

Quality Assurance Project Plan

For Groundwater Monitoring By The

East San Joaquin Water Quality Coalition

In Compliance With The

*Central Vally Groundwater Monitoring Collaborative
QAPrP*

**For The
Irrigated Lands Regulatory Program**

Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, California 95670-6114

Submitted On

April 1, 2019

Prepared By:



GROUP A. PROJECT MANAGEMENT

INTRODUCTION

Each of the participating CVGMC agricultural Coalitions must meet their own groundwater monitoring requirements, outlined in their individual General Orders. The role of the CVGMC is to establish common monitoring and reporting structure as it applies to the individual groundwater trend monitoring requirements established by each third-party group under their individual General Orders. The third-party groups will participate in a regional effort to collect and share groundwater monitoring data to be used for a broad geographical characterization of the potential effects of agricultural lands on groundwater aquifers, for and regulatory compliance and decision making throughout the Central Valley.

The Quality Assurance Program Plan (QAPrP) establishes the quality assurance and quality control standards and requirements for useable data for individual projects contributing to this regional collaboration. It also establishes the structure and requirements for a regional data management system, through which all useable data generated under the CVGMC can be stored and accessed by the participants and regulators.

In addition to the programmatic requirements address in the CVGMC QAPrP, the East San Joaquin Water quality Coalition (ESJWQC) will adhere to the following project-specific requirements established in this QAPP.

3. DISTRIBUTION LIST

Table 1. Project Personnel.

Title	Name	Organizational Affiliation	Contact Information (Telephone number, fax number, email address.)
Project Lead	Parry Klassen	ESJWQC	(209) 846-6112 klassenparry@gmail.com
Project Manager	Ally Villalpando	MLJ Environmental	(530) 756-5200 avillalpando@mljenvironmental
Project QA Officer	Lisa McCrink	MLJ Environmental	(530) 756-5200 lmccrink@mljenvironmental
Project Field Lead	Anthony Brillante	MLJ Environmental	(530) 756-5200 abrillante@mljenvironmental.com
Contract Laboratory Project Manager	Eli Greenwald	Caltest Laboraories	(707) 258-4000 eli_greenwald@caltestlabs.com
Contract Laboratory QA Officer	Nell Arguelles	Caltest Laboraories	(707) 258-4000 nell_arguelles@caltestlabs.com

4. PROJECT ROLES AND RESPONSIBILITIES

Project Lead Role

The Project Lead will oversee the project specific groundwater monitoring program and budget. The Project Lead will work with the Project Manager to ensure all protocols as outlined in this QAPP are followed. The Project Lead will be informed regarding any deviations from protocols and/or analytical issues. The Project Lead is responsible for ensuring that the Groundwater Quality Trend Monitoring (GQTM) Workplan is implemented and any deviations to the Workplan are documented.

Project Manager Role

The Project Manager facilitates the implementation of the GQTM Workplan under the guidance of the Project Lead. The Project Manager is responsible for the the coordination of well sampling, laboratory analysis and data reporting. Prior to monitoring, the Project Manager is responsible for ensuring that all parties involved with collecting and analyzing groundwater samples are aware of both field and laboratory roles and responsibilities. The Project Manager is responsible for ensuring communication with Laboratory and Project QA Officers to resolve analytical issues and maintain communication between all parties in regard to laboratory and/or sampling changes.

Project Quality Assurance Officer Role

The Project QA Officer is responsible for establishing QA/QC guidelines for field sampling and analytical procedures conducted as part of the GQTM Workplan. The Project QA Officer will oversee and manage the assessment of accuracy, completeness, and precision for samples collected as part of the GQTM and ensure that project QA/QC guidelines adhere to the QA/QC guidelines set forth in the CVGMC QAPrP.

Project Field Lead

The Project Field Lead is responsible for performing the sample collection and field measurement activities. The Project Field Lead is also responsible for all communications with the analytical laboratory regarding sample shipment, schedule and ensuring that COCs and Field Sheets are completed accurately.

Persons Responsible for the Update and Maintenance of QAPP

The Project QA Officer in coordination with the Project Lead will be responsible for creating, maintaining and updating the QAPP template. The Project QA Officer will be responsible for making changes and submitting the final version to the CVGMC and individuals identified in Section 3 of the QAPP for signature.

