QUALITY ASSURANCE PLAN
ENVIRONMENTAL SAMPLING PROGRAMS

LEWIS & CLARK PUBLIC HEALTH
LEWIS & CLARK WATER QUALITY PROTECTION DISTRICT

Approval:

____ ______

Jennifer McBroom, Lewis & Clark County Water Quality Protection District Supervisor Date

Contents

1.0 Introduction

This document presents a *Quality Assurance Plan (QAP)* for environmental sampling conducted by Lewis & Clark Public Health Water Quality Protection District (WQPD). The QAP presents the field and laboratory activities, and methods for monitoring and sampling of surface water and groundwater within the Lake Helena watershed and adjacent areas.

The QAP is intended to provide a consistent and acceptable approach to data collection and management that will facilitate achievement of program objectives. Implementation of this QAP will ensure that data collected, compiled, and generated for WQPD projects are complete, accurate, and of the type, quantity, and quality required for their intended use.

In addition to this QAP, individual **Project Plans** are developed for specific data collection projects initiated by the WQPD. Project Plans include individual project details such as: project map, monitoring stations, monitoring frequency & timeline, sampling parameters/analytes, and other vitals specific to each project (see Appendix C).

2.0 Field Activities and Sampling Methods

Field activities addressed by this QAP consist primarily of groundwater and surface water monitoring in the Helena Valley area of West-Central Montana. Groundwater monitoring includes measurement of water levels from wells, and collection and analysis of groundwater quality samples. Surface water monitoring includes channel cross-section and streamflow measurements, and collection and analysis of surface water quality samples. Where appropriate, data loggers are installed at some groundwater and surface water monitoring stations to record continual water level or stage measurements.

All sampling activity, as outlined in the following sections, follows standard protocols for environmental sampling to ensure data quality. For all field monitoring, field sheets are used to record appropriate field information at each monitoring station. Copies of these sheets are provided in Appendix A.

2.1 Groundwater Monitoring

Groundwater monitoring includes groundwater quality sampling and groundwater level measurements conducted at both dedicated monitoring wells and private residential wells. Field forms for the collection of groundwater samples, field parameters and water levels are provided in Appendix A. Appendix B includes common analyte lists used by the WQPD for laboratory analysis of groundwater samples. Individual WQPD Project Plans typically employ one of these analyte lists.

2.1.1 Water Level Measurement

Water levels are measured manually using either an electric sounding tape or a sonic water level meter. When measuring water levels using an electric sounding tape, measurements are collected following procedures found in USGS publication Groundwater Technical Procedures of the U.S. Geological Survey (Cunningham and Schalk, 2011). Sonic water level measurements are collected using a Ravensgate Model 300 Sonic Water Level Meter, operated in accordance with manufacturer's specifications.

In addition to manual water level measurements, data loggers that measure and store water level and water temperature data at established intervals (typically one hour) are deployed in several wells and may be moved among wells within the network as warranted. A variety of data loggers from manufacturers, Onset and Solinst, are deployed and operated in accordance with manufacturer's specifications.

2.1.2 Groundwater Quality Sampling

Groundwater samples will be collected after purging the well casing to induce flow into the well screen. During sampling, field parameters pH, specific conductivity, temperature and dissolved oxygen will be monitored to verify that recovered water is representative of groundwater conditions at the sample location. The purging method will be determined based on well construction and the depth to the water table. When possible, low-flow methods for well purging will be utilized to minimize the disturbance to the water column, with a goal of pumping at a rate that matches the recharge rate of the well, so that no drawdown is observed in the well. All purged water will be discharged to the ground away from the wellhead. Samples will be collected in acid-washed, polyethylene containers obtained from the project laboratory. Sampling methods are summarized as follows:

