# South Dakota Quality Assurance Project Plan for the Rotating Basin Project

South Dakota

Department of Agriculture and Natural Resources

Division of Resource Conservation and Forestry

Watershed Protection Program

April 2022

# A1: Signature Page

ROTATING BASIN PROJECT

QUALITY ASSURANCE PROJECT PLAN

SUBMITTED BY:

SOUTH DAKOTA DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES

DIVISION OF RESOURCE CONSERVATION AND FORESRTY

WATERSHED PROTECTION PROGRAM

APPROVED BY:

South Dakota Watershed Protection Program
Administrator — Date: 5-24-2022

South Dakota Watershed Protection Program
Environmental Scientist Manager, Assessment Team — Date: 5-24-2022

South Dakota Watershed Protection Program
Environmental Scientist Manager, Implementation Team — Date: 5-24-2022

South Dakota Watershed Protection Program
Quality Assurance Officer — Date: 5-24-22

South Dakota DANR Quality Assurance Officer
Quality Assurance Officer — Date: 5-27-22

South Dakota Watershed Protection Program
Rotating Basin Project Officer — Date: 5/23/2022

# A2: Table of Contents

# Table of Contents (Continued)



# List of Tables



# List of Figures

# A3: Distribution List

The current version of the Rotating Basin Quality Assurance Project Plan (QAPP) will be posted on the DANR website. It will also be saved under the file pathway; N:\WATRSHED\QAQC\QAPP's\SOPs.

*Table 1. SD DANR staff distribution list.*

| 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 assessment and implementation 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 and (TMDL) Total Maximum Daily Load assessments projects, other programs, and projects.

# A4: Project Organization

The Local Coordinator Alan Wittmuss is responsible for training all personnel working on the project in appropriate quality assurance and sampling procedures.

Alan 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 an annual Quality Assurance Report that is submitted to the DANR Quality Assurance Officer (QAO).

The Rotating Basin Program Manager will be responsible for scheduling and coordinating lake monitoring efforts. Alan Wittmuss will serve as the primary contact for RBP. Alan will coordinate with the South Dakota State Public Health Laboratory (SD Health Lab), Mid Continent Testing Laboratories (Mid Continent), Aquatic Analysts Inc. and DANR WPP staff to facilitate collection and analysis of samples. All samples will be collected by DANR WPP staff. The RBP manager will coordinate with WPP staff regarding sample results and any recommended follow-up actions that may need to be taken.

The DANR QA Office, Tyler Frideres, will be responsible for interpreting the validity of the data. SD Health Lab analysts, Mid Continent analysts and Aquatic Analysts phycologists will be responsible for conducting the laboratory analyses according to their approved Standard Operating Procedures (SOPs) and ensuring that all field documentation submitted with samples has been satisfactorily completed. Alan Wittmuss, the RBP coordinator, will coordinate with WPP staff and laboratory partners to ensure that all samples are collected according to the standard operating procedures described in the SD DANR WPP SOPs.

The South Dakota State Public Health Lab (Pierre) and Mid Continent (Rapid City) will be responsible for laboratory analysis. The SD Health Lab will provide conventional chemical sample analysis for all samples collected by WPP staff in the Pierre, Vermillion, and Sioux Falls offices. Mid Continent will provide conventional chemical sample analysis for all samples collected by WPP staff in the Rapid City office.

Laboratory audits will occur as specified in the SD Health Lab QAPP/SOP, the Mid Continent QAPP/SOP. All field sampling will be conducted by DANR staff. Field audits will be conducted by the QA/QC officer or the RBP program manager on an as-needed basis.

Alan Wittmuss, the Rotating Basin Program Manager, will make sure that the QAPP is followed as approved; and that all DANR WPP staff working on the Rotating Basin Project (RBP) have access to the most current version of the QAPP and SOP and all necessary documents to sample for RBP. Personnel will be informed of all requirements for the project prior to any sampling.

**Individual Responsibilities and Program Hierarchy:**

The organizational chart in (Figure 1) visually demonstrates program hierarchy. Key individual responsibilities can be located in the South Dakota Nonpoint Source Program QAPP. 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:/WATRSHED/QAQC – SOP/QAPP.

