

SOUTH DAKOTA NONPOINT SOURCE PROGRAM QUALITY ASSURANCE PROJECT PLAN (QAPP)

**For
Assessment and Implementation Teams**



Revision VII

April 2022

**South Dakota
Department of Agriculture and Natural Resources
Division of Resource Conservation and Forestry
Watershed Protection Program
Pierre, South Dakota**

A1 Title and Approval

**SOUTH DAKOTA NONPOINT SOURCE PROGRAM
QUALITY ASSURANCE PROJECT PLAN**

SUBMITTED BY:




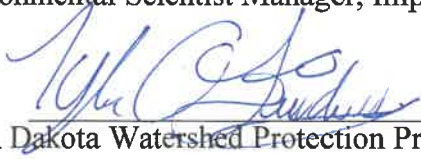

**SOUTH DAKOTA DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
DIVISION OF RESOURCE CONSERVATION AND FORESTRY
WATERSHED PROTECTION PROGRAM**

Revision VII

Prepared by: Tyler Frideres

April 2022

APPROVED BY:

 _____ South Dakota Watershed Protection Program Administrator	Date	<u>5-24-2022</u>
 _____ South Dakota Watershed Protection Program Environmental Scientist Manager, Assessment Team	Date	<u>5-24-2022</u>
 _____ South Dakota Watershed Protection Program Environmental Scientist Manager, Implementation Team	Date	<u>5-24-2022</u>
 _____ South Dakota Watershed Protection Program Quality Assurance Officer	Date	<u>5-24-22</u>
 _____ South Dakota DANR Quality Assurance Officer Quality Assurance Officer	Date	<u>5-27-22</u>

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A3 Distribution List

The current version of the Quality Assurance Project Plan (QAPP) will be posted on the [DANR website](#). It will also be saved under the file pathway; N:/WATRSLED/QAQC – SOP/QAPP.

Name	Title
Bill Smith	Division Director
Barry McLaury	Administrator Watershed Protection Program, Manager II
Paul Lorenzen	Team Leader/Environmental Scientist Manager I Assessment Team
Kris Dozark	Team Leader/Environmental Scientist Manager I Implementation Team

All personnel involved with the assessment and implementation of sampling activities for the South Dakota Department of Agriculture and Natural Resources, Watershed Protection Program (SD DANR WPP) shall receive a copy of this plan and therefore should be thoroughly familiar with WPP sampling policies, management structure, and procedures. Compliance with QAPP elements results in data collection and management that is valid and suitable for use in implementation, water quality, (TMDL) Total Maximum Daily Load assessments projects, other programs, and projects.

A4 Project/Task Organization

The Quality Assurance Officer (QAO) is responsible for training all personnel working on the project on appropriate quality assurance and sampling procedures. In addition, the QAO supervises and evaluates the quality assurance activities of all project personnel. The Quality Assurance Officer evaluates quality assurance of data continuously and reports on all quality assurance activities to the Assessment Team Leader in Pierre, SD.

The QAO or the Project Officer will develop a quality control chart for the project data which summarizes the stations, parameters analyzed, analytical methods, appropriate reporting units, precision, accuracy, and completeness. These elements will be summarized in the quality assurance/quality control (QA/QC) section of each project's final report.

All personnel working on the project must be trained to use appropriate quality assurance protocols and it is the responsibility of all project personnel to observe all quality assurance activities stipulated by the Project Officer (i.e., instrument calibration, logbook, etc.).

Project personnel must review the Quality Assurance Project Plan, [Volume I](#) and [Volume II](#) of the Standard Operating Procedures, and the project-specific sampling and analysis plan.

The QAO can conduct announced and unannounced audits of all project quality assurance activities. Based on these audits, the Quality Assurance Officer can mandate corrective actions and develop corrective action plans.

The project-specific sampling and analysis plan describes the specific responsibilities of individuals and organizations involved with the project via a flow chart summarizing these responsibilities (Figure 1).

SD DANR WPP staff members work to accomplish the goals of the program. Some, or all of the staff will be involved in the administration, management, and field activities of each project. WPP staff

responsibilities are shown in Table 1. Water quality and biological assessment samples collected by local coordinators, SD DANR WPP assessment and implementation teams, and at times private contractors will follow SD DANR WPP -Standard Operating Procedures (SOPs).

SD DANR WPP personnel and local coordinators record visual observations and perform limited field analysis of parameters including dissolved oxygen, flow, turbidity, chlorophyll-*a*, pH, specific conductance, and temperature. All other analyses are performed by outside laboratories. Currently, the SD DANR WPP utilizes five laboratories: the South Dakota Department of Health Public Health Laboratory, Mid Continent Testing Laboratories, Environmental Protection Agency Region 8 Lab, Midwest Laboratories in Omaha Nebraska and, Rhithron Associates, Inc. (Tables 2-6).