- An electric pump will be used for monitoring wells with a diameter equal to or greater than 2-inches. Parameters will be monitored using an in-line flow cell during well purging. The sample will be collected only after consecutive readings demonstrate stability of groundwater chemistry.
- A peristaltic pump will be used for piezometers with a diameter less than 2-inches, and a water level less than 25 feet below ground surface. Parameters will be monitored using an in-line flow cell during well purging. The sample will be collected only after consecutive readings demonstrate stability of groundwater chemistry.
- Bailers will be used for monitoring wells where pumping methods will not work. A new, disposable bailers will be used at each well. Purge volumes will be monitored, and parameters measured after each well volume has been removed. Sample filtration will be completed using the peristaltic pump.
- For private, potable water wells, samples will be collected from frost-free hydrants prior to any treatment for the wells. The well discharge will be split, with primary flow discharged away from the well head, and a lesser flow directed to an in-line flow cell for parameter monitoring. Samples will be collected after consecutive readings demonstrate stability of groundwater chemistry.
- Groundwater sampling equipment pumps will be decontaminated between each well by scrubbing exposed components with an alconox detergent solution, followed with a rinse in distilled water. The internal components of the pump will be washed by recirculation pumping the alconox solution through the pump and tubing, followed by a distilled water rinse using the same solution.

2.1.3 Groundwater Field Parameter Measurement

Field parameters pH, specific conductivity, temperature and dissolved oxygen will be monitored using a *YSI Professional Plus* multi-parameter meter. For groundwater sampling, a YSI flow cell will be connected to the pump discharge tube for in-line monitoring of parameters without atmospheric exposure. The meter will be calibrated each day prior to use following manufacturer's instructions. All calibration data will be logged for verification.

2.2 Surface Water Monitoring

Surface water monitoring includes surface water flow measurements and water quality sampling at established stream monitoring stations. **Field forms** for collection of water quality samples, field parameters, and discharge measurements are provided in Appendix A. Appendix B includes common analyte lists used by the WQPD for laboratory analysis of surface water samples. Individual WQPD

Project Plans typically use this analyte lists, however individual Project Plans may include modified parameter suites.

2.2.1 Surface Water Flow Measurement

Surface water flow measurement consists of measuring in-stream flow manually, and stream stage using data loggers at established monitoring stations: both *Onset* loggers and *Tru-Track* loggers are used. Data loggers record continual stage (water height) at pre-selected time intervals throughout the monitoring season (May-October). Data loggers are attached to vertical steel stakes driven into the stream channel (**Figure 1**). In order to associate the stage measurements collected by the data loggers to stream discharge in cubic-feet/second (CFS), manual in-stream flow measurements at a variety of different stages are collected. Discharge measurements provide the basis of development of a rating curve, which allows correlation of stage with discharge.

Monitoring activity consists of installing the data logger devices and an accompanying staff gage at each monitoring station, and then collecting several manual flow measurements at different stages using a *Marsh-McBirney Flow Meter*. At the end of each monitoring season, data from the loggers is downloaded to a computer and flow rating curves for each station are established. Streamflow measurement methodology follows procedures established in *Montana DEQ Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring* (DEQ, 2012).

When measuring discrete flows from drains or springs, discharge is measured by collecting all flow into a five-gallon bucket and measuring the amount of time required to fill the bucket. The flow measurement is completed three times to verify flow rates.

2.2.2 Surface Water Quality Sampling

Surface water quality sampling consists of acquiring water quality grab samples from streams, springs, effluent streams, irrigation canal, drains, lakes and ponds. Water quality sampling methodology follows procedures established in *Montana DEQ Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring* (DEQ, 2012).

2.2.3 Surface Water Field Parameter Measurement

Field surface water parameters pH, specific conductivity, temperature and dissolved oxygen are measured using a YSI Professional Plus multi-parameter meter. The meter will be calibrated each day prior to use following manufacturer's instructions. All calibration data will be logged for verification. The parameter measurements collected during sampling will be recorded on the surface water sampling form included in Appendix A.