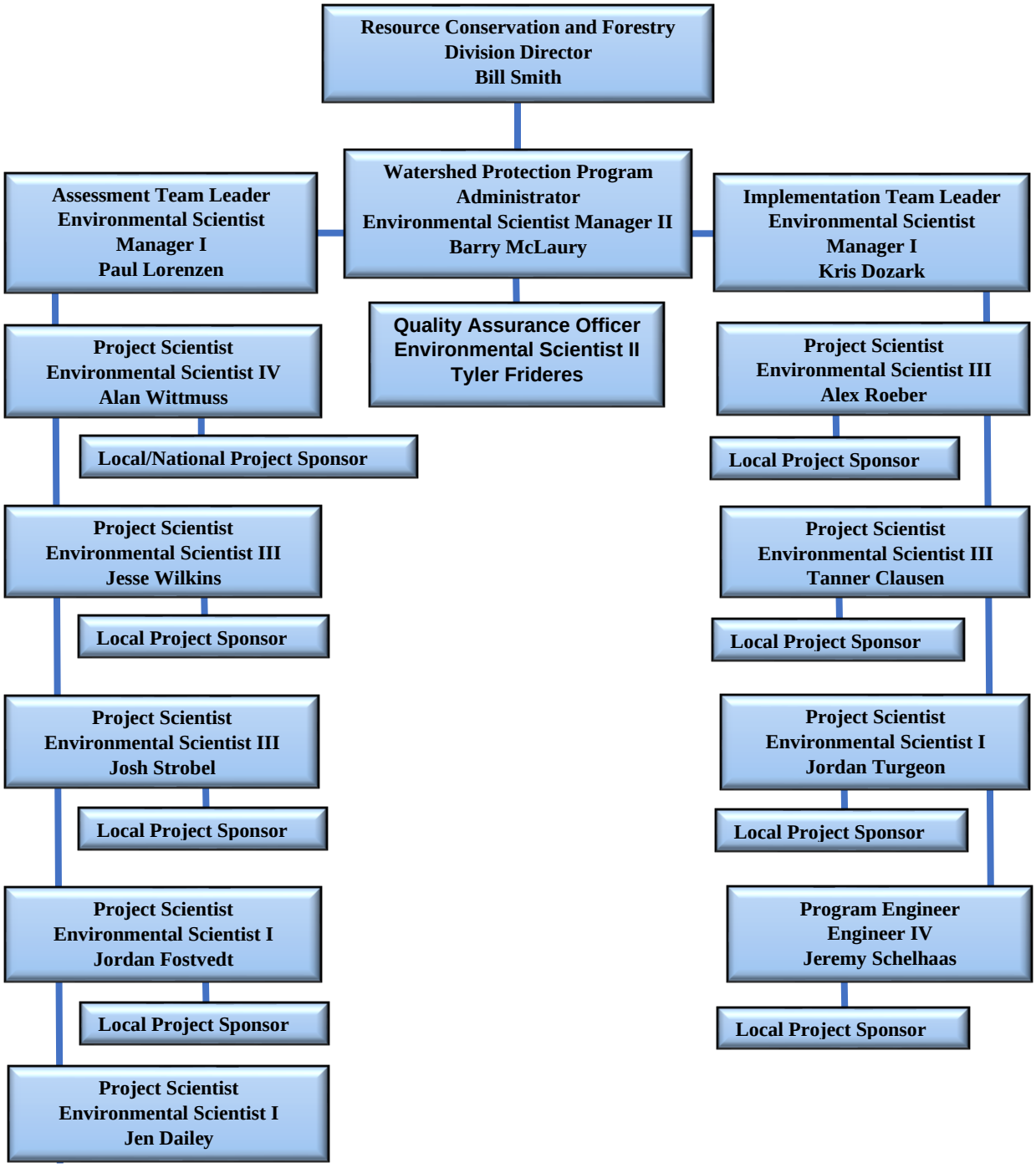


*Figure 1. SD DANR Watershed Program Organizational Chart 2022.*

## A5: Problem Definition/Background

The purpose of this monitoring project is to supplement surface water quality data collection efforts for waterbody assessment units identified in the Integrated Report. The existing data for a significant number of lake and stream segments do not meet the minimum criteria needed to determine impairment status. Data has been so infrequently collected that there may only be 1-2, if any, data points from the last 10 years. The age and/or paucity of data has significantly impacted the ability to make accurate assessments on these waterbodies. A statewide rotating basin strategy was implemented to target all waterbodies with existing assessment unit identification codes (AUIDs). The goal was to initiate a statewide effort to update the water quality data for each of these AUIDs on a 10-year cycle. The length of the monitoring cycle reflects the 10-year look back criteria outlined in listing methodology for making assessment decisions involved with Section 303(d).

Many AUIDs were created when these waterbodies were involved in previous monitoring projects, i.e. watershed type assessments, and have not been monitored since. Focusing on these lakes and streams will provide a current measure of the water quality status for these waterbodies. Waterbodies without AUIDs may be added to the monitoring network but this is dependent on resources and existing workloads.

Accurate assessments for waterbodies with respect to their beneficial uses ensures that limited resources will be expended in the appropriate areas needing water resource enhancement. This may lead to changes to existing use attainability and water quality standards, impairment designations, TMDL development, and implementation of best management practices with the hopes of full attainment of beneficial uses.

Most of the monitoring of these waters prior to now has been relegated to small projects in conjunction with the statewide ambient monitoring network. Samples are collected monthly from this network, but most of these sites are located on the larger lakes, rivers, and streams. Very few data points have been collected on the smaller lakes and numerous smaller streams identified in the Integrated Report. Increased monitoring is necessary for a more statistically accurate assessment of beneficial uses for future reporting cycles.

## A6: Project Description and Schedule

With the limitations of the current surface water quality monitoring effort in SD becoming more apparent with each new integrated reporting cycle, a rotating basin approach was implemented. This approach rotates through each of river basins every two years so that at the end of 10 years each AUID waterbody will have a more statistically accurate and current set of water quality data. Once completed the basin rotation will start again ensuring that each AUID, at a minimum, will have new water quality information collected every two years out of every decade. The large area of SD precludes any statewide annual effort of collect data on all the classified waters listed in the ARSD.

*Table 2. Parameters to be Measured*

| **Physical** | **Chemical** | **Biological** |
|---|---|---|
| Air temperature | Total Solids | *E. coli.* |
| Water temperature | Total Susp. Solids | Chlorophyll *a*** |
| Discharge* | Total Dissolved Solids | |
| Depth | Dissolved Oxygen | |
| Visual observations | Ammonia | |
| Water level* | Un-ionized Ammonia | |
| Specific Conductivity | Nitrate-Nitrite as N | |
| Field pH | TKN | |
| | Total Phosphate | |
| | Total Dissolved Phosphorus** | |
| * - Parameters measured if time and conditions allow<br>** - Parameters measured on in-lake sites only | | |

Discharge measurements and water-level data will be used, in conjunction with other data collection efforts, to calculate a stage-discharge rating curves for the river and tributary segments. If necessary, this hydrologic information will go towards TMDL.

## In-Lake Sites

In-lake sites will consist of a composite sample of the lake, physical assessment, and biological assessment. The composite sample is recognized as a representation of the waterbody as a whole. Direction on how this composite sample is taken can be found in the SOP for Field Samplers Volume I. The chemistry samples obtained from the composite sample can be found in the Chemical column of Table 3. In addition, WPP staff obtains a grab sample for an *E. coli* assessment. The grab sample for *E. coli* is done at a swimming beach or primary boat ramp but is not limited to these areas.

The physical assessment is done using a multimeter sonde. This assessment is used to generate most of the physical data located in the Physical column of Table 3. The sonde is also used to take vertical profile measurements at each station location across the in-lake site. Direction on how to take a vertical profile can be located in the SOP for Field Samplers Volume I. The methods for sampling are outlined in greater detail in the B2 portion of this QAPP.

## Rivers and Stream Sites

River and Stream Sites will consist of the collection of grab samples taken from a single location on the stream or river through the course of the 2-year/10-year cycle. Direction on how grab samples are collected can be found in the SOP for Field Samplers Volume I. Unlike the in-lake sites there will be no Chlorophyll-*a* samples taken. If river site needs additional discharge information and field samplers have additional time, they will take discharge measurement and a water level measurement. Direction on how to take a velocity or flow measurement can be found in the SOP for Field Samplers Volume I. For most sites there are manual wire weight gauge box used to generate water level measurements. These measurements help calibrate the radar sensors used to collect instantaneous stage. The methods for sampling are outlined in greater detail in the B2 portion of this QAPP.

## Basin Locations

Basin Rotations consist of five primary rotations called the Big Sioux, Lower James, Upper James, Western, and Black Hills Basins. These basins will be sampled two years out of every ten; this allows for impairment assessment via Integrated Report. Figure 1 is the proposed basin rotation for the next ten years.

*Table.3 Subbasins of Rotations and Associated Lakes and Rivers*

| Subbasin | 8-digit Hydrologic Unit Codes | # of HUCs | Rotation | Stream/River AUs* | Lake AUs* |
|---|---|---|---|---|---|
| Big Sioux | 10170201-03 | 3 | Big Sioux | 43 | 57 |
| Red | 09010101,05 | 2 | | | |
| Upper Minnesota | 07020001,03 | 2 | | | |
| Vermillion | 10170102,03 | 2 | Lower James | 25 | 31 |
| Lower James | 10160011 | 1 | | | |
| Lower Missouri Trench | 10170101,04<br>10140101,04,05 | 5 | | | |
| Keya Paha | 10150006 | 1 | | | |
| Niobrara | 10150003-04 | 2 | | | |
| Upper James | 1016003-09 | 7 | Upper James | 21 | 52 |
| Upper Missouri Trench | 10130102,05,06<br>10140103 | 4 | | | |
| White | 10140201-04 | 4 | Western Basins | 27 | 15 |
| Bad | 10140102 | 1 | | | |
| Moreau | 10130304-06 | 3 | | | |
| Little Missouri | 10110201-02 | 2 | | | |
| Grand | 10130301-03 | 3 | | | |
| Lower Cheyenne | 10120112-13 | 2 | | | |
| Upper Cheyenne | 10120106-11 | 6 | Black Hills Basins | 70 | 23 |
| Belle Fourche | 10120202-03 | 2 | | | |
| * Number of AUIDs taken from 2020 Integrated Report. | | | | | |

