Draft Groundwater Monitoring Protocol for Buena Vista WSD

Submitted to:
Buena Vista Water Storage District

Date: January 2016

Table of Contents

1 Introduction

1.1 Introduction

This groundwater monitoring protocol was developed for the Buena Vista Water Storage District (BVWSD, the District) as well as other Kern County agencies interested in applying a uniform protocol for groundwater monitoring that will satisfy the requirements of the California Statewide Groundwater Elevation Monitoring (CASGEM) program, and more importantly, lay a firm foundation for collection and analysis of data that can be used in implementing Groundwater Sustainability Plans (GSPs) required by the Sustainable Groundwater Management Act (SGMA). This groundwater monitoring protocol describes the geologic conditions and the reason for monitoring, justification of the selected monitoring network, monitoring protocol, and monitoring frequency. Data collected under this protocol will be used to assess the conditions of the aquifers that underlie the BVWSD and are used as a source of agricultural, municipal and domestic water supply.

1.2 Location

Buena Vista is located in Kern County, approximately sixteen miles west of the City of Bakersfield in the trough of California's southern San Joaquin Valley. The District is bordered by several water agencies including Belridge Water Storage District (BWSD), Semitropic Water Storage District (SWSD), Rosedale-Rio Bravo Water Storage District (RRBWSD), and the Kern Delta Water District (KDWD). The Kern Water Bank also lies close to BVWSD being separated from the District by the Tule Elk State Natural Preserve. In some areas the District borders lands that have not been organized into a district but which fall within the jurisdiction of the County of Kern and the Kern County Water Agency.

Buena Vista is made up largely of reclaimed swamp lands located in and along the pre-development course of the lower Kern River which, after exiting the Southern Sierra Nevada mountains near Bakersfield and flowing south and then southwest across the southern San Joaquin Valley, runs through the topographic axis of the valley toward its ultimate terminus at a drainage basin which was once Tulare Lake. The water conveyance systems in and around the District consist of a network of levees and diversions to control the high flows of the Kern River, as well as a system of canals and drains that deliver surface water to, and collect runoff from, the lands within the District.

The District is divided into two distinct areas, as shown in Figure 1: the Buttonwillow Service Area (BSA) comprising 43,460 acres and the Maples Service Area (MSA) comprising 4,350 acres. These two areas are separated by about 15 miles. The BSA and the MSA both lie within the lower Kern River watershed, where historic runoff created heavy clay soils from former swamp and overflow lands along the northern fringe of Buena Vista Lake.

Buttonwillow Service Area (BSA)

The BSA is a 26-mile long, three- to five-mile wide strip of land that occupies the overflow lands within the Buttonwillow Syncline, a geological feature described later in this document. As shown in Figure 1, the service area lies west of the Kern River alluvial fan between the Elk Hills and Buttonwillow Ridge, where the pre-development course of the lower Kern River followed the valley's topographic axis from the Buena Vista Lake Bed northward toward the Tulare Lake Bed. Because of the asymmetry of the San Joaquin Valley's topography, the axial trough where the BSA lies borders the western edge of the valley. Land surface elevations in the BSA range from 320 feet above sea level on the eastern flank to lower than 300 feet above sea level in the west.

The BSA shares parts of its northern, eastern, and southern boundaries with the Semitropic and Rosedale-Rio Bravo water storage districts and the Kern Water Bank and shares its western boundary with lands not organized into districts which separate the service area from the Belridge Water Storage District and oilfield properties farther to the west. The service area is situated northwest of the Buena Vista Lake Bed which consists of agricultural land that receives water from the Henry Miller Water District (HMWD) which is part of Buena Vista, but is not served district water.

The northern half of the Buttonwillow Service Area differs in several respects from the rest of the District. The soils are dense, heavy, and poorly-drained and are underlain by a shallow, perched water table containing groundwater with salinity in excess of 2,000 mg/L. These conditions result in poor infiltration, water encroaching into the root zone, and moderately saline soils. For these reasons, only salt-tolerant crops are grown, and yields are lower than in other parts of the District.

