

Conceptual Work Plan

# Central Valley Groundwater Monitoring Collaborative

October 31, 2017

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## Introduction

The Central Valley Regional Water Quality Control Board (CVRWQCB) recently revised the Irrigated Lands Regulatory Program Monitoring and Reporting Program Orders (May 5, 2017; MRP Orders) for all agricultural coalitions to allow for participation in a groundwater quality regional trend monitoring program in lieu of individual trend monitoring programs. As a result, agricultural coalitions are developing a collaborative groundwater monitoring program that will characterize groundwater quality across the Central Valley. Envisioned as a program initially involving the Central Valley agricultural coalitions, the regional monitoring program may be expanded to include other dischargers/programs with a current groundwater monitoring element, as well as future coordination with CV-SALTS and groundwater monitoring identified within the Central Valley Salt and Nitrate Management Plan (SNMP).

This Conceptual Work Plan describes the collaborative groundwater monitoring program being developed by irrigated agriculture to fulfill groundwater monitoring requirements of the Irrigated Lands Regulatory Program. This monitoring program, called the Central Valley Groundwater Monitoring Collaborative (CVGMC), is the first step in developing a Central Valley-wide program that may eventually incorporate additional groundwater quality monitoring elements of other programs.

## Background

Groundwater quality monitoring is an element of many Central Valley regulatory programs overseen by the CVRWQCB. These programs include the Irrigated Lands Regulatory Program (ILRP), the Dairy Program, and the Oil Fields Program. The CVRWQCB also requires groundwater quality monitoring as part of many individual discharger's Waste Discharge Requirements (WDR). In addition to the CVRWQCB programs, groundwater quality monitoring is an element of other state programs, such as:

- State Water Resources Control Board's Drinking Water Program,
- Sustainable Groundwater Management Act (SGMA), and
- Central Valley SNMP Surveillance and Monitoring Program (SAMP).

Individual stakeholders may be a participant of several of these programs, all with the similar objectives of characterizing groundwater quality and the potential impact of waste discharges on groundwater quality. These programs are often complex and require duplication of services and financial contributions of affected stakeholders. The development of coordinated groundwater quality monitoring efforts throughout the Central Valley will likely result in more effective and efficient monitoring compared to pursuing separate programs conducted independently in the same areas. A coordinated approach may also benefit affected dischargers by providing a more cost-effective assessment of groundwater quality within the Central Valley.

On May 5<sup>th</sup>, 2017, the Executive Officer of the CVRWQCB approved the revision of Monitoring and Reporting Program Orders to allow Regional Groundwater Monitoring Group Workplans. The Executive Officer noted that the objectives of trend monitoring are to determine current water quality conditions of groundwater relevant to irrigated agriculture and develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agriculture and its practices. It was

determined that this can be implemented more efficiently on a regional basis with coordination between Coalitions and other state agency programs that require groundwater monitoring activities. The proposed changes allow for a phased approach to develop items required for a complete Groundwater Quality Trend Monitoring (GQTM) Workplan. The revisions include the following:

1. “This MRP allows developing and implementing a regional Groundwater Quality Trend Monitoring workplan that involves participants in other areas or third-party groups, provided the regional workplan meets the objectives and sampling and reporting requirements described herein. The third-party must submit a copy of the agreement between the parties included in the regional Groundwater Quality Trend Monitoring Group (Trend Monitoring Group). Under this option, the regional workplan may propose a phased approach to develop and implement the workplan elements specified in section IV.E of this MRP.” (MRP IV.C);
2. “If the third-party participates in a Trend Monitoring Group, the proposed well network and rationale for distribution of trend monitoring wells is not required in the initial workplan. However, the initial workplan must include a schedule for developing and submitting a proposed well network and rationale for distribution of trend monitoring wells.” (MRP IV.C.2); and,
3. “If the regional Groundwater Quality Trend Monitoring Group option is selected, the workplan must be submitted to the Executive Officer by 31 October 2017. The regional Groundwater Quality Trend Monitoring Workplan may propose a schedule for a phased approach to develop and implement items 1 through 4 below. In addition, the proposed schedule shall include submittal of a QAPP for the regional Trend Monitoring Workplan. A single third-party Trend Monitoring Workplan shall provide full information/details for items 1 through 4 below upon submittal of the workplan, due one (1) year following approval of the GAR.” (MRP.IV.E).

