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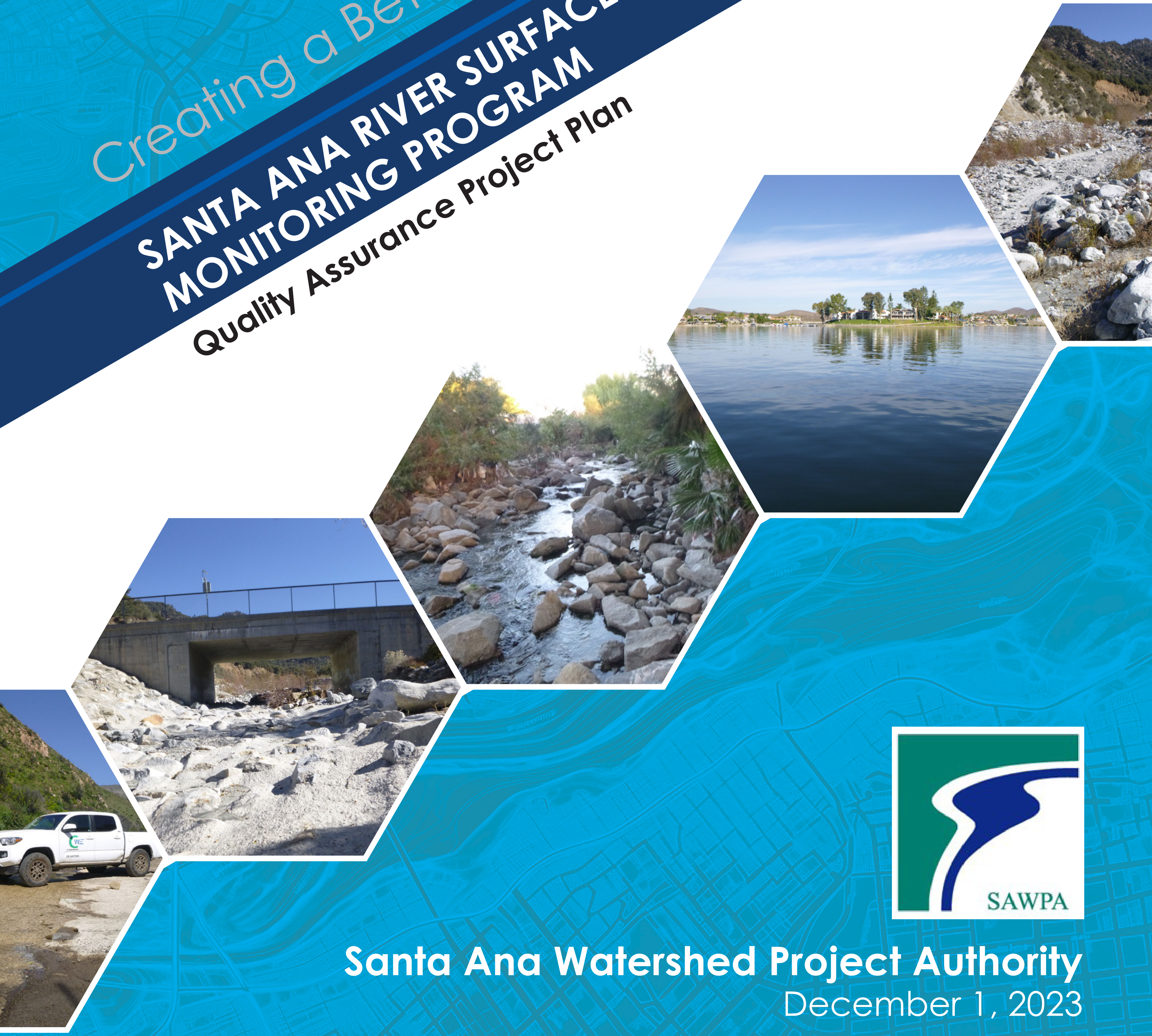
SANTA ANA RIVER SURFACE WATER QUALITY MONITORING PROGRAM

Quality Assurance Project Plan



SAWPA

Santa Ana Watershed Project Authority

December 1, 2023

Quality Assurance Project Plan

DRAFT

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December 1, 2023

Santa Ana River Surface Water Quality Monitoring Program

Quality Assurance Project Plan

Approval Sheet

Approved Signatures

Rick Whetsel, Project Director Santa Ana River Watershed Protection Agency	Date
Ian Achimore, Project Manager Santa Ana River Watershed Protection Agency	Date
Rachel Gray, Quality Assurance/Quality Control Officer Santa Ana River Watershed Protection Agency	Date
Cindy Li, Task Force Scoping Committee Member Santa Ana Regional Water Board	Date
Doug Edwards, Task Force Scoping Committee Member Eastern Municipal Water District	Date
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Approved Signatures – Continued

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Jennifer Shepardson, Task Force Scoping Committee Member Colton/San Bernardino Regional Tertiary Treatment and Wastewater Reclamation	Date

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Acronyms

CEDEN	California Environmental Data Exchange Network
COC	Chain-of-Custody
CPR	Cardiopulmonary Resuscitation
CRM	Certified Reference Material
DNQ	Detected, Not Quantifiable
DO	Dissolved Oxygen
DQO	Data Quality Objectives
ELAP	Environmental Laboratory Accreditation Program
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicates
MDL	Method Detection Limit
MQO	Measurement Quality Objective
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NWS	National Weather Service
OCWD	Orange County Water District
OSHA	Occupational Safety and Health Administration
PD	Project Director
PM	Project Manager
PPE	Personal Protective Equipment
Q	Discharge Rate
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan
RL	Reporting Limit
RPD	Relative Percent Difference
SAR	Santa Ana River
SOP	Standard Operating Procedures
SARWQCB	Santa Ana Regional Water Quality Control Board
SNMP	Salt and Nutrient Management Plan
SWAMP	Surface Water Ambient Monitoring Program
TIN	Total Inorganic Nitrogen
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WQ	Water Quality
WQO	Water Quality Objective

1. Project Management

This section of the Quality Assurance Project Plan (QAPP) covers the basic areas of project management, including distribution list, background, project description, Data Quality Objectives (DQOs), special training needs and certification, and record keeping.

1.1 Distribution List

Table 1-1 identifies the entities that shall receive a copy of a final approved QAPP, and approved revisions of this plan. These same entities shall participate in revisions to this document. It will be up to each entity or agency to distribute copies of the QAPP within their organizations, where needed. Once approved, this QAPP will be available to interested parties by requesting a copy at the address listed for the contact person on the title page of this document.

Table 1-1 Quality Assurance Project Plan Distribution List

Name	Role	Agency	Contact Number	Email
Rick Whetsel	Project Director (PD)	Santa Ana River Watershed Project Authority (SAWPA)	(951) 354-4222	rwhetsel@sawpa.org
Ian Achimore	Project Manager (PM)		(951) 354-4233	iachimore@sawpa.org
Rachel Gray	Quality Assurance and Quality Control (QA/QC) Officer		(951) 354-4242	rgray@sawpa.org
James Bean	Task Force Agency Member	Beaumont Cherry Valley Water District	(951) 845-9581 x263	james.bean@bcvwd.org
Edgar Tellez Foster		Chino Basin Watermaster	(909) 484-3888	etellezfoster@cbwm.org
		City of Banning		
Thaxton Van Belle		City of Beaumont		tvanbelle@beaumontca.gov
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Jung Joon Park		City of Redlands		jpark@cityofredlands.org
Thomas Crowley		City of Rialto	(909) 820-8056	tjcrowley@rialtoca.gov
Drew Faherty		City of Riverside		dfaherty@riversideca.gov
Jennifer Shepardson		Colton/San Bernardino Regional Tertiary Treatment and Wastewater Reclamation	(909) 453-6020	jennifer.shepardson@sbmwd.org
Doug Edwards		Eastern Municipal Water District		edwardsd@emwd.org
Lenai Hunter		Elsinore Valley Municipal Water District	(951) 674-3146 x8329	lhunter@evmwd.net

Name	Role	Agency	Contact Number	Email
John Russ		Inland Empire Utilities Agency	(909) 993-1834	jruss@ieua.org
		Irvine Ranch Water District		
Bryan Smith		Jurupa Community Services District	(951) 685-7434 x139	bsmith@jcsd.us
Kevin O'toole		Orange County Water District (OCWD)	(714) 378-8248	kotoole@ocwd.com
Greg Woodside		San Bernardino Valley Municipal Water District	(909) 387-9241	gregw@sbvmwd.com
Matt Howard		San Gorgonio Pass Water Agency	(951) 845-2577	mhoward@sgpwa.com
Jeff Pape		Temescal Valley Water District	(951) 667-6323	jeffp@temescalvwd.com
Jennifer McMullin		Western Riverside County Regional Wastewater Authority/Western Municipal Water District	(951) 571-7236	jmcmullin@wmwd.com
Ashley Gibson		Yucaipa Valley Water District	(909) 795-2491 x4	agibson@yvwd.us
Cindy Li		Santa Ana Regional Water Board	(951) 782-4906	Cindy.Li@waterboards.ca.gov
Amanda Porter	Laboratory PM	Babcock Laboratories	(951) 653-3351	aporter@babcocklabs.com
Julia Sudds	Laboratory QA/QC Manager			jsudds@babcocklabs.com
Nan Jia	Consultant PM	CWE	(714) 526-7500 x217	njia@cwecorp.com
Jason Pereira	Consultant QA/QC Manager		(714) 526-7500 x211	jpereira@cwecorp.com

1.2 Background

Project background is discussed in the section below.

1.2.1 Regulatory Background

In January 2004, the Santa Ana Regional Water Quality Control Board (SARWQCB) amended the Basin Plan to incorporate a revised Salt and Nutrient Management Plan (SNMP), the "Total Dissolved Solids (TDS)/Nitrogen Management Plan", for both surface water and groundwater in the Santa Ana River (SAR) Watershed. A Basin Monitoring Program Task Force of 22 water supply and wastewater agencies, including the SARWQCB, was formed and is administered by the SAWPA. The 2004 Basin Plan amendment also required that the Task Force to develop surface water and groundwater quality monitoring programs to support the implementation of the TDS/Nitrogen Management Plan. The SAR TDS and Total Inorganic Nitrogen (TIN) Monitoring Work Plan was submitted and approved by SARWQCB in 2005. The Work Plan was updated in 2022 to address the requirements set forth in the 2021 Basin

Plan Amendment. Pursuant to the approved Work Plans, the Task Force implements the SAR Surface Water Quality (WQ) Monitoring Program to collect water quality data to assess compliance with TDS and nitrogen objectives for Reaches 2, 3, 4, and 5 of the SAR. Each Year, the Task Force prepares the Annual Report to document the monitoring data and evaluate current compliance status.

1.2.2 Purpose of QAPP

This QAPP is intended to serve as a guide for SAWPA, contractors, and analytical laboratories for sample collection, analysis, and laboratory performance evaluations within the SAR Surface WQ Monitoring Program. The QAPP serves as the controlling mechanism during monitoring and identifies the QA/QC techniques needed for sampling, sample handling, sample storage, Chain-of-Custody (CoC) procedures, laboratory analytical protocols, data interpretation, reporting, and documentation requirements. The QAPP further provides a summary of the project, its organizational hierarchy, and objectives. QA/QC procedures will be in accordance with applicable professional technical standards, United States Environmental Protection Agency (USEPA) requirements, specific project goals, and client requirements. This QAPP was prepared utilizing: the 2022 Surface Water Ambient Monitoring Program (SWAMP) QAPP, Guidance for Quality Assurance Project Plans (USEPA 2002), and Quality Assurance Project Plan Standard (USEPA 2023).

This QAPP presents the guidelines for monitoring the performance of the analytical laboratory and is not intended to supersede the laboratory's Quality Assurance Manual. Relevant project personnel will be required to read the QAPP. A copy of the QAPP will be brought to the field or be accessible digitally during sampling events. These QA/QC requirements are designed to assist in achieving the project DQOs and analytical DQOs.

1.2.3 Document Format

The guidelines for preparing this QAPP are presented in USEPA document *Guidance for Quality Assurance Project Plan Standard* (USEPA 2002) and conforms to the following format:

Project Management This section of the QAPP covers the basic areas of project management, including project history, objectives, and the roles or responsibilities of the project participants. The objectives of this QAPP section are to define and ensure that the participants understand the project goals and approaches to be used. This section also includes management of project documents and records.

Data Generation and Acquisition This section describes the technical design and implementation of the QAPP. Effective implementation of these elements ensures that appropriate methods for sampling, measurement, analysis, data collection, data handling, utilization of field and laboratory QA/QC samples are employed during sample collection and analysis. It also directs proper documentation of QA/QC activities.

Assessment and Oversight This section describes the data quality activities for assessing that the QAPP is being implemented as prescribed and measures the effectiveness of project implementation and associated QA/QC activities.

Data Validation and Usability This section describes the data quality assessment methods to be used to evaluate field sample results against the established project and analytical DQOs.

Amendments to the QAPP will be included in **Appendix A**.

1.3 Project Organization

Figure 1-1 demonstrates the organizational structure for implementation of the SAR Surface WQ Monitoring Program.

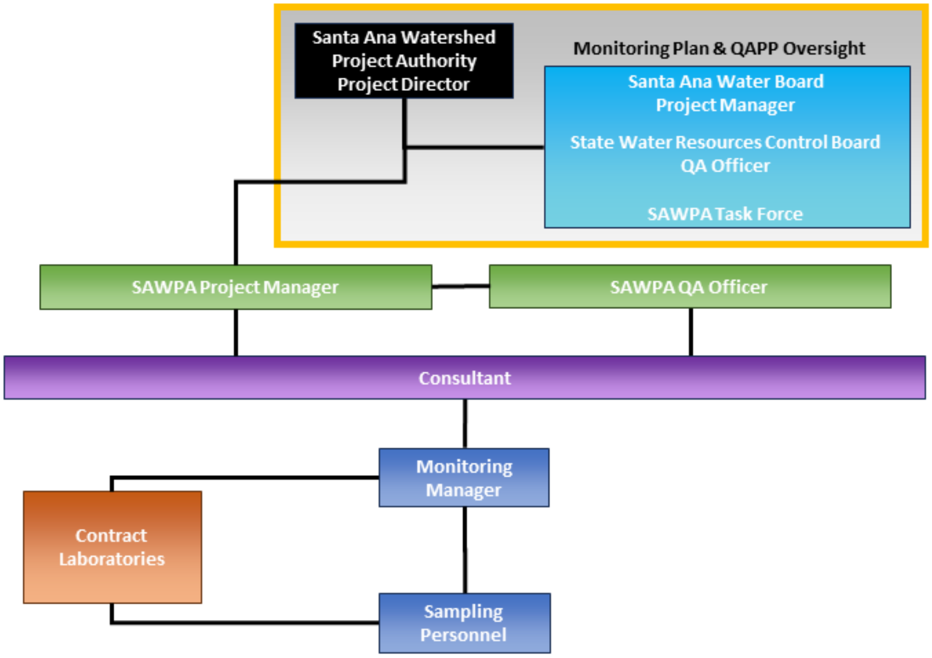


Figure 1-1 SAR Surface WQ Monitoring Program Organization Chart

The SAWPA PM will be in correspondence with the Consultant PM to communicate mobilization decision and provide approval. The Consultant PM will lead communications with the laboratory and sampling teams, to obtain concurrence on targeted sampling sites for each sampling event.

Sampling teams will be composed of two members to enhance workplace safety. The Sampling Team Lead will have direct correspondence with the Consultant PM to coordinate the sampling activities. The Sampling Team Leads are experienced samplers that are familiar with the site and sampling procedures. The Sampling Team Member will be responsible for assisting the Sampling Lead in completing field sampling activities.

1.3.1 SAWPA

Monitoring efforts will be coordinated with SAWPA staff and management. **Table 1-2** provides contact information to individuals that are main points of contact.

Table 1-2 SAWPA Contact Information

Name	Role	Phone Number	Email Address
Rick Whetsel	PD	(951)354-4222	RWhetsel@sawpa.org
Ian Achimore	PM	(951) 354-4233	IAchimore@sawpa.org
Rachel Gray	QA/QC Officer	(951) 354-4242	Rgray@sawpa.org

The PD will coordinate with Task Force and other responsible parties. The PD will develop and manage the annual budget and ensure that monitoring sites are sampled as required by the Work Plan and QAPP.

The PM will also provide programmatic guidance to support staff and ensure that documents, procedures, and project activities meet the respective standards and quality requirements. Additional responsibilities include coordination and scheduling of project meetings and presentations, overseeing budgetary expenses, ensuring the project schedule is met and providing technical review for analytical data.

The QA/QC Officer is responsible for overseeing overall QA/QC procedures and will ensure that data reported has followed appropriate protocols. The QA/QC Officer is also responsible for reporting findings to the PM, including requests for corrective actions. If there is evidence of significant deviations from protocols stated in the QAPP, or if there is evidence of systematic failure, the QA/QC Officer has the authority to stop activities until corrective actions can be documented and performed.

1.3.2 Consultants

The SAR Surface WQ Monitoring Program utilizes a consultant to ensure necessary tasks are completed. CWE is contracted by SAWPA to provide clear lines of authority and communication that will expedite and enhance the flow of information vital to effective technical controls, cost, and schedule performance. The functional roles of personnel within the organizational structure will also be clearly defined. Individuals are given the authority to accomplish their respective project assignments. Since the individuals listed below may change from time to time, **Table 1-3** provides contact information for consultants that are contracted to work under the SAR Surface WQ Monitoring Program at the time that this QAPP was developed.

Table 1-3 Consultant Contact Information

Company	Contact	Role	Email Address	Phone Number
CWE	Nan Jia	PM	njia@cwecorp.com	(714) 526-7500 x217
	Jason Pereira	QA/QC Manager	jpereira@cwecorp.com	(714) 526-7500 x211

The Consultant PM designee will report directly to the SAWPA PM. The Consultant PM is the direct line of communication between Consultant and SAWPA and is responsible for ensuring the availability of resources and overall quality of the activities completed under the SAR Surface WQ Monitoring Program. The Consultant PM will provide programmatic guidance to support staff and ensure that documents, procedures, and project activities meet the respective standards and quality requirements. The Consultant PM will also be responsible for resolving project concerns related to technical matters.

The Consultant PM is the focal point for control of project activities, continuity, quality, accountability, and leadership responsibility throughout the phases of the project. The Consultant PM will be supported by the QA/QC Manager, who provide reviews, guidance, and technical advice on project execution and issues resolution. The project team, consisting of supervisory, health and safety, and technical personnel, will support the Consultant PM to ensure that the project meets professional standards, is safely executed, and in compliance with applicable laws, regulations, statutes, and industry codes. Individuals on the project team are responsible for fulfilling appropriate portions of the project QA/QC program, in accordance with instructions provided by the Consultant PM. The Consultant PM is responsible for satisfactory completion of the project QA/QC program, may assign specific responsibilities to other members of the project staff, and will notify SAWPA of long-term changes in personnel.

Consultant field scientist and technicians report to the Consultant PM, and are responsible for field activities, including sampling, and are responsible for following the QA/QC elements of the QAPP.

1.3.3 Laboratory

The SAR Surface WQ Monitoring Program employs Babcock Laboratories to analyze samples. The laboratory is required to have accreditation from the Environmental Laboratory Accreditation Program (ELAP). Babcock Laboratories ELAP certification can be found in **Appendix B**. The laboratory is designated as the primary analytical subcontractor and will perform the analyses for the standard analytical methods. Since the individuals listed below may change from time to time, **Table 1-4** provides contact information for laboratories and laboratory PM that are contracted to work under the Monitoring Program at the time that this QAPP was developed.

Table 1-4 Laboratory Contact Information

Laboratory	Address	Role	Contact	Phone Number
Babcock Laboratories	6100 Quail Valley Court, Riverside, CA 92507	PM	Amanda Porter	(951) 653-3351
		QA/QC Manager	Julia Sudds	(951) 653-3351

The Laboratory PM will be the laboratory's primary project contact and will coordinate with the Consultant PM. Analytical services may be subcontracted with the prior approval of the QA/QC team; however, the Laboratory PM holds primary responsibility for the delivery of subcontracted services. Key positions and quality related responsibilities for laboratory personnel are assigned by the laboratory PM.

The Laboratory QA/QC Manager is responsible for the QA/QC of laboratory services and deliverables. The Laboratory QA/QC Manager will be responsible for implementing the laboratory's QA/QC programs and implementing additional and project-specific QA/QC procedures included in this QAPP.

1.4 Project Description

The approved 2022 SAR TDS and TIN Monitoring Work Plan describes the updated surface water monitoring program to collect date and annually assess compliance with the Basin Plan surface water TDS and TIN objectives for following SAR reaches:

- Reach 2 (from Prado Dam downstream to the 17th Street Bridge in the City of Santa Ana),
- Reach 3 (from Mission Boulevard downstream to Prado Dam),
- Reach 4 (from the San Jacinto Fault at the Bunker Hill-B/Colton groundwater management zones boundary downstream to Mission Boulevard), and
- Reach 5 (from outlet of the Seven Oaks Dam downstream to the San Jacinto Fault at the boundary of the Bunker Hill-B and Colton groundwater management zones).

The Task Force is responsible for the quarterly TDS and TIN monitoring in SAR Reaches 4 and 5. Other agencies, such as OCWD and Metropolitan Water District of Southern California, are responsible for the remaining monitoring activities detailed in the Work Plan. Monitoring will occur along the SAR at three locations. Detailed descriptions and directions to the sites are included in **Table 1-6**. More project details, such as constituents and trigger conditions, are discussed in **Section 2**.

1.4.1 Geographical Setting

Quarterly water quality monitoring is conducted at three (3) locations. **Table 1-5** summarizes the monitoring locations and corresponding reaches. Each of the sites are located along the Santa Ana River in the Upper Santa Ana River Basin.

Table 1-5 Monitoring Locations

Monitoring Site	SAR Reach	Monitoring Location Coordinates	Access Gate Coordinates
SAR @ E Street	5	34.067728, -117.293899	34.066609, -117.294102
SAR @ Riverside Avenue	4	34.024800, -117.362800	34.024032, -117.362812
SAR @ Mission	4	33.990861, -117.394083	33.983603, -117.402238

The monitoring locations are shown in **Figure 1-2**.

Figure 1-2 Monitoring Locations

1.4.2 Water Quality Objectives (WQOs)

The Basin Plan WQOs for TDS and TIN associated with each monitoring location is shown in **Table 1-6**.

Table 1-6 WQOs to Corresponding Reach

Monitoring Location	Reach	WQOs	
		TDS (mg/L)	TIN(mg/L)
SAR @ E Street	5	300	5
SAR @ Riverside Avenue	4	550	10
SAR @ Mission			

1.4.3 Project Schedule

Four events (4) will be scheduled per year (January 1st to December 31st), one per quarter. Consultant will analyze data collected, including field measurements and water quality results from laboratories, verify completeness of results, and conduct QA/QC of laboratory results. Consultant will coordinate with SAWPA and the laboratory on data anomalies. The laboratory will provide water quality results approximately four to six weeks after the field sample is collected.

Annually, the Consultant will upload data to the California Environmental Data Exchange Network (CEDEN). Each time the data is uploaded, the consultant will provide proof of upload, as well as the completed data templates used to upload the data, preferably in Microsoft Excel. SAWPA shall review data templates before they are uploaded.

1.4.4 Reporting

Monitoring results from the SAR Surface WQ Monitoring Program are to be compiled and reported in the Annual Report of Santa Ana River Water Quality. Annually, monitoring results will be uploaded to the CEDEN.

1.5 Quality Objectives and Criteria for Measurement Data

DQOs describe the anticipated data quality needs necessary to support the analysis and characterization of the Project goals.

Typical laboratory analytical measurement quality objectives, as evaluated based on precision, accuracy, completeness, sensitivity, representativeness, and comparability, are summarized in the following paragraphs, and presented in **Table 1-7**.

Table 1-7 DQOs for Laboratory Analysis

Analytes	Units	Accuracy	Precision	Recovery	Reporting Limits (RLs)	Completeness
Total Dissolved Solids	mg/L	80-120%	25%	80-120%	1	90%
Nitrite + Nitrate as N	mg/L	80-120%	25%	80-120%	0.01	90%
Ammonia as N	mg/L	80-120%	25%	80-120%	0.01	90%

1.5.1 Method Detection Limits (MDLs)

MDLs are the minimum constituent concentrations that can be measured and reported with a 99% confidence that the concentration is greater than zero. Each constituent has an MDL. MDLs vary based on the analytical method and laboratory, so it is important to verify if the MDLs are acceptable when selecting an analytical laboratory.

When MDLs are not within the acceptable limits, corrective actions may need to be taken, depending on the type of sample. Acceptable limits and corrective actions are discussed in **Section 2.5**.

1.5.2 RLs

For every constituent, the laboratory establishes a minimum concentration that can be reliably quantified using a given analytical method. These minimum concentrations, usually called RLs, can vary considerably depending on the laboratory or analytical method. It is important to verify that the laboratory's RLs are meeting or close to the Surface Water Ambient SWAMP Target RLs.

1.5.3 Precision

Precision measures the agreement or repeatability of a set of replicate results obtained from duplicate analyses made under identical conditions. Analysis of field duplicates will measure the precision of samplers' techniques and methods. Analysis of laboratory duplicates will measure the precision of laboratory procedures. The precision of a duplicate measurement can be expressed as the Relative Percent Difference (RPD). The RPD is calculated using the equation below:

$$\text{RPD} = \left\{ \frac{|x_1 - x_2|}{\frac{(x_1 + x_2)}{2}} \right\} \times 100$$

Where:

X_1=native sample
X_2=duplicate sample

1.5.4 Accuracy and Bias

Accuracy helps determine the level of certainty in data and how close the results are to the true value. Bias may be present during data collection, calibration, or limitations in analytical methods by the laboratory. In the laboratory, accuracy and bias will be checked with calibration solution or a Matrix Spike (MS) by introducing a known concentration of a target analyte to a sample or a blank sample, and then analyzing the sample to determine how close the result is to the known concentration. Values consistently higher or lower than the true value are considered a high bias. In the field, stream gauge height can be verified by hand measurement of water level depth; rainfall amount measured by the onsite rain gauge will be verified by another rain gauge nearby. Data validation and verification methods are further discussed in **Section 4**.

1.5.5 Representativeness

Representativeness is a qualitative measure of which sample data accurately and precisely represents a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness is demonstrated by providing full descriptions of the sampling techniques and the rationale used for selecting sampling locations in the project planning documents.

There cannot be a target goal for a qualitative parameter such as representativeness or comparability. Therefore, this criterion is evaluated subjectively rather than quantitatively. The determination of representativeness occurs during the preparation of the sampling and analysis approach and then reassessed during the data analysis process. For example, an integral part of developing the sampling and analysis approach is to answer the question, "How many samples are needed to fully evaluate x?" and then during the data usability process, "Was enough data collected to answer the original question?"

1.5.6 Completeness

Completeness is defined as the percentage of measurements judged to be valid compared to the total number of measurements made for a specific sample matrix and analysis. The mathematical equation to calculate the completeness is shown below. An overall completeness goal of 90% has been set for this project.

$$Completeness = \frac{Valid\ Measurements}{Total\ Measurements} \times 100\%$$

1.5.7 Comparability

Comparability is another qualitative measure designed to express the confidence when one data set is compared to another. Sample collection and handling techniques, sample matrix type, and analytical method all affect comparability. Comparability is limited by the other parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from one phase of an investigation can be compared to others when similar methods are used, and similar data packages are obtained.

1.5.8 Sensitivity

Sensitivity is the measure of the concentration at which an analytical method can positively identify and report analytical results. The sensitivity of a given method is commonly referred to as MDL. The MDL is the lowest concentration that a sample can be analyzed with 99% confidence. The MDL is a lab-specific and method-specific value, so there may be variation between labs. The RL is set for each analyte at a value greater than the MDL.

1.6 Special Training/Certifications

Safety training program is to ensure that field employees receive the appropriate level of trainings to conduct their work in a safe manner. Field staff are required to maintain the training qualifications necessary to perform their assigned duties and job functions. Training programs provided to sampling teams will be administered by the Consultant PM. Additional training necessary to conduct water quality sampling for the project will be managed by the project's sampling team lead. Additional trainings include, but are not limited to, the following:

- First Aid
- Cardiopulmonary Resuscitation (CPR)
- Hazards associated with homelessness

Training sessions will be documented. Documentation and certifications verifying completion will be maintained by sampling team lead, Consultant PM, and SAWPA. Copies of the training documentation will be submitted to the PM.

Contracted commercial laboratories will provide adequate training to their staff as part of its Standard Operating Procedure (SOP). Contracting laboratories will maintain their own records of its training that comply with Occupational Safety and Health Administration (OSHA) requirements. Those records can be obtained, if needed, from each contract laboratory through their QA/QC Manager.

