QUALITY ASSURANCE PROJECT PLAN
FOR
WATER QUALITY MANAGEMENT PROGRAMS

2018

Surface Water Quality Bureau
New Mexico Environment Department

Approved: November 19, 2018

New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB). 2018. *Quality Assurance Project Plan for Water Quality Management Programs [QAPP]*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

NOV 19 2018

Mr. Miguel Montoya
Quality Assurance Officer
Surface Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Drive
Santa Fe, NM 87505

Dear Mr. Montoya:

The Region 6, EPA office has completed review of the *Quality Assurance Project Plan (QAPP) for the New Mexico Environment Department Surface Water Quality Bureau Water Quality Management Programs 2018* submitted by the New Mexico Environment Department's Surface Water Quality Bureau (SWQB). This QAPP is a deliverable under the Cooperative Agreement (# I-006350-13) awarded under Section 106 of the Clean Water Act.

This document covers all SWQB activities related to the collection of water quality and watershed data. The QAPP is approved for a 36-month period; however, any significant changes to this document must be submitted immediately to this office for review and approval. The QAPP will expire on November 19, 2021 and a revised/updated QAPP must be submitted at least 60 days prior to the expiration date of this document (i.e. by September 19, 2021).

Enclosed is the completed QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference QTRAK # 19-057. If you have any questions, you may contact me at (214) 665-7163.

Sincerely yours,

Arlene Gaines
Project Officer
State & Tribal Programs Section

Enclosure

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FOR

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New Mexico Environment Department

APPROVAL PAGE

Miguel Montoya — 10/19/2018

Miguel Montoya
Quality Assurance Officer, Surface Water Quality Bureau — Date

Shelly Lemon — 10-19-2018

Shelly Lemon
Chief, Surface Water Quality Bureau — Date

Arlene Gaines — 11/19/18

Arlene Gaines
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Water Quality Protection Division, EPA Region 6 — Date

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Chief, State and Tribal Programs Section,
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APPENDICES

ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
ATTAINS	Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System
BMP	Best Management Practices
CFR	Code of Federal Regulations
CI	Confidence Intervals
CV	Coefficient of Variation
CWA	Clean Water Act
DO	Dissolved Oxygen
DQI	Data Quality Indicator
DQO	Data Quality Objectives
E. coli	Escherichia coli
GIS	Geographic Information System
GRTS	Grant Reporting and Tracking System
GWQB	Ground Water Quality Bureau
ID	Identification
LRG	Lower Rio Grande
MASS	Monitoring Assessment and Standards Section
MDL	Method Detection Limit
MRL	Method Reporting Level
MQO	Measurement Quality Objectives
µmhos/cm	Micromhos per centimeter
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
PSRS	Point Source Regulation Section
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Program
RID	Request Identification
RPD	Relative Percent Difference
SDL	Sample Detection Limit
SLD	Scientific Laboratory Division
SQUID	New Mexico's Surface Water Quality Information Database
SOP	Standard Operating Procedure
SPRT	Standards, Planning and Reporting Team
STORET	Storage and Retrieval System
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WPS	Watershed Protection Section
WQA	Water Quality Act
WQS	Water Quality Standards
WQCC	Water Quality Control Commission
WQX	Water Quality Exchange

1 PROJECT MANAGEMENT

This document was prepared in accordance with U.S. Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans (EPA 2002a) and the EPA Requirements for Quality Assurance Project Plans (EPA 2001). The Surface Water Quality Bureau's (SWQB) Standard Operating Procedures are incorporated in the SWQB's Quality Assurance Project Plan (QAPP) by reference.

1.1 Distribution List

The SWQB's Quality Assurance Officer (QAO) will provide a copy of the approved Quality Assurance Project Plan (QAPP) to the EPA Region 6 Project Officer and the SWQB Chief (contact information shown below). The QAO will ensure that a copy of the approved QAPP is available on the SWQB website.

All individuals (i.e., SWQB personnel, contractors, interns, volunteers, or other NMED staff) working under this QAPP will provide the QAO a written or electronic statement to verify and acknowledge access to the QAPP and responsibility to comply with the requirements of the QAPP. The QAO will be responsible for maintaining hard copy and electronic copies of all acknowledgement statements.

EPA: Arlene Gaines, Project Officer (gaines.arlene@epa.gov) EPA Region 6 Water Division, State/Tribal Programs Section (6WQ-AT) 1445 Ross Avenue, Suite 1200 Dallas, TX 75202-2733 Telephone: (214) 665-7163 FAX: (214) 665-6490
New Mexico Environment Department (NMED): Shelly Lemon, Chief (shelly.lemon@state.nm.us) NMED/SWQB Harold Runnels Building, N2050 P. O. Box 5469 Santa Fe, NM 87502 Telephone: (505) 827-2819 FAX: (505) 827-0160

1.2 Project/Task Organization

All project activities covered by this QAPP are performed by NMED SWQB personnel and individuals conducting work for the Bureau (e.g., contractors, interns, volunteers, or other NMED staff). The organization and responsibilities of key individuals are discussed below. The management structure of the NMED-SWQB is shown in Figure 1.1. while the organizational structure of the various sections and teams is illustrated in Figure 1.2. The majority of SWQB personnel have responsibilities that include environmental data collection and analysis. Their responsibilities are summarized in Table 1.1.

Quality Assurance Officer-For the purposes of Quality Assurance (QA), the QA Officer (QAO) reports to the Bureau Chief. The QAO is responsible for updating and maintaining the QAPP.

Program Managers-The SWQB is organized into four (4) sections: the Point Source Regulation Section (PSRS), the Monitoring, Assessment, and Standards Section (MASS), the Watershed Protection Section (WPS) and the Financial and Administrative Section. Each section is led by a Program Manager. Technical Program Managers report to the SWQB Chief and are responsible for verifying that all applicable activities of these sections and teams comply with the provisions of this QAPP and all associated Standard Operating Procedures (SOP). The Financial and Administrative Section does not collect environmental data.

SWQB Personnel-The PSRS, MASS, and WPS staff report to their respective Program Manager. All SWQB personnel within these sections who collect environmental data will do so in accordance with this QAPP. SWQB personnel collecting data are responsible for implementing the methods and procedures described in this QAPP, and must be familiar with and follow the provisions of this QAPP.

Project Coordinators-SWQB personnel who coordinate and manage specific projects report to their respective supervisor and Program Manager and are responsible for verifying that all data collection, storage, and management activities related to the project comply with the provisions of this plan and any applicable SOPs. Project Coordinators may include individuals leading routine water quality monitoring surveys, special water quality projects, NPDES compliance monitoring, Clean Water Act (CWA) §319 monitoring, and CWA §104(b)(3) Wetlands Program monitoring.

Non-SWQB Individuals working under this QAPP-On occasion individuals not directly employed with the SWQB (e.g. contractors, volunteers, interns, other NMED staff) collect environmental data for the Bureau.

Individuals working under the direct supervision of SWQB staff (volunteers and interns) must be familiar with and follow the applicable provisions of this QAPP and associated SOPs. These individuals report and provide data to the SWQB staff they are working directly under.

For those projects in which an individual is working under a contract for the SWQB but does not have a project specific QAPP, the QAO must provide review and approval of the quality assurances covered under the project's proposed workplan prior to data collection to ensure QA/QC requirements are consistent with the Bureau's quality assurance requirements. These Individuals report and provide data to the appropriate Project Coordinator.

Non-SWQB individuals (e.g., contractors) may also collect environmental data for the Bureau under a project-specific QAPP. These individuals must provide sufficient QA/QC information to ensure the data meet the Bureau's QA/QC requirements and adhere to the project-specific QAPP along with any applicable SOPs. These individuals also report and provide data to the appropriate Project Coordinator.

The majority of environmental data collected by the SWQB are analyzed by NM Department of Health Scientific Laboratory Division (SLD) and other contract laboratories. Each analytical laboratory must provide QA/QC information and conform to the specifications and requirements of this QAPP. Each contract laboratory will be provided with a copy of this QAPP and will report and provide data to the appropriate Project Coordinator and QAO.

Table 1.1 Summary of SWQB Responsibilities

Organizational Unit	Responsibilities	Data Use or Monitoring Conducted to meet Responsibilities	Product/Outcome
Point Source Regulation Section (PSRS)	Administers the State's responsibilities for the National Pollutant Discharge Elimination System (NPDES) program in NM		
Industrial & Stormwater Team and Municipal Team	• Inspects public and private facilities in NM for federal NPDES permit and State compliance issues • Inspects water, wastewater, stormwater facilities in NM for federal NPDES permit and State compliance issues • Reviews and certifies NPDES permits • Reviews environmental assessments and environmental impact statements	• NPDES Permit Compliance Evaluation • Non-Direct Measurement Data • Independent Studies • WQS Monitoring for enforcement	• Inspection Reports • Enforcement Actions • 401 Certifications • NPDES Permit Limits
Monitoring, Assessment, and Standards Section (MASS)	Acquires, integrates, analyzes and summarizes surface water quality data for NM		
Monitoring Team	• Coordinates water quality surveys to collect and analyze water quality data in streams, rivers, and lakes of New Mexico for use in various Clean Water Act activities • Organizes and conducts chemical data collection efforts (nutrients, metals, bacteria, organics, radionuclides and cyanide) • Organizes and conducts physical data collection efforts (habitat, geomorphology, sondes, thermographs, streamflow and hydrology) • Organizes and conducts biological data collection efforts (algae/periphyton, phytoplankton, benthic macroinvertebrates, fish community and fish tissue) • Verifies water quality assessments of chemical, physical and biological data, including lake and nutrient data, for use attainment determinations • Assists with development of Total Maximum Daily Loads (TMDLs) • Assists with refinement of water quality standards (WQS)	• Ambient Water Quality Monitoring for Assessment • Independent Studies • Hydrology Protocol Surveys • NPDES Permit Compliance • Effectiveness Monitoring	• Field Sampling Plans • Monitoring Survey Reports • Fish Consumption Advisories • White Papers or Special Reports
TMDL and Assessment Team	• Coordinates water quality assessment activities for NM • Assesses chemical, physical and biological data for use attainment determinations • Coordinates TMDL activities for NM and develops watershed-based TMDL or TMDL alternative bundles • Integrated Report Assessment • Manages CWA 604(b) water quality management planning projects	• Ambient Monitoring for Assessment • Non-Direct Measurement Data • Independent Studies • Nonpoint-Source and Watershed Protection	• TMDLs • TMDL Alternatives • Integrated Report • Assessment Protocols
Standards Planning & Reporting Team	• Maintains, refines and develops the State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) through independent studies and UAA's • Maintains and updates SWQB planning documents such as the Quality Management Plan (QMP), Statewide Water Quality Management Plan and Continuing Planning Process (WQMP/CPP), and Quality Assurance Project Plan (QAPP) • Performs quality assurance and project development support for the SWQB	• Ambient Monitoring for Assessment and WQS Review • Hydrology Protocol Surveys • Non-Direct Data • Independent Studies • Nonpoint-Source and Watershed Protection	• UAA workplans • UAAs (including those using the Hydrology Protocol) • WQS
Watershed Protection Section (WPS)	Develops watershed stakeholder groups and watershed restoration projects and implements best management practices (BMPs) for the prevention/reduction of nonpoint source pollution.		
Watershed Implementation, Restoration Team and NM Field Office Team	• Oversight of restoration projects • Implements BMPs to prevent/reduce nonpoint source pollution • Effectiveness monitoring as needed for watershed protecting projects • Reviews CWA §401/§404 permits for NM • Reviews environmental assessments and environmental impact statements • Reviews proposed mining and milling projects and close-out plans to assist GWQB with NM Mining Act and Superfund	• Watershed Protection Projects • Independent Studies • Effectiveness monitoring • Non-Direct Measurement Data	• 401 Certifications • Watershed Based Plans • Project Summary Reports • NPS Annual Reports • Clearing the Waters newsletter

Wetlands and Department of Transportation Team	• Manages Wetlands Program • Oversight of watershed and wetlands restoration projects • Reviews environmental assessments and environmental impact statements	• Independent Studies (e.g. Rapid assessment) • Ambient Monitoring • Effectiveness Monitoring • Non-Direct data	• Wetland Action Plans • Project Summary Reports • NPS Annual Report • Clearing the Waters newsletter

Figure 1.1 Management Structure of the NMED-SWQB

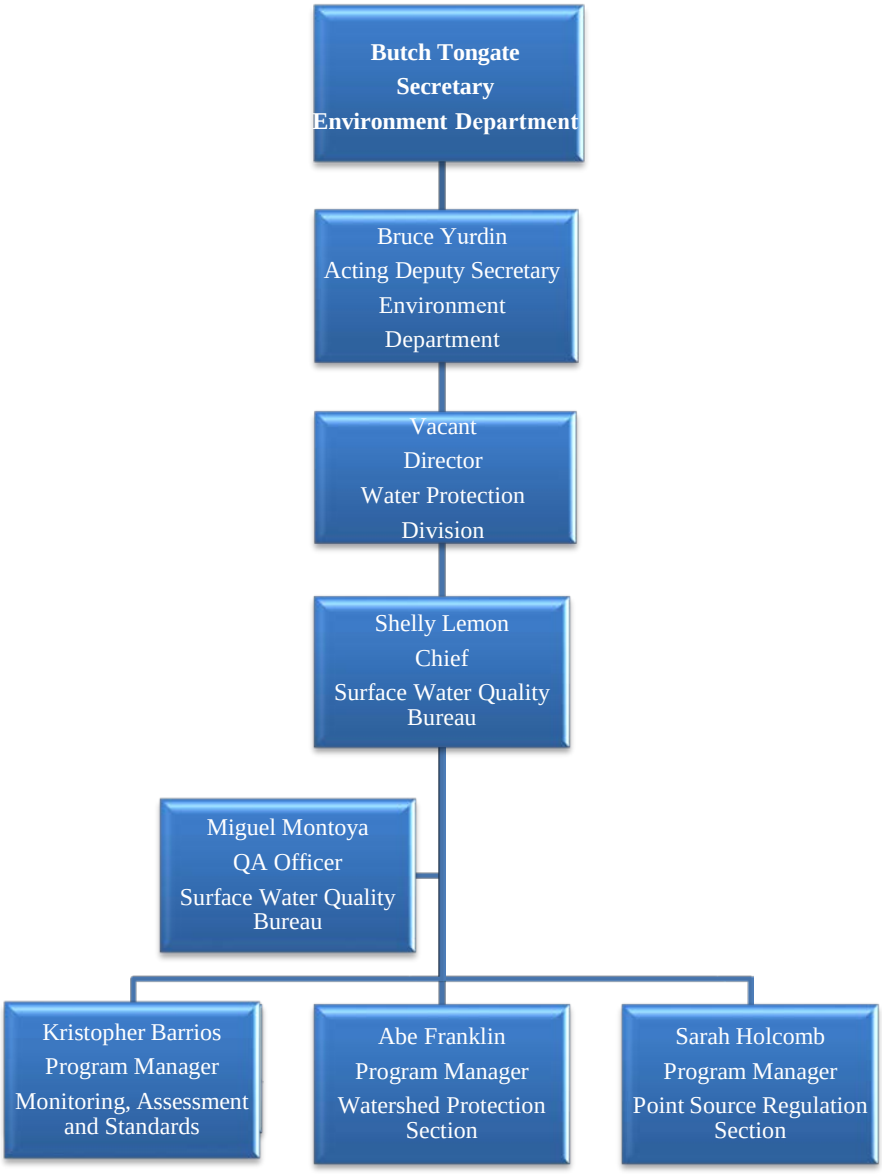
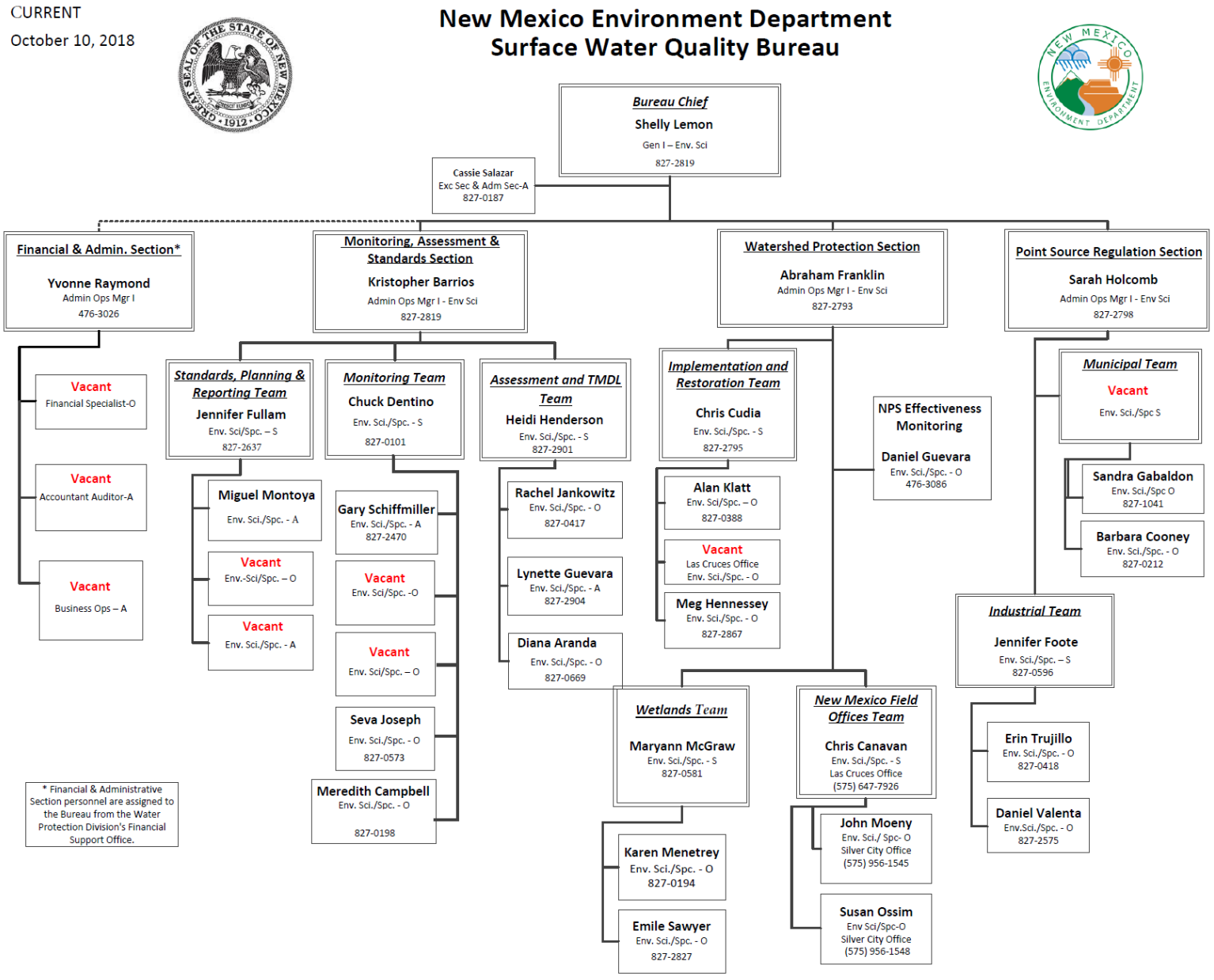


Figure 1.2 Surface Water Quality Bureau Organizational Chart October 2018



1.3 Problem Definition/Background

BACKGROUND

Section 101(a) of the federal Clean Water Act (CWA) states that "The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) restates the objective of the CWA and goes on to say that the waters include "those in New Mexico." In conformance with the CWA §§104(b), 106, 201, 205(j), 301(b), 303, 305(b), 314, 319(h), 401(a) and 604(b), the NM Water Quality Act (WQA; §§ 74-6-1 et seq., NMSA 1978) and 20.6.4 NMAC, a main goal of the SWQB data collection efforts generate and provide information to the public, the NMED and the EPA that can be used to restore and maintain the integrity of surface waters of the State of New Mexico. As such, the SWQB receives grants under the CWA to conduct water quality monitoring to achieve this goal.

PROBLEM DEFINITION

Due to the dynamic nature of natural systems, the integrity or condition of New Mexico's surface waters may not always be known due to a lack of information or because of changing conditions. For example, the location of degraded waters and/or the level of degradation or contamination may not be known or may change as a result of human activities or natural occurrences (e.g., floods, droughts, wildfires, etc.). In other cases, standards for evaluating the condition of surface waters may change.