Maples Service Area (MSA)

The MSA is about seven miles long and one mile wide and occupies the overflow lands between the Kern Lake Bed to the east and the Buena Vista Lake Bed to its west along the southern toe of the Kern River alluvial fan. The MSA is entirely surrounded by the Kern Delta Water District which overlies the groundwater basin south of the river.

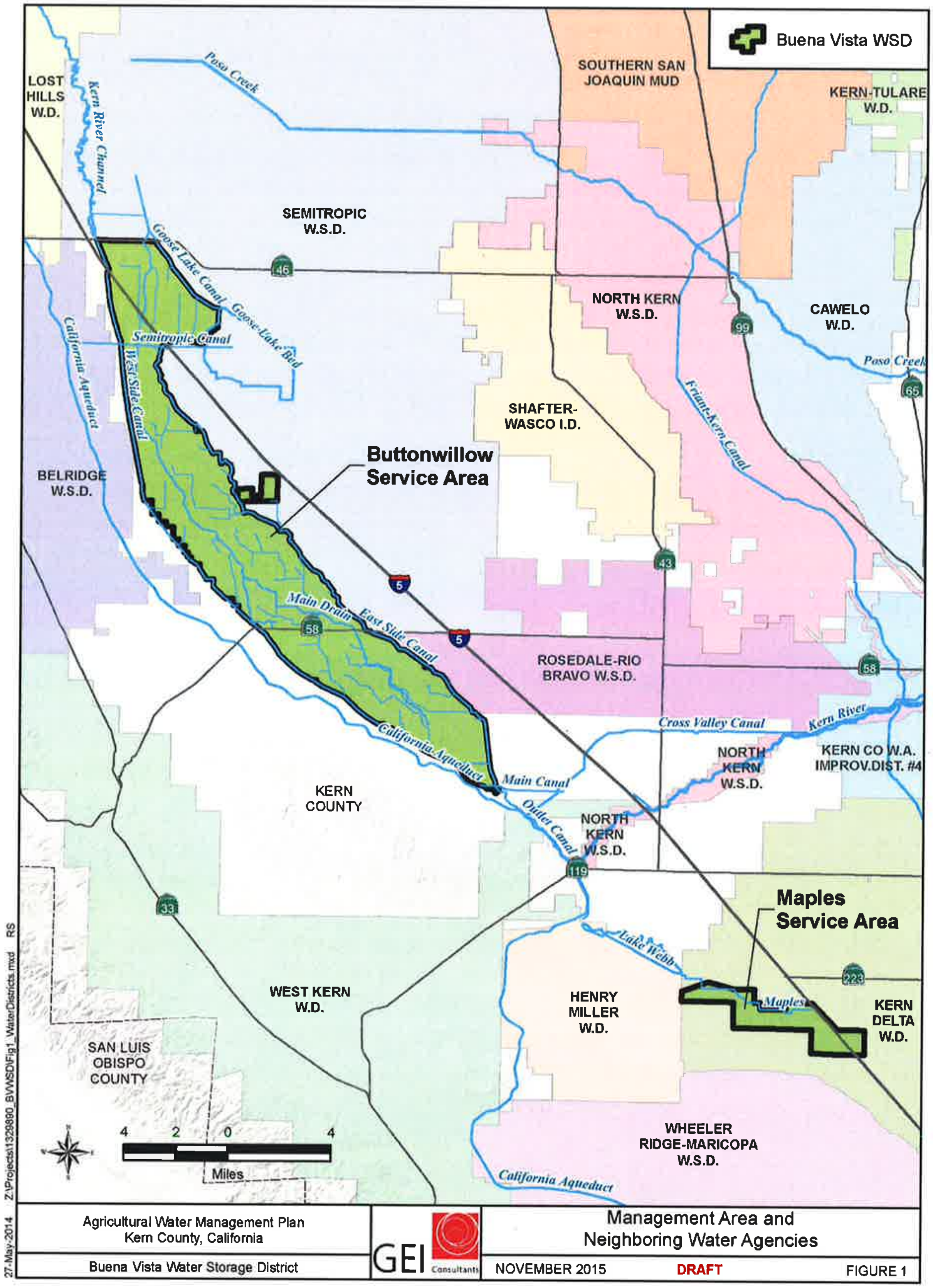


Figure 1. Management Area and Neighboring Water Agencies.