1.7 Documents and Record Keeping

Field results will be recorded at the time of completion, using the field observation forms. A copy of blank field observation form can be found in **Appendix C**. Field observation form will be completed using permanent ink with corrections made by drawing a single line through the error, corrections initialed by the corrector, and entering the correct value. Each sampling team will have one individual responsible for recording data. Data forms will be reviewed for outliers and omissions by field staff before leaving the sampling sites. The following items should be recorded on the field forms for each sampling event at each sample location:

- Data and time of sampling location
- Names of sampling team members
- Monitoring location name, and sample ID numbers
- Unique IDs for replicate or blank samples collected from the site
- Sample characteristics (color and turbidity)
- Presence of sheens, or odors
- Weather conditions
- Field parameters including temperature, dissolved oxygen (DO), pH, turbidity, and conductivity
- Check off on the form if field duplicate and/or equipment blank samples were collected and from which sample location.
- A description of unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality.

CoC form will be used to accompany samples which are being sent to the laboratory. Sample handling and custody procedures are discussed in **Section 2.3**. The field team lead will collect records for sample collection, field analyses, field data sheets, and CoC forms. Samples that are sent to the laboratory will include a copy of the CoC form. The laboratory will generate records for sample receipt and storage, analyses, and reporting, and will store records pertinent to this project. Copies of records held by the laboratory will be provided to the PM and stored in a project file.

Records generated by this project, such as field forms and laboratory reports, will be delivered to SAWPA digitally. The PM will maintain the information collected by this project for a period of at least five years following the sampling event.

Copies of the most updated monitoring plan and QAPP will be held by the SAWPA PM and will be distributed to parties involved with the project, including the contract laboratory and/or consulting field staff. Future amendments will be distributed in the same fashion. Locations, retention period and format of relevant project records are listed in **Table 1-8**.

Table 1-8 Record Retention Procedures

Document/Record	Location	Retention (years)	Format
Project Plan			
QAPP, amendments and appendices	SAWPA Headquarters	≥5 Years	Electronic or Paper
QAPP distribution documentations			
Field Documents			
Field staff training records	SAWPA Headquarters	≥5 Years	Electronic or Paper
Field equipment calibration/maintenance logs			
Field observation forms			
YSI data			Electronic
Flow data			
Rainfall data			
Laboratory Documents			
Laboratory analytical results and reports	SAWPA Headquarters	≥5 Years	Electronic or Paper
Laboratory chain of custody forms			
Laboratory calibration records	Contract Laboratory		
Laboratory equipment maintenance logs			
Laboratory quality control manuals			
Laboratory SOPs			

2. Data Generation and Acquisition

This section details the process of properly generating data through the SAR Surface WQ Monitoring Program and acquiring data generated and collected outside the program that may be used to support the project.

2.1 Sampling Process Design

The sampling process design, including sampling locations, frequencies, rationale for selection, are based on the 2022 SAR TDS and TIN Monitoring Work Plan in compliance with the requirements of the 2021 Basin Plan Amendment.

2.1.1 Monitoring Schedule

According the 2022 Work Plan, quarterly monitoring will be conducted at three monitoring locations to understand the variability in quality between low-flow and high-flow conditions throughout the year. SAR @ E Street has minimal flow during typical dry-weather conditions, and it is highly unpredictable. SAWPA intends to schedule sampling events during daylight hours a day after a storm event at the three sites. A historical flow rate and precipitation analysis was performed to determine the monitoring schedule and sampling trigger. **Table 2-1** and **Table 2-2** summarize the monthly mean discharge rate at United States Geological Survey (USGS) managed stream gauge (11059300) and precipitation at USGS rain gage at Gilbert Street (340742117161701), which is just downstream of E Street.

There is limited precipitation in summer months, especially in Quarter 3. Some year, such as 2018-2020, there is minimal precipitation and stream flow to collect water quality samples. Also, the sampling event needs to occur during daylight hours after a storm event, which requires a significant storm event. Depending on when the storm ends, there may not be flow at SAR @ E Street when the sampling team mobilizes the following morning. Due to the variability in precipitation and stream flow, it is difficult to ensure water quality samples are collected after one storm event per quarter. The monitoring consultant will aim to collect low-flow condition samples following a storm event. However, if there is insufficient precipitation during a quarter, SAR @ E Street will not be sampled. USGS stream gauge and precipitation data will be provided to support the decision.

Table 2-1 Monthly Mean Discharge at E Street

Year	**Monthly Mean Discharge (cubic feet per second)**											
	Quarter 1			**Quarter 2**			**Quarter 3**			**Quarter 4**		
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2012	3.3	4.5	33.3	17.3	0.4	0.0	0.4	2.0	0.6	0.1	6.3	27.0
2013	7.9	23.3	13.8	0.7	0.5	0.2	0.2	1.9	0.0	1.7	47.1	3.2
2014	2.1	65.2	30.3	8.2	0.0	0.0	0.0	23.2	3.5	0.0	3.8	99.3
2015	5.2	20.6	5.6	3.7	3.5	0.1	14.6	0.2	18.2	5.2	6.3	9.5
2016	72.7	3.8	11.5	10.8	6.3	0.5	0.3	0.4	0.5	1.7	10.5	92.3
2017	297.6	26.1	12.1	2.2	6.4	0.8	0.0	0.6	1.1	0.4	1.6	1.0
2018	65.5	3.8	14.2	0.2	0.3	0.0	0.0	0.0	0.0	6.0	19.5	44.1
2019	52.3	135.6	36.0	7.7	121.9	18.4	0.0	0.0	0.1	0.0	45.1	44.5
2020	2.1	2.0	78.8	120.3	0.5	0.4	0.0	0.0	0.6	0.8	4.9	14.4
2021	39.9	12.1	10.9	1.1	3.2	1.4	0.6	0.0	0.8	5.5	1.5	112.0
2022	3.9	8.5	12.8	0.3	0.9	0.2	0.0	0.2	5.5	6.5	52.3	11.9
Average	**50.2**	**27.8**	**23.6**	**15.7**	**13.1**	**2.0**	**1.5**	**2.6**	**2.8**	**2.5**	**18.1**	**41.7**

Table 2-2 Monthly Precipitation at Gilbert Street near SAR @ E Street

Year	Monthly Precipitation (inch)											
	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.79	0.81	1.88	1.66	0.06	0	0.11	0	0	0.44	1.02	4.08
2013	1.55	1.21	0.95	0.05	0.05	0.01	0.1	0.05	0.01	0.81	3.55	0.48
2014	0.04	2.4	0.59	1.01	0	0	0	1.99	1.55	0.01	0.62	4.58
2015	0.59	1.38	0.29	0.07	0.75	0	0.99	0	1.81	0.86	0.55	1.13
2016	3.41	0.32	1.46	0.98	0.13	0	0	0	0	1.17	1.27	5.62
2017	8.59	3.16	0.53	0	0.41	0	0	0.46	0.36	0	0.01	0
2018	2.68	0.65	2.88	0	0.58	0	0.01	0	0	0.79	1.29	1.37
2019	5.27	7.68	1.78	0.07	1.55	0	0	0	0.05	0	2.21	2.79
2020	0.19	0.31	3.9	3.34	0	0	0	0	0	0	1.07	1.64
2021	3.12	0.3	1.35	0	0.02	0.08	0.39	0	0.22	0.84	0	7.89
2022	0.17	0.34	0.96	0.21	0.09	0.01	0	0	0.48	0.38	1.47	2.28
Average	**2.4**	**1.69**	**1.51**	**0.67**	**0.33**	**0.01**	**0.15**	**0.23**	**0.41**	**0.48**	**1.19**	**2.9**

2.1.2 Field QA/QC Samples

Field blank and field duplicate samples will be collected as field QA/QC samples.

2.1.2.1 Field Blank

The purpose of analyzing field blanks is to demonstrate that sampling procedures do not result in contamination of the environmental samples. Field blanks will consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment using the same procedures used for environmental samples.

Once annually, field blanks are collected to detect onsite contamination. Field blank samples will account for 5% of samples in a given monitoring year.

2.1.2.2 Field Duplicate

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Once annually, field duplicates will be collected at the rate of 5% of samples annually and analyzed along with the associated environmental samples.

2.1.3 Sampling Trigger

Precipitation and flow data at SAR @ E Street during 2022-23 wet-weather season was compiled and analyzed. **Figure 2-1** demonstrates that significant flow is observed following more than 0.5 inches of precipitation. Therefore, storm events with over 0.5 inches of precipitation will be targeted.

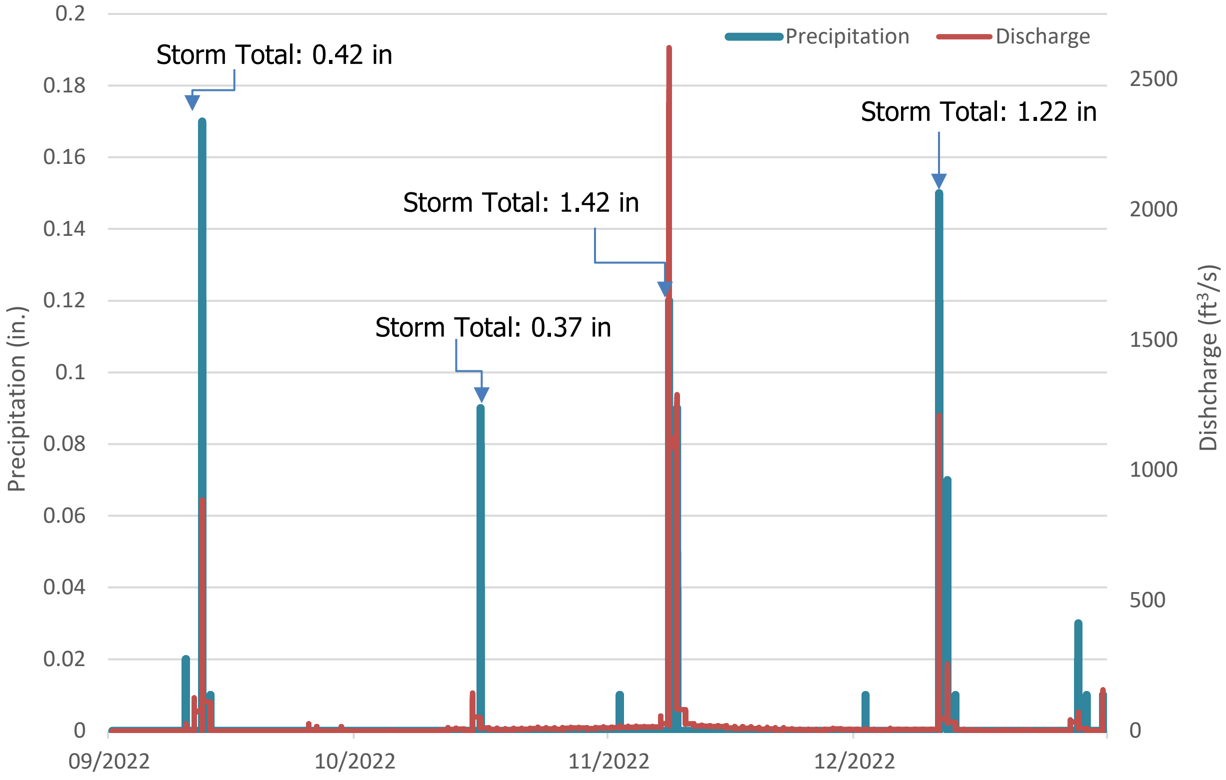


Figure 2-1 Precipitation and Flow Rate Correlation

To accurately plan for a sampling event, it is important to monitor the weather leading up to the event and to see if enough precipitation will generate flows. Real time precipitation data for Riverside Municipal Airport is available at: https://w1.weather.gov/obhistory/KRAL.html. Before the sample team mobilizes, the sampling team lead will check the USGS stream gage to ensure flow is present at SAR @ E Street, which allows water quality samples to be collected. If flow is absent, SAWPA PM will be contacted to get concurrence prior to mobilization.

2.1.4 Constituents

The monitoring program will collect water quality samples and analyze for the following constituents during each monitoring event.

- TDS
- Nitrate as N
- Nitrite as N
- Ammonia as N
- Specific Conductance (field measurement)
- TIN Calculation

Additional in-situ field measurements, including pH, DO, temperature, and turbidity will be collected and recorded using a YSI.

2.1.5 Health and Safety

There are various health and safety concerns during sampling events, including but not limited to, encounters with animals, insects, people experiencing homelessness; slips, trips and falls; inclement weather including extreme temperatures. To mitigate these concerns, sampling will be done only in daylight hours and in teams of two. Sample teams will be provided with a sampling tote that will include Personal Protective Equipment (PPE) and first aid kits. A tailgate safety meeting will be held by the sampling team lead prior to the sampling event. Discuss the planned site activities, hazards associated with the activities, and preventive measures.

If there are safety concerns during a sampling event, Riverside County Code Enforcement can be contacted to escort the team to the sampling sites. The contact information is listed below.

Robert Magee
(951) 955-0917
RMagee@rivco.org

Samples will be collected during daylight hours after the storm has passed. When there are unsafe and turbulent flows, samples will be collected from the street crossing associated with the sampling site. Riverside Avenue Bridge does not have pedestrian access and would need to have traffic control to support the sampling team during the monitoring event at that location.

2.2 Sampling Method

The following subsections provide details on the various techniques that can be utilized to collect water quality samples. Should field crews feel that it is unsafe to collect samples for any reason, the field crews **SHOULD NOT COLLECT** a sample and note on the field log that the sample was not collected, why the sample was not collected, and provide photo documentation, if feasible.

2.2.1 Clean Hands/Dirty Hands

The Clean Hands/Dirty Hands method is utilized to take grab samples, to prevent cross-contamination.

When the SAR is safe the access and is deep enough to dip the bottle in, an example of the Clean Hands/Dirty Hands Method is shown below:

- Clean Hands will watch the surroundings and assist Dirty Hands only if necessary.
- Dirty Hands will hold the primary and duplicate (if applicable) sample bottles, while Clean Hands remove the bottle caps.
- Dirty Hands will dip the primary and duplicate sample (if applicable) bottles together in the water body to fill the bottles and then Clean Hands will cap the filled bottles.
- Dirty Hands will place the filled bottles in the ice chest.
- Dirty hands will change to fresh gloves and take field measurements with the YSI while Clean Hands records on the Field Form.
- Clean Hands will change to fresh gloves to take field blank samples.
- Once all bottles are completed, both samplers can help clean up.

Dippers can only be used in the stream if it is too shallow to dip the bottles in. When it is unsafe to enter the SAR, buckets can be used when collecting samples from a bridge. When buckets and dippers are required during a sampling event, an example of the Clean Hands/Dirty Hands Method is shown below:

- Clean Hands will watch the surroundings and assist Dirty Hands only if necessary.

- Dirty Hands will use a bucket to collect the grab sample with a sanitized bucket, dipper, and rope and bring the bucket back to the bottle filling station.
- Dirty Hands will use the sanitized dipper to collect sample water from the bucket.
- Clean Hands will remove the bottle caps and hold the bottle so the Dirty Hands can pour water.
- Clean Hands will cap and place the filled bottles in the ice chest.
- Dirty hands will change to fresh gloves and take field measurements with the YSI while Clean Hands records on the field observation form.
- Clean Hands will change to fresh gloves to take field blank samples.
- Once all bottles are completed, both samplers can help clean up.

2.2.1.1 Collecting Field Blanks

To best collect field blanks, the sampling team should utilize a clean hand/dirty hand method, where after changing into new gloves, the Dirty Hands will hold bottles while the Clean Hands will remove caps from bottles and the deionized water and fill bottles. Caps will be replaced immediately after adding water.

2.2.1.2 Collecting Field Duplicates

The Clean Hands/Dirty Hands method will be utilized as described above, but both the primary and duplicate samples will be dipped into the water body simultaneously. If using bucket/scoop, samples are filled by filling each bottle with approximately 20mL from the same bucket/scoop back and forth until both bottles are filled. This will ensure that each sample is equally represented.

2.2.2 Field Measurement

For in-situ field parameters, a YSI probe will be used to measure DO, temperature, pH, and conductivity in the field during sampling events. A field data observation sheet will be completed by the field crew during each sampling event. YSI Pro Plus field measurement procedures are included in **Appendix D**. Three readings will be taken at each site approximately one minute apart. YSI data will be downloaded following the sampling event and stored per **Table 1-8.**

2.2.3 Flow Measurement Techniques

Flow will be measured and recorded for every sampling event. Measuring sticks and/or measuring tape will be utilized to measure depth and width. Stopwatches will be used to measure velocity. The following steps would be taken to measure flow.

1. Observe stream and surrounding areas to be sure it is safe to enter. Use a measuring device to determine cross section width.
2. Along that same cross section, measure the depth at 10%, 50%, and 90% across the width.
3. Estimate stream velocity (ft/s) at that reach and record at 10%, 50%, and 90% across the stream width. A good way to do this is to time the travel of a piece of floating debris. This can be done by selecting points of reference along the stream channel which can be used as upper and lower boundaries for an area of measurement. After establishing the boundaries, measure the length of the flow reach. If possible, one person stands at the upper end of the reach and drops a floating object and says “start.” A second person stands at the lower end of the reach and times the number of seconds for the floating object to float the reach. The velocity is the length of the reach in feet divided by the average time in seconds.

4. Multiply stream width (feet) by average stream depth (feet) to determine the cross-sectional area (ft^2) which when multiplied by the stream velocity (ft/s) and a correction constant of 10%, 50% and 90% and the sum of the three gives a measured flow (ft^3/s).

In cases where it is unsafe due to high flows, a visual estimation will be used instead. Since this method is subjective to the field staff's experience this method isn't ideal but can be necessary to prevent staff entering unsafe situations. Below outlines the steps if visual flow estimation is necessary.

1. Observe the stream and choose best cross section and visually estimate width.
2. Estimate the depth at 10%, 50%, and 90% across the stream width.
3. Estimate stream velocity (ft/s) at that reach and record at 10%, 50%, and 90% across the stream width. A good way to do this is to time the travel of a piece of floating debris. This can be done by selecting points of reference along the stream channel which can be used as upper and lower boundaries for an area of measurement. After establishing the boundaries, measure the length of the flow reach. If possible, one person stands at the upper end of the reach and drops a floating object and says "start." A second person stands at the lower end of the reach and times the number of seconds for the floating object to float the reach. The velocity is the length of the reach in feet divided by the average time in seconds.
4. If doing this method from a bridge (for example, because flows are too high to be in the channel), measure the width of the bridge. Have one person drop a floating object (something that can be distinguished from other floating material) at the upstream side of the bridge and say "start". The person on the downstream side of the bridge will stop the clock when the floating object reaches the downstream side of the bridge. Divide the bridge width by the number of seconds to calculate the velocity. The velocity should be measured at multiple locations along the bridge at least three times. These velocities are averaged.
5. Multiply stream width (feet) by average stream depth (feet) to determine the cross-sectional area (ft^2) which when multiplied by the stream velocity (ft/s) and a correction constant of 10%, 50% and 90% and the sum of the three gives an estimated flow (ft^3/s).

If the visual flow estimation method is used, the field staff is to report it on the field form.

2.2.4 Field Documentation

The field observation form is a document used to record field observations and measurements during each sampling event. The form is broken up into four sections. The General Information includes basic information, including location, date, time sampler. The Field Measurements Section is the YSI Readings collected. The Flow measurements section includes a table to record flow measurements. The Grab sampling section includes a checklist of samples collected, including if field blanks and duplicates were collected. The Site Observations sections is used to record the weather and other observations that could affect or indict on water quality, as discussed in **Section 2.2.4.1**. Blank field observation forms are found in **Appendix C**.

Field observation forms will be stored per **Table 1-8.**

2.2.4.1 Field Observation

Field observations are qualitative observations made while conducting the monitoring event. The field observations section on the Field Data Sheet includes information such as weather and anything that could attribute or be indicative water quality, including, but not limited to water color, presence of odor, flow type, presence of wildlife, encampments, etc. Additional qualitative comments that are relevant to the sampling event and not covered in the above sections will be included at the bottom. Photos should also be taken of anything that is an indicator of or contributor to water quality.

2.2.4.2 Field Photos

It is important to photo document during the sampling event. Important things to document with photos are the water body (upstream, downstream, sampling area, close up photo of the water characteristics), anything else worth noting. Using a photo time and date stamp are recommended for recordkeeping practices. It's best practice to check camera's functionality, including time/date, prior to the sampling event.

2.3 Sampling Handling and Custody

The laboratory will provide appropriate sample containers for the constituent being analyzed. Samples will be pre-labeled with the project name, site ID, sample type, bottle number, preservative, and analysis. Sample bottles will also be pre-labeled with a unique Sample ID to track the sample throughout its analysis. The Sample IDs will also be entered directly onto the COC Forms. The COC forms will accompany the collection and delivery of water quality samples. Samples will be collected in the bottle type, preservation method, and volume as required by the laboratory, which can be found in
Table 2-3.

Table 2-3 Sample Container, Volume, Preservation, and Holding Time Requirements

Constituent	Sample Container	Sample Volume	Immediate Processing and Storage	Holding Time
Nitrate N	HDPE	1 L	Store at 4°C	48 hours
Nitrite N				
TDS				7 days
Ammonia	HDPE	250 mL	H2SO4 and Store at 4˚C	28 days

The following sample handling protocols will be followed when collecting samples to minimize the possibility of contamination:

- New unused sample bottles will be employed. Sample bottles and bottle caps will be protected from contact with solvents, dust, or other contaminants during storage and handling.
- Samplers will make a reasonable effort to prevent large gravel and uncharacteristic floating debris from entering the sample containers. The sampler will avoid sediments disturbance from storm drain invert.
- The inside of the sampling container will not be touched to the maximum extent practicable during preparation and sampling activities.
- Vehicle engines will be turned off during sampling activities to minimize exposure of samples to exhaust fumes.
- Samples will be collected in accordance with clean sampling techniques.
- Manual water grab samples will be collected by inserting the transfer container under or down current of the direction of flow, with the container opening facing upstream.
- Once sample containers are filled, they will be promptly placed on ice, in a clean cooler (target temperature 6 degrees Celsius), in the dark and transported to the laboratory for processing to meet holding times. Necessary pre-processing for analysis, such as filtration and acidification, will take place in the laboratory by certified personnel.

- After the field crew collects and delivers the samples to the laboratory, the laboratory will conduct the analysis within appropriate holding times. These field and laboratory activities will be coordinated to make sure samples are handled within the proper holding time.

2.3.1 Pre-sampling Procedures

Prior to the collection of field data, the field staff will complete the following activities:

- Calibrate the YSI prior to sampling
- Gather equipment for field measurement parameters, including but not limited to, measuring devices, stopwatches, sampling pole/bucket, camera
- Prepare coolers with ice packs or crushed ice
- Prepare appropriate bottles with labels
- Prepare a solution of 70 percent ethanol for field sterilization of sampling equipment
- Check safety gear, including but not limited to, rubber boots, safety vests, decontamination kits.
- Prepare a tote with pens, extra bottles, sampling poles, nitrile or latex gloves, field forms, chain of custodies, access keys.

2.3.2 Sample Containers and Labels

Prior to the sampling events, constituent-specific sampling containers are ordered from laboratories. Each container should be affixed with the proper labeling to prevent confusion from samplers or laboratories. Labels at a minimum must have the site ID, site name, date, analysis, and bottle type. An example label is shown in **Figure 2-2.**

SAWPA SAR Surface WQ
YYYYDDMMSAR@Riverside
SAR @ Riverside Avenue
TDS, NO2 as N, NO3 as N
Sample Date: MM/DD/YYYY
1 L HDPE
None

Figure 2-2 Bottle Label Example

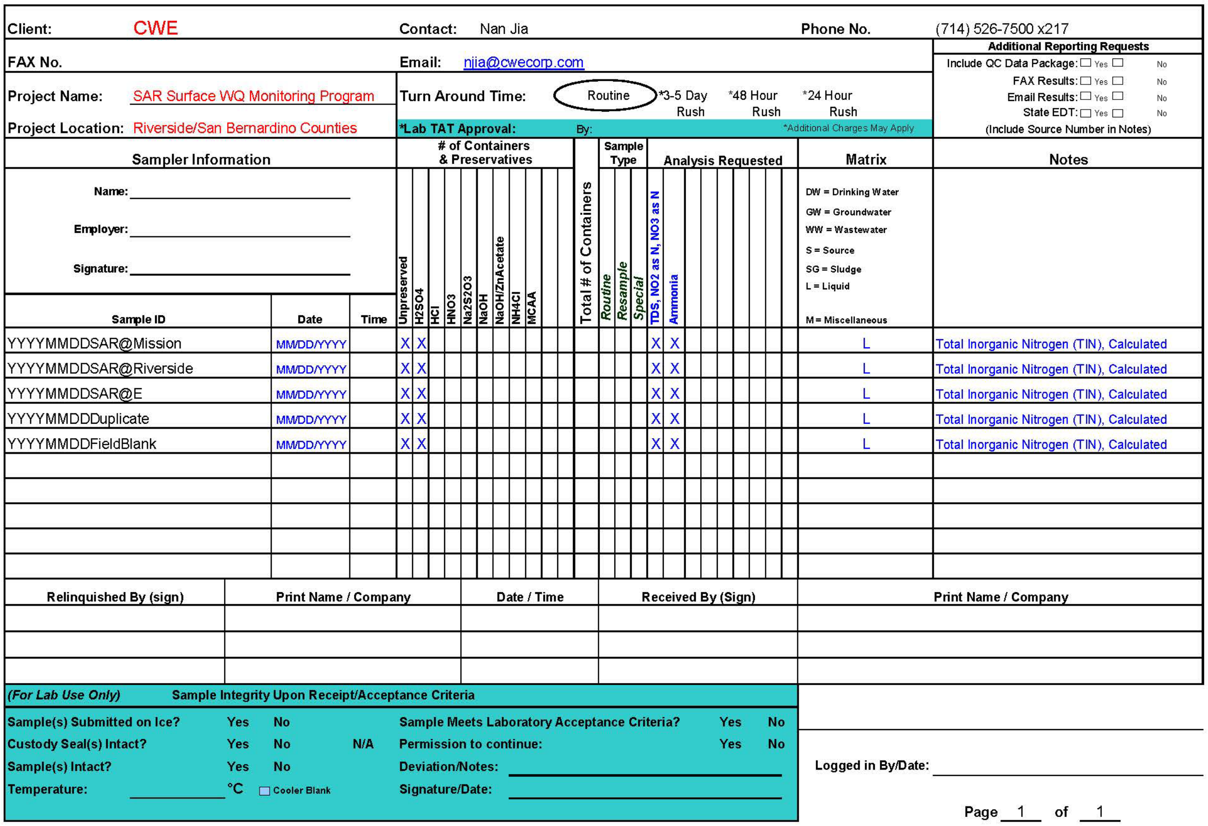
Labels can be prepared on a computer, printed, and affixed with adhesive or can be handwritten on the label stickers with the same information. The labels should be consistent with the CoC. The sampling date and submitting agency should be included on the label.

2.3.3 CoCs

The laboratory will supply the CoC forms that will be utilized by the sampling team. CoC procedures will be used for samples throughout the collection, transport, and analytical process to ensure the most accurate results. CoCs will be pre-printed along with the bottle labels and will contain the same data as the labels. The CoCs will be completed in the field with dates, times, and sample team names, and will be cross-checked with the bottles to make sure proper samples have been collected. Documentation of sample handling and custody will include the following:

- Sample identification;
- Type of sample;
- Sample collection date and time;
- Special notations on sample characteristics or analysis;
- Analyses to be performed;
- Initials of the sampling team member that collected the sample; and
- Date the sample was delivered to/sent to the laboratory.

The CoC forms will be transported with the samples to the analytical laboratory. Sampled water will be kept properly chilled and transferred to an analytical laboratory within specified holding times. When custody of the samples is transferred to the laboratory, the CoC will be signed and dated, and a PDF copy will be sent from the laboratory. An example CoC form is included in **Figure 2-3**. The CoCs will be reviewed by personnel at the receiving laboratory to make sure no samples have been lost in transport. The laboratory will also verify that each sample has been received within the appropriate holding times. CoC records will be included in the final reports prepared by the analytical laboratory and are considered an integral part of the report.