To address these problems, the SWQB collects chemical, physical and biological data to evaluate the condition of the State's surface waters, determine where degraded waters occur, and gauge the effectiveness of restoration projects and permit limits and conditions.

1.4 Project/Task Description

The SWQB collects, analyzes and uses data from waters of the State on a structured, rotating basis to identify where water quality problems exist, prioritize protection and restoration projects, and guide NPDES permitting and WQS revisions. There are several areas of focus that routinely involve data collection, management and analysis. Monitoring types and strategy details are described in Table 1.2. Details regarding section monitoring products, outcomes, questions, objectives and decision criteria are described in Table 1.3.

Table 1.2 SWQB Environmental Monitoring Types and Strategy Details

Type of Monitoring	Collected Data and Application	Section and General Schedule
NPDES Permit Compliance Evaluation -	NPDES Compliance Evaluation Inspection – Collection and evaluation of data, including self-monitoring reports as well as a review of a permitted facility's records and a visual examination of the treatment facility, effluent, and receiving waters. The results of which may lead to enforcement action.	PSRS Year-round as needed
	NPDES Compliance Sampling Inspection – Incorporates all components of a Compliance Evaluation Inspection and adds to it the collection of effluent samples and verification of flow measurements to determine effluent quality and permit compliance. Samples of the receiving stream above and below the outfall are also collected in some instances to evaluate the chemical impact of the effluent on the stream.	
	NPDES Performance Audit Inspection - Evaluation of permittee's sampling, laboratory and record-keeping procedures.	
	NPDES Reconnaissance Inspection - An abbreviated Compliance Evaluation Inspection often used to determine the general status of a facility or to focus on only one aspect of compliance, such as effluent quality, without performing a complete review.	
Water Quality Ambient/Assessment Monitoring	Targeted Monitoring - Collection and evaluation of physical, chemical and biological parameters from specified locations in order to 1) evaluate known or suspected influences on water quality (both natural and anthropogenic), 2) identify the condition of unassessed waterbodies, 3) provide information for TMDLs (or TMDL alternatives), standards development or revision, UAAs, development or revision of listing methodologies, and/or 4) assess against the State's WQS.	MASS Routine monitoring is conducted on a rotational basin schedule with intensive surveys being conducted over a two-year period for each basin so surveyed waters are evaluated within an eight-year period. Sampling is conducted annually from Spring to Early Fall (March-October)
	Fixed-Station Monitoring - The repeated long-term sampling or measurement of water quality parameters at representative locations to determine the waterbody's waterbody characteristics, and temporal trends. Fixed-station monitoring may be done over a specified location for a particular period of time or be conducted on a rotating basin survey schedule.	
	Probabilistic Monitoring – Unbiased statistical survey of waterbodies to determine general water quality condition at a watershed or state-wide scale.	
Hydrology Protocol Surveys	The collection and evaluation of hydrological, geomorphic and biological indicators of the persistence of water and is organized into two levels of evaluations. The Level 1 Evaluation is required for the expedited UAA process described in 20.6.4.15.C NMAC. Hydrology Protocol surveys may also be used to determine the appropriate application of WQS.	MASS Late Spring and Fall outside of summer monsoons and winter precipitation and snowmelt
Water Quality Standards (WQS) Monitoring for Enforcement Purposes	Collection and evaluation of environmental data from sites selected based upon known or suspected influences on water quality (both natural and anthropogenic) to determine whether pollutant concentrations in a waterbody are in compliance with the limits and conditions specified in the *State of NM Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC). This type of monitoring is similar to Targeted Monitoring with modified procedures pertaining to number of samples collected and chain of custody requirements for the purposes of considering enforcement action.	MASS or PSRS Year-round, as needed
SWQB Watershed Protection Projects	The SWQB's collection and evaluation of biological, chemical, physical (including geologic, streamflow, soils and vegetation) data to evaluate watershed conditions used for developing watershed based plans, partitioning out potential sources and causes of impairment, rapid assessments of wetlands and potential use for assessment against the State's WQS.	WPS Late Spring to Early Fall (March-October)
Effectiveness Monitoring	Collection and evaluation of environmental data to monitor and model changes in physical, chemical, and biological data associated with nonpoint source pollution control projects for the	WPS

Type of Monitoring	Collected Data and Application	Section and General Schedule
	purpose of assessing the projects overall effectiveness in reducing nonpoint sources and improving water quality. Data collected for this purpose may also have potential use for assessment against the State's WQS. Sampling design typically consists of upstream/downstream locations to be sampled before and after project implementation.	Late Spring to Early Fall (March-October)
Incident Response Monitoring	Monitoring conducted in response to a known or suspected unpermitted release, discharge or spill to a surface water body. The information is used to determine the magnitude, extent and severity of impact to designated or existing uses. Monitoring may continue, as needed, to inform incident and recovery management, and requirement of corrective actions.	MASS, PSRS, or WPS Year-round, as needed
Independent Studies conducted by the SWQB	Collection and evaluation of environmental data (direct and indirect) to monitor and model various independent studies pertaining to the goals and objectives of the SWQB.	MASS, PSRS or WPS Dependent on scope of work and goals of study

Table 1.3 SWQB Environmental Monitoring Summary for Waterbodies Sampled

Objective	Question or Decision	Decision Criteria	Products/Outcomes
Assess designated use attainment for the Integrated Report and provide information to the public on the condition of surface water	Surface waters of the state are meeting WQS criteria?	WQS as interpreted by the Assessment Protocols	Monitoring Survey Report Integrated Report
Develop NPDES permit limits	What are the maximum concentrations of pollutants that can be discharged and meet the requirements of the WQS?	WQS and receiving water assimilative capacity	401 Certification NPDES Permit Limits
Determine if an unauthorized discharge impacted water quality	Did an unauthorized discharge cause a violation of the WQS?	WQS or immediate threat to human health	Enforcement Actions (Compliance Order or Civil Action)
Evaluate compliance with NPDES permit limits	Does the effluent quality meet the NPDES permit requirements?	NPDES permit limits	Inspection Reports Enforcement Action
Develop load and waste load allocations for TMDLs	What is the maximum pollutant load a waterbody can receive and meet the requirements of the WQS?	WQS and receiving water assimilative capacity	TMDL Plans TMDL alternatives NPDES Permit Limits
Develop or refine WQS	Are existing uses appropriate for the waterbody?	Data support a petition to the WQCC to revise WQS	UAA Workplans UAAs (including those using the Hydrology Protocol) Amendments to NM WQS
Develop wetlands standards	What are the appropriate criteria for wetlands?	Data support a petition to the WQCC to incorporate wetland specific WQS	Amendments to NM WQS
Determine probable sources and nonpoint source mitigation measures	What are the probable sources of impairment and what are the potential mitigation measures to control nonpoint sources?	WQS as interpreted by the Assessment Protocols Best management practices	Watershed Based Plan
Evaluate effectiveness of restoration and mitigation measures implemented to control nonpoint sources	Have watershed restoration activities and mitigation measures improved water quality?	WQS as interpreted by the Assessment Protocols Data show improved water quality	Project Summary Reports Success Stories NPS Annual Report
Respond to citizen complaints, fish kills, spills and emergencies	Is the water or effluent quality a hazard to human or environmental health?	WQS, data and site investigation	Public communication Enforcement Actions Fish Consumption Advisories
General education and public outreach	Is the general public being informed on SWQB water quality issues	Information is disseminated to the public through the product outcomes	White paper Special Reports Clearing the Waters newsletter Monitoring Survey Report Integrated Report

1.5 Quality Objectives and Criteria for Measurement Data

The establishment of quality objectives ensures that the SWQB makes decisions relating to water quality management that are:

- consistent with the mission, goals and objectives of the NMED and SWQB;
- based on proper application of federal and state regulations, policy and guidance;
- based on all available pertinent information;
- based on a thorough understanding of the information; and
- based on accurate information.

Data Quality Objectives (DQOs) are statements about how certain the decision-maker wants to be about the decision that will be made based on the data. For data collected under this QAPP to support the decisions listed in Table 1.3, the Data Quality Indicators (DQIs) identified in Table 1.4 must be of sufficient quality to provide a high level of confidence in the resulting decisions.

Measurement Quality Objectives (MQOs) are statements about how good the measurements need to be in order to be useful as inputs to the decision process. MQOs are often expressed as statements about the acceptable values of Data Quality Indicators (DQIs) and include measures such as percent recovery, percent relative standard deviation and minimum detection level (MDL). Acceptable values for these objectives are provided in Appendix B: Analytical Methods and Detection Limits, and in SWQB SOP 15.0 Data Verification and Validation.

Table 1.4 Data Quality Indicators

DQI's	**Determination Methodologies**
Precision	The degree of variation in repeated measurements of the same quantity of a parameter are minimized by assuring samples are taken in a consistent and repeatable manner as described in the applicable SWQB SOP.
Bias	Much of the environmental sampling conducted under this QAPP, compares water quality of particular waterbodies on a temporal scale to which the potential systematic bias of a measurement or the process to which it is collected may cause errors in one direction. This is minimized, to the extent possible, by training staff on repeated sampling procedures in accordance with established SOPs and as prescribed in a field sampling plans or other project sample designs, auditing of those processes as needed and documentation through field notes and applicable revisions to SOPs.
Accuracy	The degree of correctness with which a measurement reflects the true value of the parameter being assessed is enhanced through routine calibration practices as prescribed under the applicable SOP and the use of equipment with a range of accuracy within the decision criteria. Acceptable levels of accuracy are specified in the SOPs are verified through evaluation of routine duplicate, spiked and field blank sampling, as appropriate.
Representativeness	The measure of the degree to which data accurately and precisely represent variations at a sampling point, is assessed through the sample design process and selection of methods based on the question or decision being monitored for by considering the spatial and temporal scale of the waterbody being evaluated.
Comparability	Understanding and documenting the extent and magnitude of error in a dataset is important in being able to assess if the dataset is going to be comparable. Documentation of the instruments being used, the applicable SOPs being used and any field notes along with comparisons to field blanks, spiked samples and duplicate samples will

	provide the information for a dataset to determine its comparability. Assessed through the sample design process and selection of methods.
Completeness	In order to ensure confidence of the dataset for use in the decision it is intended for, the percent of validated samples collected for a particular dataset from the number that were planned should not be below 90%. Calculated based on the required number of samples.
Sensitivity	The ability to discern the detection of a parameter within a sample set from null in order to meet the decision criteria is based on the method being used in regard to the sensitivity of the instrument, potential interferences with other parameters, training to collect and analyze the sample as well as the processes needed to calibrate within an acceptable range.

1.6 Special Training/Certifications

Proper training of field personnel represents a critical aspect of meeting the data quality objectives in order to fulfill the goals of this QAPP. All SWQB staff that collect environmental data under this QAPP will have sufficient training and experience. Additionally, all non-SWQB individuals (e.g. Volunteers) and newly hired SWQB personnel will be accompanied by experienced staff when collecting samples or field measurements until such a time that the Project Coordinator (if applicable), Supervisor, or Program Manager determines that the individual can carry out data collection activities in accordance with this QAPP and any applicable SOPs. Copies of all applicable training records are maintained in the SWQB's Personnel files. Specific requirements prior to conducting field work under this QAPP include:

- All individuals conducting work under this QAPP are required to be familiar with the Statewide Water Quality Management Plan (WQMP) and Continuing Planning Process (CPP).

- All individuals conducting work under this QAPP are required to read the SWQB's QMP and sign acknowledgement form prior to conducting any data collection, management or analysis activities. Supervisors will provide these and other applicable documents to all new staff.

- All individuals conducting work under this QAPP are required to read the applicable SOP's and sign acknowledgement forms prior to conducting any data collection, management or analysis activities. Supervisors will provide these and other applicable documents to all new staff.

- All SWQB personnel conducting work under this QAPP are required to complete and maintain their Defensive Driving certification through the National Safety Council Defensive Driving Council. All SWQB personnel are responsible for keeping this certificate on their persons when operating or while in a State Vehicle as well as providing a copy of their certificate to their supervisor, the SWQB vehicle coordinator and the NMED human resources department.

- All individuals conducting work under this QAPP must read and provide written acknowledgement of understanding of the job hazards identified under the SWQB's Job Hazard Analyses (JHA).

- All individuals conducting work under this QAPP must undergo laboratory safety training by the SWQB's Laboratory Safety Officer and be familiar with and provide written acknowledgement of understanding of the SWQB's Chemical Hygiene Plan (CHP). No individual shall be allowed in the SWQB laboratory without training and acknowledgement of the SWQB's CHP or under the presence of at least one (1) trained SWQB staff.

- The PSRS are required to receive NPDES inspector training, obtain EPA credentials and be familiar with this QAPP and EPA's NPDES Compliance Inspection Manual (EPA 2017). All new PSRS personnel are accompanied on NPDES inspections by experienced inspection officers until the Program Manager or direct Supervisor determines that the staff person is appropriately

trained and qualified to conduct an inspection, deal with compliance issues, and write an inspection report.

- Additional training may be required to conduct specific aspects of an individual's job duties either in the field or in an office setting. These trainings may be provided upon request of the individual, as resources allow, or as directed by the State Personnel Office, NMED Secretary, Deputy Secretary, Human Resources Department, Water Protection Division Director, SWQB Chief, Program Manager or Project Coordinator.

1.7 Documentation and Records

GENERAL DOCUMENTATION REQUIREMENTS.

This QAPP and referenced procedures includes methods related to: the collection, processing, analysis, reporting and tracking of environmental data. This QAPP is updated, at a minimum, tri-annually and is made available to those responsible for collecting, processing, and analyzing data in accordance with SWQB procedures.

Documentation of data generated from projects covered by this QAPP must be of sufficient quality to withstand challenges to their validity, accuracy, and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures. The documentation of all environmental data collection activities must meet the following minimum requirements:

- Data and associated information must be documented directly, promptly, and legibly by the observer onto established SWQB forms or in designated field logbooks. All reported data must be uniquely traceable to the raw data. Data reduction, correction or transformation changes must be documented, dated and initialed.

- All original data records include, as appropriate, a description of the data collected, units of measurement, station or location identification (if applicable), name or initials of the person collecting the data, date and time of collection, and as applicable, the unique sample identification (Laboratory Request Identification [RID] number).

- Any changes to the original (raw data) entry must not obscure the original entry. The reason for the change must be documented, the change must be initialed and dated by the person making the change and approved by the Program Manager.

Tables 1.5 and 1.6 summarize how records are managed by each section within the SWQB. Other specific documentation requirements are discussed below and throughout this QAPP and the most current SWQB SOPs.

Detailed descriptions and additional information on Surface Water Programs administered by the SWQB can be found in the Statewide Water Quality Management Plan (WQMP) and Continuing Planning Process (CPP) and other water quality planning related documents available on the Bureau's website at https://www.env.nm.gov/surface-water-quality/.

Documentation of the Sampling Design and Planning Processes

Each project taken on by the SWQB has a planning process that is documented through project specific Field Sampling Plans (FSPs) or Sample and Analysis Plans (SAPs) which must be approved by the Program Manager and the QAO. Each Project Coordinator is responsible for ensuring that the planning process is documented.

Documentation of Data Collection (Field and Inspection) Activities

Records are maintained for each data collection activity to ensure that samples and data are traceable and defensible. Field data and observations will be documented electronically or in hard copy on established SWQB forms or in designated field logbooks to provide a secure record of field activities, observations and measurements during sampling. At a minimum, these records will document the date, time, field staff, location and parameters being measured along with any other information required by the applicable SOP for the work being performed. Field observations and measurements not collected using SOP forms will be recorded using a hard-bound field logbook. Entries in field logbooks are never erased nor pages removed. Mistakes are stricken with one line and initialed by the data recorder. Field observations being collected in electronic format shall be completed in the field and preserved in a format to prevent unmarked entry or corrections. Completion of appropriate field documentation and forms for each sample is the responsibility of the designated data recorder. Verification of field documentation must be completed by staff not party to the data collection. Field forms and documentation are then uploaded or filed in the appropriate designated record location.

Documentation of Data Analysis and Modeling

Upon verification and validation of data, data sets may be copied and used to evaluate the decision criteria and develop the output as described in detail in Table 1.3. This may include use of the data in models or evaluation of data through functions commonly found in spreadsheets. Documentation of how manipulations were conducted, assumptions that were made and the results of such actions on the data shall be documented in the output reports.

Documentation of Analytical (Laboratory) Activities

Documentation of all water quality samples to be analyzed by an external laboratory is critical for tracking data and evaluating the success of any activity. Each analytical laboratory is required to provide the SWQB with a current QAPP (or equivalent) and must meet the requirements specified in this QAPP and EPA regulations. Documentation may include, but is not limited to, the following:

- Calibration and maintenance records for all instruments and equipment involved in the collection of environmental data;
- Records of preparation of calibration standards, spiking solutions, and dosing solutions such that each unique preparation can be tracked to the original (neat) material;
- Lot numbers for all standards, stock solutions, reagents, and solvents;
- Records of all sample processing or preparation for testing such that it is traceable to sample receipt records;
- All sample analyses request forms and results of analyses (all rejected data are accompanied by explanations of the failure and the corrective action); and
- All data reduction/transformation formulas such that reported data can be reproduced from the raw data.
- Analytical laboratory custody records
- Laboratory analysis results with quality assurance reports, appropriate data condition qualifiers and quantitated values for detection condition.
- Definitions of analytical qualifiers

MANAGEMENT AND LOCATION OF RECORDS

Records include a compilation of all documentation identified above and are managed in slightly varying ways depending on the objectives of the activity and program creating the record. They are described in detail for each as follows:

Water Quality Ambient/Assessment Monitoring

Water quality survey project files maintained by the MASS for water quality surveys include numerous and diverse documents and records. Project files are maintained by the Project Coordinator; however, the file is used by numerous staff within the section for various purposes. To ensure consistency and

accessibility to all users, hard copies of all water quality surveys and special studies project are maintained in three ring binders as follows:

Label each binder on spine and front cover with the following information:

Survey Title
Survey Year(s)
[Binder X of X]
Hydrologic Unit Code/Watershed

Create tab dividers with labels for the sections listed below and place all associated documents and records in the applicable section of the binder in the same order as listed below:

- Introductory Information
    - Map(s) of survey area
    - Field Sampling Plan
- Background Information
    - Reconnaissance Information
    - Access information (if not in database)
    - Supplemental information pertinent to the survey (land-use, land activities, BMPs, etc.)
- Chemical Data
    - Field Forms
    - Analytical Laboratory submittal forms – date stamped copies (in lieu of chain of custody)
    - Flow field forms and flow calculation worksheets
- Habitat Data
    - Habitat Field Sheets
- Long-Term Deployment
    - Sonde, datalogger and thermograph deployment sheets
- Biological Data
    - Macroinvertebrates - Benthic macroinvertebrate collection forms
    - Periphyton/Chlorophyll collection forms
    - Phytoplankton and/or diatom collection forms
    - Fish Collection Forms
- Data Verification/Validation
    - Data Verification and Validation Worksheet and associated attachments
    - Additional paperwork associated with the verification and validation process
- External Data (paper or CD form)
- Sources/Causes
    - Probable Source Field Forms

Upon completion of verification and validation of a project, the forms and associated attachments are provided to the QAO for review and approval. Final verification and validation documents are filed with the QAO.

These records are also held in electronic format on a secured area within the MASS folders on the SWQB's server where routine backup mechanisms are employed.

NPDES Compliance Inspections

In addition to the documentation of the planning process, field collection activities and of analytical activities identified above, the records for NPDES Compliance Inspections will include: inspection records, photodocumentation, non-transient correspondence records with the Permittee(s) and any other relevant supporting documentation not considered confidential or subject to attorney client privilege.

These records are held in hard copy with the assigned SWQB Compliance Officer and in electronic format on a secured area within the PSRS on the SWQB's server where routine backup mechanisms are employed.

WQS Compliance Monitoring for Enforcement Purposes

In addition to the documentation of the planning process, field collection activities and of analytical activities identified above, the records for compliance monitoring for enforcement purposes will include inspection records, photodocumentation, non-transient correspondence records with the responsible party and any other relevant supporting documentation not considered confidential or subject to attorney client privilege. These records are held in hard copy with the assigned SWQB Compliance Officer and in electronic format on a secured area within the PSRS on the SWQB's server where routine backup mechanisms are employed. NMED's Office of General Counsel will also have records of the enforcement action (e.g., notice of noncompliance, notice of violation, administrative order of consent, civil action).