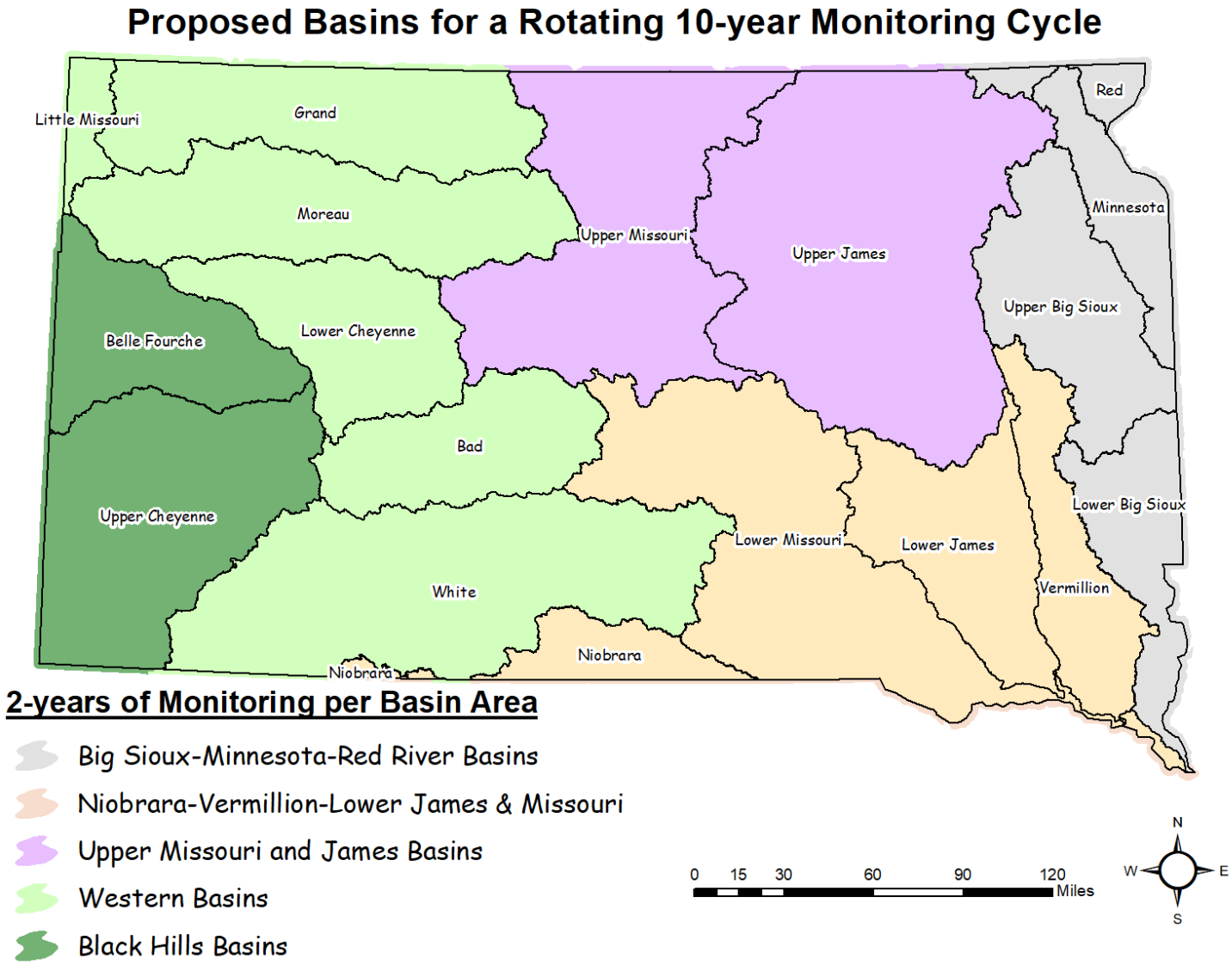


*Figure. 2 Proposed Rotating Basin Rotations*

Post sample collection, all sample bottles will be iced and shipped to the lab and collected using the methods described in the State of South Dakota Watershed Protection Programs Standard Operating Procedures for Field Samplers Volume I. Samples will be analyzed by the South Dakota Public Health Laboratory for the eastern portion of the State while Midcontinent will analyze the Black Hills portion of South Dakota's samples.

**Same Day Express**
605-366-3299

**South Dakota State Public Health Laboratory**
Dr. Tim Southern, Laboratory Director
Stacy Ellwanger, Environmental Health Supervisor
615 East 4th St.
Pierre, SD 57501-1700
Phone — 605-773-3368 or 1-800-738-2301
Fax — 605-773-6129

**Mid Continent Testing**
P.O. Box 3388
2381 South Plaza Drive
Rapid City, SD 57709
Phone: 605-348-0111
Fax: 605-721-0265

Stream discharge and stage information will be measured if time and field conditions allow. However, the focus of this monitoring effort is to characterize the surface water quality of the various rivers, streams, and lakes in these basins.

Results from all water quality monitoring efforts will be reported in subsequent Integrated Reports. Data will be managed by the South Dakota Department of Agriculture and Natural Resources and maintained in a computer database. All sample data will be entered in the US EPA WQX site. It is anticipated that multiple implementation projects will be generated by this project.

Changes to the sampling approach identified in this QAPP will be documented as necessary. The schedule for the 2022 Rotating Basin field season is shown in Table 5. Please note that this table is an estimated timeline of events for the year.

*Table 4. Timeline for Rotating Basin work activities.*

| TASK | 2022 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
| **QAPP development** | X | X | X | X | | | | | | | | |
| **QAPP Approval** | | | | | X | | | | | | | |
| **Sampling (DANR)** | | | | | X | X | X | X | | | | |
| **Lab analysis (SD Health Lab, Mid Continent)** | | | | | | X | X | X | X | | | |
| **Project Data Analysis** | | | | | | | | | | X | X | X |

## A7: Data Quality Objectives and Criteria

The primary data driven objectives for the Rotating Basin Project are to provide data for Section 303(d) assessment and TMDL development. Results from the sampling will be used by the State of South Dakota to make 303(d) listing assessments for streams and to develop Total Maximum Daily Load documents. Additionally, Rotating Basin Project archives long term trends in South Dakota Lake water quality and reassessment of the State every 10 years.

DANR will follow the criteria for deciding if data quality objectives have been met in terms of Completeness, Representativeness, Comparability, Precision, and Accuracy.

***Completeness*** is a measure of the amount of valid data obtained from measurement systems compared to the amount that expected to be obtained under optimum conditions. For a set of data to be utilized with confidence to assess a parameter for a waterbody, the data must be complete, i.e., there must be enough valid data from analysis to facilitate making the assessment. The Rotating Basin dataset will be considered complete as long as 90% of planned samples are collected and analyzed.

