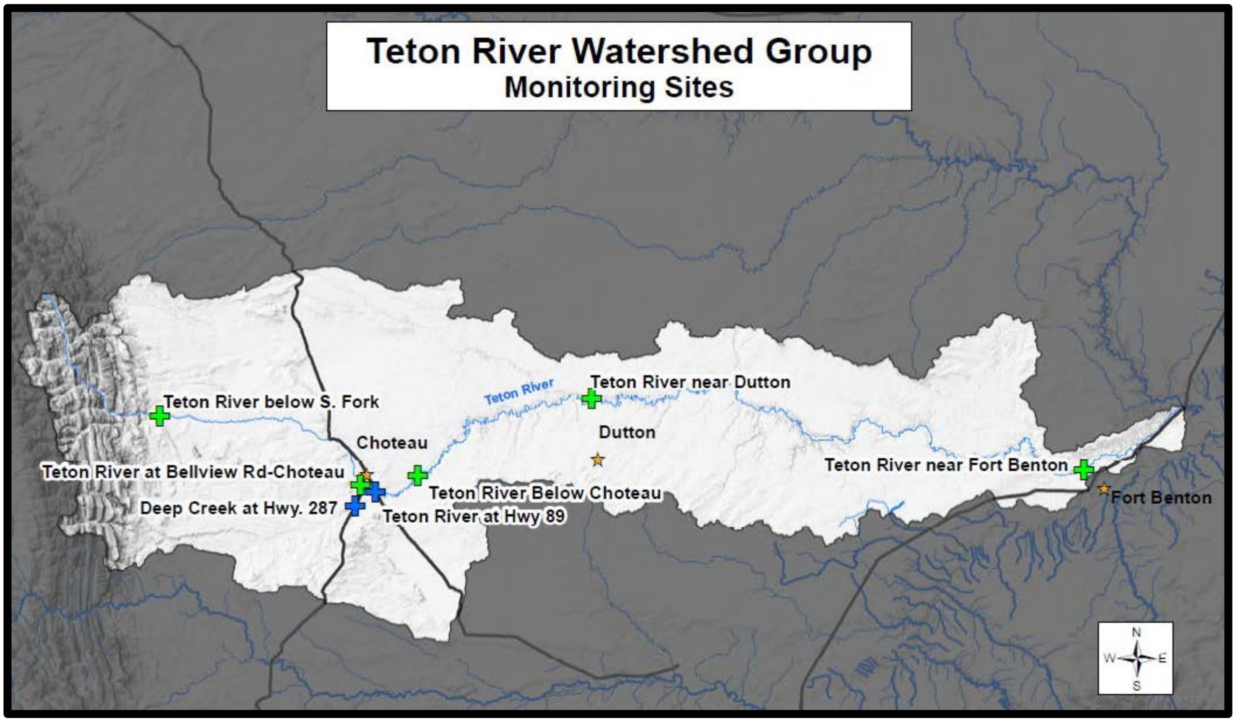
Teton River
Quality Assurance Project Plan
February 2012



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Document Summary and Purpose

This document provides overarching guidance for water quality data collection within the Teton Watershed as directed by the goals of the Teton River Watershed Group (TRWG). Monitoring goals and priorities laid out in this document are derived from feedback from the stakeholders involved with the TRWG. Feedback was gathered from stakeholders at public meetings in January and April of 2012, from Alan Rollo (watershed coordinator) and through email follow-up with additional stakeholders in February of 2012. Data is being collected in the watershed by the TRWG, the US Geological Survey, the US Forest Service, the US Bureau of Reclamation, the US Fish and Wildlife Service and the MT Dept. of Fish Wildlife and Parks. It is understood that each of these groups has specific goals and data collection policies that direct their data collection efforts. A goal of this document is to bring a degree of shared vision and methodology for long term trend monitoring to the fore which may help shape agency data collection efforts. This document will also serve as an umbrella document under which TRWG monitoring projects can be structured, but the scope of work that the TRWG is involved with is too broad for this document to exhaustively cover sampling design for all types of projects. Specifically, appropriate monitoring study design to evaluate effectiveness of best management practices is extremely project specific, so this document will provide general guidance and suggestions of methodologies, but individual sample analysis plans (SAPs) will be necessary for individual monitoring projects.

Distribution List

All stakeholders affiliated with this project should be informed and receive copies when subsequent versions of this document are created. A distribution list of these stakeholders can be found in Appendix A.

Background Information

Watershed Description

The Teton River watershed is located in west-central Montana and drains approximately 1,300 square miles. The Teton River begins along the eastern Rocky Mountain front and flows about 150 miles through western Chouteau, northern Teton, and southern Pondera counties to its confluence with the Marias River at Loma, Montana.

The Teton River's characteristics change dramatically along its continuum. As the river's headwaters flow out of the Lewis and Clark National Forest, it moves swiftly over glacial till and is turquoise in color (Figure 1). Once on the plain, the Teton disappears underground for several miles before it re-emerges above Choteau as a slower, smaller river with a darker, tannin-rich color and more plant growth (Figure 2). Nearer its confluence with the Marias, the Teton is often dry for much of the year.

Figure 1. Photo of Teton River near headwaters.

Figure 2. Photo of Teton River near Choteau, MT.

The primary causes of water quality impairments to the Teton River, listed on the 1996 and 2012 303(d) lists include salinity/TDS/chlorides or sulfides, selenium, organic enrichment/dissolved oxygen, siltation/suspended solids, temperature, and nutrients. Other listed causes include stream flow alteration (dewatering), bank erosion, riparian degradation, fish habitat alteration, and other habitat alteration. The sources of listed impairments include agricultural related (irrigated and non-irrigated crop production, range land/grazing), stream flow modification, channelization, bank modification/destabilization, habitat modification, municipal point source, resource extraction, land disposal, highway/road/bridge construction, and natural or unknown sources. Most impairment listings across the watershed result from salinity, riparian degradation, stream channel instability (bank erosion and sedimentation), and flow alteration.

Teton River Watershed Group Description

Formed in 1994 through collaboration between The Nature Conservancy, NRCS, and major landowners, the Teton River Watershed Group (TRWG) is a collaborative, locally-directed group of interested individuals, organizations, and agencies dedicated to education and to monitoring, improving, and maintaining the quality of the natural resources within the Teton River Basin. TRWG used focus meetings and surveys to establish initial direction and primary tasks. In 1996 the TRWG officially formed as a 501c (3) nonprofit organization to access additional funds to work on natural resource projects. The TRWG board meets on the second Tuesday of each month in Great Falls, Montana, and holds an annual meeting second Tuesday in January in Dutton, Montana. The annual meeting is to update the general public on special interest items and on past accomplishments.

TRWG Structure and Goals

The TRWG is a consensus-based organization that works to address natural resource management conflicts within the watershed to meet the needs of all stakeholders. The watershed group consists of four workgroups including: water management, fisheries, water quality, and weeds. The following data collection goals are laid out to help the workgroups address their concerns:

1. To assess long term (years to decades) water quality trends in the Teton and its tributaries. Primary water quality concerns are sediment, nutrients, temperature, and selenium. All of these parameters are related to flow, so flow data is a high priority.
2. To determine if best management practice (BMP) projects are improving water quality in the Teton River and its tributaries. This includes monitoring of long term persistence/maintenance of projects and assessment of whether projects are performing the intended purposes.
3. To collect data that helps to refine the TRWG work plan, identify water resource issues and prioritize projects for funding.
4. To monitor land use change and its effects on overall health and water quality within the watershed.

Sampling Design

Sampling Design Overview

With limited resources for collecting data, it is important for TRWG to be strategic about data collection to ensure that it can be used for the goals outlined above. Each goal has different considerations for the type of data needed, and limiting data collection to only those parameters necessary to assess the stated water quality goals is critical to cost-efficient monitoring. It is important to remember that without flow data, nutrient and sediment loads cannot be calculated, and interpretation of water quality data is difficult or impossible. Therefore, corresponding flow data must accompany any other data collection efforts.

The content in this QAPP document focuses on the goal of long term trend monitoring. Current funding limits data collection to parameters measured on the YSI 556 (temperature, pH, DO, conductivity), but methods and parameters are expected to be added in the future, as funding permits. These should be chosen in an effort to facilitate efficient data collection that can be used meaningfully to assess trends in the threats to water quality that are of greatest concern to the TRWG (currently sediment, nutrients, selenium, and temperature).

Setting up a monitoring plan to assess the effectiveness of BMPs must be done in the context of a specific project, with a working knowledge of the goals of the BMP and the water problems it was intended to address, and will be stated explicitly in the plans for the corresponding project. The approach for every BMP effectiveness project will be different but a few key considerations are presented here. A full guidance document on this topic is available from the NIFA Northern Plains and Mountains Regional Water Team at http://www.uwyo.edu/bmp-water/ .

BMP Effectiveness Projects:

1. Consider what the objectives of the BMP project are and cater the monitoring specifically to assess the intended project outcome. It is important to think about what water quality parameters are expected to be affected by a BMP, how quickly the BMP is expected to start providing benefits, and the timing of the benefit during the water year.
2. Consider what the BMP is actually doing to reduce pollution. What is the physical delivery process and pathway for the pollutant to the stream and the timing? Understanding these processes is essential before designing the monitoring project. Sampling at the wrong time of year or in the wrong place could completely miss the benefits.
3. Consider alternative ways to monitor benefits of a project. Even if a project significantly reduces the load of a pollutant to a stream, it may be very difficult to measure that improvement by taking water samples. Consider assessing bank conditions, or modeling the reduction of pollution from a project. It is also important to monitor the persistence of the project itself. If the project is not maintained, it cannot do what it was intended to do.

Water Quality Parameter Justification

A comprehensive list of current and potential future field and lab parameters, including preferred methods for data collection and justifications, can be found in Table 1. If resources do not allow for collection of flow and water quality at all sites in a given year, it is recommended that all data be collected at fewer sites each year, and that a schedule be developed to guide rotation through the sites from year to year. Cost-efficiency can also be improved by estimating flow at one site based on flow at a nearby site, or by collecting less expensive water quality data that can be used to estimate other parameters (for example, specific conductance to estimate total dissolved solids, or turbidity to estimate suspended sediment concentration).

Table 1. Present and potential future parameters to be collected in the Teton River watershed for the purpose of long term trend assessment.

	Preferred Method	Alternative Method	Preservation	Hold Time	Justification
Field Parameters (current parameters):					
pH	YSI 556 multi-meter	Horiba U-10	NA	NA	Collected when samples are collected.
Temperature	YSI 556 multi-meter	Horiba U-10	NA	NA	Collected when samples are collected.
Specific Conductance (SC)	YSI 556 multi-meter	Horiba U-10	NA	NA	Cheap and easy surrogate for salinity.
Dissolved Oxygen (DO)	YSI 556 multi-meter	Horiba U-10	NA	NA	Collected when samples are collected.
Discharge (Q)	USGS Gage Data	Field Observation of Gage w/ rating curve	NA	NA	Necessary to calculate loads; affects sediment, salinity and all WQ parameters.
Photos	Digital Camera	-	NA	NA	Tracking riparian condition; cheap and easy.
Lab Parameters (potential future parameters):					
Suspended Sediment Conc. (SSC)	ASTM D3977-97	-	≤ 6° C	7 days	Erosion is a long term concern in watershed.
Nitrogen (total persulfate)	A4500-N C	A4500-N B	≤ 6° C	30 days	Total N listed as cause of impairment for Teton on 2012 303d list.
Nitrate + Nitrite as N	EPA 353.2	A4500-NO3 F	H_2SO_4, ≤ 6° C	28 days	Total N listed as cause of impairment for Teton on 2012 303d list.
Phosphorus (total)	EPA 365.1	A4500-P F	H_2SO_4, ≤ 6° C	28 days	Total P listed as cause of impairment for Teton on 2012 303d list.