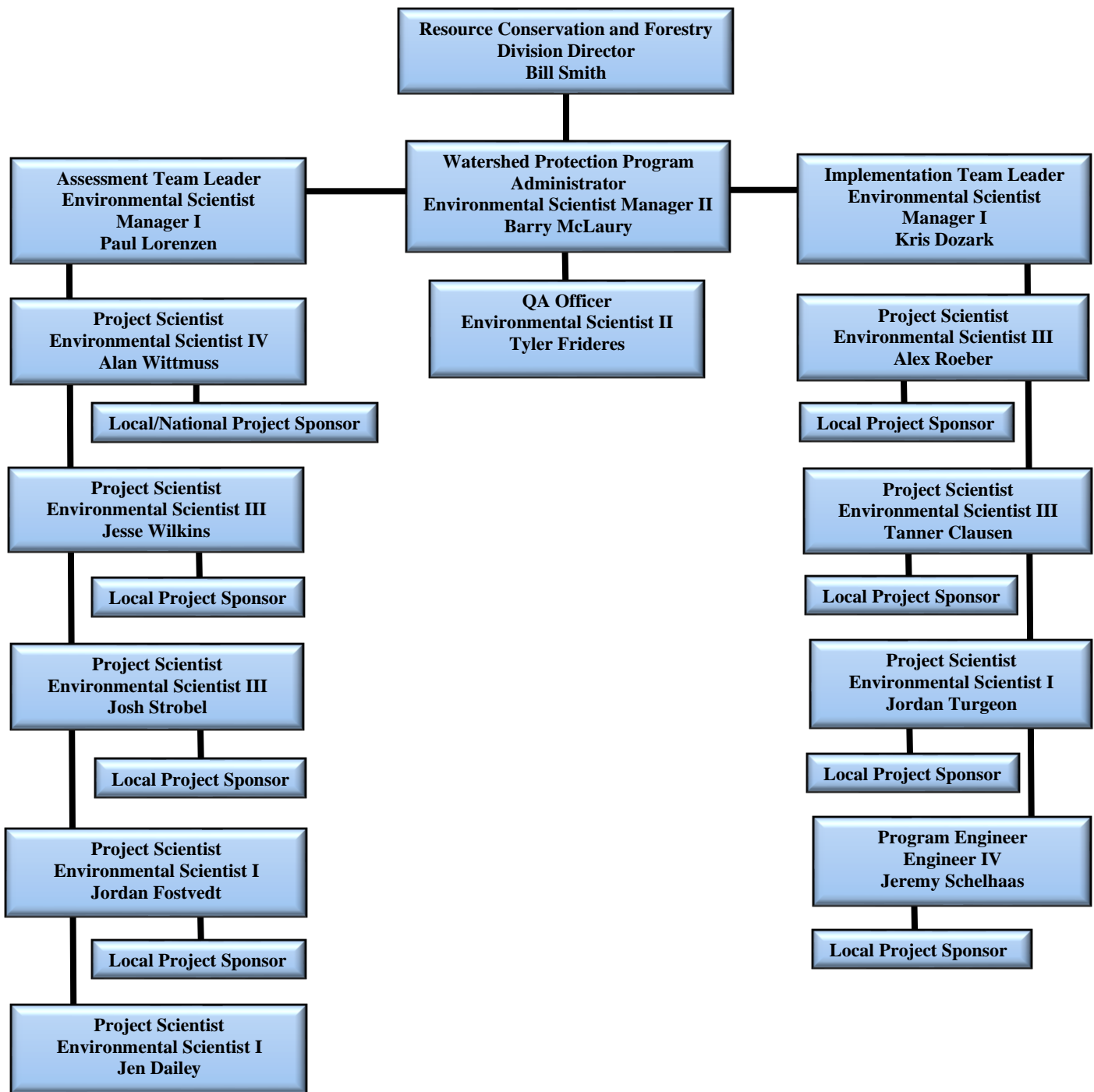


Figure 1. SD DANR Watershed Program Organizational Chart 2022.

Table 1. Watershed Protection Program tasks and responsibilities.

Resource Conservation and Forestry	
Name: Title: Organization: Responsibilities:	Bill Smith Division of Resource Conservation and Forestry Director SD DANR – FTA – Pierre Main Office <ul style="list-style-type: none"> • Supervision, planning, oversight, and setting priorities for WPP.
Watershed Protection Program	
Name: Title: Supervisor: Organization: Responsibilities:	Barry McLaury Watershed Protection Program Administrator (Manager II) Bill Smith SD DANR – WPP Watershed Protection Program – Pierre Main Office <ul style="list-style-type: none"> • Supervise WPP Assessment and Implementation Team Leaders • Coordinate NSP Activities • WPP Admin, Staffing, and Budget • Admin 319,106, 604(b) Grant and Budget • Policy and Programs for NSP Mgt • Decisions on NSP Direction • Vouchers and Expenditure Approvals • NWQI • Liaison to State Conservation Groups/Region 8 EPA • Admin Rules • Track Federal Allocations/Grant Process • Quarterly and Annual Employee Reviews

Watershed Protection Program – Implementation	
Name: Title: Supervisor: Organization: Responsibilities:	Kris Dozark 319 Nonpoint Source Program Manager Barry McLaury SD DANR – Watershed Protection Program – Pierre Main Office <ul style="list-style-type: none"> • Section 319 Program Supervisor • Section 319 Grant Manger • SHPO • Watershed Protection Final Reports • Agreements/Sub-contracts • MBE/WBE • NWQI • Environmental Justice Officer • Quarterly and Annual Employee Reviews

<p>Name: Title: Team Leader: Organization:</p> <p>Responsibilities:</p>	<p>Jeremy Schelhaas Environmental Scientist IV Kris Dozark SD DANR – Watershed Protection Program- Sioux Falls Regional Office</p> <ul style="list-style-type: none"> • 319 Implementation • NE Glacial Lakes Project • Stream Flow/Gage Coordination • Big Sioux Flows • Rating Curve Development • Tracker Database • Kister’s Database Manager • Upper Big Sioux Project • Big Sioux Project • Surveying • Regional Response
<p>Name: Title: Team Leader: Organization:</p> <p>Responsibilities:</p>	<p>Tanner Clausen Environmental Scientist III Kris Dozark SD DANR – Watershed Protection Program- Sioux Falls Regional Office</p> <ul style="list-style-type: none"> ▪ 319 Implementation ▪ RBI Project Coordinator ▪ South Central 319 Implementation Project ▪ Soil Health ▪ Flow Gauges ▪ Field Work ▪ Tracker Database Assistant ▪ GRTS ▪ Regional Response