Client: CWE
Contact: Nan Jia
Phone No. (714) 526-7500 x217
FAX No.
Email: njia@cwecorp.com
Project Name: SAR Surface WQ Monitoring Program
Project Location: Riverside/San Bernardino Counties
Turn Around Time: [✓ Routine] *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By: *Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: ______
Employer: ______
Signature: ______

			# of Containers & Preservatives												Sample Type			Analysis Requested									Matrix	Notes
Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/ZnAcetate	NH_4Cl	MCAA			Total # of Containers	Routine	Resample	Special	TDS, NO_2 as N, NO_3 as N	Ammonia								DW = Drinking Water GW = Groundwater WW = Wastewater S = Source SG = Sludge L = Liquid M = Miscellaneous	
YYYYMMDDSAR@Mission	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDSAR@Riverside	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDSAR@E	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDDuplicate	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDFieldBlank	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company

(For Lab Use Only) **Sample Integrity Upon Receipt/Acceptance Criteria**
Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature: ______ °C ☐ Cooler Blank
Sample Meets Laboratory Acceptance Criteria? Yes No
Permission to continue: Yes No
Deviation/Notes: ______
Signature/Date: ______

Logged in By/Date: ______

Page 1 of 1

Figure 2-3 Example CoC

2.3.4 Laboratory Custody Procedures

Laboratories will follow sample custody procedures as outlined in the laboratory's QA Manual. A copy of each contract laboratory's QA Manual should be available at the laboratory upon request. Laboratories shall maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times. The following sample control activities must be conducted at the laboratory:

- Initial sample login and verification of samples received with the CoC form;
- Document discrepancies noted during login on the CoC;
- Initiate internal laboratory custody procedures;
- Verify sample preservation (e.g., temperature);
- Notify the PM if problems or discrepancies are identified; and
- Perform proper sample storage protocols, including daily refrigerator temperature monitoring and sample security.

Laboratories shall maintain records to document that the above procedures are followed. Once samples have been analyzed, remaining water samples will be stored at the laboratory for at least 60 days. After this period, samples may be disposed of properly.

2.4 Analytical Method Requirements

Only USEPA certified analytical laboratories will be used for sample analysis. Water chemistry is monitored using protocols determined during laboratory certification and QA/QC procedures at the laboratory. Analytical methods to be used will follow 40 Code of Federal Regulations Part 136 requirements. The methods to be used, modifications to those methods, and the appropriate reference to a Standard Method is presented in **Table 2-4**. The Laboratories are required to have ELAP accreditation. The Laboratory's ELAP certification can be found in **Appendix B**.

Table 2-4 Pollutant Analysis methods, References, and Method Modification

Constituent	Method	Description	Modification
Ammonia as N	SM 4500-NH3 C	Titration	None
Nitrate as N	EPA 300.0	Ion Chromatography	993.30
Nitrite as N	EPA 300.0	Ion Chromatography	993.30
TDS	SM 2540 C	Gravimetric, 180°	I–1750–85

2.5 QC Requirements

This section describes the QA/QC requirements and processes. QC samples will be collected in conjunction with environmental samples to verify data quality. QC samples collected in the field will generally be collected in the same manner as environmental samples. Laboratory QA/QC samples will be analyzed with the environmental samples. **Table 2-5** presents the QC sample type addressed by each QA requirement as well as the appropriate corrective action if the acceptance limit is exceeded.

Table 2-5 QC Requirements

QC Sample Type	QA Parameter	Frequency[1]	Acceptance Limits	Corrective Action
QC Requirements – Field				
Field Blank	Contamination	5% of samples	< MDL	Examine field log. Identify contamination source. Qualify data as needed.
Field Duplicate	Precision	5% of samples	RPD < 25% if |Difference| > RL	Reanalyze both samples if possible. Identify variability source. Qualify data as needed.
QC Requirements – Laboratory				
Method Blank	Contamination	1 per analytical batch	< MDL	Identify contamination source. Reanalyze method blank and samples in batch. Qualify data as needed.
Laboratory Duplicate	Precision	1 per analytical batch	RPD < 25% if |Difference| > RL	Recalibrate and reanalyze.
MS	Accuracy	1 per analytical batch	80-120% Recovery	Check LCS/ Certified Reference Material (CRM) recovery. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Matrix Spike Duplicate (MSD)	Precision	1 per analytical batch	RPD < 30% if |Difference| > RL	Check lab duplicate RPD. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Laboratory Control Sample	Accuracy	1 per analytical batch	80-120% Recovery	Recalibrate and reanalyze LCS/ CRM and samples.

[1] "Analytical batch" refers to a number of samples (not to exceed 20 environmental samples plus the associated QC samples) that are similar in matrix type and processed/prepared together under the same conditions and same reagents (equivalent to preparation batch).

2.5.1 Field QA/QC Samples

Field QA/QC samples include filed duplicates and field blanks.

2.5.1.1 Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Field duplicates will be collected once per year. Field duplicates will consist of two grab samples collected simultaneously, to the extent practicable. The RPD of field duplicate results will be calculated and compared against the SWAMP QAPP MQOs requirements during laboratory data review. If the RPD exceeds the requirements, the sampling crew should be notified so that the source of sampling variability can be identified (if possible) and corrective measures taken prior to the next sampling event.

2.5.1.2 Field Blank

Field blanks will be collected once annually, filled with deionized water, and processed through the sampling equipment using the same procedures used for environmental samples. If constituents of interest are detected at levels greater than the acceptable limits from the SWAMP QAPP MQOs, the source(s) of contamination should be identified and eliminated, if possible. The sampling crew should be notified so that the source of contamination can be identified (if possible) and corrective measures taken prior to the next sampling event.

2.5.2 Laboratory Analyses

Water samples will be analyzed by a state certified analytical laboratory under the guidance of their Quality Assurance Manual. Prior to sampling, the analytical methods and RLs will be verified with the laboratory to ensure they can be achieved. The DQOs and MQO will apply to nutrient (Ammonia as N, nitrate as N, and nitrite as N) and TDS samples. The laboratory analyzes multiple water quality samples as a batch, and one set of QC samples will be analyzed with each batch. Every 10 or 20 water quality samples will have one associated set of QC samples. The following QC sample types are analyzed as part of the QC batch: method blank, laboratory duplicate, MS, MSD, LCS, and laboratory control sample duplicate (LCSD).

2.5.2.1 Method Blank

Method blanks are prepared and analyzed by the laboratory as closely as possible to the original and QC samples to determine if there is contamination present in the lab. The results of the method blanks provide an estimate of variability or bias by the analysis.

2.5.2.2 MS and MSD

A MS is a sample prepared by the laboratory by spiking a known concentration of a target analyte to a specific amount of sample. The MSD is similar to the MS and shows the effect of the sample matrix on the accuracy of the analytical results. If the MS recovery of an analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If recovery of LCSs is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix.

If the MSD RPD for an analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If the RPD for laboratory duplicates is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix.

2.5.2.3 LCSs

The purpose of analyzing LCSs (or CRM) is to demonstrate the accuracy of the sample preparation and analytical methods. LCSs will be analyzed at the rate of one per sample batch. LCSs will consist of laboratory fortified method blanks or a standard reference material. If recovery of an analyte is outside the acceptable range, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared again, and the LCS should be reanalyzed.

2.5.2.4 Laboratory Duplicates

The purpose of analyzing laboratory duplicates is to demonstrate the precision of the sample preparation and analytical methods. Laboratory duplicates will be analyzed at the rate of one pair per sample batch. Laboratory duplicates will consist of duplicate laboratory fortified method blanks. If the RPD for an analyte is greater than the percentage stated in **Table 2-5** and the absolute difference between duplicates is greater than the RL, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared again, and laboratory duplicates should be reanalyzed.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Calibration and Frequency

Instruments used to gather field measurements (temperature, conductivity, DO, pH, and turbidity) will be properly maintained and calibrated per the manufacturers' requirements, shown below in **Table 2-6**. Instruments will be tested prior to the start of field sampling to verify that each instrument is operating appropriately. If the instrument fails to operate within appropriate parameters, the Consultant PM will take the appropriate steps to ensure that the equipment is repaired or replaced in a timely manner.

Laboratories used to implement the SAR Surface WQ Monitoring Program will operate using QA/QC programs to maintain their equipment in accordance with their SOPs, which include those specified by the manufacturer and those specified by the analytical method. Laboratories are required to submit a copy of their SOPs for laboratory equipment maintenance to the QA/QC Manager for review and approval.

Table 2-6 Testing, Inspection, Maintenance of Sampling Equipment and Analytical Instruments

Equipment	Maintenance	Responsible Person	Frequency	SOP Reference
YSI ProPlus DSS	Maintenance and Calibrations	Consultant PM	Maintenance – conducted per manufacturer specifications; Calibrations - prior to each sampling activity	**Appendix D**
Laboratory Analytical Instruments for Conventional Constituents	Maintenance and Calibrations	Laboratory PM	Maintenance – conducted per manufacturer specifications; External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 < 0.995$ Calibrations - verification of every 20 samples after initial calibration. Standard source different than that used for initial calibration. Recovery 80% - 120%.	Per laboratory SOP manual and per equipment maintenance specifications

2.7 Instrument/Equipment Calibration and Frequency

Instruments and equipment will be calibrated daily or prior to each usage event according to the manufacturer's specifications and/or associated SOPs. Calibration will be done by trained personnel. If the calibration is unsuccessful, the instrument will be cleaned, and parts will be replaced until calibration is successful. If calibration cannot be completed successfully, the PM will be notified, and sampling or analysis will be postponed until the problem is resolved. Affected data will be flagged. Documentation of calibration will be maintained in a logbook appropriate to the equipment. This section details processes to properly calibrate and prepare instruments and equipment.

YSI calibration involves using manufacturer prepared standard solutions and the manufacturer's instructions to ensure YSI probes are reading accurately. The output reading will be adjusted to read at the standard solution value. YSIs should be calibrated within 24 hours of the sampling event to allow for reliable results. Following each sampling event, the YSIs will be cleaned and dried out for proper storage. Calibration instructions and the YSI manual are included in **Appendix D**.

At times, probes on the YSI or the device itself will need to be repaired or replaced. DO membrane cap and pH sensors need to be replaced approximately every 1.5 years. Information on ordering parts and help with repairs or other information can be accessed by visiting https://www.ysi.com/proplus.

2.8 Inspection/Acceptance of Supplies and Consumables

Sample bottles and collection equipment will be inspected upon receipt and prior to use. Supplies will be sourced from the accredited laboratory. The Consultant PM and Laboratory PM will oversee the inventory of sampling supplies and reorder when necessary. Logs will be maintained for supplies used and deficiencies will be recorded.

Upon receipt, buffer solutions, standards, reagents, and field test kits used will be inspected for leaks or broken seals. Reagents will be replaced before they exceed the manufacturer's recommended shelf life. Sample bottles will be inspected for sterility and structural integrity prior to use. Inspections will occur according to individual SOPs. Test organisms will be maintained and inspected for health prior to testing.

2.9 Non-direct Measurement

Non-Direct Measurement data can include but is not limited to:

- existing sampling and analytical data and files from a previous effort (current project and/or related project);
- photographs or topographical maps produced outside this project;
- information from the published literature;
- background information from facility or state files;
- measurements that are ancillary to addressing the project's objectives

OCWD and USGS have been performing water quality and flow monitoring in SAR Reaches 2, 3, 4, and 5. The sampling methods and laboratory analysis used in this monitoring program are equivalent to the existing monitoring efforts. Water quality and flow data from other sources will be reviewed against the DQOs listed in this document and only data which meet the criteria will be used when appropriate. The SOP and QAPP involved for the external sources will also be reviewed to ensure that the data is valid. Questionable data will be rejected. Data obtained from this method will be integrated with study data to evaluate compliance with the Basin Plan and SWAMP.

2.10 Data Management

The Consultant PM will be responsible for the proper management of field measurement and observation data. The Consultant PM will review field observation forms for completeness and maintain the original hardcopies in the project file. The field observation form responses will also be manually entered into an electronic version and these fields will be saved into a database. The data will be checked for accuracy before being saved in the database. Photographs of the monitoring sites taken by field personnel will be uploaded into the project file. Field team members will name the photographs using the photograph naming convention developed specifically for this project.

The Laboratory PM will be responsible for the proper management of laboratory data. The laboratory will conduct QC checks on the data per laboratory QA/QC procedures and record the data electronically. The results of the analysis will be sent to PM in the form of a hard copy and electronic copy. The PM will review the data for completeness and errors. The results will then be filed with the project data and recorded in the database. Original documentation such as lab notes will be kept with project files in a secure location.

3. Assessment and Oversight

3.1 Assessments and Response Actions

The Consultant PM will oversee day-to-day activities within the project. The Consultant QA/QC Manager will oversee QA/QC activities within the project and ensure that procedures are being followed. The Consultant PM will regularly review procedures in reference to the QAPP to ensure that elements of it are being implemented correctly. The use of approved equipment and methods when obtaining water samples and conducting field measurements will be verified for proper techniques following SOPs in cleaning, inspection, maintenance, calibration, and sampling. Equipment quality and record-keeping techniques will also be reviewed. Documentation will be reviewed before leaving the sample sites to ensure that the data is complete and accurate. If there are issues presented, the Consultant PM will review the necessary procedures with the field staff and take necessary corrective action. The sample will be re-collected and noted, if possible. If not, the error will be noted in the sample documents. In the event of a situation that may affect the integrity of the data, the sampling team(s) will contact the Consultant PM or QA/QC Manager to determine the corrective actions necessary. The issue and actions taken will be documented in the project file.

The Laboratory PM will periodically review procedures in the analysis of samples and verify proper techniques following SOPs in cleaning, inspection, maintenance, calibration, and analysis. Equipment and record keeping will also be reviewed. The Laboratory QA/QC Manager will also review data generated from analysis in the lab. If in a case the data is deemed erroneous, the samples will be re-analyzed when possible, and the error will be noted with the analysis results. The Laboratory QA/QC Manager will review procedures and take corrective action for issues that lead to the error. The PM will be notified of issues that occur in the laboratory. Actions taken will be documented and submitted to the QA/QC Officer for filing. The QA/QC Officer will manage activities and has the authority to halt sampling and analytical work if deviations are detrimental to the quality of the data. The QA/QC Officer may follow up and inspect results when deemed necessary.

3.2 Reports to Management

Upon delivery of the collected samples, the Consultant PM will send out a sample delivery confirmation email, which will also include summative information regarding the sampling event and PDFs of signed CoCs for submitted samples.

The field monitoring data, calibration records, and other forms will be reviewed for completeness, correctness, and other errors by the PM on a regular basis. The laboratory results will be reviewed by the Laboratory PM prior to the release of results to the consultant team. The laboratory submission will be signed as a confirmation of completeness and correctness of the procedures and results of the analysis.

4. Data Validation and Usability

The Consultant will be responsible for laboratory analysis of samples collected, in accordance with corresponding CoCs. Consultant PM will track and store received laboratory data and reports, such as Certificates of Analysis, CoCs, Work Order Summaries, etc., in an organized manner, and provide status updates to SAWPA. Laboratory reports will be reviewed to validate requested analyses and QA/QC samples were analyzed and reported according to the CoCs and SWAMP requirements. Sample holding times will be reviewed to determine if the samples were extracted and analyzed within the allowed sample holding time. Laboratory performance objectives for accuracy and precision will be verified, which includes a check of method blanks, MDLs, RLs, LCSs, and MS. Consultant will verify surrogate recoveries are within laboratory control limits and assigned data qualifiers are appropriate. If issues occur during the laboratory data QA/QC process, Consultant will contact the responsible laboratory and resolve the identified issues. Consultant will provide a data QA/QC spreadsheet, comparing the RPD between primary and duplicate sample results. Reasons why and corrective actions should be included in the QA/QC summary tables.

4.1 Data Review, Verification, and Validation

Data generated by project activities will be reviewed by the Consultant QA/QC Manager against the DQOs in this QAPP. A "peer review" process is when a second analyst or individual proficient with the method reviews the data set. A checklist will be provided to guild the reviewer through the process.

Data will be separated into three categories: (1) data meeting DQOs, (2) data failing precision or recovery criteria, and (3) data failing to meet accuracy criteria. Data meeting DQOs, but with failures of QA/QC practices will be set aside until the impact of the failure on data quality is determined. Once determined, the data will be moved into either the first category (data meets DQOs) or the last category (data failing to meet accuracy criteria).

Data falling in the first category is considered usable by the project. Data falling in the last category is considered not usable. Data falling in the second category will have aspects assessed to determine if the data is usable. If sufficient evidence is found supporting data quality for use in this project, the data will be moved to the first category, but will be flagged with a "J" as per USEPA data validation specifications.

Compare PDFs with corresponding Excel files to confirm that the constituents and analytical methods were consistent with the CoCs and Basin Plan requirements; MDLs and RLs are within acceptable range. Review laboratory QA/QC results, including method blanks, LCS and LCSD, MS and MSDs, to ensure there was no contamination or error introduced in the laboratory. Ensure that the laboratory assigned qualifiers where needed, such as if a result was detected, not quantifiable (DNQ) or if there was a holding time issue. If there are issues with the laboratory analyses or raw files, bring specifics to the attention of Consultant/Laboratory PM.

After the preliminary files have been reviewed and QA/QC issues are resolved, save chemistry data files by site in the folder for the event. Combine files for the same site and the same event in one folder. If a work order applies to multiple sites (i.e., field blank sample), be sure to copy the data over for each applicable site.

4.2 Verification and Validation Methods

Data recorded in the field, including field measurements, observation, and CoC forms must pass a review process before final results are released. Field data will be checked by the Consultant PM to ensure that necessary data and activities were completed, including collection of water samples, field blanks, field replicates, correct unit measurements were reported, and values fall within expected ranges. The validation will also check to ensure that samples were delivered to the laboratory within the required holding times and that sample handling and custody procedures were followed. The project's data scientist will perform a subsequent check on 10 % of the reports.

In addition to field data validation, there will be a validation of laboratory results. The Laboratory QA/QC Manager will perform checks of laboratory records. The review will involve verifying that required parameters listed on the COC were measured and analyzed, reported in the correct units, and that results fall within expected ranges.

Issues, including missing data, incomplete site visits, reporting errors (such as incorrect units of measure or incorrect date/time information, etc.), or data management errors will be communicated to the responsible party immediately and documented in the QA/QC reports for either field sampling, laboratory activities, or database management. Reconciliation and correction will be done by a committee composed of the QA/QC Officer and PM. Corrections require a unanimous agreement that the correction is appropriate.

Flow data collected in association with this monitoring will be reviewed for quality assurance purposes. These data will be checked for inconsistencies, gaps, anomalies between the rain gauge data and water level. In the event that quality assurance issues are identified on the basis of these reviews, a site visit will be performed to troubleshoot the issue and possible corrective actions may be implemented.

Rainfall data will be measured by the on-site rain gauge located at the nearest National Weather Service rain gauge.

4.3 Reconciliation with User Requirements

The data quality will be evaluated according to this document with respect to the sampling design, sampling methods, field and laboratory analyses, quality control, and maintenance. By properly following the guidelines in this document and references, the data quality will be validated. If samples or procedures used in this study fail to meet the guidelines listed in this document, the data will be flagged and reported to the PM. The limitations and assumptions of the data will be provided to the end-user to allow the user to determine the data's usefulness.

The end-user will use this data to determine the compliance of the Basin Plan within the management area. This data will help to characterize pollutant loads and identify the sources responsible for pollutants. The results will identify areas where the Task Force must refine and improve pollutant control measures. A summary of this will be published in an annual report.

5. References

Santa Ana Watershed Project Authority. "2022 Annual Report of Santa Ana River Water Quality." August 2023. Final-2022-Annual-Rpt-of-SAR-Water-Quality.pdf (sawpa.gov)

State Water Resources Control Board. "Quality Assurance/Quality Control." California Environmental Protection Agency. 31 January 2014. http://www.swrcb.ca.gov/water_issues/programs/quality_assurance/index.shtml

State Water Resources Control Board. "SWAMP Quality Assurance Program Plan." January 2022. https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/swamp-qaprp-2022.pdf

Title 40, Chapter I, Subchapter D, Part 136. "Guidelines Establishing Test Procedures for the Analysis of Pollutants." https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-136.

United States Environmental Protection Agency. "Guidance for Quality Assurance Project Plans." December 2002.

United States Environmental Protection Agency. "Quality Assurance Project Plan Standard." March 2023.

United States Geological Survey. "Gilbert Street Precipitation Gage at San Bernardino." https://waterdata.usgs.gov/monitoring-location/340742117161701/#parameterCode=00045&period=P7D&showMedian=true

United States Geological Survey. "Santa Ana River at E Street near San Bernardino." Santa Ana R a E ST NR San Bernardino CA - USGS Water Data for the Nation

Appendix A
Amendment Log

Amendment Log

Amendment Location	Amendment Description	Date of Approval

Appendix B
Babcock ELAP Certification, Chain of Custody, and Bottle Order Form

CALIFORNIA STATE
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Fields of Accreditation

Babcock Laboratories, Inc.

6100 Quail Valley Court
Riverside, CA 92507
Phone: 9516533351

Certificate Number: **2698**
Expiration Date: **5/31/2024**

Field of Accreditation:101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM 9215 B
101.020	004	Total Coliform (Enumeration)	SM 9221 B,C
101.020	005	Fecal Coliform (Enumeration)	SM 9221 B,E
101.020	006	E. coli (Enumeration)	SM 9221 B,F
101.050	001	Total Coliform P/A	SM 9223 B Colilert
101.050	002	E. coli P/A	SM 9223 B Colilert
101.050	003	Total Coliform (Enumeration)	SM 9223 B Colilert
101.050	004	E. coli (Enumeration)	SM 9223 B Colilert
101.050	005	Total Coliform P/A	SM 9223 B Colilert 18
101.050	006	E. coli P/A	SM 9223 B Colilert 18
101.050	007	Total Coliform (Enumeration)	SM 9223 B Colilert 18
101.050	008	E. coli (Enumeration)	SM 9223 B Colilert 18
101.100	001	Total Coliform P/A	Colitag
101.100	002	E. coli P/A	Colitag

Field of Accreditation:102 - Inorganic Chemistry of Drinking Water

102.026	001	Calcium	EPA 200.7
102.026	002	Magnesium	EPA 200.7
102.026	003	Potassium	EPA 200.7
102.026	004	Silica	EPA 200.7
102.026	005	Sodium	EPA 200.7
102.026	006	Hardness (Calculation)	EPA 200.7
102.030	001	Bromide	EPA 300.0
102.030	003	Chloride	EPA 300.0
102.030	005	Fluoride	EPA 300.0
102.030	006	Nitrate (as N)	EPA 300.0
102.030	007	Nitrite (as N)	EPA 300.0
102.030	008	Phosphate,Ortho (as P)	EPA 300.0
102.030	009	Sulfate (as SO4)	EPA 300.0
102.040	001	Bromide	EPA 300.1
102.040	002	Chlorite	EPA 300.1
102.040	003	Chlorate	EPA 300.1
102.040	004	Bromate	EPA 300.1
102.045	001	Perchlorate	EPA 314.0

102.048	001	Perchlorate	EPA 332.0
102.095	001	Turbidity	SM 2130 B-2001
102.100	001	Alkalinity	SM 2320 B-1997
102.120	001	Hardness (Calculation)	SM 2340 B-1997
102.130	001	Specific Conductance	SM 2510 B-1997
102.140	001	Residue, Filterable TDS	SM 2540 C-1997
102.175	001	Chlorine, Free	SM 4500-Cl G-2000
102.175	002	Chlorine, Total Residual	SM 4500-Cl G-2000
102.180	001	Chlorine Dioxide	SM 4500-ClO2 D-2000
102.190	001	Cyanide, Total	SM 4500-CN E-1999
102.200	001	Fluoride	SM 4500-F C-1997
102.203	001	Hydrogen Ion (pH)	SM 4500-H+ B-2000
102.220	001	Nitrite (as N)	SM 4500-NO2 B-2000
102.240	001	Phosphate,Ortho (as P)	SM 4500-P E-1999
102.260	001	Organic Carbon-Total (TOC)	SM 5310 B-2000
102.261	001	Dissolved Organic Carbon (DOC)	SM 5310 B-2000
102.270	001	Surfactants	SM 5540 C-2000
102.280	001	UV254	SM 5910 B-2011
102.570	001	Cyanide, Free	OIA-1677, DW

Field of Accreditation:103 - Toxic Chemical Elements of Drinking Water

103.030	001	Mercury	SM 3112 B
103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	015	Silver	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.130	018	Boron	EPA 200.7
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	011	Mercury	EPA 200.8

103.140	012	Nickel	EPA 200.8	
103.140	013	Selenium	EPA 200.8	
103.140	014	Silver	EPA 200.8	
103.140	015	Thallium	EPA 200.8	
103.140	016	Zinc	EPA 200.8	
103.140	018	Vanadium	EPA 200.8	
103.310	001	Chromium VI (Hexavalent Chromium)	EPA 218.6	
103.311	001	Chromium VI (Hexavalent Chromium)	EPA 218.7	

Field of Accreditation:104 - Volatile Organic Chemistry of Drinking Water

104.030	001	1,2-Dibromoethane (EDB)	EPA 504.1	I
104.030	002	1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	I
104.035	001	1,2,3-Trichloropropane (TCP)	SRL 524M-TCP	I
104.200	001	1,1,1,2-Tetrachloroethane	EPA 524.2	
104.200	002	1,1,1-Trichloroethane	EPA 524.2	
104.200	003	1,1,2,2-Tetrachloroethane	EPA 524.2	
104.200	004	1,1,2-Trichloroethane	EPA 524.2	
104.200	005	1,1-Dichloroethane	EPA 524.2	
104.200	006	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 524.2	
104.200	007	1,2,3-Trichlorobenzene	EPA 524.2	
104.200	008	1,2,4-Trichlorobenzene	EPA 524.2	
104.200	009	1,2,4-Trimethylbenzene	EPA 524.2	
104.200	010	1,2-Dichlorobenzene	EPA 524.2	
104.200	011	1,2-Dichloroethane (Ethylene Dichloride)	EPA 524.2	
104.200	012	1,2-Dichloropropane	EPA 524.2	
104.200	013	1,3,5-Trimethylbenzene	EPA 524.2	
104.200	014	1,3-Dichlorobenzene	EPA 524.2	
104.200	015	1,4-Dichlorobenzene	EPA 524.2	
104.200	016	2-Chlorotoluene	EPA 524.2	
104.200	017	4-Chlorotoluene	EPA 524.2	
104.200	018	Benzene	EPA 524.2	
104.200	019	Carbon Disulfide	EPA 524.2	
104.200	020	Carbon Tetrachloride	EPA 524.2	
104.200	021	Chlorobenzene	EPA 524.2	
104.200	022	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene)	EPA 524.2	
104.200	023	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 524.2	
104.200	024	Dichlorodifluoromethane	EPA 524.2	
104.200	025	Dichloromethane (Methylene Chloride)	EPA 524.2	
104.200	027	Ethyl tert-butyl Ether (ETBE)	EPA 524.2	
104.200	028	Ethylbenzene	EPA 524.2	
104.200	029	Isopropylbenzene	EPA 524.2	
104.200	030	Methyl isobutyl ketone (MIBK, 4-Methyl-2-pentanone)	EPA 524.2	
104.200	031	Methyl tert-butyl Ether (MTBE)	EPA 524.2	

104.200	032	Naphthalene	EPA 524.2
104.200	033	n-Butylbenzene	EPA 524.2
104.200	034	N-propylbenzene	EPA 524.2
104.200	035	sec-Butylbenzene	EPA 524.2
104.200	036	Styrene	EPA 524.2
104.200	037	t-Butyl alcohol (2-Methyl-2-propanol)	EPA 524.2
104.200	038	tert-Amyl Methyl Ether (TAME)	EPA 524.2
104.200	039	tert-Butylbenzene	EPA 524.2
104.200	040	Tetrachloroethylene (Tetrachloroethene)	EPA 524.2
104.200	041	Toluene	EPA 524.2
104.200	042	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene)	EPA 524.2
104.200	043	trans-1,3-Dichloropropylene (trans-1,3 Dichloropropene)	EPA 524.2
104.200	044	Trichloroethylene (Trichloroethene)	EPA 524.2
104.200	045	Trichlorofluoromethane	EPA 524.2
104.200	046	Trichlorotrifluoroethane	EPA 524.2
104.200	047	Vinyl Chloride	EPA 524.2
104.200	101	m-Xylene	EPA 524.2
104.200	102	m+p-Xylene	EPA 524.2
104.200	103	o-Xylene	EPA 524.2
104.200	104	p-Xylene	EPA 524.2
104.200	201	Bromodichloromethane	EPA 524.2
104.200	202	Bromoform	EPA 524.2
104.200	203	Chloroform	EPA 524.2
104.200	204	Dibromochloromethane (Chlorodibromomethane)	EPA 524.2

Field of Accreditation:105 - Semi-volatile Organic Chemistry of Drinking Water

105.010	004	Chlordane	EPA 505
105.010	006	Endrin	EPA 505
105.010	007	Heptachlor	EPA 505
105.010	008	Heptachlor Epoxide	EPA 505
105.010	009	Hexachlorobenzene	EPA 505
105.010	010	Hexachlorocyclopentadiene	EPA 505
105.010	011	Lindane (HCH-gamma)	EPA 505
105.010	012	Methoxychlor	EPA 505
105.010	014	Toxaphene	EPA 505
105.010	015	PCBs as Aroclors (screen)	EPA 505
105.082	001	2,4-D	EPA 515.3
105.082	002	Dinoseb	EPA 515.3
105.082	003	Pentachlorophenol	EPA 515.3
105.082	004	Picloram	EPA 515.3
105.082	005	2,4,5-TP (Silvex)	EPA 515.3
105.082	006	Bentazon	EPA 515.3
105.082	007	Dalapon	EPA 515.3

