentrations relative to thresholds.	Perform statistical trend analysis for nutrients, incorporating new data into existing long-term dataset.
	Are improvement (or lack of improvement) trends similar across the watershed?		Compare concentrations between sites.
Identify contributions to impairments.	How do nutrient concentrations compare at sites across the watershed?	Collect nutrient samples at seven sites across the watershed including upstream and downstream reaches on the Sun and at tributaries before they converge with the Sun River.	Compare concentrations from site to site.
	How are water quality parameters affected by land uses or management strategies?		Compare data from site to site, noting if land uses or management strategies vary from site to site
	How are water quality parameters affected by irrigation practices?	Collect nutrient samples throughout the watershed before, during, and after irrigation season.	Compare data from site to site, noting if irrigation practices near sites vary; compare temporal data looking for variance before, during, and after irrigation.

Goal	Question	Objective	Data Analysis
Prioritize future work.	What additional monitoring would tell SRWG which areas/reaches would benefit most from future projects or BMPS?	Review data analysis from the prior questions and meet periodically with advisors (DEQ, MSUEWQ) to discuss trends, differences across watershed, and strategies for additional monitoring to identify changes in parameters compared to changes in practices or projects.	

2.2 MONITORING LOCATIONS

The SRWG will continue to collect data at the same sites that have been sampled since 2004. These seven sites are summarized in **Table 2** and **Figure 2** and include three sites on the mainstem Sun River and sites near the mouths of four tributaries. Monitoring sites were chosen, in part, to:

- Promote consistency with past data collection efforts;
- Represent conditions near the upstream and downstream extents of the Sun River, for example, to enable comparisons among areas upstream with likely less agricultural influence and areas downstream more likely influenced by agricultural practices; and
- Represent conditions near the mouths of tributaries to enable relative comparisons between the influence of each tributary on the Sun River.

Landowner access has been verbally granted to SRWG for monitoring purposes at each private property sampling site. All other sampling sites are located on public land or right-a-ways.

Table 2. Sun River Watershed Group Long-Term Monitoring Locations

Site ID	Site Description	Latitude	Longitude	Rationale for Site Selection
SUN-SUNR50	Sun River near Great Falls	47.547861	-112.36625	Near headwaters
SUN-SUNR51	Sun River below Muddy Creek	47.547258	-111.531208	Below confluence of Muddy Creek
SUN-SUNR56	Sun River at Augusta	47.492028	-111.334361	Near confluence with Missouri River
SUN-DUCKC01	Big Coulee near Simms	47.516972	-111.887306	Near confluence with Sun River
SUN-ADBEC01	Adobe Creek near Ft Shaw	47.510583	-111.800611	Near confluence with Sun River
SUN-MILCU01	Mill Coulee near Sun River	47.540611	-111.705806	Near confluence with Sun River
SUN-MUDYC57	Muddy Creek at Vaughn	47.561056	-111.538306	Near confluence with Sun River

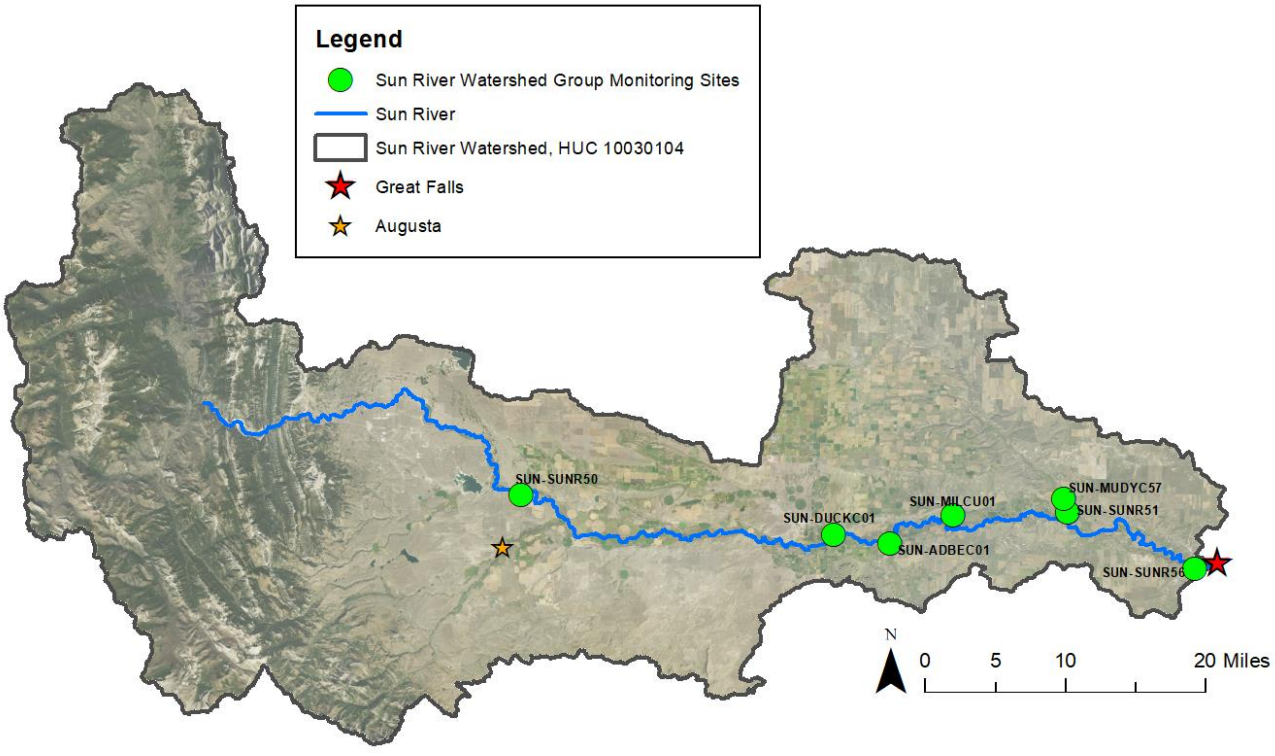

Figure 2. Sun River Watershed Group Long-Term Monitoring Locations

2.3 MONITORING SCHEDULE

Water quality monitoring will occur monthly from April through October (**Table 3**); this period represents conditions before, during, and after irrigation season to capture the influence of changing flows and agricultural impacts on water quality. High flow generally begins around May 1 based on an inflection point in the median daily discharge at the USGS gage on the Sun River near Great Falls (MSUEWQ 2019). Per Montana's numeric nutrient criteria, the growing season for the Northwestern Glaciated Plains Ecoregion is from June 16th through September 30th. Base flow generally spans from October through April.

Samples are generally collected at the same time of day unless adjustments must be made due to unforeseen events; if delays occur, data collection will be rescheduled as close as possible to the desired date and time.

Table 3. Monitoring Schedule

Date	Rationale for Timing
April	Prior to high flow and irrigation
May	During high flows and prior to irrigation
June	During high flows and start of irrigation
July	During irrigation season
August	During irrigation season
September	During low flows at end of irrigation season
October	During low flows after irrigation season

2.4 WATER QUALITY PARAMETERS

The water quality parameters and supplemental data types that are collected during this project are summarized in **Table 4**; when possible, all parameters will be collected during every site visit. If any parameter cannot be collected on a visit, it will be noted on the site visit form.