Name: Title: Team Leader: Organization: Responsibilities:	Jordan Turgeon Environmental Scientist I Kris Dozark SD DANR – Watershed Projection Program <ul style="list-style-type: none"> • 319 Implementation • Conservation Commission • Field Work • Flow Gauges • Chlorophyll-<i>a</i> Analysis • Equipment Management • I&E Project
Name: Title: Team Leader: Organization: Responsibilities:	Alex Roeber Environmental Scientist III Kris Dozark SD DANR – Watershed Protection Program – Pierre Office <ul style="list-style-type: none"> • 319 Implementation • Belle Fourche Project • TMDL Development • Field Work • Conservation Commission Work
Watershed Protection Program tasks and responsibilities. Watershed Protection Program – Assessment Team	
Name: Title: Supervisor: Organization: Responsibilities:	Paul Lorenzen TMDL Assessment Program Manager Barry McLaury SD DANR – WPP Watershed Protection Program – Pierre Main Office <ul style="list-style-type: none"> • Assessment Team Leader • 106 Grant Manager • TMDL Reviewer • TMDL Vision Strategy • Agreements/Sub-Contracts • 106 Grant/Budget Finances • Monitoring Strategy • Quarterly and Annual Employee Reviews

<p>Name: Title: Team Leader: Organization:</p> <p>Responsibilities:</p>	<p>Alan Wittmuss Environmental Scientist IV Paul Lorenzen SD DANR – WPP Watershed Protection Program – Vermillion Regional Office</p> <ul style="list-style-type: none"> • TMDL development and oversight • NRSA/NLA Program Management • NLA Crew Lead • Field Work • Rotating Basin Project • Reference Site Development Project • State Intensification Survey • Regional Response
<p>Name: Title: Team Leader: Organization:</p> <p>Responsibilities:</p>	<p>Tyler Frideres Environmental Scientist II Paul Lorenzen SD DANR Watershed Protection Program – Pierre Office</p> <ul style="list-style-type: none"> • TMDL Development • Field Work • Flow Gauges • QAQC Officer • NLA Crew Lead • WPP QAQC Report • QA Audits
<p>Name: Title: Team Leader: Organization:</p> <p>Responsibilities:</p>	<p>Jesse Wilkens Environmental Scientist III Paul Lorenzen SD DANR Watershed Protection Program – Rapid City Regional Office</p> <ul style="list-style-type: none"> • TMDL Development • Field Work • NLA Crew Lead • Rotating Basin West • Topeka Shiner • Website Manager • SWLA Coordinator • Volunteer Monitoring Project • WQ Map Manager • Regional Response

Name: Title: Team Leader: Organization: Responsibilities:	Josh Strobel Environmental Scientist III Paul Lorenzen SD DANR Watershed Protection Program – Pierre Office <ul style="list-style-type: none"> • TMDL Development • Chlorophyll-<i>a</i> Analysis/Database Management • HAB’s Coordinator • Integrated Report • Field Work • JRWDD Stream Sampling Project • Rotating Basin Project Manager
Name: Title: Team Leader: Organization: Responsibilities:	Jen Dailey Environmental Scientist I Paul Lorenzen SD DANR Watershed Protection Program – Pierre Office <ul style="list-style-type: none"> • Water Quality WISKI/NR92 Database Manager • TMDL Development • Rotating Basin Final Reports • Chlorophyll-<i>a</i> Analysis/Database Management • Field Work
Name: Title: Team Leader: Organization: Responsibilities:	Jordan Fostvedt Environmental Scientist I Paul Lorenzen SD DANR Watershed Protection Program—Rapid City Regional Office <ul style="list-style-type: none"> • TMDL Development • Rotating Basin West • Field Work • Website and Database Assistant • Regional Response

Table 2. South Dakota Department of Health Laboratory

Name: Title: Organization: Responsibilities:	Stacy Ellwanger Environmental Supervisor SD DOH – Environmental Team <ul style="list-style-type: none"> ▪ Implement, update, and monitor laboratory QA/QC ▪ Review laboratory reports ▪ Supervise laboratory personnel
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Table 3. Mid Continent Testing Laboratories

Name:	Dean Aurand
Title:	Laboratory President
Organization:	Mid Continent Testing Laboratories
Responsibilities:	<ul style="list-style-type: none"> ▪ Implement, update, and monitor laboratory QA/QC ▪ Review laboratory reports ▪ Supervise laboratory personnel

Table 4. EPA Region 8 Lab

Name:	Marcie Tidd
Title:	Laboratory Manager
Organization:	EPA Region 8 Laboratories
Responsibilities:	<ul style="list-style-type: none"> ▪ Implement, update, and monitor laboratory QA/QC ▪ Review laboratory reports ▪ Supervise laboratory personnel

Table 5. Midwest Laboratories

Name:	Kerri Stanek
Title:	Account Manager
Organization:	Midwest Testing Laboratories
Responsibilities:	<ul style="list-style-type: none"> ▪ Implement, update, and monitor laboratory QA/QC ▪ Review laboratory reports ▪ Supervise laboratory personnel

Table 6. Rhithron Associates, Inc.

Name:	Wease Bollman
Title:	Laboratory Manager/Owner
Organization:	Rhithron Associates, Inc.
Responsibilities:	<ul style="list-style-type: none"> ▪ Supervise and coordinate biological laboratory workloads and tasks ▪ Coordinate marketing ▪ Implement, update, and monitor laboratory QA/QC ▪ Generate and review laboratory reports ▪ Supervise laboratory personnel

QAPP Maintenance/Revisions

The SD DANR WPP Quality Assurance Officer (SD DANR WPP-QAO) is responsible for maintaining, reviewing, and updating this SD DANR WPP QAPP. This Quality Assurance Project Plan is reviewed annually; however, updated revisions of the plan are only required when there are significant changes to program or teamwork procedures and/or goals. The exception shall be sections A3 Distribution List and A4 Project Task/Organization. These sections specifically identify staff involved in data collection and data entry. Revisions to the QAPP are not required in the event of personnel or contractor changes; an addendum will be attached to reflect personnel changes.

A5 Problem Definition/Background

A narrative of the problem definition must be included in the Project Implementation Plan (PIP) and any monitoring and assessment strategies. The definition should contain information from a previously concluded assessment. If no assessment is conducted, background or historical information must be approved by the Watershed Protection Program staff. Additionally, regulatory information needs to be identified for the project, criteria thresholds, and action limits if applicable.