2.3 Sample Handling and Identification

All water samples will be placed into an ice-packed cooler for storage immediately after collection. Proper chain of custody documentation will be completed and will accompany all samples until they are delivered to the laboratory. Samples will be transported to the project laboratory in person, generally on the same day as samples are collected, or within 24 hours of sample collection.

All water samples are identified with unique Sample ID specific to the sampling location and date. Groundwater samples taken from wells are identified by their GWIC number followed by the sample collection date, written as a six-digit number. Surface water samples are identified by their Station ID followed by the sample collection date, written as a six-digit number (example P4_070319). Sample labels will be completed and affixed to the sample containers with Sample ID, preservation (if applicable), filtering, samplers initials, and the time and date of sample collection. Labels will be completed using a waterproof marker.

An example Sample ID name for a well is:

278755_070319

or

1055MillRd_070319

Where:

- 278755 is the GWIC number
- if GWIC number not assigned, an address will be used such as 1055 Mill Rd, and
- 070319 is the sample date, July 7, 2019 in a six-digit format

Field duplicate samples will be identified using the same convention, adding a 'D' at the end of the Sample ID. The identification of the sample will be noted on the groundwater sampling form. Field blanks samples, comprised of deionized water placed into a sample container and transported with the collected samples, will be identified as a unique monitoring well, adding a 'B' at the end of the Sample ID.

3.0 Quality Assurance

This section describes the quality assurance elements associated with the monitoring program, and presents details regarding the project organization, data quality objectives, data documentation, sample collection and laboratory analysis, data management, response actions and data validation.

3.1 Project Organization

Project organization for each Project Plan governed by this QAP is defined by individual project management staff at the WQPD. The typical project management structure and roles for project participants are listed in **Table 3-1**. The project will be managed as part of the regular workload at the Lewis & Clark County Water Quality Protection District. All project activities will be completed under the direct supervision of the Project Manager.

Table 3-1. Key Program Personnel

Position	Affiliation	Activities
Project Manager	WQPD	Oversight of project activities
Laboratory Manager	WQ Lab	Responsible for laboratory Quality Assurance Program
Staff	WQPD	Responsible for conducting field data collection and data entry

3.2 Analytical Methods

All methods for water quality analysis are derived from *Standard Methods for the Examination of Water and Wastewater, 21st Edition* (AWWA, 2005) and are performed by a state-certified laboratory using standard methods. The project laboratory is responsible for applying quality assurance to laboratory analyses following their EPA and DEQ approved Quality Assurance Program The laboratory will provide standard data qualifiers (**Table 3-2**), when appropriate, to reported sample results.

The analytical parameters, analytical methods and reporting limits for water quality samples are defined in individual Project Plans. Examples of commonly used analyte lists for WQPD groundwater and surface water sampling projects and activities are provided in Appendix B.

3.3 Data Quality Objectives and Criteria for Monitoring Data

Data quality objectives (DQOs) are the quantitative and qualitative terms used to specify how good the data need to be to meet the project's specific monitoring objectives. DQOs for measurement data, also referred to as data quality indicators, include precision, accuracy, measurement range, representativeness, completeness, and comparability. Data quality objectives for the monitoring program are addressed below.

Precision represents the ability of a specific measurement system to obtain replicate measurements. The precision of laboratory analytical data will be evaluated using the relative percent difference (RPD) in duplicate analyses. The precision laboratory goals are 10% for analytical controls and 20% for method batch controls. The RPD is calculated as follows:

$$\text{RPD} = \frac{|\text{Original Result} - \text{Duplicate Result}|}{(\text{Original Result} + \text{Duplicate Result})/2} \times 100$$

Accuracy represents a measure of the reported value compared with the true value. The accuracy of field measurements will be evaluated with calibration records, used to evaluate drift or bias within the system. Laboratory accuracy will be evaluated using matrix spikes added to samples, and control samples run with each sample run. Laboratory guidelines for analytical controls are 10% of analyses, and 20% for method batch controls. Accuracy is determined by the percent recovery for each sample, determined as follows:

$$\text{Matrix Spike \% Recovery} = \frac{(\text{Spiked Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{Control Stnd \% Recovery} = \frac{(\text{Instrument Determined Concentration})}{\text{True Concentration}} \times 100$$

Representativeness reflects how the sample and data results can be used to characterize field conditions. Study design, site selection, and proper field and sample management protocols helps ensure that samples and data are representative of environmental conditions. Complete field notes and field forms will document the representativeness of samples and field data.