1.3 Background

On November 4, 2009, the California State Legislature amended the Water Code with SBx7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal, the amendment requires collaboration between local monitoring entities and the Department of Water Resources (DWR) to collect groundwater elevation data. Collection and evaluation of such data on a statewide scale is a fundamental step toward improving management of California's groundwater resources.

In accordance with this amendment to the Water Code, DWR developed the CASGEM program. The intent of the program is to establish a permanent, locally-managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. CASGEM builds on the many established, local long-term groundwater monitoring and management programs. DWR's role is to coordinate the CASGEM program, to work cooperatively with local entities, and to maintain the collected elevation data in a readily and widely available public database.

The Sustainable Groundwater Management Act, signed into law in September 2014, requires sustainable management of groundwater resources to improve long-term reliability while avoiding undesirable impacts. SGMA grants local agencies substantial new powers to monitor, control and fund groundwater basin management and imposes aggressive timelines for implementation of sustainable management practices. Central to compliance with SGMA is development and implementation of Groundwater Sustainability Plans (GSPs) that rely on water budgets to define how Groundwater Sustainability Agencies (GSAs) will manage their water supplies in a way that will support long-term sustainability. Data collected by groundwater monitoring will be essential both to development of these water budgets and for verification of whether management practices carried out by a GSA are resulting in sustainable management. Thus, SGMA elevates the importance of the type of groundwater data to be reported to CASGEM by making this data the foundation for management actions to be exercised by local agencies or by the state.

1.4 Goals and Objectives

The objectives of this monitoring plan are to establish a groundwater monitoring network that will be used to characterize groundwater occurrence, flow direction, and recharge areas, and to provide a sound technical foundation for groundwater management. This plan will provide the necessary tools and procedures for the BVWSD to monitor groundwater levels in its service area. The intent is that this protocol can also be applied more broadly within Kern County to form a standard approach to data collection that will provide uniform, reliable data in a format that can be easily consolidated and analyzed to assess groundwater conditions in the County to guide development and implementation of policies needed to protect the groundwater resource.

2 Monitoring Network

The following sections describe the rationale for the selection of monitoring points included in the monitoring network.

2.1 Rationale

Groundwater within the BVWSD is influenced by groundwater pumping, subsurface inflow and outflow, and recharge from distribution and application of irrigation water. The District's groundwater monitoring network is intended to quantify the occurrence, level, and gradient of each aquifer as well as informing understanding of interactions between aquifers and of the quality of groundwater underlying the BVWSD.

2.2 Hydrogeology

BVWSD overlies the Kern County Subbasin (DWR Basin No. 5-22.14) which comprises the entire southern end of the San Joaquin Valley Groundwater Basin. The subbasin covers about 3,040 square miles and is bounded on the east, south and west by the topographic slope break between the valley fill and the surrounding dissected foothills. To the north, the basin is delineated by the boundary between Kern, Kings, and Tulare counties, a political boundary which does not define a change in geological or flow conditions.

The District is shown in relation to the groundwater basin boundary in Figure 2, and the size of the basin is indicated below in Table 1.