105.082	008	Dicamba	EPA 515.3	
105.090	001	Alachlor	EPA 525.2	
105.090	003	Atrazine	EPA 525.2	
105.090	004	Benzo(a)pyrene	EPA 525.2	
105.090	005	Butachlor	EPA 525.2	
105.090	008	Di(2-ethylhexyl) Adipate	EPA 525.2	
105.090	009	Di(2-ethylhexyl) Phthalate	EPA 525.2	
105.090	022	Molinate	EPA 525.2	
105.090	025	Simazine	EPA 525.2	
105.090	028	Thiobencarb	EPA 525.2	
105.101	001	Carbofuran (Furadan)	EPA 531.2	
105.101	002	Oxamyl	EPA 531.2	
105.101	003	Aldicarb (Temik)	EPA 531.2	
105.101	004	Aldicarb Sulfone	EPA 531.2	
105.101	005	Aldicarb Sulfoxide	EPA 531.2	
105.101	006	Carbaryl (Sevin)	EPA 531.2	
105.101	007	3-Hydroxycarbofuran	EPA 531.2	
105.101	008	Methomyl (Lannate)	EPA 531.2	
105.103	001	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	EPA 533	I
105.103	002	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	EPA 533	I
105.103	003	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	EPA 533	I
105.103	004	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	EPA 533	I
105.103	005	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	EPA 533	I
105.103	006	Perfluorobutanoic Acid (PFBA)	EPA 533	I
105.103	007	Perfluorobutane Sulfonic Acid (PFBS)	EPA 533	I
105.103	008	1H,1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2FTS)	EPA 533	I
105.103	009	Perfluorodecanoic Acid (PFDA)	EPA 533	I
105.103	010	Perfluorododecanoic Acid (PFDoA)	EPA 533	I
105.103	011	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	EPA 533	I
105.103	012	Perfluoroheptane Sulfonic Acid (PFHpS)	EPA 533	I
105.103	013	Perfluoroheptanoic Acid (PFHpA)	EPA 533	I
105.103	014	1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2FTS)	EPA 533	I
105.103	015	Perfluorohexane Sulfonic Acid (PFHxS)	EPA 533	I
105.103	016	Perfluorohexanoic Acid (PFHxA)	EPA 533	I
105.103	017	Perfluoro-3-methoxypropanoic acid (PFMPA)	EPA 533	I
105.103	018	Perfluoro-4-methoxybutanoic acid (PFMBA)	EPA 533	I
105.103	019	Perfluorononanoic Acid (PFNA)	EPA 533	I
105.103	020	1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2FTS)	EPA 533	I
105.103	021	Perfluorooctane Sulfonic Acid (PFOS)	EPA 533	I
105.103	022	Perfluorooctanoic Acid (PFOA)	EPA 533	I
105.103	023	Perfluoropentanoic Acid (PFPeA)	EPA 533	I
105.103	024	Perfluoropentane Sulfonic Acid (PFPeS)	EPA 533	I

105.103	025	Perfluoroundecanoic Acid (PFUnDA)	EPA 533
105.106	001	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	EPA 537.1
105.106	002	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	EPA 537.1
105.106	003	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	EPA 537.1
105.106	004	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	EPA 537.1
105.106	005	N-Ethylperfluorooctane Sulfonamido Acetic Acid (NEtFOSAA)	EPA 537.1
105.106	006	N-Methylperfluorooctane Sulfonamido Acetic Acid (NMeFOSAA)	EPA 537.1
105.106	007	Perfluorobutane Sulfonic Acid (PFBS)	EPA 537.1
105.106	008	Perfluorodecanoic Acid (PFDA)	EPA 537.1
105.106	009	Perfluorododecanoic Acid (PFDoA)	EPA 537.1
105.106	010	Perfluoroheptanoic Acid (PFHpA)	EPA 537.1
105.106	011	Perfluorohexane Sulfonic Acid (PFHxS)	EPA 537.1
105.106	012	Perfluorohexanoic Acid (PFHxA)	EPA 537.1
105.106	013	Perfluorononanoic Acid (PFNA)	EPA 537.1
105.106	014	Perfluorooctanoic Acid (PFOA)	EPA 537.1
105.106	015	Perfluorooctane Sulfonic Acid (PFOS)	EPA 537.1
105.106	016	Perfluorotetradecanoic Acid (PFTeDA)	EPA 537.1
105.106	017	Perfluorotridecanoic Acid (PFTrDA)	EPA 537.1
105.106	018	Perfluoroundecanoic Acid (PFUnDA)	EPA 537.1
105.120	001	Glyphosate	EPA 547
105.140	001	Endothall	EPA 548.1
105.190	001	Bromoacetic Acid	SM 6251 B
105.190	003	Chloroacetic Acid	SM 6251 B
105.190	005	Dibromoacetic Acid	SM 6251 B
105.190	006	Dichloroacetic Acid	SM 6251 B
105.190	007	Trichloroacetic Acid	SM 6251 B
105.201	003	Bromoacetic Acid	EPA 552.3
105.201	004	Chloroacetic Acid	EPA 552.3
105.201	005	Dibromoacetic Acid	EPA 552.3
105.201	006	Dichloroacetic Acid	EPA 552.3
105.201	007	Trichloroacetic Acid	EPA 552.3

Field of Accreditation:106 - Radionuclides in Drinking Water

106.092	001	Uranium	EPA 200.8

Field of Accreditation:107 - Microbiological Methods for Non-Potable Water and Sewage Sludge

107.001	001	Total Coliform (Enumeration)	SM 9221 B,C-2006
107.001	002	Fecal Coliform (Enumeration)	SM 9221 C,E-2006
107.001	003	E. coli (Enumeration)	SM 9221 C,F-2006
107.007	001	Enterococci	SM 9230 B-2007
107.007	002	Fecal Streptococci	SM 9230 B-2007
107.011	001	Enterococci	SM 9230 D-2007
107.015	001	E. coli (Enumeration)	SM 9223 B-2004 Colilert 18
107.017	001	Enterococci	Enterolert

Field of Accreditation:108 - Inorganic Constituents in Non-Potable Water

108.007	001	Residue, Volatile	EPA 160.4	
108.013	001	Calcium	EPA 200.7	
108.013	002	Magnesium	EPA 200.7	
108.013	004	Potassium	EPA 200.7	
108.013	005	Silica, Dissolved	EPA 200.7	
108.013	006	Sodium	EPA 200.7	
108.017	001	Bromide	EPA 300.0	
108.017	002	Chloride	EPA 300.0	
108.017	003	Fluoride	EPA 300.0	
108.017	004	Nitrate (as N)	EPA 300.0	
108.017	005	Nitrate-Nitrite (as N)	EPA 300.0	
108.017	006	Nitrite (as N)	EPA 300.0	
108.017	007	Phosphate,Ortho (as P)	EPA 300.0	
108.017	008	Sulfate (as SO4)	EPA 300.0	
108.019	001	Bromide	EPA 300.1	
108.029	001	Kjeldahl Nitrogen,Total (as N)	EPA 351.2	
108.033	001	Nitrate-Nitrite (as N)	EPA 353.2	I
108.033	002	Nitrite (as N)	EPA 353.2	I
108.049	001	Phenols, Total	EPA 420.4	
108.053	002	Oil & Grease, Total Recoverable	EPA 1664 B	
108.055	001	Color	SM 2120 B-2011	
108.059	001	Turbidity	SM 2130 B-2011	
108.063	001	Alkalinity	SM 2320 B-2011	
108.065	001	Hardness (Calculation)	SM 2340 B-2011	
108.069	001	Specific Conductance	SM 2510 B-2011	
108.071	001	Residue, Total	SM 2540 B-2011	
108.073	001	Residue, Filterable TDS	SM 2540 C-2011	
108.075	001	Residue, Non-filterable TSS	SM 2540 D-2011	
108.077	001	Residue, Volatile	SM 2540 E-2011	
108.079	001	Residue, Settleable	SM 2540 F-2011	
108.114	001	Chlorine, Total Residual	SM 4500-Cl G-2011	
108.114	002	Chlorine, Free	SM 4500-Cl G-2011	
108.125	001	Cyanide, Total	SM 4500-CN E-2011	
108.129	001	Cyanide, Available	SM 4500-CN G-2011	
108.131	001	Fluoride	SM 4500-F C-2011	
108.137	001	Hydrogen Ion (pH)	SM 4500-H+ B-2011	
108.147	001	Ammonia (as N)	SM 4500-NH3 G-2011	
108.153	001	Nitrite (as N)	SM 4500-NO2 B-2011	
108.165	001	Oxygen, Dissolved	SM 4500-O C-2011	I
108.173	001	Oxygen, Dissolved	SM 4500-O G-2011	
108.175	001	Phosphate,Ortho (as P)	SM 4500-P E-2011	

108.175	002	Phosphorus,Total	SM 4500-P E-2011	
108.177	001	Phosphate,Ortho (as P)	SM 4500-P F-2011	I
108.177	002	Phosphorus,Total	SM 4500-P F-2011	I
108.201	001	Sulfide (as S)	SM 4500-S D-2011	
108.207	001	Biochemical Oxygen Demand	SM 5210 B-2011	
108.207	002	Carbonaceous BOD	SM 5210 B-2011	
108.213	001	Chemical Oxygen Demand	SM 5220 D-2011	
108.215	001	Organic Carbon-Total (TOC)	SM 5310 B-2011	
108.225	001	Surfactants	SM 5540 C-2011	
108.321	001	Cyanide, Total	ASTM D7511-12	
108.339	001	Cyanide, Available	OIA-1677-09	
108.339	002	Cyanide, Free	OIA-1677-09	

Field of Accreditation:109 - Metals and Trace Elements in Non-Potable Water

109.623	001	Aluminum	EPA 200.7
109.623	002	Antimony	EPA 200.7
109.623	003	Arsenic	EPA 200.7
109.623	004	Barium	EPA 200.7
109.623	006	Boron	EPA 200.7
109.623	007	Cadmium	EPA 200.7
109.623	008	Chromium	EPA 200.7
109.623	009	Cobalt	EPA 200.7
109.623	010	Copper	EPA 200.7
109.623	011	Iron	EPA 200.7
109.623	012	Lead	EPA 200.7
109.623	013	Manganese	EPA 200.7
109.623	014	Molybdenum	EPA 200.7
109.623	015	Nickel	EPA 200.7
109.623	016	Selenium	EPA 200.7
109.623	017	Silver	EPA 200.7
109.623	018	Thallium	EPA 200.7
109.623	019	Tin	EPA 200.7
109.623	020	Titanium	EPA 200.7
109.623	021	Vanadium	EPA 200.7
109.623	022	Zinc	EPA 200.7
109.625	001	Aluminum	EPA 200.8
109.625	002	Antimony	EPA 200.8
109.625	003	Arsenic	EPA 200.8
109.625	004	Barium	EPA 200.8
109.625	005	Beryllium	EPA 200.8
109.625	007	Cadmium	EPA 200.8
109.625	008	Chromium	EPA 200.8
109.625	009	Cobalt	EPA 200.8

109.625	010	Copper	EPA 200.8
109.625	013	Lead	EPA 200.8
109.625	014	Manganese	EPA 200.8
109.625	015	Molybdenum	EPA 200.8
109.625	016	Nickel	EPA 200.8
109.625	017	Selenium	EPA 200.8
109.625	018	Silver	EPA 200.8
109.625	019	Thallium	EPA 200.8
109.625	020	Tin	EPA 200.8
109.625	022	Vanadium	EPA 200.8
109.625	023	Zinc	EPA 200.8
109.629	001	Chromium VI (Hexavalent Chromium)	EPA 218.6
109.667	001	Mercury	SM 3112 B-2011

Field of Accreditation:110 - Volatile Organic Constituents in Non-Potable Water

110.040	001	Acetone	EPA 624.1
110.040	002	Acetonitrile	EPA 624.1
110.040	003	Acrolein	EPA 624.1
110.040	004	Acrylonitrile	EPA 624.1
110.040	005	Benzene	EPA 624.1
110.040	006	Bromodichloromethane	EPA 624.1
110.040	007	Bromoform	EPA 624.1
110.040	008	Bromomethane (Methyl Bromide)	EPA 624.1
110.040	009	t-Butyl alcohol (2-Methyl-2-propanol)	EPA 624.1
110.040	010	Carbon Tetrachloride	EPA 624.1
110.040	011	Chlorobenzene	EPA 624.1
110.040	012	Chloroethane	EPA 624.1
110.040	013	2-Chloroethyl vinyl Ether	EPA 624.1
110.040	014	Chloroform	EPA 624.1
110.040	015	Chloromethane (Methyl Chloride)	EPA 624.1
110.040	016	Dibromochloromethane (Chlorodibromomethane)	EPA 624.1
110.040	017	1,2-Dichlorobenzene	EPA 624.1
110.040	018	1,3-Dichlorobenzene	EPA 624.1
110.040	019	1,4-Dichlorobenzene	EPA 624.1
110.040	020	1,1-Dichloroethane	EPA 624.1
110.040	021	1,2-Dichloroethane (Ethylene Dichloride)	EPA 624.1
110.040	022	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 624.1
110.040	023	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene)	EPA 624.1
110.040	024	1,2-Dichloropropane	EPA 624.1
110.040	025	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 624.1
110.040	026	trans-1,3-Dichloropropylene (trans-1,3 Dichloropropene)	EPA 624.1
110.040	028	Ethyl Acetate	EPA 624.1
110.040	029	Ethylbenzene	EPA 624.1

110.040	031	Methylene Chloride (Dichloromethane)	EPA 624.1
110.040	032	4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	EPA 624.1
110.040	034	1,1,2,2-Tetrachloroethane	EPA 624.1
110.040	035	Tetrachloroethylene (Tetrachloroethene)	EPA 624.1
110.040	036	Tetrahydrofuran	EPA 624.1
110.040	037	Toluene	EPA 624.1
110.040	038	1,1,1-Trichloroethane	EPA 624.1
110.040	039	1,1,2-Trichloroethane	EPA 624.1
110.040	040	Trichloroethylene (Trichloroethene)	EPA 624.1
110.040	041	Vinyl Chloride	EPA 624.1
110.040	042	m-Xylene	EPA 624.1
110.040	043	o-Xylene	EPA 624.1
110.040	044	p-Xylene	EPA 624.1
110.040	045	Trichlorofluoromethane	EPA 624.1
110.040	046	m+p-Xylene	EPA 624.1

Field of Accreditation:111 - Semi-volatile Organic Constituents in Non-Potable Water

111.055	001	Aldrin	EPA 608.3
111.055	002	alpha-BHC	EPA 608.3
111.055	003	beta-BHC	EPA 608.3
111.055	004	delta-BHC	EPA 608.3
111.055	005	gamma-BHC (Lindane)	EPA 608.3
111.055	006	Chlordane	EPA 608.3
111.055	007	4,4'-DDD	EPA 608.3
111.055	008	4,4'-DDE	EPA 608.3
111.055	009	4,4'-DDT	EPA 608.3
111.055	010	Dieldrin	EPA 608.3
111.055	011	Endosulfan I	EPA 608.3
111.055	012	Endosulfan II	EPA 608.3
111.055	013	Endosulfan Sulfate	EPA 608.3
111.055	014	Endrin	EPA 608.3
111.055	015	Endrin Aldehyde	EPA 608.3
111.055	016	Heptachlor	EPA 608.3
111.055	017	Heptachlor Epoxide	EPA 608.3
111.055	019	PCB-1016 (Aroclor-1016)	EPA 608.3
111.055	020	PCB-1221 (Aroclor-1221)	EPA 608.3
111.055	021	PCB-1232 (Aroclor-1232)	EPA 608.3
111.055	022	PCB-1242 (Aroclor-1242)	EPA 608.3
111.055	023	PCB-1248 (Aroclor-1248)	EPA 608.3
111.055	024	PCB-1254 (Aroclor-1254)	EPA 608.3
111.055	025	PCB-1260 (Aroclor-1260)	EPA 608.3
111.055	046	Methoxychlor	EPA 608.3
111.055	060	Toxaphene	EPA 608.3

111.160	001	Acenaphthene	EPA 625.1	
111.160	002	Acenaphthylene	EPA 625.1	I
111.160	003	Anthracene	EPA 625.1	
111.160	004	Benzidine	EPA 625.1	
111.160	005	Benzo(a)anthracene	EPA 625.1	
111.160	006	Benzo(a)pyrene	EPA 625.1	
111.160	007	Benzo(b)fluoranthene	EPA 625.1	
111.160	008	Benzo(g,h,i)perylene	EPA 625.1	
111.160	009	Benzo(k)fluoranthene	EPA 625.1	
111.160	010	Bis(2-chloroethoxy) Methane	EPA 625.1	
111.160	011	Bis(2-chloroethyl) Ether	EPA 625.1	
111.160	012	bis(2-Chloroisopropyl) ether (2,2’-Oxybis[1-chloropropane])	EPA 625.1	
111.160	013	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl) phthalate)	EPA 625.1	
111.160	014	4-Bromophenyl Phenyl Ether	EPA 625.1	
111.160	015	Butyl Benzyl Phthalate	EPA 625.1	
111.160	016	2-Chloronaphthalene	EPA 625.1	
111.160	017	4-Chlorophenyl Phenyl Ether	EPA 625.1	
111.160	018	Chrysene	EPA 625.1	
111.160	019	Dibenz(a,h)anthracene	EPA 625.1	
111.160	020	3,3'-Dichlorobenzidine	EPA 625.1	
111.160	021	Diethyl Phthalate	EPA 625.1	
111.160	022	Dimethyl Phthalate	EPA 625.1	
111.160	023	Di-n-butyl Phthalate	EPA 625.1	
111.160	024	2,4-Dinitrotoluene	EPA 625.1	
111.160	025	2,6-Dinitrotoluene	EPA 625.1	
111.160	026	Di-n-octyl Phthalate	EPA 625.1	
111.160	027	Fluoranthene	EPA 625.1	
111.160	028	Fluorene	EPA 625.1	
111.160	029	Hexachlorobenzene	EPA 625.1	
111.160	030	Hexachlorobutadiene	EPA 625.1	
111.160	031	Hexachloroethane	EPA 625.1	
111.160	032	Indeno(1,2,3-c,d)pyrene	EPA 625.1	
111.160	033	Isophorone	EPA 625.1	
111.160	034	Naphthalene	EPA 625.1	
111.160	035	Nitrobenzene	EPA 625.1	
111.160	036	N-nitroso-di-n-propylamine	EPA 625.1	
111.160	037	Phenanthrene	EPA 625.1	
111.160	038	Pyrene	EPA 625.1	
111.160	039	1,2,4-Trichlorobenzene	EPA 625.1	
111.160	040	4-Chloro-3-methylphenol	EPA 625.1	
111.160	041	2-Chlorophenol	EPA 625.1	
111.160	042	2,4-Dichlorophenol	EPA 625.1	

111.160	043	2,4-Dimethylphenol	EPA 625.1
111.160	044	2,4-Dinitrophenol	EPA 625.1
111.160	045	2-Methyl-4,6-dinitrophenol	EPA 625.1
111.160	046	2-Nitrophenol	EPA 625.1
111.160	047	4-Nitrophenol	EPA 625.1
111.160	048	Pentachlorophenol	EPA 625.1
111.160	049	Phenol	EPA 625.1
111.160	050	2,4,6-Trichlorophenol	EPA 625.1
111.160	052	Aldrin	EPA 625.1
111.160	058	alpha-BHC	EPA 625.1
111.160	059	beta-BHC	EPA 625.1
111.160	060	delta-BHC	EPA 625.1
111.160	061	gamma-BHC (Lindane)	EPA 625.1
111.160	076	4,4'-DDD	EPA 625.1
111.160	077	4,4'-DDE	EPA 625.1
111.160	078	4,4'-DDT	EPA 625.1
111.160	083	Dieldrin	EPA 625.1
111.160	086	Endosulfan I	EPA 625.1
111.160	087	Endosulfan II	EPA 625.1
111.160	088	Endosulfan Sulfate	EPA 625.1
111.160	089	Endrin	EPA 625.1
111.160	096	Heptachlor	EPA 625.1
111.160	097	Heptachlor Epoxide	EPA 625.1
111.160	098	Hexachlorocyclopentadiene	EPA 625.1
111.160	108	N-nitrosodimethylamine	EPA 625.1
111.160	110	N-nitrosodiphenylamine	EPA 625.1
111.345	001	N-Ethylperfluorooctane Sulfonamido Acetic Acid (NEtFOSAA)	DoD QSM Version 5.1 (or newer)
111.345	002	4:2 Fluorotelomer Sulfonic Acid (4:2 FTS)	DoD QSM Version 5.1 (or newer)
111.345	003	6:2 Fluorotelomer Sulfonic Acid (6:2 FTS)	DoD QSM Version 5.1 (or newer)
111.345	004	8:2 Fluorotelomer Sulfonic Acid (8:2 FTS)	DoD QSM Version 5.1 (or newer)
111.345	005	N-Methylperfluorooctane Sulfonamido Acetic Acid (NMeFOSAA)	DoD QSM Version 5.1 (or newer)
111.345	006	Perfluorobutanoic Acid (PFBA)	DoD QSM Version 5.1 (or newer)
111.345	007	Perfluorobutane Sulfonic Acid (PFBS)	DoD QSM Version 5.1 (or newer)
111.345	008	Perfluorodecanoic Acid (PFDA)	DoD QSM Version 5.1 (or newer)
111.345	009	Perfluorododecanoic Acid (PFDoA)	DoD QSM Version 5.1 (or newer)
111.345	010	Perfluorodecane Sulfonic Acid (PFDS)	DoD QSM Version 5.1 (or newer)
111.345	011	Perfluoroheptanoic Acid (PFHpA)	DoD QSM Version 5.1 (or newer)
111.345	012	Perfluoroheptane Sulfonic Acid (PFHpS)	DoD QSM Version 5.1 (or newer)
111.345	013	Perfluorohexane Sulfonic Acid (PFHxS)	DoD QSM Version 5.1 (or newer)
111.345	014	Perfluorohexanoic Acid (PFHxA)	DoD QSM Version 5.1 (or newer)
111.345	015	Perfluorononanoic Acid (PFNA)	DoD QSM Version 5.1 (or newer)
111.345	016	Perfluorooctanoic Acid (PFOA)	DoD QSM Version 5.1 (or newer)

111.345	017	Perfluorooctane Sulfonic Acid (PFOS)	DoD QSM Version 5.1 (or newer)
111.345	018	Perfluorooctane Sulfonamide (PFOSAm)	DoD QSM Version 5.1 (or newer)
111.345	019	Perfluoropentanoic Acid (PFPeA)	DoD QSM Version 5.1 (or newer)
111.345	020	Perfluoropentane Sulfonic Acid (PFPeS)	DoD QSM Version 5.1 (or newer)
111.345	021	Perfluorotetradecanoic Acid (PFTeDA)	DoD QSM Version 5.1 (or newer)
111.345	022	Perfluorotridecanoic Acid (PFTrDA)	DoD QSM Version 5.1 (or newer)
111.345	023	Perfluoroundecanoic Acid (PFUnDA)	DoD QSM Version 5.1 (or newer)
111.345	024	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	DoD QSM Version 5.1 (or newer)
111.345	025	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	DoD QSM Version 5.1 (or newer)
111.345	026	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	DoD QSM Version 5.1 (or newer)
111.345	027	N-Ethylperfluorooctane Sulfonamide (EtFOSAm)	DoD QSM Version 5.1 (or newer)
111.345	028	N-Ethylperfluorooctane Sulfonamido Ethanol (EtFOSE)	DoD QSM Version 5.1 (or newer)
111.345	029	10:2 Fluorotelomer Sulfonic Acid (10:2 FTS)	DoD QSM Version 5.1 (or newer)
111.345	030	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	DoD QSM Version 5.1 (or newer)
111.345	031	N-Methylperfluorooctane Sulfonamide (NMeFOSA)	DoD QSM Version 5.1 (or newer)
111.345	032	N-Methylperfluorooctane Sulfonamido Ethanol (NMeFOSE)	DoD QSM Version 5.1 (or newer)
111.345	033	Perfluorohexadecanoic Acid (PFHxDA)	DoD QSM Version 5.1 (or newer)
111.345	034	Perfluorononane Sulfonic Acid (PFNS)	DoD QSM Version 5.1 (or newer)
111.345	035	Perfluorooctadecanoic Acid (PFODA)	DoD QSM Version 5.1 (or newer)
111.345	036	2H,2H,3H,3H-Perfluorodecanoic Acid (7:3 FTCA)	DoD QSM Version 5.1 (or newer)
111.345	037	2H,2H,3H,3H-Perfluorohexaanoic Acid (3:3 FTCA)	DoD QSM Version 5.1 (or newer)
111.345	038	2H,2H,3H,3H-Perfluorooctanoic Acid (5:3 FTCA)	DoD QSM Version 5.1 (or newer)
111.345	039	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	DoD QSM Version 5.1 (or newer)
111.345	040	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	DoD QSM Version 5.1 (or newer)
111.345	041	Perfluoro-3-methoxypropanoic acid (PFMPA)	DoD QSM Version 5.1 (or newer)
111.345	042	Perfluoro-4-methoxybutanoic acid (PFMBA)	DoD QSM Version 5.1 (or newer)

Field of Accreditation:114 - Inorganic Constituents in Hazardous Waste

114.315	002	Antimony	EPA 6010 B
114.315	003	Arsenic	EPA 6010 B
114.315	004	Barium	EPA 6010 B
114.315	005	Beryllium	EPA 6010 B
114.315	007	Cadmium	EPA 6010 B
114.315	008	Calcium	EPA 6010 B
114.315	009	Chromium	EPA 6010 B
114.315	010	Cobalt	EPA 6010 B
114.315	011	Copper	EPA 6010 B
114.315	013	Lead	EPA 6010 B
114.315	014	Magnesium	EPA 6010 B
114.315	016	Molybdenum	EPA 6010 B
114.315	017	Nickel	EPA 6010 B
114.315	020	Silver	EPA 6010 B
114.315	023	Thallium	EPA 6010 B

114.315	026	Vanadium	EPA 6010 B
114.315	027	Zinc	EPA 6010 B
114.335	002	Antimony	EPA 6020
114.335	003	Arsenic	EPA 6020
114.335	004	Barium	EPA 6020
114.335	005	Beryllium	EPA 6020
114.335	006	Cadmium	EPA 6020
114.335	007	Chromium	EPA 6020
114.335	008	Cobalt	EPA 6020
114.335	009	Copper	EPA 6020
114.335	010	Lead	EPA 6020
114.335	012	Nickel	EPA 6020
114.335	014	Thallium	EPA 6020
114.335	015	Zinc	EPA 6020
114.335	016	Molybdenum	EPA 6020
114.335	018	Vanadium	EPA 6020
114.535	001	Mercury	EPA 7471 A
114.705	001	Cyanide, Total	EPA 9012 A
114.745	001	Fluoride	EPA 9056

Field of Accreditation:115 - Leaching/Extraction Tests and Physical Characteristics of Hazardous Waste

115.055	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.085	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
115.095	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312
115.135	001	Corrosivity - pH Determination	EPA 9045 C

Field of Accreditation:116 - Volatile Organic Compounds in Hazardous Waste

116.220	001	Gasoline Range Organics (GRO)	EPA 8015 B
116.265	001	Benzene	EPA 8260 B
116.265	002	Bromobenzene	EPA 8260 B
116.265	003	Bromochloromethane	EPA 8260 B
116.265	004	Bromodichloromethane	EPA 8260 B
116.265	005	Bromoform	EPA 8260 B
116.265	006	Bromomethane (Methyl Bromide)	EPA 8260 B
116.265	007	n-Butylbenzene	EPA 8260 B
116.265	008	sec-Butylbenzene	EPA 8260 B
116.265	009	tert-Butylbenzene	EPA 8260 B
116.265	010	Carbon Disulfide	EPA 8260 B
116.265	011	Carbon Tetrachloride	EPA 8260 B
116.265	012	Chlorobenzene	EPA 8260 B
116.265	013	Chlorodibromomethane (Dibromochloromethane)	EPA 8260 B
116.265	014	Chloroethane	EPA 8260 B
116.265	015	Chloroform	EPA 8260 B
116.265	016	Chloromethane (Methyl Chloride)	EPA 8260 B