Sample Site List and Descriptions

A list of current and potential future data collection sites, including site location descriptions and justifications, can be found in Table 2. All site locations are shown within the watershed in Figure 3. A more comprehensive list of sites, including more detailed site descriptions, driving directions, and photos, is available in the TRWG Standard Operating Procedures (SOPs) in Appendix B.

Table 2. Current and potential future monitoring sites within the Teton River watershed for the purpose of long term trend assessment.

Site Name	SITE ID	Latitude	Longitude	Site Status	Site Description	Site Justification
Teton River below S. Fork	TR-SF	47.88324	112.61203	current	¼ mile south of Canyon Rd. on Bellview Teton Rd.	Headwaters data for comparisons. Gage in place.
Deep Creek at Hwy. 287	DC-287	47.76955	112.20454	potential/ future	East side of Hwy 287, 2.5 miles south of Choteau.	Assess effects from Deep Creek.
Teton River at Bellview Road - Choteau	TR-BV	47.79901	112.19595	current	Heuscher property, Bellview Rd. ¼ mile W of Hwy 287.	Assess Choteau and water treatment inputs, upstream comparison.
Teton River at Hwy 89	TR-89	47.78977	112.16418	potential/ future	Mader Farm, Hwy 89 2 miles south of Choteau.	Assess water treatment inputs, downstream comparison.
Teton River below Choteau	TR-221	47.81319	112.07915	current	At Hwy 221, approx. 5 miles east of Choteau.	Assess Choteau inputs, downstream comparison.
Teton River near Dutton	TR-DT	47.92729	111.72705	current	Frontage Rd., east side of US-15, 2.5 miles south of exit 321.	Assess Dutton effects, gauge in place.
Teton River near Fort Benton	TR-FB	47.84406	110.71449	current	MT 223, 4 miles northwest of Fort Benton.	Assess Loma effects, gauge in place.

Watershed Map

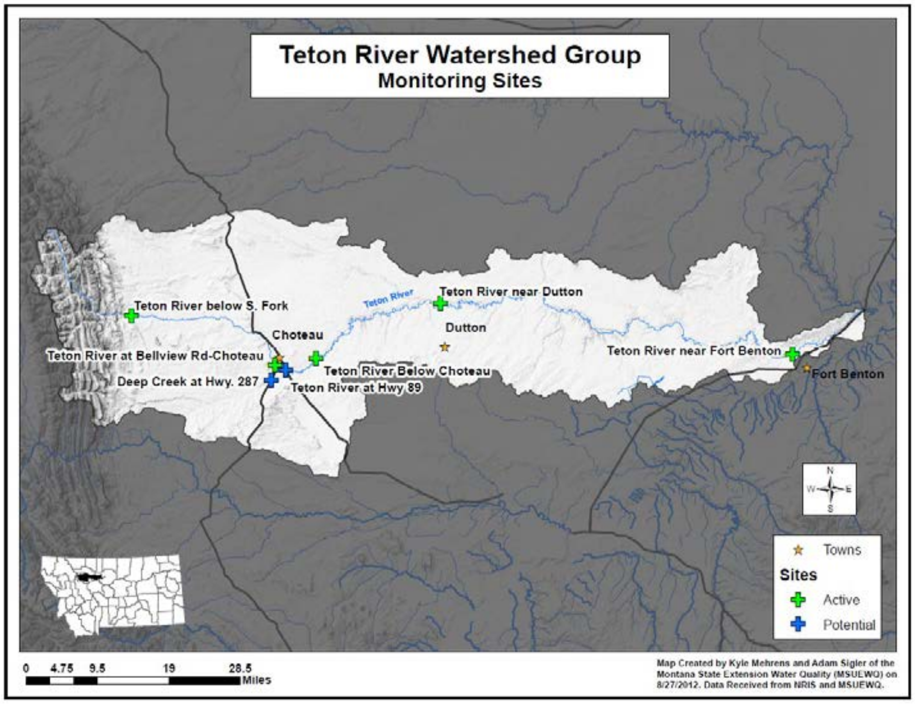

Figure 3. Map of current and potential future sample site locations within the Teton River watershed.

Data Collection Responsibilities

In order to have a complete dataset that can be meaningfully interpreted, it is important that every group participating in the data collection process understands their responsibilities. A list of current sites, including the organizations with data collection responsibilities at each, can be found in Table 3.

Table 3. Data collection responsibilities at current sites.

Site Name	Site ID	Water Quality Data	Discharge Data/ Method
Teton River below S. Fork	TR-SF	TRWG Volunteer	USGS / gauge # 06102500
Teton River above Choteau	TR-BV	TRWG Volunteer	TRWG Volunteer / manually read gauge
Teton River below Choteau	TR-221	TRWG Volunteer	TRWG Volunteer[1] / manually read gauge
Teton River near Dutton	TR-DT	TRWG Volunteer[2]	USGS[3] / gauge # 06108000
Teton River near Fort Benton	TR-FB	TRWG Volunteer	USGS[4] / gauge # 06108800

[1] Additional discharge data available from DNRC for this site (TruTrack).

[2] USGS also collecting continuous temperature data at this site.

[3] Financial support for gauge through FWP.

[4] Financial support for gauge through DNRC, Teton River at Loma gauge used as surrogate.

Additional Data Resources

When planning data collection strategies, it is important to work with other groups and agencies collecting data within the watershed so that resources are used efficiently. Awareness of the data being collected by others can benefit everyone by eliminating the collection of duplicate data and facilitating professional relationships through the sharing of data resources. A list of potential additional data resources known at this time can be found in Table 4.

Table 4. Potential additional resources within the Teton River watershed.

Agency/Contact Name	Data Collected	Data Collection Location
DNRC/ Aaron Fiaschetti afiaschetti@mt.gov	nutrients	Teton River at Loma USGS gauge (06108800)
FWP	temperature	Teton Spring Creek
N/A	baseline WQ assoc. with oil & gas development	eastern Teton River watershed

Sampling Supply Responsibilities

Alan Rollo will be responsible for ordering sample bottles from the contracted analytical laboratory prior to each sampling season, and for obtaining calibration solutions and other consumable items necessary for the maintenance of the YSI 556 and other sampling equipment.

Sampling Methods

Water quality parameter sampling efforts will be conducted by a TRWG volunteer, according to the TRWG SOP document, located in Appendix B. A Site Visit Form (see Appendix C) will be completed for each site visit and will include all field data collected and an inventory of samples collected for analysis at the contracted laboratory. Site locations will be corroborated using the GPS coordinates, driving directions and photographs provided in the SOP document. A GPS reading will be taken and recorded on the field visit form, and photographs will be taken using a digital camera. Field parameter data will be collected with a YSI 556, calibrated on the day of the sampling event, according to the manufacturer instructions. These instructions are clearly explained, with pictures, in the SOP (see Appendix 2). Site Visit Forms should be checked for completeness before leaving the sample site by a TRWG volunteer, and undergo a final review by Alan Rollo.

Instrument / Equipment Maintenance and Calibration

The YSI 556 will be housed at the Teton County Extension office in Choteau, under the supervision of Mark Rhea. Maintenance and pre-deployment calibration will be the responsibility of the volunteer checking the meter out for use. Only adequately trained volunteers (see “Monitoring Program Maintenance” section) should maintain, calibrate, or deploy the YSI for data collection. Larger repairs, such as probe replacement, will be the responsibility of Alan Rollo.

A calibration log was provided by MSUEWQ for the YSI 556 and should be kept for each meter employed for TRWG data collection efforts. The performance standards for the YSI 556 can be found in Table 5, and detailed instructions on YSI maintenance and calibration can be found in the SOP document (Appendix B).

Table 5. Performance characteristics for YSI 556.

Parameter	Measurement Range	Resolution	Accuracy
Temperature	-5 to 45° C	0.01° C	±0.15° C
pH	1.0 to 14.00 units	0.01 units	±0.2 units
Spec. Conductance	0 to 200 mS/cm	0.001 mS/cm to 0.1 mS/cm	±0.5% of reading or ±0.001 mS/cm
Dissolved Oxygen	0 to 50 mg/L	0.01 mg/L	±2% of the reading or 0.2 mg/L

Flow (Discharge) Measurement

USGS uses automated gauges to collect flow data at the Teton River below South Fork (TR-SF) and Teton River near Dutton (TR-DT) sites, and at Teton River near Loma, which is used as a surrogate for flow at Teton River near Fort Benton (TR-FB). USGS maintains and calibrates these gauges in accordance with their own procedures and standards. Discharge at Teton River below Choteau (TR-221), Deep Creek at 287 (DC-287), and Teton River at Hwy 89 (TR-89) will be collected by volunteers via rated gauge readings. DNRC is also collecting discharge data at these sites via TruTrack, in accordance with their procedures and standards.

Water Sample Collection and Handling for Laboratory Analysis

The following information is provided in the event that TRWG decides to submit samples to an analytical lab in the future. Grab samples will be collected for delivery to the contracted lab for chemistry analysis using acid washed, polyethylene bottles provided by the testing laboratory. Table 6 details the analytical methods and handling procedures for each parameter. A detailed sampling schedule for each stream is included in the Sampling Schedule and Parameters table of the SOP (Appendix B).

Table 6. Lab parameter analytical methods, reporting limits, hold times, and preservatives.

Parameter	Preferred Method	Alternate Method	Req. Report Limit ug/L	Holding Time	Bottle	Preservative
Suspended Sediment Conc. (SSC)	ASTM D3977-97	-	4000	7 days	500ml HDPE	≤ 6° C
Total Nitrogen	A4500-N C	A4500-N B	50	30 days	500ml HDPE	≤ 6° C
Nitrate	EPA 353.2	A4500-NO3 F	10	28 days	500ml HDPE	H_2SO_4, ≤ 6° C
Total Phosphorous	EPA 365.1	A4500-P F	3	28 days	500ml HDPE	H_2SO_4, ≤ 6° C

Bottles must be rinsed three times with stream water prior to sample collection in a well-mixed portion of each stream. During sampling, the sample bottle opening should face upstream and should be drawn through the water column once, carefully avoiding disturbance of bottom sediments. Samples will be preserved in the field and stored on ice until shipment to the lab well in advance of the hold times listed above. Sample preservation is explained in detail in the Sample Collection and Bottle Labeling section of the SOP (Appendix B).

Quality control (QC) samples consisting of blanks and duplicates will be collected two times per sampling season at different sites each time. A field blank is prepared by transporting laboratory-grade deionized (DI) water to the field (provided by the laboratory) and pouring it into sample containers provided by the lab. The blank will be prepared at the same time that the samples are collected from the stream. A duplicate sample is a second stream sample collected at the same time in the same way that the regular stream sample is collected. Duplicate and blank samples are labeled according to the labeling protocol below, which does not identify which sample is which to the lab. Blank and duplicate samples are handled and delivered to the lab in the same manner that regular samples are handled.