Table 4. Water Quality Parameters

Parameter or Data Type	Collection Approach	Justification for Collecting
Total Nitrogen (TN)	Parameters measured via water samples analyzed by an analytical lab	Existing nutrient impairments
Total Phosphorus (TP)		Existing nutrient impairments
Nitrite plus Nitrate (NO_{2+3})		Existing nutrient impairments
Total suspended solids (TSS)		Existing sediment impairments; erosion concerns; TSS can help evaluate nutrient patterns
pH	Parameters measured *in situ* with hand-held YSI meter	Common descriptive water quality parameter
Water temperature		
Specific conductance (SC)		
Salinity		
Turbidity	Parameter measured on site with turbidity meter	Existing sediment impairments and erosion concerns
Discharge (flow)	Water Level recorded from staff gages; rating curves; automated gages	Necessary to calculate loads; affects all water quality parameters including nutrients, sediment, and salinity.
Photos	Digital camera	Tracking riparian conditions; cheap and easy.

3.0 SAMPLING PROCEDURES

This section overviews the procedures that will be followed during each site visit for this project. The data collection procedures used to collect data for this project are detailed in SRWG's Standard Operating Procedures (SRWG in revision).

3.1 PRE-FIELD CHECKLIST

1. Prepare for departure; perform any necessary equipment maintenance, communicate with project coordinator for safety and logistical purposes, and pack necessary equipment and supplies using the Equipment and Supply Checklist in **Appendix B**. Submit completed volunteer waiver form to SRWG office **Appendix G**. Calibrate YSI and Hatch meters according to manufacturer's instructions.
2. Calibrate the YSI meter and Hach turbidity meter.
3. Acquire ice for sample preservation.
4. Navigate to the site using the Site Access Guide in **Appendix C**.
5. Complete field operations as described on the backside of the **Site Visit Form**.

3.2 FIELD FORMS

Two field forms will be used to record all field activities and field measurements (**Appendix D)**.

1. A **Site Visit Form** is filled out during every site visit to each site to record:
    - Site visit information (date, time, team members)
    - Site information (site name, site ID, latitude and longitude)
    - Site visit comments
    - Weather observations
    - Staff gage readings
    - Field measurements (taken with YSI meter and turbidimeter)
    - Site photos (photo number and description)
    - Water samples (number and type of samples, duplicates or blanks)

- Water sample shipping information (date, time, person, and method)

2. A laboratory **Chain of Custody Form** is filled out each time a batch of water samples is being sent to the analytical laboratory to communicate:
   - Account information (who will be invoiced for the analytical and shipping costs, quote number)
   - Report information (who will receive lab reports and data deliverables from the lab)
   - Project information (name and organization)
   - Sample information for each sample (site name, collection date and time, analyses requested)

3.3 VERIFY AND RECORD SITE LOCATION

Navigate to the site using the Site Access Guide in **Appendix C** which provides driving directions, site access instructions and photographs for reference. Upon arrival at the site, use the Garmin GPS 12 XL unit to collect a reading of latitude and longitude coordinates using the NAD 1983 State Plane Montana datum. Corroborate that the coordinates observed on the GPS unit closely match those in **Table 2** and the Site Access Guide in **Appendix C**. Take photos as described in **Section 3.7** of this document.

3.4 *IN SITU* FIELD PARAMETERS WITH YSI METER

In situ field parameters (pH, SC, salinity, and temperature) will be measured with a YSI 556 meter as described in **Section TBD** of SRWG's SOP (SRWG, in revision). Required calibrations for this meter are described in **Section TBD** of SRWG's SOP (SRWG in revision). Field measurements will be recorded on the **Site Visit Form** (**Appendix D**).

3.5 TURBIDITY WITH TURBIDITY METER

Turbidity samples will be collected using the Hach turbidity meter model 2100P as described in **Section TBD** of SRWG's SOP (SRWG in revision). Turbidity will be recorded on the **Site Visit Form, Appendix D**. Turbidity samples are analyzed on-site, so no preservation or sample handling is necessary.

3.6 WATER SAMPLES

Sample Bottles

All samples will be collected in high-density polyethylene (HDPE) bottles provided by the lab:

- Total Persulfate Nitrogen (TPN): 250 ml square bottle with white lid
- Total Phosphorus (TP) and Nitrite plus Nitrate (NO_{2+3}): 250 ml bottle with yellow lid
- TSS: 1,000 ml square bottle with white lid

Sample bottles and labels that require preservatives will be color-coded and the label will indicate which acid is required (e.g., yellow lid and label for sulfuric acid).

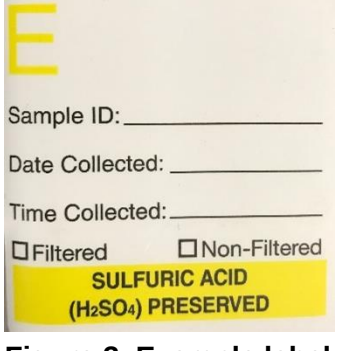

Figure 3. Example label on a sample bottle from Energy Lab

Sample Labels

Prior to collecting each sample, a permanent, fine-point marker will be used to fill out the label on each sample bottle with the following information:

- Sample ID (site ID)

- Date collected
- Time collected
- Whether the sample is filtered or not filtered.

The Sample ID must follow the SRWG naming convention:

Sample ID = [YearMonthDay]_[Site ID]_[Sample-Type Letter]

- Year, month and day reflect the date that the sample is collected
- Site ID as shown in **Table 2**
- Sample-type letter reflects the type of sample: A = Regular routine sample, B = Duplicate sample, C = Blank sample

For example:
- A regular sample collected at Adobe Creek on August 15th, 2019: 0180815_SUN-ADBEC01_A
- A duplicate at the same place and time as above: 20180815_SUN-ADBEC01_B
- A blank at the same place and time as above: 20180815_SUN-ADBEC01_C

Each label will be covered with clear plastic tape to protect the label from water damage.

Sample Collection
Water samples for nutrients and TSS will be collected, preserved, and stored on ice according to the unfiltered grab technique described in SRWG's SOP (SRWG in revision). Quality control samples (field duplicates and field blanks) will be collected/prepared and submitted to the lab alongside each batch of routine samples as described in **Sections 4** and **5** of this document.

Sample Documentation
All samples will be recorded on the **Site Visit Form** as well as on a laboratory **Chain of Custody Form Appendix D**. Field duplicates and field blanks will be entered on the same chain-of-custody form as the routine samples collected at a site.

Sample Shipping
As soon as possible after collection, the batch of water samples will be delivered to the analytical laboratory following shipping instructions detailed in SRWG's SOP (SRWG, in revision); samples must be shipped the same day as collected.

3.7 SITE PHOTOS

During each sampling event, digital photos will be taken at each collection site. For each site, one photo is taken looking upstream, downstream, and directly across the stream as shown in the **Site Access Guide, Appendix C**. Additional photos may also be taken to document field conditions. All photos will be recorded (photo number and description with jpg number from camera) on the **Site Visit Form, Appendix D**. Photos will be uploaded, stored, and named according to **Section 6.3** of this document.