***Representativeness*** expresses the degree to which data accurately and precisely represents the characteristics of that which is being measured. All samples will be collected in such a manner and at such sites to be representative of the medium from which they are taken. Multiple stations within each lake will be sampled in order to get a representation of the entire lake and to account for wind and other currents. Lakes that are sufficiently small in surface area that environmental factors result in chemically homogenous waterbody, samples will be collected at a single central station.

*E. coli* samples will be collected at the lake's shoreline location where the greatest proportion of recreational activity takes place. The primary location for *E. coli* collection are public swimming beaches. Secondary locations for *E. coli* sample collection are public access areas such as boat ramps.

***Comparability*** expresses the confidence with which one data set can be compared to another. Comparability can be measured and assessed using standard, published sampling and analytical data. The comparability of data is achieved by the commitment of SD DANR staff and contracted laboratories to use standardized methods, where possible, including the EPA-approved analytical methods, standard methods, or documented modifications thereof which provide equal or better results. All analytical results will be reported in appropriate concentration values and units to facilitate comparison.

***Precision*** 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). Precision will be assessed through field duplicate and lab duplicate analyses. Collection of field blanks will also make sure there is no cross contamination.

***Accuracy*** is a measure of how much of the constituent is present. It shows how close the sample value is to the "true" value. Accuracy will be assessed through the project by the collection of field blanks and duplicates. Also, following QA/QC practices will help ensure that accuracy is accounted for.

Please refer to the SD DANR SOP Volume I for measurements of precision and accuracy and specific procedures for corrective actions.

## A8: Special Training and Certification

Any special training requirements needed for the completion of this project will be assigned on an as-needed basis. Alan Wittmuss, the project officer, will make sure that any necessary and needed training is documented and completed. All training and certifications will be discussed with the Quality Assurance Officer, Tyler Frideres, and reported on annually in the Program QAQC Report.

## A9: Documents and Records

Documentation and record collection is an integral part of maintaining proper QA protocols. The project officer, Alan Wittmuss, will make sure that before any sampling is done, all staff have a copy of the most current version of the SOP and QAPP. Prior to project sampling, Alan will also make sure that all sampling sites have been entered into the NR92/WISKI database with the correct information and latitude and longitude coordinates. All data will be stored indefinitely on a SQL server and backed up to the state IT system. Information about sample analysis and location will be accessible to the public.

At the completion of the project, all project data, reports, documentation, and records will be given to the project officer and stored.

## B1: Sampling Process Design

Sample design is based on generating a statistically robust set of data to accurately assess lakes, rivers, and streams across South Dakota. Each basin area identified in Figure 1 and Table 4 will be targeted separately on a bi-annual basis through the course of 10 years. Stations and sampling sites can change between cycles, so to convey transparency the most current and accurate site list can be found in the directory, "N:\WATRSHED\Waterbodies\Rotating Basins\" at the beginning of each basin area monitoring project. The stream and lake site list for the 2022 season can be found in Appendix A.

## Rotation 1: May 2020-2021

**Rivers and Streams**

Collect water quality samples from 42 river and stream segment-monitoring sites. Samples from all 42 locations will be collected on a regular basis throughout the May 1 through September 30 considered the recreation season as defined in the Administrative Rules of South Dakota (ARSD). With no regard for flow conditions or storm events, river and tributary samples will be scheduled for collection twice a month. An estimated minimum number of 462 samples will be collected. Sampling will begin May 1 of 2020. An additional 92 samples will be used for quality assurance/quality control purposes.

**In-Lake Sites**

Collect water quality samples from 22 lakes monthly through May 1 through September 30 considered the recreation season as defined in the Administrative Rules of South Dakota (ARSD). An estimated total number of 132 samples will be collected. Sampling will begin May 1 of 2019. An additional 26 samples will be used for quality assurance/quality control purposes.

## Rotation 2: May 2022-2023

**Rivers and Streams**

Collect water quality samples from 66 river and stream segment-monitoring sites. Samples from all 66 locations will be collected throughout the recreation season defined as May 1 through September 30 in the Administrative Rules of South Dakota (ARSD). 15 stream segments will be sampled for sodium adsorption ratio (SAR) and salinity for a total of 300 samples over both sampling seasons. With no regard for flow conditions or storm events, river and tributary samples will be scheduled for collection twice a month. An estimated total number of 660 samples will be collected over both sample seasons. Sampling will begin May 1 of 2022 and end September 30 of 2023. An additional 132 samples will be used for quality assurance/quality control purposes. A list of the rivers and stream sites for this rotation can be found in Appendix A.

**In-Lake Sites**

Collect water quality samples from 26 lakes three months out of the May 1 through September 30 recreation season as defined in the Administrative Rules of South Dakota (ARSD). An estimated total number of 162 samples will be collected over both sampling seasons. Lakes will be sampled for microcystin if an algal boom is identified. Sampling will begin May 1 of 2022 and end September 30 of 2023. An additional 34 samples will be used for quality assurance/quality control purposes. A list of the in-lake sites that will be visited can be found in Appendix A.

# B2: Sampling Methods

**In-Lake Methods:**

Samples are collected by DANR WPP staff according to protocols defined in the SD DANR Standard Operating Procedures document.

Water for the composite sample will be collected to a depth twice the secchi disk measurement at each of the three composite stations on each lake, then deposited into the composite jug for mixing. The composite jug should be rinsed with DI water on shore before embarking onto the lake for sampling. The water will be collected using an integrated sampler tube constructed of PVC. After water has been collected at all three stations and deposited into the composite jug, sample bottles A, B, and chlorophyll-*a* will be filled

directly from the composite jug. To preserve the A bottle, place in a cooler with ice. To preserve the B bottle, add 2 mL of concentrated sulfuric acid ($H_2SO_4$) and then invert the bottle to mix and place in a cooler with ice.

The *E. coli* sample (C bottle) will be collected at the designated bacteria station, which is located along the shoreline at either a public swimming beach, boat ramp, or other public access point. The collection method is a grab sample, where their sampler wades into the water and collects the sample at a depth of approximately 0.3m. The C bottle is preserved with sodium thiosulfate and is submerged in ice.

Vertical multimeter profiles will be collected using a multimeter probe that will be calibrated each day before use. The pH calibration will consist of a 2-point calibration at pH 7 and pH 10. The multimeter data filter will be set to the most rapid averaging period possible to minimize time needed for sensors to stabilize between measurements. A surface measurement will be logged at a depth of 0.5m and subsequent measurements will be logged at whole meter intervals starting at 1m. At least 20 seconds must pass between measurements to allow sensors to stabilize. A bottom measurement will be logged 0.5 meters above the substrate. It is important to not drop the multimeter sonde into the substrate with force, which suspends sediment and influences results.

**Stream or River Methods:**

Samples are collected by DANR WPP staff according to protocols defined in the SD DANR Standard Operating Procedures document.