Sample labels should be filled out with Company (TRWG), the date, the time, and the sample ID. The sample ID is very important and includes the year, the month, the day, the site ID and a letter indicating they type of sample (regular, duplicate, or blank).

Sample ID = [Year, Month, Day]_[Site ID]_[Sample-Type Letter]

A = Regular Sample
B = Duplicate Sample
C = Blank Sample

Sample ID Examples:

A regular sample collected at the Teton River near Dutton site on August 15th, 2012 would be labeled:

20120815_TR-DT_A

A duplicate at the same place and time as above:

20120815_TR-DT_B

A blank at the same place and time as above:

20120815_TR-DT_C

Immediately following grab-sample collection, samples should be put on ice. The contracted analytical lab's chain of custody (COC) forms will be used to document and track all samples collected during the project. COCs will be completed for each set of samples submitted to the laboratory. A sample COC can be found in the SOP document (Appendix B). TRWG Coordinator Alan Rollo will be responsible for QC of the analyte sample COCs and sending samples on to the contracted analysis laboratory.

Data Quality Control

In order for water quality data to be useful, it needs to accurately represent the conditions in the river or stream at the time the samples were collected. This requires proper sample handling, processing, and assessment of data to ensure quality. Data quality objectives (DQOs) state the required quality of data for the intended use and data quality indicators (DQIs) are the specific criteria by which data are assessed to determine quality. These indicators are assessed by collecting quality control (QC) samples and then performing quality assurance (QA) checks on those samples.

QC samples are blank, duplicate and spike samples collected or created in the lab and/or the field for evaluation of quality indicators. Once the lab results are returned for the QC samples, QA involves assessing the data through use of indicators to determine data quality. A glossary of QA/QC terms can be found in Appendix D.

Data Quality Objectives

Provisions are in place to ensure sensitivity of data collected to differences in stream water quality and comparability of data collected to other datasets. These provisions include the collection of grab samples and field QC for submission to a certified laboratory and assessment of QC data relative to data quality indicators.

In order to ensure the highest degree of data completeness possible, volunteers need to fill out datasheets completely and review them before leaving a site. Alan Rollo will review datasheets for completeness and will follow-up with volunteers if any fields are illegible, inaccurate, or incomplete.

Data Quality Indicators

Quality control (QC) samples can be broken down into a field and a laboratory component. The field component consists of collection of blank and duplicate samples and comparison of data to criteria. The laboratory component consists of analysis of blanks, duplicates, and spiked samples by the lab. Blank samples should ideally yield results indicating “no detection” of the analyte in question. Duplicate samples should ideally produce identical results and analysis of spiked samples should recover exactly the amount of analyte added. Methods are not perfect however, so the criteria outlined in the following section should be used to determine if data is of acceptable quality.

Quality Assurance for Quality Control Samples

For TRWG sites, field quality control samples will be collected for 10% of all samples collected. If additional sites are added, collecting additional sets of QC samples should be considered so that a QC rate of greater than 10% is maintained. Each set of field QC samples will include a blank and a duplicate for each analyte being sampled. Accuracy for field QC samples will be assessed by ensuring that blank samples return values less than the data quality indicator criteria specified in Table 6. If a blank sample returns a result greater than the threshold for a given parameter, all data for that parameter in that batch of samples may need to be qualified when it is entered into the database. The exception is that data with a value greater than 10 times the detected value in the blank does not need to be qualified. Precision for field QC samples will be assessed by ensuring that relative percent difference (RPD) between duplicates is less than 25%. RPD is calculated using the equation below. In addition to these accuracy/precision checks, it will be necessary to check that all samples were processed within their specified hold times.

RPD as % = ((D1 – D2)/((D1 + D2)/2)) x 100

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

Certified laboratories run QC samples for at least 10% of their sample volume. Integrity of laboratory data will be determined by comparing results for laboratory QC samples to the data quality indicator criteria in Table 7. Reports with lab QC results and data quality indicator calculations should be provided by the lab with each set of sample results. Each of the quality indicator criteria in Table 7 must be checked for each analyte for each batch of samples submitted to the lab. This process is easier if a matrix is used to systematically check the numbers. An example of a completed matrix is provided in Appendix E.

Table 7. Data quality indicator criteria for lab and field QC samples.

Parameter	**Suspended Sediment Concentration**	**Total Nitrogen**	**Nitrate-Nitrite as N**	**Total Phosphorus as P**
Field Blank Threshold	4000 µg/L	0.05 mg/L	0.01 mg/L	0.005 mg/L
Field Duplicate RPD	< 25% RPD	< 25% RPD	< 25% RPD	< 25% RPD
Analysis Method	EPA 160.2	A4500-N C or A4500-N B	A353.2 or A4500-NO3 F	EPA 365.1 or 4500-P F
Method Blanks	4000 µg/L	0.1 mg/L	0.01 mg/L	0.005 mg/L
Lab Duplicates (RPD)	< 10% RPD	< 10% RPD	< 10% RPD	< 10% RPD
Lab Control LCS/LFB (% recovery)	70%-130%	90%-110%	90%-110%	90%-110%
Matrix Spike/ Matrix Spike Dup (% recovery)	-	90%-110%	90%-110%	90%-110%

Data Qualification

When data is uploaded to EQuIS, if data quality criteria are not met, the quality of the data points in question needs to be qualified. Data qualifier codes are provided in Appendix F for different types of data quality issues.

Monitoring Program Maintenance

Training

Water quality data is currently collected by adjacent property owners and other stakeholders in the Teton River watershed, under the supervision of Alan Rollo. On June 7th and 8th of 2012, Torie Bunn from MSUEWQ accompanied Alan Rollo to each of the proposed sample sites to confirm site locations and to collect site coordinates, photos, and driving directions. Torie also went over calibration of the new YSI 556 meter, bottle labeling and preservation, and the use of the site visit forms with Alan. This served as pre-sample season training for the 2012 season.

Beginning in early 2013, a two-phase, ongoing program maintenance and training program has been proposed. In February of each year, Alan will meet with representatives from DEQ and/or MSUEWQ, and TRWG volunteer monitors to review data from the previous year and discuss logistics and other details for the upcoming sample season. Any noteworthy outcomes of this meeting will be brought to the Teton River Water Quality Work Group meeting, held annually in March. Then in April of each year, DEQ and/or MSUEWQ personnel will conduct a field audit with volunteers, reviewing the procedures outlined in the TRWG SOP.

Data Management

Data management is necessary to ensure that data sets are complete and accurately interpreted. Clearly articulated data pathways ensure that all stakeholders understand their responsibilities throughout the monitoring process, from sample collection to data reporting.

Copies of TRWG laboratory reports and electronic data spreadsheets in the EQuIS format will be provided by the analytical lab to Alan Rollo for further data processing and TRWG reporting and to Montana DEQ.

Spreadsheets with all field data collected by TRWG will be emailed to Alan Rollo, who will review all laboratory and field data and conduct all QC procedures outlined in the Data Quality Control section of this document prior to data entry into the TRWG master spreadsheet. A checklist of necessary QC activities is included for guidance in Appendix G. The spreadsheet will ultimately be publically accessible via the TRWG website. TRWG data will be housed in these spreadsheets and uploaded to EQuIS on an as-appropriate basis, with assistance from Jolene McQuillan (MT DEQ EQuIS Database Manager) or other DEQ and/or MSUEWQ personnel.

MSUEWQ has created a master data spreadsheet for each site the Sun River Watershed Group (SRWG). These spreadsheets are up-to-date with historic discharge and water quality data, and only need to be amended at the end of the sampling season each year. This approach could be implemented for TRWG as multiple years of data are amassed.

Discharge Data Collection

Qualified water quality data needs to be paired with corresponding discharge data before annual data summaries and other meaningful reporting can be completed. Discharge data for TRWG is collected by a variety of sources, and is accordingly compiled through a variety of processes. For example, USGS data is downloaded from the National Water Information System (NWIS) website and/or requested from USGS if it has not been published to the web by the time of reporting. DNRC data is obtained through other methods. Various resources and processes for obtaining relevant discharge data are outlined in Appendix H.

Annual Data Summaries for TRWG

Annual data summaries will be prepared for TRWG annual meetings by Alan Rollo. In addition to reporting for the TRWG annual meeting, electronic copies of raw data and data summaries will be maintained on TRWG's website. As TRWG amasses data, the approach created by MSUEWQ for SRWG could be used to streamline this process. This approach utilizes 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. A video tutorial outlining this process can be found at: https://camtasia.msu.montana.edu/Relay/Files/p55w886/SRWG%20Data%20Management%20Tutorial/SRWG_Data_Management_Tutorial_-_Flash_%28Small%29_-_20120510_04.15.05PM.html

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Scientific and Technical Basis of the Numeric Nutrient Criteria for Montana's Wadeable Streams and Rivers. Michael Suplee, Ph.D. - Montana Department of Environmental Quality; Vicki Watson, Ph.D. – University of Montana; Arun Varghese and Josh Cleland – ICF International. Available on the web at: http://deq.mt.gov/wqinfo/standards/PDF/WhitePaper_FNL3_Nov12-08.pdf [verified June 5, 2010]. Appendix B: Site Visit Form and QC Checklist

Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring. Montana Dept. of Environmental Quality, WQPBWQM-020, revision 2. February, 2012. Available at http://deq.mt.gov/wqinfo/qaprogram/PDF/SOPs/WQPBWQM-020.pdf

Appendices

Appendix A: TRWG Distribution List

Currently being finalized by Alan.

Appendix B: TRWG Standard Operating Procedures

Teton River Watershed Group
Standard Operating Procedures (SOPs)

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TRWG Gear Checklist

General

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

Personal Items

1. Cell Phone
2. Sun screen
3. Waders
4. Bug spray

Collecting Samples for Lab Analysis (Anticipated 2013)

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

Field Activity Checklist

_______ 1. Calibrate YSI meter before going to the field

_______ 2. Deploy YSI meter

_______ 3. Begin filling out field visit form

_______ 4. Label sample containers (when applicable)

_______ 5. Collect water samples (when applicable)

_______ 6. Collect YSI meter measurements

_______ 7. Take staff gauge readings (where applicable)

_______ 8. Prepare samples for shipping (when applicable)

_______ 9. Fill out chain of custody(when applicable)

_______ 10. Check that all forms are complete

_______ 11. Check that all gear is accounted for

Sampling Schedule and Parameters

Teton River below S. Fork (TR-SF)

Month	Parameters
April	YSI Readings (DO, pH, Specific Conductance, Temperature)
May	YSI Readings (DO, pH, Specific Conductance, Temperature)
June	YSI Readings (DO, pH, Specific Conductance, Temperature)
July	YSI Readings (DO, pH, Specific Conductance, Temperature)
August	YSI Readings (DO, pH, Specific Conductance, Temperature)
September	YSI Readings (DO, pH, Specific Conductance, Temperature)
October	YSI Readings (DO, pH, Specific Conductance, Temperature)

Deep Creek at 287 (DC-287) **Potential Future Site**

Month	Parameters
April	
May	
June	
July	
August	
September	
October	

Teton River at Bellview Road - Choteau (TR-BV)

Month	Parameters
April	YSI Readings (DO, pH, Specific Conductance, Temperature)
May	YSI Readings (DO, pH, Specific Conductance, Temperature)
June	YSI Readings (DO, pH, Specific Conductance, Temperature)
July	YSI Readings (DO, pH, Specific Conductance, Temperature)
August	YSI Readings (DO, pH, Specific Conductance, Temperature)
September	YSI Readings (DO, pH, Specific Conductance, Temperature)
October	YSI Readings (DO, pH, Specific Conductance, Temperature)

*Underlined parameters will be processed by the lab.