3.8 STAFF GAGE READING

SRWG volunteers do not measure flow in the field. Instead, SRWG relies on a stream gages installed on the waterbodies of interest and discharge rating curves created by the entities who maintain the gages:

- USGS automated gages at Sun River at Augusta (SUN-SUNR50), Muddy Creek at Vaughn (SUN-MUDYC57), and Sun River at Great Falls (SUN-SUNR56).
- DNRC gages at Big Coulee (SUN-DUCKC01) and Mill Coulee (SUN-MILCU01).
- Fort Shaw Irrigation District rating curve at Adobe Creek (SUN-ADBEC01).

However, field personnel will read the staff gage at all sites where the gage is visible and record the water level on the **Site Visit Form, Appendix D**.

3.9 WRAP-UP

Before departing each monitoring site, the field crew will:

- Review all field forms for completeness and accuracy
- Confirm all samples were preserved and stored properly
- Verify no equipment or litter has been left behind
- Confirm the condition of the site is the same as it was upon arrival

4.0 LABORATORY ANALYTICAL REQUIREMENTS

Table 5 describes the sample preservation and analytical requirements for water samples that are sent to the analytical laboratory for this project.

Table 5. Monitoring Parameter Suite, Sample Handling, Analysis & Preservation

Parameter	Required Method	Required Reporting Limit ug/L	Holding Time Days	Bottle	Preservative
Total Suspended Solids (TSS)	A2540 D	4000	7	500 ml HDPE	≤6°C on ice
Total Persulfate Nitrogen (TN)	A4500-N C	40	28	250ml HDPE	≤6°C on ice
Total Phosphorus as P (TP)	EPA 365.1	3		250ml HDPE	H_2SO_4, ≤6°C on ice
Nitrate-Nitrite as N (NO_{2+3})	EPA 353.2	10			

An analytical budget for this project is in **Appendix E**.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

5.1 OVERVIEW

Projects require adequate documentation, proper sample collection, handling, and analysis, and other measured to produce high quality, credible data that accurately represent conditions in the watershed and can be used to answer scientific questions or guide resource management decisions.

Quality Assurance (QA) is the overall system used to ensure a monitoring project produces data of the desired level of quality necessary to meet project goals and objectives. For example, QA activities include developing a sampling and analysis plan, properly training volunteers, communicating analytical requirements to the lab, and adhering to standard operating procedures.

Quality control (QC) are technical activities used to detect and control errors. For example, QC activities include collecting field duplicates, preparing field blanks, reviewing field forms for accuracy, and calibrating equipment. Good QC will help to identify problems with the data if they arise and help identify what the cause of the problem likely is.

A list of QA/QC terms and definitions is included in **Appendix F**.

5.2 TRAINING

All program participants will attend a monitoring training in which protocols are reviewed by the program leader and/or water quality professionals. Each participant will be provided with and asked to

review this sampling and analysis plan, the SRWG Standard Operating procedure (SRWG in revision), and field forms before sampling commences, and must have copies with them in the field during all sampling events for reference. A program leader or alternate experienced volunteer will accompany each volunteer during sampling events at least until they demonstrate proficiency.

5.3 QC Samples: Field Duplicates

Field duplicates are two samples (i.e., a routine sample and a duplicate sample) of ambient water collected from a waterbody as close as possible to the same time and place by the same person and carried through identical sampling and analytical procedures. Field duplicate samples are labeled, collected, handled and stored in the same way as the routine samples and are sent to the laboratory at the same time.

Field duplicates are typically collected at a rate of approximately 10% of the total number of routine samples collected. Therefore, to achieve this, one set of field duplicates will be collected during each monthly sampling event. Duplicates may be collected at any of the monitoring locations shown in **Section 2.2**. See **Section 3.6** for information about duplicate sample labelling, and **Section 5.0** for analytical requirements.

Field duplicates are used to determine field precision to ensure that proper procedures are followed consistently. For each field duplicate set collected, the relative percent difference will be calculated:

$$\text{Relative Percent Different (RPD)} = ((D1 - D2) / ((D1 + D2)/2)) \times 100$$

where: D1 = routine sample result value
D2 = duplicate sample result value

Precision will be assessed by ensuring that relative percent difference (RPD) between duplicates is less than 25%. If the RPD of field duplicates is greater than 25% and the parent and duplicate result values are greater than five times the lower reporting limit, the result values will be flagged with a "J".

5.4 QC Samples: Field Blanks

Field blanks are samples of analyte-free, deionized water poured into a sample container in the field using the same method, container, and preservation as routine samples, and shipped to the lab along with other field (i.e., routine and duplicate) samples. All labeling, rinsing, preservation, and storage requirements applied for routine and duplicate samples are applied to field blanks; the only difference is that the water is deionized water rather than ambient stream water. Field blanks must be prepared while in the field.

One set of field blanks is submitted to the laboratory with each batch of samples delivered to the laboratory. Therefore, one set of field blanks will be prepared at or near the end of each monthly sampling event (April through October) and submitted to the laboratory alongside the other routine and duplicate samples from that trip. See **Section 3.6** for information about field blank sample labelling, and **Section 4** for analytical requirements.

Field blanks are used to determine the integrity of the field personnel's handling of samples, the condition of the sample containers supplied by the laboratory, and the accuracy of the laboratory methods. Accuracy will be assessed by ensuring that field blanks return values less than the lower reporting limit (i.e., non-detects) (shown in **Section 4**). If an analyte is detected in a field blank, all result values for that analyte from that batch of samples associated with the field blank will be qualified with a "B" flag. The exception is that data with a value greater than 10 times the detected value in the blank does not need to be qualified.

5.5 Instrument Calibration and Maintenance

The YSI 556 meter will be calibrated before starting each sampling day.

The Hach turbidity meter (model 2100P) will be calibrated before starting each sampling day.

All instruments will be maintained, cleaned and stored according to the manufacturers' instructions and they will be tested at the start of each field season before being used to collect data at a site to ensure they are in proper working order.

5.6 DATA QUALITY INDICATORS

Data quality indicators (DQIs) are attributes of samples that allow data users to assess data quality. Because there are large sources of variability in streams and rivers, DQIs are used to evaluate the sources of variability and error and thereby increasing confidence in our data.

This section describes how the sampling and analysis plan and study design aims to achieve data quality for each data quality indicator (representativeness, comparability, completeness, sensitivity, precision and accuracy). General term definitions are included in **Appendix F**.

Spatial representation - Sampling sites were chosen to capture variability in land use, flow, and other watershed characteristics that may be influencing water quality. Sites include key tributaries and represent the Sun River Watershed from Gibson Dam to the mouth.

Temporal representation - Sampling occurs at approximately the same time of day and same time each month to provide a consistent representation of watershed conditions. The sampling period was chosen to ensure water management practices and seasonal fluctuations are captured. Sampling occurs before seasonal peak flows, during peak flows but before irrigation season, during peak flow and irrigation season, mid-irrigation season, at seasonal low-flow during irrigation, and after irrigation season is complete and seasonal flows are still typically low.

Comparability – Comparability is achieved through the use of Standard Operating Procedures (SOPs – DEQ or USGS) for field collection and the use of the same analytical methods published by the EPA, APHA - Standard Methods, or USGS in the laboratory. This sampling project utilizes sampling methods, analysis methods, and sample locations from previous years and studies in order to encourage comparability.