A6 Project/Task Description

An organized outline containing a project objective and task description should be included as required by the PIP, monitoring plan, or assessment strategy. A short narrative of each task should include the scope of the work, the cost of the work, and the responsible party. The format for this section can be found in the [PIP Guidance Document](#).

A7 Quality Objectives and Criteria

The objective of the SD DANR WPP quality assurance program is to conduct sufficient activities to assure complete, accurate, representative, and comparable data. These activities are a combination of field and laboratory procedures that, when performed, will provide measurements that are of known quality, technically sound, statistically accurate, properly documented, and representative of the media being measured. This QA plan addresses the quality control procedures that will be applied to every aspect of SD DANR WPP work assignments. This includes:

Completeness

A measure of the amount of valid data obtained from measurement systems compared to the amount that is expected to be obtained under optimum conditions. So that a set of data can be utilized with confidence to assess a lake, stream, or waterbody, the data must be complete, i.e., there must be enough valid data from analysis to facilitate making the assessment. The total number of samples to be collected during the project is outlined in the PIP document. As the project continues the Local Coordinator will contact the Project Officer if significant deviations from these numbers are occurring and the Project Officer will adjust the sampling plan (corrective actions) to ensure there is enough data for analysis and assessment in order to reach a valid and defensible conclusion. Ideally, 100 percent of the data should be available. However, the possibility of data becoming unavailable due to laboratory, sampling, or other

types of errors may be expected. Also, unexpected situations may arise where field conditions (drought, floods, etc.) do not allow for 100 percent data completeness. Therefore, 90 percent data completeness is required by the WPP. If less than 90 percent data completeness is obtained, the Project Officer will decide if the information is usable. Corrective actions may be issued as appropriate.

Representativeness

Expresses the degree to which data accurately and precisely represents the characteristics of that which is being measured, for example, population, parameter variations of a sampling point, a process condition, or an environmental condition. All samples will be collected in such a manner and at such sites to be representative of the medium from which they are taken.

The representativeness of the data is mainly dependent on the sampling locations and sampling procedures adequately representing the true condition of the sample site. Sample site location, sampling of relevant media (water, sediment, and biota), and use of only approved/documented analytical methods will determine that the measurement data does represent the conditions at the investigation site, to the best extent possible. The goal for meeting the total representation of the site will be tempered by the types and number of potential sampling points and media as well as the potential funding required for meeting complete representativeness. Sampling schedules will be designed with respect to frequency, locations, and methodology to maximize representativeness, where possible and applicable.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be measured and assessed through the use of standard, published sampling and analytical data. The comparability of data is achieved by the commitment of SD DANR WPP staff, Local Coordinators, and contracted laboratories to use standardized methods, where possible, including [SD DANR WPP-SOPs](#), EPA-approved analytical methods, standard methods, or documented modifications thereof which provide equal or better results. Measurements are made according to standard procedure, or documented modifications, using units that are comparable within samples and comparable to South Dakota Surface Water

Quality Standards Chapter 74:51:01 or EPA standards as applicable. All analytical results will be reported with concentration values and units to facilitate comparison.

The QA objectives for each laboratory are addressed in their respective laboratory QA manuals.

Bias

Bias is a systematic or persistent distortion of a measurement process that causes errors in one direction. Bias is acknowledged and corrected by field samplers when using calibration standards re-measured over time. Field meters equipment shall be re-calibrated if the re-measured reading varies one percent from the reference standard. All calibrations and calibration checks will be recorded on that specific day's original calibration sheet and noted in the project notebook and reviewed by Project Officer and SD DANR WPP QAO.

Precision

The precision and accuracy of data are determined by particular actions of the analytical laboratory and field staff. The precision of data is a measure of the reproducibility of the measurement when an analysis is repeated. It is reported in Relative Percent Difference (RPD) or Relative Standard Deviation (RSD). The accuracy of an analysis is a measure of how much of the constituent actually present is determined. It is measured, where applicable, by adding a

known amount of the constituent to a portion of the sample and determining how much of this spike is then measured and reported as Percent Recovery.

Accuracy

Accuracy may also be measured by analyzing reference material. The acceptable percent deviations and the acceptable percent recoveries are dependent on many factors including the analytical method used, the laboratory used, the media of sample, and the constituent being measured.

Please refer to Sections 7.0 and 8.0 of the [SD DANR WPP-SOP Volume I](#) for measurements of precision and accuracy and specific procedures for corrective actions.

A8 Special Training/Certification

Any special training requirements needed for the completion of a project will be written in the PIP, monitoring strategy, and assessment strategy. The cost for the training will be budgeted in the PIP and parties required to take the special training will be identified. It will be the duty of the individual Project Officers to assure the training is completed or certification is met. All certifications will be discussed with the Quality Assurance Officer.

Documentation of the training and certification will be recorded in the GRTS semi-annual and annual reports to EPA and also in the final document.

In addition to in-field training and certification/documentation of such training, field samplers are evaluated on their field performance during field QA audits conducted by the SD DANR WPP QAO or Project Officers. The SD DANR WPP Field Samplers Audit Form is provided in Appendix A and must be filled out when the QAO or the Project Officer audits field personnel. If any deficiencies are noted during the audit, they will be documented and remedied prior to further field sampling. Verification of correction of any deficiencies must be documented in writing on the Field Samplers Audit Form prior to the continuation of further sample collection activities. Documentation will be kept in the project file and copies will be scanned and sent to the SD DANR WPP QAO for submittal with the annual QA/QC report and will also be made available upon request.

A9 Documentation and Records

Documentation and record collection are an integral part of maintaining proper QA protocols. The local sampler will keep an accurate field log of all occurrences in the watershed. The field log will be handed over to the Project Officer after the completion of the project. The type of information which should be entered into the field log can be found in the [SD DANR WPP-SOPs](#). The information in the field log will help the Project Officer conclude on what may have been happening in the watershed that may affect water quality.