Teton River at Hwy 89 (TR-89) **Potential Future Site**

Month	Parameters
April	
May	
June	
July	
August	
September	
October	

Teton River below Choteau (TR-221)

Month	Parameters
April	YSI Readings (DO, pH, Specific Conductance, Temperature)
May	YSI Readings (DO, pH, Specific Conductance, Temperature)
June	YSI Readings (DO, pH, Specific Conductance, Temperature)
July	YSI Readings (DO, pH, Specific Conductance, Temperature)
August	YSI Readings (DO, pH, Specific Conductance, Temperature)
September	YSI Readings (DO, pH, Specific Conductance, Temperature)
October	YSI Readings (DO, pH, Specific Conductance, Temperature)

Teton River near Dutton (TR-DT)

Month	Parameters
April	YSI Readings (DO, pH, Specific Conductance, Temperature)
May	YSI Readings (DO, pH, Specific Conductance, Temperature)
June	YSI Readings (DO, pH, Specific Conductance, Temperature)
July	YSI Readings (DO, pH, Specific Conductance, Temperature)
August	YSI Readings (DO, pH, Specific Conductance, Temperature)
September	YSI Readings (DO, pH, Specific Conductance, Temperature)
October	YSI Readings (DO, pH, Specific Conductance, Temperature)

Teton River near Fort Benton (TR-FB)

Month	Parameters
April	YSI Readings (DO, pH, Specific Conductance, Temperature)
May	YSI Readings (DO, pH, Specific Conductance, Temperature)
June	YSI Readings (DO, pH, Specific Conductance, Temperature)
July	YSI Readings (DO, pH, Specific Conductance, Temperature)
August	YSI Readings (DO, pH, Specific Conductance, Temperature)
September	YSI Readings (DO, pH, Specific Conductance, Temperature)
October	YSI Readings (DO, pH, Specific Conductance, Temperature)

*Underlined parameters will be processed by the lab.

Sample Site IDs and HUC Codes

Site ID	Site Name	Latitude	Longitude	HUC Code
TR-SF	Teton River below S. Fork	47.88306	112.61111	100302050105
TR-BV	Teton River at Bellview Road - Choteau	47.79901	112.19595	100302050401
TR-89	Teton River at Hwy 89	47.78977	112.16418	100302050405
DC-287	Deep Creek at Hwy 287	47.76958	112.20454	100302050306
TR-221	Teton River below Choteau	47.81276	112.07937	100302050406
TR-DT	Teton River near Dutton	47.93028	111.55194	100302050905
TR-223	Teton River near Fort Benton	47.84406	110.71449	100302051204

Site Photos and Driving Directions

Teton River below South Fork (TR-SF)

(1) Upstream at site

(2) Across (S) at site

(3) Downstream at site

Directions: Take Canyon Road west from Choteau ~ 23 miles to Bellview Teton Road on left/south. Site is at bridge ¼ mile after turning. Access river to sample downstream of bridge on south side of river.

GPS Coordinates: 47.88306 lat, 112.61111 lon **(Disharge taken from USGS GAUGE)**

Teton River at Bellview Road - Choteau (TR-BV)

(1) Upstream from site

(2) Across (south) at site

(3) Downstream from bridge

Directions: Coming from Choteau, take Hwy 287 S ~1 mile to Bellview Road. Turn right (west) and continue ~¼ to bridge. Site is on the property of Cliff & Sally Heuscher. Sample downstream of the bridge on the south side of the river.

GPS Coordinates: 47.79901 lat
112.19595 lon

DISCHARGE taken via STAFF GAUGE

Teton River at Highway 89 (TR-89) **Potential Future Site**

(1) Upstream from site

(2) Across (north) at site

(3) Downstream from site

(4) Parking landmarks at site.

Directions: Site is at Mader farm, and has "COSTA LOTSA RANCH" sign at road. From Choteau, take highway 89 south ~ 2 miles to bridge. Just past bridge, turn right into Mader driveway/pulloff. Sample where pulloff dead-ends at river.

GPS Coordinates: 47.78977 lat
112.16418 lon

DISCHARGE taken via DNRC GAUGE

Deep Creek at Highway 287 (DC-287) **Potential Future Site**


(1) Upstream from site


(2) Across (south) at site


(3) Downstream from site


(4) Parking at Hwy 287 (south)

Directions: From Choteau, take Highway 287 south ~3 miles. Sign identifying Deep Creek on right (photo 4). Park on NW side of bridge and cross guardrail to access site east of bridge (downstream) on the north bank.

GPS Coordinates: 47.76958 lat
112.20454 lon

DISCHARGE taken via DNRC GAUGE

Teton River below Choteau (TR-221)


(1) Upstream from site


(2) Across (east) at bridge


(3) Downstream from site


(4) Across (west) at bridge

Directions: From Choteau, take Highway 221 east ~5 miles. Park on SW side of bridge and cross road to access site north of bridge (upstream) on the west bank.

GPS Coordinates: 47.81276 lat
112.07937 lon

DISCHARGE taken via DNRC GAUGE

Teton River near Dutton (TR-DT)


(1) Upstream from site


(2) Across (south) at bridge


(3) Downstream from site


(4) Sampling access site

Directions: From I-15 exit 313 at Dutton, take frontage road on east side of highway north ~7 miles. Access is on the west side of the road (upstream), north of bridge.

GPS Coordinates: 47. 93028 lat
111.55194 lon

(DISCHARGE FROM USGS)

Teton River near Fort Benton (TR-223)


(1) Upstream from site


(2) Across (north) at bridge


(3) Downstream from site


(4) Across (west) at bridge

Directions: From Fort Benton, take Hwy 223 northwest ~4 miles. Site is at bridge with 'War on Weeds' sign on the northwest side. Sample upstream on southeast side of bridge.

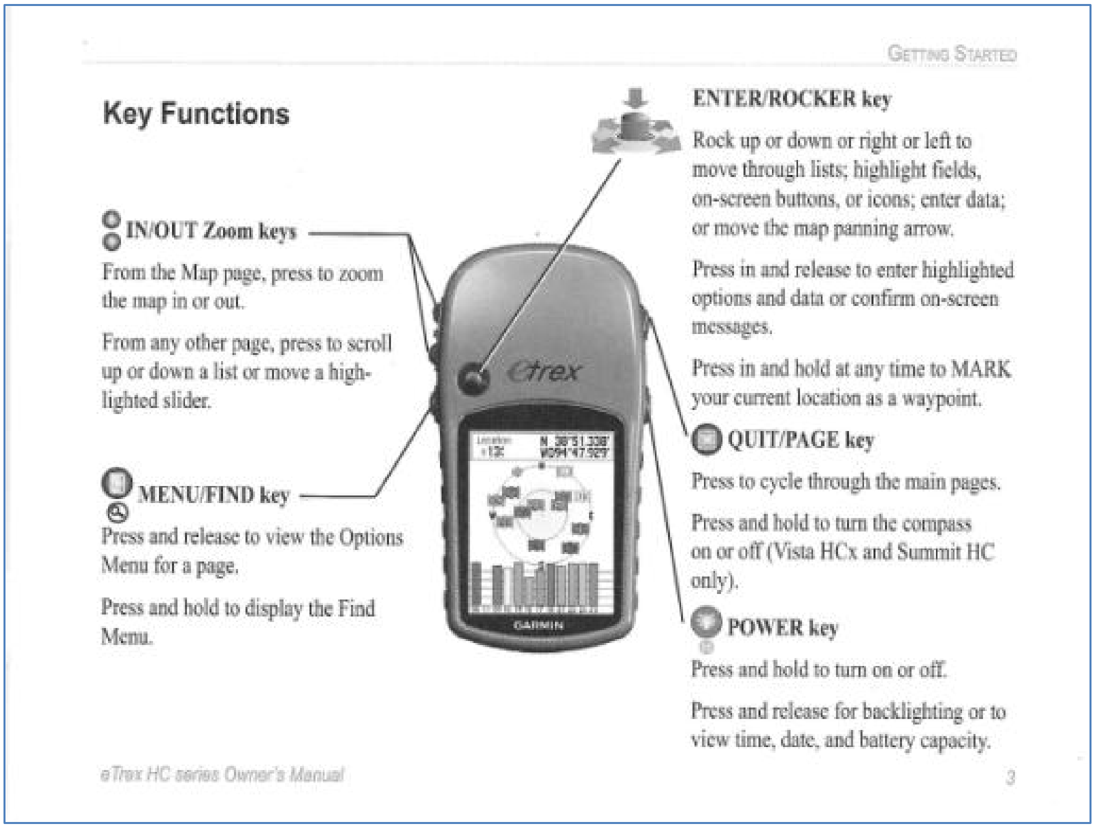
GPS Coordinates: 47. 84406 lat
110.71449 lon

(DISCHARGE FROM USGS)

Verifying Site Locations with GPS

Lat/Long and Elevation

Using the Garmin E-Trex GPS to take a waypoint:



GETTING STARTED

Key Functions

IN/OUT Zoom keys

From the Map page, press to zoom the map in or out.

From any other page, press to scroll up or down a list or move a highlighted slider.

MENU/FIND key

Press and release to view the Options Menu for a page.

Press and hold to display the Find Menu.

ENTER/ROCKER key

Rock up or down or right or left to move through lists; highlight fields, on-screen buttons, or icons; enter data; or move the map panning arrow.

Press in and release to enter highlighted options and data or confirm on-screen messages.

Press in and hold at any time to MARK your current location as a waypoint.

QUIT/PAGE key

Press to cycle through the main pages.

Press and hold to turn the compass on or off (Vista HCx and Summit HC only).

POWER key

Press and hold to turn on or off.

Press and release for backlighting or to view time, date, and battery capacity.

eTrex HC series Owner's Manual 3

Figure 1: Key functions for Garmin ETrex GPS unit.

Use power key to turn device on. Press and hold the rocker key until the Mark Waypoint page appears. The waypoint name and lat/long/elevation data can be found on this screen. To accept the waypoint with the data, highlight OK.

Latitude and Longitudes should be obtained in decimal degrees using a GPS unit reading NAD83. If a lat/long is obtained by another method, the datum and method must be recorded in the Site Visit Comments. Elevation should be recorded in feet.