5. PROBLEM DEFINITION/BACKGROUND

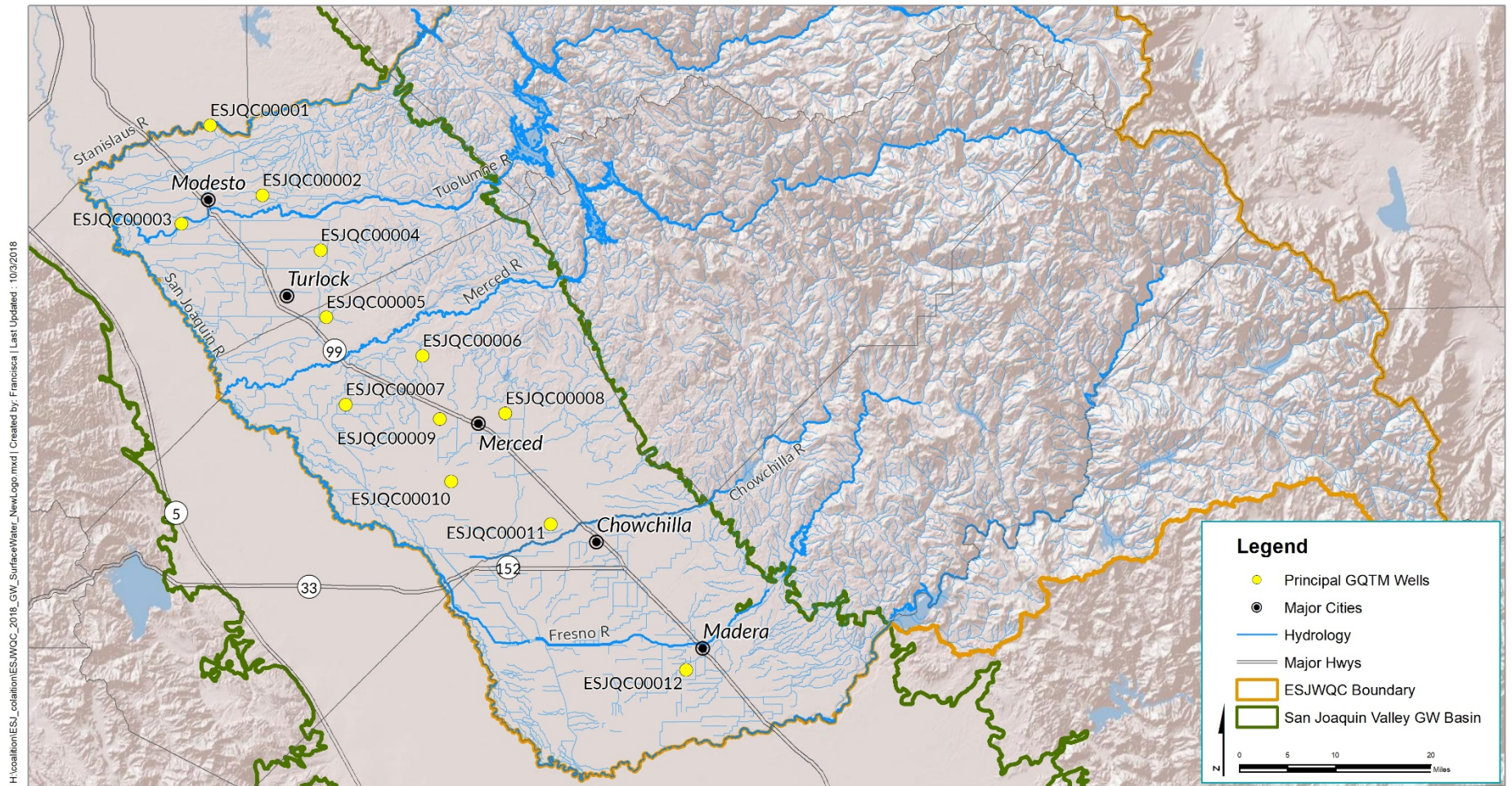
This QAPP includes project-specific information pertaining to the groundwater monitoring to be performed by the ESJWQC as described within the GQTM Workplan submitted on March 1, 2018. The Coalition is a member of the CVGMC and has developed a GQTM Workplan and QAPP in adherence with the CVGMC Technical Workplan and Programmatic QAPP (QAPrP) submitted to the Central Valley Regional Water Quality Control Board on May 16, 2018.