When taking stream samples for RBP begin by calibrating the YSI multi-probe sonde. Fill the cooler with ice and label bottles. Rinse the 1L A and B sample bottles and caps 3 times with sampling water. Do not pre-rinse the C bottle, instead remove the plastic seal from around the neck of the bottle. Take all the grab samples by positioning the open end of the bottle toward the current flow and away from the hand of the collector. Plunge the bottle to avoid surface scum and fill to the neck of the bottle at a depth of 15 cm to 30 cm. To preserve the A bottle, place in a cooler with ice. To preserve the B bottle, add 2 mL of concentrated sulfuric acid ($H_2SO_4$) and then invert the bottle to mix and place in a cooler with ice. The C bottle is preserved with sodium thiosulfate and is submerged in ice. The ice should keep the bottles at a temperature of 6°C. Take a YSI reading from the stream by placing it in a flowing section of the stream and allowing the values to stabilize. Record YSI values on the lab datasheet.

Deliver A, B, and C bottles to the State Public Health Lab or Mid Continent Labs within the proper hold time of 48 hours for the A bottle, 28 days for the B bottle, and 24 hours for the C bottle. Ensure that preservation temperature is kept. Deliver the Chlorophyll-*a* bottle to the SD DANR lab for analysis.

*Table 5. Sample bottle types for RBP.*

| Image | Bottle | Size | Lab | Preservation | Rinse |
|---|---|---|---|---|---|
|  | A | 500mL | Mid Continent Rapid City, SD | Ice | Yes |
|  | B | 500mL | Mid Continent Rapid City, SD | 1mL sulfuric acid, Ice | Yes, if not pre-preserved |
|  | C | 125mL | Mid Continent Rapid City, SD | Sodium Thiosulfate, Ice | No |
|  | A | 1-Liter Narrow Mouth Nalgene | Health Lab Pierre, SD | Ice | Yes |
|  | B | 1-Liter Narrow Mouth Nalgene | Health Lab Pierre, SD | 2mL sulfuric acid, Ice | Yes |
|  | C | 250mL | Health Lab Pierre, SD | Ice | No |
|  | Chl-a | 500ml, 1-liter, or 2-liter (always brown) | DANR Lab Pierre, SD | Ice | Yes |

**Site Disturbance:**

Ensure that the sample site is not disturbed prior to collecting a sample. Disturbing the sediment can resuspend *E. coli* and result in uncharacteristically high turbidity and *E. coli* concentrations that wouldn't have been there if the site wasn't disturbed.

- Avoid walking in the water near the edge of the waterbody.
- Don't enter the waterbody prior to sample collection.

**Sampling Equipment Cleaning:**

The composite jug will be rinsed on shore with deionized water three times before field staff start sampling. The integrated sampler tube will be rinsed with lake water at each site before sample collection.

**Field Duplicates:**

A field duplicate is collected in the same manner as a regular sample. The duplicates are given their own sample number and labeled as "duplicate" for the sample type. A duplicate sample set consists of all bottle

types scheduled for collection from each lake. The field duplicate sample is factored into the total number of samples. A field duplicate will be collected for every 10 samples.

**Blank:**

A field blank is treated in the same manner as a regular sample. The blanks are given their own sample number and labeled as "blank." A blank sample set consists of all bottle types scheduled for collection from each lake. The field blank sample is factored into the total number of samples (e.g., one sample plus one duplicate and one field blank for a total of three samples). Field blanks should be filled with deionized water. A blank will be collected for every 10 samples.

**Corrective Actions:**

Corrective actions for deficiencies will be addressed immediately in the field or after lab receipt (documentation errors). Corrective actions include but are not limited to; discarding improperly collected or handled samples, re-sampling, and correcting labels or COC's. The RBP coordinator will work and communicate with the DANR staff and QA/QC officials in order to fix and issues or deficiencies with sample collection and documentation.

## B3: Sample Handling, Custody and Documentation

All samples will be stored on ice or refrigerated (4-8°C) in the dark. If samples are being shipped the day of sample collection, they will be kept in the dark on ice until shipment. If samples are being held overnight, samples will be placed in a refrigerator until ready for shipment or delivery. Samples collected by Pierre, Sioux Falls, and Vermillion staff will be shipped to the SD Health Lab by using the SD Health Lab courier or Same Day Express. Samples collected by Rapid City staff will be hand delivered to Mid Continent. *E. coli* samples must be received by the lab within 24 hours of collection. The SD Health Lab and Mid Continent only accept samples Monday – Friday. Coordination of sampling schedule will be arranged prior to deployment by field staff. DANR staff will only sample Monday – Thursday so that all samples are received by the lab Monday - Friday.

Lab staff will check temperature of samples once received in order to verify that they are within the holding standards. If the temperature limit of 6°C is exceeded, samples will have to be discarded and if possible, a re-sample may need to occur.

**Chain of Custody Form:**

Chain-of-Custody forms are used to handle and track samples from field collection to delivery to the laboratory. Chain-of-Custody forms will be signed including the date and time when samples are shipped through an intermediary such as the SD Health Lab courier. The chain of custody form can be found under the pathway address; N:\WATRSHED\REFDEVA\Forms and Lists\REFDEVA Chain of Custody.

A SD DANR chain-of-custody form accompanies the samples, and includes the following for each sample:

- Waterbody/Location
- Site ID
- Date Sample Collected
- Time Sample Collected
- Sampler's Initials
- Identification of QC Sample Type: Field Sample, Field Duplicate, Field Blank
- Analysis Required

## B4: Analytical Methods

The analysis of chemistry and *E. coli* samples will be conducted by the SD Health Lab in Pierre, SD and Mid Continent testing in Rapid City, SD. Chemistry samples will be analyzed for the parameters listed in Table 3. The SD Health Lab and Mid Continent Testing will follow all EPA approved methods for laboratory analysis. All DANR analytical methods for specific parameters can be found in the SD DANR WPP SOP Volume I.

## B5: Quality Control

The SD Health Lab and Mid Continent are responsible for complying with their internal data quality requirements. If data quality requirements are not met, the specific laboratory will need to be in contact with project officer, Alan Wittmuss, in order to take necessary corrective actions. Data must be comparable for all samples within each sample set. Both the SD Health Lab and Mid Continent must follow in house QA/QC requirements. South Dakota DANR field staff and project partners will meet QA/QC guidelines and ensure that procedures including field duplicates, field blanks, field techniques, holding times, and forms are completed. On an annual basis, the project officer will evaluate blanks and duplicates of all samples and equipment to determine if acceptability requirements have been met. The South Dakota DANR field staff will follow their own QA/QC requirements of 10% (10% blanks and 10% replicates).

**Field Techniques:**

DANR field staff will ensure that all samples are collected using proper techniques and following SD DANR and EPA approved methodology.

**Field Duplicate:**

The field duplicate samples will provide an indication of variability withing the sampling. Selection of sites for duplication is determined by field staff. For replicates, (one out of 10) samples need to have a replicate to compare variability.

**Field Blank:**

A field blank QA/QC sample is supplied to the SD Health Lab and Mid Continent for analysis for each sampling event (one per 10 samples). The blank sample should be treated like all other samples for the remainder of the field visit, during transportation and shipment.

**Holding Times:**

Holding times for sampled collected during Rotating Basin are presented in Table 3.