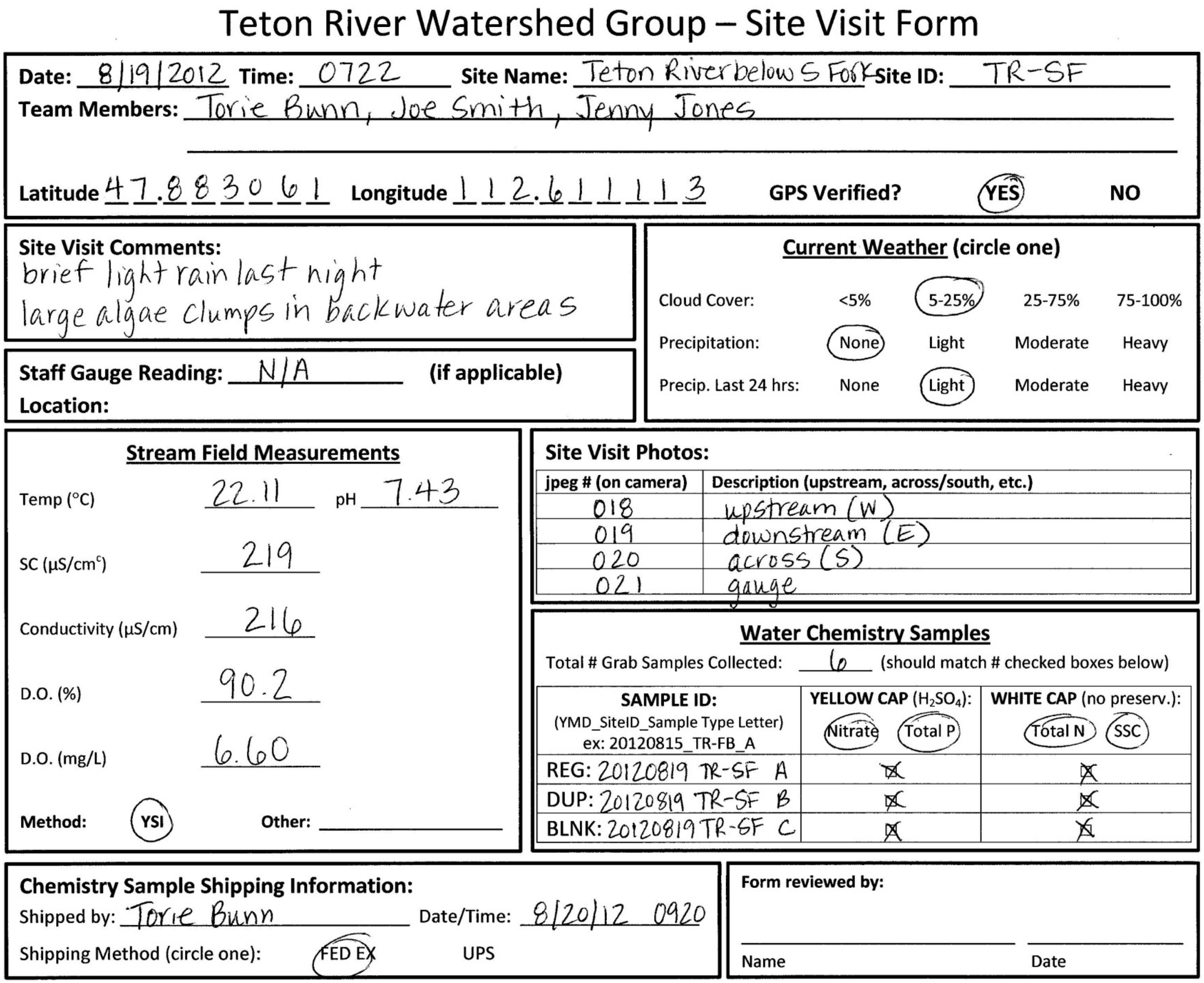
GPS Datum and Verification

The GPS unit should be reading NAD83 and the point will be verified by the data entry person upon entry of data.

Way point

Record a waypoint for the site with the GPS unit and note the waypoint number on the form.

Example Site Visit Sheet



Teton River Watershed Group – Site Visit Form

Date: 8/19/2012 **Time:** 0722 **Site Name:** Teton River below S Fork **Site ID:** TR-SF

Team Members: Torie Bunn, Joe Smith, Jenny Jones

Latitude 47.883061 **Longitude** 112.611113 **GPS Verified?** [✓ **YES**] **NO**

Site Visit Comments:
brief light rain last night
large algae clumps in backwater areas

Staff Gauge Reading: N/A **(if applicable)**
Location:

Current Weather (circle one)

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) 22.11 pH 7.43

SC (µS/cm^c) 219

Conductivity (µS/cm) 216

D.O. (%) 90.2

D.O. (mg/L) 6.60

Method: [✓ **YSI**] **Other:** ____

Site Visit Photos:

jpeg # (on camera)	Description (upstream, across/south, etc.)
018	upstream (W)
019	downstream (E)
020	across (S)
021	gauge

Water Chemistry Samples

Total # Grab Samples Collected: 6 (should match # checked boxes below)

SAMPLE ID: (YMD_SiteID_Sample Type Letter) ex: 20120815_TR-FB_A	**YELLOW CAP** (H_2SO_4): [✓ Nitrate] [✓ Total P]	**WHITE CAP** (no preserv.): [✓ Total N] [✓ SSC]
REG: 20120819 TR-SF A	☒	☒
DUP: 20120819 TR-SF B	☒	☒
BLNK: 20120819 TR-SF C	☒	☒

Chemistry Sample Shipping Information:
Shipped by: Torie Bunn Date/Time: 8/20/12 0920
Shipping Method (circle one): [✓ FED EX] UPS

Form reviewed by:
Name ____ Date ____

Sample Collection and Bottle Labeling

1. All samples (including quality control samples) should be labeled with a permanent marker before being filled and then covered with clear packing tape so that the labeled information does not smear. Labels should include:
    a. Company Name (Client): Teton River Watershed Group = TRWG
    b. Project = Teton River
    c. Date and time (military time)
    d. Sample ID (includes year, month, day, site ID, and letter indicating sample type)
        Sample ID = Year-Month-Day-SiteID-Sample Type Letter
            A = Regular Sample
            B = Duplicate Sample
            C = Blank Sample

<u>Sample ID Examples:</u>

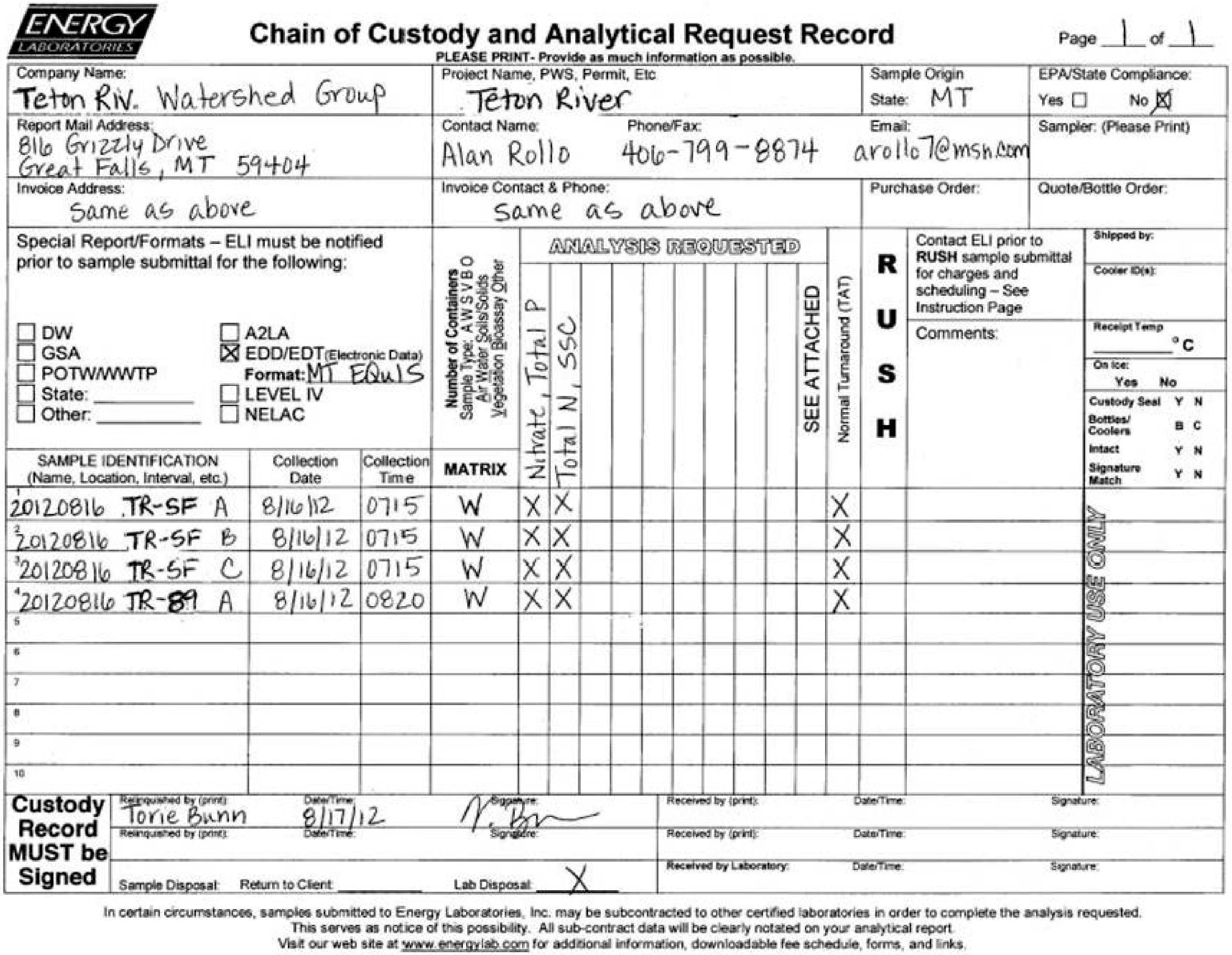
A **regular sample** collected at the South Fork site on August 15th, 2012 would be labeled:
20120815-TR-SF-A
A **duplicate** at the same place and time as above:
20120815-TR-SF-B
A **blank** at the same place and time as above:
20120815-TR-SF-C
A regular sample collected at the Teton River near Dutton site on July 3rd, 2012 would be labeled:
20120703- TR-DT-A

2. Samples will be collected in a well-mixed portion of each stream.
3. Bottles and lids shall be rinsed three times with stream water prior to sampling. During sampling, the sample bottle opening should face upstream and should be drawn through the water column once, carefully avoiding disturbance of bottom sediments.
4. One set of quality control (QC) samples consisting of blanks and duplicates will be collected for approximately every 10 stream samples collected.
    a. A field blank is prepared by transporting laboratory-grade deionized (DI) water to the field and pouring it into sample containers provided by the lab. The blank will be prepared at the same time that the samples are collected from the stream. A duplicate sample is a second stream sample collected at the same time in the same way that the regular stream sample is collected.
    b. Duplicate and blank samples will be collected at the same location for each event but the site they are collected at will rotate through the sample sites for subsequent sample events.
5. Blank and duplicate samples are handled and delivered to the lab in the same manner that regular samples are handled.
6. Any preservative necessary should be added to samples in the field. Sulfuric acid (H_2SO_4) (yellow vials and bottle caps) is typically added to samples for nutrient analysis and nitric acid (red vials and bottle caps) is added to samples for metal analysis.