116.265	017	Dibromomethane	EPA 8260 B
116.265	018	Dichlorodifluoromethane (Freon 12)	EPA 8260 B
116.265	019	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene)	EPA 8260 B
116.265	020	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene)	EPA 8260 B
116.265	021	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 8260 B
116.265	022	trans-1,3-Dichloropropylene (trans-1,3 Dichloropropene)	EPA 8260 B
116.265	023	Ethylbenzene	EPA 8260 B
116.265	024	Hexachlorobutadiene	EPA 8260 B
116.265	025	Methyl tert-butyl Ether (MTBE)	EPA 8260 B
116.265	026	Methylene Chloride (Dichloromethane)	EPA 8260 B
116.265	027	Naphthalene	EPA 8260 B
116.265	028	Nitrobenzene	EPA 8260 B
116.265	029	N-propylbenzene	EPA 8260 B
116.265	030	Styrene	EPA 8260 B
116.265	031	Tetrachloroethylene (Tetrachloroethene)	EPA 8260 B
116.265	032	Toluene	EPA 8260 B
116.265	033	Trichloroethylene (Trichloroethene)	EPA 8260 B
116.265	034	Trichlorofluoromethane	EPA 8260 B
116.265	035	Vinyl Chloride	EPA 8260 B
116.265	036	m+p-Xylene	EPA 8260 B
116.265	037	o-Xylene	EPA 8260 B
116.265	038	m-Xylene	EPA 8260 B
116.265	039	p-Xylene	EPA 8260 B
116.265	040	1,1-Dichloroethane	EPA 8260 B
116.265	041	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 8260 B
116.265	042	1,1,1-Trichloroethane	EPA 8260 B
116.265	043	1,1,1,2-Tetrachloroethane	EPA 8260 B
116.265	044	1,1,2,2-Tetrachloroethane	EPA 8260 B
116.265	045	1,1,2-Trichloroethane	EPA 8260 B
116.265	046	1,2-Dichlorobenzene	EPA 8260 B
116.265	047	1,2-Dichloroethane (Ethylene Dichloride)	EPA 8260 B
116.265	048	1,2-Dibromoethane (EDB)	EPA 8260 B
116.265	049	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260 B
116.265	050	1,2-Dichloropropane	EPA 8260 B
116.265	051	1,2,3-Trichloropropane (TCP)	EPA 8260 B
116.265	052	1,2,4-Trichlorobenzene	EPA 8260 B
116.265	053	1,3-Dichlorobenzene	EPA 8260 B
116.265	054	1,4-Dichlorobenzene	EPA 8260 B
116.265	055	2-Chloroethyl vinyl Ether	EPA 8260 B
116.265	056	4-Chlorotoluene	EPA 8260 B
116.265	057	4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	EPA 8260 B
116.265	058	t-Butyl alcohol (2-Methyl-2-propanol)	EPA 8260 B

116.265	059	Diisopropyl ether (DIPE)	EPA 8260 B
116.265	061	Ethyl tert-butyl Ether (ETBE)	EPA 8260 B
116.265	062	tert-Amyl Methyl Ether (TAME)	EPA 8260 B

Field of Accreditation:117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.235	002	Diesel Range Organics (DRO)	EPA 8015 B
117.235	004	Oil Range Organics (ORO) [LUFT Range]	EPA 8015 B
117.315	001	Aldrin	EPA 8081 A
117.315	002	alpha-BHC	EPA 8081 A
117.315	003	beta-BHC	EPA 8081 A
117.315	004	delta-BHC	EPA 8081 A
117.315	005	gamma-BHC (Lindane)	EPA 8081 A
117.315	006	Chlordane (total)	EPA 8081 A
117.315	008	4,4'-DDD	EPA 8081 A
117.315	009	4,4'-DDE	EPA 8081 A
117.315	010	4,4'-DDT	EPA 8081 A
117.315	011	Dieldrin	EPA 8081 A
117.315	012	Endosulfan I	EPA 8081 A
117.315	013	Endosulfan II	EPA 8081 A
117.315	014	Endosulfan Sulfate	EPA 8081 A
117.315	015	Endrin	EPA 8081 A
117.315	016	Endrin Aldehyde	EPA 8081 A
117.315	018	Heptachlor	EPA 8081 A
117.315	019	Heptachlor Epoxide	EPA 8081 A
117.315	020	Methoxychlor	EPA 8081 A
117.315	021	Toxaphene	EPA 8081 A
117.335	001	Aroclor 1016	EPA 8082
117.335	002	Aroclor 1221	EPA 8082
117.335	003	Aroclor 1232	EPA 8082
117.335	004	Aroclor 1242	EPA 8082
117.335	005	Aroclor 1248	EPA 8082
117.335	006	Aroclor 1254	EPA 8082
117.335	007	Aroclor 1260	EPA 8082
117.425	001	2,4-D	EPA 8151 A
117.425	002	2,4-DB	EPA 8151 A
117.425	003	2,4,5-TP (Silvex)	EPA 8151 A
117.425	004	2,4,5-T	EPA 8151 A
117.425	005	Dalapon	EPA 8151 A
117.425	006	Dicamba	EPA 8151 A
117.425	007	Dichloroprop	EPA 8151 A
117.425	008	Dinoseb	EPA 8151 A
117.425	012	Pentachlorophenol	EPA 8151 A
117.435	001	Acenaphthene	EPA 8270 C

117.435	002	Acenaphthylene	EPA 8270 C
117.435	003	Aniline	EPA 8270 C
117.435	004	Anthracene	EPA 8270 C
117.435	005	Benzidine	EPA 8270 C
117.435	006	Benzoic Acid	EPA 8270 C
117.435	007	Benzo(a)anthracene	EPA 8270 C
117.435	008	Benzo(b)fluoranthene	EPA 8270 C
117.435	009	Benzo(k)fluoranthene	EPA 8270 C
117.435	010	Benzo(g,h,i)perylene	EPA 8270 C
117.435	011	Benzo(a)pyrene	EPA 8270 C
117.435	012	Benzyl Alcohol	EPA 8270 C
117.435	013	Bis(2-chloroethoxy) Methane	EPA 8270 C
117.435	014	Bis(2-chloroethyl) Ether	EPA 8270 C
117.435	015	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl) phthalate)	EPA 8270 C
117.435	016	Butyl Benzyl Phthalate	EPA 8270 C
117.435	017	Chrysene	EPA 8270 C
117.435	018	Dibenz(a,h)anthracene	EPA 8270 C
117.435	019	Dibenzofuran	EPA 8270 C
117.435	020	Di-n-butyl Phthalate	EPA 8270 C
117.435	021	Diethyl Phthalate	EPA 8270 C
117.435	022	Dimethyl Phthalate	EPA 8270 C
117.435	023	Di-n-octyl Phthalate	EPA 8270 C
117.435	024	Fluoranthene	EPA 8270 C
117.435	025	Fluorene	EPA 8270 C
117.435	026	Naphthalene	EPA 8270 C
117.435	027	Nitrobenzene	EPA 8270 C
117.435	028	Pentachlorobenzene	EPA 8270 C
117.435	029	Pentachlorophenol	EPA 8270 C
117.435	030	1-Chloronaphthalene	EPA 8270 C
117.435	031	1,2-Dichlorobenzene	EPA 8270 C
117.435	032	1,3-Dichlorobenzene	EPA 8270 C
117.435	033	1,4-Dichlorobenzene	EPA 8270 C
117.435	034	2-Chloronaphthalene	EPA 8270 C
117.435	035	2-Chlorophenol	EPA 8270 C
117.435	036	2,4-Dichlorophenol	EPA 8270 C
117.435	037	2,4-Dimethylphenol	EPA 8270 C
117.435	038	2,4-Dinitrophenol	EPA 8270 C
117.435	039	2,4-Dinitrotoluene	EPA 8270 C
117.435	040	2,6-Dichlorophenol	EPA 8270 C
117.435	041	2,6-Dinitrotoluene	EPA 8270 C
117.435	042	2-Nitroaniline	EPA 8270 C
117.435	043	2-Nitrophenol	EPA 8270 C

117.435	044	3-Nitroaniline	EPA 8270 C	
117.435	045	3,3'-Dichlorobenzidine	EPA 8270 C	
117.435	046	4-Chloroaniline	EPA 8270 C	
117.435	047	4-Chloro-3-methylphenol	EPA 8270 C	
117.435	048	4-Bromophenyl Phenyl Ether	EPA 8270 C	
117.435	049	4-Chlorophenyl Phenyl Ether	EPA 8270 C	
117.435	050	4-Nitroaniline	EPA 8270 C	
117.435	051	4-Nitrophenol	EPA 8270 C	
117.435	052	Aldrin	EPA 8270 C	
117.435	053	alpha-BHC	EPA 8270 C	
117.435	054	beta-BHC	EPA 8270 C	
117.435	055	delta-BHC	EPA 8270 C	
117.435	056	gamma-BHC (Lindane)	EPA 8270 C	
117.435	057	4,4'-DDD	EPA 8270 C	
117.435	058	4,4'-DDE	EPA 8270 C	
117.435	059	4,4'-DDT	EPA 8270 C	
117.435	060	Dieldrin	EPA 8270 C	
117.435	061	Dinoseb	EPA 8270 C	I
117.435	062	Endosulfan I	EPA 8270 C	
117.435	063	Endosulfan II	EPA 8270 C	
117.435	064	Endosulfan Sulfate	EPA 8270 C	
117.435	065	Endrin	EPA 8270 C	
117.435	068	Heptachlor	EPA 8270 C	
117.435	069	Heptachlor Epoxide	EPA 8270 C	
117.435	070	Methoxychlor	EPA 8270 C	
117.435	071	Demeton-O	EPA 8270 C	
117.435	072	Demeton-S	EPA 8270 C	
117.435	073	Dichlorvos (DDVP)	EPA 8270 C	
117.435	074	Disulfoton	EPA 8270 C	
117.435	075	Malathion	EPA 8270 C	
117.435	076	Parathion Ethyl	EPA 8270 C	
117.435	077	Parathion Methyl	EPA 8270 C	
117.435	078	Phorate	EPA 8270 C	
117.435	079	Terbufos	EPA 8270 C	
117.435	087	N-nitrosodiethylamine	EPA 8270 C	
117.435	088	N-nitrosodimethylamine	EPA 8270 C	
117.435	089	N-nitrosodiphenylamine	EPA 8270 C	
117.435	090	N-nitroso-di-n-propylamine	EPA 8270 C	
117.435	091	Indeno(1,2,3-c,d)pyrene	EPA 8270 C	
117.435	092	Isophorone	EPA 8270 C	
117.435	093	2-Methylnaphthalene	EPA 8270 C	
117.435	094	Phenanthrene	EPA 8270 C	

117.575	001	N-Ethylperfluorooctane Sulfonamide (EtFOSAm)	DoD QSM Version 5.1 (or newer)	I
117.575	002	N-Ethylperfluorooctane Sulfonamido Acetic Acid (NEtFOSAA)	DoD QSM Version 5.1 (or newer)	
117.575	003	N-Ethylperfluorooctane Sulfonamido Ethanol (EtFOSE)	DoD QSM Version 5.1 (or newer)	
117.575	004	4:2 Fluorotelomer Sulfonic Acid (4:2 FTS)	DoD QSM Version 5.1 (or newer)	
117.575	005	6:2 Fluorotelomer Sulfonic Acid (6:2 FTS)	DoD QSM Version 5.1 (or newer)	
117.575	006	8:2 Fluorotelomer Sulfonic Acid (8:2 FTS)	DoD QSM Version 5.1 (or newer)	
117.575	007	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	DoD QSM Version 5.1 (or newer)	
117.575	008	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	DoD QSM Version 5.1 (or newer)	
117.575	009	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	DoD QSM Version 5.1 (or newer)	
117.575	010	N-Methylperfluorooctane Sulfonamide (NMeFOSA)	DoD QSM Version 5.1 (or newer)	
117.575	011	N-Methylperfluorooctane Sulfonamido Acetic Acid (NMeFOSAA)	DoD QSM Version 5.1 (or newer)	
117.575	012	N-Methylperfluorooctane Sulfonamido Ethanol (NMeFOSE)	DoD QSM Version 5.1 (or newer)	
117.575	013	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	DoD QSM Version 5.1 (or newer)	
117.575	014	Perfluorobutanoic Acid (PFBA)	DoD QSM Version 5.1 (or newer)	
117.575	015	Perfluorobutane Sulfonic Acid (PFBS)	DoD QSM Version 5.1 (or newer)	
117.575	016	Perfluorodecanoic Acid (PFDA)	DoD QSM Version 5.1 (or newer)	
117.575	017	Perfluorododecanoic Acid (PFDoA)	DoD QSM Version 5.1 (or newer)	
117.575	018	Perfluorodecane Sulfonic Acid (PFDS)	DoD QSM Version 5.1 (or newer)	
117.575	019	Perfluoroheptanoic Acid (PFHpA)	DoD QSM Version 5.1 (or newer)	
117.575	020	Perfluoroheptane Sulfonic Acid (PFHpS)	DoD QSM Version 5.1 (or newer)	
117.575	021	Perfluorohexane Sulfonic Acid (PFHxS)	DoD QSM Version 5.1 (or newer)	
117.575	022	Perfluorohexanoic Acid (PFHxA)	DoD QSM Version 5.1 (or newer)	
117.575	023	Perfluorononanoic Acid (PFNA)	DoD QSM Version 5.1 (or newer)	
117.575	024	Perfluorooctanoic Acid (PFOA)	DoD QSM Version 5.1 (or newer)	
117.575	025	Perfluorooctane Sulfonic Acid (PFOS)	DoD QSM Version 5.1 (or newer)	
117.575	026	Perfluorooctane Sulfonamide (PFOSAm)	DoD QSM Version 5.1 (or newer)	
117.575	027	Perfluoropentanoic Acid (PFPeA)	DoD QSM Version 5.1 (or newer)	
117.575	028	Perfluoropentane Sulfonic Acid (PFPeS)	DoD QSM Version 5.1 (or newer)	
117.575	029	Perfluorotetradecanoic Acid (PFTeDA)	DoD QSM Version 5.1 (or newer)	
117.575	030	Perfluorotridecanoic Acid (PFTrDA)	DoD QSM Version 5.1 (or newer)	
117.575	031	Perfluoroundecanoic Acid (PFUnDA)	DoD QSM Version 5.1 (or newer)	
117.575	032	10:2 Fluorotelomer Sulfonic Acid (10:2 FTS)	DoD QSM Version 5.1 (or newer)	
117.575	033	Perfluorohexadecanoic Acid (PFHxDA)	DoD QSM Version 5.1 (or newer)	
117.575	034	Perfluorononane Sulfonic Acid (PFNS)	DoD QSM Version 5.1 (or newer)	
117.575	035	Perfluorooctadecanoic Acid (PFODA)	DoD QSM Version 5.1 (or newer)	
117.575	036	2H,2H,3H,3H-Perfluorodecanoic Acid (7:3 FTCA)	DoD QSM Version 5.1 (or newer)	
117.575	037	2H,2H,3H,3H-Perfluorohexaanoic Acid (3:3 FTCA)	DoD QSM Version 5.1 (or newer)	
117.575	038	2H,2H,3H,3H-Perfluorooctanoic Acid (5:3 FTCA)	DoD QSM Version 5.1 (or newer)	
117.575	039	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	DoD QSM Version 5.1 (or newer)	
117.575	040	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	DoD QSM Version 5.1 (or newer)	
117.575	041	Perfluoro-3-methoxypropanoic acid (PFMPA)	DoD QSM Version 5.1 (or newer)	
117.575	042	Perfluoro-4-methoxybutanoic acid (PFMBA)	DoD QSM Version 5.1 (or newer)	

Field of Accreditation:126 - Microbiological Methods for Ambient Water

126.003	001	Total Coliform (Enumeration)	SM 9221 B,C-2006
126.003	002	Fecal Coliform (Enumeration)	SM 9221 C,E-2006
126.003	003	E. coli (Enumeration)	SM 9221 C,F-2006
126.009	001	Fecal Streptococci	SM 9230 B-2007
126.017	001	E. coli (Enumeration)	SM 9223 B-2004 Colilert 18
126.019	001	Enterococci	Enterolert

Field of Accreditation:130 - Inorganic constituents in Hazardous waste (Matrix Aqueous)

130.010	001	Aluminum	EPA 6010 B
130.010	002	Antimony	EPA 6010 B
130.010	003	Arsenic	EPA 6010 B
130.010	004	Barium	EPA 6010 B
130.010	005	Beryllium	EPA 6010 B
130.010	006	Boron	EPA 6010 B
130.010	007	Cadmium	EPA 6010 B
130.010	008	Calcium	EPA 6010 B
130.010	009	Chromium	EPA 6010 B
130.010	010	Cobalt	EPA 6010 B
130.010	011	Copper	EPA 6010 B
130.010	012	Iron	EPA 6010 B
130.010	013	Lead	EPA 6010 B
130.010	014	Magnesium	EPA 6010 B
130.010	015	Manganese	EPA 6010 B
130.010	016	Molybdenum	EPA 6010 B
130.010	017	Nickel	EPA 6010 B
130.010	018	Potassium	EPA 6010 B
130.010	019	Selenium	EPA 6010 B
130.010	020	Silver	EPA 6010 B
130.010	021	Sodium	EPA 6010 B
130.010	022	Strontium	EPA 6010 B
130.010	023	Thallium	EPA 6010 B
130.010	024	Tin	EPA 6010 B
130.010	025	Titanium	EPA 6010 B
130.010	026	Vanadium	EPA 6010 B
130.010	027	Zinc	EPA 6010 B
130.030	002	Antimony	EPA 6020
130.030	003	Arsenic	EPA 6020
130.030	004	Barium	EPA 6020
130.030	005	Beryllium	EPA 6020
130.030	006	Cadmium	EPA 6020
130.030	007	Chromium	EPA 6020
130.030	008	Cobalt	EPA 6020

130.030	009	Copper	EPA 6020
130.030	010	Lead	EPA 6020
130.030	011	Manganese	EPA 6020
130.030	012	Nickel	EPA 6020
130.030	013	Silver	EPA 6020
130.030	014	Thallium	EPA 6020
130.030	015	Zinc	EPA 6020
130.030	016	Molybdenum	EPA 6020
130.030	017	Selenium	EPA 6020
130.030	018	Vanadium	EPA 6020
130.170	001	Chromium VI (Hexavalent Chromium)	EPA 7199
130.250	001	Mercury	EPA 7470 A
130.430	001	Cyanide, Total	EPA 9012 A

Field of Accreditation:131 - Leaching/Extraction, Physical Chacterstics in Hazardous Waste (Matrix Aqueous)

131.010	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
131.040	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
131.050	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312
131.060	001	Ignitability	EPA 1010
131.110	001	Corrosivity - pH Determination	EPA 9040 B

Field of Accreditation:132 - Volatile Organic Compounds in Hazardous Waste (Matrix Aqueous)

132.010	001	1,2-Dibromoethane (EDB)	EPA 8011
132.010	002	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011
132.015	001	Gasoline Range Organics (GRO)	EPA 8015 B
132.060	001	Benzene	EPA 8260 B
132.060	002	Bromobenzene	EPA 8260 B
132.060	003	Bromochloromethane	EPA 8260 B
132.060	004	Bromodichloromethane	EPA 8260 B
132.060	005	Bromoform	EPA 8260 B
132.060	006	Bromomethane (Methyl Bromide)	EPA 8260 B
132.060	007	n-Butylbenzene	EPA 8260 B
132.060	008	sec-Butylbenzene	EPA 8260 B
132.060	009	tert-Butylbenzene	EPA 8260 B
132.060	010	Carbon Disulfide	EPA 8260 B
132.060	011	Carbon Tetrachloride	EPA 8260 B
132.060	012	Chlorobenzene	EPA 8260 B
132.060	013	Chlorodibromomethane (Dibromochloromethane)	EPA 8260 B
132.060	014	Chloroethane	EPA 8260 B
132.060	015	Chloroform	EPA 8260 B
132.060	016	Chloromethane (Methyl Chloride)	EPA 8260 B
132.060	017	Dibromomethane	EPA 8260 B
132.060	018	Dichlorodifluoromethane (Freon 12)	EPA 8260 B
132.060	019	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene)	EPA 8260 B

132.060	020	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene)	EPA 8260 B
132.060	021	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 8260 B
132.060	022	trans-1,3-Dichloropropylene (trans-1,3 Dichloropropene)	EPA 8260 B
132.060	023	Ethylbenzene	EPA 8260 B
132.060	024	Hexachlorobutadiene	EPA 8260 B
132.060	025	Methyl tert-butyl Ether (MTBE)	EPA 8260 B
132.060	026	Methylene Chloride (Dichloromethane)	EPA 8260 B
132.060	027	Naphthalene	EPA 8260 B
132.060	029	N-propylbenzene	EPA 8260 B
132.060	030	Styrene	EPA 8260 B
132.060	031	Tetrachloroethylene (Tetrachloroethene)	EPA 8260 B
132.060	032	Toluene	EPA 8260 B
132.060	033	Trichloroethylene (Trichloroethene)	EPA 8260 B
132.060	034	Trichlorofluoromethane	EPA 8260 B
132.060	035	Vinyl Chloride	EPA 8260 B
132.060	036	m+p-Xylene	EPA 8260 B
132.060	037	o-Xylene	EPA 8260 B
132.060	038	m-Xylene	EPA 8260 B
132.060	039	p-Xylene	EPA 8260 B
132.060	040	1,1-Dichloroethane	EPA 8260 B
132.060	041	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 8260 B
132.060	042	1,1,1-Trichloroethane	EPA 8260 B
132.060	043	1,1,1,2-Tetrachloroethane	EPA 8260 B
132.060	044	1,1,2,2-Tetrachloroethane	EPA 8260 B
132.060	045	1,1,2-Trichloroethane	EPA 8260 B
132.060	046	1,2-Dichlorobenzene	EPA 8260 B
132.060	047	1,2-Dichloroethane (Ethylene Dichloride)	EPA 8260 B
132.060	048	1,2-Dibromoethane (EDB)	EPA 8260 B
132.060	049	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260 B
132.060	050	1,2-Dichloropropane	EPA 8260 B
132.060	051	1,2,3-Trichloropropane (TCP)	EPA 8260 B
132.060	052	1,2,4-Trichlorobenzene	EPA 8260 B
132.060	053	1,3-Dichlorobenzene	EPA 8260 B
132.060	054	1,4-Dichlorobenzene	EPA 8260 B
132.060	055	2-Chloroethyl vinyl Ether	EPA 8260 B
132.060	056	4-Chlorotoluene	EPA 8260 B
132.060	057	4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	EPA 8260 B
132.060	058	t-Butyl alcohol (2-Methyl-2-propanol)	EPA 8260 B
132.060	059	Diisopropyl ether (DIPE)	EPA 8260 B
132.060	061	Ethyl tert-butyl Ether (ETBE)	EPA 8260 B
132.060	062	tert-Amyl Methyl Ether (TAME)	EPA 8260 B

Field of Accreditation:133 - Semi-Volatile Organic Chemistry in Hazardous Waste (Matrix Aqueous)

133.010	002	Diesel Range Organics (DRO)	EPA 8015 B
133.090	001	Aldrin	EPA 8081 A
133.090	002	alpha-BHC	EPA 8081 A
133.090	003	beta-BHC	EPA 8081 A
133.090	004	delta-BHC	EPA 8081 A
133.090	005	gamma-BHC (Lindane)	EPA 8081 A
133.090	006	Chlordane	EPA 8081 A
133.090	008	4,4'-DDD	EPA 8081 A
133.090	009	4,4'-DDE	EPA 8081 A
133.090	010	4,4'-DDT	EPA 8081 A
133.090	011	Dieldrin	EPA 8081 A
133.090	012	Endosulfan I	EPA 8081 A
133.090	013	Endosulfan II	EPA 8081 A
133.090	014	Endosulfan Sulfate	EPA 8081 A
133.090	015	Endrin	EPA 8081 A
133.090	016	Endrin Aldehyde	EPA 8081 A
133.090	017	Endrin Ketone	EPA 8081 A
133.090	018	Heptachlor	EPA 8081 A
133.090	019	Heptachlor Epoxide	EPA 8081 A
133.090	020	Methoxychlor	EPA 8081 A
133.090	021	Toxaphene	EPA 8081 A
133.120	001	Aroclor 1016	EPA 8082
133.120	002	Aroclor 1221	EPA 8082
133.120	003	Aroclor 1232	EPA 8082
133.120	004	Aroclor 1242	EPA 8082
133.120	005	Aroclor 1248	EPA 8082
133.120	006	Aroclor 1254	EPA 8082
133.120	007	Aroclor 1260	EPA 8082
133.220	001	2,4-D	EPA 8151 A
133.220	002	2,4-DB	EPA 8151 A
133.220	003	2,4,5-TP (Silvex)	EPA 8151 A
133.220	004	2,4,5-T	EPA 8151 A
133.220	005	Dalapon	EPA 8151 A
133.220	006	Dicamba	EPA 8151 A
133.220	007	Dichloroprop	EPA 8151 A
133.220	008	Dinoseb	EPA 8151 A
133.220	012	Pentachlorophenol	EPA 8151 A
133.230	001	Acenaphthene	EPA 8270 C
133.230	002	Acenaphthylene	EPA 8270 C
133.230	003	Aniline	EPA 8270 C
133.230	004	Anthracene	EPA 8270 C
133.230	005	Benzidine	EPA 8270 C

133.230	006	Benzoic Acid	EPA 8270 C
133.230	007	Benzo(a)anthracene	EPA 8270 C
133.230	008	Benzo(b)fluoranthene	EPA 8270 C
133.230	009	Benzo(k)fluoranthene	EPA 8270 C
133.230	010	Benzo(g,h,i)perylene	EPA 8270 C
133.230	011	Benzo(a)pyrene	EPA 8270 C
133.230	012	Benzyl Alcohol	EPA 8270 C
133.230	013	Bis(2-chloroethoxy) Methane	EPA 8270 C
133.230	014	Bis(2-chloroethyl) Ether	EPA 8270 C
133.230	015	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl) phthalate)	EPA 8270 C
133.230	016	Butyl Benzyl Phthalate	EPA 8270 C
133.230	017	Chrysene	EPA 8270 C
133.230	018	Dibenz(a,h)anthracene	EPA 8270 C
133.230	019	Dibenzofuran	EPA 8270 C
133.230	020	Di-n-butyl Phthalate	EPA 8270 C
133.230	021	Diethyl Phthalate	EPA 8270 C
133.230	022	Dimethyl Phthalate	EPA 8270 C
133.230	023	Di-n-octyl Phthalate	EPA 8270 C
133.230	024	Fluoranthene	EPA 8270 C
133.230	025	Fluorene	EPA 8270 C
133.230	026	Naphthalene	EPA 8270 C
133.230	027	Nitrobenzene	EPA 8270 C
133.230	028	Pentachlorobenzene	EPA 8270 C
133.230	029	Pentachlorophenol	EPA 8270 C
133.230	030	1-Chloronaphthalene	EPA 8270 C
133.230	031	1,2-Dichlorobenzene	EPA 8270 C
133.230	032	1,3-Dichlorobenzene	EPA 8270 C
133.230	033	1,4-Dichlorobenzene	EPA 8270 C
133.230	034	2-Chloronaphthalene	EPA 8270 C
133.230	035	2-Chlorophenol	EPA 8270 C
133.230	036	2,4-Dichlorophenol	EPA 8270 C
133.230	037	2,4-Dimethylphenol	EPA 8270 C
133.230	038	2,4-Dinitrophenol	EPA 8270 C
133.230	039	2,4-Dinitrotoluene	EPA 8270 C
133.230	040	2,6-Dichlorophenol	EPA 8270 C
133.230	041	2,6-Dinitrotoluene	EPA 8270 C
133.230	042	2-Nitroaniline	EPA 8270 C
133.230	043	2-Nitrophenol	EPA 8270 C
133.230	044	3-Nitroaniline	EPA 8270 C
133.230	045	3,3'-Dichlorobenzidine	EPA 8270 C
133.230	046	4-Chloroaniline	EPA 8270 C
133.230	047	4-Chloro-3-methylphenol	EPA 8270 C