Prior to project start-up, the Project Officer will enter project-specific sampling sites into the GIS Stations Loc geo-database and SD DANR project database for pre-printing project-specific water quality datasheets to be used during the project. Water quality data will be sent directly from the laboratory to the Local Coordinator and Project Officer with the Project Officer receiving an electronic copy of the data in a format acceptable to the SD DANR WPP QAO. If necessary, the Local Coordinator will enter data into a project-specific spreadsheet file. All the data will be entered into a standardized file format which will be provided to the Project Officers by the Database Coordinator. After a project is completed and the Project Officer is certain of the accuracy of the information, the project file will be uploaded to South Dakota's NR92 and

[EPAs Water Quality Portal](#) databases.

All information in the database will be considered public information and released upon request. Read-only access will be available to all staff members. Full access will be available only to the SD DANR WPP QAO, Database Coordinator, and the Assessment Team Leader.

After the project, all project data, reports including the PIP, documentation, and records will be handed over to the Project Officer and stored for three years. After three years project files will be boxed and archived at a central location for five years. Archived materials will be returned to the Project Officer for final disposition and destroyed. Electronic copies of the final reports are kept on CD by SD DANR indefinitely and copies are available on the [South Dakota website](#).

According to SDCL 14-1A-1, State publications must be submitted to the South Dakota State Library for dissemination to other state entities providing public access to the documents. The Team Leaders or their designees are responsible for submitting the project's final reports to the State Library.

B1 Sampling Process Design (Experimental Design)

A detailed description of the sampling design will be mentioned in each PIP, monitoring strategy, or assessment strategy. The design of each sampling plan will refer to the following criteria:

- 1) The narrative will explain what specific goals will be met by the samples collected (nutrient loads, documentation of water quality improvements, or any other specific goals);
- 2) Narrative will state how water quality data and field data will be used to conclude;
- 3) Maps and figures of the sampling site locations will be provided along with longitudes and latitudes of proposed sites; and
- 4) Water quality parameters to be analyzed will be listed in the PIP, monitoring strategy, or assessment strategy.

B2 Sampling Methods

The sampling methods used on any specific project will follow the [SD DANR WPP-SOPs](#). Any diversion from the SD DANR WPP-SOPs sampling procedures must be written in the PIP for each altered task. At a minimum the following categories of information will be addressed:

- 1) Description of sampling procedures or references to specific SD DANR WPP-SOPs;
- 2) Description of sample containers, reagents, preservation, holding times, transport, and storage;
- 3) All procedures for preparation and use of sampling equipment to avoid sample contamination; and

- 4) Description of field data collected at the time of sample collection.

Key aspects of quality control associated with sample collection for chemical or biological analyses are as follows:

- 1) Field personnel will be thoroughly trained in the proper use of sample collection gear and will be able to distinguish acceptable versus unacceptable water, sediment, or biological specimen samples in accordance with pre-established criteria;
- 2) Field personnel will be thoroughly trained to recognize and avoid potential sources of sample contamination;
- 3) Sample gear or equipment that comes in direct contact with the water sample will be made of non-contaminating materials and will be thoroughly cleaned between sampling events according to appropriate cleaning protocols;
- 4) Sample containers will be of the recommended type and will be free of contaminants; and
- 5) Conditions for sample collection, preservation, and holding times will be followed.

Field sampling personnel have primary responsibility for responding to and reporting failures in sampling or measurement systems. Deviations from WPP procedures and/or the SD DANR WPP QAPP are documented in the project/field logbook. If monitoring equipment fails, the Local Coordinator will contact their SD DANR WPP Project Officer immediately, report the problem, and document it in the comment section of their sample datasheets and project/field logbook. Corrective actions will be taken to temporarily replace units with or repair broken equipment as soon as possible in the field prior to the next field use. Data values will not be recorded for the variables in question until problems are corrected. Data will not be used that was known to be collected with any faulty equipment. It is the combined responsibility of all members of the sampling crew to determine if the performance requirements of the specific sampling method have been met and to collect an additional sample if required. Corrective action documentation will be kept with the overall project files and made available to SD DANR WPP or SD DANR WPP QAO for review. Sample datasheets and procedures for field samplers can be found in [SD DANR WPP-SOPs](#).

B3 Sample Handling and Custody

SD DANR WPP typically does not use a chain of custody procedures for water quality monitoring. Chain of custody methods will be used for HABs toxin samples and specific enforcement cases.

Custody procedures for field samplers can be found in the [SD DANR WPP-SOP Volume I](#). Custody procedures for laboratories are presented in their respective quality assurance plans (PIPs), monitoring strategies, and assessment strategies.

B4 Analytical Methods

Analytical methods used for specific parameters are listed in the [SD DANR WPP-SOP, Volume I](#). The parameters must be EPA-approved. Methods, detection limits, and measurement units are agreed upon by the State Health Laboratory and the state. If laboratories other than the State Health Lab are used for sample analysis, the methods, detection limits, and measurement units will be addressed in each project's sampling and analysis plan.

Information on how samples bottles should be labeled can be found in Sections 11.0, 13.0, 15.0, 16.0, 17.0, and 18.0 of [SD DANR WPP-SOP Volume I](#).

B5 Quality Control

Calibration and performance evaluations are used to assess the overall performances of field and laboratory procedures. Each project-specific sampling and analysis plan will describe and or reference all specific quality assurance/quality control methods to be followed. The following is a list of methods that may be used:

Field Blanks	Spiked Samples	Trip Blanks
Split Samples	Control Charts	Reagent Checks
Duplicate Samples	Replicate Samples	Internal Standards
Surrogate spikes	Calibration Standards	Matrix Spikes

Quality control checks used in the laboratory are addressed in each laboratory quality assurance manual. At a minimum, the following quality control checks will be utilized for all SD DANR WPP Projects:

Spiked Samples	Field Blanks	Duplicate Samples
Control Charts	Reagent Checks	

The SD DANR WPP conducts quality control activities to ensure that sample collection is representative, sample integrity is maintained through sample preservation and handling, quality criteria are met for the application, and to assess the performance of sampling and laboratory personnel.