6. PROJECT DESCRIPTION

6.1. Geographical Setting

The Coalition has developed its own network of wells for groundwater quality trend monitoring as described in the GQTM Workplan. These networks include wells spatially distributed across high and low vulnerability areas the Coalition region in accordance with Coalition-specified prioritization criteria. This well network will be monitored and incorporated into the CVGMC network for regional analysis and reporting.

Figure 1. Map of ESJWQC well network.



ESJWQC Groundwater Quality Trend Monitoring Well Network

ESJWQC

Coordinate System: NAD 1983 StatePlane California II FIPS 0403 Feet
 Projection: prproj=hammer, Conformal Conic
 Units: Foot US
 Service Layer Credits: Shaded Relief: Copyright: 2014 Esri
 Hydrology: NHD Hydrodata, 1:24,000-scale, http://nhd.usgs.gov/
 Roads: highways, railroads: ESRI



7. PROJECT QUALITY OBJECTIVES

7.1. Data Quality Indicators

The minimum requirements for Data Quality Indicators (DQIs) (precision, accuracy, comparability, completeness, representativeness and sensitivity) are addressed in the CVGMC QAPrP. Project specific measurement quality objectives (MQOs) are included in **Section 14** are established to ensure that the Coalition is meeting the minimum requirements as outlined in the QAPrP.

8. SPECIAL TRAINING/CERTIFICATION

8.1. Specialized Training or Certifications

The Project Lead is responsible for ensuring that all field crews receive proper training and certifications as outlined in the QAPrP. The Contract Laboratory Project Manager is responsible for ensuring that all laboratory staff maintain current training in all relevant aspects of their role in the sample processing and data generation. Training records must be maintained and available upon request.

Table 2. Specialized training or certifications.

Specialized Training	Description of Training	Training Provider	Personnel Receiving Training	Location of Records & Certificates
Field Sampling	Procedures and techniques for collecting groundwater samples.	MLJ Environmental	All sampling personnel	MLJ Environmental Offices
Field and Office Safety	Overview of safety concerns and procedures for field sampling and office work.	MLJ Environmental	All sampling personnel	MLJ Environmental Offices

9. PROJECT DOCUMENTATION

Copies of this QAPP will be distributed to all personnel and/parties involved in the project as outlined in the distribution list. If the Coalition's GQTM and associated QAPP requires the analysis of a constituent not already included in this QAPrP, a method not already identified, or proposes different DQOs that are less stringent than those listed, an amendment form must be submitted to the Program QA Officer for review once the GQTM is approved. The Coalition's GQTM does not require an amendment to the QAPrP.

This Coalition's QAPP Appendix Form includes project-specific information for the following sections:

10. Sampling Process and Design, 11. Sampling Methods, 12. Sample Handling and Custody, 13. Analytical Methods, 14. Quality Control, 15. Instrument/Equipment Testing, Inspection and Maintenance, 16. Instrument/Equipment Calibration and Frequency, 17. Inspection/Acceptance of Supplies and Consumables.

Field Sheets

The Coalition's field sheet is included in **Figure 2**. At a minimum field sheets must include the following:

- Project name
- Site name
- Site code
- Physical address of property on which well is situated
- State well number (if available)
- Sampling personnel
- GPS coordinates taken with each sampling event
- Sample type
- QC sample type
- Date and time of sample collection
- Results of field measurements
- Depth to standing water (static water level)
- Sampling conditions
- Constituents sampled
- Sample container
- Sample preservation

Chain of Custody

The Coalition's Chain of Custody (COC) form is included in **Figure 3**. At a minimum COC forms must include the following:

- Collection agency name and contact information
- Receipt agency name and contact information
- Sample Identification
- Date and time of sample collection
- Analyses requested
- Sample container type
- Number of sample containers
- Preservation
- Relinquished by name(s)
- Relinquished by date(s)
- Relinquished by signature(s)
- Received by name(s)
- Received by date(s)
- Received by signature(s)

Figure 2. ESJWQC field sheet.

[illegible]

Figure 3. ESJWQC Chain of Custody form.