Hydrology Protocol Surveys

The documentation and records generated for hydrology protocols are maintained with the Standards, Planning and Reporting Team under the MASS program. These surveys are used to develop hydrology protocol UAAs, as applicable and become part of the administrative record pending the result of the survey warranting a standards revision in accordance with the Hydrology Protocol outlined under Appendix C of the Department's WQMP/CPP. Records are held in hard copy with the Water Quality Standards Team Supervisor and in electronic format on the SWQB's server where routine backup mechanisms are employed.

SWQB Watershed Protection Projects

The records affiliated with Watershed Protection Section projects conducted by the SWQB are maintained with the individual SWQB's project officer's files. SWQB project officers also maintain records for those projects being implemented by outside entities which must have their own project specific QAPP. Records are held in hard copy with the Project Officer and in electronic format within a secured area within the WPS folders on the SWQB's server where routine backup mechanisms are employed.

Effectiveness Monitoring

The records affiliated with effectiveness monitoring are held both in electronic and hard copy by the effectiveness monitoring project coordinator. Electronic records are held within a secured area within the WPS folders on the SWQB's server where routine backup mechanisms are employed.

Other SWQB Projects

Hard copy and electronic copies of records affiliated with other projects conducted by the SWQB will be maintained by the principle investigator (project coordinator). Electronic records are held within a secured area of the SWQB's server where routine backup mechanisms are employed.

Location of Hard Copy Documents

Physical files are maintained for all projects undertaken by the SWQB. Table 1.5 identifies the contents of each file type and the respective locations. The public has access to SWQB files in accordance with the Inspection of Public Records Act, NMSA 1978, Sections 14-2-1 et seq. and the NMED Inspection of Public Records Policy 01-06 (2004). All SWQB files and documents will be maintained in accordance with the New Mexico Executive Record Retention and Disposition Schedule (**1.18.667**.1 NMAC - N, 7/8/2000; A, 5/14/2007).

Table 1.5 Locations of Documents Available from the SWQB

Records	Locations	Contents
Project Files	Hard Copy: Project Coordinator or designee's office or SWQB Library (Ste. N2104 Rolling Files) Electronic Copy: Bureau's designated folder on Agency server.	A project file is maintained for each project undertaken by the SWQB. The Project Coordinator creates the file immediately upon assignment and maintains the file until completion. Each project file includes all documents (hard copy and/or electronic copies) pertaining to the project, including data forms, data reports, QA/QC and Data Verification and Validation information, notes, etc. Once a project is considered complete the file is transferred to the appropriate SWQB Library location and stored according to that section's record retention and disposition schedule.
Quality Assurance Files	Hard Copy: QA Officer's office or SWQB Library (Ste. N2104 Rolling Files) Electronic Copy: Bureau's designated folder on Agency server.	Quality Assurance files include all information relating to QAPP and QMP revisions, QAPP training, acknowledgement forms, SOPs, copies of Data Validation and Verification results and Data Quality Assessment information.
Administrative Record for actions taken by the WQCC	Hard Copy: Administrator for Boards & Commissions Electronic Copy: Bureau's designated folder on Agency server, and on the New Mexico WQCC website	The Administrative Record contains all documents that were submitted to the WQCC for the record to set forth their decisions regarding the development and revisions to the State's Water Quality Standards, the approval of the Integrated Report and issuance of TMDLs. All documents approved by the WQCC are posted on the SWQB website.
NPDES Inspection Records, PSRS Public Files	Hard Copy: SWQB Ste. N2050 On SWQB PSRS website	All information pertaining to NPDES permits and inspections. Files are maintained by facility type and filed under facility type, name and permit number in a "Reports" file. Results of non-traditional NPDES inspections and inspection reports are filed under "Reports" by NPDES permit type (e.g. CAFO, storm water, etc.). Any additional records obtained from the facility during an NPDES inspection or submitted by a facility operator for clarification subsequent to an inspection are also filed under the appropriate "Reports" file. Reports and files are maintained indefinitely; however, older files are transferred to compact disc or archived.
SWQB Reports	Hard Copy: State Library, Program Manager and SWQB Library (Ste. N2104 Rolling Files) Electronic Copy: Bureau's designated folder on Agency server.	Reports to EPA as required under approved workplans, Statewide Water Quality Management Plan/Continuing Planning Process, Nonpoint Source Pollution (NPS) Annual Report, Nonpoint Source Management Plan and Water Quality Survey Summaries
Other Records	Hard Copy: SWQB Premises Electronic Copy: Bureau's designated folder on Agency server.	Each Section within the SWQB maintains the documents produced by the section. In addition, each section also maintains reference and informational documents pertinent to that section. Contact Program Manager for information on exact locations.

REPORTING DOCUMENTS

Numerous reporting documents are produced by the various sections of the SWQB and are summarized in Table 1.6. In addition to the reports described below many SWQB projects require the submittal of progress reports to provide periodic status reports on a project.

Table 1.6 Summary of SWQB Reporting Documents

Organizational Unit	Reporting Documents Produced	Description
Point Source Regulation Section (PSRS)	Inspection Reports	Inspection reports are partially based on a review and evaluation of records maintained by the facility and PSRS. Records reviews vary by the type of facility (different facilities/permits have different record keeping requirements) and may include: monitoring reports, previous inspection reports, permit applications, permits, and past or pending EPA enforcement actions, laboratory records, site self-inspection records, employee training records, nutrient management records, etc. Results from inspections are documented on EPA form 3560-3 and are discussed in the Inspection Report. Inspections Reports include details on all findings made during an inspection and may include photographs taken during the inspection. Inspection reports are submitted to both the facility operator(s) and EPA. Inspection reports may be used to determine compliance with the federal CWA.
Monitoring, Assessment, and Standards Section (MASS)	State of NM Clean Water Act §303(d)/§305(b) Integrated Report	A summary of the water quality status of NM waters and the management actions necessary to protect and restore them.
	Water Quality Survey Summaries	Summary of the results of a water quality survey that includes a map of the study area, descriptions of the sampling stations, and a summary of the sampling events.
	TMDL Planning Documents	A written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads.
	State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC)	Establishes the designated uses for a waterbody in order to restore and maintain the chemical, physical and biological integrity for the protection of aquatic life and for recreation in and on the water in accordance with the CWA. It further defines the water quality criteria determined to be protective of the designated uses and establishes the State's antidegradation policy for protection of waters.
	Statewide Water Quality Management Plan/Continuing Planning Process	Establishes the state's processes which are used for managing its water quality program and describes how water quality assessments are used to prioritize water quality problems and implement control measures.
	Quality Management Plan	Describes the SWQB quality system for planning, implementing, documenting and assessing the effectiveness of environmental data operations.
	Quality Assurance Project Plan	Planning document that describes the necessary QA procedures, QC activities, and other technical activities that are implemented by the SWQB.
Watershed Protection Section (WPS)	Nonpoint Source Pollution (NPS) Annual Report	Provides an overview of NPS management related activities conducted in NM each year and summarizes the status of NPS 319(h) projects and wetland restoration activities.
	Project Summaries	Provide detailed information on the results of individual watershed restoration projects.

2 DATA GENERATION AND AQUISITION

This section addresses all aspects of data generation and acquisition to ensure that appropriate procedures for sampling, measurements and analysis, data collection/generation, data handling and QC activities that are employed and documented by the SWQB are appropriate, reliable, defensible and of sufficient quality to fulfill the project goals and objectives.

2.1 Sampling Design Process

Sample design for any data collection activity conducted by the SWQB must be completed before sampling or data collection commences in order to ensure data is collected in a manner which aptly reflects the goals of the study and meets the DQIs of this QAPP. The general components to be incorporated into the sampling design for data collection conducted by the SWQB are described below.

- General project organization and key staff
- Sampling locations and a description on the methods used to determine the sampling locations
- Sampling parameters
- Sampling methodologies
- Sampling frequencies
- Sample size
- Overall timeframes
- Location and types of QC samples
- A summary of any previous data collection within the study area including those beyond SWQB's activities, if information is available

For each of the monitoring activities listed under Table 1.2, sufficient information regarding the sampling design is either described under this QAPP or is supplemented with a FSP or SAP for the particular data collection activity. If a field sampling plan is required, it must be reviewed and approved by the applicable Program Manager and QAO prior to commencement of work.

The sampling design for projects implemented under this QAPP will vary depending on the objectives of the project; however, the majority of the sampling done by the SWQB is based on a targeted sampling design. Targeted sampling design is the selection of sampling locations, dates, parameters, and frequencies based on knowledge of the features and conditions under investigation and on professional judgment, with no randomization. The advantage of a targeted design is that data needs and questions regarding specific waterbodies can be addressed efficiently. However, targeted sampling adds potential bias to a dataset and reduces the level of confidence to be quantified and limits the statistical inferences that can be made (EPA 2002b). In order to draw unbiased conclusions on the status of the State's waters, SWQB implements a probabilistic sampling design for select water resource types.

WATER QUALITY AMBIENT/ASSESSMENT MONITORING

The Monitoring, Assessment, and Standards Section (MASS) conducts water quality surveys on waterbodies within basins throughout NM. Specific details on SWQB's monitoring program can be found in the *10-Year Monitoring and Assessment Strategy* (NMED/SWQB 2016). Information regarding specific sampling designs can be found in the Field Sampling Plans. Field Sampling Plans for surveys conducted under this QAPP include sampling locations, sampling frequencies, dates/timeframes, sample size and frequency and location of QC samples.

Waterbodies that are monitored during a given survey are determined by immediate data needs and age of existing data. Data needs have been determined based on impairments from previous studies, identified data gaps, and consultation with SWQB technical staff as well as other state agencies, federal agencies, tribes, local watershed groups, and interested parties. Waterbodies with data greater than five years old are given a higher priority. An eight year rotational monitoring schedule for water sampling activities is currently being utilized. This rotational cycle may be modified as necessary to reflect changing priorities and special requirements. The primary objective of Bureau's ambient monitoring program is to

assess designate use attainment for the Integrated Report and provide information to the public on the condition of surface waters of NM.

Table 2.1 Commonly Sampled Parameters

Analytical Suite	Parameters	Notes, if applicable
Field Parameters	pH	Both instantaneous and long-term deployment
	Temperature	Both instantaneous and long-term deployment
	Specific Conductance	Both instantaneous and long-term deployment
	Dissolved Oxygen (DO)	Both instantaneous and long-term deployment
	Turbidity	Both instantaneous and long-term deployment
	Flow (Discharge)	Flow not taken if stream gage present
Metals	Dissolved Metals	List of specific metals identified in FSP
	Total Metals	Total Al: 10 μm filter for Turbidity > 30 NTU, List of specific metals identified in FSP
Anion and Cations	Alkalinity	
	Bicarbonate	
	Calcium	For hardness calculation
	Carbonate	
	Chloride	Subject to segment-specific numeric criteria
	Hardness	Must be collected concurrently with metals for which the WQS criterion is “hardness dependent”
	Magnesium	For hardness calculation
	Sulfate	Subject to segment-specific numeric criteria
	Total Dissolved Solids	Subject to segment-specific numeric criteria
	Total Suspended Solids	
Nutrients	Ammonia	
	Nitrate plus Nitrite	
	Phosphorus, Total	
	Total Kjeldahl Nitrogen	
	Total Persulfate Nitrogen	
Bacteria	Escherichia coli	
	Total Coliform	
Organic Chemicals	Base/Neutral/Acids Semivolatiles (SVOCs)	See USEPA Method 8270D or Appendix B for list of specific SVOCs analyzed
	Volatile Organic Chemicals (VOCs)	See USEPA Method 8260B or Appendix B for list of specific VOCs analyzed
	PCBs	Congeners, Blank Corrected
Radionuclides	Radium 226/228	Required for adjusted Gross α/Gross β
	Gross α/Gross β	
	Total Uranium	Required for adjusted Gross α/Gross β
Other Parameters	Cyanide	WQS criteria is for total recoverable cyanide
	Total Chlorine Residuals	
	Chlorophyll a	Collected for nutrient assessment
Toxicity	Ambient Toxicity	Analysis performed by USEPA Region VI
Biological	Macroinvertebrates	
	Fish Community	

	Fish Tissue	Analyzed for PCBs, Hg, Se, DDT or other contaminants of concern
	Periphyton	
	Phytoplankton	
Physical Habitat	Percent Sand and Fines	
	Stream Slope	
	Percent Canopy Cover	
	Channel Cross Section	

Table 2.2 Parameters Associated with Designated Uses

Designated Use	Parameters
Aquatic Life[1]	- Dissolved oxygen, pH, specific conductance and turbidity (7-14 day sonde deployment, generally in late summer and fall) - Temperature (capturing summer season maximum) - Total nutrients[2], total metals[3], dissolved metals[4], hardness -Flow (if a stream) and depth (if a lake)
Primary or Secondary Contact	*Escherichia coli* and pH
Domestic Water Supply	Total nutrients[2], total metals[3], dissolved metals[4], radionuclides[5], and organics[6]
Irrigation	pH, dissolved metals[4], TDS/TSS, hardness, chloride, and sulfate
Livestock Watering	Total nutrients[2], total metals[3], dissolved metals[4], and radionuclides[5]
Wildlife Habitat	Total metals and cyanide
Human Health	Dissolved metals[4] and organics[6]

1 Parameters collected for aquatic life use are also used to assess narrative standards such as biological integrity, bottom deposits, plant nutrients, and turbidity.
2 Total Nutrients include nitrate + nitrite, ammonia, total Kjeldahl nitrogen, and total phosphorus and may also include Total Persulfate Nitrogen.
3 Total metals include aluminum, mercury and selenium at a minimum.
4 Dissolved metals typically include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.
5 Radionuclides include gross alpha/beta and Ra-226 + Ra-228 and Total Uranium.
6 Organics include base/neutral acid extractables (Method 8270) and volatile organic compounds (Method 8260).

Core biological indicators for surface waters

SWQB measures biological indicators of water quality at selected sites when core indicators indicate reasonable probability of impairment or to support special studies. Core biological indicators may include:

- Environmental Monitoring & Assessment Program (EMAP) or SWQB habitat survey (during index period) to include physical habitat data such as substrate composition, geomorphology, and riparian health assessments
- Benthic macroinvertebrate collection (during index period – August through November), identification, and enumeration
- Nutrient survey (during index period) to include chlorophyll *a*, ash free dry mass, and periphyton community composition
- Fish survey (during index period), identification, and enumeration
- Fish tissue samples for updates to fish consumption advisories

HYDROLOGY PROTOCOL

The parameters collected for the Hydrology Protocol are outlined under Appendix C of the Department's WQMP/CPP which is subject to public comment prior to review and approval by the WQCC and EPA Region 6.

NPDES COMPLIANCE INSPECTIONS EVALUATIONS

The federal NPDES permit program is the principal mechanism used by New Mexico for the protection of its surface waters from pollution by point-source discharges. Under this program, a permit specifies the amounts and concentrations of contaminants that a permittee may discharge to a waterbody. In addition, various (depending on the type of facility permitted) administrative (e.g., signatory, reporting and legal, etc.) and procedural (e.g., frequency and type of monitoring and analysis, etc.) requirements, and specific structural (e.g., detention/retention basins, vegetated swales and natural depressions, infiltration of runoff onsite, etc.) and non-structural (e.g., good housekeeping, preventive maintenance, spill prevention and response procedures, periodic inspections, employee training, nutrient management, etc.) pollution prevention measures and practices may be specified.

New Mexico does not directly implement the federal NPDES permitting program; however, the Point Source Regulation Section (PSRS) provides assistance to EPA in the following ways:

- Conducting compliance inspections on behalf of EPA;
- Providing information to the regulated community and the public;
- Reviewing NPDES permits proposed by EPA to assure that these permits are compliant with applicable provisions of the federal Clean Water Act §§208(e), 301, 302, 303, 306, and 307 and appropriate requirements of state law;
- Issuing CWA Section 401 State Certification for all NPDES permits to assure compliance with applicable state water quality standards.
- Conducting outreach as appropriate to inform facilities of the requirements of NPDES permits.

EPA categorizes NPDES permits as either "municipal," "non-municipal (often termed "industrials")," or "federal." Municipal permits are issued for publicly owned community wastewater treatment plants. Other dischargers are classified as non-municipal or federal. Many of the discharges covered by individual NPDES permits for non-municipal sources are from small private domestic wastewater or mining operations. Discharges covered by general NPDES permits include Concentrated Animal Feeding Operations (CAFOs) and storm water run-off associated with construction or industrial facilities. NPDES permittees are further categorized by EPA as either "major" or "minor" dischargers. Major municipal permittees are generally those with design flows of one million gallons per day (MGD) or greater. Industrial permittees are classified based upon a number of factors, including the type of industry, chemical constituents in the discharge and designated uses of the receiving stream.

According to EPA policy, all active permitted facilities classified as major (municipal, non-municipal or federal) should be inspected periodically by either EPA or the SWQB's PSRS. Each year EPA coordinates with the PSRS to identify inspections that will be conducted by the PSRS or EPA. Facilities classified as minor dischargers are inspected on a prioritized basis. The priority list is based primarily on the date of the last inspection, with the facilities having gone the longest without an inspection receiving the highest priority. Additional factors considered when determining which minor facilities to inspect include citizen complaints, specific requests from EPA, the facility status with respect to Significant Non-Compliance status and proximity to the above major and traditional minor facility inspection locations.

Several methods are used for ensuring compliance with environmental laws and regulations. These include conducting NPDES compliance evaluation activities (including inspections) to detect violations and create a strong enforcement presence. Enforcement actions may be taken by EPA against violators to correct violations. Inspections are a crucial link in this effort. An effective enforcement program begins with individual inspections and the specific enforcement responses to violations detected by those

inspections. A principal function of an inspection, regardless of inspection type (evaluation, sampling, audit or reconnaissance, see Table 1.2 for descriptions) is to detect and document violations at the facility. Evidence collected during the inspection supports the resulting enforcement action that will bring the facility into compliance with EPA and NMWQCC regulations. Inspections can also provide an opportunity to communicate regulatory requirements to the facility operator, thus enhancing their ability to meet EPA program requirements. Requirements for inspection of NPDES permittees are addressed in §308 of the CWA. Guidelines for conducting these inspections are available in the NPDES Compliance Inspection Manual (EPA 305-K=001, Interim Revised Version, January 2017).

Effluent samples collected by the PSRS in conjunction with an NPDES permit compliance sampling inspection are collected from the facility outfall sampling location if practical and appropriate; and from existing stations, if available. If pre-existing stations are not available, then the Lead Inspector will select stations from a location that is representative of the effluent discharge quality. An accessible station will be selected far enough upstream from the discharge point to eliminate any possibility of influence from the discharge. A downstream station will be selected at a point where the effluent is completely mixed in the receiving water. This point can be determined by checking the specific conductance of a transect taken completely across the receiving water. When the readings are consistent, (±10 µmhos/cm) the effluent is considered to be completely mixed for sampling purposes. Table 2.3 provides a general summary of the parameters commonly sampled for compliance monitoring purposes. Sampling frequency is once per compliance sampling inspection event and the number of samples taken is one for all parameters except bacteria, which has a sample size of two. Any deviations from the generalized sampling plan set forth in Table 2.3 is documented as part of the NPDES permit compliance sampling inspection. Specific procedures, methods, and considerations are documented in SWQB SOP 8.3 for NPDES Wastewater Sampling.

Table 2.3 Parameters Commonly Sampled for NPDES Permit Compliance Evaluation Purposes

Analytical Suite	Parameters	Notes, if applicable
Field Parameters	pH	
	Temperature	
	Specific Conductance	
	Dissolved Oxygen (DO)	
	Turbidity	
	Flow (Discharge)	Inspection team evaluates permittee's flow-measuring equipment and uses the flow obtained if the equipment is found to be acceptable
Metals	Dissolved Metals	List of metals analyzed is determined on a permit-specific basis
	Total Metals	List of metals analyzed is determined on a permit-specific basis
	Dissolved Hardness	Must be collected concurrently with metals for which the WQS criterion is "hardness dependent"
Anion and Cations	Alkalinity	
	Bicarbonate	
	Calcium	
	Carbonate	
	Chloride	
	Fluoride	
	Magnesium	
	Potassium	
	Sodium	
	Sulfate	
	Total Dissolved Solids	
	Total Suspended Solids	

Analytical Suite	Parameters	Notes, if applicable
Nutrients	Ammonia	Sampled only if required in NPDES permit
	Nitrate plus Nitrite	Sampled only if required in NPDES permit
	Phosphorus, total	Orthophosphate is analyzed only when specifically requested
	Total Kjeldahl Nitrogen	Sampled only if required in NPDES permit
	Total Organic Carbon	Sampled only if required in NPDES permit
	Chlorophyll a	Sampled only if required in NPDES permit
Bacteria	Fecal coliform	Duplicate Samples Required
	Escherichia coli	
Other Parameters	Cyanide	Sampled only if required in NPDES permit; WQS criterion is for total recoverable cyanide
	Biochemical Oxygen Demand (5-day)	
	Chemical Oxygen Demand	Sampled only if required in NPDES permit
	PCBs	Sampled only if required in NPDES permit
	Total Chlorine Residual	Sampled only if required in NPDES permit

WQS COMPLIANCE MONITORING FOR ENFORCEMENT PURPOSES

The sampling design for enforcement purposes will be developed on a case by case basis in cooperation with EPA and/or NMED's Office of General Counsel to determine sampling locations, frequency of data collection and parameters to be sampled.