Equipment blanks will be used to verify that the equipment used during sampling does not contaminate the sample; DI water is filtered through the filtration equipment, transferred to a sample bottle, preserved, and analyzed by the laboratory. The equipment blank is collected at 10 percent of sampling locations. Data acceptability of equipment blanks is determined by evaluating a group of equipment blanks. Acceptable results are determined by the following:

$$SD < \bar{\mu}$$

Where SD = Standard deviation and μ
= Sample population mean

If acceptability criteria for equipment blanks are exceeded in any parameter, the Local Coordinator will report exceedance to the Project Officer. The Project Officer will review data and discuss results with the QAO, Team Leader, and Laboratory Manager to identify and develop a corrective action plan(s).

Replicate samples will be collected for all parameters at 10 percent of sampling sites. A sample will be gathered and divided into separate containers to be treated as separate samples throughout the remaining sample handling and analytical processes. Replicate sample quality control is an effort to examine total error (precision) associated with sample heterogeneity, sample methodology, and analytical procedures. Field replicates may be especially important when determining precision for critical samples with contamination concentrations near or above the action level (action level refers to the minimum concentration necessary to require some type of remediation or monitoring).

Precision may be expressed as Relative Percent Difference (RPD) where S=sample and R=Replicate. RPD is used to determine precision when only a small amount of data is

available. Water Resources Assistance Program will use a control limit of 80–120 percent RPD for normally distributed sample parameters with original and replicate sample values greater than or equal to five times the analyte detection limit; or a control limit of plus or minus the analyte detection limit if either the sample or replicate value is less than five times the analyte detection limit. The results for two samples should be compared using the relative percent difference between them (20 percent RPD).

$$RPD = \left[\frac{|S - R|}{S + R/2} \right] \times 100$$

Sample parameters TSS, VTSS, *E. coli*, and fecal coliform bacteria typically do not display normal distribution. The following technique is used to determine control limits. TSS, VTSS, fecal coliform, and *E. coli* bacteria duplicate, and original results are assessed by calculating precision criteria and determining whether the log ranges are acceptable using the following procedure:

- 1) The data are arranged in pairs where D1 is the original sample and D2 is the duplicate.
- 2) The log of each measurement is determined (L1, L2).
- 3) The difference (range) of the log values is calculated: R = (L1-L2).
- 4) Using the absolute value of each range, a mean range (Mean-R) is calculated: Mean-R = (R1+R2+R3+...R_n)/N.
- 5) The precision criterion is calculated by multiplying the Mean-R by 3.27 and rounding to the tenths place.
- 6) The precision criterion is compared to the range of each pair.
- 7) Acceptable – the log range value is lower than the precision criterion;
Unacceptable – the log range value is above the precision criterion.

On an annual basis, SD DANR WPP Project Officers will evaluate equipment blank and duplicate results to determine if acceptability requirements have been met. SD DANR WPP understands that there may be occasional exceedances of acceptability criteria and will allow up to a 10% margin of error. However, if exceedances to acceptability criteria are concentrated around a particular sampler, laboratory, site, or parameter, the 10% margin of error is not applicable. If results from the equipment blank or duplicate sample do not meet

acceptability criteria, the Project Officer will notify the Team Leader and the Laboratory Manager to discuss the issue and to identify and correct the source of error.

The results for three or more samples should be compared using the standard deviation among them (± 2 standard deviations). A minimum of eight replicate samples are required in order for valid statistical analysis to be performed. Field replicates may be collected on a site-specific basis and do not have to be collected at all sites investigated.

If results from the replicate sample do not meet acceptability criteria, the Project Officer will notify the Local Coordinator, Team Leader, and the Laboratory Manager to discuss the issue and to identify and correct the source of error.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

To ensure accurate and dependable use of equipment and measurement systems, all field sampling and laboratory equipment must be properly maintained and in good working condition. Backup equipment and common spare parts are available so that if any piece of equipment fails during use, repairs, or replacements can be made as quickly as possible and the measurement tasks resumed.

Field and laboratory equipment and instrumentation will be cleaned, visually inspected for damage and if applicable powered up to ensure equipment is in good working condition. For instruments and equipment issued exclusively to regional field staff, it is the responsibility of that staff member to keep the equipment properly maintained and inspected prior to use.

All equipment will be properly maintained following the manufacturer's recommendations and checked between sampling periods to minimize equipment breakdown. Spare parts for routine field repairs will be made available to field and laboratory personnel as needed with duplicate or replacement instrumentation available, when possible, to avoid downtime. More involved repairs will require shipping of the defective instrument to the manufacturer. The local coordinator/sampler will contact their Project Officer when any problems arise before any such repairs are made. If any equipment becomes unusable for any reason, Jordan Turgeon, the equipment manager, will aid in servicing and replacing needs for the external party. Jordan can be contacted by email at jordan.turgeon@state.sd.us or 605-773-6718.

B7 Instrument/Equipment Calibration and Frequency

An instrument or device used in obtaining an environmental measurement must be calibrated using a known standard. Every instrument or measuring device has a specific procedure and type of standard to be used for calibration. The means and frequency of calibration recommended by the manufacturer of the equipment or devices as well as any instruction given in an analytical method will be followed. Records of calibration must be kept by the person performing the calibration and be accessible for verification during a laboratory or field audit.

Calibration will be performed each day before fieldwork begins. Each field instrument must be calibrated prior to use and operated according to manufacturer specifications. If problems with any field instrument are encountered, the user should consult the manufacturer's manual, the project officer, and/or call the manufacturer helpline. Calibration procedures are provided in [SD DANR WPP-SOP Volume I](#) Section 6.0, and instrument observations must be recorded in the project logbook following SD DANR WPP-SOP Volume I, Section 5.0 - Logbook Procedure protocols prior to field use. Logbooks are to be kept and filled out while in the field and made available for inspection during an audit.

Equipment deficiencies observed during calibration or use will be reported to the Project Officer. The Project Officer will take appropriate action to repair, replace, or remove the equipment from service as deemed necessary.