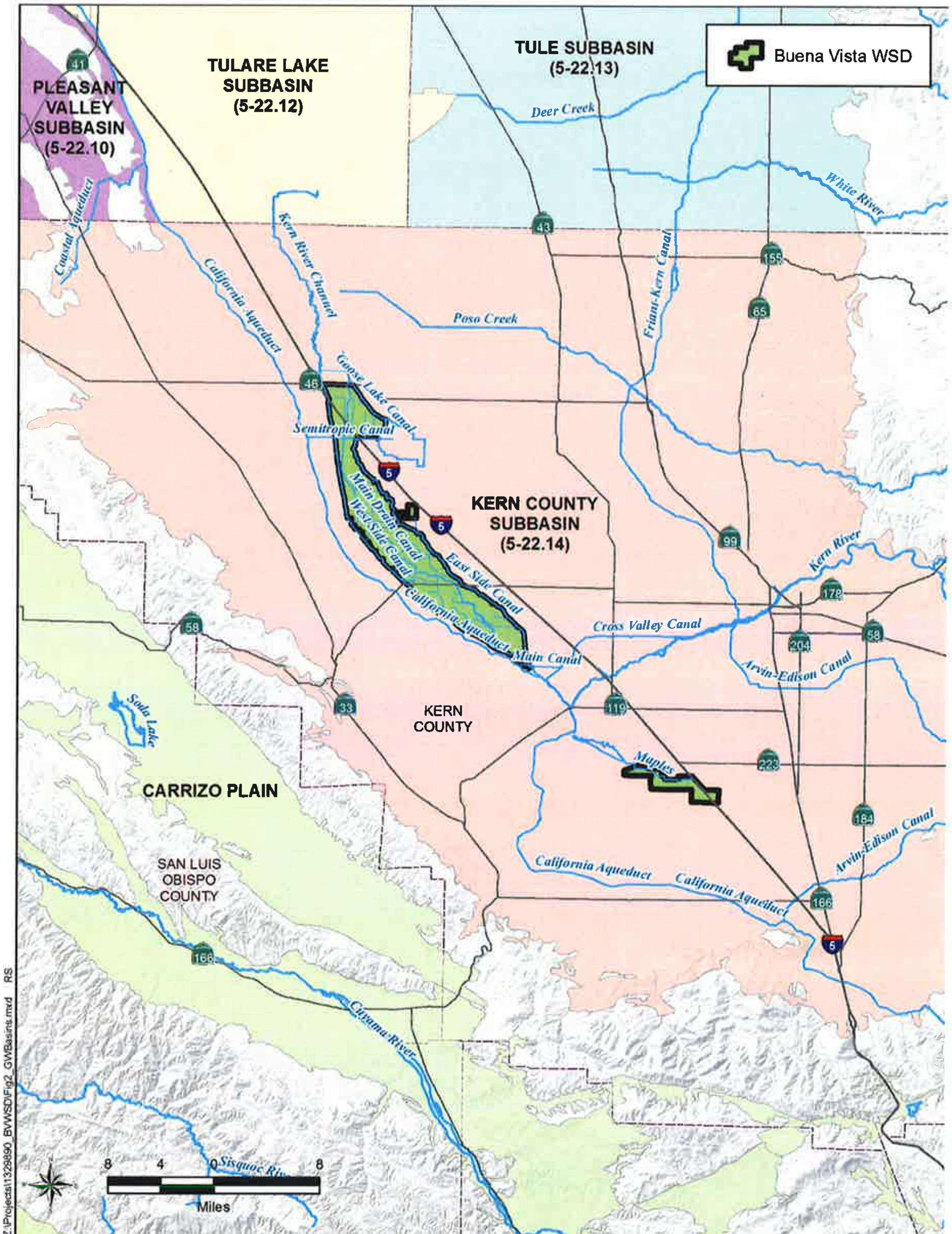
Table 1.Groundwater Basins

Basin Name	Size (Sq. Mi.)	Estimated Capacity (AF)	Safe Yield (AFY)
Kern County Groundwater Subbasin	3,040	40,000,000	Unknown

Source: DWR San Joaquin District Kern County Groundwater Basin Information:
http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/5-22.14.pdf

The Subbasin has been divided into additional hydrological subbasins based on geophysical analysis and seismic mapping of undulating bedrock structures formed due to folding or faulting (KCWA, 1991). One such subbasin is a structural entity named the Buttonwillow Subbasin which underlies the entire Buttonwillow Service Area. This subbasin exhibits some isolation from the larger main subbasin to the east and exhibits groundwater behavior which is consistent with the interpreted shape and structural controls of the Buttonwillow Subbasin (Sierra Scientific, 2013).

The Kern County Subbasin has been classified by DWR as a critically overdrafted groundwater basin (Bulletin 118). However, as described above, data on local geology and groundwater conditions within Buena Vista suggest that the District is substantially isolated from much of



Groundwater Monitoring Protocol	GEI Consultants	Groundwater Basins		
Buena Vista Water Storage District		JANUARY 2016	DRAFT	FIGURE 2

the Kern County Subbasin and that this isolation, coupled with the District's access to surface water, leads to groundwater supply conditions within the District's boundaries that differ from those characteristic of many other locations within Kern County.