The program described in this initial Conceptual Work Plan proposes to evaluate groundwater quality conditions in regions dominated by irrigated agriculture. In addition, the CVGMC will collect groundwater quality information that can be used to evaluate potential effects of irrigated agriculture. Collected groundwater quality data may also be used to document long-term improvements in groundwater quality resulting from implementation of ILRP efforts, such as the localized Groundwater Quality Management Plans and the Management Practices Evaluation Program (MPEP). Additionally, because of the similarities between the regional groundwater quality trend monitoring program proposed in this Conceptual Work Plan and the groundwater monitoring program proposed by CV SALTS through the SNMP, this program may potentially serve as a functionally equivalent SAMP to support implementation of the SNMP once the Basin Plan amendment process is complete. The details of the linkages between the CVGMC regional groundwater quality monitoring program and the SAMP will be described in the Phase 1 Work Plan.

## Roles of Individual Coalitions and CVGMC Goal

Each of the Central Valley ILRP Coalitions have developed a Groundwater Quality Assessment Report (GAR) that characterized the existing groundwater quality within each respective Coalition region.

These reports include comprehensive summaries of available groundwater quality data and conditions for individual Coalition areas.

Each Coalition was required to prepare a GQTM Work Plan to establish long term groundwater monitoring within their Coalition area. GQTM Workplans were due 1 year following approval or conditional approval of each Coalitions GAR by the CVRWQCB. Many of the ILRP Coalitions completed these plans per the original ILRP General Order requirements, but due to varied submittal timelines some Coalitions elected to defer completion of their plans pending the group GQTM Work Plan option and to participate in the CVGMC. **Table 1** outlines submittal timelines for individual ILRP agricultural coalitions.

Table 1. Submission dates of individual Groundwater Trend Monitoring Program Work Plans.

Coalition	Submission date	Description
East San Joaquin	June 4, 2015; January 29, 2016	Phase 1 monitoring proposal; Phase 2 monitoring proposal
Westside San Joaquin River	September 16, 2016	Phase 1 monitoring proposal
San Joaquin County and Delta	December 19, 2016	Complete monitoring proposal
Grasslands Drainage Area	November 16, 2017	Phase 1 monitoring proposal
Sacramento Valley	September 18, 2017	Phase 1 monitoring proposal
Cawelo	April 19, 2017	Phase 1 monitoring proposal
Buena Vista	May 23, 2017	CVGMC Participation notification
Kings River Watershed	April 26, 2017	Phase 1 monitoring proposal
Westlands	June 6, 2017	CVGMC Participation letter
Westside	May 18, 2017	Phase 1 monitoring proposal
Tule Basin	January 6, 2017	Phase 1 monitoring proposal
Kaweah Basin	February 3, 2017	Phase 1 monitoring proposal
Kern River Watershed	June 28, 2017	Phase 1 monitoring proposal

The long-term objectives of the CVGMC will be developed using the phased approach defined in the updated MRP.

- Phase I: ILRP Technical Work Plan** – In Phase 1, the CVGMC will develop a Technical Work Plan that identifies consistent approach(es) for monitoring and reporting among the Coalitions to meet requirements of the General Orders. This document outlines how monitoring and reporting will occur, and how quality assurance will be maintained as part of the CVGMC. The CVGMC will discuss potential linkages between the CVGMC regional groundwater quality monitoring program and the SAMP which will be implemented as required by the CV-SALTS process.
- Phase II: Coordination Among Existing Groundwater Monitoring Programs** - After developing the initial groundwater monitoring components and common approach(es) between the ILRP Coalitions, Phase II will expand the CVGMC within each Coalition by identifying other permittees within the Coalition boundaries that are required to monitor groundwater. These permittees

include but are not limited to dairy operations, food processors, Publicly Owned Treatment Works (POTWs), and oil and gas operations. Several of these groups participated in the early discussions when developing the CVGMC and are anticipated to participate in future CVGMC processes.

- **Phase III: Future Groundwater Monitoring Program Coordination** - Phase III will work to coordinate CVGMC planning and efforts with the requirements of the SGMA Groundwater Sustainability Plans (GSPs) and SAMP.

## Phase I: ILRP Technical Work Plan

A Technical Work Plan will be prepared that will identify common approaches to the CVGMC groundwater monitoring implementation agreed upon by the participating ILRP Coalitions. Approaches will be consistent with the requirements of each General Order. Appendix A outlines required groundwater monitoring elements in the General Order Attachment B of the Monitoring and Reporting Plan.