B8 Inspection/Acceptance of Supplies and Consumables

The procurement of supplies, equipment, and services must be controlled to ensure that specifications are met for the high quality and reliability required for each field and/or laboratory function. Upon receipt of materials or equipment, the Project Officer or Local Coordinator

receives and signs for the materials. The items are reviewed to ensure the shipment is complete, and they are then delivered to the proper storage location. All items are inspected for the quality of the product. All chemicals are dated upon receipt. All supplies are stored appropriately and are discarded upon expiration date in accordance with local, state, and federal regulations.

B9 Non-direct Measurements

The use of data obtained from sources other than SD DANR (non-direct measurements) is highly encouraged in data assessment/data interpretation activities, provided the data were collected in projects that were supported by approved and documented standard operating procedures. SD DANR WPP staff must use their professional discretion for the use of data obtained from other sources. The data are usually obtained in electronic format and should be inspected in raw form before data reduction and interpretation. Ideally, other entities collecting data should use SD DANR WPP QAPP, field sampling SOPs, or EPA protocols to collect high-quality field data.

B10 Data Management

Information management occurs on several levels. First, the sample collection must be completed in a manner to ensure the quality, compatibility, and timeliness of the data collected. Once collected and organized, it must be available for review, analysis, and interpretation. Ultimately, the data may be used in several aspects: to assess the water quality of the waterbody based on beneficial use, monitor waters of the state, monitor TMDLs, permit compliance, and provide general information to other interested organizations and the general public.

Field data results are recorded electronically by the meter and downloaded on a computer, hand recorded in a field book or recorded on task-specific datasheets.

Sample results produced by a laboratory are reduced and validated at the laboratory and are the responsibility of the Laboratory Manager or designee. The data are sent electronically and/or by hard copy (per an agreement between SD DANR WPP and the laboratory) to the appropriate Project Officer.

Field data and laboratory sample data are imported into the SD DANR NR92 SQL and WISKI databases. The data import is compared to the hard copy results to ensure accurate entry and data verification. Quality control sample results are compared to the original samples. Any deficiencies in quality control comparisons will be documented by the Project Officer, discussed, and reviewed by the SD DANR WPP QAO and assessment Team Leader to develop a corrective action plan and corrected accordingly.

The SD DANR NR92 database is backed up nightly by South Dakota's Bureau of Information Telecommunications (BIT). BIT is responsible for all computer hardware and software within South Dakota Department of Agriculture and Natural Resources and SD DANR WPP. Data is easily stored and retrieved through database functions. Upon request, data in the SD DANR NR92 database are available for use by SD DANR WPP, SD DANR, other agencies, and the general public. The SD DANR WPP Team Leaders, the Database Coordinator and BIT are responsible for data maintenance in the SD NR92 database.

The data must also be imported into EPA's Storage and Retrieval Water Quality Portal database. Currently, EPA is using the Water Quality Exchange (WQX) system for uploading the data.

The Database Coordinator is responsible for uploading the data into the [Water Quality Portal](#).

Hard copies of data results, project reports, and other assessment reports are filed in the respective SD DANR WPP office as appropriate for three years, archived in a central location for 5-years, and destroyed.

C1 Assessments and Response Actions

Assessments will be conducted on a project-by-project basis to ensure the QAPP is implemented as prescribed in each project plan. Assessments for projects will include:

Surveillance - Project Officers will keep in constant contact with the local project sponsors to ensure all QA efforts are being taken. Any questions Project Officers have can be directed to the SD DANR WPP QAO.

Peer Review - Peer review may be performed before a project starts and after a project is completed. Before a project is started, staff members may review the proposal to ensure the objectives and tasks are technically, adequately, and competently designed to meet quality requirements.

After the project is completed the Project Officers may submit the report to staff members with equal or greater experience. The staff members will review the report for completeness, accuracy, and proper documentation.

Management Systems Review - Management systems review will be performed between 1/4 to the mid-point of the task being performed. The purpose of this assessment will be to determine if the processes and procedures are adequate for the type and quality of data needed for the project. The Project Officer will continually analyze the data collected and determine if quality requirements are being met.

Readiness Review - Readiness Review will be conducted before a project is ready to commence. Readiness review will be comprised of acquiring support letters from local sponsors and other supporting entities. Along with the letters of support, the program staff will ensure all project objectives are capable of being met within set milestones.

Technical Systems Audit - A technical systems audit will be the responsibility of the program Equipment Officer, SD DANR WPP QAO, and Project Officer. The previously mention personnel will be responsible for assessing the equipment needed for each project. It is their responsibility to ensure that the equipment is in working order and will perform the tasks required by the PIP work plan. Once the project is started, it will be the responsibility of the Project Officer to maintain equipment and to communicate with the local coordinator on a regular basis about the condition of the equipment.

Audit of Data Quality - The audit of data quality will be performed along with the peer review and the management systems review. These two processes will ensure the quality of the data being collected.

Data Quality Assessment - Data quality assessments will be conducted at the midpoint and conclusion of each project. Statistical tests will be run on the data collected at the midpoint to ensure the procedures and the amount of data collected insufficient to meet project objectives.

Access to Information by Region VIII Personnel – Region VIII personnel can find QA/QC information in final report documents or contact the South Dakota Department of Agriculture and Natural Resources Watershed Protection Program Project Officer at (605) 773-4254.

OAPP Review – The SD DANR WPP QAO is responsible for reviewing the SD DANR WPP QAPP annually updating personnel and PIPs as needed.

Internal Systematic Audit – Periodically the SD DANR WPP QAO will perform a systems audit covering all aspects outlined below for full systems audit. This type of audit will be performed approximately every three to four years to evaluate how well SD DANR WPP personnel are following QA/QC procedures.

Systems Audit – A full scale systematic, on-site, qualitative review (audit) of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management and reporting aspects of the SD DANR WPP program will be completed by the SD DANR QAO every five-years to evaluate SD DANR WPP QA/QC procedures.