SWQB WATERSHED PROTECTION PROJECTS

The SWQB staff working in the Watershed Protection Section periodically conduct water quality surveys on waterbodies throughout NM for various projects including but not limited to development of watershed based plans, determination of wetlands and evaluation of wetland conditions. These projects are those specifically being conducted by the SWQB and do not cover those projects being implemented by outside entities which must have their own project specific QAPP.

Each project must have a field sampling plan approved by the Program Manager and the Quality Assurance Officer which addresses the general elements of this section. Should the proposed data collection be outside of the approved SOPs or this QAPP, additional information on sampling methods (i.e. specific modifications to a part of the SOP) must be included in the FSP or SAP or a project-specific QAPP must be developed to be approved by the Program Manager, QAO and EPA Region 6 prior to commencing work.

EFFECTIVENESS MONITORING

The study designs for watershed protection projects consist of monitoring for effectiveness and assessment purposes and are described in project specific QAPPs. The study design will generally consist of sampling stations both upstream and downstream of the project areas, with sampling conducted before and after project implementation (Grabow et al. 1998). Exact monitoring locations will be determined in the field based on professional judgement, restoration locations, data gaps, data needs, known SWQB monitoring locations and will require cooperator assistance for each specific project.

For temperature-related projects, thermographs are generally deployed at the selected locations between May and September of each monitoring year to construct a continuous record of temperature during this period to identify maximums and minimums, as well as diel fluctuations. Thermographs are deployed in accordance with SWQB SOPs in locations representative of ambient stream conditions, generally in the transition between a riffle/run and a pool, or at the toe of a pool, rather than in shallow riffles or deep pools. Certain locations may be selected for analysis with the Stream Segment Temperature Model (SSTEMP, Bartholow 2002). At these locations additional measurements will be collected to feed into the model, such as: channel geometry, flow, percent canopy cover, and meteorology. A FSP for

effectiveness monitoring will be established each year before monitoring commences by the Effectiveness Monitoring Coordinator.

OTHER SWQB PROJECTS

The study design for other SWQB Projects, (not including those conducted by outside entities) that are not identified specifically above, must have a FSP or a SAP approved by the QAO and Program Manager prior to implementing work. The elements of the FSP or SAP must have, at a minimum the general requirements identified in this section of the QAPP. In addition, these projects may require a project-specific QAPP to ensure quality assurance of any data collection or data acquisition activities.

2.2 Sampling Methods

Methods of sample collection, preservation and handling used in determining water quality as a part of this QAPP shall be in accordance with SWQB SOPs (Table 2.4) or with methods described in the following references or otherwise approved by EPA:

- "Guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act," 40 CFR Part 136 or any test procedure approved or accepted by EPA using procedures provided in 40 CFR Parts 136.3(d), 136.4 and 136.5;
- Standard Methods for the Examination of Water and Wastewater, latest edition, American Public Health Association;
- Methods for Chemical Analysis of Water and Waste, and other methods published by EPA Office of Research and Development or Office of Water;
- Techniques of Water Resource Investigations of the USGS;
- Annual Book of American Society for Testing and Materials (ASTM) Standards. Volumes 11.01 and 11.02, Water (I) and (II), latest edition, ASTM International;
- Federal Register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations;
- National Handbook of Recommended Methods for Water-Data Acquisition, latest edition, prepared cooperatively by agencies of the U.S. Government under the sponsorship of the USGS;
- Federal Register, latest methods published for monitoring pursuant to the Safe Drinking Water Act regulations;
- EPA's most recent NPDES Compliance Inspection Manual; or
- Hydrology Protocol as published in Appendix C of the New Mexico Environment Department's EPA approved WQMP/CPP.

All field activities will be conducted in accordance with the SOPs; however, site conditions or project-specific data collection objectives may necessitate the use of alternative field procedures not included in the SOPs. The use of field methods other than those presented above or in the Bureau's SOPs must be approved prior to data collection by the Subject Matter Expert and QAO and documented onto established SWQB forms or in designated field logbooks.

Table 2.4 SWQB Standard Operating Procedures

SWQB SOPs	Description	Purpose
Chapter 1.0 General SOPs		
1.1 Creation and Maintenance of SOP	Describes the process for creating, reviewing, and maintaining SOPs for the SWQB.	Template for creating SOPs.
Chapter 2.0 Planning SOPs		
2.1 Development of Field Sampling Plan (FSP)	Describes the process for preparing and implementing a FSP.	Serves as the comprehensive record for each project.

Chapter 3.0 Equipment		
3.0 Equipment	List the equipment used by SWQB for environmental data collecting activities.	Serves a master equipment checklist for SWQB.
Chapter 4.0 Field Observations		
4.1 Probable Source Determination	Describes the process for developing a qualitative evaluation of probable sources of impairment based on visual observations made by professionals in the field.	Used to incorporating information into Total Maximum Daily Loads (TMDLs) and the Clean Water Act (CWA) §303d/§305b Integrated List.
4.2 Hydrology Protocol	Provides the methodology for distinguishing among ephemeral, intermittent and perennial streams and rivers in New Mexico.	Used to provided technical support for an UAA and is required for the expedited UAA process (20.6.4.15.C NMAC).
Chapter 5.0 Physical Habitat		
5.0 Physical Habitat	Describes the procedure for measuring the physical habitat attributes and geomorphic characteristics relating to the dimension, pattern, and profile of wadeable streams.	Used by SWQB to ensure physical habitat measurements are collected in accordance with SOP so that accurate defensible data is collected by SWQB.
6.0 Sondes & Thermographs		
6.1 Sonde Calibration and Maintenance	Describe the procedure for calibrating and maintaining water quality monitoring sondes and dataloggers for collection of instantaneous or unattended measurements.	Used by SWQB to ensure that sondes and dataloggers used by SWQB are properly calibrated, checked and maintained in accordance with SOP so that accurate defensible data is collected by SWQB.
6.2 Sonde Deployment	Describes the procedure for deploying water quality monitoring sondes and dataloggers (excluding thermographs) in rivers and streams for instantaneous or unattended measurements.	Used by SWQB to ensure that sondes and dataloggers (excluding thermographs) are deployed in accordance with SOP so that accurate defensible data is collected by SWQB.
6.3 Thermographs	Describe the procedure for deploying thermographs in rivers and streams for unattended measurements. Also, include maintenance procedures for thermographs.	Used by SWQB to ensure that thermographs are deployed and maintained in accordance with SOP so that accurate defensible data is collected by SWQB.
6.4 Data Logger & Upload	Describe the procedures for retrieving recorded data from sondes and datalogger. Used to assess the quality of data from sondes and dataloggers in water. Details how to standardize data formatting in Excel; for uploading data into SQUID.	Used by SWQB for retrieving recorded data from sondes and data loggers, assessing data quality and details the procedure used for uploading data into SQUID.
Chapter 7.0 Flow		
7.0 Flow	Describes the process and equipment for measuring stream flow in rivers and streams.	Used by SWQB to ensure that flow is collected in accordance with SOP so that accurate defensible data is collected by SWQB.
Chapter 8.0 Chemical Sampling		
8.1 Cleaning of Sampling Equipment	Describes the procedure, equipment, and supplies, needed to clean typical water chemical sampling equipment.	Used by SWQB when cleaning and maintaining sampling equipment.
8.2 Chemical Sampling in Lotic Environments	Describe the sample collection techniques, preservation and acidification requirements, equipment, and quality control activities	Used by SWQB when sampling for total suspended solids, total dissolved solids, nutrients, metals,

	associated with the chemical sampling of surface water in lotic environments.	hardness, radionuclides, cyanide, organics, etc. in lotic environments to ensure accurate defensible data is collected according to SOP.
8.3 NPDES Wastewater Sampling	Describes the methods and considerations to be used and observed when collecting wastewater samples for field screening and details laboratory analysis procedures during NPDES Compliance Sampling Inspections.	Used by SWQB when sampling surface water for NPDES compliance sampling inspections.
Chapter 9.0 Bacteriological Sampling		
9.1 Bacteriological Sampling	Describes the collection and analysis of ambient water and wastewater samples for total coliform and E. coli using the IDEXX laboratories, Inc. Colilert method for water quality standards assessment and permit compliance monitoring.	Used by SWQB when sampling for total coliform and E.coli.
Chapter 11.0 Biological Sampling		
11.1 Benthic Macroinvertebrates	Describe the sample collection techniques, preservation requirements, equipment, and quality control activities associated with benthic macroinvertebrate sampling.	Used by SWQB when sampling for benthic macroinvertebrate to ensure accurate defensible data is collected according to SOP.
11.2 Periphyton	Describes the sample collection techniques, preservation requirements, equipment, and quality control activities associated with periphyton sampling in lotic environments.	Used by SWQB when sampling for periphyton to ensure accurate defensible data is collected according to SOP.
11.3 Phytoplankton	See lake sampling SOP	
11.4 Fish Community Sampling	Describe the process of fish collection for fish community studies. NMED/SWQB only collects fish for community studies in lotic waters.	Used by SWQB when sampling for fish community studies to ensure accurate defensible data is collected according to SOP.
11.5 Fish Consumption Advisory Program	Describe the development process for Fish Consumption Advisories to determine the presence of environmental contaminants.	Used by SWQB when sampling fish tissue to ensure accurate defensible data is collected according to SOP.
Chapter 12.0 Lake Sampling		
12.0 Lake Sampling	Describe the sample collection techniques, preservation requirements, equipment, and quality control activities associated with chemical, physical, and biological sampling of surface water in lentic environments.	Used by SWQB when sampling for chemical, physical, and biological characteristics of surface water in lentic environments.
Chapter 15.0 Data Verification and Validation		
15.0 Data Verification and Validation	Describe activities associated with the validation and verification of chemical, physical, and biological data.	Used by SWQB staff for verification and validation of data collected under the SWQB.

2.3 Sample Handling and Custody

This section describes SWQB's efforts to ensure that each sample collected retains its original physical form and chemical composition from time of collection through its final disposition.

SAMPLE HANDLING

The details of the sample handling procedures are found in the most current SWQB SOPs and NPDES Wastewater Sampling Guidance. A summary of the most common sample handling procedures is located in Appendix A. Amendments to EPA's sampling handling requirements as listed under Table II at 40 CFR 136.3(e) "*Required Containers, Preservation Techniques, and Holding Times*" will be updated in relevant SWQB SOPs.

SAMPLE CUSTODY

For samples that require transport off-site or physical change of custody, SWQB practices two different chain of custody procedures; informal or formal. They are as follows:

Informal chain of custody procedure:
Requires that the receiving laboratory acknowledge receipt of the samples by date stamping the submittal forms and providing copies of the stamped forms to the person delivering the samples. This date-stamped submittal form is then held as part of the record. This procedure, as outlined in SWQB SOP 8.2, ensures the integrity and quality of these samples. Unless specifically noted, this procedure is applied, as applicable, for Ambient/Assessment Water Quality Monitoring, Hydrology Protocol Surveys, Watershed Protection Projects, Effectiveness Monitoring, Independent Studies and other SWQB Projects not noted elsewhere.

Formal chain of custody procedure:
Required for NPDES Compliance Monitoring Evaluation, WQS Compliance Monitoring for Enforcement Purposes and Incident Response Monitoring. This procedure, as outlined in SWQB SOP 8.3, is intended to ensure the integrity of samples so they can be used as admissible evidence to enforce environmental laws and regulations. Facility samples taken in cases involving an enforcement or administrative action related to a permit, certificate, order, or potential violation of a regulation or law shall follow chain of custody procedures provided by the contracted analytical laboratory. Analysis sample containers are required to be sealed with evidence tape to uphold the integrity of the sample against tampering or contamination.

2.4 Analytical Methods

Analytical methods shall be performed in accordance with methods listed in Appendix B or otherwise approved by EPA for Clean Water Act purposes. Appendix B includes a list of common analytes and analytical methods for Water Quality Ambient/Assessment Monitoring, WQS Compliance Monitoring for Enforcement Purposes, Watershed Protection Projects, Effectiveness Monitoring, and other SWQB Projects.

Methods used for NPDES Permit Compliance Evaluations shall be in accordance with those approved under 40 CFR Part 136 unless other test methods have been specified in the permit or approved by the Regional Administrator.

Prior to contracting with any outside laboratory, the laboratory's equipment, analytical methods and quality control procedures will be provided to the SWQB through a QAPP (or equivalent) to confirm they are in accordance with the procedures listed in this QAPP and current SWQB SOPs.

DETECTION LIMITS AND LABORATORY REPORTING CONVENTIONS

For most analytical analysis of samples, the SWQB uses the Air and Heavy Metals, Organics, Water, and Radiochemistry Sections of the New Mexico State Laboratory Division (SLD) Chemistry Bureau. SLD uses a software-based Laboratory Information Management System (LIMS) to issue standardized result reports which include detection limits, quantitation limits, and data qualifiers. The following tables summarize the reporting conventions that the Organic and Inorganic Chemistry Sections have adopted.

- Method Detection Limit (MDL) –The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results (EPA 821-R-16-006, 2016).

- Minimum Reporting Level (MRL) - The lowest concentration at which an analyte can be detected in a sample and its concentration can be reported with a reasonable degree of accuracy and precision.
- Sample Detection Limit (SDL) – The sample specific detection limit; equal to (Dilution Factor x MDL (organics) or Dilution Factor x MRL (inorganics)).

The reporting of detection and quantitation limits for the Organics section (Table 2.5) and Inorganic sections (Table 2.6) are summarized in the following tables:

Table 2.5 SLD Organic Section Detection and Quantitation Limits

SLD Section	Method Detection Limit (MDL)		Dilution Factor (DF)		Sample Detection Limit (SDL)		Method Reporting Limit (MRL)
Organic	MDL	x	DF	=	SDL	=	MRL

Table 2.6 SLD Inorganic Section Detection and Quantitation Limits

SLD Section	Method Reporting Limit (MRL)		Dilution Factor (DF)		Sample Detection Limit (SDL)
Air and Heavy Metals	MRL*	x	DF	=	SDL
Water Chemistry	MRL*	x	DF	=	SDL

The qualifiers and reporting conventions for the detection conditions of analytical results used by SWQB are provided in Table 2.7.

Table 2.7 Detection Condition Qualifiers and Reporting Conventions

LABORATORY QUALIFIERS AND REPORTING CONVENTIONS

Detection Condition	Criteria	Logical Response(1)	Qualifier	Reporting Convention
not detected at C ≥ SDL	C < SDL	TRUE	U	Report SDL
detected at C < SDL but >MDL	SDL > C >MDL	FALSE	J	Report estimated value
detected at C ≥ SDL	C ≥ SDL	FALSE	No Qualifier	Report value

C = analytical concentration

(1) Logical Question: Was the substance not detected at a concentration greater than or equal to the SDL?

Because “MDL” refers to a method detection limit and “SDL” incorporates both a quantitation factor and a sample-specific dilution factor, SWQB has requested that the Organics section assign “U” and “J” flags according to Table 2.7, Inorganic sections will report results as either positive values or <SDL. The SLD

Inorganic sections use the MRL as a consistent reporting limit for a given analyte. It is always greater than the MDL, which is instrument and operator specific, by a factor that may range between 3 and 10.

2.5 Quality Control

Quality control (QC) activities are technical activities, including data verification and validation procedures, that measures the attributes and performance of a process, item or service against a defined standard which are performed on a routine basis to quantify the variability that is inherent to any environmental data measurement activity. The purpose of implementing QC activities is to reduce variability and uncertainty in the decision-making process. Additionally, the results obtained from the QC analysis, or data quality assessment, may identify areas where the variability can be reduced or eliminated in future data collection efforts, thereby improving the overall quality of the project being implemented. Quality Control mechanisms are implemented as described under the Quality Objectives and Criteria for Measurement Data as well as the SWQB SOPs identified under this QAPP.

FIELD QUALITY CONTROL

The SWQB controls the quality of the field data by using standardized methods that are documented in the most current SWQB SOPs. All personnel who collect environmental data must be familiar with these protocols, sign acknowledgment forms associated with specific SWQB SOPs and collect data in accordance with the procedures as they are defined in the SOPs.

The collection and analysis of field QC samples is an important part of the continuing effort to improve the quality of the resultant data by assessing and possibly refining the collection, transportation, and handling procedures. These procedures are summarized in this QAPP (Section 2.0) and are also included in the most current SWQB SOPs.

Additional checks on the quality of field activities performed by the SWQB staff include periodic Quality Assurance Audits. Quality Assurance Audits will be performed periodically as resources allow. Field crews to be audited will be randomly selected and the audits will be performed by the QAO or designee.

BLANKS AND COLLECTION FREQUENCY

A blank sample is a sample that is processed and handled in the same manner as the associated environmental sample and is intended to be free of the analytes of interest.

Frequency of blank collection is based upon sampling run and number of samples collected per sampling run. A sampling run (or run) is defined as a period of time used to represent and define the most common collecting period or grouping of sampling activities that are indicative of SWQB sampling operations. Typically, most samples are collected during multi-day collection events that depart and return to the office in a given week (M-F). Blanks associated with a run are assumed to collectively represent a grouping of samples whereby the staff, equipment, vehicle, reagents, preservation, and storage remain constant. When multiple single day trips are planned within a given week that maintain constant variables as described above, the single day trips may be considered collectively as a run. The frequency of blanks is also outlined in the applicable SWQB SOPs.

The following types of QC blank samples are used by SWQB:

- Trip Blank – Trip blanks are samples of analyte-free water that are prepared in the analytical laboratory using deionized, distilled water, and preserved as required. Trip blanks are used for volatile organic compound samples only. Trip blanks are transported, unopened, to the field with other sample containers, handled like environmental samples and shipped to the laboratory for analysis with the collected samples. Trip blanks are used to identify contamination that might occur during sample transport and analysis rather than during sample collection and processing (WQX Activity Type #26). One VOC trip blank is collected per sampling run involving the collection of VOC samples.

- Field Blank – A sample of analyte-free water that is prepared in the field using a clean sample container with an aliquot of deionized water. Field blanks are collected for *E. coli*, *TSS/TDS/anions,* nutrients and cyanide and are treated as regular samples in all respects, including exposure to sampling station conditions, storage, and preservation. The purpose of these samples is to determine if any of these field conditions or processes have caused sample contamination (WQX Activity Type #21). A minimum of one field blank collected per sampling run with an additional blank collected for each 10th sample (for a minimum 10% collection rate). For example, a run consisting of nine samples would have one blank collected while a run consisting of eleven samples would have two blanks collected.
- Equipment Blank – A sample of analyte-free water that is prepared in the field using the appropriate sampling equipment with an aliquot of distilled and deionized water that is processed using applicable field equipment in the same manner as environmental samples. Equipment blanks collected for dissolved metals are used to demonstrate that sample-collection equipment and sample-processing equipment are not introducing contamination. Equipment blanks can be prepared for individual pieces of collection and processing equipment. Typically, SWQB equipment blanks are only prepared to assure non-contamination of samples during the filtration process (WQX Activity Type #28). A minimum of one equipment blank per sampling run (when equipment blanks are needed), at a frequency minimum of 10% collection rate.
- Reagent Blank – A sample of analyte-free water and reagent that is not exposed to site conditions. Reagent blanks may be collected for *E. coli* or nutrients or as need if contamination from sample containers, analyte-free water and/or preservative is suspected. Reagent blanks are performed in the laboratory to check the sample for contamination from the sample bottle and preservative or growth agents (WQX Activity Type #27).
  *WQX # refers to the applicable STORET WQX activity type identifier

BLANK VALIDATION CODES

An analysis of blank contamination is conducted in accordance with the SWQB Data Verification and Validation SOP during the data validation process. After validation is completed, qualifier codes are assigned to any data points that, based on the blank samples, may have been contaminated. Qualifier codes indicate to the data user that chemicals were detected in the associated blank and that the sample results may be contaminated.