*Table 6. Holding times and preservation methods for RBP samples.*

| Bottle | Size & Material | Preservative | Parameters | Holding Time |
|---|---|---|---|---|
| A | 1,000 mL HDPE or 250 mL HDPE | Cool to 6ºC | Alkalinity, total solids, TSS, volatile solids, TDS, BOD, CBOD, $CO_3$, Hardness, K, lab pH, lab conductivity, nitrate, chloride, fluoride, $HCO_3$, $SO_4$ | 48 hours |
| B | 1,000 mL HDPE or 250 mL HDPE | 2 mL $H_2SO_4$ pH <2 Cool to 6ºC | Ammonia, Nitrate+Nitrate, TKN, Total P, COD | 28 days |
| C | 100 mL or 250 mL sterilized HDPE | $Na_2SO_3$ if chlorinated Cool to 6ºC | Fecal coliform, *E. coli*, total coliform, enterococci, fecal PFG | 24 hours |
| Chlorophyll-a | 500, 1,000, or 2,000 mL brown HDPE bottle | Cool to 6ºC | Chlorophyll-*a* | 48 hours (unfiltered) 28 days (filtered) |

## B6: Instrument/Equipment Testing, Inspection, and Maintenance

Multi-meter thermometers will be checked against an NIST verified thermometer by the WPP equipment manager, Jordan Turgeon, on an annual basis and will be replaced if not within 1 degree C of the NIST thermometer. Results of this testing are supplied to the WPP and DANR QA/QC officers. Sensors for pH will be replaced on an annual basis or as-needed. Sensors for dissolved oxygen and temperature/specific conductance will be checked annual and replaced on an as-needed basis when sensor calibration constants are not within manufacturer specifications. If a sensor does not perform to manufacturer specifications during the field season, it will be replaced as soon as possible. Field data will not be recorded by a sensor not meeting manufacturer specifications. Field staff may contact the RBP project officer or the WPP equipment manager to obtain new sensors and parts for multi-meters.

## B7: Instrument/Equipment Calibration and Frequency

Multi-meters will be calibrated for dissolved oxygen, pH, specific conductance, and depth every day before use. If a significant change in barometric pressure or altitude occurs, dissolved oxygen should be calibrated again. If the multi-meter does not calibrate because a sensor is out of range, that sensor may not be used for that day. If possible, the sensor should be replaced before proceeding with sampling.

## B8: Inspection/Acceptance of Supplies and Consumables

The SD Health Lab will provide deionized water to Pierre WPP staff for the QA/QC blank samples that will be collected during the field season. Field offices will use distilled water purchases locally for blank samples. If blank samples result in detectable levels of analytes, a new blank sample will be collected using a different source of deionized or distilled water to account for possible contamination from the deionized or distilled water.

Oakton brand calibration buffer solutions for pH 7 and pH 10 will be purchased from Cole Parmer, Inc. and must not be expired before use. Calibration solution for specific conductance will be made by the SD Health Lab chemists and supplied to WPP staff. Specific conductance calibration solution must be used within 6 months of when a bottle is opened, according to SD Health Lab chemists.

## B9: Non-direct Measurements

Annual results from previous RBP sampling will be used to compare to the current year to look for any possible trends and to help build a long-term dataset for the lakes in South Dakota.

## B10: Data Management

Information management occurs on several levels. First, 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 water quality of the waterbody based on beneficial use and provide general information to other interested organizations and the public.

All data and results will ultimately be entered into the DANR NR92 water quality database. The SD Health Lab will transmit sample results and field notes from the Laboratory Information Management System to the NR92 database electronically. Mid Continent will provide the RBP coordinator with sample results and field notes in MS Excel files monthly during field season that will be manually uploaded to the NR92 database.

Field notes for each site will be recorded on the DANR Chain-of-Custody form and include the following:

- Sampler(s) name(s)
- Station ID
- Date sample collected
- Time sample collected
- Additional observations

The RBP coordinator will be responsible for ensuring all RBP data is received from field staff and each lab and entered into the NR92 database. Once data is marked as approved by the RBP coordinator it will be available for public access on the DANR Water Quality Monitoring Access Portal website (WQ Map). Data may be downloaded directly from the NR92 database by DANR staff at any time.

## C1: Assessment and Response Actions

The State of South Dakota is responsible for field sample collection and QA/QC procedures. Corrective actions for deficiencies will be addressed immediately in the field or will be resolved through collaboration of DANR staff.

The State of South Dakota will use the following assessments for RBP:

**Surveillance:**

The project officer will keep in constant contact with the WPP field staff, the SD Health Lab and Mid Continent to ensure that all QA/QC components are being followed.

**Peer Review:**

Peer review may be performed before a project starts and after a project is completed. Staff members will review the RBP project for completeness, accuracy, and proper documentation.

**Field Performance Audit:**

Field audits will be performed at the discretion of the RBP project officer or the SD DANR WPP QA/QC officer. Field audits will typically be performed on an as-needed basis.

**Systems Audit:**

A full scale systematic, qualitative review of 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, Tyler Frideres, every 5 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 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, Tyler Frideres, will submit a quality assurance report to the SD DANR QAO, Shannon Minerich, who in turn reports the information to EPA and the Program Administrator in an annual report covering the SD RBP Program. All reports will also be sent to the Team Leader and Administrative Leader. The report should include the following:

- Assessment results of measurement data, accuracy, precision, and completeness
- Results of performance and system audits
- Quality assurance issues
- List of training activities including dates
- Corrective actions and results
- A list of all QA documents, including status, and if the document is for a new or continuing project; (this would be a list of all SOPs, QAPPs, PIPs, SAPs and indicate if they are new, under revision, or approved)

## D1: Data Review, Verification, and Validation

The objective of data review is to assess whether 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 (date, time collected, depth, site number, etc.) are also checked against field reports for accuracy. 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

Data verification will include a review of the findings of all QA/QC assessment activities including:

- Appropriate sample collection and preparation of field transfer blank sample: assessed during sample collection by responsible field personnel.
- Chain-of-custody procedures: assessed by the responsible field personnel and laboratory sample custodians for the SD Health Lab, Mid Continent and Aquatic Analysts.
- Analytical data collection, recording, and reporting including laboratory QA/QC procedures: assessed by the SD Health Lab, Mid Continent and Aquatic Analysts.

Data review, verification, and validation are key steps in the transition from the data collection to data review and acceptance. Data review, verification, and validation are the responsibility of the project officer and are accomplished by following the quality assurance guidelines and criteria addressed in the SD DANR WPP-SOP, Volume I.

## D3: Reconciliation with User Requirements

It will be the State of South Dakota's responsibility to assess and interpret data originating from RBP, but EPA assistance by the project manager is available upon request.