Completeness – The overall project goal is 90% completeness.

- Prior to leaving a sampling site, field forms will be reviewed by the field leader on site to reduce the occurrence of empty data fields.
- Sampling events that are cancelled due to unforeseen circumstances will be rescheduled.
- Samples that are damaged within a short amount of time after collection will be recollected.
- Lab reports will be reviewed upon receipt to ensure that results for each sample submitted are received.

Sensitivity – Detection and reporting limits are specified for this project which are adequately low enough to enable comparison to the thresholds of interest (e.g., numeric nutrient standards). The laboratory routinely checks sensitivity (e.g., method blanks, continuing calibration blanks, and laboratory reagent blanks) per their quality management plan.

Precision, Bias, and Accuracy:

- Adhering to standard operating procedures during sampling will reduce sampling bias.
- Field duplicates (**Section 5.3**) will be collected during this project and used to determine field precision. If problems are linked to field crew sampling error, supplemental training will be provided prior to the next sampling event.
- Field blanks (**Section 5.4**) will be prepared during this project and used to evaluate accuracy for field activities. The laboratory uses EPA approved and validated methods and performs precision and accuracy performance evaluations per their quality management plan.

Holding Time – All samples will be checked to verify that they were processed within their specified holding times. Sample results whose holding time was exceeded prior to being processed will be qualified with an "H" flag.

5.7 Field Health and Safety

Field personnel commonly encounter hazards while performing monitoring activities. All participants are advised to take adequate precautions to avoid injury or loss of life due to hazards including, but not limited to, driving, wading and other activities in and around water, weather conditions, wildlife interactions, people interactions, use of chemical preservatives, etc.

On every sampling trip, field personnel should carry with them a communication device (e.g., cell phone), first aid kit, bear spray, adequate drinking water, clothing appropriate for a range of weather conditions, personal protective equipment including waders, adequate footwear, and gloves to be worn while handling preservatives, and any other necessary safety-related items.

Each volunteer will be required to sign a waiver acknowledging risk and these waivers will be kept on file by the project coordinator, see **Appendix G**. If, for any reason, field personnel feel unsafe while navigating to or from monitoring sites or while collecting data, they should err on the side of caution and not collect the data. Any delays or changes should be reported to the project coordinator as soon as possible so sampling can be rescheduled if possible.

6.0 Data Management and Record Keeping

The person(s) responsible for data management, record keeping, data quality review and data upload will perform the following activities:

- Review field forms for completeness and accuracy, especially Site Visit and Chain of Custody forms.
- Draft a brief synopsis of any SAP derivations that occurred.
- Store and backup all data generated during this project, including field forms, laboratory reports obtained from the laboratories, electronic copies of field photographs, and written field notes.
- Review data quality and flag result values (Appendix E), as needed, prior to uploading into the database(s). Upload all laboratory data into MT e-WQX database (if DEQ funding or support is provided) as described in **Section 6.1**.
- Maintain records of volunteer hours, travel and other budget tracking, as needed.

6.1 DEQ's MT-eWQX database and Data Quality Review

Analytical laboratories will prepare and analyze the samples in accordance with the chain-of-custody forms and analytical methods specified in **Tables 4 and 6**. The lab will then supply the project coordinator with laboratory analytical reports and Electronic Data Deliverable (EDD) spreadsheets.

If DEQ funding is received in support of the monitoring project (e.g., through DEQ's Volunteer Monitoring Lab Analysis Support Program or other funding mechanism), all data collected must be entered by the project coordinator into DEQ's MT-eWQX database (also known as EQuIS). Instructions for preparing, validating and submitting the EDD to MT-eWQX must be followed (available at http://deq.mt.gov/Water/SurfaceWater/SubmitData). For example, steps include:

- Compiling data (including site information, field measurements and lab results),
- Transforming the data into the required format,
- Performing a thorough quality control check of the data to correct errors, qualify problematic sample result values with data flags, etc.,
- Validating the data, and
- Submitting EDDs to MT-eWQX.

Full instructions specific to SRWG's EDD and MT-eWQX process can be found in the SRWG EDD Guide, currently in development.

6.2 MSUEWQ DATA HUB

SRWG's water quality data (including nutrient concentration data and photos) will be entered into the Montana State University Extension Water Quality Program Data Hub, which provides web-based storage and visualization of surface water data and photos collected by citizen scientists across Montana.

6.3 PHOTOS

All digital photos will be stored on SRWG coordinator's computer and in SRWG's Dropbox "cloud" storage under the corresponding year and month.

Photos are stored at: Dropbox\Photos\WQ Monitoring Photos\20YY WQ photos\20YY MM WQ Monitoring photos

Photo file names include the four-digit year(space) two-digit month (space) one- or two-character site abbreviation and direction photo was taken.
Site abbreviations:

A	Augusta	M	Muddy Creek
BC	Big Coulee	VB	Vaughn-Ulm Bridge
AC	Adobe Creek	GF	Great Falls
MC	Mill Coulee North		

Direction abbreviations: U= looking upstream; M=looking straight across the stream; L=looking downstream

For example:
2018 04 ACU = Photo taken on April 2018 monitoring visit at Adobe Creek looking upstream

6.4 FIELD FORMS

Field forms will be scanned and the electronic files will be stored on the SRWG coordinator's computer and in SRWG's Dropbox "cloud" storage under the corresponding year and month.

Field forms will be saved at: Dropbox\Grants and Projects\DEQ\DEQ Monitoring Grant\20YY DEQ Monitoring Grant\20YY Field Forms\20YY MM WQ Field Forms.

The naming convention for Field Forms is: 20YY MM WQ Field Form.

Hard copies of the field forms will be stored in the SRWG office.

7.0 DATA ANALYSIS AND REPORTING

7.1 DATA ANALYSIS

The following are examples of intended data analyses to be conducted with the data produced by this project:

- Plot values of each parameter against distance from the mouth, to observe spatial trends related to potential land use or other activities. At each site, plot values of each parameter over time across the study time period to visually inspect potential seasonal trends. If possible, include data from previous years collected by DEQ or volunteers to better understand long-term trends.
- Compare the data values for each analyte, each sampling location, and each month to the corresponding data value for each analyte, sampling location, and month from the previous monitoring year by calculating the RPD between the values to determine the difference.

- Compare each month's data to the recent 10-year average for each month, sampling location, and analyte by calculating the RPD between the current year's value and the 10-year average value (for example: compare site SUN-SUNR50's TSS value for June to the 10-year average of site SUN-SUNR50's June TSS data values).
- Compare concentrations to the Sun River TMDL target values and Montana numeric nutrient criteria (DEQ 2004) or other applicable standards or thresholds.
- Periodically review the analyses described above, discuss with DEQ and MSUEWQ and determine whether additional monitoring sites are recommended.
- Evaluate land uses and irrigation practices upstream from or in proximity to areas where there are higher concentrations of nutrients, turbidity, etc. and discuss these and other analyses described above with advisors (MSUEWQ and DEQ) to determine whether additional monitoring sites are recommended.
- Perform a new nutrient trend analysis similar to that done by MSUEWQ in 2019 (MSUEWQ 2019) approximately every 5 to 7 years.