133.230	048	4-Bromophenyl Phenyl Ether	EPA 8270 C
133.230	049	4-Chlorophenyl Phenyl Ether	EPA 8270 C
133.230	050	4-Nitroaniline	EPA 8270 C
133.230	051	4-Nitrophenol	EPA 8270 C
133.230	052	Aldrin	EPA 8270 C
133.230	053	alpha-BHC	EPA 8270 C
133.230	054	beta-BHC	EPA 8270 C
133.230	055	delta-BHC	EPA 8270 C
133.230	056	gamma-BHC (Lindane)	EPA 8270 C
133.230	057	4,4'-DDD	EPA 8270 C
133.230	058	4,4'-DDE	EPA 8270 C
133.230	059	4,4'-DDT	EPA 8270 C
133.230	060	Dieldrin	EPA 8270 C
133.230	062	Endosulfan I	EPA 8270 C
133.230	063	Endosulfan II	EPA 8270 C
133.230	064	Endosulfan Sulfate	EPA 8270 C
133.230	065	Endrin	EPA 8270 C
133.230	068	Heptachlor	EPA 8270 C
133.230	069	Heptachlor Epoxide	EPA 8270 C
133.230	070	Methoxychlor	EPA 8270 C
133.230	071	Demeton-O	EPA 8270 C
133.230	072	Demeton-S	EPA 8270 C
133.230	073	Dichlorvos (DDVP)	EPA 8270 C
133.230	074	Disulfoton	EPA 8270 C
133.230	075	Malathion	EPA 8270 C
133.230	076	Parathion Ethyl	EPA 8270 C
133.230	077	Parathion Methyl	EPA 8270 C
133.230	078	Phorate	EPA 8270 C
133.230	079	Terbufos	EPA 8270 C
133.230	087	N-nitrosodiethylamine	EPA 8270 C
133.230	088	N-nitrosodimethylamine	EPA 8270 C
133.230	089	N-nitrosodiphenylamine	EPA 8270 C
133.230	090	N-nitroso-di-n-propylamine	EPA 8270 C
133.230	091	Indeno(1,2,3-c,d)pyrene	EPA 8270 C
133.230	092	Isophorone	EPA 8270 C
133.230	093	2-Methylnaphthalene	EPA 8270 C
133.230	094	Phenanthrene	EPA 8270 C
133.380	001	N-Ethylperfluorooctane Sulfonamide (EtFOSAm)	DoD QSM Version 5.1 (or newer)
133.380	002	N-Ethylperfluorooctane Sulfonamido Acetic Acid (NEtFOSAA)	DoD QSM Version 5.1 (or newer)
133.380	004	4:2 Fluorotelomer Sulfonic Acid (4:2 FTS)	DoD QSM Version 5.1 (or newer)
133.380	005	6:2 Fluorotelomer Sulfonic Acid (6:2 FTS)	DoD QSM Version 5.1 (or newer)
133.380	006	8:2 Fluorotelomer Sulfonic Acid (8:2 FTS)	DoD QSM Version 5.1 (or newer)

133.380	007	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	DoD QSM Version 5.1 (or newer)
133.380	008	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	DoD QSM Version 5.1 (or newer)
133.380	009	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	DoD QSM Version 5.1 (or newer)
133.380	010	N-Methylperfluorooctane Sulfonamide (NMeFOSA)	DoD QSM Version 5.1 (or newer)
133.380	011	N-Methylperfluorooctane Sulfonamido Acetic Acid (NMeFOSAA)	DoD QSM Version 5.1 (or newer)
133.380	012	N-Methylperfluorooctane Sulfonamido Ethanol (NMeFOSE)	DoD QSM Version 5.1 (or newer)
133.380	013	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	DoD QSM Version 5.1 (or newer)
133.380	014	Perfluorobutanoic Acid (PFBA)	DoD QSM Version 5.1 (or newer)
133.380	015	Perfluorobutane Sulfonic Acid (PFBS)	DoD QSM Version 5.1 (or newer)
133.380	016	Perfluorodecanoic Acid (PFDA)	DoD QSM Version 5.1 (or newer)
133.380	017	Perfluorododecanoic Acid (PFDoA)	DoD QSM Version 5.1 (or newer)
133.380	018	Perfluorodecane Sulfonic Acid (PFDS)	DoD QSM Version 5.1 (or newer)
133.380	019	Perfluoroheptanoic Acid (PFHpA)	DoD QSM Version 5.1 (or newer)
133.380	020	Perfluoroheptane Sulfonic Acid (PFHpS)	DoD QSM Version 5.1 (or newer)
133.380	021	Perfluorohexane Sulfonic Acid (PFHxS)	DoD QSM Version 5.1 (or newer)
133.380	022	Perfluorohexanoic Acid (PFHxA)	DoD QSM Version 5.1 (or newer)
133.380	023	Perfluorononanoic Acid (PFNA)	DoD QSM Version 5.1 (or newer)
133.380	024	Perfluorooctanoic Acid (PFOA)	DoD QSM Version 5.1 (or newer)
133.380	025	Perfluorooctane Sulfonic Acid (PFOS)	DoD QSM Version 5.1 (or newer)
133.380	026	Perfluorooctane Sulfonamide (PFOSAm)	DoD QSM Version 5.1 (or newer)
133.380	027	Perfluoropentanoic Acid (PFPeA)	DoD QSM Version 5.1 (or newer)
133.380	028	Perfluoropentane Sulfonic Acid (PFPeS)	DoD QSM Version 5.1 (or newer)
133.380	029	Perfluorotetradecanoic Acid (PFTeDA)	DoD QSM Version 5.1 (or newer)
133.380	030	Perfluorotridecanoic Acid (PFTrDA)	DoD QSM Version 5.1 (or newer)
133.380	031	Perfluoroundecanoic Acid (PFUnDA)	DoD QSM Version 5.1 (or newer)
133.380	032	10:2 Fluorotelomer Sulfonic Acid (10:2 FTS)	DoD QSM Version 5.1 (or newer)
133.380	033	Perfluorohexadecanoic Acid (PFHxDA)	DoD QSM Version 5.1 (or newer)
133.380	034	Perfluorononane Sulfonic Acid (PFNS)	DoD QSM Version 5.1 (or newer)
133.380	035	Perfluorooctadecanoic Acid (PFODA)	DoD QSM Version 5.1 (or newer)
133.380	036	2H,2H,3H,3H-Perfluorodecanoic Acid (7:3 FTCA)	DoD QSM Version 5.1 (or newer)
133.380	037	2H,2H,3H,3H-Perfluorohexaanoic Acid (3:3 FTCA)	DoD QSM Version 5.1 (or newer)
133.380	038	2H,2H,3H,3H-Perfluorooctanoic Acid (5:3 FTCA)	DoD QSM Version 5.1 (or newer)
133.380	039	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	DoD QSM Version 5.1 (or newer)
133.380	040	Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	DoD QSM Version 5.1 (or newer)
133.380	041	Perfluoro-3-methoxypropanoic acid (PFMPA)	DoD QSM Version 5.1 (or newer)
133.380	042	Perfluoro-4-methoxybutanoic acid (PFMBA)	DoD QSM Version 5.1 (or newer)

Client: CWE
Contact: Nan Jia
Phone No. (714) 526-7500 x217

FAX No.
Email: njia@cwecorp.com

Project Name: SAR Surface WQ Monitoring Program
Project Location: Riverside/San Bernardino Counties

Turn Around Time: [✓ Routine] *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By: *Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: ____________________
Employer: ____________________
Signature: ____________________

Matrix
DW = Drinking Water
GW = Groundwater
WW = Wastewater
S = Source
SG = Sludge
L = Liquid
M = Miscellaneous

Sample ID	**Date**	**Time**	**# of Containers & Preservatives**											**Total # of Containers**	**Sample Type**			**Analysis Requested**									**Matrix**	**Notes**
			Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA				*Routine*	*Resample*	*Special*	TDS, NO2 as N, NO3 as N	Ammonia									
YYYYMMDDSAR@Mission	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDSAR@Riverside	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDSAR@E	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDDuplicate	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated
YYYYMMDDFieldBlank	MM/DD/YYYY		X	X														X	X								L	Total Inorganic Nitrogen (TIN), Calculated

Relinquished By (sign)	**Print Name / Company**	**Date / Time**	**Received By (Sign)**	**Print Name / Company**

(For Lab Use Only) **Sample Integrity Upon Receipt/Acceptance Criteria**

Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature: __________ °C ☐ Cooler Blank

Sample Meets Laboratory Acceptance Criteria? Yes No
Permission to continue: Yes No
Deviation/Notes: ____________________
Signature/Date: ____________________

Logged in By/Date: ____________________

Page 1 **of** 1

ESB

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Babcock Laboratories, Inc.

Environmental Laboratories

Bottle Order Form

Please fill in your request and allow at least 72 hours to process your bottle order.

Select Delivery Method: ☐**UPS** ☐**Pick-Up** ☐**Field Delivery**

Client:

Address:

City: State: Zip:

Phone: Email:

Date Due: **Select Delivery Time:** ☐Early Morning ☐Afternoon

BOTTLE SETS

Qty	Description	Pres.	Type of Analyses
	Drinking Water Title 22 (set) for Non-Chlorinated (raw water)	Various	Coliform, GM, IO, GP, 504, 505, 515, 524, 525, 531, 547, 548, 549, Gross Alpha, Asbestos, Dioxin
	Drinking Water Title 22 (set) for Chlorinated (treated water)	Various	Coliform, GM, IO, GP, 504, 505, 515, 524, 525, 531, 547, 548, 549, Gross Alpha, Asbestos, Dioxin
	Priority Pollutants (set) for Non-Chlorinated	Various	608, 624, 625, CN, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn, Cr III, Cr VI, Dioxin
	Priority Pollutants (set) for Chlorinated	Various	608, 624, 625, CN, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn, Cr III, Cr VI, Dioxin
	CTR (ML) - Priority Pollutants for Non-Chlorinated (set)	Various	608, 624, 625, 8270, CN, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn, Cr III, Cr VI, Dioxin
	CTR (ML) - Priority Pollutants for Chlorinated (set)	Various	608, 624, 625, 8270, CN, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn, Cr III, Cr VI, Dioxin

GENERAL BOTTLES

Qty	Description	Pres.	Type of Analyses
	100ml Sterile	$Na_2S_2O_3$	Total/Fecal Coliform, E. Coli, HPC, or FecalStrep/Enterococcus
	125 ml Poly	Hex Chrome Buffer	Hex Chrome Buffer
	150ml Sterile Plastic	Unpres.	LL Perchlorate
	Half Gallon Plastic	Unpres.	Alk., Anions, BOD, Cl, EC, Fluoride, MBAS, NO2N, NO3N, pH, Ortho-Phos., Reactive Si, Solids or SO4
	Quart Plastic	Unpres.	Asbestos, or any few items listed above
	Half Gallon Plastic	Unpres.	Gross Alpha/Beta, Uranium, Ra 266 or RA 228
	Pint Plastic with Headspace	Unpres.	Perchlorate by 314
	Pint Plastic	H_2SO_4	COD, Nutirents, TKN, NH4N, Org.-N or T. Phos.
	Pint Plastic	HNO_3	Metals, Cations, or Uranium by ICPMS

Submit this form to data@babcocklabs.com

Babcock Laboratories, Inc.

Bottle Order Form

GENERAL BOTTLES (cont.)

Qty	Description	Pres.	Type of Analysis
	Pint Plastic	NaOH	Cyanide, Ammen. Cyanide, WAD Cyanide
	Pint Plastic (To fill line)	Unpres.	Perchlorate
	Dissolved Sulfide Kit	Various	Dissolved Sulfide
	Pint Plastic	ZnAce/NaOH	Total Sulfide
	500ml Amber Glass (WM)	H_2SO_4	Oil & Grease, Phenols
	500ml Amber Glass (WM)	H_2SO_4	Tot. Org. Halides (TOX)
	40ml Amber Vial (x2)	H_2SO_4	TOC
	40ml Amber Vial (x2)	$Na_2S_2O_3$	THMs, 524-THM
	40ml Amber Vial (x3)	HCl	524, 624, 8260, 8015Gas, 8015Diesel, TCP
	40ml Amber Vial (x3)	$Na_2S_2O_3$	504, 547, 505
	40ml Amber Vial (x4)	Unpres.	THM - Formation Potential
	40ml Amber Vial (x4)	NH_4Cl	6251 (HAAs)
	40ml Amber Vial (x2)	PDC	531
	40ml Amber Vial (x3)	$Na_2S_2O_3$	Chlorinated samples for 504, 547, 524*, 624,* 8260* (*HCl to be added in field)
	1 Liter Amber Glass	Unpres.	508, 515, 548, Dioxin, 625, 608, 8081, 8082, 8141, 8151, 8270, 8270-NDMA, 8270-1,4Dioxane, 8270-PAHs, Low Level DW Phenols
	1 Liter Amber Poly	Unpres.	Diquat 549
	1 Liter Amber Poly	$Na_2S_2O_3$	Chlorinated samples for Diquat 549
	1 Liter Amber Glass (x3)	HCl	525
	1 Liter Amber Glass (x3)	Na_2SO_3	Chlorinated 525 (HCl to be added in field)
	1 Liter Amber Glass	$Na_2S_2O_3$	Chlorinated 508, 515, 548, 608, 625, 8081, 8082, 8141, 8151, 8270
	1 Liter Amber Glass (X3)	H_2SO_4	TPH-418.1
	250ml Amber Glass	Unpres.	UV-254
	250ml Amber Glass (x2)	Unpres.	Radon
	250ml Glass Container w/ Tube	Unpres.	GP (COT)
	Dissolved Oxygen Kit	Various	Dissolved Oxygen
	8oz. Glass Jar	Unpres.	Soils, Solids, Haz. Mat.

OTHER SUPPLIES

Qty	Description
	Ice Chest Needed
	Blue Ice Needed
	Chain of Custody Forms
	Sample Labels

Submit this form to data@babcocklabs.com

Appendix C
Blank Field Observation Forms

Santa Ana River Watershed Surface Water Quality Monitoring Program - Field Data Sheet

General Information:

Site Name: ________________________________
Site ID: ___________________________________
Date: ________/______/______
Time (24-hr clock): __________________________
Sampling Team: ___________________________/___________________________

Field Measurements: *(average of three readings)*

	Reading #1	Reading #2	Reading #3	Average
Conductivity: mS/cm ☐ uS/cm ☑	________	________	________	________
Dissolved Oxygen: (mg/L)	________	________	________	________
pH:	________	________	________	________
Turbidity: (NTU)	________	________	________	________
Temp (water): (°C)	________	________	________	________
Other ____________	________	________	________	________

Flow Connectivity: Y/N (Describe) ____

Flow measurements ***(check boxes for units of measure)*****:**

Total Section Width (*W*):________feet ☑ meters ☐

Cross-section:	Depth (*D*)	Velocity (*V*)	Comments
10% across	________in ☑ cm ☐	________ ft/sec ☑ m/sec ☐	______________
50% across	________in ☑ cm ☐	________ ft/sec ☑ m/sec ☐	______________
90% across	________in ☑ cm ☐	________ ft/sec ☑ m/sec ☐	______________

Estimated Flow ________ft^3/sec ☑ m^3/sec ☐ $Q\ (ft^3/sec) = (0.2*W*D_{10}/12*V_{10}) + (0.6*W*D_{50}/12*V_{50}) + (0.2*W*D_{90}/12*V_{90})$

Grab Sampling: Filled and labeled *(check if applicable)*

1 – 250 mL polyethylene bottle (w/ H_2SO_4 preservative) for **Nutrients**: .... ________
2 – 1,000 mL polyethylene bottles for **TDS**:.. ________
Additional bottle sets are included for field duplicates and trip blanks .... ________

Site Observations:

Weather: ____

Other: ____

____
____
____
____
____

Appendix D
YSI Manuals

Professional Plus
Quick-Start Guide

This Quick-Start Guide is meant to serve as a quick reference in operating the Professional Plus. It is not intended to replace the information found in the Operations Manual. For your convenience, this quick start guide will enable you to unpack your instrument and get to the field quickly.

GETTING STARTED

Unpack the instrument and install (2) C size batteries in the back of the instrument. Tighten the four screws of the battery plate on to the back of the instrument.

If necessary, install the sensors into the cable assembly by inserting the sensors into the ports and then hand tightening them. Do not use a tool and do not over tighten.

If using a 1010 cable, a sensor must be installed in port 1 for correct operation. If installing a pH/ORP combo sensor into a 1010 cable, ORP will not be measured. If using a 1020 cable, install a pH, ORP, pH/ORP, or an ISE sensor in port 1 and a DO sensor in port 2.

If using a Quatro cable, install a pH, ORP, or ISE sensor in ports label 1 and 2. A sensor must be installed in port 1 for port 2 to operate correctly. If you install a pH/ORP combo sensor into port 1 or port 2, ORP will not be measure. Install the Dissolved Oxygen sensor in the port labeled DO. Install the Conductivity/Temperature sensor in the port labeled CT following the instructions included with the sensor. For ease of installation, YSI recommends that you install a sensor into port 1 first; followed by DO installation, then port 2, and lastly C/T.

Please refer to the Getting Started Setup section of the Manual for a complete list of sensor/cable port configurations.

Install a port plug into any port that does not have an installed sensor. Attach the cable assembly to your instrument.

INSTALLING THE DO MEMBRANE

Note: The DO sensor is shipped with a red protective cap to protect the electrode. A new membrane cap must be installed before the first use.

1. Prepare the O_2 probe solution according to the instructions on the bottle. After mixing, allow the solution to sit for 1 hour. This will help prevent air bubbles from later developing under the membrane.
2. Remove, and discard or save the red protective cap.
3. Thoroughly rinse the sensor tip with distilled or deionized water.
4. Fill a new membrane cap with probe solution. Avoid touching the membrane portion of the cap.
5. Thread the membrane cap onto the sensor, moderately tight. A small amount of electrolyte will overflow.
6. Screw the probe sensor guard on moderately tight.

MENU FUNCTIONS

The Professional Plus has a menu-based interface. Press the “hot keys” to access the System, Sensor, Calibration, and File menus (from left to right at the top of the keypad). To navigate through the menus, use the up and down arrow keys to highlight a desired menu option with a highlight bar, and press the Enter key to activate the selection. Use the left arrow key to go back one screen. Press the Esc key to return to the run screen or to exit an alpha/numeric entry screen. The Pro Plus will automatically power on to the Run screen.

SETTING THE DATE AND TIME

1. Press the System key .
2. Highlight **Date/Time** and press Enter.
3. Highlight **Date Format** and press Enter. Highlight the correct format and press Enter.
4. Highlight **Date** and press Enter. Use the keypad to enter the correct date, then highlight ↵on the display keypad, and press Enter.
5. Highlight **Time Format** and press Enter. Highlight the correct format and press Enter.
6. Highlight **Time** and press Enter. Use the keypad to enter the correct time, then highlight ↵on the display keypad, and press Enter.
7. Press Esc to return to the Run screen.

SETTING UP SENSORS & REPORTING UNITS

A sensor must be enabled in the **Sensor** menu for it to operate. Once a sensor is enabled, the desired units for that sensor must be selected in the **Display** menu to determine what will be displayed.

1. Press the Sensor key.
2. Highlight **Setup** and press enter. Highlight the parameter of interest and press enter. Highlight **Enabled** and press enter to ensure a checkmark in the box. When enabling the ISE1 and ISE2 ports, you must select the correct sensor after enabling the port.
3. When Dissolved Oxygen is enabled, a submenu allows the user to select the sensor type (Polarographic or Galvanic) and membrane type being used. Highlight **Sensor Type** or **Membrane** and press **Enter** to modify these settings.
4. Press the left arrow key to return to the previous screen or press Esc to return to the Run screen.

Once changes to the Sensor menu have been completed, you must determine which units will be reported (i.e. %, mg/L, °C, °F, etc.).

1. Select the Sensor hot key on the keypad, highlight **Display**, and press enter.
2. Highlight the parameter you want to access and press the Enter.
3. A submenu will open allowing you to select the reporting units. Some parameters can be reported in multiple units. For example, DO can be reported in DO%, DO mg/L, and DO ppm. Other parameters, for example temperature, can only be reported in one unit. Make selections from the submenu, and then press the left arrow key to return to the Display menu or press Esc to return to the Run screen.

BAROMETER CALIBRATION

1. Determine your local barometric pressure (BP) in mmHg from a mercury barometer, an independent laboratory, or from a local weather service. If the

BP reading has been corrected to sea level, use the following equation to determine the true BP in mmHg for your altitude:

True BP = (Corrected BP in mmHG) – {2.5 * (Local Altitude in feet/100)}

2. Press the **Cal** Cal key.
3. Highlight **Barometer** and press Enter. Use the arrow keys to highlight the desired units and press Enter to confirm.
4. Highlight **Calibration Value** and press enter to adjust.
5. Use the Alpha/Numeric screen to enter your True BP, then highlight <<<**ENTER**>>> and press enter.
6. Highlight **Accept Calibration** and press enter to finish the calibration.

CONDUCTIVITY, PH, AND ORP CALIBRATION

1. Press the **Cal** Cal key.
2. Highlight the parameter you wish to calibrate and press enter. For Conductivity, a second menu will offer the option of calibrating **Specific Conductance**, **Conductivity**, or **Salinity**. Calibrating one automatically calibrates the other two. An additional sub-menu will require you to select the calibration units. For pH, auto-buffer recognition will determine which buffer the sensor is in and it will allow you to calibrate up to 6 points.
3. Place the correct amount of calibration standard into a clean, dry or pre-rinsed container.
4. Immerse the probe into the solution, making sure the sensor and thermistor are adequately immersed. Allow at least one minute for temperature to stabilize.
5. For any of parameters, enter the calibration solution value by highlighting **Calibration Value**, pressing enter, and then using the alpha/numeric keypad to enter the known value. Once you have entered the value of the calibration standard, highlight <<<**ENTER**>>> and press enter.
6. Wait for the readings to stabilize, highlight **Accept Calibration** and press enter to calibrate.
7. For pH, continue with the next point by placing the probe in a second buffer and following the on-screen instructions or press **Cal** Cal to complete the calibration.

DO CALIBRATION

The Pro Plus offers four options for calibrating dissolved oxygen. The first is an air calibration method in % saturation. The second and third calibrates in mg/L or ppm to a solution with a known DO concentration (usually determined by a Winkler Titration). Calibration of any option (% or mg/L and ppm) will automatically calibrate the other. The fourth option is a zero calibration. If performing a zero calibration, you must perform a % or mg/L calibration following the zero calibration. For both ease of use and accuracy, YSI recommends performing the following 1-point DO % calibration:

1. Moisten the sponge in the cal/transport sleeve with a small amount of water and install it on the probe. The cal/transport sleeve ensures venting to the atmosphere. For dual port and Quatro cables, place a small amount of water (1/8 inch) in the calibration/transport cup and screw it on the probe. Disengage a thread or two to ensure atmospheric venting. **Make sure the DO and temperature sensors are <u>not</u> immersed in the water.**
2. Turn the instrument on. If using a polarographic sensor, wait 10 minutes for the DO sensor to stabilize. Galvanic sensors do not require a warm up time.
3. Press the **Cal** Cal key, highlight **DO** and press enter.
4. Highlight DO%, then press Enter.
5. Verify the barometric pressure and salinity displayed are accurate. Once DO and temperature are stable, highlight **Accept Calibration** and press enter.

TAKING MEASUREMENTS AND STORING DATA

1. The instrument will be in Run mode when powered on.
2. To take readings, insert the probe into the sample. Move the probe in the sample until the readings stabilize. This releases any air bubbles and provides movement if measuring DO.
3. **Log One Sample** is already highlighted in Run mode. Press enter to open a submenu. Highlight **Sites** or **Folders** and press enter to select the site or folder to log the sample to.
4. If necessary, use the keypad to create a new Site or Folder name. If Site List and Folder List are disabled in the System menu, you will not see these options when logging a sample.
5. Once the Site and/or Folder name is selected, highlight **Log Now** and press enter. The instrument will confirm that the data point was logged successfully.
6. If you would like to log at a specific interval vs. logging one sample at a time, press the **System** ⚙ key. Use the arrow keys to highlight **Logging** and press enter. Enable **Continuous Mode** and adjust the time **Interval** if necessary. On the Run screen, the option to log will change from **Log One Sample** to **Start Logging** based on the time interval entered.
7. During a continuous log, the **Start Logging** dialog box on the Run screen will change to **Stop Logging.**

UPLOADING DATA TO A PC WITH DATA MANAGER

1. Make sure Data Manager and the USB drivers are installed on the PC. The USB drivers will be installed during the Data Manager installation.
2. Connect the Communications Saddle to the back of the Pro Plus instrument and use the USB cable to connect the saddle to the USB port on the PC.
3. If connecting for the first time, Windows® may prompt you through two 'New Hardware Found' Wizard in order to complete the USB driver installation.
4. Open Data Manager on the PC and turn on the Pro Plus.
5. Click on the correct instrument in Data Manager under the **Select Instrument** heading. Once you've highlighted the correct instrument, click the **Retrieve Instrument Data** tab and check **Data, GLP, Site List, Configuration** or **Select All** options to retrieve data. Click **Start.**
6. After the file transfer is complete, the data is available for viewing, printing, and exporting from Data Manger and the data can be deleted from the Pro Plus if desired.
7. Press the File 📁 key and choose **Delete Data** if you no longer need the data on the Pro Plus.

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Professional *Plus*

Calibration Tips

Table of Contents

Introduction

This guide provides helpful instructions, tips and troubleshooting suggestions for calibrating a Professional Plus instrument. For more detailed information on calibration and information on how to setup and operate a Pro Plus, please refer to the Pro Plus User Manual.

Calibration Worksheet

The Calibration Worksheet on the following page is provided for your convenience. Utilizing the Calibration Worksheet can help document your calibration and track the performance of your sensors.

Date of Calibration: ____________________ Technician: ____

Instrument Serial Number:_______________ Software Revision:_______________ Cable Model Number:________________

Temperature Reading___________________ Temperature Accurate: Y N

DO Sensor in use: Polarographic Galvanic Sensor notated in Sensor menu? Y N

DO membrane changed? Y N Color of Membrane_____________ Color notated in Sensor menu? Y N

Record the following calibration values:

	Pre Cal	After Cal	
Conductivity	_______________	______________	
ORP	_______________	______________	
DO	_______________	______________	True Barometric Pressure at time of calibration ____________________

	Pre Cal		
pH 7	_______________	pH mV value____________	Range 0 mV ± 50 mV
pH 4	_______________	pH mV value____________	Range +165 to +180 from 7 buffer mV value
pH 10	_______________	pH mV value____________	Range -165 to -180 from 7 buffer mV value

NOTE: See pH Cal tips section for additional information. Span between pH 4 and 7 and 7 and 10 mV values should be ≈ 165 to 180 mV. 177 is the ideal distance or 59 mV per pH unit.

Ammonium

1st point (1 mg/L) _________ NH4 mV value_______ Range: 0 mV +/- 20 mV (new sensor only)

2nd point (100 mg/L)________ NH4 mV value_______ Range: 90 to 130 mV > 1 mg/L mV value

Nitrate

1st point (1 mg/L) __________ NO3 mV value_______ Range: 200 mV +/- 20 mV (new sensor only)

2nd point (100 mg/L)________ NO3 mV value_______ Range: 90 to 130 mV < 1 mg/L mV value

Chloride

1st point (10 mg/L) _________ Cl mV value _______ Range: 225 mV +/- 20 mV (new sensor only)

2nd point (1000mg/L)________ Cl mV value _______ Range: 80 to 130 < 10 mg/L mV value

Record the following diagnostic numbers **after** calibration, by viewing the .glp file and reading the values for the day's calibration

Conductivity Cal Cell Constant ____________ Range 5.0 +/- 1.0 acceptable

DO Sensor Value (uA) ____________ (Membrane dependent, see DO Cal Tips)

pH Slope ____________ (≈ 55 to 60 mV/pH, 59 ideal)

pH Slope % of ideal ____________

Temperature

CALIBRATION TIPS

Before calibrating any other Pro Plus sensor, verify that the temperature sensor is reading accurately by comparing it to a traceable thermometer or other known reference in a water bath. Temperature compensation is used in every other sensor measurement so its accuracy should be verified and recorded each time the Pro Plus is calibrated. Be sure to consider the specification tolerances of both the Pro Plus temperature sensor and the thermometer when comparing the measurements.

The Pro Plus temperature sensor can not be calibrated nor should calibration be required.

TROUBLESHOOTING TIPS

If the temperature sensor is not reading accurately, ensure that it is clean and free of debris. The conductivity cleaning brush and warm water with mild detergent can be used to scrub the temperature sensor if needed. Alternatively, you can use a toothbrush to clean the sensor.

Quatro Cables

Quatro cables have a replaceable combination conductivity/temperature sensor (p/n 005560). All other Pro Plus cables have integral temperature sensors. If using a Quatro cable and your temperature sensor is not reading accurately, remove the conductivity/temperature sensor from the cable. The Pro Plus should read ----- °C without a temperature sensor installed. If the instrument is reading any other value, the conductivity/temperature port on the cable may be contaminated. Refer to the Cleaning the Sensor Port section of this document for information on how to clean the port.

After cleaning the port, recheck the temperature reading. If the temperature reading is still not displaying ----- °C without the sensor installed, there may be a problem with the cable and/or instrument. In this case, contact your local YSI Representative or a YSI Authorized Service Center.

Other Pro Plus Cables

If your temperature sensor is not reading accurately after cleaning around the sensor, contact your local YSI Representative or an YSI Authorized Service Center.

Conductivity

The conductivity calibration should be verified every day the instrument is used. However, the conductivity sensor is very stable and may hold its calibration for several weeks.