# Appendix A: 2022 River/Streams and In-Lake Sites

| Waterbody | Location | DANR AUID |
|---|---|---|
| Annie Creek | Spearfish Creek to S3, T4N, R2E | SD-BF-R-ANNIE_01 |
| Battle Creek[1] | Hwy 79 to mouth | SD-CH-R-BATTLE_01_USGS |
| Battle Creek[3] | Near Horsethief Lake to Teepee Gulch Creek | SD-CH-R-BATTLE_01 |
| Battle Creek[3] | Teepee Gulch Creek to SD HWY 79 | SD-CH-R-BATTLE_02 |
| Bear Butte Creek[1] | Headwaters to Strawberry Creek | SD-BF-R-BEAR_BUTTE_01 |
| Bear Butte Creek[1] | Strawberry Creek to S2, T4N, R4E | SD-BF-R-BEAR_BUTTE_02 |
| Beaver Creek | WY border to Cheyenne River | SD-CH-R-BEAVER_01 |
| Beaver Creek[1] | Near Buffalo Gap | SD-CH-R-BEAVER_01_USGS |
| Beaver Creek | S13, T5S, R4E to SD Hwy 79 | SD-CH-R-BEAVER_02_USGS |
| Belle Fourche River[2] | Redwater River to Whitewood Creek | SD-BF-R-BELLE_FOURCHE_02 |
| Belle Fourche River[2] | Whitewood Creek to Willow Creek | SD-BF-R-BELLE_FOURCHE_03 |
| Belle Fourche River | Willow Creek to Alkali Creek | SD-BF-R-BELLE_FOURCHE_04 |
| Belle Fourche River[2] | Wyoming border to Redwater River | SD-BF-R-BELLE_FOURCHE_01 |
| Belle Fourche River | Alkali Creek to mouth | SD-BF-R-BELLE_FOURCHE_05 |
| Box Elder Creek[3] | Cheyenne River to S22, T2N, R8E | SD-CH-R-BOX_ELDER_01 |
| Box Elder Creek | S16, T2N, R6E to S14, T3N, R4E | SD-CH-R-BOX_ELDER_02 |
| Cascade Creek | headwaters to Cheyenne River | SD-CH-R-CASCADE_01 |
| Castle Creek[3] | Deerfield Reservoir to Rapid Creek | SD-CH-R-CASTLE_01 |
| Cheyenne River[1] | WY border to Beaver Creek | SD-CH-R-CHEYENNE_01 |
| Cheyenne River | Beaver Creek to Cascade Creek | SD-CH-R-CHEYENNE_02 |
| Cheyenne River | Cascade Creek to Angostura Reservoir | SD-CH-R-CHEYENNE_02B |
| Cheyenne River | Fall River to Cedar Creek | SD-CH-R-CHEYENNE_03 |
| Cheyenne River[3] | Cedar Creek to Belle Fourche River | SD-CH-R-CHEYENNE_04 |
| Cleopatra Creek | Confluence with East Branch Cleopatra Creek to mouth | SD-BF-R-CLEOPATRA_01 |
| Crow Creek[1] | S22, T6N, R1E to Redwater River | SD-BF-R-CROW_01_USGS |
| Deadwood Creek | Rutabaga Gulch to Whitewood Creek | SD-BF-R-DEADWOOD_01 |
| Elk Creek | S9, T3N, R7E to S27, T4N, R3E | SD-CH-R-ELK_01_USGS |
| Elm Creek[1] | S8, T8N, R10E to Belle Fourche River | SD-BF-R-ELM_01 |
| Fall River | Hot Springs to mouth | SD-CH-R-FALL_01 |
| False Bottom Creek[1] | S26, T5N, R2E to Burno Gulch Creek | SD-BF-R-FALSE_BOTTOM_01 |
| Fantail Creek[1] | Headwaters to Nevada Gulch | SD-BF-R-FANTAIL_01 |
| Flynn Creek | SF Lame Johnny Creek to S23, T4S, R5E | SD-CH-R-FLYNN_01 |
| French Creek | S23, T3S, R3E to Custer | SD-CH-R-FRENCH_01 |
| French Creek | Custer to Stockade Lake | SD-CH-R-FRENCH_02 |
| French Creek | Stockade Lake to SD HWY 79 | SD-CH-R-FRENCH_03 |
| Grace Coolidge Creek | S12, T3S, R5E to Battle Creek | SD-CH-R-GRACE_COOLIDGE_01 |
| Grizzly Bear Creek[3] | Near Keystone, SD | SD-CH-R-GRIZZLY_BEAR_01_USGS |
| Highland Creek[1] | Wind Cave Natl Park and near Pringle, SD | SD-CH-R-HIGHLAND_01_USGS |
| Horse Creek[2] | Indian Creek to mouth | SD-BF-R-HORSE_01_USGS |
| Horsehead Creek[1] | At Oelrichs | SD-CH-R-HORSEHEAD_01_USGS |

| | | |
|---|---|---|
| Iron Creek[3] | From Battle Creek to S33, T2S, R5E | SD-CH-R-IRON_01 |
| Little Spearfish Creek[1] | S16, T4N, R1E to Spearfish Creek | SD-BF-R-LITTLE_SPEARFISH_01_USGS |
| North Fork Rapid Creek[3] | From confluence with Rapid Creek to S8, T3N, R3E | SD-CH-R-RAPID_N_FORK_01 |
| Rapid Creek[3] | Canyon Lake to S15, T1N, R8E | SD-CH-R-RAPID_03 |
| Rapid Creek[3] | S15, T1N, R8E to above Farmingdale | SD-CH-R-RAPID_04 |
| Rapid Creek[3] | Above Farmingdale to Cheyenne River | SD-CH-R-RAPID_05 |
| Rapid Creek[3] | Headwaters to Pactola Reservoir | SD-CH-R-RAPID_01 |
| Rapid Creek[3] | Pactola Reservoir to Canyon Lake | SD-CH-R-RAPID_02 |
| Redwater River[1] | WY border to Hwy 85 | SD-BF-R-REDWATER_01_USGS |
| Redwater River | US HWY 85 to mouth | SD-BF-R-REDWATER_01 |
| Rhoads Fork[3] | Near Rochford, SD | SD-CH-R-RHOADS_FORK_01_USGS |
| Spearfish Creek | Intake Gulch to Annie Creek | SD-BF-R-SPEARFISH_01 |
| Spearfish Creek | Annie Creek to Cleopatra Creek | SD-BF-R-SPEARFISH_02 |
| Spearfish Creek | Cleopatra Creek to Spearfish City intake dam in S33, T6N, R2E | SD-BF-R-SPEARFISH_04 |
| Spearfish Creek | Homestake Hydroelectric Plant at Spearfish in S15, T6N, R2E to Higgins Gulch | SD-BF-R-SPEARFISH_05 |
| Spearfish Creek | Higgens Gulch to mouth | SD-BF-R-SPEARFISH_06 |
| Spring Creek[3] | S5, T2S, R3E to Sheridan Lake | SD-CH-R-SPRING_01 |
| Spring Creek[3] | Sheridan Lake to SD HWY 79 | SD-CH-R-SPRING_02 |
| Stewart Gulch | Whitetail Creek to NW1/4, NW1/4, S7, T4N, R3E | SD-BF-R-STEWART_01 |
| Victoria Creek[1,3] | Rapid Creek to S19, T1N, R6E | SD-CH-R-VICTORIA_01_USGS |
| West Strawberry Creek[1] | Headwaters to mouth | SD-BF-R-W_STRAWBERRY_01 |
| Whitetail Creek | Whitewood Creek to S18, T4N, R3E | SD-BF-R-WHITETAIL_01 |
| Whitewood Creek | Gold Run Creek to Deadwood Creek | SD-BF-R-WHITEWOOD_02 |
| Whitewood Creek | Spruce Gulch to Sandy Creek | SD-BF-R-WHITEWOOD_04 |
| Whitewood Creek | Sandy Creek to I-90 | SD-BF-R-WHITEWOOD_05 |
| Whitewood Creek | I-90 to Crow Creek | SD-BF-R-WHITEWOOD_06 |
| Whitewood Creek | Crow Creek to mouth | SD-BF-R-WHITEWOOD_07 |
| Whitewood Creek | Deadwood Creek to Spruce Gulch | SD-BF-R-WHITEWOOD_03 |
| Whitewood Creek[1] | Whitetail Summit to Gold Run Creek | SD-BF-R-WHITEWOOD_01 |