Possible results:

1. Sampling data reveals an increase in nutrient concentrations relative to the previous year(s), requiring SRWG to evaluate change of irrigation practices or land use upstream or if SRWG needs to reevaluate BMP projects. SRWG will discuss these changes with advisors and determine whether additional monitoring might be needed to isolate source or increase so SRWG could work with land and water managers upstream to respond.
2. Sampling data reveals a decrease in nutrient concentrations. SRWG and partners evaluate whether this is a trend or isolated annual incidence. If it is a trend, SRWG and partners determine whether additional monitoring sites are needed to isolate source of change. SRWG would work with land and water managers to implement BMPs and projects in more areas to replicate practices that contributed to the decrease.
3. Sampling data reveals the Sun River and tributaries are meeting water quality targets. SRWG will request DEQ assistance to evaluate data and consider delisting the Sun River from the impaired stream list.

7.2 REPORTING

Annual data summaries will be prepared for SRWG annual meetings and semi-annual meetings of the water quality working group by the SRWG coordinator. Electronic copies of data summaries will be sent to DEQ and maintained on SRWG's website at http://www.sunriverwatershed.org/. To streamline this process, MSUEWQ has created an appendable Excel spreadsheet for each monitoring site that includes graphs of water quality parameters of interest using available historic data. The addition of the current year's water quality and discharge data, and some minor changes to the source data used to create the graphs is all that's needed to bring these files up-to-date.

As part of SRWG's 10-Year Strategic Plan, community education tools are being developed that will include a brochure and potentially other methods of communicating the results of this project with the public. SRWG also periodically hosts watershed tours and workshops that feature water quality issues, projects and BMPs implemented to improve water quality, and discussion of land and water stewardship activities that private landowners can implement on their own land to promote better water quality. Data and analysis collected through this project will inform those events.

8.0 PROJECT TEAM AND RESPONSIBILITIES

The people directly involved with implementing various components of this project are shown in **Table 6.**

Table 6. Project Team Roles and Responsibilities

Role	Person(s)	Contact phone, email
Develop Sampling and Analysis Plan (SAP)	Tracy Wendt, Coordinator	tracy@sunriverwatershed.org (406) 214 2868
Oversee monitoring personnel	Tracy Wendt, Coordinator	tracy@sunriverwatershed.org (406) 214 2868
Train monitoring personnel		_____
Review field forms	Emma Kelsick	emma@sunriverwatershed.org (406) 851 9240
Lab coordination (e.g., bottle orders, shipping notifications, lab EDDs)	Emma Kelsick	emma@sunriverwatershed.org (406) 851 9240
Ship or deliver samples to lab	Emma Kelsick	emma@sunriverwatershed.org (406) 851 9240
Review data quality	Emma Kelsick	emma@sunriverwatershed.org (406) 851 9240
Upload data into MT-eWQX database and Data Hub	Emma Kelsick	emma@sunriverwatershed.org (406) 851 9240
Write final report	Tracy Wendt, Coordinator	tracy@sunriverwatershed.org (406) 214 2868

9.0 REFERENCES

Montana Department of Environmental Quality (DEQ). 2004. Water Quality Restoration Plan and Total Maximum Daily Loads for the Sun River Planning Area. Montana Dept. of Environmental Quality: Helena, MT. Available at http://deq.mt.gov/Portals/112/Water/WQPB/TMDL/PDF/Sun/M13-TMDL-01a.pdf.

Montana Department of Environmental Quality (DEQ). 2014. Department Circular DEQ 12-A: Montana Base Numeric Nutrient Standards. Montana Dept. of Environmental Quality: Helena, MT. Available at http://deq.mt.gov/Portals/112/Water/WQPB/Standards/NutrientWorkGroup/PDFs/NutrientRules/CircularDEQ12A_July2014_FINAL.pdf.

Montana State University Extension Water Quality Division (MSUEWQ). 2019. Sun River Watershed Group Volunteer Monitoring Program Nutrient Data Summary. Available upon request: info@sunriverwatershed.org.

Sun River Watershed Group. 2004. Sun River Watershed Restoration Plan. Available at https://www.usbr.gov/watersmart/cwmp/docs/plans/Sun-River-Watershed.pdf

Sun River Watershed Group. 2019. Sun River Watershed Group 10-Year Strategic Plan. Available at: www.sunriverwatershed.org.

Sun River Watershed Group. *In development*. Sun River Watershed Group Standard Operating Procedures.

APPENDIX A - WATER QUALITY IMPAIRMENT SUMMARY IN THE SUN RIVER WATERSHED

Waterbody*	Assessment Unit ID	Length (miles)	Impairments	Beneficial Uses Affected	TMDL completed in 2004?
Sun River, Gibson Dam to Muddy Creek	MT41K001_010	83.01 miles	Sedimentation-siltation	Aquatic Life	x
			Temperature	Aquatic Life	x
			Alteration in stream-side or littoral vegetative covers	Aquatic Life	
			Flow regime modification	Aquatic Life	
Sun River, Muddy Creek to mouth (Missouri River)	MT41K001_020	17.3 miles	Total Nitrogen	Aquatic Life, Primary Contact Recreation	x
			Total Phosphorus	Aquatic Life, Primary Contact Recreation	x
			Sedimentation-siltation	Aquatic Life	x
			Total suspended solids (TSS)	Aquatic Life	x
			Flow regime modifications	Aquatic Life, Agriculture	
Muddy Creek, headwaters to mouth (Sun River)	MT41K002_010	35.84 miles	Total Nitrogen	Aquatic Life, Primary Contact Recreation	
			Total Phosphorus	Aquatic Life, Primary Contact Recreation	
			Sedimentation-siltation	Aquatic Life	
			Temperature	Aquatic Life	
			Selenium	Aquatic Life	
			Salinity	Aquatic Life, Agriculture, Drinking Water	
			Sulfate	Aquatic Life, Agriculture, Drinking Water	
			Total dissolved solids (TDS)	Aquatic Life, Agriculture, Drinking Water	
Ford Creek	MT41K002_020	2.48 miles	Sedimentation-siltation	Aquatic Life	x
			Alteration in stream-side or littoral vegetative covers	Aquatic Life	
			Other anthropogenic substrate alterations	Aquatic Life	
Freezeout Lake	MT41K004_030	3,013.2 acres	Total Phosphorus	Aquatic Life, Primary Contact Recreation	
			Selenium	Aquatic Life, Drinking Water	x
			Sulfate	Aquatic Life, Agriculture, Drinking Water	x
			Total dissolved solids (TDS)	Aquatic Life, Agriculture, Drinking Water	x
			Aquatic plants (Macrophytes)	Aquatic Life	
Huber Coulee	MT41K002_040	3.6 miles	*Escherichia coli* (*E. coli*)	Primary Contact Recreation	

*All waterbodies in this table are contained within the Northwestern Glaciated Plains Ecoregion