Packaging Samples for Shipment

1. Samples need to be kept on ice or in a refrigerator until shipping.
2. Samples should be shipped as quickly after collection as possible but need to be shipped on a Monday or Tuesday and not later than Wednesday. Next day delivery is ideal, but if outside temperatures aren't too high, two day delivery would work too. Samples need to be shipped so they do not arrive on a weekend.
3. Samples should be packaged immediately before shipping to avoid unnecessary loss of ice before shipping.
4. Organize all samples on a table, grouped by site, in the order they were collected.
5. Check that all sample labels are completely filled out.
6. Fill out the chain of custody for the testing laboratory. This includes listing all of the sample IDs and sampling times. See the completed example on the following page.
7. Place a large trash bag inside the cooler. This bag will hold all of the samples and be tied off at the end to prevent any liquids from leaking from the cooler.
8. Place sample bottles in the ziplock bags (they may have come from the lab in bags initially which can be used). Samples preserved with nitric acid (red caps) should be bagged together separately. This is because nitrogen in the form of acid was added to these bottles and we don't want them to contaminate the nutrient samples if they were to leak.
9. Fill a minimum of 2 1-gallon ziplock bags with ice purchased from a store or ice from your freezer (whichever is more convenient) to include with the samples. The volume of ice should be at least equal to that of the samples.
10. Place all of the samples and the bagged ice inside the trash bag, inside the cooler and tie off the top of the trash bag.
11. Tear off the pink sheet on the completed chain of custody to give to Rai. Place the other COC completed sheets inside a ziplock bag and tape it to the top of the cooler.
12. Close the cooler and tape it closed. Sign and stick the custody seal on the cooler. Peel the tracking sticker on the UPS prepaid sticker and place it on the pink sheet. Deliver the cooler to the shipping center immediately.
13. Timely delivery of samples is critical so the ice doesn't melt. Especially if temperatures are hot, samples need to reach the lab quickly to avoid overheating.

Example Chain of Custody



ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT- Provide as much information as possible.

Company Name: Teton Riv. Watershed Group	Project Name, PWS, Permit, Etc: Teton River	Sample Origin State: MT	EPA/State Compliance: Yes ☐ No ☒
Report Mail Address: 816 Grizzly Drive Great Falls, MT 59404	Contact Name: Alan Rollo Phone/Fax: 406-799-8874	Email: arollo7@msn.com	Sampler: (Please Print)
Invoice Address: Same as above	Invoice Contact & Phone: Same as above	Purchase Order:	Quote/Bottle Order:

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW
☐ GSA
☐ POTW/WWTP
☐ State: ________
☐ Other: ________
☐ A2LA
☒ EDD/EDT (Electronic Data) Format: MT EQuIS
☐ LEVEL IV
☐ NELAC

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

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Nitrate, Total P	Total N, SSC	SEE ATTACHED	Normal Turnaround (TAT)
1 20120816 TR-SF A	8/16/12	0715	W	X	X		X
2 20120816 TR-SF B	8/16/12	0715	W	X	X		X
3 20120816 TR-SF C	8/16/12	0715	W	X	X		X
4 20120816 TR-89 A	8/16/12	0820	W	X	X		X
5							
6							
7							
8							
9							
10							

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: Yes No
Custody Seal Y N
Bottles/Coolers B C
Intact Y N
Signature Match Y N

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Torie Bunn	Date/Time: 8/17/12	Signature: T. Bu	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: X		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.

YSI Calibration & Care Instructions

(Adapted from a QAPP for the Gallatin Volunteer Monitoring Program written by Tammy Crone)

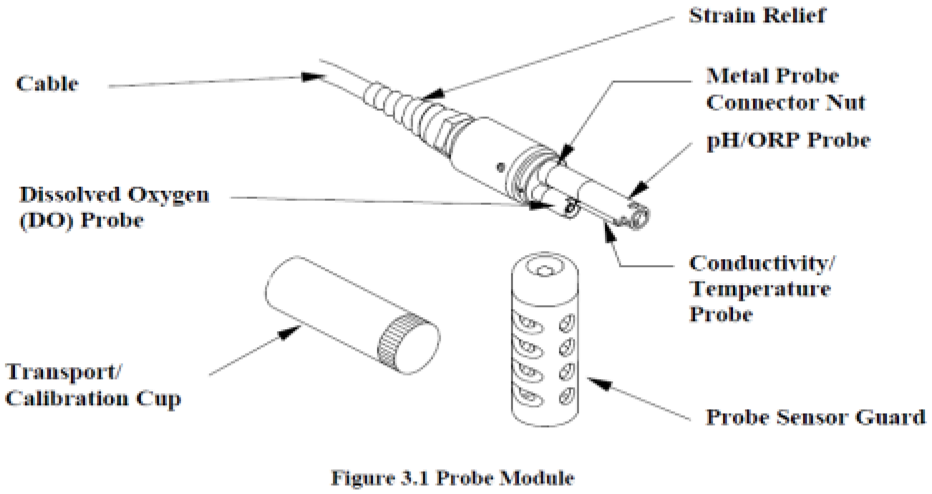


Figure 1: Probe Module from the YSI 556 Manual

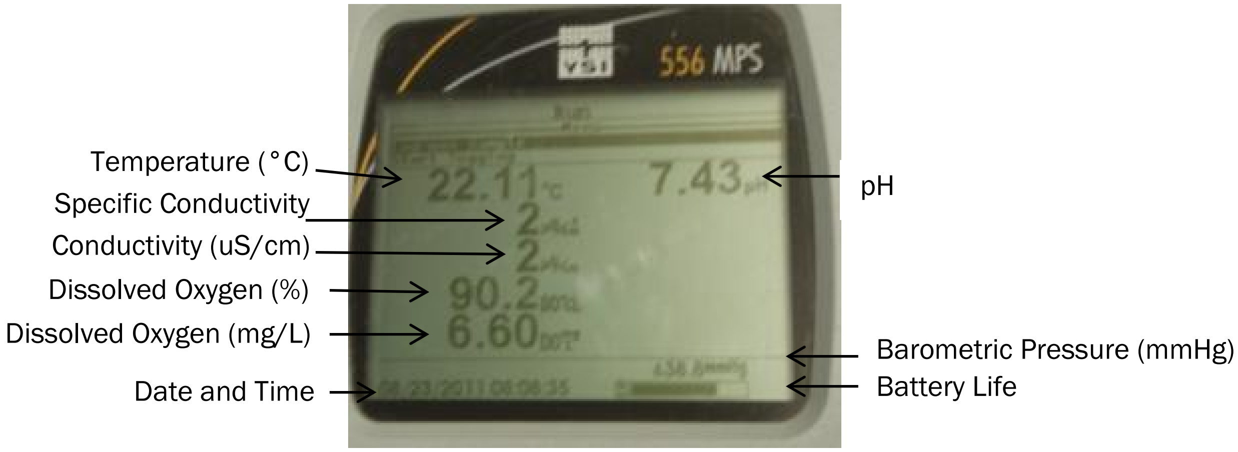


Figure 2: Screen Shot of YSI 556 Interface

YSI 556 CARE

- Before calibrating the YSI, check the condition of all of the probes
  - The pH glass bulb at the end of the probe should be clear. If it is starting to get cloudy or if you notice the pH taking a long time (> 5min) to calibrate then consider replacing the pH probe
  - Inspect the membrane on the dissolved oxygen probe. The membrane should be clear and not cloudy/dirty or scratched. There should not be bubbles under the membrane.
  - Check all probes to make sure they are free of sediment or buildup that may have accumulated since the last time it was used.

CALIBRATION TIPS & HINTS

- Calibration solutions should ideally be stored at room temperature and calibration should be performed at room temperature.
- The transport/calibration cup that comes with the probe serves as a calibration chamber for all calibrations and minimizes the volume of calibration solutions required.
- Ensure all sensors are immersed in the calibration solution. Many of the calibrations factor in readings from other sensors (e.g., temperature sensor). The top vent hole of the conductivity sensor must also be immersed during some calibrations.
- Make sure to loosen the seal of the transport/calibration cup prior to the DO calibration to allow pressure equilibration.
- For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe (Figure 1).
- Put some deionized (DI) water at ambient temperature to rinse the probe between calibration solutions.
- Have several clean, absorbent paper towels or Kim-wipes available to dry the probe between rinses and calibration solutions. Shake excess rinse water off the probe. Dry off the outside of the probe and sensor guard. (Making sure the probe module is dry reduces carry-over contamination of calibration solutions and increases the accuracy of the calibration.)

Figure 1. Bottles of solution for each calibration solution for rinsing.

PROBE INSPECTION

- Ensure the o-ring is installed in the o-ring groove of the transport/calibration cup and that the bottom cap is securely tightened. **NOTE:** Do not overtighten!
- Remove the probe sensor guard, if installed.
- Remove the o-ring, if installed, from the probe and inspect for defects. Replace with extra o-ring if defects found.

PROBE STORAGE

- Store the probe with about half an inch of tap water in the storage cup.

ACCESSING THE CALIBRATION SCREEN

1. Press the **On/Off** key to display the **Run** screen.
2. Press the **Escape** key to display the main menu screen (figure 2).

3. Use the arrow keys to highlight **Calibrate** (figure 3).
4. Press **Enter** key. **Calibrate** screen is displayed. Conductivity will automatically be highlighted on this screen.

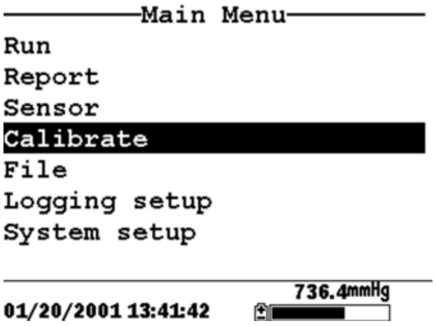


Figure 2. Main Menu Screen

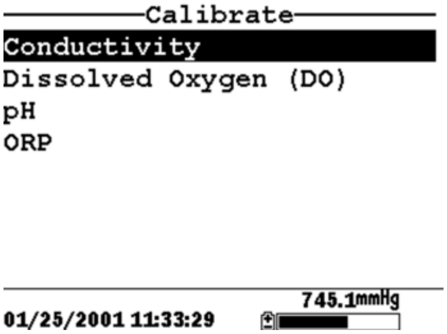


Figure 3. Calibrate Menu Screen

CONDUCTIVITY CALIBRATION

Picture 1

Picture 2

1. Go to **Calibrate screen** as described above.
2. Highlight **Conductivity** and press **Enter**. The Conductivity Calibration Screen is displayed.
3. **Specific Conductance** parameter will automatically be highlighted. Press **Enter.**
4. Remove the plastic **transport/calibration cup (Picture 1)**.
5. Pre-rinse the conductivity sensor with a little bit of the **1413 standard conductivity calibration solution** and discard into a waste jar.
6. Pour enough new **1413 standard** into the **transport/calibration cup** to entirely cover all 3 sensors including the vent hole on the conductivity sensor (~55ml) **(Picture 2, arrow)** and secure the cup to the probe. Tap the probe gently to remove air bubbles.
7. Use the keypad to enter the **calibration value** of the standard being used. The **1413 uS/cm Standard Solution** should be entered as**: 1.413** (the 1.413 value may automatically be displayed)
8. Press **Enter**. The **Cond Calibration Menu** Screen will be displayed.