1 – Stream segments that will be sampled for Salinity and SAR.
2- Stream segments sampled by The Belle Fourche River Watershed Partnership
3- Stream located in the WDWDD

**2022 In-Lake Sites**

**Appendix A: (continued)**

| **2022 Lakes Waterbody** | **DANR AUID** |
|---|---|
| Cottonwood Springs Lake | SD-CH-L-COTTONWOOD_SPRINGS_01 |
| Lakota Lake | SD-CH-L-LAKOTA_01 |
| Newell Lake | SD-BF-L-NEWELL_01 |
| Orman Dam (Belle Fourche Reservoir) | SD-BF-L-ORMAN_01 |
| Curlew Lake | SD-CH-L-CURLEW_01 |
| Legion Lake | SD-CH-L-LEGION_01 |
| Iron Creek Lake | SD-BF-L-IRON_CREEK_01 |
| Mirror Lake East | SD-BF-L-MIRROR_EAST_01 |
| Mirror Lake West | SD-BF-L-MIRROR_WEST_01 |
| Newell City Pond | SD-BF-L-NEWELL_CITY_01 |
| Center Lake | SD-CH-L-CENTER_01 |
| Cold Brook Reservoir | SD-CH-L-COLD_BROOK_01 |
| Deerfield Lake[1] | SD-CH-L-DEERFIELD_01 |
| New Wall Lake | SD-CH-L-NEW_WALL_01 |
| Pactola Reservoir[1] | SD-CH-L-PACTOLA_01 |
| Sheridan Lake[1] | SD-CH-L-SHERIDAN_01 |
| Stockade Lake | SD-CH-L-STOCKADE_01 |
| Sylvan Lake | SD-CH-L-SYLVAN_01 |
| Angostura Reservoir | SD-CH-L-ANGOSTURA_01 |
| Bismark Lake | SD-CH-L-BISMARK_01 |
| Canyon Lake[1] | SD-CH-L-CANYON_01 |
| Horsethief Lake[1] | SD-CH-L-HORSETHIEF_01 |
| Bear Butte Lake | SD-BF-L-BEAR_BUTTE_01 |
| Cox Lake | SD-BF-L-COX_01 |
| New Underwood Lake[1] | SD-CH-L-NEW_UNDERWOOD_01 |
| Roubaix Lake | SD-CH-L-ROUBAIX_01 |
| 1- Lake located in the WDWDD | |

# Appendix B: SD DANR Water Quality Datasheet

Agency Code

## SD DANR Water Quality Data

Rev 05/21

Sample Date | Time | Samplers Print/Sign

Source Water | Station ID

Site Location

Project | Project ID

**Type of Sample**: ☐ Replicate ☐ Grab ☐ Integrated Vertical ☐ Blank ☐ Composite ☐ Integrated Flow

**Medium**: ☐ Water / Other

**Relative Depth**: ☐ Surface ☐ Bottom ☐ Midwater

| | | | | | |
|---|---|---|---|---|---|
| H2O Temp | | C | Sample Depth | | Ft |
| SPC | | µmho/cm | Total Depth | | Ft |
| DO | | mg/L | Width | | Ft |
| pH | | SU | Gage Stage | | Ft |
| Secchi | | Meters | Discharge | | CFS |

*Field Comments*

***All Samples must be packed in ice and chilled to 6 C***

**A - 1 Liter**
- ☐ Alkalinity
- ☐ TSOL
- ☐ TSSOL
- ☐ VTSS
- ☐ TDSOL
- ☐ BOD
- ☐ CBOD
- ☐ CO3
- ☐ Hardness
- ☐ K
- ☐ Lab Cond
- ☐ Cl
- ☐ Fluoride
- ☐ HCO3
- ☐ SO4

**B - 1 Liter**
*pH<2 ~2 mL H2SO4*
- ☐ Ammonia
- ☐ NO3+NO2-N
- ☐ TKN
- ☐ Total P
- ☐ COD

**D - 100 mL**
*Filtered + pH<2 0.25 mL H2SO4*
☐ TDP ☐ DIN

**R - 4L Cube**
☐ Ra 226 ☐ Ra 228

**CN - 150 mL**
*pH >10 ~0.4 mL NAOH*
☐ CN ☐ WADCN

**H - Liter Glass Amber**
*pH<2 ~2 mL HCL*
☐ TPH Diesel

**OG - Liter Glass Amber**
*pH<2 ~2 mL HCL*
☐ Oil Grease

**Dissolved Metals - 100 mL**
*Filtered + pH<2 ~0.5 mL HNO3*
☐ Ca ☐ Na ☐ Mg ☐ Mn ☐ K ☐ Fe

**Recoverable Metals - 100 mL**
*pH<2 ~0.5 mL HNO3*
☐ Ca ☐ Na ☐ Mg ☐ Mn ☐ Fe

**E - 1 Liter** *Filtered*
☐ HCO3 ☐ Cl ☐ SO4 ☐ Fluoride

**C - 100 mL Idex** *Na2SO3 if source is Chlorinated*
*Note: Use 250 mL bottle if requesting multiple tests*
☐ Fecal Coliform* ☐ Total Coliform ☐ Fecal PFGE ☐ E Coli* ☐ Entercocci*

| V-40mL | V1-40 mL | V2-120 mL | V3-120 mL |
|---|---|---|---|
| *3 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space* | *2 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space* | *120 mL Amber Bottle 1.5 mL H2SO4* | *120 mL Amber Bottle Filtered 1.5 mL H2SO4* |
| ☐ TPH Gas | ☐ VOC | ☐ TOC | ☐ DOC |

*Lab Comments*

**Dissolved Metals - 250 mL**
*Filtered + pH<2 ~1.5 mL HNO3*
- ☐ Al
- ☐ Sb
- ☐ As
- ☐ Ba
- ☐ Be
- ☐ B
- ☐ Cd
- ☐ Cr
- ☐ Cu
- ☐ Hg
- ☐ Pb
- ☐ Ni
- ☐ Se
- ☐ Ag
- ☐ Ti
- ☐ U
- ☐ V
- ☐ Zn
- ☐ Mo
- ☐ Silica

**Recoverable Metals - 250 mL**
*pH<2 ~1.5 mL HNO3*
- ☐ Al
- ☐ Sb
- ☐ As
- ☐ Ba
- ☐ Be
- ☐ B
- ☐ Cd
- ☐ Cr
- ☐ Cu
- ☐ Hg
- ☐ Pb
- ☐ Ni
- ☐ Se
- ☐ Ag
- ☐ Ti
- ☐ U
- ☐ V
- ☐ Zn
- ☐ Mo

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

**Sample Temp (C)** **Date / Time Received** **Lab #**