Comparability is a measure of how data results can be compared between different sampling events at the same location, how data can be compared between different sampling locations, and how data can be compared to regulatory standards. For this study, comparability will be achieved by following consistent field sampling protocols, sampling at the consistent locations, and obtaining analytical data following standardized methods for chemical analyses of water.

Completeness is a measure of the usability of the complete data set generated from the sampling program. Data may be rejected due to problems with field sampling protocols, or through the laboratory data validation procedure. The project goal is 90% completeness of the data set. If this number is not achieved, corrective actions may be employed including resampling specific locations, or re-analyzing samples in the laboratory.

3.4 Quality Control

Quality control comprises methods of verifying that the sampling and analysis program is adequately designed to characterize environmental conditions.

3.4.1 Field Quality Control

Field quality control for laboratory analyses will be evaluated using field blanks and duplicate samples. The field blank is a sample of filtered, deionized water treated as a water quality sample. Field duplicate samples are used to evaluate the precision of the laboratory analytical system, and how field sampling conditions, equipment and protocols may influence analytical precision. For each sampling events, field blanks and field duplicates will be collected at a 10% rate (i.e one field duplicate and one field blank for every 10 samples collected) with a minimum of one each per project sampling event.

3.4.2 Laboratory Quality Control

Laboratory quality control will be maintained by the analytical laboratory accordance with their Quality Assurance Manual. The analytical laboratories take responsibility for sample management and analysis with completion of chain-of-custody documentation upon receipt at the laboratory. Upon receipt, the laboratory inspects the samples, checks that samples have been properly cooled since collection, and verifies that sample labels and identification are consistent with the chain-of-custody. The samples are logged into the laboratory system for tracking and management to ensure that proper analytical methods are used within necessary holding times.

The analytical laboratory provides a quality assurance package with each set of analyses documenting their quality control procedures and results. The laboratory quality assurance program includes duplicate analyses, matrix spike samples, blank samples and reference samples. When analytical precision or accuracy goals are not met, the data is flagged with the appropriate identification (**Table 3-2**), and, depending on the analytical problem, the usability of data results is evaluated.

Table 3-2. Analytical Laboratory Data Qualifiers

Data Result Qualifier	Description
B	Field and/or trip blank detection
D	Increase in detection limit due to sample matrix interference
H	Exceedence of Holding Time
J	Estimated – analyte presence positively identified, concentration is approximate
R	Rejected – unusable data as quality assurance criterion were not met.
U	Not Detected

3.4.3 Instrument Calibration and Maintenance

A YSI Professional Plus multi-parameter meter is used for field parameter measurement is calibrated daily prior to use according to manufacturer's instructions. All calibration information is recorded in a logbook dedicated to the instrument. Calibration standards are obtained from commercial sources and restocked on a regular basis. Any significant maintenance or corrective action for the instrument are completed by the manufacturer, or a representative of the manufacturer.

The project laboratory is responsible for calibration, maintenance and corrective action for analytical instrumentation in accordance with their Quality Assurance Manual. This includes proper documentation of procedures and any problems which may impact the quality of the data results.

4.0 Data Management and Record Keeping

4.1 Data Management

All field and laboratory data collected by the WQPD under this QAP is managed in-house by the WQPD in spreadsheet format using Excel software. Laboratory analytical data is provided from the analytical laboratory in electronic format, accompanied by all relevant quality assurance data.