If a chemical or constituent (bacteria, chlorophyll, etc.) is not measured in the blank at a concentration greater than or equal to the Sample Detection Limit (SDL) [defined as the sample-specific Method Detection Limit (MDL) or Minimum Reporting Limit (MRL) times the dilution factor if the sample was diluted for analysis], no blank validation code is assigned.

If a chemical or constituent is measured in the blank at a concentration greater than or equal to the SDL then all results for the sampling run for that parameter since the previous compliant blank and up to the next compliant blank will be reviewed and validation codes of “BU”, “B1” or “RB1” will be assigned according to the following guidelines and summarized in Table 2.8. If only one blank sample was collected during a discrete sampling run and results in a detection equal to or greater than the SDL, all samples collected during the sampling run will be qualified**.** These blank validation codes serve to alert the data user that the results are outside Quality Assurance control limits and may require re-sampling or a separate qualitative analysis based on professional judgment.

- If the blank concentration is greater than or equal to 5% of the sample concentration, a blank validation code of RB1 will be assigned.

- If the blank concentration is less than 5% of the sample concentration a blank validation code of B1 will be assigned. Results with a B1 validation code may be used for assessment purposes since the analytical error associated with the reported sample concentration is typically 5% or greater, and the blank contamination would be indistinguishable from analytical error. Analytical error is the coefficient of variation (the standard deviation of replicate measurements divided by the mean) expressed as a percent

- If the blank concentration is equal to or greater than the SDL and the sample concentration is less than the SDL, a validation code of “BU” will be assigned. These results are not rejected since the issue or analytical error that resulted in a blank detection did not measurably impact the environmental sample.

- If the sample was collected for compliance or enforcement purposes, and the blank concentration is greater than or equal to the SDL, a blank validation code of RB1 will be assigned indicating that the results are rejected

Table 2.8 Blank validation codes

Concentration in Blank	Monitoring Type	
	I	II
< SDL	No Code	No Code
≥ 5% of Sample Concentration	RB1	RB1
≥ SDL and <5% of Sample Concentration	B1	RB1
≥ SDL and Sample Concentration <SDL	BU	RB1

I = Ambient/Assessment, Watershed Protection Projects and Effectiveness Monitoring
II = NPDES Compliance Evaluation and WQS Enforcement Monitoring

There may be cases where, due to the sensitivity of the analytical method (e.g. PCB congener analytical method) or other characteristics of the procedures, it may be appropriate to subtract the value of the blank from the value of the result. If this is done, the subtraction should be approved by the SWQB QA Officer and Project Coordinator, and documented.

FIELD REPLICATES AND DUPLICATES.

SWQB may collect replicates or duplicates as needed for special investigations. However, the SWQB does not routinely collect replicates because replicate samples do not isolate sample collection and analytical error from environmental variability, and because a small set of replicate samples does not provide information that is useful for making decisions about the other samples on the sampling run. Also, the SWQB does not routinely collect duplicate samples, and instead relies on standard procedures and laboratory quality assurance to ensure the repeatability of the data. Field replicates and duplicates are defined as:

- Duplicate – a sample that is split and submitted and analyzed as two routine samples. (WQX Activity Type #14.

- Replicate – a sample that is collected within 15 minutes and within 1 meter of routine sample and analyzed as a routine sample. (WQX Activity Type #22).

LABORATORY QUALITY CONTROL

Chemical data received electronically are provided to the QAO who is responsible for uploading into SQUID. All chemical analytical results received by the SWQB must include the following information:

- Data Source – the lab code from which the data originated
- SWQB unique sample location ID (specific to location)
- SWQB unique sample ID
- Sample Collection Date
- Sample Collection Time
- Laboratory Sample Number
- Sample Analysis Date

- Sample Analysis Time
- Analytical Method
- Analyte Suite
- Analyte Name
- Chemical Abstracts Service Reference Number (CASRN)
- Concentration Units
- Method Detection Limit (MDL) – The minimum concentration of a substance that can be measured and reported with 99 % confidence that the analyte concentration is greater than zero.
- Minimum Reporting Level (MRL) - Lowest concentration that can be reported.
- Sample Detection Limit (SDL) – The sample specific detection limit; equal to (Dilution Factor x MDL (organics) or Dilution Factor x MRL (inorganics)).
- Result Concentration Value and Laboratory Qualifier Codes

Numerical results should be reported in number format (not numbers in text format) with the maximum number of appropriate significant figures possible, typically 2-3, depending on laboratory section/instrument.

Most chemical analysis for SWQB is conducted by the NM Department of Health SLD. The laboratory reports method detection limits, method reporting limits, and sample detection limits according to Tables 2.5 and 2.6.

All analytical samples, with the exception of those bacteria samples analyzed in-house using IDEXX water microbiology test kits, are analyzed by laboratories that have established QA programs that implement the following key elements:

- Demonstrate the laboratory's capability and qualifications to perform environmental analyses by summarizing and documenting the QA procedures employed by the laboratory,
- Control laboratory operations by establishing procedures that measure the laboratory's performance on a daily, weekly, monthly, quarterly, and yearly basis,
- Measure matrix effects to determine the effect of a specific matrix on method performance and analyte recoveries, and
- Provide a means of ensuring that appropriate QC information is consistent, available and recoverable, to enable the end user to assess the quality of the data.

Statistical criteria used by the contract laboratories for validating and expressing the variability of analytical results are described in the QAPP or equivalent that is provided by each laboratory. The majority of samples are analyzed by SLD. Their data qualifiers are listed in the Data Verification and Validation SOP Worksheet(s) (Data Verification and validation Form) located on the SWQB website.

Bacteria samples analyzed in-house are collected and analyzed in accordance with the SWQB Bacteriological Sampling SOP. As part of the QC process, a certified thermometer is kept in the incubator. Incubator temperatures are recorded on the *E. coli* data sheet when the sample tray is placed in the incubator and at the end of the incubation period. If both the temperature at the initiation and conclusion of the incubation are within 35 ± 0.5°C, the results of the *E. coli* count are not flagged and can be used for assessment purposes without reservation. If either the initiation or the conclusion temperature is less than 34.5 °C, the data are discarded. If either temperature is between 35.5 and 38 °C, the data are flagged and may only be used as supporting evidence for assessments. If either temperature is greater than 38 °C, the data are discarded.

2.6 Instrument/Equipment Testing, Inspection and Maintenance

FIELD OPERATIONS

All field equipment must undergo inspection and maintenance prior to each sampling trip. Complete procedures for operating and maintaining equipment used for collecting environmental measurements are contained in the manufacturer's instruction manual for each instrument and in the most current SWQB

SOPs. Results of equipment maintenance and inspections will be noted in a dedicated file for each instrument. Any deficiencies in equipment must be noted and reported immediately to the Project Coordinator or Program Manager who will recheck the equipment and arrange for repair by the manufacturer or replacement. SWQB staff will not use equipment if the working condition of the equipment is in doubt. A summarized list of equipment with specifics detailing inspection, calibration, and maintenance can be found in Appendix C.

LABORATORY OPERATIONS

Information regarding analytical equipment and associated maintenance used by contract laboratories is provided in the laboratory's QAPP or equivalent. Information regarding SWQB analytical equipment and analysis of total coliforms and *E. coli* are provided in SWQB SOP 9.1.

OFFICE OPERATIONS

The SWQB has ongoing technical support for Department owned computers, email services, printers, plotters, databases, geographical information systems, network servers and software applications. Routine updates and repairs of information technology equipment are maintained by NMED's Office of Information Technology (OIT). Staff are responsible for reporting anomalies and malfunctions and reporting them to OIT in a timely manner.

2.7 Instrument/Equipment Calibration and Frequency

FIELD OPERATIONS

All field equipment requiring calibration must be calibrated in accordance with the most current SWQB SOPs. Procedures for operating and calibrating field equipment used for collecting environmental data are contained in the manufacturer's instruction manual for each instrument. All SWQB personnel using field equipment are expected to read and be thoroughly familiar with all procedures detailed in these manuals. Frequency and specific calibration procedures unique to the NMED SWQB are specified in specific SOPs for each type of field equipment and data collection event. A calibration log shall be kept for each instrument which includes all of the calibration forms associated with the instrument. SWQB staff routinely enter dates of calibration, calibration methods used, and any other pertinent data (e.g. erratic instrument behavior) in the logbook. A summary of calibration procedures for field equipment is provided in Appendix C. SWQB staff will not use equipment if the working condition of the equipment is in doubt.

LABORATORY OPERATIONS

Analytical instruments and equipment used by the contract laboratory are calibrated prior to each instrument analysis batch using manufacturer's recommended procedures and the guidelines provided in the Handbook for Analytical Quality Control (EPA 1979). All calibration procedures are validated and documented by the contract laboratory and are described in the laboratory's QAPP or equivalent.

OFFICE OPERATIONS

There are no particular calibration requirements for equipment used in processing, writing and evaluating data.

2.8 Inspection/Acceptance of Supplies and Consumables

The activities and procurement processes for supplies and consumables for all activities discussed under this QAPP adhere to the State of New Mexico's purchasing policy.

2.9 Non-Direct Measurements (Data Acquisition Requirements)

Most SWQB decisions made pursuant to this QAPP involve new data acquired using procedures described or referenced in this document. When decisions must be partially based on historical data, past data acquired by the SWQB are given preference because of known data quality. Data acquired by other

sources will be reviewed by the Bureau but must be accompanied by supporting quality assurance documentation and metadata in order to evaluate its usability. Validated water quality and gage data collected by USGS are considered to meet the SWQB's QA requirements and may be used for most purposes, if referenced.

Data collected by individuals or organizations other than the SWQB to be used for enforcement of water quality standards under the NM Water Quality Act (74-6-10 NMSA), water quality assessments, development of the Integrated List, TMDL development, or WQS amendments being proposed by the SWQB must, at a minimum, meet the QA/QC requirements described in this QAPP. The quality assurance measures used to collect and manage the data must be incorporated in a QAPP (or equivalent) and submitted with the data set. The QAO will determine if the analytical methods used meet the requirements specified in Analytical Methods and Detection Limits (Appendix B) and the methods of data collection are the same as, or comparable to, those included in the most current SWQB SOPs and this QAPP. Additionally, the QC criteria used to verify and validate the data must be equivalent, or comparable to, those listed in the SWQB Data Verification and Validation SOP 15.0. The QAO will approve the use of the data if the supporting documentation demonstrates comparability to the Bureau's quality assurance requirements.

Non-Direct Measurement Data collected by EPA or the permittee, intended for use with NPDES Permit Compliance Evaluation must be collected in accordance with 40 CFR 136 and does not require the SWQB QA Officer's review prior to use.

Data collected by entities intended to be used for specific projects such as watershed based plans or effectiveness monitoring but not specifically conducted by the SWQB or under direct supervision of SWQB staff or those projects that deviate from this QAPP must have an approved QAPP prior to conducting any work. Upon approval of the QAPP by the SWQB QAO, the data may be considered for use by the Bureau for those tasks that the data meets quality assurance measures for.

It may be possible to use data that do not meet SWQB QA/QC requirements for purposes other than ambient/assessment monitoring, effectiveness monitoring or compliance evaluation. Examples include screening, planning, and informal information gathering to guide decision making.

2.10 Data Management

All data collected by the SWQB are maintained in either hard copy or electronic formats, depending on how the data were obtained. Document and records management are further detailed in Section 1.7.

PAPER DATA MANAGEMENT

SWQB data obtained or received in hard copy format are entered into one of the databases identified in Table 2.9, by the Project Coordinator or designee and then imported into electronic format for processing

All hard copy paper data is filed and labeled in a consistent manner. Project specific data are filed as specified in each data management section below. Paper copies of project specific data and associated materials are maintained in a project binder. Additional information pertaining to documents to be included in the project binders is provided in Section 1.7.

ELECTRONIC DATA MANAGEMENT

SWQB data obtained or received in electronic formats are imported or entered into the appropriate database(s) by the designated staff person dependent on data purpose and type.

Electronic data are initially managed on individual computers temporarily prior to being transferred to a specified location in the SWQB network server and then uploaded to SQUID. All data housed on individual computers either awaiting calculations, Verification and Validation, or upload are backed up to the network server on a weekly basis at a minimum. These data are filed and labeled in a consistent manner using a dedicated filing system. The files and folders are named as clearly as possible, typically

including the survey/project title and year and any other descriptors to help identify what is included in the file.

To facilitate the integration of all of these tools, waterbodies are georeferenced, or categorized, based on geographic location. Additional categories are applied to waterbodies, such as assessment unit, watershed size/area, designated uses, ecoregion, elevation, habitat type, etc., to facilitate data comparability and communication within and among the assorted data management tools used by various water quality management programs.

Data to be entered into the National Pollutant Discharge Elimination System (NPDES) Database fall into primarily two categories: permit information and inspection information. Unless otherwise indicated, each PSRS staff member is responsible for inputting and maintaining the data for the permits to which they are assigned. Permit information originates when either a permit application is received from an existing or potential permittee or when the EPA sends NMED a draft permit to be certified by the state. Inspection information originates when a PSRS staff member conducts a Compliance Evaluation Inspection (CEI), Compliance Sampling Inspection (CSI), or any other formal inspection. The summary of the inspection report is entered into the database by the staff member who conducted the inspection. The data are usable following entry into the database.

The primary data management tools used by the SWQB are summarized in Table 2.9.

Table 2.9 SWQB Data Management Tools

Data Management Tool	Description
SWQB Water Quality Database	Archival Access-based database used by the SWQB to house water quality data (chemical, physical, biological) collected by the Water Quality Monitoring Program for data collected in 2000- 2009.
SQUID	The SWQB's in-house Surface Water Quality Information Database (SQUID) is an integral tool for coordinated storing, assessing, and reporting of water quality data and conclusions between SWQB programs, to EPA, and to New Mexico's stakeholders. This Oracle© database, developed and maintained by NMED's Information Technology Bureau, allows for required electronic reporting of monitoring data to EPA's water quality exchange (WQX) database and WQS attainment conclusions to EPA's ATTAINS database. SQUID also contains many survey planning and tracking tools and reports. SQUID was updated in 2018 to be compatible with EPA's newly-redesigned ATTAINS database
ATTAINS	The Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) is an online system for accessing information about the conditions in the Nation's surface waters. ATTAINS tracks water quality assessment data, including use attainment, and causes and sources of impairment, and supports three principal functions: (1) Improve the quality and consistency of water quality reporting (2) Reduce the burden of preparing reports under CWA §§ 303(d), 305(b), 314, and 319 (3) Improve water quality data analysis ATTAINS provides data entry forms and automates the production of reports that NM submits to EPA through the 303(d)/305(b) process. The ATTAINS web reports also provide users with easy access to view the information on the status of waters at the national, state and site-specific waterbody levels.
SWQB's NPDES database	Access-based database that helps the SWQB track the status of the permits and the state's certification of the permits (and is not intended to duplicate database information maintained by EPA for NPDES permits). The database contains information about individual permits in relation to waterbody assessment units for integration into SWQB projects such as TMDL development and watershed assessment/planning activities.
Grants Reporting and Tracking System (GRTS)	The Nonpoint Source Program's main reporting vehicle for the CWA Section 319 program. GRTS is a data management system that enables EPA and States to describe the progress they have made in implementing the national Nonpoint Source (NPS) Pollution program. GRTS electronically tracks projects and activities funded with CWA Section 319(h) funds.
Water Quality Exchange	The Water Quality Exchange (WQX) Data Warehouse (previously referred to as STORET) is EPA's repository of the water quality monitoring data collected by water resource management groups across the country. WQX is populated with biological, chemical and physical data on surface and ground water collected by federal, state and local agencies, Indian Tribes, volunteer groups, academics and others. SWQB flows

Data Management Tool	Description
	data to WQX through NMED's node. Outside groups can submit data to WQX through the Water Quality Portal.

TYPES OF DATA COLLECTED AND SPECIFIC MANAGEMENT

CHEMICAL DATA

Physico-chemical Field Data

Field data originate when the data is collected and recorded directly onto field sheets by SWQB technical staff. Field data include direct observations recorded by technical staff and data recorded immediately from various equipment onto field sheets (e.g. sondes and other meters). Field data only include instantaneous readings and do not include long term deployment data that are electronically downloaded from recording devices such as thermographs or sondes that record data over an extended period of time (these data are covered in subsequent section). Original field forms are maintained by the Project Coordinator and kept in the project binder. Data from the field forms are entered into the SWQB SQUID database by the Project Coordinator or designee. Once the data are in the database they are then verified and validated accordance with the procedures set forth in the most current SWQB Data Verification and Validation SOP. The data are usable following the completion of the data verification and validation process. Additional details describing paper record (hard copy), electronic form and data storage and management procedures are referenced in SWQB SOPs 8.2 and 12.0.

Chemical Analytical Data

Chemical analytical data originate when the contracted analytical laboratory produces results from the water samples submitted by the SWQB. Chemical analytical data include measurements from the water column or sediment of chemical parameters such as ions, nutrients, metals, volatile organic compounds, and radionuclides. Analytical results are provided in both paper copy and/or electronic files, depending on the laboratory and/or parameters. If paper copies of data are received, they are maintained in the project binder. When chemical analytical data are received back from the laboratory in paper format the data are entered into a spreadsheet by the QA officer and then uploaded to the database. When data are received from the analytical laboratory in electronic formats, they are given to the QA officer for upload to the database. The QA officer performs an initial quality assurance audit of the reported detection flags and then informs project staff when all uploads have been completed. Once the data are in the database they are then verified and validated by the designated project member in accordance with the procedures set forth in the most current SWQB Data Verification and Validation SOP. The data are usable following the completion of the data verification and validation process.

Data transformations must be performed on subsets of data in order to assess the attainment of water quality standards:

- Hardness data are provided by the laboratory or calculated from a subset of metals data reported above a screening threshold set at the minimum possible standard (i.e. lowest possible hardness) performed using Microsoft Excel spreadsheets. These metals include dissolved silver, dissolved cadmium, dissolved chromium, dissolved copper, dissolved lead, total aluminum, dissolved manganese dissolved nickel and dissolved zinc. A paper copy of the calculation spreadsheet is attached to the applicable assessment form for those data.

- Gross alpha (Am-241 reference) transformations are done for data reported at or above the quantification limit. The transformations are performed manually and reported on the applicable assessment forms.

Fish Tissue

Fish tissue data originate when the contracted analytical laboratory produces results from the fish tissue samples submitted by the SWQB. Fish tissue data include measurements of toxic chemicals present in fish tissue such as mercury, DDT, and PCBs to be used for development of fish consumption advisories.

The data are received from the analytical laboratory in both paper copy and/or electronic formats. All paper copies of data are maintained by the SWQB fish biologist in cabinet files. Data are organized by waterbody. The data are eventually transferred to a summary spreadsheet. Electronic data are loaded into the SQUID database by the SWQB fish biologist. The data are usable once incorporated into the summary spreadsheet and placed in the referenced repositories (paper file location or SQUID database). SWQB staff have access to the data directly via the database. These data are also provided to EPA annually who maintains a national database for fish consumption advisories. Data users can obtain data through EPA's website or through requests to SWQB staff.

Ambient Toxicity

Ambient toxicity data originate when EPA or the contracted analytical laboratory produces results from water or sediment samples submitted by SWQB. Ambient water toxicity results include the results from analyses of water or sediment samples as measured by an organism's response upon exposure to the sample (e.g., lethality, impaired growth, or reproduction). These data are received from the lab in electronic and/or paper copies. Paper copies of the data are maintained in the project file by the project coordinator and electronic copies are filed according to the filing system described previously. Data are usable upon receipt from lab. Data can be obtained through requests to SWQB staff or via EPA's website.

Bacteriological Data

Bacteriological data originate when the contracted analytical laboratory produces results from the water samples submitted by the SWQB or when the results are produced from analyses conducted in-house by SWQB staff using IDEXX equipment. Results received from analytical laboratories are managed in the same way as chemical analytical data. Refer to that section for managing bacteriological data. If results are produced in-house, then the results are transcribed from the results form into a spreadsheet that is then uploaded into SQUID. The results forms are filed in the Project Binder and the spreadsheets are maintained by the Project Coordinator on the SWQB's network server. The data are usable following the completion of the data verification and validation process described in the most current SWQB Data Verification and Validation SOP. Additional details describing paper record (hard copy), electronic form and data storage and management procedures are referenced in most current SWQB SOP for Bacteriological Sampling.