Based on groundwater level data, little groundwater appears to flow across the boundaries of the northern half of the BSA. This is especially evident along the eastern boundary shared with Semitropic WSD. While the water elevation averages 10 feet above MSL in Semitropic, an average elevation of 180 feet above MSL is observed in Buena Vista. This large difference in elevation across a distance of two miles is thought to be the consequence of the Buttonwillow Anticline, a subsurface structure which forms Buttonwillow Ridge and is believed to separate the main groundwater basin to the east from the Buttonwillow Subbasin (Buena Vista Water Storage District, 2014). In the southern portion of the BSA, there is some evidence of groundwater flowing out of the District into the Rosedale-Rio Bravo WSD and into the District from Belridge Water District to the west. However, there is insufficient data to draw firm conclusions, and more dedicated monitoring wells are needed on the western border of the District to evaluate the groundwater conditions.

2.3 Aquifers

The depth to groundwater below ground surface in the main aquifer varies from about 30 feet to 140 feet, generally increasing in a southerly direction. Groundwater elevations vary from about 230 feet to 130 feet above MSL and generally decrease in a southerly direction. The gradient evidenced by the groundwater elevations indicates that groundwater may flow from north to south within the District (Buena Vista Water Storage District, 2014). Generally groundwater levels observed over the past 20 years appear to be stable in the north while declining in the south which suggests that the north-to-south gradient has been increasing. However, the operation of groundwater banks in areas neighboring the District generate fluctuations in gradients that can temporarily alter the direction of subsurface flow.

The main production aquifer beneath the BSA consists of a sequence of interbedded, laterally discontinuous, sandy and silty sediments. Down to a depth of about 200 feet, silty sediments tend to predominate, but from 200 to 600 feet, sandy and silty sediments occur in approximately equal proportions. The Corcoran Clay, or another stratigraphically-equivalent clay, has been mapped or inferred to exist under both the BSA and MSA. The clay layer lies from 450 to 600 feet below the ground surface under the central portion of the BSA, but rises to about 100 feet below the surface under the south end and 250 feet below the surface under the north end. The clay layer is about 500 feet deep under the MSA.

The aquifer materials under the District are all unconsolidated sediments which are classified by grain size as sands, silts, or clays. The physical properties of interest include the *in-situ* porosity, permeability, density, compressibility, moisture content and grain-size distribution. These properties quantify the flow and storage properties of the aquifer strata. The District has recently begun to acquire aquifer data through core sampling and well testing. Based on the results of a Phase 1 aquifer study which was performed by URS in 2009 through 2010, numerical values were developed for the deep-aquifer storage and transport properties in the area near Seventh Standard Road and Main Drain Road. Based on the preliminary results of a Phase 2 aquifer study, numerical values are also available for the perched-aquifer storage and transport properties in the area where Seventh Standard Road intersects the East Side Canal and the West Side Canal.

Deep Aquifer Characteristics

The deep aquifer is defined as extending from 200 to 600 feet below ground surface. The local irrigation wells have 100- to 300-foot-long completion intervals within this depth range and are capable of delivering between 23.9 cfs and 5.3 cfs of sustained flow at discharge/drawdown ratios in the range of 0.04 to 0.09 cfs/ft. On the basis of tests, the aquifer transmissivity ranges from 15,000 to 25,000 ft^2/day. Using the aquifer net sand thickness from E-logs of the tested wells, the analysis for well test data from the Buttonwillow Service Area gave hydraulic conductivities in the range of 30 to 80 ft/day, with an average K-value of 77 to 31 ft/day. The groundwater TDS is variable, depending on the depth zone, but ranges from 1,000 to 2,700 mg/l in the area of the test wells.

Shallow Aquifer Characteristics

The portion of the BSA north of 7th Standard Road includes fine-grained soils near the surface resulting in a shallow perched aquifer ranging from approximately two to twelve feet below ground surface that underlies approximately 12,000 to 15,000 acres (Krieger & Stewart, 2009). Water quality in the perched aquifer is poor with a TDS of 2,000 ppm or higher which limits the types of crops that can be grown and reduces crop yields. The perched aquifer is monitored with an extensive network of shallow piezometers. No intentional recharge or banking is performed within the northern portion of the District due to subsoil conditions.