4.2 Records Management

All documents generated during the course of the project will be stored in dedicated project files. These documents include:

- Field notes and field forms
- Chain-of custody forms for analytical samples
- Laboratory data reports
- Project reports – status reports, final reports or required project reporting forms
- Data Validation reports
- Additional Project Management notes – records of phone calls, emails and other correspondence pertinent to the project

4.3 Data Validation

An evaluation of all data results is conducted to ensure that data is usable for intended purposes, and that completeness goals are met. Field notes, field measurements, and field forms are reviewed to verify that proper protocols were followed during field sampling and data collection activities. Additionally, data is reviewed through the detailed examination of raw data to check for calculation and transformation errors, measurements within calibration range, and data entry errors. Various computer software programs may be used to assist in the data review process to help identify potentially erroneous data.

The project laboratory is responsible for validation of laboratory data, and for flagging data with qualifiers as needed. The data validation process includes compliance with holding times, and the results of quality control samples. The data validation process for the laboratory is included in their Quality Assurance Manual. WQPD reviews laboratory data validation results, and any issues requiring corrective actions are communicated to the project laboratory.

5.0 References

AWWA, 2005. Standard Methods for the Examination of Water and Wastewater, 21st Edition (Centennial Edition). American Public Health Association.

EPA, 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. United States EPA Publication EPA/24O/B-01/003, 40 p.

Cunningham, W.L., and Schalk, C.W., comps., 2011, Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1, 151 p.

Montana Department of Environmental Quality. 2012. Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring Version 3.0. Helena, MT: Montana Dept. of Environmental Quality

Figure 1: Stream Monitoring Station

Appendix A

Field Forms

A1: Groundwater Field Sampling Form

Site/Well		**Date**
Location		Weather
Well Diameter	Water Level	
Casing Type	Total Depth	Temperature
Measuring Point	Water Column	
Completion Depth	Well Volume	
Sampling Device		
Purge Water Disposal Method		
Sampling Personnel		

Time	**Temp**	**Dissolved Oxygen**		**Specific Conductivity**	**Conductivity**	**pH**	**ORP**	
	°C	**% Sat**	**mg/L**	**uS/cm**	**µs/cm**	**SU**	**pH mV**	**ORP mV**
Total Purge Volume								

Sample ID		**Date/Time**
Sample Container	**Preservative**	**Analytes**

COMMENTS:

A2: Groundwater Level Monitoring Field Form

Route Order	GWIC ID	Name	Address	Date	Time	SWL	Field Comment

A3: Surface Water Discharge Field Form

Water Quality Protection District Discharge Measurement notes					
Site Name					
Site Number		Hydrographer		Air Temp	
Date		Weather		Water Temp	
Time start		Precip		Gage Ht start	
Time finish		Wtr Clarity		Gage Ht finish	
Notes/Control					
Remarks					

Distance	**Width**	**Depth**	**Velocity**	**Comment**

A4: Surface Water Field Parameter Form

Station:____________________

Date: _____________________

Water Quality Field Measurements

meter: YSI ProPlus____ YSI 63____

Air Temp	(C/F)	
Water Temp	(C/F)	
DO saturation	(%)	
DO concentration	(mg/l)	
SPC	(uS/cm)	
C	(uS/cm)	
TDS	(mg/l)	
SAL	(ppt)	
pH	(su)	
Staff Gauge	(ft)	

Notes:

A5: Surface Water Sampling/Site Visit Form

Date:	**Time:**	**Team Member(s):**	**Station ID:**	**Visit #:**

Waterbody:	Site Description:	County:
HUC:	Latitude: ___.______	Longitude: ____.______	Lat/Long Verified? By:

		Circle One - "Coordinates: Decimal Degrees/Degrees-Minutes-Seconds"
Elevation (m):		GPS Datum: NAD 83