The EPA project manager or a representative of the Regional Quality Assurance Officer may, at any time, conduct an announced or unannounced audit or review of any data collection and analysis activities associated with assessment and implementation projects. This includes any contracts or subcontracts thereof used in the data collection and analysis effort.

C2 Reports to Management

On an annual basis, the SD DANR WPP QAO will submit a quality assurance report to the SD DANR QAO, who in turn reports the information to EPA and the Program Administrator in an annual report covering all SD DANR programs. The report should include the following:

- 1) Assessment results of measurement data accuracy, precision, and completeness;
- 2) Results of performance and system audits;
- 3) Quality assurance issues;
- 4) Corrective actions and results; and
- 5) Revisions to Standard Operating Procedures and Quality Assurance Project Plans.

D1 Data Review, Verification, and Validation

The objective of data review is to assess whether or not the data collected achieved the quality objectives of the project. All analytical data generated for the Watershed Protection Program by a laboratory undergoes reduction and report preparation by the respective laboratory. Laboratory reports are reviewed by the Project Officer and the SD DANR WPP QAO for reasonableness. The field data recorded in the laboratory (i.e., date, time collected, depth, site number, etc.) are also checked against field reports for accuracy. If an analyte concentration appears out of the normal range, the Project Officer, or the SD DANR WPP QAO will initiate corrective actions. These actions should include but are not limited to:

- 1) The Project Officer will check with the Local Coordinator or the field logbook of the Local Coordinator for any abnormalities which may have been noticed in or around the sample site.
- 2) The SD DANR WPP QAO, Project Officer, and/or Local Coordinator investigating the area upstream to try to identify what possible causes would be responsible for the outlying concentration.

- 3) The Project Officer will make narrative mention of the outlying concentration in the final report if no laboratory error, sampler error or other influence can be found.
- 4) In the case of hydrologic data, the Project Officer may have to remove flow data because of the influence of ice, back flow, or other conditions that would change the hydrologic conditions at the site. These will be determined by assessing the data through Aquarius Time-Series™ as stated in the SD DANR WPP-SOP and removing points that the program and Project Officer determines as outliers.
- 5) At the end of the project, the Project Officer will review sample data for completeness using the project logbook, spreadsheets, project Tracker and GRTS reports to ascertain the total number of samples collected at each site. The total number of samples collected will be compared to the number outlined in the PIP to determine if the number of samples agrees with the experimental design. Ideally, sample percentages should exceed 90 percent to adequately represent current conditions.
- 6) QA discussion and documentation of data review, verification, validation, and acceptability may be found in the project final report.

Data review, verification, and validation are key steps in the transition from the assessment and TMDL phase to the implementation phase. Data review, verification, and validation are the responsibility of the Project Officer and are accomplished by following quality assurance guidelines and criteria addressed in the [SD DANR WPP-SOP, Volume I](#).

D2 Verification and Validation Methods

Sample verification and validation will follow the following methods. The local samplers will send the samples directly to a laboratory that uses approved EPA methods and procedures. The laboratory will use its approved protocols to track the sample as different tests are conducted. Once the analysis is completed, the laboratory will send a copy of the results to the Project Officer. If a non-approved laboratory is going to be used, the protocols must be sent to SD DANR and approved before samples are analyzed.

The Project Officer is responsible for the compilation of the data throughout the entire project. Once the data collection for the project is completed the Project Officer will verify and validate data by QA checking at least ten percent of the total samples entered against original data sheets. In the event that data or audits do not conform to quality standards, the SD DANR WPP QAO or Project Officer will take appropriate measures to determine the source of the nonconformance and remediate the situation. Issues are resolved as appropriate on a case-by-case basis. Upon verification and validation, the data is sent to the Database Coordinator to be uploaded into the SD DANR NR92 SQL database and eventually batch loaded into EPAs [Water Quality Portal](#) database. Once the information is in the SD DANR NR92 database, the data will be accessed by department staff with “Read Only” access.

D3 Reconciliation with User Requirements

Ultimately the SD DANR WPP Project Officer, with the help of department staff, will decide if the data collected will answer the questions stated by the specific task or project. The entire QA process will aid in the formulation of the decision. The Project Officer will rely heavily on the process stated in the SD DANR WPP-SOP.

SD DANR WPP staff will also be valuable in the “completeness” of the data collected. Each

final report will state how and if the samples collected answered the project objectives. The report will state the statistical analysis or mathematical equation used to reach the decision. If the data quality objectives have not been met, the final report will state what additional information is needed to complete the process.

APPENDIX A: SD DANR Field Samplers Audit Form

Sampler(s): _____ ; **Date:** _____ ; **Time:** _____

Task	Description	Compliance (Y, N, or NA)	Comment
1	Updated SOP on-hand and available		
2	Calibration Standards expired		
3	Laboratory or office calibration		
4	Calibration sheet completed properly		
5	Barometric pressure recorded on calibration sheet		
6	Re-calibration of DO at each site		
7	Random re-check of calibration throughout the day		
8	Flow meter calibrated if necessary		
9	Life vest (in water) or safety vest (on bridge) worn		
10	Flow measurements collected and recorded properly		
11	Flow data sheet filled out and flow calculated properly		
12	Sampling equipment available and in working order		
13	Appropriate project sample data sheets available		
14	Recorded YSI parameters properly and in correct units		
15	Sample parameters appropriate based on project PIP		
16	Bottles proper type (per SOPs)		
17	Bottle labels filled out correctly		
18	Bottles rinsed before sample collection (except bacteria and TDP)		
19	Water samples collected using proper technique/equipment		
20	QA/QC replicate/blank samples collected properly (if collected)		
21	Bottles preserved correctly		
22	Samples preserved in loose ice and in appropriate cooler(s)		
23	Made copies of sample data sheets and retained one in file		
24	Sample data sheets stored with samples and delivered to lab		
25	Filled out Project Logbook for the site or for the day		

Comments and overall review:

Corrective Actions:

Signatures:

Auditor: _____ ; **Sampler(s):** _____