The General Orders allow flexibility in developing a monitoring plan that is appropriate based on local conditions. The CVGMC Technical Work Plan will determine specific monitoring and reporting elements to be conducted independently by each Coalition and identify elements to be completed based on a common approach. The common approach may include a coordinated groundwater data management system, quality assurance procedures, a standardized approach to data analysis, and a standardized format for reporting.

## Technical Work Plan Elements

Described below is a summary of the technical elements for all GQTM Work Plans as found in the General Orders. The coordinated program will be consistent with these elements. These elements have been addressed in the GQTM Work Plans proposed by individual coalitions, and many elements will remain as proposed in those plans with the exceptions discussed below. Other elements will be coordinated by the CVGMC to establish among participating Coalitions a common approach.

## Monitoring Plan

A monitoring plan will be developed that contains a rationale for appropriate monitoring well distribution, encompassing agricultural regions of the Central Valley. The monitoring wells and well distribution will follow the plans outlined in each of the individual GQTM work plans. Each Coalition has developed (or in some cases will be developing) its own trend monitoring network distributed between high and low vulnerability regions within their Coalition boundaries. These monitoring networks will be maintained and incorporated into the regional approach. Each monitoring network will use existing relatively shallow wells (i.e., completed in the upper part of the groundwater system). These relatively shallow wells are not necessarily wells screened in the uppermost zone of first encountered groundwater.

## Quality Assurance Program Plan

The Coalitions participating in the CVGMC will follow a single Quality Assurance Program Plan (QAPP) that meets the requirements described in the General Order. The QAPP will include descriptions of the annual sampling schedule, analytical methods with detection and reporting limits, Standard Operating Procedures (SOPs) used for sample collection, and data management procedures. Each Coalition will be responsible for performing groundwater monitoring and data analysis in their region. All monitoring by entities joining the CVGMC will be performed using the standardized methods for sample collection, same analytical methods, and quality assurance procedures.

## Data Management

The CVGMC anticipates using a coordinated data management system that will be maintained by a contractor. Each Coalition can maintain their own data in their own database if desired, but a coordinated data management system will be used to facilitate analyses of regional groundwater quality data.

## Reporting

Reporting will be accomplished using a common analytical framework. All participating Coalitions will agree on a data analysis method that will be used to evaluate groundwater quality within each Coalition region and across the Central Valley agricultural region encompassed by the CVGMC.

As required by the ILRP General Orders, each Coalition will provide an Annual Report describing groundwater monitoring in their region. It is anticipated that these Annual Reports will be consistently formatted to include basic data tables, time series plots (when sufficient data are available), and figures to display the monitoring results of the current year and variation across years.

Five years after initiating the CVGMC, a coordinated report will be provided to the CVRWQCB that characterizes groundwater quality across the entire Central Valley (or the portions of the Central Valley participating in the CVGMC). The report will include separate chapters reporting on trends in groundwater quality in each Coalition region as well as a chapter(s) that characterizes groundwater quality across all participating regions. Each chapter will be consistently formatted with common maps, figures, and text to facilitate review by CVRWQCB staff and other interested parties.

## Governance

The Technical Work Plan will identify the financial support and governance among the Coalitions. The participating Coalitions have developed a Memorandum of Agreement that provides relevant details about operation and governance of the CVGMC.

## Schedule for completing the Phase 1 Technical Work Plan

The Phase 1 Technical Work Plan will be completed and submitted 180 days after acceptance of the Conceptual Work Plan by the CVRWQCB. While the CVRWQCB is reviewing the Conceptual Work Plan, the CVGMC will contract with a technical consultant who will be responsible for completing the Technical Work Plan. When the Conceptual Work Plan is approved, the technical consultant will initiate the development of the Technical Work Plan. The 180 days allows time for the Work Plan to be



prepared, reviewed and accepted by each Coalition, and submitted for review to the Regional Water Board.

After approval of the Phase 1 Technical Work Plan, each Coalition may develop, supplement or amend their individual GQTM Work Plans to be consistent with the approved Phase 1 Technical Work Plan. For Coalitions that have not yet submitted an individual GQTM Work Plan, there may be elements of the Phase 1 Work Plan that can be incorporated into their individual GQTM Work Plans. For those Coalitions that have submitted GQTM Work Plans, the Phase 1 Technical Work Plan will supersede their individual Work Plans negating the requirement to amend their individual Work Plans. If Coalitions agree to participate in the CVGMC and fund the development of the program, additional expense to modify their initial GQTM plans should not be required.