MLJ
ENVIRONMENTAL

Caltest CHAIN-OF-CUSTODY RECORD

Client Name: MLJ-LLC Address: 1480 Drew Ave. Suite #130, Davis, CA 95618 Sampled By: _____ Phone: (530) 756-5200 Fax: (530) 756-5225 Project Manager: Michael Johnson Project Name: East San Joaquin Water Quality Coalition						Total Alkalinity as CaCO3 (SM 2320B) Total Dissolved Solids (SM2540C) Chloride, Sulfate SO4 (EPA 300) Boron, Calcium, Magnesium, Sodium, Potassium Nitrate as N (EPA300) Field pH					
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Sample Identification	Field Point Name	Global ID	Sample Date	Sample Time	Number	Type	Total Alkalinity as CaCO3 (SM 2320B)	Total Dissolved Solids (SM2540C)	Chloride, Sulfate SO4 (EPA 300)	Boron, Calcium, Magnesium, Sodium, Potassium	Nitrate as N (EPA300)	Field pH	LAB ID
1					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
2					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
3					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
4					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
5					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
6					1	500-ml Poly							
					1	500-ml Poly							
					1	500-ml Poly							
7					1	500-ml Poly							
					1	500-ml Poly							

Comments: Please fax signed and completed COC to MLJ LLC: (530) 756-5225, or email to abrillante@mlj-llc.com If samples are collected for individual monitoring please write the individual Global ID in the sample comments. Temperature at Log In: (°C)	Relinquished By		Relinquished By	
	Signature		Signature	
	Print Name		Print Name	
	Organization		Organization	
	Date Time		Date Time	
	Received By		Received By	
	Signature		Signature	
	Print Name		Print Name	
	Organization		Organization	
	Date Time		Date Time	

Sample Matrix:
 ☐ Sediment
 ☐ Freshwater
 ☐ Wastewater
 ☐ Stormwater
 ☒ Groundwater

Full; pg ____ of ____

GROUP B. DATA GENERATION AND ACQUISITION

10. SAMPLING DESIGN

For purposes of characterizing the relatively shallower part of the groundwater system, the CVGMC emphasizes monitoring in the Upper Zone within the upper part of the groundwater system. Wells selected for trend monitoring will be sampled and tested at an annual frequency for water quality parameters including nitrate as nitrogen (as N), electrical conductivity at 25 °C (EC), pH, dissolved oxygen (DO), and temperature. Electrical conductivity, pH, DO, and temperature will be measured in the field whereas nitrate concentration will be analyzed by a certified laboratory. In most Coalition regions, public water supply wells represent additional ongoing monitoring wells that are regularly tested. Public water supply wells and any associated external sampling agencies are identified in **Table 4**. Non-direct measurements and analytical data collected by external agencies are processed according to Section 18 of the QAPrP. During the first monitoring event, wells selected for inclusion in the CVGMC GQTM will be sampled and tested for additional water quality constituents, including total dissolved solids (TDS), major anions (carbonate, bicarbonate, chloride, sulfate), and major cations (boron, calcium, sodium, magnesium, potassium). Wells will be tested for these additional constituents every 5 years.

Sample collection will occur during the seasonal window specified in the Workplan. Seasonal sampling reduces variability in groundwater aquifers across the wet and irrigation seasons. Attempts will be made to sample every well within the network during this time. Inaccessible wells should be re-sampled whenever possible. If inaccessibility is permanent or resampling cannot occur during the specified sampling period, then the well may need to be removed from the well network. The Project Manager and Project Lead must be notified so that a suitable replacement well can be located and submitted to Regional Board staff for approval.

All samples collected will be submitted to the contract laboratory with enough time for analysis to occur within the holding times prescribed in **Table 5**. Sample submittals shall occur according to the procedures outlined in the Field Sampling SOP.

Table 3. Well information.