APPENDIX B – EQUIPMENT AND SUPPLY CHECKLIST
SRWG Gear Checklist

General

1. SAP/SOP
2. YSI multi parameter meter or handheld meters
3. Calibration solutions
4. Calibration logs
5. Solution discard bottle
6. pH solutions (4, 7 and 10)
7. EC 1413 µS/cm Standard
8. Deionized water squirt bottle
9. Kim wipes
10. Tap water for YSI storage
11. Calibration Log for YSI
12. Clipboard
13. Site Visit Forms
14. Pencils and Extra lead
15. Fine tip permanent marker
16. Broad tip permanent marker
17. Calculator
18. Batteries (4 C for YSI, 2 AA for GPS)
19. Duct tape
20. Camera or camera phone
21. First aid kit
22. Bear spray plus transport container
23. Garmin GPS 12 XL Unit
24. Multi-tool or screwdriver
25. Life Jacket (if applicable)
26. Boots or waders (if applicable)
27. Backpack to carry gear

Collecting Samples for Lab Analysis

1. Cooler from lab
2. Chain of Custody form (COC)
3. One set of sample bottles for each site and for any blank and duplicate QC samples
4. Sample Preservative (sulfuric acid)
5. Laboratory grade deionized water for blank samples
6. Plastic gloves
7. Safety glasses
8. Chain of Custody Forms
9. Ice
10. Packing tape for labels

APPENDIX C – SITE ACCESS GUIDE

Sun River at Augusta (Site Name: A, Site ID: SUN-SUNR56)
Directions: Approximately 4 miles north of the town of Augusta on highway 287. Cross over Sun River and park in pullout on northeast side of bridge. Sampling site is ~75 yards upstream of bridge on the north bank. Looking upstream, USGS gage is located by old pilling (Photo 1).

GPS Coordinates: 47.492028 latitude
-111.3343361 longitude

Photo 1. Upstream at Augusta Site.

Photo 2. Across from Augusta Site.

Photo 3. Downstream at Augusta Site.

Big Coulee (Site Name: BC, Site ID: SUN-DUCKC01)
Directions: From Highway 200 at Simms, take SR 565 (Simms-Fairfield Road) north 1 mile to Simms Ashuelot Road on right. Follow Simms Ashuelot Road (zizagging L, R, L, R) ~3 miles to site bridge. Access Big Coulee on the southeast corner of bridge, downstream. The stream gage is located approximately 150' south of the sample site, as seen in photo #6 below, top right of the photo.

GPS Coordinates: 47.516972 latitude
-111.887306 longitude

Photo 4. Upstream at Big Coulee Site.

Photo 5. Across from Bug Coulee Site.

Photo 6. Downstream at Big Coulee Site.

Adobe Creek (Site Name: AC, Site ID: SUN-ADBEC01)
Directions: Take highway 200 northeast from Fort Shaw for ~1 mile. Adobe Creek flows just west of driveway #13402. Park on west side of bridge and sample ~100 feet upstream on the south side of the road, past the barbed wire fence.

GPS Coordinates: 47.510583 latitude
-111.800611 longitude

Photo 7. Upstream at Adobe Creek Site.

Photo 8. Across at Adobe Creek Site.

Photo 9. Downstream at Adobe Creek Site.

Mill Coulee North (Site Name: MC, Site ID: SUN-MILCU01)
Directions: From intersection of Highways 200 and 89, take highway 89 north towards Fairfield/Glacier National Park for approximately ¾ mile. Cross over the Mill Coulee Bridge. Approximately 100 feed past the bridge is an entrance on the east side to multiple homes. Park in the entrance just off the road. Walk towards Mill Coulee and the sample site.

GPS Coordinates: 47.540611 latitude
-111.705806 longitude

Photo 10. Upstream at Mill Coulee Site.

Photo 11. Across from Mill Coulee Site.

Photo 12. Downstream at Mill Coulee Site.

Muddy Creek at Vaughn (Site Name: M, Site ID: SUN-MUDYC57)
Directions: From I-15, take Exit 290 to highway 200 West. Parking is ~0.25 miles west of interchange on 200. Historic water quality data was collected at the railroad bridge just north of highway 200. Park east of Muddy Creek bridge on highway 200, use Exxon gas station as landmark. A USGS gage can be seen on the river left of Muddy Creek.

GPS Coordinates: 47.561056 latitude
-111.538306 longitude

Photo 13. Upstream at Muddy Creek Site.

Photo 14. Across from Muddy Creek Site.

Photo 15. Downstream at Muddy Creak Site.

Vaughn-Ulm Bridge (Site Name: VB, Site ID: SUN-SUNR51)
From Vaughn-Ulm Road, go .6 miles to the Sun River bridge (Vaughn-Ulm Bridge). Park off the road on the right and walk down to the river.

GPS Coordinates: 47.547258 latitude
-111.531208 longitude

Photo 16. Upstream at Vaughn-Ulm Bridge Site.

Photo 17. Across at Vaughn-Ulm Bridge Site.

Photo 18. Downstream at Vaughn-Ulm Bridge Site.

Sun River at Great Falls (Site Name: GF, Site ID: SUN-SUNR50)
Directions: Site is on 13th Avenue SW in Great Falls just past the Beacon Bar on the left. Park in bar overflow parking and follow path at end of fence down to site. Sampling is upstream from railroad bridge on south side of river.

GPS Coordinates: 47.547861 latitude
-112.36625 longitude

Photo 19. Upstream at Great Falls Site.

Photo 20. Across from Great Falls Site.

Photo 21. Downstream at Great Falls Site.

APPENDIX D – FIELD FORMS

SUN RIVER WATERSHED GROUP

SITE VISIT FORM

Please complete a separate form for each site on each visit following instructions on reverse.

Date _____ **Time** _____ **Site Name** _____ **Site ID** _____

Team Members _____

_____

Latitude _____ **Longitude** _____ **GPS Verified?** **Yes** **No**

Site Visit Comments

Staff Gage Reading _____

Gage Location _____

Current Weather (circle one for each row)

Cloud Cover	<5%	5-25%	25-75%	75-100%
Precipitation	None	Light	Moderate	Heavy
Precip. Last 24 hrs	None	Light	Moderate	Heavy

Stream Field Measurements

Temp (° C) _____ pH _____

SC(µS/cm³) _____ Salinity (%) _____

Conductivity (µS/cm) _____

Method: **YSI** **Other:** _____

Turbidity (ntu) _____

Method: **Hatch 2100P** **Other:**

Water Chemistry Samples

Total # Grab Samples Collected: ____ should match # boxes checked

Sample ID (YMD_SiteID_Sample Type)	Yellow Cap (H_2SO_4) Nitrate	Yellow Cap (H_2SO_4) Total P	White Cap (no preserv) Total N	White Cap (no preserv) SSC
REG	☐		☐	
DUP	☐		☐	
BLNK	☐		☐	

Site Visit Photos (list jpg # from camera and description of photo)