Long-term Deployment Datalogger Data (Sonde/Datalogger/Thermograph Data)

Sonde/thermograph data originate when the data are uploaded from the recording device and exported to LTD Data Management spreadsheets by the Project Coordinator or designee. Sonde/datalogger/thermograph data include parameters such as dissolved oxygen, pH and temperature that are recorded during long-term deployment in waterbodies. The electronic files are maintained by the Project Coordinator according to the filing system described previously. The data are QA'd following procedures outlined in the most current SWQB SOP for LTD Datalogger Data QA and SQUID Upload. QA'd data files are uploaded into the SWQB SQUID database by the Project Coordinator or designee. The data are usable following the completion of the Verification and Validation procedure identified in the most current SWQB Data Verification and Validation SOP. Additional details describing paper record (hard copy), electronic form and data storage and management procedures are referenced in most current SWQB SOPs for Sonde Deployment, Thermographs and LTD Datalogger Data QA and SQUID Upload.

PHYSICAL DATA

Habitat Data

Habitat data originate when the field measurements are recorded directly onto field forms by project team members. Data include physical habitat and geomorphological measurements such as percent canopy cover, pebble counts, cross-sections, etc. Each field form associated with habitat data are checked for completeness and accuracy by the crew lead in the field prior to leaving the site. Completely checked field forms are indicated by crew lead's initials on each page of field data. Physical habitat data will be entered into electronic spreadsheets for upload to SQUID. The spreadsheets are maintained by the

Project Coordinator using the filing system described previously. The data are usable following the completion of the Data Verification and Validation process. Usable data are indicated as “V V” in the database heading for each study. SWQB staff have access to the data directly via the database. Additional details describing physical habitat paper records (hard copy), electronic forms and data storage and management procedures are referenced in most current SWQB SOP for Physical Habitat.

Data transformations must be performed on subsets of data in order to assess the attainment of water quality standards:

- Logarithm of Relative Bed Stability (LRBS) calculations are performed within an Excel spreadsheet on sediment data to determine the relationship of the median particle size in a stream reach compared to the critical particle size calculated to be mobilized by standardized fluvial stresses in the reach. Median particle size is determined using a reach-wide pebble count (Peck et al. 2006). Critical particle size is calculated from channel dimensions, flow characteristics, and channel roughness factors (Kaufmann et al. 2008). The measure is expressed as a logarithm of the ratio of geometric mean to critical particle size.

Rosgen Geomorphic Data

Rosgen geomorphic data originates when the field measurements are recorded directly in field forms or field notebooks by project team members and are collected in accordance with Dave Rosgen procedures. Upon review and verification following field data collection activities SWQB staff store data in project specific folders on the SWQB network server. It is the responsibility of the SWQB Project Officer to ensure data is stored in correct project specific folder. Data is not upload into SQUID and is not used for Assessment purposes in the Comprehensive Assessment and Listing Methodology document. Additional information on Dave Rosgen geomorphic data collection procedures can be found in numerously published literature.

FLOW DATA

Flow data originate when the data are recorded directly onto flow field form by SWQB technical staff. Flow data include measurements recorded directly from various flow meters or equipment or using best professional judgment (method is indicated with data), including entering a “0” for dry, non-flowing streams. Upon returning from field, the flow data are entered into Microsoft Excel template [located in SOP folder on the SWQB network server or available from the SWQB website] for Q determination. All flow calculation files are maintained by project using the filing system described previously. Copies of the calculation spreadsheets are printed out and included in the project binder with original field sheet or copy of field notebook page(s). Once the calculations have been completed the results are entered into the SQUID database by a designated project member. Once the data are in the database they are then verified and validated in accordance with the procedures set forth in the most current SWQB Data Verification and Validation SOP. The data are usable following the completion of the Data Verification and Validation process. Additional details describing paper record (hard copy), electronic form and data storage and management procedures are referenced in SWQB SOP for Flow.

BIOLOGICAL DATA

Biological data are provided to the Project Coordinator expert or designee who is responsible for importing or entering the data in the appropriate database. All biological analytical results received by the SWQB must include the following information:

- Sample Location,
- Sample Collection Date,
- Sample Collection Time,
- Sample Collection Method, and
- Results (list of specimens to lowest practical taxon and enumeration).

Fish Ecology

Fish community data originate when the data are recorded directly onto field forms by technical staff. Fish community data include species composition, number of each species collected, etc. Voucher specimens are typically taken for each species of fish for taxonomic verification. Any questionable identifications are verified upon returning to the SWQB lab, indicating any corrections directly on the field form. Museum of Southwestern Biology (Museum) staff also perform taxonomic verification on voucher specimens. Specific information from the field forms are transcribed to Museum field notes form and submitted to the Museum for archiving. Copies of the museum forms and the SWQB field forms are maintained by SWQB's fish biologist and are housed in the file cabinet located in their office. Data are organized by watershed. Data from field forms are entered into the SQUID database. Once the data are in the database they are then verified and validated in accordance with the procedures set forth in the most current SWQB Data Verification and Validation SOP. The data are usable following the completion of the Data Verification and Validation process.

Macroinvertebrates

Macroinvertebrate data originate when the contracted taxonomic laboratory produces results from the macroinvertebrate samples submitted by SWQB. Macroinvertebrate data include identification to lowest practical taxon and enumeration of aquatic macroinvertebrate specimens collected from a waterbody. Results are received in electronic format and are maintained by the Program Manager or designee. The data are uploaded to SQUID database where a series of calculations are performed for use in biological assessments. The data are usable following import into SQUID.

Periphyton/Phytoplankton Data

Periphyton and phytoplankton data originate when the contracted analytical and/or taxonomic laboratory produces biomass (chlorophyll a) and community composition results from the periphyton and phytoplankton samples submitted by SWQB. Results from contract laboratories are received in electronic format and are maintained by the Program Coordinator or designee. The data are uploaded to SQUID by the Project Coordinator or designee and are usable following import into the database.

OTHER DATA TYPES/DATABASES

Photographs

SWQB manages photographs on an individual project or survey basis and are only used as ancillary data to document project location and physical features in project area. Photographs use predefined labeling conventions that incorporate site location, date, and watershed.

Hydrology Protocol

The data collected in accordance with the Hydrology Protocol is uploaded into SQUID upon review and verification following field data collection activities. Additional information for Hydrologic Protocol field data form and data storage and management procedures in included in Appendix C of the New Mexico Statewide Water Quality Management Plan and Continuing Planning Process (WQMP/CPP).

WQX

Data to be uploaded to WQX originate when the data have been verified and validated in accordance with the procedures set forth in the most current SWQB Data Verification and Validation SOP and considered to be "quality data" within SQUID. Quality data in SQUID will be submitted to Internal Node, which in turn generates XML file and submits it to WQX. WQX Web utilizes a standard set of data elements and internet protocols to create and store XML data submission files. The data are then imported by EPA staff to the WQX national data warehouse. Data that are uploaded to WQX include field data and chemistry analytical data. All data that meet the QA/QC specifications are uploaded to WQX. Data are usable once they become available through the national data warehouse, Figure 2.1 illustrates the data flow from SWQB field collection activities through the storage of validated data on the WQX system.

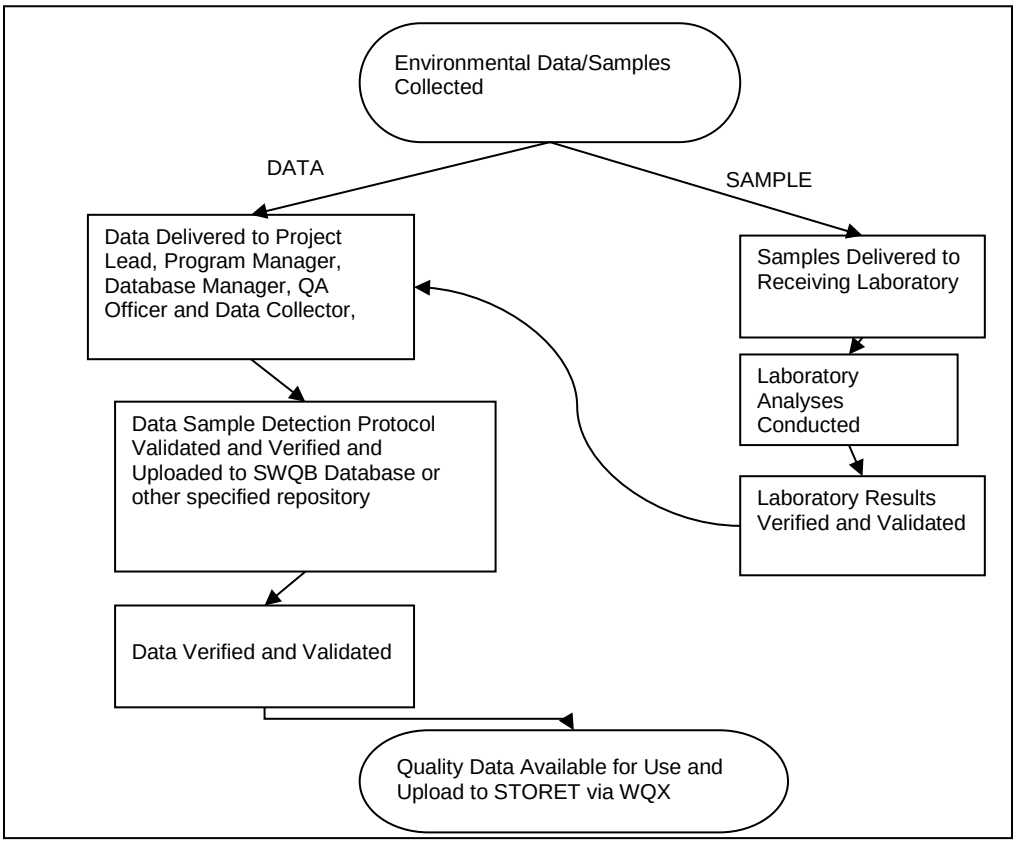


Figure 2.1 SWQB Data Flow Summary (Collection to WQX)

DATA ACCESS

SWQB staff have access to the data directly via the database(s). Other data users may obtain data through either requests to SWQB staff or through a formal Inspection of Public Records Act requests submitted to the NMED. The Department, with assistance through OIT, manage access to databases for authorized personnel through a database access approval process.

GRANT REPORTING AND TRACKING SYSTEM (GRTS)

Information to be input into the Grant Reporting and Tracking System (GRTS) originates when a contract or interagency agreement is approved for a Watershed Protection project identified through an advertisement process (e.g. Request for Proposals, Solicitation for Applications). Each Watershed Protection project has an assigned SWQB Project Officer who is responsible for maintaining the project-specific information in GRTS. Upon being assigned a project, the Project Officer logs onto the GRTS database and enters the identified mandatory elements for each project. The Project Officer is responsible for maintaining and updating the database throughout the course of the project. The information input into GRTS is usable immediately. GRTS is an EPA mandated database and can be accessed by EPA, SWQB staff and the general public (log on to database as guest user).

3 QUALITY SYSTEM ASSESSMENT AND OVERSIGHT

3.1 Quality System Assessment and Response Actions

SWQB field sampling and measurement techniques are continually undergoing review and modification. It is envisioned that all SWQB procedures will continue to evolve and be refined. Techniques will never be

considered “final,” but will always be examined for possible improvements. The findings of procedural evaluations should be shared and discussed with other SWQB field personnel, Team Leaders, and Program Managers. Problems encountered during the course of this project will be immediately reported to the Project Managers who will consult with appropriate individuals to determine appropriate action. Decisions will be made by Program Managers, Project Coordinators, and Team Leaders, with input from field staff, whether to continue with existing methods and techniques, switch to new methods and techniques or to use combinations of both. If it is discovered that methodologies must deviate from an approved SWQB SOP, a revision of the SOP must be approved before work can be continued. Any changes to procedures covered or referenced by this QAPP will be documented. Should the corrective action impact the project or data quality, the Project Manager will alert the QA Officer. The collection of high-quality and representative data is the most important consideration. It is important that all SWQB technical staff communicate throughout the entire survey process, from initial planning to final report publication.

Quality Assurance Evaluations/Audits will be conducted periodically to provide assessment of the implementation of the procedures outlined and/or referenced in this QAPP.

At the end of each field season (i.e., annually), data are verified and validated by the SWQB Project Coordinator or designee (see most current SWQB Data Verification and Validation SOP) to determine variability and data usability. The QA Officer will work with appropriate staff and summarize QA issues periodically. Problem areas will be identified through this process and the QA Officer and appropriate Project Coordinators will work to take corrective action. QA reports prepared by contract laboratories further help to determine accuracy and the limits of the data. Due to the fact that analytical methods are continuously becoming more sensitive, this communication process is vital and on-going.

3.2 Reports to Management

The Project Coordinator is responsible for keeping the Program Manager and Team Leaders informed concerning the progress of the water quality survey or project and any problems or anomalies encountered. The Project Coordinator or designee is responsible for maintaining and completing the applicable Data Verification and Validation Worksheet(s) and submitting a copy of the results to the QA Officer. The original Verification and Validation Worksheet(s) will be maintained in the survey project binder and electronic version are maintained within the MASS Core folder on the network server. Data collected by WPS or PSRS will follow procedures outline in the most current SWQB Data Verification and Validation SOP and maintain their own project binders and electronic version. The SWQB QA Officer and technical personnel in conjunction with appropriate laboratory staff will determine if any corrective actions are necessary. Upon request laboratories will submit a summary of data accuracy and precision, results of performance and system audits, and discussion of significant QA problems and recommended solutions. The QA Officer will periodically compile a summary report of all QA/QC issues encountered to be distributed to the contract laboratories, EPA Region 6 and appropriate SWQB staff. Any adopted changes will be subsequently reflected as changes to this QAPP.

4 DATA VALIDATION AND USABILITY

All data collected by the SWQB undergo a series of Verification and Validation processes using checklist (forms) to ensure that the data are of sufficient quality and conform to a project's specific objectives. Previous SWQB Water Quality Databases are maintained for data retrieval purposes only and all data maintained in these databases have undergone Verification and Validation in previous years.

4.1 Data Review, Verification, and Validation

Data review, verification and validation are key steps for ensuring the integrity, suitability, and usability of the data. All field and analytical data are continually reviewed by the Project Coordinator or designee and verified and validated according to the procedures identified in this QAPP and the most current SWQB Data Verification and Validation SOP. Results from the data verification and validation process are summarized on the Data Verification and Validation Worksheet and included in the project file. Copies of these results are also provided to the QA Officer for use in the Data Quality Assessment process. The Project Coordinator and/or QA Officer will resolve data quality issues. All information pertaining to this process will be documented thoroughly and maintained in the project file.

4.2 Verification and Validation Methods

The data verification and validation procedures conducted by the SWQB are described in the most current SWQB Data Verification and Validation SOP. This process establishes the criteria for accepting, rejecting or qualifying data. The Data Verification and Validation Worksheet(s) serve as the summary of results for each type of data verified and validated. These worksheets serve as a record for the Project Coordinator and QA Officer, who will resolve any data quality issues. The QA Officer will also use the information provided in the Data Verification and Validation Worksheet(s) to prepare a summary of the issues that arose and resulting resolution status on a periodic basis. All information pertaining to this process is documented and included in the project file.

Data validation and verification procedures and associated acceptance criteria used by a contract analytical laboratory are described in the QAPP (or equivalent) as provided by each laboratory. Statistical criteria used by the laboratory for validating and expressing the variability of analytical results are the standard deviation, coefficient of variation, range, 95-percent confidence limits and control charts.
All data not meeting the appropriate QA/QC requirements as identified through the data verification and validation process are assigned appropriate laboratory qualifier or SWQB validation codes. A summary of laboratory and the SWQB's qualifier codes is provided in the Data Verification and Validation Worksheet(s) (an attachment to SWQB Data Verification and Validation SOP).

4.3 Reconciliation with User Requirements

Data are considered usable once the data verification and validation process has been completed and the data have been accepted, rejected or qualified. The SWQB uses the data to meet the objectives described in Section 1 of this QAPP. Guidelines for using qualified data are provided in the Comprehensive Assessment Listing Protocols (NMED/SWQB 2017). In general, data rejected (e.g., with a data qualifier of "R," "R1," "R2," etc.) are considered unusable for ambient/assessment or compliance purposes. Other data that are qualified (as specified by qualifier or validation code), but not rejected, may be used provided the potential uncertainties associated with the data are addressed and appropriate caveats attached. The data are also provided to the public for use through EPA's WQX database.

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6 APPENDCIES

Appendix A
Sample Handling Procedures and Holding Times

Sample Type	Sample Container	Preservation [1]	Maximum Holding Time[13]
Inorganic Tests			
Ions – full Suite[2] Ions – SWQB suite [3]	1-quart polyethylene cubitainer	On ice, approximately 6°C	7 days TSS – TDS 14 days other
TDS and TSS only	250 ml HDPE or 1 quart polyethylene cubitainer	On ice, approximately 6°C	7 days
Chloride	1-quart polyethylene cubitainer	None	28 days
Total Nutrients [4]	1-quart polyethylene cubitainer	1 mL H_2SO_4, on ice, approximately 6°C	28 days
Total Persulfate Nitrogen	250 ml HDPE or 1 quart polyethylene cubitainer	On ice, approximately 6°C or freeze	On ice: 7 days Frozen: 6 months
Dissolved Nutrients [5]	1-quart polyethylene cubitainer	Filtered within 15 minutes of sample collection, 1 mL H_2SO_4, on ice, approximately 6°C	28 days
Cyanide [6]	1-quart polyethylene cubitainer	5-7 pellets NaOH, 0.6g ascorbic acid if chlorine present on ice, approximately 6°C	14 days
Hardness Ca + Mg	1-quart polyethylene cubitainer	1.8 mL H_2SO_4, on ice, approximately 6°C	180 days
Metals			
Total Metals [7]	1-quart polyethylene cubitainer	2.0. mL HNO_3,	28 days mercury – 6 months other
Total Recoverable Aluminum	1-quart polyethylene cubitainer	Turbidity <= 30 NTU: 2.0 mL HNO_3 Turbidity > 30 NTU: Filtered (10μm) within 15 minutes of sample collection, 2.0 mL HNO_3	6 Months
Dissolved Metals [8]	1-quart polyethylene cubitainer	Filtered (0.45μm) within 15 minutes of sample collection, 2.0 mL HNO_3	28 days mercury – 6 months other
Microbiological Tests			
: Total Coliform, and *E. coli* [9]	120-mL shrink-banded containers(IDEXX part number WB120SBST) 125-mL sterile polypropylene bottels(lab)	0.0008% $Na_2S_2O_3$, on ice, less than 10°C	8 hours
Organic Tests [10]			
Method 8270 – Base/Neutral Acid Extractables [11]	Two 1-liter amber glass bottles (lab)	On ice, approximately 6°C	7 days until extraction, 40 days after extraction
Method 8260 – Volatile Organic Compounds [11]	Two 40-mL glass vials (lab) in Whirl-Pack	5 drops 10% HCl per vail (HCl provided by lab and prepared within 30 days of use), on ice, approximately 6°C	14 days
Radiological Tests			
Radionuclides [12]	Two 1-gallon polyethylene cubitainers	No preservative, store at room temperature	6 months
Biological Tests			
Ambient Toxicity (acute and chronic) in water and sediment	1-gallon polyethylene cubitainer (water) and/or Two 1-quart, wide-mouth glass containers (sediment)	On ice, approximately 6°C	36 hours
Chlorophyll *a* (streams/rivers)	1-quart opaque container	Filter sample with Whatman GF/F or GF/C filters. Place filters in cooler with dry ice or store in cooler at 6°C or less and freeze no more than 12 hours after collection	28 Days.