CALIBRATION TIPS

1. It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance (temperature compensated conductivity) for greatest ease and accuracy.
2. Ensure the conductivity sensor is clean and dry before performing a specific conductance calibration.
3. Always use fresh, traceable conductivity calibration solution when calibrating the conductivity sensor.
    a. The shelf life of conductivity solution is one month after being opened. This is due to potential changes in the value of the solution caused by evaporation which can occur after opening the bottle. Be sure to write the open date on the bottle so you know that you are using good calibration solution.
    b. Never calibrate with a conductivity solution that is less than 1.0 mS/cm. You are setting the slope on a linear device so a good strong conductivity signal will give you the best performance. Use 1.0 mS/cm for fresh water, 10 mS/cm for brackish to estuarine water and 50 mS/cm for salt water. 1.0 mS (millisiemens) = 1000 uS (microsiemens).
4. Pre-rinse the cal cup and sensors with a small amount of calibration standard or rinse standard and discard.
5. When calibrating the conductivity sensor, the calibration solution must cover the top vent holes of the conductivity sensor. If using a Quatro cable, the top vent hole is located on the side of the combination conductivity/temperature sensor. If using a different cable, the conductivity sensor is integral to the cable and the sensor has two vent holes located close to the cable. Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value.
6. After placing the sensor into the solution, gently move the sensor up and down to remove any air bubbles that may be trapped in the conductivity sensor.
7. If calibrating Specific Conductance, enter the value of the conductivity solution as it is listed for 25°C. Make sure you are entering the correct units. 1 mS = 1,000 uS.
8. If you receive a warning message stating that the calibration is questionable, do not continue with the calibration. Instead, select 'No' and investigate what is causing the questionable results. If you accept a questionable calibration, your conductivity readings (and your DO mg/L readings) will be erroneous. Typical causes for this error message include: incorrect entries (entering 1000 uS/cm instead of 1.0 mS/cm), not using enough solution to cover the vent holes, air bubbles trapped in the sensor, calibrating in conductivity instead of specific conductance, dirty conductivity electrodes, and/or bad calibration solution.
9. After accepting a good calibration, navigate to the GLP file and check the conductivity cell constant for the calibration. For highest accuracy, the cell constant should be 5.0 +/- 0.5. However, the acceptable range is 5 +/- 1.0. A cell constant outside of this range indicates that a questionable calibration was accepted.

TROUBLESHOOTING TIPS

If you get an error message during calibration, be sure that you are:

1. Entering the correct calibration value (1 mS/cm = 1000 uS/cm).
2. Calibrating in Specific Conductance mode.
3. Using enough solution to cover the vent holes on the sensor.
4. Dislodging any air bubbles that could be trapped in the sensor.
5. Using a fresh, traceable conductivity calibration solution.

If you are following the above recommendations and still receiving an error message, check the conductivity sensor to make sure it is clean. A clean conductivity sensor should read less than 3 uS/cm in dry air. If your sensor is dry and giving you a reading higher than 3 uS/cm in air, it should be cleaned.

The conductivity calibration generates its cell constant value after calibration. The ideal cell constant is 5.0 +/-0.5 but 5.0 +/- 1.0 is acceptable. Any significant jump or change in this number from one calibration to the next usually indicates a problem with the calibration and/or sensor. If you are sure that your calibration standard is good and your calibration process is correct, then your sensor may need to be cleaned.

Cleaning the Conductivity Sensor

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity sensor with calibration solution.

Quatro Cables

Quatro cables have a replaceable combination conductivity/temperature sensor (p/n 5560). All other Pro Plus cables have integral conductivity sensors. If using a Quatro cable and your conductivity sensor is not calibrating or is reading > 3 uS/cm in dry air after being cleaned, remove the conductivity/temperature sensor from the cable. The Pro Plus should read < 3 uS/cm for conductivity (not specific conductance) without a conductivity sensor installed. If the instrument is reading > 3 uS/cm without a sensor installed, the conductivity/temperature port on the cable may be contaminated. Refer to the Cleaning the Sensor Port section of this document for information on how to clean the port.

If the conductivity measurement continues to read more than 3 uS/cm without a conductivity/temperature sensor installed, there may be a problem with the cable and/or instrument. In this case, contact your local YSI Representative or a YSI Authorized Service Center.

Other Pro Plus Cables

If your conductivity sensor is not calibrating or is reading > 3 uS/cm in dry air after performing a sensor cleaning, contact your local YSI Representative or a YSI Authorized Service Center.

pH

The pH calibration should be verified every day the instrument is used. However, a new pH sensor may be capable of holding its calibration for several days.

CALIBRATION TIPS

1. If using a pH sensor in a 6051010 or Quatro cable, calibrate the sensor in port 1 prior to calibrating the sensor in port 2. The sensor in port 2 uses the reference of the sensor installed in port 1. Therefore, it is important to verify that the port 1 sensor is working properly before calibrating the port 2 sensor. See pH Troubleshooting Tips for additional info.
2. The pH sensor can be calibrated with up to six calibration points.
3. Calibration can be accomplished in any buffer order.
4. pH 7 buffer should be used regardless of how many calibration points you use; however, it does not have to be the first point.
5. In most cases, a two-point calibration is all that is required (4 and 7 or 7 and 10). You can bracket the expected in-situ pH values. Use a three-point calibration with 4, 7 and 10 if the in-situ pH values are unknown or if you expect the in-situ values to be on both sides of the pH scale.
6. Rinse the sensors and cal cup with a small amount of pH buffer. Fill the cup so that the pH sensor tip and the temperature sensor are submerged in buffer.
7. If necessary, highlight the Calibration Value and enter the pH value of the buffer solution. Note: The Pro Plus has auto buffer recognition which can be set to USA (4, 7, 10) or NIST (4.01, 6.86, 9.18) buffer values in the pH Sensor Setup menu.
8. Record the pH millivolts for each calibration point. The acceptable mV outputs for each buffer are shown below.
    pH 7 mV value = 0 mV +/- 50 mV
    pH 4 mV value = +165 to +180 from 7 buffer mV value
    pH 10 mV value = -165 to -180 from 7 buffer mV value
    - A value of +50 or -50 mVs in buffer 7 does not indicate a bad sensor.
    - The mV span between pH 4 and 7 and 7 and 10 mV values should be ≈ 165 to 180 mV. 177 is the ideal distance. The slope can be 55 to 60 mV per pH unit with an ideal of 59 mV per pH unit.
    - If the mV span between pH 4 and 7 or 7 and 10 drops below 160, clean the sensor and try to recalibrate.
9. Wait for the pH to stabilize in the each buffer and then press enter to accept each calibration point.
10. Rinse the sensor and cal cup with a small amount of the next buffer between calibration points.
11. After pressing enter to accept your last calibration point, press cal Cal to complete the calibration. Otherwise you will continue calibrating up to 6 calibration points.
12. If you receive a warning message stating that the calibration is questionable, do not continue with the calibration. Instead, select ‘No’ and investigate what is causing the questionable results. If you accept a questionable calibration, your pH readings will be erroneous. Typical causes for this error message include: incorrect Sensor/Port setup in the instrument, a dirty sensor or bad buffer solution.
13. After accepting a good calibration, navigate to the GLP file and check the pH Slope and Slope % of ideal. A good slope should be between 55 and 60 mVs while the ideal is 59 mV. If the slope drops below 53, the sensor should be reconditioned and recalibrated.

TROUBLESHOOTING TIPS

Typical working life for pH sensors is approximately 12-24 months depending on usage, storage and maintenance. Proper storage and maintenance generally extends the sensor’s working life.

Clean and recondition the sensor if a slow response in the field has been reported or if it takes more than 90 seconds to stabilize in pH buffer.

If you get an error message during a pH calibration, check the following:

1. Ensure the pH buffers are good and not expired
2. Ensure that the pH sensor is installed in the correct port of the cable and the correct ISE is enabled in the Sensor Setup menu.
    a. If using a pH or pH/ORP combo sensor in a 6051020 cable, ensure the sensor is installed in port 1.
    b. If using a pH or pH/ORP combo sensor in a 60510, 6051020 or 6051030 cable, pH should be enabled in ISE1 of the instrument's Sensor Setup menu.
    c. If using a pH sensor in a 6051010 or Quatro cable, check to see if the pH sensor is installed in port 1 or port 2. If the pH sensor is installed in port 1, enable pH in ISE1 of the Sensor Setup menu. If the pH sensor is installed in port 2, enable pH in ISE2 of the Sensor Setup menu. Note: It is not recommended to use a pH/ORP combo sensor in 6051010 or Quatro cables. If using a pH/ORP combo sensor in a 6051010 or Quatro cable, ORP will not be measured or reported.
3. If using a 6051010 or Quatro cable, you must have a sensor installed in port 1 for port 2 to operate. Additionally, ensure that the sensor installed in port 1 is in good working order. In 6051010 and Quatro cables, the sensors installed in port 1 and port 2 use the reference from the sensor installed in port 1 only. Therefore, if the sensor installed in port 1 is not working properly, the readings from the sensor installed in port 2 will be erroneous. For greatest ease, install a pH sensor in port 1 of both 6051010 and Quatro cables and your other ISE sensor in port 2.
4. If you continue to get error messages during calibration, clean and recondition the sensor.

Cleaning and Reconditioning the pH, ORP or pH/ORP Sensor

If the pH or pH/ORP sensor has been allowed to dry out or has been stored in distilled or deionized water for an extended period of time, soak the sensor in buffer 4 overnight to try and restore functionality.

Cleaning is required whenever deposits or contaminants appear on the glass and/or platinum surfaces or when the sensor's response slows. The cleaning can be chemical and/or mechanical.

Removing the sensor from the cable may make cleaning easier. Initially, moisten a soft clean cloth, lens cleaning tissue or cotton swab to remove all foreign material from the glass bulb and/or platinum button. Then use a moistened cotton swab to carefully remove any material that may be blocking the reference electrode junction of the sensor. ***CAUTION***: When using a cotton swab, be careful NOT to wedge the swab between the guard and the glass sensor. If necessary, remove cotton from the swab tip, so that the cotton can reach all parts of the sensor tip without stress. You can also use a pipe cleaner for this cleaning if more convenient.

If good pH and/or ORP response is not restored, perform the following additional procedure:

1. Soak the sensor for 10-15 minutes in clean water containing a few drops of commercial dishwashing liquid.
2. GENTLY clean the glass bulb and platinum button by rubbing with a cotton swab soaked in the cleaning solution.
3. Rinse the sensor in clean water, wipe with a cotton swab moistened with clean water, and then re-rinse with clean water.

If good pH and/or ORP response is still not restored, perform the following additional procedure:

1. Soak the sensor for 30-60 minutes in one molar (1 M) hydrochloric acid (HCl). This reagent can be purchased from most lab supply distributors. Be sure to follow the safety instructions included with the acid.

2. Rinse the sensor in clean water, wipe with a cotton swab moistened with clean water (not DI water), and then re-rinse with clean water. To be certain that all traces of the acid are removed from the sensor crevices, soak the sensor in clean tap water for about an hour with occasional stirring.

If biological contamination of the reference junction is suspected or if good response is not restored by the above procedures, perform the following additional cleaning step:

CAUTION: Do not mix the acid from the previous step with the chlorine bleach in the following step. A toxic gaseous product can form from the reaction between the acid and the chlorine bleach. Be certain to copiously rinse the sink and drain system of acid after its disposal and before the disposal of chlorine bleach.

1. Soak the sensor for approximately 1 hour in a 1:1 dilution of commercially available chlorine bleach.
2. Rinse the sensor with clean water and then soak for at least 1 hour in clean tap water with occasional stirring to remove residual bleach from the junction. (If possible, soak the sensor for a period of time longer than 1 hour in order to be certain that all traces of chlorine bleach are removed.) Then re-rinse the sensor with clean water and retest.

Prior to reinstalling the sensor, dry the port and sensor connector with compressed air. If you suspect port contamination, follow the instructions in the Cleaning a Sensor Port section of this document before reinstalling the sensor.

If your pH sensor is still not calibrating after performing a sensor cleaning, contact your local YSI Representative or a YSI Authorized Service Center.

ORP

The ORP calibration should be verified every day the instrument is used. However, a new ORP sensor may be capable of holding its calibration for several days.

CALIBRATION TIPS

1. If using a pH/ORP combination sensor, calibrate pH first to ensure it is working.
2. If using an ORP sensor in a 6051010 or Quatro cable, calibrate the sensor in port 1 prior to calibrating the sensor in port 2. The sensor in port 2 uses the reference of the sensor installed in port 1. Therefore, it is important to verify that the port 1 sensor is working properly before calibrating the port 2 sensor. See ORP Troubleshooting Tips for additional info.
3. Rinse the sensors and cal cup with a small amount of ORP calibration solution. Fill the cup so that the ORP sensor tip and the temperature sensor are submerged in solution.
4. Enter the calibration value per the temperature reading. The value of ORP calibration solution is greatly affected by temperature. The ORP solution should include a chart of solution values per temperature. If not, contact the supplier of the ORP solution to obtain this information. The Pro Series ORP sensors use a Ag/AgCl 3.5 M KCl reference. Be sure the value you enter is for this type of reference. If using the YSI Zobell calibration solution, the Pro Plus will automatically determine the calibration value.
5. Wait for the readings to stabilize and then press enter to accept the calibration.
6. If you receive a warning message stating that the calibration is questionable, do <u>not</u> continue with the calibration. Instead, select ‘No’ and investigate what is causing the questionable results. If you accept a questionable calibration, your ORP readings will be erroneous. Typical causes for this error message include: incorrect Sensor/Port setup in the instrument, a dirty sensor or bad calibration solution.

TROUBLESHOOTING TIPS

Typical working life for ORP sensors is approximately 12-24 months depending on usage, storage and maintenance. Proper storage and maintenance generally extends the sensor’s working life.

Clean and recondition the sensor if the sensor exhibits a slow response in Zobell solution, i.e. it takes more than 90 seconds to stabilize when placed in Zobell.

If you get error messages during an ORP calibration, check the following:

1. Ensure the ORP calibration solution is good and not expired.
2. Ensure that the ORP sensor is installed in the correct port of the cable and the correct ISE is enabled in the Sensor Setup menu.
    a. If using an ORP or pH/ORP combo sensor in a 6051020 cable, ensure the sensor is installed in port 1.
    b. If using an <u>ORP sensor</u> in a 60510, 6051020 or 6051030 cable, ORP should be enabled in ISE1 of the instrument’s Sensor Setup menu.
    c. If using a <u>pH/ORP combo sensor</u> in a 60510, 6051020 or 6051030 cable, ORP should be enabled in ISE2 of the instrument’s Sensor Setup menu.
    d. If using an ORP sensor in a 6051010 or Quatro cable, check to see if the ORP sensor is installed in port 1 or port 2. If the ORP sensor is installed in port 1, enable ORP in ISE1 of the Sensor Setup menu. If the ORP sensor is installed in port 2, enable ORP in ISE2 of the Sensor Setup menu.
5. If using a pH/ORP combo sensor in a 6051010 or Quatro cable, ORP will <u>not</u> be measured or reported.
6. If using a 6051010 or Quatro cable, you must have a sensor installed in port 1 for port 2 to operate. Additionally, ensure that the sensor installed in port 1 is calibrated and in good working order. In 6051010 and Quatro cables, the sensors installed in port 1 <u>and</u> port 2 use the reference from the sensor installed in

port 1 only. Therefore, if the sensor installed in port 1 is not working properly, the readings from the sensor installed in port 2 will be erroneous.

7. If you continue to get error messages during calibration, clean and recondition the sensor per the instructions in the pH Troubleshooting section of this document. If you suspect port contamination, follow the instructions in the Cleaning a Sensor Port section before reinstalling the sensor.
8. If you continue to have problems, you can check the offset of the ORP sensor by performing a factory reset to the ORP sensor. After resetting the sensor, compare the ORP mV readings in Zobell solution to the calibration value. The difference between values should be less than 100 mVs. If the difference is 80 mVs or higher, consider replacing the sensor as it is nearing the end of its life span.

Dissolved Oxygen

The dissolved oxygen sensor should be calibrated every day the instrument is used. It is not necessary to calibrate in both % and mg/L or ppm. Calibrating in % will simultaneously calibrate mg/L and ppm and vice versa.

CALIBRATION TIPS

1. The Pro Plus can be calibrated in air-saturated water, water-saturated air or against a Winkler Titration. You can perform a 1 or 2 point DO calibration. A 2 point calibration includes 1 point in a zero oxygen environment and the 2nd point at full saturation.
2. For both ease of use and accuracy, YSI recommends that you perform a 1 point calibration in water-saturated air.
3. Make sure that there is a good membrane with fresh electrolyte (O2 probe solution) installed on the DO sensor. The membrane should be clean and free of wrinkles. There should not be any air bubbles present under the membrane. Membranes should be changed regularly and generally last 2-8 weeks depending on use and storage.
4. To perform a 1 point calibration in water-saturated air, place the sensor in a 100% humid environment. This can be accomplished several ways:
    a. For the 60520 and 6052030 cables, moisten the sponge in the gray calibration sleeve with a *small* amount of clean water and place it over the sensor guard.
    b. For the 6051020 and Quatro cables, place a small amount of water in the calibration/storage cup and place it over the sensors. When screwing the calibration cup onto the sensor bulkhead, only engage one or two threads. Do <u>not</u> screw the calibration cup completely onto the sensor bulkhead. The goal is to have air exchange between inside and outside the calibration cup.

    The sponge and calibration sleeve/cup should be clean since bacterial growth may consume oxygen and interfere with the calibration. Be sure the sensor is in air, not water, and that there are not any water droplets on the membrane or temperature sensor.
5. After entering the % calibration mode, wait approximately 5 to 15 minutes for the storage container to become completely saturated and, if using a polarographic sensor, to allow the sensor to stabilize.
6. Salinity affects the ability of water to hold oxygen and is used by the instrument to calculate DO mg/L (ppm). The Salinity value displayed near the top of the DO calibration screen is either the salinity correction value entered in the Sensor menu or the Salinity value as measured by the conductivity sensor in use. If you are using a conductivity sensor, ensure that it is calibrated and reading correctly in order to obtain accurate DO mg/L (ppm) measurements. If you are not using a conductivity sensor, the Salinity correction value should be the salinity of the water you <u>will</u> be testing. Highlight Salinity and press enter to modify this setting if necessary. The salinity of fresh water is typically 0-0.5 ppt and seawater is typically 35 ppt.
7. After accepting the calibration, navigate to the GLP menu and record the DO sensor's value (sensor current in uA). The acceptable sensor currents when calibration is performed at 25°C, in a 100% saturated air environment at 760 mmHg are:

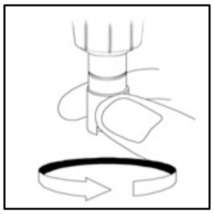
    1.25 mil PE membrane (yellow membrane): Average 6.15 uA (min. 4.31 uA, max. 8.00 uA)
    2.0 mil PE membrane (blue membrane): Average 3.38 uA (min. 2.37 uA, max. 4.40 uA)
    1 mil Teflon membrane: Average 16.29 uA (min. 11.40 uA, max. 21.18 uA)
8. If you receive a warning message stating that the calibration is questionable, do <u>not</u> continue with the calibration. Instead, select 'No' and investigate what is causing the questionable results. If you accept a questionable calibration, your DO readings will be erroneous. Typical causes of a calibration error message include: incorrect sensor, membrane or port setup in the instrument, incorrect barometric pressure information, a bad membrane or a sensor that needs reconditioned.

TROUBLESHOOTING TIPS

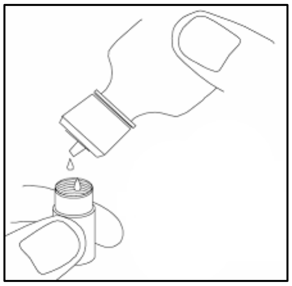
1. Ensure that the correct sensor type and membrane type are enabled in the Sensor Setup Menu. Galvanic sensors have a gray probe body and Polarographic sensors have a black probe body.
2. If using a 6051020 cable, ensure that the DO sensor is installed in port 2. If using a Quatro cable, ensure that the DO sensor is installed in the port labeled DO.
3. Ensure the Pro Plus barometer is reading accurately. The DO % Saturation calibration uses the instrument's barometric pressure reading for the DO % calibration. If the barometer is not reading accurately, the calibration will be erroneous. The barometer should be reading *true* barometric pressure. If you suspect the barometer reading is incorrect, calibrate the barometer and then recalibrate the DO sensor. Laboratory barometer readings are usually "true" (uncorrected) values of air pressure and can be used "as is" for barometer calibration. Weather service readings are usually not "true", i.e., they are corrected to sea level, and therefore cannot be used until they are "uncorrected". An approximate formula for this "uncorrection" is: True BP in mmHg = Corrected BP in mmHg – [2.5 * (Local Altitude in ft. above sea level/100)]
4. Install a new membrane with fresh electrolyte onto the DO sensor. Ensure you are using the correct electrolyte solution. Polarographic sensors use electrolyte that is in a white labeled bottle (KCl/Na_2SO_4). Galvanic sensors use electrolyte that is in a blue labeled bottle (NaCl).
5. Recondition the DO sensor and then install a new membrane.
6. If you suspect port contamination, remove the sensor and follow the instructions in the Cleaning a Sensor Port section.
7. If you continue to have trouble calibrating the DO sensor, contact your local YSI Representative or a YSI Authorized Service Center.

Membrane Cap Installation

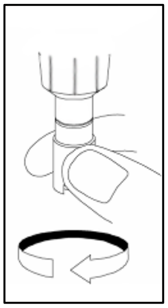
The DO membrane and electrolyte solution (O2 solution) should be changed once every 2-8 weeks depending on use and storage. In addition, the membrane and electrolyte solution should be changed if (a) bubbles are visible under the membrane; (b) significant deposits of dried electrolyte are visible on the membrane; or (c) if the sensor shows unstable readings or other sensor-related symptoms. To install a new membrane cap follow these instructions:



1. Remove the sensor guard or cal cup to access the sensor tip.
2. Unscrew and remove any old membrane cap by holding the sensor when unscrewing the membrane cap. Discard the used membrane cap.
3. Thoroughly rinse the sensor tip with distilled or DI water.

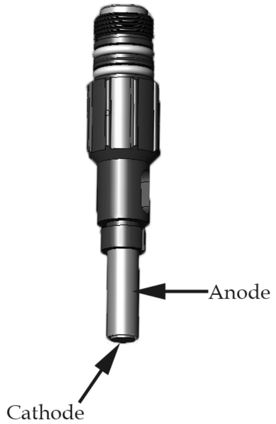


4. Fill a new membrane cap with the appropriate electrolyte solution that has been prepared according to the directions on the bottle. Polarographic sensors use electrolyte that is in a white labeled bottle (KCl/Na_2SO_4). Galvanic sensors use electrolyte that is in a blue labeled bottle (NaCl). Be very careful not to touch the membrane surface during this process. Lightly tap the side of the membrane cap to release air bubbles that may be trapped.



5. Thread the membrane cap onto the sensor. It is normal for a small amount of electrolyte to overflow.

Reconditioning the DO Sensor



Polarographic Sensors - Model # 605203

Due to the chemical reaction taking place under the membrane, deposits will form on the gold cathode and silver anode. The gold cathode will begin to appear dull and the silver anode will turn dark in color. This discoloration is normal; however, it is recommended that you remove the deposits as needed. Perform the following cleaning procedures to remove the deposits if 1.) You have troubles calibrating the sensor or the DO readings are unstable; and 2.) Changing a membrane does not correct the problem.

Silver Anode:

After extended use, a layer of Silver Chloride (AgCl) builds up on the silver anode reducing the sensitivity of the sensor. The anode must be cleaned to remove this layer and restore proper performance. The cleaning can be chemical and/or mechanical:

Chemical cleaning: Remove the membrane cap and rinse the electrodes with deionized or distilled water. Soak the sensing electrode section of the sensor in a 14% ammonium hydroxide solution for 2 to 3 minutes or in a 3% ammonia solution overnight for 8-12 hours (most household ammonia cleaners are typically around 3%). Rinse heavily in cool tap water followed by a thorough rinsing with distilled or deionized water. The anode should then be thoroughly wiped with a wet paper towel to remove the residual layer from the anode. Trapping residual ammonia under the new membrane cap can quickly tarnish the electrode and/or give false readings.

Note: Chemical cleaning should be performed as infrequently as possible (1 or 2 times per year depending on use). First attempt a membrane change and recalibrate. If a new membrane does not resolve the problem, then proceed with cleaning.

After performing a chemical cleaning, perform a mechanical cleaning on both the anode and cathode.

Mechanical cleaning: In order to sand the silver anode along the shaft of the sensor, remove the membrane and hold the sensor in a vertical position. Wet 400 grit wet/dry sand paper with a small amount of clean water then gently wrap it around the sensor anode and twist it a few times to lightly sand the anode (the goal is to sand off any build-up without scratching or removing layers of the anode itself). Usually, 3 to 4 twists of the sanding disk are sufficient to remove deposits. However, in extreme cases, more sanding may be required to remove all of the deposits.

After completing the sanding procedure, repeatedly rinse the electrode with clean water and wipe with lens cleaning tissue to remove any grit left by the sanding disk. Thoroughly rinse the entire tip of the sensor with distilled or deionized water and install a new membrane.

Gold Cathode:

For correct sensor operation, the gold cathode must be textured properly. It can become tarnished or plated with silver after extended use. Never use chemicals or abrasives not recommended or supplied by YSI.

First dry the sensor tip completely with lens cleaning tissue. Wet 400 grit wet/dry sand paper with a small amount of clean water and place it face up in the palm of your hand. Next, with your free hand, hold the sensor in a vertical position, tip down. Place the sensor tip directly down on the sanding disk and twist it in a circular motion to sand the gold cathode. The goal is to sand off any build-up and to lightly scratch the cathode to provide a larger surface area for the electrolyte solution under the membrane. Usually, 3 to 4 twists of the sanding disk are sufficient to remove deposits and for the gold to appear to have a matte finish. Rinse thoroughly and wipe the gold cathode with a wet paper towel before putting on a new membrane cap.

Note: Be sure to: (1) Only use fine 400 grit wet/dry sand paper and (2) Sand as mentioned in the above procedures. Not adhering to either of these instructions can damage the electrodes. If this procedure is unsuccessful, as indicated by improper DO sensor performance, contact your local YSI Representative or a YSI Authorized Service Center.

Galvanic Sensors – Model # 605202

The Galvanic dissolved oxygen sensor is continuously reducing oxygen even when the Pro Plus is turned off. This factor allows the sensor to be used with no warm-up time as soon as the instrument is powered on. However, because the sensor is "on" all the time, some solid from the oxidation of the zinc anode will form in the electrolyte within 1-2 weeks of activation. The Galvanic electrolyte solution will appear milky white after use but this will not affect the accuracy of the sensor unless there is excessive build up which may result in jumpy readings. Otherwise, the color change is acceptable and normal as long as DO readings remain stable. The rate of solid formation is dependent on the type of membrane installed. The formation of solids typically form more rapidly with the 5912 (black 1 mil Teflon), less rapid with 5913 (yellow 1.25 mil PE), and least rapid with 5914 (blue 2 mil PE).

When changing the membrane, rinse the anode and cathode with distilled or deionized water and wipe with a clean paper towel. If white deposits are evident on the anode after rinsing and wiping, remove the deposits by sanding the anode with 400 grit wet/dry sand paper following the "Mechanical Cleaning" instructions under the Polarographic Silver Anode maintenance section. If there are deposits on the cathode, sand the cathode with 400 grit wet/dry sand paper following the maintenance instructions listed for the Polarographic Gold Cathode.

Note: Do not perform the Polarographic chemical cleaning on a Galvanic sensor.

If this procedure is unsuccessful, as indicated by improper sensor performance, contact your local YSI Representative or a YSI Authorized Service Center.

Ammonium

The ammonium sensor should be calibrated every day the instrument is used. The ammonium sensor should only be used in fresh water (salinity < 2 ppt) and to depths of 55 feet (17 meters) of water.

Ammonia is calculated from the ammonium, temperature and pH readings. pH greatly affects the ammonia calculation. Therefore, for highest accuracy in the ammonia calculation, be sure to use a pH sensor in conjunction with an ammonium sensor during measurements. If a pH sensor is not in use, the instrument will assume the sample is neutral (pH 7) for the calculation.

CALIBRATION TIPS

1. If using an ammonium sensor with either a pH or ORP sensor on a 6051010 or Quatro cable, install the pH or ORP sensor in port 1 and the ammonium sensor in port 2.
2. If using an ammonium sensor on a 6051010 or Quatro cable, calibrate the sensor in port 1 prior to calibrating the sensor in port 2. The sensor in port 2 uses the reference of the sensor installed in port 1. Therefore, it is important to verify that the sensor in port 1 is working properly before calibrating the sensor in port 2. See ammonium Troubleshooting Tips for additional information on port configuration.
3. Exposure to the high ionic content of pH buffers can cause a significant, but temporary, drift in the ammonium sensor. Therefore, if calibrating a pH sensor, either:
    a. Remove the ammonium sensor from the cable bulkhead and plug the port. After pH calibration is complete, reinstall the ammonium sensor and proceed with its calibration with no stabilization delay.