GQTM Well Name	Well ID	GeoTracker Global ID	State Well Number	Well Completion Report Number	Well Type	Well Depth	Well Depth Unit	Year Drilled	Latitude	Longitude	Datum
P01_2a_McHenry	ESJQC00001	AGC100012331		190887	Domestic	135	Feet	1987	37.7522	-120.994	NAD83
P02_1b_Root	ESJQC00002	AGC100012331		290694	Domestic	180	Feet	1988	37.6467	-120.894	NAD83
P03_1q_Vivian	ESJQC00003	AGC100012331		64838	Domestic	105	Feet	1987	37.6031	-121.048	NAD83
P04_1e_Swanson	ESJQC00004	AGC100012331		22701	Domestic	136	Feet	1977	37.5641	-120.783	NAD83
P05_2f_Harding	ESJQC00005	AGC100012331		81-152-D	Domestic	180	Feet	1981	37.4629	-120.772	NAD83
P06_3g_Eucalyptus	ESJQC00006	AGC100012331		465203	Domestic	236	Feet	1993	37.4048	-120.589	NAD83
P07_2g_Atwater	ESJQC00007	AGC100012331	07S11E14	803853	Domestic	230	Feet	2003	37.3308	-120.735	NAD83
P08_1k_East	ESJQC00008	AGC100012331		359701	Domestic	180	Feet	1990	37.3178	-120.432	NAD83
P09_2h_Rodgers	ESJQC00009	AGC100012331		334471	Domestic	180	Feet	1989	37.3092	-120.556	NAD83
P10_2j_Rahilly	ESJQC00010	AGC100012331		Not Found	Domestic	180	Feet	1965	37.2144	-120.535	NAD83
P11_3y_Road11	ESJQC00011	AGC100012331		Not Found	Domestic				37.1497	-120.347	NAD83
P12_1p_Road25	ESJQC00012	AGC100012331		242495	Domestic	276	Feet	1985	36.9287	-120.092	NAD83

Table 4. Well ownership type and sampling agency.

GQTM Well Name	Well ID	Owner Type	Sampling Agency	Sampling SOP
P01_2a_McHenry	ESJQC00001	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P02_1b_Root	ESJQC00002	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P03_1q_Vivian	ESJQC00003	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P04_1e_Swanson	ESJQC00004	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P05_2f_Harding	ESJQC00005	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P06_3g_Eucalyptus	ESJQC00006	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P07_2g_Atwater	ESJQC00007	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P08_1k_East	ESJQC00008	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P09_2h_Rodgers	ESJQC00009	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P10_2j_Rahilly	ESJQC00010	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P11_3y_Road11	ESJQC00011	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling
P12_1p_Road25	ESJQC00012	Member	MLJ Environmental	Standard Operating Procedures for Groundwater Sampling

11. SAMPLING METHODS

All samples will be collected according to the attached Standard Operating Procedures for Groundwater Sampling which includes instructions for collecting samples and cleaning equipment between samples. The field SOP meets the minimal sampling method requirements as described in the QAPrP including details regarding field meter calibration, sampling and purging details. By following the field sampling SOP, samples will be void of contamination, representative of the groundwater, and reproducible.

Any deviation from the written SOP requires notification of the Project QA Officer. All deviation or problems will be noted both on the field sheet and corrective actions should be determined by the Project QA Officer. Deviations will also be reviewed by the CVGMC Program QA Officer to determine acceptability of data.

12. SAMPLE HANDLING AND CUSTODY

All sample containers should be clearly labeled with sample ID, collection date and time, collector, and requested analyses. Chain of Custody forms will be completed and remain with samples during transport to the laboratory as described in the QAPrP. All samples will meet the requirements for sampling containers, holding time, and sample custody outlined in **Table 5** below. Holding times refer to the maximum time limit at which a laboratory must analyze a sample for the constituent listed.

13. ANALYTICAL METHODS

The Project QA Officer should be in communication with the Laboratory Project Manager to resolve analytical issues, when they arise. It is the responsibility of the Project QA Officer to determine the most appropriate course of action to resolve any problems and/or accept data. All corrective actions should be reported in the annual reports.

Table 5. Sample handling and analytical information.

