

ACWA Guidelines for Groundwater Monitoring

California's Groundwater Sustainability legislation of 2014, along with other recent documents, such as the State of California's *Water Action Plan* (January, 2014) and the Association of California Water Agencies' (ACWA's) *Recommendations for Achieving Groundwater Sustainability* (2014), identify improved, sustainable groundwater management as both urgent and essential for making best use of the State's water resources. ACWA is committed to the principle that effective groundwater management must be based on a foundation of regionally consistent, scientifically sound data.

ACWA believes locally appropriate groundwater data should be collected in every basin in California. Groundwater monitoring is already common in California: approximately two-thirds of DWR-identified high priority and medium priority groundwater basins already collect and report groundwater elevation data to DWR. ACWA realizes, however, that some groundwater basins need to develop groundwater monitoring plans, and other basins need to update existing plans to fully support their groundwater management objectives.

This document presents ACWA's recommended minimum standards for acceptable groundwater monitoring plans, and provides guidance for developing or updating these plans. Groundwater monitoring plans that meet or exceed the guidelines in this document are assumed to meet any standards for data collection.

Guiding Principles

Consistent with ACWA's *Recommendations for Achieving Groundwater Sustainability* (2014), as well as ACWA's Board-adopted *Groundwater Management Policy Principles* and ACWA's *Sustainability from the Ground Up: A Framework for Groundwater Management in California* (2011), a groundwater monitoring plan should be designed and implemented in accordance with the following general principles.

- Groundwater monitoring is best conducted by local agencies, either alone or in coordination with other agencies, as part of a locally driven groundwater management effort.
- Groundwater data collection should be consistent across a DWR defined groundwater sub-basin.
- Groundwater monitoring and management must be conducted in a transparent manner. Wherever possible, and to the extent practical, data should be made

available to stakeholders and the State, consistent with statutory and other legal protections offered to data sources, through regular reports, web-based applications, or similar methods.

- Groundwater monitoring must support the implementation of local Groundwater Sustainability Plans (GSP) where they exist, and therefore be consistent with, or functionally equivalent to, monitoring requirements laid out in the Groundwater Sustainability legislation of 2014.
- The quantity and quality of groundwater monitoring data must be adequate to effectively evaluate progress toward achieving sustainable groundwater management objectives.
- No single groundwater monitoring plan is appropriate for all of the State's groundwater basins. Groundwater monitoring plans should be customized for local groundwater conditions, economic needs, relative basin priority, and degree of groundwater use.

Minimum Groundwater Monitoring Plan Standards

Groundwater monitoring plans must be designed to address specific questions and support GSPs. While the details of GSPs will vary between sub-basins, monitoring data must serve some fundamental functions. These include:

- Measuring progress towards meeting Basin Management Objectives (BMOs). GSPs must include quantifiable BMOs. The groundwater monitoring plan must collect adequate data to determine the degree to which these objectives are met.
- Demonstrating sustainability. Sufficient data must be collected to document progress towards sustainability. Groundwater monitoring plans must show a clear connection between the type and quantity of data collected, and the sustainability metrics detailed in a GSP.
- Quantifying overdraft. If overdraft is occurring, sufficient data must be collected to quantify the amount of overdraft. This includes "temporary overdraft" that may be an acceptable part of sustainable groundwater management.
- Identifying other groundwater threats.

The table below lists both essential and supplemental components of a groundwater monitoring plan. Any groundwater monitoring plan that includes the essential components listed below meets the requirements necessary to support sustainable groundwater management. Some flexibility in the components may be appropriate for low priority or very low priority basins.

Essential Components	Supplemental Components
Groundwater Elevation Monitoring	
<ul style="list-style-type: none"> • Collect sufficient data on a regular, systematic schedule to determine long term groundwater elevation trends • Collect groundwater level information sufficient to comply with CASGEM guidelines. • Collect sufficient groundwater level data to <ul style="list-style-type: none"> ○ support sub-basin sustainability assessments; ○ help identify areas of overdraft, and; ○ quantify progress towards meeting BMOs • Collect data from each significant water producing zone in the sub-basin. • Convert groundwater level data to groundwater elevation data using established ground elevations, such as USGS 10-foot contour topo maps 	<ul style="list-style-type: none"> • Collect sufficient data to demonstrate seasonal or monthly fluctuations • Collect sufficient spatial and temporal data to demonstrate correlation between groundwater levels, pumping, and recharge • Collect groundwater level data from dedicated monitoring wells • Convert groundwater level data to groundwater elevation data based on surveyed reference point elevations • Collect sufficient spatial and temporal groundwater elevation data to support the development and calibration of a numerical groundwater flow model.
Groundwater Quality Monitoring	
<ul style="list-style-type: none"> • Collaborate with other agencies to compile and share readily available water quality data from existing sources such as CDPH, USGS, DWR, Regional boards, EPA, etc. • Collect sufficient data on a regular, systematic schedule to determine long term groundwater quality trends for established constituents of concern. • Collect sufficient groundwater quality data to quantify progress towards meeting BMOs • Collect data from each significant water producing zone in the sub-basin. 	<ul style="list-style-type: none"> • Collect water quality data from dedicated monitoring wells • Collect sufficient spatial and temporal data to demonstrate groundwater quality correlation with recharge or land use activities • Collect sufficient spatial and temporal data to support the development of mass balance calculations. • Collect sufficient spatial and temporal groundwater quality data to support the development and calibration of a numerical groundwater transport model.

Essential Components	Supplemental Components
Groundwater Budget Monitoring	
<ul style="list-style-type: none"> • Compile data allowing annual estimation of natural and imported water sources including recharge from precipitation; recharge from streams, lakes, and reservoirs; irrigation return flow; and underflow; among other sources. • Compile annual estimates of groundwater usage based upon gross population, available land use data, and surface water deliveries. • Collect sufficient groundwater budget data to: <ul style="list-style-type: none"> ○ support sub-basin sustainability assessments ○ quantify progress towards meeting BMOs, and; ○ estimate quantities of overdraft, and identify possible remedial actions. 	<ul style="list-style-type: none"> • Meter M&I groundwater production • Meter agricultural production. • Estimate seasonal or monthly groundwater recharge and groundwater use. • Compile gaged measurements of significant inflow and outflow components. • Quantify or estimate water use of smaller users such as private domestic users • Collect sufficient spatial and temporal groundwater budget data to support the development and effective calibration of a numerical groundwater flow model.
Data Management and Reporting	
<ul style="list-style-type: none"> • Organize all water level, water quality and water budget data in an electronic format, suitable for establishing and reporting long term trends • Publish annual reports of groundwater level, quality, and budget elements, including relevant maps and trends. • Share data with other groundwater management agencies within the same sub-basin. • Provide electronic data and annual reports to the public as requested, consistent with statutory and other legal protections offered to data sources. • Provide data to the State of California as required. 	<ul style="list-style-type: none"> • Develop a searchable electronic database of groundwater data • Post groundwater level maps and trends, groundwater quality maps and trends, and groundwater budget elements on a web site • Post location of known waste discharge sites on web site • Develop a regional Geographic Information System (GIS) built upon the database