## Phase II: Coordination with Additional Programs and Dischargers

As previously discussed, many entities and programs must collect groundwater monitoring data that is either relevant to irrigated agriculture or that may be leveraged to produce a more informed regional analysis as a part of or in addition to Coalition-defined monitoring networks. Phase II of the CVGMC will identify entities required to monitor groundwater quality within Coalition areas and expand coordination efforts to include other programs as deemed appropriate.

As described above, Phase I of the CVGMC establishes a common approach to data collection and analyses to produce consistent groundwater monitoring and reporting to fulfill the General Order requirements. This framework provides the basis for Phase II coordination, and a means by which to incorporate complementary groundwater monitoring components of ongoing and upcoming programs. The goal of this coordination is to facilitate appropriate use of available data in sub-basins and across Coalition boundaries to present informed regional analyses.

The CVGMC will seek participation from other groundwater quality stakeholders, including regulated permittees, CVRWQCB, State Water Resources Control Board (SWRCB), California Department of Water Resources (DWR), the Department of Pesticide Regulation (DPR), and local Groundwater Sustainability Agencies (GSAs) formed in response to SGMA. Many of these stakeholders are also engaged in the CV-SALTS program.

Table 2. A summary of potential partners and relevant groundwater monitoring programs.

Agency	Program	Mechanism	Status
CVRWQCB	ILRP	Regional Trend Monitoring	Ongoing
CVRWQCB	Dairy	Individual Dairy Monitoring, Representative Monitoring Program (RMP)	Ongoing
CVRWQCB	Waste Discharge Requirements (WDRs)	Individual Dischargers Monitoring and Reporting Programs	Ongoing
SWRCB	Oil and Gas Monitoring Program (SB4)	Individual Orders to drilling locations, Regional Monitoring Program (USGS)	Ongoing/ Future
DPR	Groundwater Protection Program	Annual Monitoring, Groundwater Protection Areas	Ongoing
SWRCB	Groundwater Ambient Monitoring and Assessment (GAMA) Program	Domestic well sampling (SWRCB), special studies (LLNL), Priority Basins Monitoring Program (USGS)	Ongoing
DWR	Groundwater Sustainability Agencies	Undefined monitoring program	Future
CVRWQCB	CV SALTS	SNMP and BPA	Future

Phase II efforts will include identification of entities and programs with common monitoring requirements and objectives where data is accessible and appropriate to incorporate. After identifying common monitoring elements and requirements, the CVGMC coalitions will begin outreach and coordination efforts to define consistent protocols for sampling, data storage, and analysis. Although the ILRP Coalition-led CVGMC will begin outreach and coordination efforts with relevant dischargers, it will be most beneficial to transfer CVGMC coordination to an agency or program that can provide coverage for additional required permittees over time.

## Schedule for Completion

Phase II program review, outreach, and coordination will begin after completion of the Phase I Technical Work Plan. As noted, the Technical Work Plan will serve as the foundation for evaluating and coordinating with other programs. Initial contact has already been made with representatives for Dairy, Publicly Owned Treatment Works (POTWs), food processors, the oil and gas industry, as well as CV-SALTS participants. Although efforts will eventually be made to contact relevant GSAs, many are still establishing basin wide coordination agreements in preparation for completing GSPs due in 2020 or 2022.

## Phase III: Future Groundwater Monitoring Program Coordination

In Phase III, the CVGMC will seek to coordinate with the requirements of programs that are currently in development. These programs include the SNMP and SGMA monitoring programs.

The rationale for Phase III efforts is the nexus of CVGMC and Region 5 SNMP:

- 1) The SNMP contains numerous requirements for regional groundwater monitoring and analysis;
- 2) The SNMP will be implemented by permittees through individual discharge permits, including all ILRP Coalitions;
- 3) ILRP coalitions have trend monitoring requirements as well as broad regional analyses required in the future updates of their individual Groundwater Assessment Report (GAR) specified in the WDRs.