Chemistry Sample Shipping Information

Shipped by _____ Date/Time _____

Shipping Method FedEx UPS

Form Reviewed by _____ _____

Name Date

SUN RIVER WATERSHED GROUP

SITE VISIT FORM

FORM INSTRUCTIONS

Date: Enter date in MM/DD/YY format
Time: Enter time, military format
Site name: Enter SRWG site name abbreviation. A: Sun River at Augusta; BC: Big Coulee near Simms; AC: Adobe Creek near Fort Shaw; MC: Mill Coulee near Sun River; M: Muddy Creek at Vaughn; VB: Sun River at Vaughn-Ulm Bridge; GF: Sun River near Great Falls
Site ID: Enter DEQ Site ID number. SUN-SUNR56: Sun River at Augusta; SUN-DUCKC01: Big Coulee near Simms; SUN-ADBEC01: Adobe Creek near Fort Shaw; SUN-MILCU01: Mill Coulee near Sun River; SUNMUDYC57: Muddy Creek at Vaughn; SUN-SUNR51: Sun River at Vaughn-Ulm Bridge; SUN-SUNR50: Sun River near Great Falls
Lat/Long: enter latitude and longitude in decimal degree format
GPS verified: circle yes or no – were coordinates verified on this visit?
Site visit comments: Any descriptions of the site, weather, or other notes
Staff gage reading: write in reading, or NA
Location: location of staff gage
Current weather: circle a response for each weather parameter listed
Stream field measurements: Fill in measurements for each parameter. Circle or fill in method used
Water chemistry samples: Write in the number of grab samples collected (one set = three bottles = three nutrient checks and one SSC check) Lablel sample bottles with site name, "B" or "C" if needed (B=Duplicate; C= Blank), collection date, and time.
Site visit photos: list the jpg # from camera associated with each photo and a description. There should be looking upstream, downstream, and across for each site at a minimum. If additional photos are taken, describe them here.
Chemistry sample shipping information: Fill in name of person sending shipment and date time it is sent. Circle shipping method.
Form reviewed by: Name of person reviewing form and date reviewed

FIELD ACTIVITY CHECKLIST

BEFORE GOING OUT TO THE FIELD

- ☐ Calibrate YSI meter and the Hach turbidity meter before going to the field.
- ☐ Ensure you have the following:
  - YSI Field Kit
  - Hach Field Kit
  - Ice chest with sufficient bottles for day's sampling, acid, ice
  - Chain of Custody forms and labels, return shipping labels
  - Field binder
  - Field bag/backpack

AT EACH FIELD SITE

- ☐ Visually inspect the site for safety. **Do not proceed if site is not safe** (flooding, wildlife, ice, bees, etc.).
- ☐ Take site photos

BEFORE LEAVING EACH FIELD SITE

- ☐ Check that all gear is accounted for
- ☐ Verify both sides of Site Field Form are completed

AT THE END OF THE DAY

- ☐ Fill out chain of custody
- ☐ Ensure samples are on ice and prepared for shipping
- ☐ Ship same day samples are collected. UPS by 1600 hours
- ☐ Verify all forms are completed. Note any missing information in field log book.

BEFORE NEXT SAMPLE EVENT

- ☐ Mail or PDF all forms from sample event to SRWG Coordinator
- ☐ Email all labeled photos to SRWG Coordinator
- ☐ Complete monthly spreadsheet and email to SRWG coordinator (tracy@sunriverwatershed.org)

ENERGY LABORATORIES

Trust our People. Trust our Data.

Chain of Custody & Analytical Request Record

www.energylab.com

Page _____ of _____

Account Information (Billing information)

Company Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☐Email
Purchase Order / Quote / Bottle Order	

Report Information (If different than Account Information)

Company Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Report ☐Hard Copy ☐Email	
Special Report Formats: ☐ LEVEL IV ☐ NELAC ☐ EDD/EDT (contact laboratory) ☐ Other _____	

Comments

Project Information

Project Name, PWSID, Permit, etc.	
Sampler Name	Sampler Phone
Sample Origin State	EPA/State Compliance ☐ Yes ☐ No

BILLING CLIENTS, please indicate sample type.
*If can has been processed or utilized, call before sending.
☐ Byproduct 11 (a)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes: A - Air; W - Water; S - Solid / Solids; V - Vegetation; B - Biosolids; O - Other; DW - Drinking Water

Analysis Requested

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)										See Attached	RUSH TAT	ELI LAB ID (Laboratory Use Only)
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

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 laboratory (print)	Date/Time	Signature

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals: Y N C B	Intact: Y N	Receipt Temp: °C	Temp Blank: Y N	On Ice: Y N	Payment Type: CC Cash Check_____	Amount: $	Receipt Number (paper receipt only)

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 subcontracted data will be clearly notated on your analytical report.

APPENDIX E - PROJECT BUDGET

Projected Budget for Laboratory Analysis and Shipping

Parameter	Price per Parameter	Number of Sites	Number of visits per site	Number of routine samples (number of sites x number of visits per site)	Number of field blanks (often one per sampling event)	Number of field duplicates (often ~10% of the total number of routine samples)	Total number of samples (routine + duplicates + blanks)	Total Cost (Total number of samples x cost per parameter)
Total Suspended Solids (TSS)	$10	7	7	49	7	7	63	$630
Total Persulfate nitrogen (TPN)	$15	7	7	49	7	7	63	$945
Total Phosphorus as P	$15	7	7	49	7	7	63	$945
Nitrate-Nitrite as N	$9	7	7	49	7	7	63	$567
Shipping	$20		7					$140
Sample Mgmt Fee	$2	7	7		49	7	63	$126
							Total:	$3,353

APPENDIX F – QA/QC TERMS AND DEFINITIONS

Accuracy. A data quality indicator, accuracy is the extent of agreement between an observed value (sampling result) and the accepted, or true, value of the parameter being measured. High accuracy can be defined as a combination of high precision and low bias.

Analyte. Within a medium, such as water, an analyte is a property or substance to be measured. Examples of analytes would include pH, dissolved oxygen, bacteria, and heavy metals.

Bias. Often used as a data quality indicator, bias is the degree of systematic error present in the assessment or analysis process. When bias is present, the sampling result value will differ from the accepted, or true, value of the parameter being assessed.

Blind sample. A type of sample used for quality control purposes, a blind sample is a sample submitted to an analyst without their knowledge of its identity or composition. Blind samples are used to test the analyst's or laboratory's expertise in performing the sample analysis.

Comparability. A data quality indicator, comparability is the degree to which different methods, data sets, and/or decisions agree or are similar.

Completeness. A data quality indicator that is generally expressed as a percentage, completeness is the amount of valid data obtained compared to the amount of data planned.

Data users. The group(s) that will be applying the data results for some purpose. Data users can include the monitors themselves as well as government agencies, schools, universities, businesses, watershed organizations, and community groups.

Data quality indicators (DQIs). DQIs are attributes of samples that allow for assessment of data quality. These include precision, accuracy, bias, sensitivity, comparability, representativeness and completeness.

Data quality objectives (DQOs). Data quality objectives are quantitative and qualitative statements describing the degree of the data's acceptability or utility to the data user(s). They include data quality indicators (DQIs) such as accuracy, precision, representativeness, comparability, and completeness. DQOs specify the quality of the data needed in order to meet the monitoring project's goals. The planning process for ensuring environmental data are of the type, quality, and quantity needed for decision making is called the DQO process.

Detection limit. Applied to both methods and equipment, detection limits are the lowest concentration of a target analyte that a given method or piece of equipment can reliably ascertain and report as greater than zero.