Sample Type	Sample Container	Preservation [(1)]	Maximum Holding Time[(13)]
Chlorophyll *a* (lakes)	1-quart opaque container.	Filter sample with Whatman GF/F or GF/C filters. Place Whatman filter in petri dish, wrap in foil , and place in cooler with dry ice and keep frozen.	28 Days if samples taken from a lake with pH ≥7
Phytoplankton (lakes)	1-quart polyethylene cubitainer	10-25 mL Acid Lugol's Solution within 2 hours of collection, on ice or refrigerated, approximately 6°C or less, in the dark	not applicable
Diatoms (lakes/streams/rivers)	glass or plastic vials, 45 mL	10 mL 95% ethanol or Lugol's Solution. On ice or refrigerated, approximately 6°C	not applicable
Periphyton community composition (streams/rivers)	50-mL plastic vial	2-4 mL of 10% formalin	not applicable
Macroinvertebrates	glass or polypropylene jar(s), size varies	fill jar with 95% ethanol; remove air bubbles	not applicable
Fish	Whirl-pack or equivalent	10% formalin to cover; remove air bubbles	not applicable
Fish Tissue	Filet and wrap in foil	Keep on ice and freeze	not applicable

Notes:
1 Preserve samples as soon as reasonably possible, preferably immediately after sample collection. Pre-preserved sample containers may be used.
2 Ions (full suite) include calcium, magnesium, potassium, sodium, hardness, alkalinity, bicarbonate, carbonate, sulfate, chloride, TDS, and TSS.
3 Ions (SWQB suite) include TDS, TSS, hardness, fluoride, chloride, and sulfate.
4 Total Nutrients include nitrate + nitrite, ammonia, total Kjeldahl nitrogen, and total phosphorus.
5 Dissolved nutrients include nitrate + nitrite, ammonia, orthophosphate, and dissolved phosphorus.
6 If chlorine or sulfide is suspected to be present, see SWQB SOPs for alternative handling procedures and holding times.
7 Total metals include aluminum, mercury and selenium at a minimum.
8 Dissolved metals include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.
9 $Na_2S_2O_3$ is included in containers provided by IDEXX. If samples analyzed by SLD, contact SLD Environmental Microbiology regarding sample containers and schedule.
10 Various other organic analyses are available upon request. Refer to the SLD Organic Chemistry section (505 841-2571) or other contract labs for sample container, preservation and holding time information.
11 Refer to 40CFR136 for the list of parameters analyzed using methods 8270 and 8260.
12 Radionuclides generally include gross alpha/beta and Ra-226 + Ra-228.
13 Contact laboratory in advance of sampling to ensure that samples can be analyzed within the required holding times.

Appendix B

Analytical Methods and Detection Limits *for Water Quality Ambient/Assessment Monitoring, WQS Compliance Monitoring for Enforcement Purposes, and Effectiveness Monitoring*

(Methods and detection limits for NPDES Permit Compliance Evaluations will be those approved under 40 CFR 136, specified in the permit or approved by the Regional Administrator, as appropriate).

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Alkalinity	E1640192	Total	SM 2320B	2875
Aluminum	7429-90-5	Dissolved	200.8	1.24
Aluminum	7429-90-5	Total	200.8	1.24
Ammonia	7664-41-7	Dissolved	350.1	40.32
Ammonia	7664-41-7	Total	350.1	31.32
Antimony	7440-36-0	Dissolved	200.8	0.11
Arsenic	7440-38-2	Dissolved	200.8	0.2
Asbestos	1332-21-4	Total	100.2	0.2 MFL
Barium	7440-39-3	Dissolved	200.8	0.22
Beryllium	7440-41-7	Dissolved	200.8	0.17
Bicarbonate	71-52-3	Total	SM 2320B	1340
Biological Oxygen Demand	N/A	Total	SM 5210B	2000
Boron	7440-42-8	Dissolved	200.7	3.8
Cadmium	7440-43-9	Dissolved	200.8	0.13
Calcium	7789-78-8	Total	200.7	8.38
Carbonate	3812-32-6	Total	SM 2320B	1600
Chemical Oxygen Demand	E1641638	Total	SM 5220D	10,000
Chloride	16887-00-6	Total	300	544
Chlorine Residual	7782-50-5	Dissolved	330.5	0.2
Chromium	7440-47-3	Dissolved	200.8	0.07
Chromium III	16065-83-1	Dissolved	N/A	1.38
Chromium VI	18540-29-9	Dissolved	N/A	1.38
Cobalt	7440-48-4	Dissolved	200.8	0.02
Copper	7440-50-8	Dissolved	200.8	0.38
Cyanide	57-12-5	Dissolved	335.4	2.98
Cyanide	57-12-5	Total	335.4	2.98
Dissolved Oxygen	7782-44-7	Total	360.1, D888-09C	N/A
Dioxin	1746-01-6	Total	8290	5 pg/L
Fluoride	7782-41-4	Total	340.2, SM 4500-F	7.4
Gross alpha (adjusted)	N/A	Total	Calculated	0.2 pCi/L
Gross Alpha	12587-46-1	Total	SM 7100B	0.1 pCi/L

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Gross Beta	12587-47-2	Total	SM 7100B	0.1 pCi/L
Hardness (2.497*Ca + 4.118*Mg)	N/A	Dissolved	Calculated	N/A
Iron	7439-89-6	Dissolved	200.8	3.11
Lead	7439-92-1	Dissolved	200.8	1
Magnesium	7439-95-4	Dissolved	200.7	1000
Manganese	7439-96-5	Dissolved	200.7; 200.8	8.17
Mercury	7439-97-6	Dissolved	245.1	0.01
Mercury	7439-97-6	Dissolved	200.8	0.007
Mercury	7439-97-6	Total	245.1	0.01
Methylmercury	22967-92-6	Total	1630	1.0 ng/g
Molybdenum	7439-98-7	Dissolved	200.8	0.03
Molybdenum	7439-98-7	Total	200.8	0.03
Nickel	7440-02-0	Dissolved	200.8	0.24
Nitrate + Nitrite	14797-55-8	Dissolved	353.2	14.5
Nitrate + Nitrite	14797-55-8	Total	353.2	14.5
Nitrate as N	84145-82-4	Total	353.2	5.73
Organic Carbon	7440-44-0	Dissolved	SM 5310C	500
Organic Carbon	7440-44-0	Total	SM 5310C	500
Orthophosphate	98059-61-1	Dissolved	365.1	3
pH	N/A	Total	150.2	N/A
Phosphate	7723-14-0	Dissolved	365.4	34.1
Phosphate	7723-14-0	Total	365.4	34.1
Polychlorinated biphenyls (PCBs)	1336-36-3	Total	1668A	0.64
Potassium	7440-09-7	Total	200.7	20.68
Radium-226	13982-63-3	Total	903.1	0.14 pCi/L
Radium-226 + 228	N/A	Total	Calculated	N/A
Radium-228	15262-20-1	Total	904	0.21 pCi/L
Salinity	N/A	Total	2520A	N/A
Selenium	7782-49-2	Dissolved	200.9	0.27
Selenium	7782-49-2	Dissolved	200.8	0.23
Selenium	7782-49-2	Total	200.9	0.39
Selenium	7782-49-2	Total	200.8	0.23
Silicon	7440-21-3	Total	200.7	21
Silver	7440-22-4	Dissolved	200.8	0.02
Sodium	7440-23-5	Total	200.7	5

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Specific Conductance	N/A	Total	120.1	N/A
Strontium	7440-24-6	Total	200.7	1.11
Strontium-90	10098-97-2	Total	SM 7110B	3 pCi/L
Sulfate	18785-72-3	Total	300	430
Temperature	N/A	Total	170.1	N/A
Thallium	7440-28-0	Dissolved	200.8	0.02
Turbidity	N/A	Total	ISO 7027	N/A
Total Dissolved Solids	E1642222	Total	SM 2540C	17350
Total Kjehldal Nitrogen	E17148461	Total	351.2	100
Total Persulfate Nitrogen	5466-54-6	Total	SM 4500-N-C	10
Total Suspended Solids	E1642818	Total	SM 2540D	968
Tritium	10028-17-8	Total	N/A	N/A
Uranium	7440-61-1	Dissolved	200.8	0.02
Uranium	7440-61-1	Total	200.8	0.02
Uranium - 234 (isotopic)	15117-96-1	Total	Method 900	0.06 pCi/L
Uranium - 238 (isotopic)	7440-61-1	Total	Method 900	0.04 pCi/L
Vanadium	7440-62-2	Dissolved	200.8	0.06
Zinc	7440-66-6	Dissolved	200.8	0.57
Total Coliforms	E761700	Total	Colilert-182000, Colilert/2000, 9221, 9222	1 MPN/CFU
Escherichia coli	68583-22-2	Total	Colilert-182000, Colilert/2000, 9221, 9222	1 MPN/CFU
1,1,1,2-Tetrachloroethane	630-20-6	Total	8260B	0.1
1,1,1-Trichloroethane	71-55-6	Total	8260B	0.4
1,1,2,2-Tetrachloroethane	79-34-5	Total	8260B	0.19
1,1,2-Trichloroethane	79-00-5	Total	8260B	0.1
1,1-Dichloroethane	75-34-3	Total	8260B	0.23
1,1-Dichloroethene	75-35-4	Total	8260B	0.3
1,1-Dichloropropene	563-58-6	Total	8260B	0.2
1,2,3-Trichlorobenzene	87-61-6	Total	8260B	0.2
1,2,3-Trichloropropane	96-18-4	Total	8260B	0.12
1,2,4-Trichlorobenzene	120-82-1	Total	8270D	0.31
1,2,4-Trichlorobenzene	120-82-1	Total	8260B	0.22
1,2,4-Trimethylbenzene	95-63-6	Total	8260B	0.2
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	Total	8260B	0.15

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
1,2-Dibromoethane (Ethylene dibromide (EDB))	106-93-4	Total	8260B	0.14
1,2-Dichlorobenzene	95-50-1	Total	8270D	0.47
1,2-Dichlorobenzene	95-50-1	Total	8260B	0.12
1,2-Dichloroethane	107-06-2	Total	8260B	0.15
1,2-Dichloropropane	78-87-5	Total	8260B	0.12
1,2-Dinitrobenzene	528-29-0	Total	8270D	0.4
1,2-Diphenylhydrazine	122-66-7	Total	8270D	2
1,3,5-Trimethylbenzene	108-67-8	Total	8260B	0.2
1,3-Dichlorobenzene	541-73-1	Total	8270D	0.53
1,3-Dichlorobenzene	541-73-1	Total	8260B	0.16
1,3-Dichloropropane	142-28-9	Total	8260B	0.16
1,3-Dinitrobenzene	99-65-0	Total	8270D	0.91
1,4-Dichlorobenzene	106-46-7	Total	8270D	0.55
1,4-Dinitrobenzene	100-25-4	Total	8270D	0.35
1,4-Dioxane	123-91-1	Total	8260B	18
1-Methylnaphthalene	90-12-0	Total	8270D	0.32
2,2-Dichloropropane	594-20-7	Total	8260B	0.46
2,3,4,6-Tetrachlorophenol	58-90-2	Total	8270D	0.4
2,3,5,6-Tetrachlorophenol	935-95-5	Total	8270D	0.4
2,4,5-Trichlorophenol	95-95-4	Total	8270D	0.31
2,4,6-Trichlorophenol	88-06-2	Total	8270D	0.23
2,4-Dichlorophenol	120-83-2	Total	8270D	0.29
2,4-Dimethylphenol	105-67-9	Total	8270D	0.43
2,4-Dinitrophenol	51-28-5	Total	8270D	0.42
2,4-Dinitrotoluene	121-14-2	Total	8270D	0.2
2,6-Dinitrotoluene	606-20-2	Total	8270D	0.23
2-Butanone (MEK)	78-93-3	Total	8260B	2.2
2-Chloroethyl Vinyl Ether	110-75-8	Total	8260B	10
2-Chloronaphthalene	91-58-7	Total	8270D	0.23
2-Chlorophenol	95-57-8	Total	8270D	0.32
2-Chlorotoluene	95-49-8	Total	8260B	0.2
2-Hexanone	591-78-6	Total	8260B	0.39
2-Methylnaphthalene	91-57-6	Total	8270D	0.4
2-Methylphenol	95-48-7	Total	8270D	0.22

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
2-Nitroaniline	88-74-4	Total	8270D	0.34
2-Nitrophenol	88-75-5	Total	8270D	0.37
3,3'-Dichlorobenzidine	91-94-1	Total	8270D	0.45**
3-Methylphenol & 4-Methylphenol	108-39-4 & 106-44-5	Total	8270D	0.655
3-Nitroaniline	99-09-2	Total	8270D	0.96
4,4'-DDD	72-54-8	Total	8081A	0.0144**
4,4'-DDE	72-55-9	Total	8081A	0.00437**
4,4'-DDT	50-29-3	Total	8081A	0..00727**
4,6-Dinitro-2-methylphenol	534-52-1	Total	8270D	0.4
4-Bromophenyl Phenyl Ether	101-55-3	Total	8270D	0.19
4-Chloro-3-methylphenol	59-50-7	Total	8270D	0.32
4-Chloroaniline	106-47-8	Total	8270D	0.2
4-Chlorophenyl Phenyl Ether	7005-72-3	Total	8270D	0.41
4-Chlorotoluene	106-43-4	Total	8260B	0.2
4-Isopropyltoluene	99-87-6	Total	8260B	0.2
4-Methyl-2-pentanone	108-10-1	Total	8260B	1.0
4-Nitroaniline	100-01-6	Total	8270D	0.43
4-Nitrophenol	100-02-7	Total	8270D	0.4
Acenaphthene	83-32-9	Total	8270D	0.56
Acenaphthylene	208-96-8	Total	8270D	0.36
Acetone	67-64-1	Total	8260B	3.3
Acetonitrile	75-05-8	Total	8260B	7.6
Acrolein	107-02-8	Total	8260B	13**
Acrylonitrile	107-13-1	Total	8260B	1.5**
Alachlor	15972-60-8	Total	8270D	0.2
Alachlor	15972-60-8	Total	525.2	0.1
Aldrin	309-00-2	Total	8270D	0.2**
Aldrin	309-00-2	Total	525.2	0.1**
Aldrin	309-00-2	Total	8081A	0.00807**
Allyl Chloride	107-05-1	Total	8260B	3.8
alpha-BHC	319-84-6	Total	8270D	0.1**
alpha-BHC	319-84-6	Total	8081A	0.00357
Aniline	62-53-3	Total	8270D	0.1
Anthracene	120-12-7	Total	8270D	0.44

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Atrazine	1912-24-9	Total	8270C or D	0.67
Azobenzene	103-33-3	Total	8270D	0.28
Benzene	71-43-2	Total	8260B	0.2
Benzidine	92-87-5	Total	8270D	0.31**
Benzo(a)anthracene	56-55-3	Total	8270D	0.2
Benzo(a)pyrene	50-32-8	Total	8270D	0.43
Benzo(b)fluoranthene	205-99-2	Total	8270D	0.44
Benzo(g,h,i)perylene	191-24-2	Total	8270D	0.63
Benzo(k)fluoranthene	207-08-9	Total	8270D	0.35
Benzyl alcohol	100-51-6	Total	8270D	0.21
beta-BHC	319-85-7	Total	8270D	0.2**
beta-BHC	319-85-7	Total	8081A	0.00763
bis(2-Chloroethoxy)methane	111-91-1	Total	8270D	0.49
bis(2-Chloroethyl)ether	111-44-4	Total	8270D	0.24
bis(2-Chloroisopropyl)ether	108-60-1	Total	8270D	0.46
bis(2-Ethylhexyl)adipate	103-23-1	Total	8270D	0.23
bis(2-Ethylhexyl)phthalate	117-81-7	Total	8270D	0.2
Bromobenzene	108-86-1	Total	8260B	0.12
Bromochloromethane	74-97-5	Total	8260B	0.21
Bromodichloromethane	75-27-4	Total	8260B	0.2
Bromoform	75-25-2	Total	8260B	0.34
Bromomethane	74-83-9	Total	8260B	13
Butylbenzyl Phthalate	85-68-7	Total	8270D	0.36
Carbazole	86-74-8	Total	8270D	0.18
Carbon Disulfide	75-15-0	Total	8260B	0.2
Carbon Tetrachloride	56-23-5	Total	8260B	0.2
Chlorobenzene	108-90-7	Total	8260B	0.16
Chloroethane	75-00-3	Total	8260B	1.4
Chloroform	67-66-3	Total	8260B	0.2
Chloromethane	74-87-3	Total	8260B	0.37
Chloroprene	126-99-8	Total	8260B	0.33
Chrysene	218-01-9	Total	8270D	0.26**
cis-1,2-Dichloroethene	156-59-2	Total	8260B	0.2
cis-1,3-Dichloropropene	10061-01-5	Total	8260B	0.15

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
cis-1,4-Dichloro-2-butene	1476-11-5	Total	8260B	1.1
cis-Chlordane (alpha-chlordane)	5103-71-9	Total	8270D	0.2
cis-Chlordane (alpha-chlordane)	5103-71-9	Total	8081A	0.00515
Chlordane	57-74-9	Total	8270D	0.2**
Chlordane	57-74-9	Total	8081A	0.0927**
Cyanazine	21725-46-2	Total	525.3	0.2
delta-BHC	319-86-8	Total	8270D	0.2
delta-BHC	319-86-8	Total	8081A	0.00434
Dibenz(a,h)anthracene	53-70-3	Total	8270D	0.66
Dibenzofuran	132-64-9	Total	8270D	0.23
Dibromochloromethane	124-48-1	Total	8260B	0.25
Dibromomethane	74-95-3	Total	8260B	0.13
Dichlorodifluoromethane	75-71-8	Total	8260B	0.35
Dieldrin	60-57-1	Total	8270D	0.1**
Dieldrin	60-57-1	Total	8081A	0.00378**
Diethylphthalate	84-66-2	Total	8270D	0.35
Dimethylphthalate	131-11-3	Total	8270D	0.26
Di-n-butyl Phthalate	84-74-2	Total	8270D	0.59
Di-n-octyl phthalate	117-84-0	Total	8270D	0.33
Endosulfan I (alpha)	959-98-8	Total	8270D	0.1**
Endosulfan I (alpha)	959-98-8	Total	8081A	0.004
Endosulfan II (beta)	33213-65-9	Total	8270D	0.2**
Endosulfan II (beta)	33213-65-9	Total	8081A	0.00619
Endosulfan sulfate	1031-07-8	Total	8270D	0.2
Endosulfan sulfate	1031-07-8	Total	8081A	0.01
Endrin	72-20-8	Total	8270D	0.2**
Endrin	72-20-8	Total	8081A	0.00437
Endrin aldehyde	7421-93-4	Total	8270D	0.1
Endrin aldehyde	7421-93-4	Total	8081A	0.00498
Endrin ketone	53494-70-5	Total	8270D	0.2
Endrin ketone	53494-70-5	Total	8081A	0.0109
Ethyl Methacrylate	97-63-2	Total	8260B	0.79
Ethylbenzene	100-41-4	Total	8260B	0.2
Fluoranthene	206-44-0	Total	8270D	0.28

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Fluorene	86-73-7	Total	8270D	0.36
gamma-BHC (lindane)	55963-76-6	Total	8270D	0.1
gamma-BHC (lindane)	55963-76-6	Total	8081A	0.00507
Heptachlor	76-44-8	Total	8270D	0.1**
Heptachlor	76-44-8	Total	8081A	0.00486**
Heptachlor epoxide	1024-57-3	Total	8270D	0.2**
Heptachlor epoxide	1024-57-3	Total	8081A	0.0045**
Hexachlorobenzene	118-74-1	Total	8270D	0.23**
Hexachlorobutadiene	87-68-3	Total	8270D	0.27
Hexachlorobutadiene	87-68-3	Total	8260B	0.31
Hexachlorocyclopentadiene	77-47-4	Total	8270D	0.32
Hexachloroethane	67-72-1	Total	8270D	0.2
Indeno(1,2,3-cd)pyrene	193-39-5	Total	8270D	0.41**
Iodomethane	74-88-4	Total	8260B	0.68
Isobutyl Alcohol	78-83-1	Total	8260B	10
Isophorone	78-59-1	Total	8270D	0.43
Isopropylbenzene	98-82-8	Total	8260B	0.2
meta para Xylene mix	108-38-3 & 106-42-3	Total	8260B	0.32
Methacrylonitrile	126-98-7	Total	8260B	4.4
Methoxychlor	72-43-5	Total	8270D	0.2
Methoxychlor	72-43-5	Total	8081A	0.0147
Methyl Methacrylate	80-62-6	Total	8260B	0.15
Methylene Chloride (Dichloromethane)	75-09-2	Total	8260B	0.1
Metolachlor	51218-45-2	Total	525.2	0.1
Metribuzin	21087-64-9	Total	525.2	0.1
Naphthalene	91-20-3	Total	8270D	0.42
Naphthalene	91-20-3	Total	8260B	0.24
n-Butylbenzene	104-51-8	Total	8260B	0.3
Nitrobenzene	98-95-3	Total	8260B	5.4
Nitrobenzene	98-95-3	Total	8270D	0.27
N-nitrosodimethylamine	62-75-9	Total	8270D	0.36**
N-nitroso-di-n-propylamine	621-64-7	Total	8270D	0.4**
N-nitrosodiphenylamine	86-30-6	Total	8270D	0.31
ortho-Xylene	95-47-6	Total	8260B	0.2