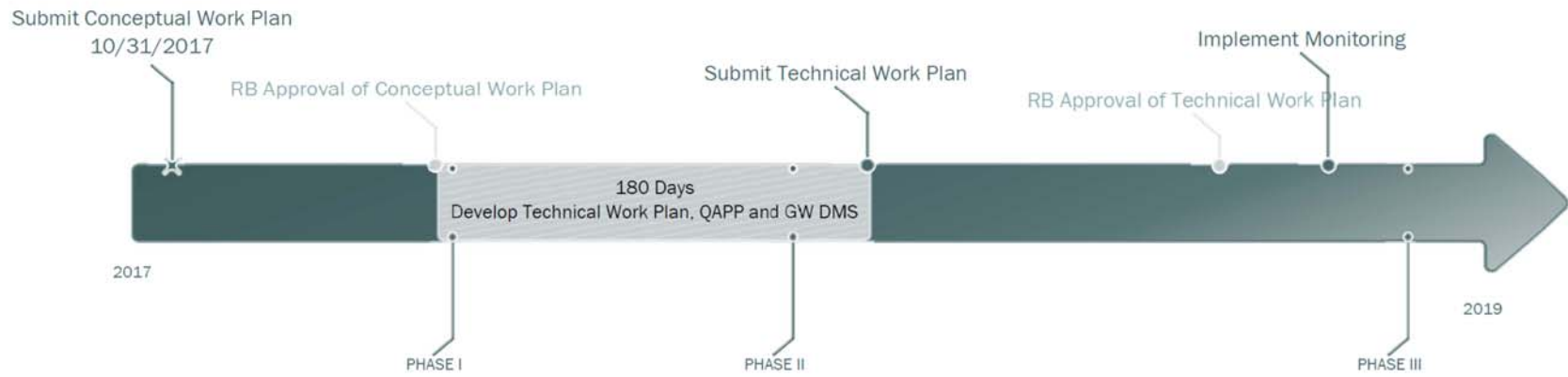
The Coalitions will develop the CVGMC with consideration of the SNMP SAMP requirements as well as any regional analyses required under SGMA to inform efficient approaches to regional groundwater monitoring. Coordination with future groundwater monitoring programs encompassed in Phase III will begin when these programs are fully developed.

## Timeline

The timeline for CVGMC activities is provided in Figure 1. The CVGMC expects the development of the Phase I Technical Work Plan will take approximately 180 days, including the time necessary for review of the document by participating ILRP Coalitions' respective Boards of Directors. Simultaneous with the development of the Phase I Technical Work Plan, the CVGMC will produce a QAPP that will guide the development of each Coalition's Quality Assurance Project Plans produced by each Coalition. The Coalitions will also explore the development of a centralized groundwater quality data management system to house CVGMC data from across the Central Valley. This database will be used by a contractor responsible for conducting the Valley-wide characterization of groundwater quality.

While the Phase I Technical Work Plan is being developed and discussed, the CVGMC will begin Phase II outreach to other dischargers who are conducting groundwater monitoring. The initial discussions will involve understanding the regulatory requirements of the discharger's permit(s) and any intersection with the CVGMC monitoring objectives. This process is expected to take several months as the CVGMC and the individual dischargers determine if combining monitoring efforts is feasible. It is also anticipated that discussions with CVRWQCB staff may need to occur if it is determined that harmonization of monitoring programs will require modification of permits. As additional dischargers or agencies join the CVGMC monitoring effort, the Phase I Technical Work Plan and supporting documents, and MOA will be amended as necessary.

Figure 1. CVGMC sequence of events.



## Appendix A

<i>Summary of Required Groundwater Monitoring Elements of the ILRP</i>	
<b>Groundwater Trend Monitoring Workplan Requirements of Appendix MRP-1 of the General Order</b>	
<b>Implementation</b>	
<b>GO Att B IV.C.2</b>	Coalitions shall develop a groundwater monitoring network that will: <ol style="list-style-type: none"> <li>1) Be implemented over both high and low vulnerability areas</li> <li>2) Employ shallow wells, but not necessarily wells completed in the uppermost zone of first encountered groundwater</li> </ol>
<b>Development Timeline</b>	
GO VIII.D.3	The trend monitoring workplan shall be submitted to the Central Valley Water Board within one (1) year after written approval of the GAR by the Executive Officer
<b>Required Objectives</b>	
GO Att B IV.C.2	The overall objectives of groundwater trend monitoring are to determine current water quality conditions of groundwater relevant to irrigated agriculture and develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices
GO B IV.A.1	Utilize prioritization and groundwater quality data provided by the GAR
<b>Approach</b>	
GO Att B IV.E.1	Rational for the number of proposed wells to be monitoring and their locations must consider the following; <ol style="list-style-type: none"> <li>1) the variety of agricultural commodities produced within the third-party's boundaries (particularly those commodities comprising the most irrigated agricultural acreage)</li> <li>2) the conditions discussed/identified in the GAR related to the vulnerability prioritization</li> <li>3) the areas identified in the GAR as contributing significant recharge to urban and rural communities where groundwater serves as a significant source of supply</li> </ol>
<b>Well details</b>	
GO Att B IV.E.2	Details for wells proposed for trend monitoring, including: <ol style="list-style-type: none"> <li>i. GPS coordinates;</li> <li>ii. Physical address of the property on which the well is situated (if available);</li> <li>iii. California State well number (if known);</li> <li>iv. Well depth;</li> </ol>