Duplicate sample. Used for quality control purposes, duplicate samples are an additional sample taken at the same time from, and representative of, the same site that are carried through all assessment and analytical procedures in an identical manner. Duplicate samples are used to measure natural variability as well as the precision of a method, monitor, and/or analyst. More than two duplicate samples are referred to as replicate samples.

Environmental sample. An environmental sample is a specimen of any material collected from an environmental source, such as water or macroinvertebrates collected from a stream, lake, or estuary.

Field blank. Used for quality control purposes, a field blank is a "clean" sample (e.g., distilled water) that is otherwise treated the same as other samples taken from the field. Field blanks are submitted to the analyst along with all other samples and are used to detect any contaminants that may be introduced during sample collection, storage, analysis, and transport.

Instrument detection limit. The instrument detection limit is the lowest concentration of a given substance or analyte that can be reliably detected by analytical equipment or instruments (see detection limit).

Matrix. A matrix is a specific type of medium, such as surface water or sediment, in which the analyte of interest may be contained.

Measurement Range. The measurement range is the extent of reliable readings of an instrument or measuring device, as specified by the manufacturer.

Method detection limit (MDL). The MDL is the lowest concentration of a given substance or analyte that can be reliably detected by an analytical procedure (see detection limit).

Precision. A data quality indicator, precision measures the level of agreement or variability among a set of repeated measurements, obtained under similar conditions. Relative percent difference (RPD) is an example of a way to calculate precision by looking at the difference between results for two duplicate samples.

Protocols. Protocols are detailed, written, standardized procedures for field and/or laboratory operations.

Quality assurance (QA). QA is the process of ensuring quality in data collection including: developing a plan, using established procedures, documenting field activities, implementing planned activities, assessing and improving the data collection process and assessing data quality by evaluating field and lab quality control (QC) samples.

Quality assurance project plan (QAPP). A QAPP is a formal written document describing the detailed quality control procedures that will be used to achieve a specific project's data quality requirements. This is an overarching document that might cover a number of smaller projects a group is working on. A QAPP may have a number of sample analysis plans (SAPs) that operate underneath it.

Quality control (QC). QC samples are the blank, duplicate and spike samples that are collected in the field and/or created in the lab for analysis to ensure the integrity of samples and the quality of the data produced by the lab.

Relative percent difference (RPD). RPD is an alternative to standard deviation, expressed as a percentage and used to determine precision when only two measurement values are available. Calculated with the following formula: RPD as % = ((D1 – D2)/((D1 + D2)/2)) x 100 Where: D1 is first replicate result D2 is second replicate result

Replicate samples. See duplicate samples.

Representativeness. A data quality indicator, representativeness is the degree to which data accurately and precisely portray the actual or true environmental condition measured.

Sampling and Analysis Plan (SAP). A SAP is a document outlining objectives, data collection schedule, methods and data quality assurance measures for a project.

Sensitivity. Related to detection limits, sensitivity refers to the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. The more sensitive a method is, the better able it is to detect lower concentrations of a variable.

Spiked samples. Used for quality control purposes, a spiked sample is a sample to which a known concentration of the target analyte has been added. When analyzed, the difference between an environmental sample and the analyte's concentration in a spiked sample should be equivalent to the amount added to the spiked sample.

Standard operating procedures (SOPs). An SOP is a written document detailing the prescribed and established methods used for performing project operations, analyses, or actions.

APPENDIX G – VOLUNTEER WAIVER FORM

Sun River Watershed Group Volunteer Agreement
Waiver & Release of Liability

Welcome to the Sun River Watershed Group's volunteer team! We appreciate your decision to contribute your valuable time to furthering SRWG's mission. SRWG requires that you read this document carefully and **attest, acknowledge, and agree** for yourself and on behalf of your family, heirs, assigns, executors, representatives, and estate before you participate in SRWG's volunteer activities, including any activities incidental to such participation, (collectively, "Volunteer Activities"):

- My participation in the Volunteer Activities is wholly voluntary and without salary or other valuable consideration.
- I am not a SRWG employee, am not entitled to any employee benefits. SRWG does not provide me insurance (e.g. medical, workers compensation), and SRWG may terminate my volunteer assignment(s) without cause or notice.
- Volunteer Activities include, but are not limited to pulling or spraying weeds, cutting and staking willows, planting vegetation, trash removal, or data collection.
- Participating in the Volunteer activities involves risks including, but not limited to, property damage, personal injury, disability, and death. I am participating voluntarily with knowledge of the risks and expressly assume all risks, known and unknown, associated with the Volunteer Activities.
- At all times while volunteering, I will wear any required safety equipment, will comply with all safety rules, will comply with all SRWG privacy and confidentiality policies and rules, and will follow the instructions of my supervisors.
- I, my family, heirs, assigns, executors, representatives, and estate **release from liability and agree not to sue** SRWG, its officers, directors, employees, agents, sponsors, contractors, affiliates, successors, and assignees (collectively, the "SRWG Parties") for any injury, damage, death, or other loss suffered by me directly or indirectly arising out of or resulting from, in whole or in part, my participation in the Volunteer Activities.
- I will **defend, indemnify, and hold harmless** the SRWG Parties with respect to any actual or alleged claims, losses, damages, liabilities, suits, or expenses (including, but not limited to, reasonable attorneys' fees and costs) directly or indirectly arising out of or resulting from, in whole or in part, my gross negligence or willful misconduct while participating in the Volunteer Activities.
- I will notify SRWG immediately of any incident that occurs of which I am aware and which may give rise to liability on my part or that of SRWG.
- I am at least eighteen (18) years of age, have sufficient training, am in good health and physically fit to participate in the Volunteer Activities, and have no condition or impairment that would endanger myself or others.

This Agreement is a contract which grants certain rights to and eliminates the liability of the SRWG Parties. **To the fullest extent permitted by law, it includes any claims caused or alleged to be caused, in whole or in part, by the negligence of any SRWG Parties and includes claims for personal injury, property damage, wrongful death, breach of contract or otherwise.** It shall interpreted and construed in accordance with the laws of the State of Montana. Any and all claims, controversies and causes of action arising out of or related to it, whether sounding in contract, tort, or statute shall be governed by the laws of the State of Montana, including statutes of limitations, without giving effect to any conflict-of-laws rules that would result in the application of the laws of a different jurisdiction, and that any mediation, suit, or proceeding must be filed or entered into in Montana. If any portion of this Agreement is deemed void or unenforceable, the remaining provisions shall continue in full force and effect. This Agreement expresses the complete understanding of the parties and may not be modified unless mutually agreed to by the parties in writing.

By signing this document, you may be waiving your legal right to a jury trial to hold the SRWG Parties legally responsible for injuries or damages resulting from risks inherent in the Volunteer Activities or for any injuries or damages you may suffer due to the SRWG Parties' ordinary negligence that are the result of their failure to exercise reasonable care.

I have carefully read, understand, and voluntarily sign this Agreement.

_____ _____

Signature of Volunteer Date

VOLUNTEER INFORMATION

Name: _____

Phone: _____

Email: _____

EMERGENCY CONTACT INFORMATION

Name: _____

Phone: _____

Relationship: _____

This form to be completed before participation in SRWG volunteer activities and kept on file at SRWG office.