Constituent	Lab- oratory	Analytical Method	Matrix	Fraction	Sample Volume	Sample Container	Preparation	Preservative	Maximum Hold Time	Method Detection Limit (MDL)	Reporting Limit (RL)	Reporting Unit
Field Parameters												
Dissolved Oxygen (DO)	MLJ	SM 4500-O	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	0.01	mg/L
Electrical Conductivity (EC) at 25 °C	MLJ	EPA 120.1	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	2.5	µS/cm
pH	MLJ	EPA 150.1	Groundwater	Unfiltered	NA	NA	None	None	15 minutes	NA	0.1	pH units
Temperature	MLJ	SM 2550	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	0.1	°C
Depth to standing water (static water level)	MLJ	NA	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	NA	ft
Oxidation-reduction potential (ORP)	MLJ	NA	Groundwater	Unfiltered	NA	NA	None	None	NA	NA	NA	mV
Turbidity	MLJ	EPA 180.1	Groundwater	Unfiltered	10 mL	NA	None	None	NA	NA	1	NTU
Nutrients												
Nitrate + Nitrite as N	Caltest	EPA 353.2	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	H2SO4	28 days	0.07	0.1	mg/L (as N)
Anions												
Bicarbonate	Caltest	SM 2320B	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	14 days	1.2	10	mg/L
Carbonate	Caltest	SM 2320B	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	14 days	1.2	10	mg/L
Chloride	Caltest	EPA 300.0	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	28 days	0.2	1	mg/L
Sulfate (SO4)	Caltest	EPA 300.0	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	28 days	0.1	0.5	mg/L
Cations												
Boron	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.002	.01	mg/L
Calcium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Magnesium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.005	0.05	mg/L
Potassium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Sodium	Caltest	EPA 200.8	Groundwater	Unfiltered*	500 mL	Polyethylene	Field Acidified	HNO3	6 months	0.02	0.05	mg/L
Solids												
Total Dissolved Solids (TDS)	Caltest	SM 2540 C	Groundwater	Unfiltered*	500 mL	Polyethylene	None	None	7 days	4	10	mg/L

*Samples with a final turbidity measurement > 10 NTU will be filtered in the field.

14. QUALITY CONTROL

Field Quality Control

Field QC results must adhere to the limits of error and frequency requirements detailed in **Table 6**. Field QC frequencies are calculated to ensure that a minimum of 5% of all analyses are for QC purposes (both field duplicate and field blanks).

Table 6. Field Sampling QC.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Field Duplicate	5% annual total	RPD $\leq$ 25%	Determine cause, take appropriate corrective action.
Field Blank	5% annual total	Detectable substance contamination <RL or < sample/5	Determine cause of problem, remove sources of contamination.

Analytical Quality Control

Analytical QC results must adhere to the minimum limits of error and frequency requirements detailed in **Table 7**. All analytical QCs must be analyzed at a frequency of 1 every 20 samples, minimum of 1 per batch.

Table 7. Analytical measurement quality objectives.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Nutrients			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	90-110%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Anions			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.

Sample Type	Frequency	Acceptable Limits	Corrective Action
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Cations			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Matrix Spike*	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	75-125%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Total Dissolved Solids			
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD < 25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.

*For the purposes of this project it is acceptable for the matrix spike duplicate or the laboratory control duplicate to stand in for the lab duplicate as a measure of the precision of the analytical method.

Precision will be assessed through a combination of field duplicate samples and laboratory duplicate samples utilizing the formulas described in the QAPrP. Accuracy is assessed using either an LCS or MS using the formulas described in the QAPrP. Corrective actions shall occur as described in the QAPrP including communication between the laboratory, Project Lead, and Project QA Officer to discuss additional corrective actions on a case by case basis. Field crews and contract laboratories are responsible for responding to failures in their measurement systems. If sampling or analytical equipment fails, personnel must record the problem according to their documentation protocols.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field equipment and laboratory instruments must be inspected, repaired and maintained as described in the QAPrP. Records of maintenance will be available to the CVGMC Program Manager upon request.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field calibration procedures will follow manufacturer specifications for the equipment used and are outlined within the attached Standard Operating Procedures for Groundwater Sampling. Records of field equipment calibration should be maintained for each instrument. These records will be available to the CVGMC Program Managers upon request. Calibration of laboratory instruments will be documented in the Quality Assurance Manual for each laboratory which will be available to the CVGMC Program Manager upon request.

Table 8. Instrument/Equipment Testing, Inspection, and Maintenance.