*Summary of Required Groundwater Monitoring Elements of the ILRP*

**Groundwater Trend Monitoring Workplan Requirements of Appendix MRP-1 of the General Order**

- v. Top and bottom perforation depths;
- vi. A copy of the water well drillers log, if available;
- vii. Depth of standing water (static water level), if available (this may be obtained after implementing the program); and
- viii. Well seal information (type of material, length of seal)

**Proposed Sampling Schedule**

GO Att B IV.E.3 Trend monitoring wells will be sampled, at a minimum, annually at the same time of the year for the indicator parameters identified below as annual requirements, with additional 5-year rotating sampling

**Monitoring Constituents**

GO Att B IV.E.3 Annual trend monitoring sampling:

- i. Conductivity (at 25 °C)\* (µmhos/cm)
- ii. pH\* (pH units)
- iii. Dissolved oxygen (DO)\* (mg/L)
- iv. Temperature\* (°C)
- v. Nitrate as nitrogen (mg/L)

\*field parameters

GO Att B IV.E.4 Trend monitoring wells are also to be sampled initially and once every five years thereafter for the following COCs:

- a. Total dissolved solids (TDS) (mg/L)
- b. General minerals (mg/L):
  - i. Anions (carbonate, bicarbonate, chloride, and sulfate)
  - ii. Cations (boron, calcium, sodium, magnesium, and potassium)

**Monitoring Results**

GO Att B V.B Annually, by 1 May, the third-party shall submit the prior year’s groundwater monitoring results as an Excel workbook containing an export of all data records uploaded and/or entered into the State Water Board GeoTracker database. If any data are missing from the report, the submittal must include a description of what data are missing and when they will be submitted to the Central Valley Water Board. If data are not loaded into the GeoTracker database, this shall also be noted with the submittal.

*Summary of Required Groundwater Monitoring Elements of the ILRP*

**Groundwater Trend Monitoring Workplan Requirements of Appendix MRP-1 of the General Order**

**Reporting**

GO Att B V.C	<p>The Annual Monitoring Report shall be submitted by 1 May every year, with the first report due 1 May 2014. The report shall cover the monitoring periods from the previous hydrologic water year. A hydrologic water year is defined as 1 October through 30 September. The report shall include the following components:</p> <ul style="list-style-type: none"> <li>i. Monitoring objectives and design</li> <li>ii. Sampling site/monitoring well descriptions and rainfall records for the time period covered under the Monitoring Report"</li> <li>iii. Location map(s) of sampling sites/monitoring wells, crops and land uses</li> <li>iv. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible</li> <li>v. In reporting monitoring data, the third-party shall arrange the data in tabular form so that the required information is readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with the data collection requirements of the MRP</li> <li>vi. Discussion of data relative to water quality objectives, and water quality management plan milestones/Basin Plan Amendment Workplan updates, where applicable; The report shall include a discussion of the third-party's compliance with the data collection requirements of the MRP."</li> <li>vii. The third-party should incorporate pesticide use information, as needed, to assist in its data evaluation.</li> </ul>
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**Data Analysis**

GO Att B V.C	<p>The third-party must evaluate its monitoring data in the Monitoring Report in order to identify potential trends and patterns in surface and groundwater quality that may be associated with waste discharge from irrigated lands. As part of this evaluation, the third-party must analyze all readily available monitoring data that meet program quality assurance requirements to determine deficiencies in monitoring for discharges from irrigated agricultural lands and whether additional sampling locations are needed.</p>
GO Att B IV.A.4	<p>The third-party must review and confirm or modify vulnerability designations every five (5) years after Executive Officer approval of the GAR. The vulnerability designations will be made by the third-party using a combination of physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (irrigation method, crop type, nitrogen application and removal rates, etc.)</p>