Note: *the YSI is set-up for "temperature compensation". Always use the value for the calibration standard at **25°C**.*

9. Allow at least one minute for **instrument temperature** to stabilize. The current values of enabled sensors will appear on the screen and will change with time as they stabilize.

10. Observe the reading under **Specific Conductivity (uS/cm^C)**. When the reading shows no significant change for ~**30 seconds**, then record the **"Temp of Standard"** and record the **Specific Conductivity** (**uS/cm^C)** value on the calibration log sheet under **"Reading Before Cal"** then press **Enter** key.

If the meter displays a warning similar to "Value out of range, accept anyway?" Do **NOT** accept the value. Recalibrate and try again

11. Record the **"Set to" values** in the **YSI Calibration Log** (which should be 1413 uS/cm^C)
12. Remember to record the **"Expiration Date"** of the solution too
13. Press **Enter** key again, screen will indicate calibration has been accepted.
14. Record the new Specific Conductivity (uS/cmC) value under **"Reading After Cal"** on the calibration log sheet
15. Press **Enter** key again, to return to the **Conductivity Calibration Selection Screen**.
16. Press **Escape** to return to the **Calibrate Menu Screen**.
17. **Rinse** the probe and sensors with **DI water**

DISSOLVED OXYGEN CALIBRATION in % SATURATION

1. In the **Calibration Screen**, use the **arrow keys** to highlight **DO 2 mil PE (Blue)**.
2. Press **Enter** key. The **DO %** will automatically be highlighted.
3. Press Enter key again. The Enter Baro mmHG screen will be displayed. Enter the local barometric pressure, determined online or with the included benchtop barometer.
4. Record the **Barometric Pressure** on the calibration log sheet
5. Pour approximately 1/8 inch of water (Picture 3, arrow 2) in bottom of **transport/calibration cup**. *** Do Not** immerse any of the sensors in the water.
6. Screw the **transport/calibration cup** onto the probe using only 1 or 2 threads, so it is just hanging on (Picture 3, arrow 1).
7. Press **Enter** key. The **DOsat Calibration Menu Screen** will be displayed.
8. Allow 10 minutes for the **DO probe** to stabilize (and for the temperature to stabilize).

Picture 3

9. When the **DO %** reading is stable for 30 seconds, record the **DO%** and **DO mg/L** values in the calibration log.
10. Press **Enter** key to accept the reading.

If the meter displays a warning "Value out of range, accept anyway?" Do **NOT** accept the value, recalibrate and try again

11. **Record** the new **DO% and DO mg/L** values in the **YSI Calibration Log**
12. Press **Enter** key again. This returns you to the **DO Calibration Menu Screen**.
13. Press **Escape** key, to return to the **Calibrate Menu Screen**.

pH CALIBRATION

Picture 4

1. In the **Calibration Screen**, use the **arrow keys** to highlight **pH**.
2. Press **Enter** key. The pH Calibration Screen will be displayed.
3. Use **arrow keys** to highlight **2-point** option to calibrate the pH sensor.
4. Press the **Enter** key, the **pH Entry Screen** will be displayed.
5. **Enter value** of **pH standard** being used - **NOTE:** Always calibrate in **7 buffer** first.
7. **Rinse** the **pH sensor** with little bit of the **7.00 buffer** and discard.
8. **Pour ~35 ml 7.00 buffer** into the **transport/calibration cup (picture 4)** and secure the cup to the probe. Tap the probe gently to remove air bubbles.
9. Use the keypad to enter the **calibration value** of the **pH standard** being used.
10. Press **Enter**. The **pH Calibration Screen** will be displayed.
11. Allow **1 minute** for temperature to stabilize. **Observe pH reading**. If **no significant change** in **30 seconds**, record the current pH value under **"Reading Before Cal"** and the temperature of the standard under **"Temp of Standard"**
12. Press **Enter** key. The screen will indicate **calibration accepted.**

If the meter displays a warning similar to "Value out of range, accept anyway?" Do **NOT** accept the value. Recalibrate and try again

13. **Record** the **"Set to"** value on the **Calibration Log** and record the new pH reading under **"Reading After Cal"**
14. Pour used solution into a waste container and rinse the probes with DI water.
15. Press **Enter** key to return to **pH Calibration Screen**, continue with the **second point** of calibration for **pH 10.00** (**repeat steps 5-13).**
16. Press **Enter** to return to the **pH Calibration Screen**. Press **Escape** twice to return to the data logging menu.
17. **Rinse** the probe and sensors with **DI water.**

Appendix C: TRWG Site Visit Form

Teton River Watershed Group – Site Visit Form

Date: ______________ **Time:** ______________ **Site Name:** ____________________________ **Site ID:** _____________________

Team Members: ____

____

Latitude __ __.__ __ __ __ __ __ **Longitude** __ __ __.__ __ __ __ __ __ **GPS Verified?** **YES** **NO**

Site Visit Comments:

Staff Gauge Reading: _________________ **(if applicable)**

Location:

Current Weather (circle one)

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/cm^c) ______________

Conductivity (µS/cm) _____________

D.O. (%) ______________

D.O. (mg/L) ______________

Method: **YSI** **Other:** ______________________

Site Visit Photos:

jpeg # (on camera)	**Description (upstream, across/south, etc.)**

Water Chemistry Samples

Total # Grab Samples Collected: _________ (should match # checked boxes below)

SAMPLE ID: (YMD_SiteID_Sample Type Letter) ex: 20120815_TR-FB_A	**YELLOW CAP** (H_2SO_4): Nitrate Total P	**WHITE CAP** (no preserv.): Total N SSC
REG:	☐	☐
DUP:	☐	☐
BLNK:	☐	☐

Chemistry Sample Shipping Information:

Shipped by: __________________________________ Date/Time: _____________________

Shipping Method (circle one): FED EX UPS

Form reviewed by:

________________________________ __________________

Name Date

Appendix D: Glossary of QA/QC Terms

QA/QC Terms

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 two samples 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.

Equipment or rinsate blank. Used for quality control purposes, equipment or rinsate blanks are types of field blanks used to check specifically for carryover contamination from reuse of the same sampling equipment (see *field blank*).

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.

Sample 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.

Split sample. Used for quality control purposes, a split sample is one that has been equally divided into two or more subsamples. Splits are submitted to different analysts or laboratories and are used to measure the precision of the analytical methods.

Standard reference materials (SRM). An SRM is a certified material or substance with an established, known and accepted value for the analyte or property of interest. Employed in the determination of bias, SRMs are used as a gauge to correctly calibrate instruments or assess measurement methods. SRMs are produced by the U. S. National Institute of Standards and Technology (NIST) and characterized for absolute content independent of any analytical method.

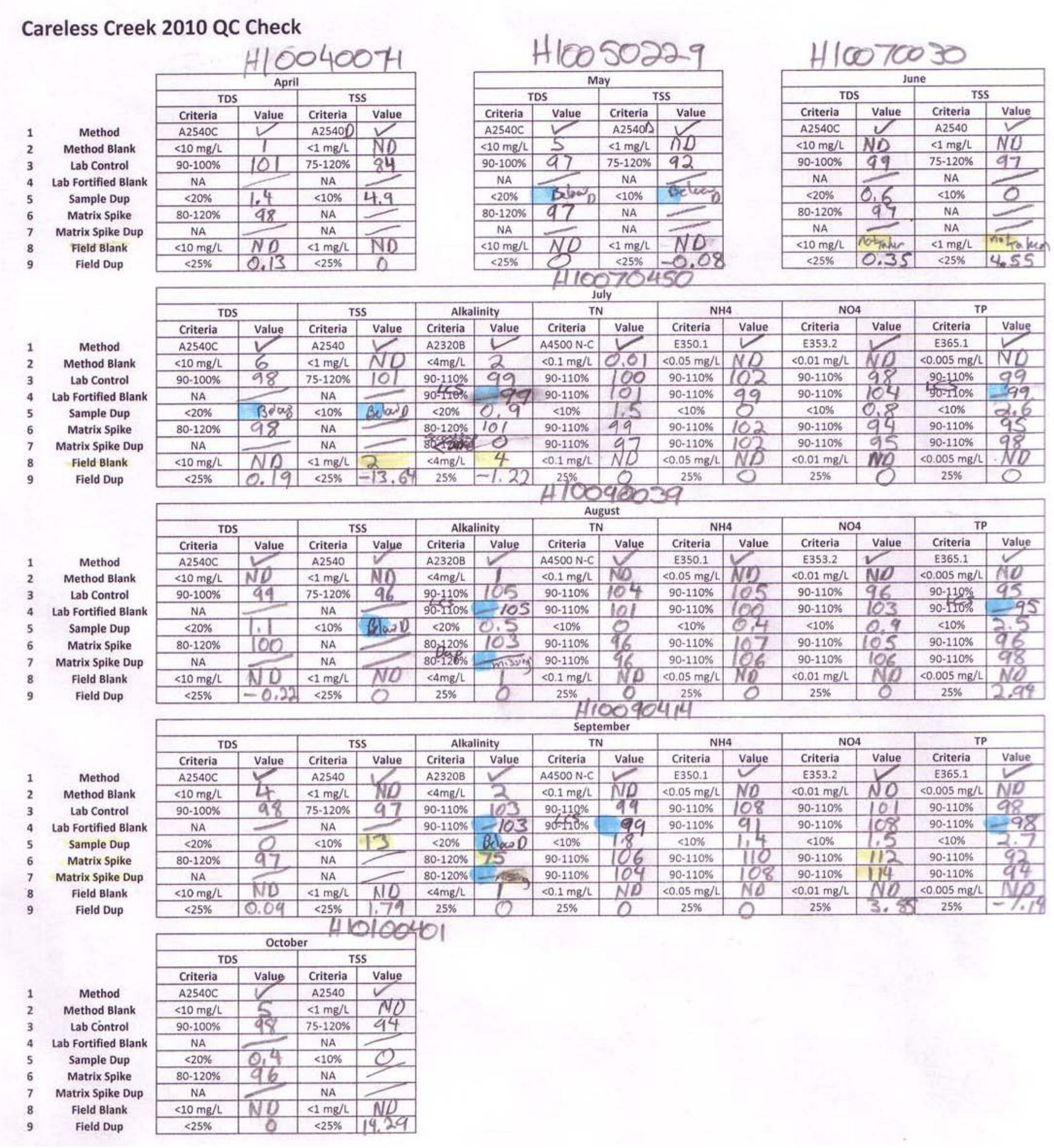
Standard operating procedures (SOPs). An SOP is a written document detailing the prescribed and established methods used for performing project operations, analyses, or actions.

True value. In the determination of accuracy, observed measurement values are often compared to true, or standard, values. A true value is one that has been sufficiently well established to be used for the calibration of instruments, evaluation of assessment methods or the assignment of values to materials.

Appendix E: QA/QC Matrix

Example QA/QC matrix

Below is an example of a matrix for use in addressing whether all data quality criteria are met for each analyte for each batch of samples. This table can be created using the thresholds from Tables 6 and 7 in this QAPP. QC numbers from the lab and calculated from the field are filled in, and compared to thresholds to perform QC checks.