Samples collected:		**Sample ID:**	**Sample Collection/Preservation Info**
Water			Grab
Analysis requested:			
Total Persulfate Nitrogen			HNO3 H2SO4 HCL None
Total Phosphorus (P)			HNO3 H2SO4 HCL None
Nitrate-nitrite as N			HNO3 H2SO4 HCL None
Total Ammonia			HNO3 H2SO4 HCL None
Total hardness			HNO3 H2SO4 HCL None
Total recoverable Metals			HNO3 H2SO4 HCL None

Field Measurements:			**Field Assessments:**	**Current Weather (Circle one):**
Temperature: (Water/Air)	W °C °F	A °C °F	Photographs: Digitals Film	Cloud Cover:
pH:			Channel Cross –Section	<5% 5-25% 25-75% 75-100%
Specific conductance :(µS)			Habitat Assessment:	Precipitation:
Dissolved Oxygen:	mg/L	%Sat.	Reach Scale:	None Light Mod. Heavy
Turbidity (Visual) Clear Slight Turbid Opaque			Site Scale:	Past Precipitation (last 24 hours)
Flow: (cfs)	Flow Method: Meter Float Gage		Substrate; Pebble Count	None Light Mod. Heavy
Flow Comments: Dry Bed No Measurable Flow				
Site Visit Comments:				

Chemistry Lab information:			
Lab Samples Submitted to:	Account #:	Date Submitted:	Analytical
Invoice Address: Water Quality Protection District, 316 North Park Ave, Room 220, Helena, MT 59623			
Contact name & phone:			
Relinquished by & Date/Time:	Shipped by & Date/time:	Received By & Date/Time:	

Appendix B

Analytical Parameter Lists

B1: Groundwater Analyte Suite 1- Aquifer Characteristics

Analyte	Analytical Method	Reporting Limit	Units	Preservative
Non-Metals				
Alkalinity (total as CaCO3)	A2320-B	1	mg/L	cool ≤ 6°C
Bicarbonate as HCO3	A2320-B	1	mg/L	cool ≤ 6°C
Bromide	EPA 300.0	0.05	mg/L	cool ≤ 6°C
Carbonate as CO3	A2320-B	1	mg/L	cool ≤ 6°C
Chloride	EPA 300.0	1	mg/L	cool ≤ 6°C
Conductance, Specific @ 25C	EPA 120.1	1	uS/cm	cool ≤ 6°C
Fluoride	EPA 300.0	0.1	mg/L	cool ≤ 6°C
Hardness (total as CaCO3)	A2340-B	1	mg/L	cool ≤ 6°C
Nitrogen: Nitrate plus Nitrite as N	E353.2	0.01	mg/L	cool ≤6C, H_2SO_4 to pH<2
pH (lab)	EPA 150.2	0.1	s.u.	NA
Phosphorus, Total, low level	E365.1	0.005	mg/L	cool ≤6C, H_2SO_4 to pH<2
Sulfate	EPA 300.0	1	mg/L	cool ≤ 6°C
Total Dissolved Solids	A 2540 C	10	mg/L	cool ≤ 6°C
Metals (Total Recoverable or Dissolved)				
Arsenic	E200.8/A3114B	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Calcium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Iron	E200.7/E200.8	0.02	mg/L	cool ≤6C, HNO_3 to pH<2
Magnesium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Potassium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Sodium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Uranium	E200.7/E200.8	0.0003	mg/L	cool ≤6C, HNO_3 to pH<2