Equipment / Instrument	Maintenance Activity, Testing Activity or Inspection Activity	Frequency	Responsible Person
YSI Pro Plus - Glass Electrode pH Sensor	Clean glass bulb and visually inspect	<24 hours before sampling	Field Lead
YSI Pro Plus - Polarographic DO Sensor	Change membrane and KCl solution	Every 30 days	Field Lead
YSI Pro Plus - Electrode Cell EC and Thermistor Temperature Probe	Clean electrodes	<24 hours before sampling	Field Lead
YSI Pro Plus - Platinum Band ORP Sensor	Clean sensor	<24 hours before sampling	Field Lead
Hanna Instruments Portable Turbidimeter	Battery check; visually inspect and clean samples cuvetts	<24 hours before sampling	Field Lead
DGSI Water Level Indicator	Clean cable and check batteries.	<24 hours before sampling	Field Lead
SEAL AQ2 Discrete Analyzer	Clean cells, check all tubing, regenerate cadmium coil	According to manufacturer specifications	Lab QA Officer
Man-Sci Titrasip	Clean titration cup, check tubing	According to manufacturer specifications	Lab QA Officer
Ion Chromatograph (DX 320)	Clean column, check bed supports, replace regenerant, replace suppressor	According to manufacturer specifications	Lab QA Officer
ICP-MS	Check pump tubing, check pump oil, clean cones, clean torch, replace nebulizer, replace torch	According to manufacturer specifications	Lab QA Officer
Balance	Clean pan and check if level, check range of mass used	According to manufacturer specifications	Lab QA Officer

Table 9. Instrument/Equipment Calibration and Frequency.

Equipment / Instrument	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
YSI Pro Plus - Glass Electrode pH Sensor	3 Point calibration at pH 4, 7, and 10; calibration must be accepted by YSI meter	Daily before first measurement	Field Lead
YSI Pro Plus - Polarographic DO Sensor	H2O Saturated air calibration (%O2) at default 760mm Hg	Before each measurement	Field Lead
YSI Pro Plus - Electrode Cell EC and Thermistor Temperature Probe	Calibration to 1413 $\mu\text{S}/\text{cm}$; calibration must be accepted by YSI meter. Temperature calibration is factory set and does not require user calibration	Daily before first measurement and when EC changes substantially between wells	Field Lead
YSI Pro Plus - Platinum Band ORP Sensor	Calibration using ZoBell solution to proper value based on temperature	Daily before first measurement	Field Lead
Hanna Instruments Portable Turbidimeter	2 point calibration at < 0.10 and 15 NTUs	<24 hours before sampling event	Field Lead
SEAL AQ2 Discrete Analyzer	Linear, $r \geq 0.995$	Daily, before analysis	Lab QA Officer
Man-Sci Titrasip	pH calibration before use,	Daily, before analysis	Lab QA Officer
Ion Chromatograph (DX 320)	Mixed-standard curve calibration, $r \geq 0.995$	Daily, before analysis	Lab QA Officer
ICP-MS	Three calibration standards per linear range, MDL determination, ICV, CCV	When analyst observes calibration is necessary, MDL determined annually, ICV immediately after calibration, CCV after every 10 samples and at end of sample run	Lab QA Officer
Balance	Mass within 0.5%	Daily, before analysis	Lab QA Officer

17. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Acceptance criteria for supplies and consumables are outlined in the Laboratory Quality Assurance Manual and field sampling SOPs. Laboratory personnel and field crews are responsible for ensuring that all supplies and consumables meet these criteria prior to analysis of sample collection. Inspecting and testing records will be maintained by the laboratories and field crews, and available to Program Managers on request.

Table 10. Inspection/Acceptance of Supplies and Consumables.

Consumable	Acceptance Criteria	Frequency	Responsible Person
pH standard calibrating solutions (Fisher Scientific)	Manufacturer's seal intact, measurements within ± 0.2 of prior standard measurement	Upon opening a fresh standard solution	Field Lead
EC standard calibrating solutions (Fisher Scientific)	Manufacturer's seal intact, measurements within $\pm 0.5\%$ or $1\mu\text{S}/\text{cm}$ of prior standard measurement	Upon opening a fresh standard solution	Field Lead
Certified pre-cleaned bottles (from laboratory)	Bottles and caps intact	At receipt date of shipment	Field Lead
Pre-preserved containers (from laboratory)	Proper preservative volume present, bottles and caps intact	At receipt date of shipment	Field Lead
Nitrile Gloves (Fisher Scientific)	Carton is intact and gloves within are clean and intact	At receipt date of shipment	Field Lead

18. NON-DIRECT MEASUREMENTS (EXISTING DATA)

Review and assembly of data collected by other entities will follow the procedures described in the QAPrP.