    Or,

    b. Calibrate pH first, immersing both sensors in the pH buffers. After calibrating pH, place the sensors in 100 mg/L ammonium standard and monitor the reading. Usually, the reading starts low and may take awhile to reach a stable value. When it does, proceed with the calibration. This may take several hours.
4. The ammonium sensor can be calibrated with up to three calibration points. For highest accuracy, perform a two point calibration with 1 and 100 mg/L standards within 10°C of your sample temperature.
5. Rinse the sensors and cal cup with a small amount of ammonium solution (1 mg/L for the first point and 100 mg/L for the second point). Fill the cup so that the ammonium sensor tip and the temperature sensor are submerged in solution. If using a Quatro cable or 6051030 cable, ensure that the conductivity sensor is also submerged in the calibration solution. The salinity reading from the conductivity sensor is used in the algorithm for the ammonium measurement.
6. After entering the calibration screen, change the calibration value if necessary.
7. If not using a conductivity sensor, enter the salinity value of the calibration standard. After calibration, change the salinity correction value to the salinity value of the water you will be testing in the field in order to obtain the most accurate ammonium measurement. You can change the salinity correction value in the Sensor menu. As mentioned, the Ammonium sensor should only be used in fresh water salinity < 2 ppt). The salinity of fresh water is typically 0 to 0.5 ppt.
8. Record the NH_4 millivolts for each calibration point. The acceptable mV outputs for each calibration solution are shown below.

    NH_4 1 mg/L = 0 mV +/- 20 mV (new sensor only)
    NH_4 100 mg/L = 90 to 130 mV > 1 mg/L mV value

    - The mV span between 1 mg/L and 100 mg/L values should be ≈ 90 to 130 mV. The slope should be 45 to 65 mV per decade.
9. Wait for the ammonium and temperature readings to stabilize in each calibration solution and then press enter to accept each calibration point.
10. Rinse the sensor and cal cup between calibration points with a small amount of the next buffer.
11. After pressing enter to accept your last calibration point, press cal Cal to complete the calibration. Otherwise you will continue calibrating up to 3 calibration points.

12. If you receive a warning message stating that the calibration is questionable, do not continue with the calibration. Instead, select ‘No’ and investigate what is causing the questionable results. If you accept a questionable calibration, your ammonium and ammonia readings will be erroneous. Typical causes for this error message include: incorrect Sensor/Port setup in the instrument, a dirty sensor or bad buffer solution.

Preparing Ammonium Calibration solution

We recommend using YSI calibration solutions whenever possible. However, qualified users can save cost by following these recipes for 1 and 100 mg/L standards. Other concentrations can be made by altering the amount of ammonium chloride. All other ingredient concentrations should remain unchanged. It is important to note that some of these chemicals are hazardous and therefore, the standards should only be prepared by qualified chemists in laboratories where proper safety precautions are possible. It is the responsibility of the user to obtain and study the MSDS for each chemical and to follow the required instructions with regard to handling and disposal of these materials.

You will need: solid Ammonium Chloride or a certified 100 mg/L NH_4^+-N from a supplier, Lithium Acetate Dihydrate, concentrated hydrochloric acid, high purity water, a good quality analytical balance, a 1000 ml volumetric flask, accurate volumetric measuring devices for 100 ml and 10 ml of solution, and a 1000 ml glass or plastic storage vessels. **(Caution: Hydrochloric acid is highly corrosive and toxic and should therefore be handled with extreme care in a well-ventilated fume hood. The user could also add the equivalent amount of a less-hazardous, more dilute sample of the acid if preferred.)**

100 mg/L Standard: Accurately weigh 0.3817 g of ammonium chloride and transfer quantitatively into a 1000 ml volumetric flask. Add 2.6 g of lithium acetate dihydrate to the flask. Add approximately 500 ml of distilled or deionized water to the flask, swirl to dissolve all of the reagents and then dilute to the volumetric mark with distilled or deionized water. Mix well by repeated inversion and then transfer the 100 mg/L standard to a storage bottle. Add 3 drops of concentrated hydrochloric acid to the bottle, then seal and agitate to assure homogeneity. Alternatively, 100 ml of certified 100 mg/L NH_4^+-N standard can be used in place of the solid ammonium chloride.

1 mg/L Standard: Accurately measure 10.0 ml of the above 100 mg/L standard solution into a 1000 ml volumetric flask. Add 2.6 g of lithium acetate dihydrate to the flask. Add approximately 500 ml of distilled or deionized water, swirl to dissolve the solid reagents and then dilute to the volumetric mark with water. Mix well by repeated inversion and then transfer the 1 mg/L standard to a storage bottle. Add 3 drops of concentrated hydrochloric acid to the bottle, then seal and agitate to assure homogeneity.

TROUBLESHOOTING TIPS

Typical working life for ammonium sensors is approximately 3-6 months depending on use, storage and maintenance. Proper storage and maintenance generally extends the sensor’s working life.

If you get error messages during an ammonium calibration, check the following:

1. Ensure the ammonium solutions are good and not expired
2. Ensure that the ammonium sensor is installed in the correct port of the cable and the correct ISE is enabled in the Sensor Setup menu.
    a. If using an ammonium sensor in a 6051020 cable, ensure the sensor is installed in port 1.
    b. If using an ammonium sensor in a 60510, 6051020 or 6051030 cable, ammonium should be enabled in ISE1 in the instrument’s Sensor Setup menu.
    c. If using an ammonium sensor in a 6051010 or Quatro cable, check to see if the ammonium sensor is installed in the port 1 or port 2. If the ammonium sensor is installed in port 1, enable ammonium in ISE1 of the Sensor Setup menu. If the ammonium sensor is installed in port 2, enable ammonium in ISE2 of the Sensor Setup menu. Note: If using with a pH or ORP sensor, it is recommended to install the pH or ORP sensor in port 1 and the ammonium sensor in port 2.

3. If using a 6051010 or Quatro cable, you must have a sensor installed in port 1 for port 2 to operate. Additionally, ensure that the sensor installed in port 1 is in good working order. In 6051010 and Quatro cables, the sensors installed in port 1 and port 2 use the reference from the sensor installed in port 1 only. Therefore, if the sensor installed in port 1 is not working properly, the readings from the sensor installed in port 2 will be erroneous as well.
4. If you continue to get error messages during calibration, clean the sensor.
5. If you continue to get error messages during calibration, soak the sensor in 100 mg/L ammonium standard for several hours or overnight.
6. If you suspect port contamination, follow the instructions in the Cleaning a Sensor Port section.
7. If you continue to have trouble calibrating the ammonium sensor, contact your local YSI Representative or a YSI Authorized Service Center.

Cleaning the Ammonium Sensor

The ammonium sensor uses a PVC membrane. As always, when handling a sensor, care should be taken to avoid damaging the membrane. After extensive use, the membranes may become coated with a deposit or scoured with fine scratches which may cause a slow or reduced response (low slope) or unstable readings. Deposits may be removed with a fine jet of deionized water or rinsing in alcohol followed by soaking in 100 mg/L ammonium calibration standard.

The sensor may require soaking in the high ammonium calibration solution to recover its performance. Soak in 100 mg/L for several hours or overnight.

Nitrate

The nitrate sensor should be calibrated every day the instrument is used. The nitrate sensor should only be used in fresh water (salinity < 2 ppt) and to depths of 55 feet (17 meters) of water.

CALIBRATION TIPS

1. If using a nitrate sensor with either a pH or ORP sensor on a 6051010 or Quatro cable, install the pH or ORP sensor in port 1 and the nitrate sensor in port 2.
2. If using a nitrate sensor on a 6051010 or Quatro cable, calibrate the sensor in port 1 prior to calibrating the sensor in port 2. The sensor in port 2 uses the reference of the sensor installed in port 1. Therefore, it is important to verify that the sensor in port 1 is working properly before calibrating the sensor in port 2. See nitrate Troubleshooting Tips for additional information on port configuration.
3. Exposure to the high ionic content of pH buffers can cause a significant, but temporary, drift in the nitrate sensor. Therefore, if calibrating a pH sensor, either:
    a. Remove the nitrate sensor from the cable bulkhead and plug the port. After pH calibration is complete, reinstall the nitrate sensor and proceed with its calibration with no stabilization delay.

    Or

    b. Calibrate pH first, immersing both sensors in the pH buffers. After calibrating pH, place the sensors in 100 mg/L nitrate standard and monitor the reading. Usually, the reading starts low and may take awhile to reach a stable value. When it does, proceed with the calibration. This may take several hours.
4. The nitrate sensor can be calibrated with up to three calibration points. For highest accuracy, perform a two point calibration with 1 and 100 mg/L standards within <u>10°C of your sample temperature</u>.
5. Rinse the sensors and cal cup with a small amount of nitrate solution (1 mg/L for the first point and 100 mg/L for the second point). Fill the cup so that the nitrate sensor tip and the temperature sensor are submerged in solution. If using a Quatro cable or 6051030 cable, ensure that the conductivity sensor is also submerged in the calibration solution. The salinity reading from the conductivity sensor is used in the algorithm for the nitrate measurement.
6. After entering the calibration screen, change the calibration value if necessary.
7. If not using a conductivity sensor, enter the salinity value of the calibration standard. After calibration, change the salinity correction value to the salinity value of the water you will be testing in the field in order to obtain the most accurate nitrate measurement. You can change the salinity correction value in the Sensor menu. As mentioned, the nitrate sensor should only be used in fresh water (salinity < 2 ppt). The salinity of fresh water is typically 0 to 0.5 ppt.
8. Record the NO_3 millivolts for each calibration point. The acceptable mV outputs for each calibration solution are shown below.

    NO_3 1 mg/L = 200 mV +/- 20 mV (new sensor only)

    NO_3 100 mg/L = 90 to 130 mV < 1 mg/L mV value

    - The mV span between 1 mg/L and 100 mg/L values should be ≈ 90 to 130 mV. The slope should be -45 to -65 mV per decade.
9. Wait for the nitrate and temperature readings to stabilize in each calibration solution and then press enter to accept each calibration point.
10. Rinse the sensor and cal cup between calibration points with a small amount of the next buffer.
11. After pressing enter to accept your last calibration point, press cal Cal to complete the calibration. Otherwise you will continue calibrating up to 3 calibration points.
12. If you receive a warning message stating that the calibration is questionable, do <u>not</u> continue with the calibration. Instead, select ‘No’ and investigate what is causing the questionable results. If you accept a questionable calibration, your nitrate readings will be erroneous. Typical causes for this error message include: incorrect Sensor/Port setup in the instrument, a dirty sensor or bad buffer solution.

Preparing Nitrate Calibration Solution

We recommend using YSI calibration solutions whenever possible. However, qualified users can save cost by following these recipes for 1 and 100 mg/L nitrate standards. Other concentrations can be made by altering the amount of potassium nitrate. All other concentrations should remain unchanged. It is important to note that some of these chemicals are hazardous and therefore, the standards should only be prepared by qualified chemists in laboratories where proper safety precautions are possible. It is the responsibility of the user to obtain and study the MSDS for each chemical and to follow the required instructions with regard to handling and disposal of these materials.

You will need: Solid Potassium Nitrate or a certified 1000 mg/l NO^-_3-N from a supplier, Magnesium Sulfate, high purity water, good quality analytical balance, 1000 ml volumetric flask, accurate volumetric measuring devices for 100 ml, 10 ml and 1 ml of solution, and 1000 ml glass or plastic storage vessels.

100 mg/L standard: Accurately weigh 0.7222 g of anhydrous potassium nitrate and transfer quantitatively into a 1000 ml volumetric flask. Add 1.0 g of anhydrous magnesium sulfate to the flask. Add approximately 500 ml of water to the flask, swirl to dissolve all of the reagents, and then dilute to the volumetric mark with distilled or deionized water. Mix well by repeated inversion and then transfer the 100 mg/L standard to a storage bottle. Rinse the flask extensively with water prior to its use in the preparation of the 1 mg/l standard. Alternatively, 100 mL of certified 1000 mg/L NO^-_3-N standard can be used in place of the solid potassium nitrate.

1 mg/L standard: Accurately measure 10.0 mL of the above 100 mg/L standard solution into a 1000 mL volumetric flask. Add 1.0 g of anhydrous magnesium sulfate to the flask. Add approximately 500 mL of distilled or deionized water, swirl to dissolve the solid reagents, and then dilute to the volumetric mark with water. Mix well by repeated inversion and then transfer the 1 mg/L standard to a storage bottle.

Recipes are given for 1 and 100 mg/L. Other concentrations can be made by altering the amount of potassium nitrate. All other concentrations should remain unchanged.

TROUBLESHOOTING TIPS

Typical working life for nitrate sensors is approximately 3-6 months depending on use, storage and maintenance. Proper storage and maintenance generally extends the sensor's working life.

If you get error messages during a nitrate calibration, check the following:

1. Ensure the nitrate solutions are good and not expired
2. Ensure that the nitrate sensor is installed in the correct port of the cable and the correct ISE is enabled in the Sensor Setup menu.
   a. If using a nitrate sensor in a 6051020 cable, ensure the sensor is installed in port 1.
   b. If using a nitrate sensor in a 60510, 6051020 or 6051030 cable, nitrate should be enabled in ISE1 of the instrument's Sensor Setup menu.
   c. If using a nitrate sensor in a 6051010 or Quatro cable, check to see if the nitrate sensor is installed in port 1 or port 2. If the nitrate sensor is installed in port 1, enable nitrate in ISE1 of the Sensor Setup menu. If the nitrate sensor is installed in port 2, enable nitrate in ISE2 of the Sensor Setup menu. Note: If using with a pH or ORP sensor, it is recommended to install the pH or ORP sensor in port 1 and the nitrate sensor in port 2.
3. If using a 6051010 or Quatro cable, you must have a sensor installed in port 1 for port 2 to operate. Additionally, ensure that the sensor installed in port 1 is in good working order. In 6051010 and Quatro cables, the sensors installed in port 1 and port 2 use the reference from the sensor installed in port 1 only. Therefore, if the sensor installed in port 1 is not working properly, the readings from the sensor installed in port 2 will be erroneous as well.

4. If you continue to get error messages during calibration, clean the sensor.
5. If you continue to get error messages during calibration, soak the sensor in 100 mg/L nitrate standard for several hours or overnight.
6. If you suspect port contamination, follow the instructions in the Cleaning a Sensor Port section.
7. If you continue to have trouble calibrating the nitrate sensor, contact your local YSI Representative or a YSI Authorized Service Center.

Cleaning and Reconditioning the Nitrate Sensor

The nitrate sensor uses a PVC membrane. As always, when handling a sensor, care should be taken to avoid damaging the membrane. After extensive use the membranes may become coated with a deposit or scoured with fine scratches which may cause a slow or reduced response (low slope) or unstable readings. Deposits may be removed with a fine jet of deionized water or rinsing in alcohol followed by soaking in 100 mg/L nitrate calibration standard.

The sensor may require soaking in the high nitrate calibration solution to recover its performance. Soak in 100 mg/L for several hours or overnight.

Chloride

The chloride sensor should be calibrated every day the instrument is used. The chloride sensor should only be used in fresh water (salinity < 2 ppt) and to depths of 55 feet (17 meters) of water.

CALIBRATION TIPS

1. If using a chloride sensor with either a pH or ORP sensor on a 6051010 or Quatro cable, install the pH or ORP sensor in port 1 and the chloride sensor in port 2.
2. If using a chloride sensor on a 6051010 or Quatro cable, calibrate the sensor in port 1 prior to calibrating the sensor in port 2. The sensor in port 2 uses the reference of the sensor installed in port 1. Therefore, it is important to verify that the sensor in port 1 is working properly before calibrating the sensor in port 2. See Chloride Troubleshooting Tips for additional information on port configuration.
3. Exposure to the high ionic content of pH buffers can cause a significant, but temporary, drift in the chloride sensor. Therefore, if calibrating a pH sensor, either:
    c. Remove the chloride sensor from the cable bulkhead and plug the port. After pH calibration is complete, reinstall the chloride sensor and proceed with its calibration with no stabilization delay.

    Or,

    d. Calibrate pH first, immersing both sensors in the pH buffers. After calibrating pH, place the sensors in 1,000 mg/L chloride standard and monitor the reading. Usually, the reading starts low and may take awhile to reach a stable value. When it does, proceed with the calibration. This may take several hours.
4. The chloride sensor can be calibrated with up to three calibration points. For highest accuracy, perform a two point calibration with 10 and 1000 mg/L standards within <u>10°C of your sample temperature</u>.
5. Rinse the sensors and cal cup with a small amount of chloride solution (10 mg/L for the first point and 1,000 mg/L for the second point). Fill the cup so that the chloride sensor tip and the temperature sensor are submerged in solution. If using a Quatro cable or 6051030 cable, ensure that the conductivity sensor is also submerged in the calibration solution. The salinity reading from the conductivity sensor is used in the algorithm for the chloride measurement.
6. After entering the calibration screen, change the calibration value if necessary.
7. If not using a conductivity sensor, enter the salinity value of the calibration standard. After calibration, change the salinity correction value to the salinity value of the water you will be testing in the field in order to obtain the most accurate chloride measurement. You can change the salinity correction value in the Sensor menu. As mentioned, the chloride sensor should only be used in fresh water (salinity < 2 ppt). The salinity of fresh water is typically 0 to 0.5 ppt.
8. Record the Cl millivolts for each calibration point. The acceptable mV outputs for each calibration solution are shown below.

    Cl 10 mg/L = 225 mV +/- 20 mV (new sensor only)
    Cl 1,000 mg/L = 80 to 130 mV < 10 mg/L mV value

    - The mV span between 10 mg/L and 1000 mg/L values should be ≈ 80 to 130 mV. The slope should be -40 to -65 mV per decade.
9. Wait for the chloride and temperature readings to stabilize in each calibration solution and then press enter to accept each calibration point.
10. Rinse the sensor and cal cup between calibration points with a small amount of the next buffer.
11. After pressing enter to accept your last calibration point, press cal Cal to complete the calibration. Otherwise you will continue calibrating up to 3 calibration points.
12. If you receive a warning message stating that the calibration is questionable, do <u>not</u> continue with the calibration. Instead, select ‘No’ and investigate what is causing the questionable results. If you accept a questionable calibration, your chloride readings will be erroneous. Typical causes for this error message include: incorrect Sensor/Port setup in the instrument, a dirty sensor or bad buffer solution.

Preparing Chloride Calibration Solution

The following recipes are provided for preparation of 10 and 1000 mg/L chloride reagents.

It is important to note that some of the chemicals required for these solutions could be hazardous under some conditions. It is the responsibility of the user to obtain and study the MSDS for each chemical and to follow the required instructions with regard to handling and disposal of these chemicals.

You will need: Solid sodium chloride or a certified 1000 mg/L chloride solution from a supplier, magnesium sulfate, high purity water, a good quality analytical balance, 1000 ml volumetric flask, an accurate 10 ml measuring devices, and 1000 ml glass or plastic storage vessels.

1000 mg/L standard: Accurately weigh 1.655 grams of anhydrous sodium chloride and transfer into a 1000 ml volumetric flask. Add 0.5 grams of anhydrous magnesium sulfate to the flask. Add 500 ml of distilled or deionized water to the flask, swirl to dissolve all of the reagents, and then dilute to the volumetric mark with water. Mix well by repeated inversion and then transfer the 1000 mg/L standard to a storage bottle. Rinse the flask extensively with water prior to its use in the preparation of the 10 mg/L standard. Alternatively, simply add 0.5 grams of magnesium sulfate to a liter of a 1000 mg/L chloride standard from a certified supplier.

10 mg/L standard: Accurately measure 10 ml of the above 1000 mg/L standard solution into a 1000 ml volumetric flask. Add 0.5 grams of anhydrous magnesium sulfate to the flask. Add 500 ml of distilled or deionized water, swirl to dissolve the solid reagents, and then dilute to the volumetric mark with water. Mix well by repeated inversion and then transfer the 10 mg/L standard to a storage bottle.

TROUBLESHOOTING TIPS

Typical working life for chloride sensors is approximately 3-6 months depending on use, storage and maintenance. Proper storage and maintenance generally extends the sensor's working life.

If you get error messages during a chloride calibration, check the following:

1. Ensure the chloride solutions are good and not expired
2. Ensure that the chloride sensor is installed in the correct port of the cable and the correct ISE is enabled in the Sensor Setup menu.
    a. If using a chloride sensor in a 6051020 cable, ensure the sensor is installed in port 1.
    b. If using a chloride sensor in a 60510, 6051020 or 6051030 cable, chloride should be enabled in ISE1 of the instrument's Sensor Setup menu.
    c. If using a chloride sensor in a 6051010 or Quatro cable, check to see if the chloride sensor is installed in port 1 or port 2. If the chloride sensor is installed in port 1, enable chloride in ISE1 of the Sensor Setup menu. If the chloride sensor is installed in port 2, enable chloride in ISE2 of the Sensor Setup menu. Note: If using with a pH or ORP sensor, it is recommended to install the pH or ORP sensor in port 1 and the chloride sensor in port 2.
3. If using a 6051010 or Quatro cable, you must have a sensor installed in port 1 for port 2 to operate. Additionally, ensure that the sensor installed in port 1 is in good working order. In 6051010 and Quatro cables, the sensors installed in port 1 and port 2 use the reference from the sensor installed in port 1 only. Therefore, if the sensor installed in port 1 is not working properly, the readings from the sensor installed in port 2 will be erroneous as well.
4. If you continue to get error messages during calibration, clean the sensor.
5. If you continue to get error messages during calibration, soak the sensor in 1000 mg/L chloride standard for several hours or overnight.
6. If you suspect port contamination, follow the instructions in the Cleaning a Sensor Port section.
7. If you continue to have trouble calibrating the chloride sensor, contact your local YSI Representative or a YSI Authorized Service Center.

Cleaning and Reconditioning the Chloride Sensor

The chloride sensor is considered a pellet membrane ISE. As always, when handling sensors, care should be taken to avoid damaging the membrane. This sensor can be regenerated by washing with alcohol and/or gently polishing with fine emery paper in a circular motion to remove any deposits or discoloration, then thoroughly washing with deionized water to remove any debris.

The sensor may require soaking in the high chloride calibration solution to recover its performance. Soak in 1000 mg/L for several hours or overnight.

Installing and Uninstalling Sensors

GENERAL PRECAUTIONS

It is important that the entire sensor connector and cable connector be dry when installing, removing or replacing sensors. This will prevent water from entering the port. Once a sensor is removed, examine the connector inside the port. If any moisture is present, use compressed air to completely dry the connector or place directly in front of a steady flow of fresh air. If you suspect port contamination, follow the port cleaning procedures listed under Cleaning a Sensor Port.

Remove sensors upside down (facing the ground) to help prevent water from entering the port upon removal.

The instrument utilizes o-rings as seals to prevent water from entering the sensor ports. When the sensors are removed, the o-rings that provide the seal should be carefully inspected for contamination (e.g. debris, grit, etc.) and cleaned if necessary.

If no dirt or damage to the o-rings is evident, wipe the o-rings with a lint free cloth or lens cloth to remove the old o-ring grease. Then, lightly apply new o-ring grease (provided in the maintenance kit) to the o-rings without removing them from their groove. If there is any indication of damage, the o-ring should be replaced with an identical o-ring. At the time of o-ring replacement, the entire o-ring assembly should be cleaned.

Do not over-grease the o-rings. The purpose of the o-ring grease it to keep the o-ring in good condition. Excess grease may collect grit particles that can compromise the seal. Excess grease can also cause the waterproofing capabilities of the o-ring to diminish, potentially causing leaks. If excess grease is present, remove it using a lens cloth or lint-free cloth.

To remove the o-rings:
Use a small, flat-bladed screwdriver or similar blunt-tipped tool to remove the o-ring from its groove. Do not use a sharp object to remove the o-rings. Using a sharp object could damage the o-ring groove which would allow water to enter the port resulting in permanent damage to the port and sensor. Check the o-ring and the groove for any excess grease or contamination. If contamination is evident, clean the o-ring and nearby plastic parts with lens cleaning tissue or equivalent lint-free cloth. Alcohol can be used to clean the plastic parts, but use only water and mild detergent on the o-ring itself. Using alcohol on o-rings may cause a loss of elasticity and may promote cracking. Also, inspect the o-rings for nicks and imperfections.

Before re-installing the o-rings, make sure to use a clean workspace, clean hands, and avoid contact with anything that may leave fibers on the o-ring or grooves. Even a very small amount of contamination (hair, grit, etc.) may cause a leak.

To re-install the o-rings:
Place a small amount of o-ring grease between your thumb and index finger. Draw the o-ring through the grease while pressing the fingers together to place a very light covering of grease to the o-ring. Place the o-ring into its groove making sure that it does not twist or roll. Do no excessively stretch the o-ring during installation.

Use your grease-coated finger to once again lightly go over the mating surface of the o-ring.

Do not over-grease the o-rings. The excess grease may collect grit particles that can compromise the seal. Excess grease can also cause the waterproofing capabilities of the o-ring to diminish, potentially causing leaks. If excess grease is present, remove it using a lens cloth or lint-free cloth.

UNINSTALLING DO, PH, ORP, PH/ORP AND ISE SENSORS

First, ensure that the entire sensor and cable bulkhead are clean and dry. Remove sensors upside down (facing the ground) to help prevent water from entering the port upon removal.

Simply unscrew the sensor from the cable by holding the sensor port end of the cable (bulkhead) in one hand and the sensor in the other hand. Twist the sensor counter-clockwise to unscrew the sensor from the port.

INSTALLING DO, PH, ORP, PH/ORP AND ISE SENSORS

First, ensure both the sensor connector and sensor port on the cable are clean and dry. If any moisture is present, use compressed air to completely dry the connector or place directly in front of a steady flow of fresh air. If you suspect port contamination, follow the port cleaning procedures listed under Cleaning a Sensor Port.

To connect the sensor, grasp the sensor with one hand and the sensor port end of the cable (bulkhead) in the other. Push the sensor into the connector on the cable until it is properly seated and only one o-ring is visible. Failure to properly seat the sensor may result in damage. Twist the sensor clockwise to engage threads and finger tighten. Do not use a tool. This connection is waterproof. Please refer to the sensor installation sheet that is included with each sensor for detailed instructions.

UNINSTALLING A CONDUCTIVITY/TEMPERATURE SENSOR IN A QUATRO CABLE

First, ensure that the entire sensor and cable bulkhead are clean and dry. Remove sensors upside down (facing the ground) to help prevent water from entering the port upon removal.

Remove the conductivity/temperature sensor using the installation tool to loosen the stainless steel retaining nut. Insert the tool into one of the holes in the stainless steel retaining nut. Next, use the installation tool to turn the stainless steel retaining nut counter-clockwise to loosen. Do not allow the sensor to be turned with the tool. Turning the sensor with the tool will likely damage the sensor connector. Once the stainless steel retaining nut has been completely loosened from the bulkhead, remove the sensor from the bulkhead by pulling the sensor straight out of the port.

INSTALLING A CONDUCTIVITY/TEMPERATURE SENSOR IN A QUATRO CABLE

First, ensure both the sensor connector and sensor port on the cable are clean and dry. If any moisture is present, use compressed air to completely dry the connector or place directly in front of a steady flow of fresh air. If you suspect port contamination, follow the port cleaning procedures listed under Cleaning a Sensor Port.

1. Align the connectors of the sensor and the port. With connectors aligned, push the sensor in towards the bulkhead until you feel the sensor seat in its port. You will experience some resistance as you push the sensor inward, this is normal
2. Once you feel the sensor seat into the port, gently rotate the stainless steel sensor nut clockwise with your fingers, do not use the tool.
3. The nut must be screwed in by hand. If the nut is difficult to turn, STOP, as this may indicate cross threading. If you feel resistance or cross threading at any point, unscrew the nut and try again until you are able to screw the nut down completely without feeling any resistance. Damage to your cable/sensor may occur if you force the parts together.
4. Once completely installed, the nut will seat flat against the bulkhead. At this point, use the installation tool that was included with the sensor to turn the nut an additional ¼ to ½ turn. Do not over tighten.
5. Please refer to the sensor installation sheet that is included with the conductivity/temperature sensor for detailed instructions.

Cleaning a Sensor Port

If you suspect port contamination, you can clean the port on the cable by filling the port with Isopropyl Alcohol for 30 seconds and then dumping it out. Next, allow the port to air dry completely or blow it out with compressed air. Installing a sensor into a port that is not completely dry is likely to cause erratic and erroneous readings.

If the connector is corroded, contact your local YSI Representative or a YSI Authorized Service Center.

Verifying Sensor Accuracy and Calibration

Sensor accuracy and calibration can be verified by immersing a sensor into calibration solution or YSI Confidence Solution®. Compare the readings on the Pro Plus display to the value of the solution. If the readings have drifted more than the accuracy specification of the sensor, perform a calibration before taking field measurements.

YSI Confidence Solution can be used to check the accuracy and calibration of the conductivity, pH and ORP sensors. However, to maintain the highest accuracy of the instrument, it should <u>not</u> be used to perform a calibration.

Resetting a Sensor to Factory Default

Occasionally, it may be necessary to reset the instrument to its factory calibration default values. To reset the calibration values, press the Cal key Cal, highlight **Restore Default Cal** and press enter. Highlight the parameter you wish to reset to default and press enter. Next, you will be asked to confirm the operation. Highlight **Yes** and press enter to confirm.

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