B2: Groundwater Analyte Suite 2 – Domestic Drinking Water

Analyte	Analytical Method	Reporting Limit	Units	Preservative
Non-Metals				
Alkalinity (total as CaCO3)	A2320-B	1	mg/L	cool ≤ 6°C
Chloride	EPA 300.0	1	mg/L	cool ≤ 6°C
Conductance, Specific @ 25C	EPA 120.1	1	uS/cm	cool ≤ 6°C
Fluoride	EPA 300.0	0.1	mg/L	cool ≤ 6°C
Hardness (total as CaCO3)	A2340-B	1	mg/L	cool ≤ 6°C
Nitrogen: Nitrate plus Nitrite as N	E353.2	0.01	mg/L	cool ≤ 6°C
pH (lab)	EPA 150.2	0.1	s.u.	NA
Sulfate	EPA 300.0	1	mg/L	cool ≤ 6°C
Total Dissolved Solids	A 2540 C	10	mg/L	cool ≤ 6°C
Total Coliforms/E.coli, present/absent	A 9223 B	1	P/A	cool, < 10°C
Metals (Dissolved)				
Arsenic	E200.8/A3114B	0.001	mg/L	cool ≤ 6°C
Calcium	E200.7/E200.8	1	mg/L	cool ≤ 6°C
Iron	E200.7/E200.8	0.02	mg/L	cool ≤ 6°C
Magnesium	E200.7/E200.8	1	mg/L	cool ≤ 6°C
Potassium	E200.7/E200.8	1	mg/L	cool ≤ 6°C
Sodium	E200.7/E200.8	1	mg/L	cool ≤ 6°C

B3: Surface Water Analyte Suite 1– Stream Characteristics

Analyte	Analytical Method	Reporting Limit	Units	Preservative
Non-Metals				
Alkalinity (total as CaCO3)	A2320-B	1	mg/L	cool ≤ 6°C
Bicarbonate as HCO3	A2320-B	1	mg/L	cool ≤ 6°C
Carbonate as CO3	A2320-B	1	mg/L	cool ≤ 6°C
Chloride	EPA 300.0	1	mg/L	cool ≤ 6°C
Conductance, Specific @ 25C	EPA 120.1	1	uS/cm	cool ≤ 6°C
Fluoride	EPA 300.0	0.1	mg/L	cool ≤ 6°C
Hardness (total as CaCO3)	A2340-B	1	mg/L	cool ≤ 6°C
Nitrogen, Total (persulfate)	SM 4500-N C	0.04	mg/L	cool ≤ 6°C
Nitrogen: Ammonia as N	A 4500 NH_3 H	0.05	mg/L	cool ≤6C, H_2SO_4 to pH<2
Nitrogen: Nitrate plus Nitrite as N	E353.2	0.01	mg/L	cool ≤6C, H_2SO_4 to pH<2
pH (lab)	EPA 150.2	0.1	s.u.	NA
Phosphorus, Total, low level	E365.1	0.005	mg/L	cool ≤6C, H_2SO_4 to pH<2
Sulfate	EPA 300.0	1	mg/L	cool ≤ 6°C
Total Dissolved Solids	A 2540 C	10	mg/L	cool ≤ 6°C
Total Suspended Solids (TSS), low level	A2540D	1	mg/L	cool ≤ 6°C
Metals (Total Recoverable)				
Arsenic	E200.8/A3114B	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Cadmium	E200.7/E200.8	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Calcium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Copper	E200.7/E200.8	0.005	mg/L	cool ≤6C, HNO_3 to pH<2
Iron	E200.7/E200.8	0.02	mg/L	cool ≤6C, HNO_3 to pH<2
Lead	E200.7/E200.8	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Magnesium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Potassium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Sodium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Uranium	E200.7/E200.8	0.0003	mg/L	cool ≤6C, HNO_3 to pH<2
Zinc	E200.7/E200.8	0.01	mg/L	cool ≤6C, HNO_3 to pH<2

Appendix C

Example Project Plan Format

C1: Example Project Plan

Project Plan

1.0 Project Introduction/Context/Background

2.0 Project Goals and Objectives

3.0 Project Area Overview & Map

4.0 Project Study Design

Monitoring/Sampling Stations & Map
Monitoring/Sampling Parameters
Monitoring Schedule & Timeline
Monitoring Budget

5.0 Project Team & Responsibilities

Project Partners

6.0 Project Data Management and Reporting

Data Management and Storage
Project Reports and Deliverables