Southern areas of the BSA have sands at shallow depths. The hydraulic conductivities of these sands in the top 100 ft are from 3 to 20 feet/day, quite permeable but much lower than the conductivities of the deep aquifer. However, the overall vertical permeability of the shallow aquifer is low because of the presence of silt and clay layers interbedded with the sand. The TDS of the shallow, perched zone ranges from 850 to 5,500 mg/l based on District data from shallow piezometers.

2.4 Groundwater Quality

Protecting groundwater quality is a cardinal consideration for water management in Buena Vista. Groundwater quality can be protected through proper use of pesticides, herbicides and fertilizers, storm water and septic system management, and proper well construction and abandonment procedures. Some of these functions are the responsibility of cities and communities, but the District supports their efforts whenever possible.

Within the Buttonwillow Service Area, groundwater quality varies with location and depth. In the southern portion of the area, the TDS from production wells varies from 300 to 1,000 mg/L while in the northern portion, the TDS varies from 1,000 to 4,500 mg/L. The TDS of the shallow, perched zone ranges from 850-5,500 mg/L based on annual data from shallow piezometers. In the Maples Service Area the TDS ranges from 200 to 1,600 mg/L. Groundwater quality is generally better in the south, and improves in the interior of the District, possibly due to dilution with surface water from canal seepage and deep percolation from irrigation.

Groundwater salinity levels have generally been increasing over the past 20 years. The sources of the salinity are not fully understood but may include groundwater inflow from the west.

2.5 Monitoring Network

Production Wells

The District currently measures the depth to groundwater in 57 of more than 200 irrigation wells quarterly. Water quality samples are also taken from about 25 wells and analyzed for standard irrigation constituents and other constituents of concern annually or when possible due to pumping cycles. Every five years, a full well survey monitors and classifies all irrigation wells within the District. Recorded data include well location, state of use, depth to water, and any available pumping equipment physical characteristics.

Monitoring Wells

Currently there are 14 designated monitoring wells throughout the District. In 1994 the District completed three monitoring wells within the central part of the Buttonwillow Service Area to better cover the north-south alignment of the existing monitoring grid. In 1992, in cooperation with the Kern Water Bank, DWR installed three double completion monitoring wells in the southern portion of the Buttonwillow Service Area to coordinate monitoring the activities of the Kern Water Bank. All of the monitoring wells are measured for depth to water quarterly and samples are taken and analyzed for standard irrigation constituents of concern annually during the summer.

Shallow Piezometers

The District, in conjunction with DWR, has installed 104 piezometers designed to assist in monitoring the shallow groundwater table within the northern portion of the District. These 20-foot-deep wells measure the groundwater found in the upper zone of the soil profile and are monitored for depth to water quarterly and for salinity levels annually in the spring. Data from these piezometers provides the information needed to plot shallow groundwater level contours to denote annual fluctuations as well as changes over time for both water levels and groundwater quality.

3 Monitoring and Reporting Frequency

The following sections describe the frequency of monitoring and reporting. Specific methods and procedures are described in Section 5.

3.1 Groundwater Levels

Groundwater levels from all wells listed in Tables 1 and 2 shall be measured quarterly according to the schedule developed by the District. This schedule will specify dates for monitoring which fall within the monitoring periods developed each year by DWR. Details of the monitoring schedule are described below in Section 6. Groundwater level measurements during each of the monitoring cycles will be completed during a period that does not exceed one week.

3.2 Well Location

BVWSD will retain a Professional Land Surveyor to establish the horizontal and vertical locations for each of the wells included in its monitoring program. The latitude and longitude of the wells will be referenced to the North American Datum System of 1983 (NAD83) and the vertical elevations of the ground surface will be referenced to the North American Vertical Datum of 1988 (NAVD88). The distance from the measuring point to the location where the well casing intersects the ground surface will be measured with a tape measure.