19. DATA MANAGEMENT

The CVGMC will use a coordinated data management system that will be centrally maintained for the purpose of implementing the CVGMC. A coordinated data management system (DMS) will be used to facilitate analyses and reporting of regional groundwater quality data across the CVGMC area and submittal of CVGMC data; the DMS is described in the QAPrP. The Data Management SOP for the CVGMC DMS will be submitted as an amendment to the QAPrP.

GROUP C. ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS & RESPONSE ACTIONS

All reviews of QA data will be made by the Project QA Officer including an assessment of precision, accuracy and completeness as outlined in the Data Management SOP. Reviews may include the Program QA Officer, if necessary. Contract laboratories are responsible for self-assessment and oversight of finalized data submitted in laboratory reports and GeoTracker files, although data are audited for compliance as part of the Coalition's QA/QC program. The Project QA Officer is responsible for ensuring that all data that do not meet the established MQOs are flagged.

If a discrepancy is discovered during the review, the Project QA office will discuss the discrepancy with the personnel responsible for the activity. The discussion will include the accuracy of the information, potentials cause(s) leading to the deviation, how the deviation might impact data quality and the corrective actions that might be considered. If discrepancies are observed, the details of the discrepancy and any corrective action will be reported in the final monitoring report. The Project QA Officer will be responsible for addressing all corrective actions.

21. REPORTS TO MANAGEMENT

Personnel involved in project tasks may encounter unforeseen issues/concerns at any time. It is important that staff report issues/concerns to managers when they are identified. Managers are responsible for project resolutions. If the resolution requires changes to approved documents, the CVRQWCB will be contacted and the appropriate actions will be taken to have changes approved.

GROUP D. DATA VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

The Project QA Officer will review data collected as part of the GQTM according to the data quality objectives and QA/QC practices outlined in the CVGMC Data Management SOP. The decision to accept or reject the data will be based on an assessment of the impact of the data quality failure. Data collected by other monitoring agencies will go through a more general review as stated within **Section 18**.

23. VERIFICATION AND VALIDATION METHODS

The Project's QA Officer or a delegate of the QA Officer will do all reviews of 100% of the reports as outlined in the Data Management SOP. Each contract laboratory's QA Officer will perform checks of all of its records at a frequency that the lab determines sufficient.

24. RECONCILIATION WITH USER REQUIREMENTS

Procedures to review, verify and validate project data is included in the Data Management SOP. The Program Quality Objectives section describes the role of the DQO process and identifies the program's objectives. Reconciliation with the DQOs involves reviewing the data to determine whether the DQOs have been attained and that the data are adequate for their intended use. At the project level, reconciliation occurs during the data quality assessment.

Limitations in data use will be reported to the CVRWQCB in the Annual Reports and CVGMC Five-Year Assessment Reports.

ADDITIONAL REQUIRED DOCUMENTS

The following attached documents are associated with this project.

Table 11. Standard Operating Procedures

Responsible Agency	Method	SOP Title	Revision	Revision Date
MLJ	NA	Standard Operating Procedures for Groundwater Sampling	2.0	Mar-19
Caltest	EPA Method 353.2 / SM 4500NO3F	Nitrate + Nitrite as N	W-NNO3-rev9a	Sep-17
Caltest	SM 2540 C & E / EPA 160.1, 160.4	Total Dissolved Solids, Fixed & Volatile Dissolved Solids	W-TDS-rev10a	Nov-13
Caltest	SM 2320B	TitraSip Automated Water Quality Testing Equipment	W-TitraSip-rev2b	Sep-13
Caltest	EPA 160.1	Total and Volatile Solids, Total and Volatile Solids in Solid Samples	W-RESIDUE-rev9a	Jan-14
Caltest	EPA 300.0	The Determination of Inorganic Anions by Ion Chromatography	W-Dioxex-rev10a	Nov-14
Caltest	EPA 200.8	Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry (3 Modes)	M-2008-3mode-rev3a	Sep-13