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Pentachloroethane	76-01-7	Total	8260B	0.2
Pentachlorophenol	87-86-5	Total	8270D	0.27
Phenanthrene	85-01-8	Total	8270D	0.45
Phenol	108-95-2	Total	8270D	0.58
Prometryn	7287-19-6	Total	619	0.1
Propionitrile	107-12-0	Total	8260B	4.3
Propylbenzene	103-65-1	Total	8260B	0.2
Pyrene	129-00-0	Total	8270D	0.21
Pyridine	110-86-1	Total	8270D	0.46
sec-Butylbenzene	135-98-8	Total	8260B	0.2
Simazine	122-34-9	Total	525.2	0.1
Styrene	100-42-5	Total	8260B	0.13
tert-Butyl Methyl Ether (MTBE)	1634-04-4	Total	8260B	0.32
tert-Butylbenzene	98-06-6	Total	8260B	0.2
Tetrachloroethene	127-18-4	Total	8260B	0.19
Tetrahydrofuran (THF)	109-99-9	Total	524.2	7.9
Toluene	108-88-3	Total	8260B	0.2
Toxaphene	8001-35-2	Total	8081A	0.42**
trans-1,2-Dichloroethene	156-60-5	Total	8260B	0.2
trans-1,3-Dichloropropene	10061-02-6	Total	8260B	0.31
trans-1,4-Dichloro-2-butene	110-57-6	Total	8260B	0.5
trans-Chlordane	5103-74-2	Total	8081B	0.2
Trichloroethene	79-01-6	Total	8260B	0.2
Trichlorofluoromethane	75-69-4	Total	8260B	0.3
Bromoform	75-25-2	Total	8260B	0.34
Chloroform	67-66-3	Total	8260B	0.18
Dichlorobromomethane	75-27-4	Total	8260B	0.2
Chlorodibromomethane	124-48-1	Total	8260B	0.25
Vinyl Acetate	108-05-4	Total	8260B	0.4
Vinyl Chloride	75-01-4	Total	8260B	0.3
Xylene	1330-20-7	Total	8260B	0.12
Mercury	7439-97-6	Tissue	7471A	9.9 ug/kg
Selenium	7782-49-2	Tissue	6020	98 ug/kg
Aldrin	309-00-2	Tissue	8081	0.14 ug/kg

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Dieldrin	60-57-1	Tissue	8081	0.16 ug/kg
Endosulfan sulfate	1031-07-8	Tissue	8081	0.53 ug/kg
Endrin	72-20-8	Tissue	8081	0.21 ug/kg
Endrin aldehyde	7421-93-4	Tissue	8081	0.35 ug/kg
Endrin ketone	53494-70-5	Tissue	8081	0.32 ug/kg
Heptachlor	76-44-8	Tissue	8081	0.51 ug/kg
Heptachlor epoxide	1024-57-3	Tissue	8081	0.17 ug/kg
Lindane	58-89-9	Tissue	8081	0.21 ug/kg
Methoxychlor	72-43-5	Tissue	8081	2.4 ug/kg
Toxaphene	8001-35-2	Tissue	8081	20 ug/kg
cis-Chlordane	5103-71-9	Tissue	8081	0.17 ug/kg
p,p'-DDD	72-54-8	Tissue	8081	0.29 ug/kg
p,p'-DDE	72-55-9	Tissue	8081	0.22 ug/kg
p,p'-DDT	50-29-3	Tissue	8081	0.79 ug/kg
trans-Chlordane	5103-74-2	Tissue	8081	0.18 ug/kg
.alpha.-Endosulfan	959-98-8	Tissue	8081	0.19 ug/kg
.alpha.-Hexachlorocyclohexane	319-84-6	Tissue	8081	0.14 ug/kg
.beta.-Endosulfan	33213-65-9	Tissue	8081	0.81 ug/kg
.beta.-Hexachlorocyclohexane	319-85-7	Tissue	8081	0.55 ug/kg
.delta.-Hexachlorocyclohexane	319-86-8	Tissue	8081	0.22 ug/kg
Polychlorinated biphenyls (PCBs) Congeners, Total Blank Corrected	1336-36-3	Tissue	1668A	0.5 ug/kg

** MDL may be greater than the WQC.

Appendix C
SWQB Equipment Maintenance and Calibration

The requirements provided below are examples that have been summarized and are not meant to be exhaustive procedures—always refer to the manufacturer's instruction manual for each instrument.

Equipment Description	Maintenance
In-Situ Aqua TROLL 600	All field staff should acquaint themselves with the details of their operation and maintenance per manufacturer's specifications. Intractable problems should be referred to designated staff for correction or shipment to an approved repair facility. Prior to use, inspect instrument to ensure all components are clean and in good working order. If sonde is to be used in unattended mode, ensure that batteries retain a full charge or replace batteries. Assure that all appropriate probes are activated and set to report. Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. Inspect O-rings for damage or discoloration and replace if necessary. For short term storage (<week), fill the storage cup with clean water and screw on the restrictor cap. For long-term storage (>week), replace the clean water with pH 4.0 solution. At end of field season, remove batteries and all probes. Store the pH probe in pH 4.0 solution in the pH/ORP cap. Place dust caps on sensor connectors.
In-Situ 63470 pH/ORP Sensor	The pH sensor must be kept moist for its operational life. For storage greater than one week, ensure the sensor is in contact with pH 4.0 solution. Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. Replace sensor fill solution according to manufacturer's instruction every six months or when sensor is slow to respond or does not calibrate. If performance does not improve, replace the pH junction according to manufacturer's instruction.
In-Situ 63450 RDO Sensor	RDO sensor caps have a two-year combined shelf and operational life. Clean only with non-abrasive cloth and clean water or vinegar. To clean the optical window, remove the sensor cap and gently wipe the window with a dry non-abrasive cloth. Store dry or wet but ensure the sensor cap or optical window cannot be abraded.
In-Situ 63460 Conductivity/Temperature Sensor	Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. Store dry or wet.
In-Situ 63480 Turbidity Sensor	Keep optical windows free of foreign material. Clean the optical window with clean water and a non-abrasive cloth or brush. Store dry or wet but ensure the optical window cannot be abraded.
In-Situ 63500 Central Wiper	Replace wiper bristles according to manufacturer's instruction when visibly bent, damaged or fouled.
Vu-Situ Mobile Device	Ensure the device battery is fully charged and software is up to date prior to field use. Vu-Situ software updates will automatically update In-Situ sonde and sensor firmware upon connection, if needed. Clean according to manufacturer's instructions.
YSI Model 6820, 6920 and 600 XLM Sondes	All field staff should acquaint themselves with the details of their operation and maintenance as per factory specifications. Intractable problems should be referred to designated staff for correction or shipment to an approved repair facility. Prior to use, inspect instrument to ensure all components are clean and in good working order. If sonde is to be used in unattended mode, ensure that batteries retain a full charge or replace batteries. Assure that all appropriate probes are activated and set to report. Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. Inspect O-rings for damage or discoloration and replace if necessary. For short term storage (<week), fill the storage cup with clean water. For long-term storage (>week), replace the clean water with pH 4.0 solution. At end of field season, remove batteries and all probes. Store the pH probe in pH 4.0 solution in the pH/ORP cap. Place dust caps on sensor connectors.
YSI 6560 Conductivity/ Temperature Probe	Periodically clean ports with tubing brush (provided) and mild soap.
YSI 6561 pH probe	In the event that the probe will not calibrate, carefully clean electrode as per manufacturer's instructions. If the probe still will not calibrate, refer problem to designated staff for correction or replacement.

Equipment Description	Maintenance
YSI 6562 DO probe (rapid pulse)	Check membrane for bubbles and electrode for corrosion prior to calibration. Replace membrane/clean silver electrode as per manufacturer's instructions as needed (see manual). Refresh potassium chloride (KCl) solution and change membrane prior to unattended deployment.
YSI 6150 optical DO probe	Ensure wiper pad is clean and that wiper arm is parking correctly. Inspect membrane for scratches.
YSI 6026 and 6136 Turbidity probe wiper	Ensure proper functioning of wiper arm. If wiper arm pad is discolored, replace pad.
YSI 650 MDS Data logger.	Keep clean and dry. Check batteries and battery compartment for leakage. Protect from excessive heat and the screen from direct sunlight. Cables and connectors must be in good working order.
Hach HydroLab MS5 Sondes	All field staff should acquaint themselves with the details of their operation and maintenance as per factory specifications. Intractable problems should be referred to designated staff for correction or shipment to an approved repair facility. Inspect the instrument prior to use to ensure all components are clean and in good working order. If sonde is to be used in unattended mode, ensure that batteries retain a full charge or replace batteries. The PocketPC handsets use replaceable or rechargeable battery packs, fully charge rechargeable batteries prior to use or take extra batteries in the field. Using the Hydras 3LT software, assure that all appropriate probes are activated and set to report. Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. Inspect O-rings for damage or discoloration and replace if necessary. For short term storage (<week), fill the storage cup with clean water. For long-term storage (>week), replace the clean water with pH 4.0 solution. Remove batteries at end of field season.
Hach HydroLab 007455 LDO probe	The manufacturer recommends periodic maintenance to remove contaminants such as oil, biological growth, dirt, etc. Sensor maintenance should be conducted after every deployment cycle. Do not use organic solvents, as they damage the plastic sensor cap.
Hach HydroLab 004446/004454/004461 pH probe	Clean according to manufacturer's instructions, beginning with the gentlest method and proceeding to other methods only if necessary. After long term storage or when sensor performance slows or fails to calibrate, clean the pH sensor, replace Reference Electrolyte/KCl Pellets, and replace the Reference Junction following the manufacturer's instructions.
Hach HydroLab 007180 Self-Cleaning Turbidity Probe	Ensure proper functioning of the wiper arm and clear any debris near the optics. Replace the wiper and brush when they become fouled with biological growth or debris or if cracked.
Hach HydroLab 004468 Conductivity Probe	Periodically clean debris from the gap in the probe using the included brush and mild soap.
Hach Pocket Colorimeter	Turn meter on and check for any errors indicated by the meter's self-check display. Take a spare set of batteries (four AAA) in the field.
Hach Turbidimeter Model 2100P	Turn meter on and check for any errors indicated by the meter's self-check display; check for calibration. Take a spare set of batteries (four AAA) in the field. After the meter indicates a low-battery condition, the batteries can be replaced in 30 seconds or less and maintain the calibration. Check cuvettes for dirt or scratches.
HF Scientific Pocket Colorimeter	Maintain as per manufacturer's instructions. Check to ensure instrument is in good working order and cuvettes are clean and/or replaced as needed. Taking spare batteries is strongly advised.
GeoTech GeoPump II	Wipe off outside of GeoPump with a damp cloth; check pump head and power cords.
Filtration Tubing	Soak new tubing for not less than one hour and not more than two hours in 10% hydrochloric acid (HCl) solution. Rinse inside and out with deionized (DI) water. Using clean technique (gloved, clean hands/dirty hands), transfer tubing into new re-closable plastic bags for transport to field. Tubing is used once, re-bagged, and returned to the lab for cleaning and re-use. Used tubing will be washed in laboratory grade detergent and rinsed in tap water prior to immersion in acid bath. Sufficient tubing to accomplish all sampling objectives should be prepared prior to each sampling run.
Wildco Kemmerer Bottle	Inspect before each sampling trip and check operation. Adjust as necessary. Worn or age-hardened stoppers should be replaced to prevent leakage.
Kahl Irradiometer	Inspect deck sensors, underwater sensors, and power cord before each sampling trip and check operation.

Equipment Description	Maintenance
Ekmann Dredge	Inspect before each sampling trip and check operation. Adjust as necessary.
ISCO® Automatic Sampler	At the beginning of a monitoring season (May – Oct) replace peristaltic pump tubing and check program for compliance with FSP. Prior to deployment, charge battery if needed. Replace paper in flow meter if needed. Replace suction line at each deployment. Taking a spare ISCO® , flow meter, and battery is advised. After a sampling trip, thoroughly clean (and acid rinse) the sample bottles, and peristaltic pump tubing of the ISCO® and allow to air dry. If repair is required new parts will be ordered and replaced. Upon retrieval from field in fall or when changing locations decontaminate sampler and perform winter maintenance for the next deployment. Follow the ISCO® instruction manual and decontamination procedures in SWQB SOP 8.1 – Chemical Sampling Equipment Cleaning Procedures.
HOBO® Water Temp Pro V. 2	A National Institute of Standards and Technology (NIST) traceable thermometer, with a resolution and accuracy of 0.1°C or better, should be used to test accuracy annually. The NMDoH, SLD can certify a thermometer for accuracy and NIST traceability at no cost to SWQB.
HOBO® DO Logger U26-001	Sensor caps have a seven-month operational life following initialization. Ensure the installed cap will not expire while deployed. Clean only with non-abrasive cloth and clean water, mild detergent or vinegar. To clean the optical window, remove the sensor cap and gently wipe the window with a dry non-abrasive cloth. Do not get the optical window wet. When storing with the sensor cap installed, wet a small sponge, place the calibration boot over the logger and cover in plastic wrap.
HOBO® Conductivity Logger U24-001	Clean only with non-abrasive cloth and clean water, mild detergent or vinegar. Use a cotton swab to clean the sensor face and rinse with clean or distilled water.
Oxford Macro-Set Pipetter	Check pipetter for smoothness of operation through maximum stroke. Install a tip, draw a sample of liquid, hold the pipetter vertically, and check for leaks. If operation is not smooth, disassemble and clean cylinder wall, the O-ring, and the piston of all deposits and old lubricants. Lubricate and recheck. If leakage or lack of smoothness persists, replace O-ring. Separate pipetters will be used for sulfuric acid (H_2SO_4) (pH <2) and nitric acid (HNO_3) (pH <2), to avoid cross contamination. The separate pipetters should be transported and stored separately.
Smith-Root Type 12-B P.O.W. Electrofisher	Assure that gel-pack batteries are fully charged before each trip. Take at least two batteries for most routine fish-shocking trips. If several sites will be shocked during a sampling trip, take battery charger along for overnight charging. Gel-pack batteries must be maintained while in storage on the Model MC-24 Maintenance Charger.
Laser Level LB-1	Charge batteries prior to field use. Check batteries on sensors. Check accuracy, precision, and reproducibility by closing a survey loop back to an initial benchmark. After use, clean instrument, repack in case and carefully secure in vehicle.
Marsh-McBirney Flo-Mate FlowMeter Model 2000	Check the probe to see that it is clean; if dirty, clean with mild soap and water. Check batteries by looking to see if low battery flag is displayed. If batteries are low, replace with two fresh D-size batteries.
Ott MFPro	Clean the sensor according to manufacturer's specifications following use in muddy or silty streams or if materials accumulate on the sensor. Clean the hand unit with water or a mild detergent and non-abrasive cloth. Charge the internal rechargeable battery prior to use in the field. If battery performance degrades, remove and replace following manufacturer's specifications.
Pygmy/AA Flow Meters	Clean, dry and lubricate after each use and check that these procedures have been followed prior to each use. Examine for damage and perform "spin test" prior to use—cup wheel should spin for one minute. When not in use, insert shipping pin or equivalent.
Top-setting Wading Rod	This equipment shall be cleaned and examined before and after each discharge measurement. The examination shall include a check on the sliding rod and lockset mechanism.
V-Notch and Rectangular Weir Plates	Clean and examine before and after each field installation. Clean plates with soapy water, then rinse in distilled water. Inspect the weir plates to ensure that the upstream edge remains sharp.
USGS Staff Gages	Check for damage, warping, legibility, etc. before use.
Garmin eTrex Vista personal navigator	Check battery power prior to use and take spare batteries.

Equipment Description	Maintenance
IDEXX Quanti-Tray System	Use and maintain as per manufacturer's instructions. Ensure equipment is clean and in proper working order.
NB-201(C) General Incubator, Thermotote Incubator, TriTech Research Digitherm Incubator	Periodically check seals for warping or cracking and replace if needed. Clean with clean water or mild detergent and a non-abrasive cloth.

Equipment	Calibration Requirements
Hach Turbidimeter Model 2100P	Check the turbidity of the Gelex secondary standard closest to the expected range daily. If the reading varies by more than ±5 percent, recalibrate with primary formazin standards. Instrument must be recalibrated with primary formazin standards every three months or after battery replacement if calibration is lost. Refer to manual for formazin-standard preparation. After calibration, read each of the Gelex secondary standards in the kit and mark the lids with the proper reading. These secondary standards must always be re-read after formazin calibration of the meter
Hach Pocket Colorimeter	The instrument is factory calibrated and is ready for use. Test the accuracy of the meter by using a chlorine voluette ampoule standard solution at least once a quarter. Refer to the manual for proper procedures. If there are any discrepancies, contact the manufacturer
Marsh-McBirney Flo-Mate FlowMeter Model 2000	Clean sensor; place in 5 gallon plastic bucket of water, keeping it at least 3 in from sides; wait 10-15 min to settle water; simultaneously press STO and RCL keys (will see "3" on display). Decrement to zero using the ↓ key and then you will see "32" on display; the unit will automatically decrement to zero and turn off and calibration is complete.
Ott MFPro	The Ott MFPro flowmeter is factory calibrated and performs a self-diagnostic test when powering up. The instrument performs an auto depth calibration each time the sensor is lifted out of water into the air. To set a temporary velocity offset, use ambient water to fill a non-metallic 5-gallon bucket on site. Place the sensor in the center of the bucket, not touching the walls or bottom. Let the water velocity reading stabilize and zero the velocity calibration. The temporary offset will last until another offset is entered or the power is turned off.
Pygmy/AA Flow Meters	Clean, dry and lubricate after each use. Perform "spin test" prior to use—cup wheel should spin for a full minute. When not in use, insert shipping pin or equivalent
ISCO® Automatic Sampler	When in use, check periodically to assure that the aliquot bottles are filling properly and that a new aliquot is automatically collected at the lapsed time selected
YSI, Hydrolab, and In-Situ Sondes	Calibrate sensors according to SWQB SOP 6.1 – Sonde Calibration and Maintenance prior to a sampling event. Recalibrate DO sensor in the field to compensate for changes in altitude greater than 300 meters. With the exception of DO, calibration verification shall be performed following the sampling event using standards (if available) that bracket sampling result values between calibration and calibration verification. DO calibration verification shall be determined by verifying local 100% saturation or concentration at 100% saturation. Turbidity and pH shall receive two-point calibration and calibration verification at a minimum. The temperature thermistor accuracy will be tested following the thermograph procedures listed below.
HOBO® DO Logger U26-001	Calibrate the DO Logger according to SWQB SOP 6.1 – Sonde Calibration and Maintenance prior to deployment. Collect pre and post deployment field verification measurements according to instructions detailed in SWQB SOP 6.2 – Sonde Deployment.
HOBO® Conductivity Logger U24-001	Calibrate the Conductivity Logger according to SWQB SOP 6.1 – Sonde Calibration and Maintenance prior to deployment. Collect pre and post deployment field verification measurements according to instructions detailed in SWQB SOP 6.2 – Sonde Deployment.

HOBO® Water Temp Pro V. 2 thermographs	Accuracy of the thermistor must be verified both preceding and following field deployment (annually, at a minimum) in a stable water bath or other controlled temperature environment at both a low range of approximately 4°C and a high range of approximately 35°C. The stable temperature of a controlled environment allows direct comparison of the unit's readout with that of the certified or calibrated thermometer. Accuracy should be within ±0.5°C. A log must be kept that documents each unit's calibration date, test result, and the reference thermometer used. Thermographs that fall outside the acceptable accuracy range should be returned to the manufacturer for adjustment or replacement.
NB-201(C) General Incubator, Thermotote Incubator, TriTech Research Digitherm Incubator	Verify temperature operation is within 35 ^{o}C, +/- 0.5 ^{o}C using a NIST-traceable internal thermometer. Adjust incubator thermostat according to manufacturer's instructions.
Garmin eTrex Vista GPS	Calibrate electronic compass according to manufacturer's instructions after changing batteries or if last calibration is unknown.