To assure that the same well is being measured each time, BVWSD will use a standard Well Identification Sheet. Each Well Identification Sheet includes: well number, date of survey, latitude and longitude, groundwater surface (GS) elevation, reference point (RP) elevation, distance between GS and RP, location description and map, well type, well completion type, total depth (if available), screened intervals (if available), well completion report number (if available), well use, description of RP, landowner information, and picture of RP location.

Every five years the District will conduct a visual survey to update well locations, as well as drivers (electrical, diesel and natural gas) of all wells active and inactive.

3.3 Reporting

Measurements collected by the District will be recorded on a standard *Groundwater Level Monitoring Form* (Appendix A) and will be available for use by other Groundwater Sustainability Agencies cooperating in a coordinated GSP and to DWR within one month of completion of the monitoring program. The data will be used to maintain compliance with DWR's CASGEM program, however its main purpose will be to demonstrate sustainable groundwater management for compliance with SGMA.

4 Project Organization and Responsibility

BVWSD will carry out the monitoring protocol, make necessary changes to the monitoring network and consolidate and archive groundwater data collected during each of the monitoring cycles. In addition, the District will develop and refine, as needed, a Quality Assurance/Quality Control (QA/QC) program to be instituted to maintain the integrity of the monitoring protocol and of the data collected by the program. The Quality Assurance Plan will detail the measures the District will follow in exercising Quality Control when implementing its monitoring program. The following is a summary of the monitoring and reporting responsibilities under the Monitoring Plan:

- Coordinating monitoring and sampling schedules so that all activities are performed as scheduled.
- Scheduling equipment needed for monitoring.
- Measuring and recording groundwater levels.
- Quality Control of monitoring protocol implementation and of information entered into the District's Groundwater Management Database
- Revising the groundwater monitoring network as additional monitoring wells are introduced, inactive wells are removed or as new information becomes available on wells already in the network.

The District will also be responsible for:

- Quality control of water level measurements to identify inconsistencies in data.
- Refinement of Quality Assurance Plan and of Quality Control practices to be applied to sampling and monitoring methods and procedures.
- Distribution of groundwater monitoring results to other Groundwater Sustainability Agencies cooperating in a coordinated GSP.
- Analysis of data for use in assessment of groundwater conditions, reporting to CASGEM and development and implementation of the GSP(s).

5 Groundwater Level Monitoring

Groundwater levels and conductivity shall be measured in all wells designated for monitoring (Tables 1 and 2) on a quarterly basis. The monitoring schedule will correlate with the DWR monitoring program and is intended to provide complete coverage across the BVWSD service area.

5.1 Preparation for Field Work

Prior to collecting groundwater level and conductivity measurements and before going to the field, sampling personnel shall clean, maintain, test and calibrate devices to be used for measuring groundwater elevations and the EC meter using appropriate standards.

5.2 Monitoring Procedures

The following procedures shall be used to measure the depth to water at each designated monitoring well.

Each well will be assigned a unique identification number and a common name by the District. The *Groundwater Level Monitoring Forms* will list each of the wells by number and name and will be used to record all groundwater level measurements.

Depth to groundwater will be measured and reported to the nearest 0.1 ft and may be measured in one of four ways: 1) electric well sounder, 2) plopper, 3) steel tape, and 4) transducer. In addition, acoustic sounders may be used in conditions where groundwater depths make acoustic sounders the only practical device for taking measurements. Each of the above mentioned measurement methods is described briefly below.

- Electric sounder: Electric sounders typically include an electrode (probe) that is lowered within a well by a single line of conductive wire. When the tip of the probe contacts water, an electric circuit is completed which registers on a current meter built into the sounder box. Once the water level has been located by the probe, an engineer's tape is used to determine the depth to groundwater. Groundwater levels are confirmed when two consecutive measurements are within 0.1 ft of one another.

- Steel tape: Steel tapes have been used for many years by the USGS, DWR and the KCWA. They are typically used where a well's construction prevents measurement of water levels by electric sounders or ploppers. As is the case with electric sounders, the depth to water is confirmed by two consecutive measurements where the depth to water is within 0.1 ft.

- Plopper: A plopper is a capped ¾-inch threaded reduced bushing attached to an engineer's tape graduated to hundredths of a foot. The air pocket trapped in the capped bushing produces a distinctive plopping noise when the bushing strikes the standing water within the well casing. Under ideal conditions, water levels can be measured to an accuracy of 0.1 foot.