Careless Creek 2010 QC Check

H10040071

April

		TDS		TSS	
		Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540D	✓
2	Method Blank	<10 mg/L	1	<1 mg/L	ND
3	Lab Control	90-100%	101	75-120%	84
4	Lab Fortified Blank	NA	—	NA	—
5	Sample Dup	<20%	1.4	<10%	4.9
6	Matrix Spike	80-120%	98	NA	—
7	Matrix Spike Dup	NA	—	NA	—
8	Field Blank	<10 mg/L	ND	<1 mg/L	ND
9	Field Dup	<25%	0.13	<25%	0

H10050229

May

		TDS		TSS	
		Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540D	✓
2	Method Blank	<10 mg/L	5	<1 mg/L	ND
3	Lab Control	90-100%	97	75-120%	92
4	Lab Fortified Blank	NA	—	NA	—
5	Sample Dup	<20%	Below D	<10%	Below D
6	Matrix Spike	80-120%	97	NA	—
7	Matrix Spike Dup	NA	—	NA	—
8	Field Blank	<10 mg/L	ND	<1 mg/L	ND
9	Field Dup	<25%	0	<25%	-0.08

H10070030

June

		TDS		TSS	
		Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540	✓
2	Method Blank	<10 mg/L	ND	<1 mg/L	ND
3	Lab Control	90-100%	99	75-120%	97
4	Lab Fortified Blank	NA	—	NA	—
5	Sample Dup	<20%	0.6	<10%	0
6	Matrix Spike	80-120%	99	NA	—
7	Matrix Spike Dup	NA	—	NA	—
8	Field Blank	<10 mg/L	Not taken	<1 mg/L	Not taken
9	Field Dup	<25%	0.35	<25%	4.55

H10070450

July

		TDS		TSS		Alkalinity		TN		NH4		NO4		TP	
		Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540	✓	A2320B	✓	A4500 N-C	✓	E350.1	✓	E353.2	✓	E365.1	✓
2	Method Blank	<10 mg/L	6	<1 mg/L	ND	<4mg/L	2	<0.1 mg/L	0.01	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
3	Lab Control	90-100%	98	75-120%	101	90-110%	99	90-110%	100	90-110%	102	90-110%	98	90-110%	99
4	Lab Fortified Blank	NA	—	NA	—	LCS 90-110%	99	90-110%	101	90-110%	99	90-110%	104	LCS 90-110%	99
5	Sample Dup	<20%	Below	<10%	Below D	<20%	0.9	<10%	1.5	<10%	0	<10%	0.8	<10%	2.6
6	Matrix Spike	80-120%	98	NA	—	80-120%	101	90-110%	99	90-110%	102	90-110%	94	90-110%	95
7	Matrix Spike Dup	NA	—	NA	—	80-120%	0	90-110%	97	90-110%	102	90-110%	95	90-110%	98
8	Field Blank	<10 mg/L	ND	<1 mg/L	2	<4mg/L	4	<0.1 mg/L	ND	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
9	Field Dup	<25%	0.19	<25%	-13.64	25%	-1.22	25%	0	25%	0	25%	0	25%	0

H10080039

August

		TDS		TSS		Alkalinity		TN		NH4		NO4		TP	
		Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540	✓	A2320B	✓	A4500 N-C	✓	E350.1	✓	E353.2	✓	E365.1	✓
2	Method Blank	<10 mg/L	ND	<1 mg/L	ND	<4mg/L	1	<0.1 mg/L	ND	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
3	Lab Control	90-100%	99	75-120%	96	90-110%	105	90-110%	104	90-110%	105	90-110%	96	90-110%	95
4	Lab Fortified Blank	NA	—	NA	—	LCS 90-110%	105	90-110%	101	90-110%	100	90-110%	103	LCS 90-110%	95
5	Sample Dup	<20%	1.1	<10%	Below D	<20%	0.5	<10%	0	<10%	0.4	<10%	0.9	<10%	2.5
6	Matrix Spike	80-120%	100	NA	—	80-120%	103	90-110%	96	90-110%	107	90-110%	105	90-110%	96
7	Matrix Spike Dup	NA	—	NA	—	Dup 80-120%	missing	90-110%	96	90-110%	106	90-110%	106	90-110%	98
8	Field Blank	<10 mg/L	ND	<1 mg/L	ND	<4mg/L	1	<0.1 mg/L	ND	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
9	Field Dup	<25%	-0.22	<25%	0	25%	0	25%	0	25%	0	25%	0	25%	2.94

H10090414

September

		TDS		TSS		Alkalinity		TN		NH4		NO4		TP	
		Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540	✓	A2320B	✓	A4500 N-C	✓	E350.1	✓	E353.2	✓	E365.1	✓
2	Method Blank	<10 mg/L	4	<1 mg/L	ND	<4mg/L	2	<0.1 mg/L	ND	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
3	Lab Control	90-100%	98	75-120%	97	90-110%	103	90-110%	99	90-110%	108	90-110%	101	90-110%	98
4	Lab Fortified Blank	NA	—	NA	—	90-110%	103	LCS 90-110%	99	90-110%	91	90-110%	108	90-110%	98
5	Sample Dup	<20%	0	<10%	13	<20%	Below D	<10%	1.8	<10%	1.4	<10%	1.5	<10%	2.7
6	Matrix Spike	80-120%	97	NA	—	80-120%	75	90-110%	106	90-110%	110	90-110%	112	90-110%	92
7	Matrix Spike Dup	NA	—	NA	—	80-120%	missing	90-110%	104	90-110%	108	90-110%	114	90-110%	94
8	Field Blank	<10 mg/L	ND	<1 mg/L	ND	<4mg/L	1	<0.1 mg/L	ND	<0.05 mg/L	ND	<0.01 mg/L	ND	<0.005 mg/L	ND
9	Field Dup	<25%	0.09	<25%	1.79	25%	0	25%	0	25%	0	25%	3.88	25%	-1.19

H10100401

October

		TDS		TSS	
		Criteria	Value	Criteria	Value
1	Method	A2540C	✓	A2540	✓
2	Method Blank	<10 mg/L	5	<1 mg/L	ND
3	Lab Control	90-100%	98	75-120%	94
4	Lab Fortified Blank	NA	—	NA	—
5	Sample Dup	<20%	0.4	<10%	0
6	Matrix Spike	80-120%	96	NA	—
7	Matrix Spike Dup	NA	—	NA	—
8	Field Blank	<10 mg/L	ND	<1 mg/L	ND
9	Field Dup	<25%	0	<25%	14.29

Appendix F: Data Qualifiers and Descriptions

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.

Appendix G: Quality Control Checklist

QC Checklist

___Condition of samples upon receipt
___Cooler/sample temperature
___Proper collection containers
___All containers intact
___Sample pH of acidified samples <2
___All field documentation was complete. If incomplete areas cannot be completed, document the issue.
___Holding times met
___Field duplicates collected at the proper frequency (specified in QAPP)
___Field blanks collected at the proper frequency (specified in QAPP)
___All sample IDs match those provided in the QAPP. Field duplicates are clearly marked on samples and noted as such in lab results.
___Analyses carried out as described within the QAPP (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
___Laboratory blanks/duplicates/matrix spikes/lab control samples were analyzed at a minimum 10% frequency
___Laboratory blanks/duplicates/matrix spikes/lab control samples were all within the required control limits defined within the QAPP
___Project DQOs and DQIs were met (as described in QAPP)
___Summary of results of QC analysis, issues encountered, and how issues were addressed (corrective action)
___Completed QC checklist before upload to website

Appendix H: Obtaining TRWG Discharge Data

Instructions for Obtaining TRWG Discharge Data

TRWG Site Name: Teton River below South Fork
Site ID: TR-SF
Discharge Data Source: USGS National Water Information System website

Notes: The USGS gauge number for this site is “USGS 06102500”. To query data for this site, you need to go to http://waterdata.usgs.gov and select [Surface Water], [Daily Data], then check the “Site Number” box and select [Submit]. From here, type “06102500” in the “Site Number” section, choose “Streamflow, ft^3/s” in the “Water Level/Flow Parameters” section, enter the “First date” and “Last date” that correspond with the dates of your data interest in the “Retrieve Data for:” section, and choose “Tab-separated data” in the “Output Options:” section. You can choose to “save to file” or “display in browser”, either of which can then be copied and pasted into SRWG’s appendable Excel spreadsheets.

TRWG Site Name: Teton River above Choteau
Site ID: TR-BV
Discharge Data Source: TRWG volunteer staff gauge readings

Notes: This data should accompany TRWG Site Visit forms, and will need to be manually added into TRWG’s appendable Excel spreadsheets.

TRWG Site Name: Teton River below Choteau
Site ID: TR-221
Discharge Data Source: TRWG volunteer staff gauge readings, DNRC TruTrack

Notes: Staff gauge data should accompany TRWG Site Visit forms, and will need to be manually added into TRWG’s appendable Excel spreadsheets. DNRC TruTrack data will need to be requested from DNRC (Aaron Fiaschetti, afiaschette@mt.gov) and copied and pasted into SRWG’s appendable Excel spreadsheets or entered manually, depending of format.

TRWG Site Name: Teton River near Dutton
Site ID: TR-DT
Discharge Data Source: USGS National Water Information System website

Notes: The USGS gauge number for this site is “USGS 06108000”. To query data for this site, you need to go to http://waterdata.usgs.gov and select [Surface Water], [Daily Data], then check the “Site Number” box and select [Submit]. From here, type “06108000” in the “Site Number” section, choose “Streamflow, ft^3/s” in the “Water Level/Flow Parameters” section, enter the “First date” and “Last date” that correspond with the dates of your data interest in the “Retrieve Data for:” section, and choose “Tab-separated data” in the “Output Options:” section. You can choose to “save to file” or “display in browser”, either of which can then be copied and pasted into SRWG’s appendable Excel spreadsheets.

TRWG Site Name: Teton River near Fort Benton
Site ID: TR-FB
Discharge Data Source: USGS National Water Information System website

Notes: The USGS gauge number for this site is "USGS 06108800". To query data for this site, you need to go to http://waterdata.usgs.gov and select [Surface Water], [Daily Data], then check the "Site Number" box and select [Submit]. From here, type "06108800" in the "Site Number" section, choose "Streamflow, ft^3/s" in the "Water Level/Flow Parameters" section, enter the "First date" and "Last date" that correspond with the dates of your data interest in the "Retrieve Data for:" section, and choose "Tab-separated data" in the "Output Options:" section. You can choose to "save to file" or "display in browser", either of which can then be copied and pasted into SRWG's appendable Excel spreadsheets.

TRWG POTENTIAL/FUTURE SITES: Deep Creek at Hwy. 287 and Teton River at Hwy. 89
Site ID: DC-287, TR-89
Discharge Data Source: TRWG volunteer staff gauge readings, possible supplemental data from DNRC

Notes: Staff gauge data should accompany TRWG Site Visit forms, and will need to be manually added into TRWG's appendable Excel spreadsheets. DNRC TruTrack data will need to be requested from DNRC (Aaron Fiaschetti, afiaschette@mt.gov) and copied and pasted into SRWG's appendable Excel spreadsheets or entered manually, depending of format.