- Transducer: Transducers are now utilized in several monitoring wells within Kern County. Transducers are calibrated and the data is downloaded according to manufacturers' specifications.

- Acoustic sounder: Acoustic well sounders measure depth to water by bouncing sound waves off the water surface. Readings taken by acoustic sounders have a measurement error of from 3% to 5% and, due to this inaccuracy, are not recommended for use in this monitoring program. However, in instances where depth to water exceeds 500 ft, acoustic sounders may be the only practical device for measuring depths to groundwater. Groundwater level readings collected by acoustic sounder will be labeled as "questionable" when reported.

6 Quality Control

Quality Control will be performed in accordance with the Quality Assurance Plan. The Quality Assurance Plan will be periodically reviewed and updated as conditions warrant.

6.1 Groundwater Level Measurements

Groundwater depth measurements will be recorded in field notebooks or iPads organized by Township and Range and formatted to contain the information specified in the *Groundwater Level Monitoring Forms*. Technicians are required to enter the date, depth to groundwater to the nearest 0.1 ft, comments and initials. Comments may include the following: pump running, questionable measurement, pumping nearby, oil present, cascading water, etc. During each field visit, prior level readings will be compared to the new readings to provide a benchmark and approximate location of water levels.

After field personnel have completed their work, data recorded on their notebooks or iPads will be entered into an electronic spreadsheet or database for quality control. Managers will review groundwater level measurements for accuracy, and should a measurement appear suspicious, a confirmation reading will be obtained. After quality control, field data will be archived on the BVWSD Groundwater Management Database.

6.2 Monitoring Schedule

BVWSD will monitor levels at well sites designated in its monitoring network quarterly. All wells will be measured within one week of one another following a schedule that will be developed by the District in coordination with DWR. Groundwater pumping typically peaks during the summer growing season and slows in the winter. Therefore, spring levels represent an annual high prior to summer irrigation demands while fall levels represent an annual low after the summer irrigation demands.

Data on depths to groundwater will be used for analysis of long-term water level trends. Comparisons of groundwater levels in specific wells from the spring of one year to the spring of subsequent years can indicate groundwater trends.

6.3 Annual Monitoring Device Calibration

District personnel will routinely clean, maintain, and test the accuracy of measurement devices.

6.4 Monitoring Well Upgrade Program

BVWSD will implement a plan to upgrade their monitoring program by replacing production wells that are now monitored with dedicated monitoring wells having screened intervals and nesting designs intended to facilitate the collection and interpretation of data. The plan will also include a protocol to use downhole cameras to determine screened intervals and depths of wells that are included in the monitoring program but for which well completion reports are not available. The District is now implementing a program to install magnetic flow meters on all production wells within its service area.

7 References

California Department of Water Resources, January 2006. California's Groundwater Bulletin 118 Update 2003 Report.

United States Geological Survey, National Water Quality Assessment (NAWQA) Program, http://water.usgs.gov/nawqa/.

California Department of Water Resources, December 2010. Groundwater Elevation Monitoring Guidelines.

Arvin-Edison Water Storage District. CASGEM Monitoring Plan.

Kern-Tulare Water District. CASGEM Monitoring Plan.

Kern County Water Agency. Groundwater Level Monitoring Protocol.

Appendix A – Monitoring Well Location Map and Inventory

Map of monitoring well locations and list of all wells included in the monitoring program

Table 1
Well Inventory
Buena Vista WSD

Well Name	Date Constructed	Well Completion Report Number	Use of Well	Township Range Section	Parcel No.	Latitude (NAD83)	Longitude (NAD83)	Reference Elevation
Active Monitoring Wells								
Potential Monitoring Wells - Approval to use and release construction details required								

Appendix B – Groundwater Level Monitoring Forms

Should access to a well be prevented or should a measurement be of questionable quality, use the codes listed on the bottom of the forms to provide a reason why the measurement could not be collected and/or the reason that the measurement may be questionable. Insert the appropriate codes from the following table into the "NM"- No Measurement or "QM" – Questionable Measurement column of the Monitoring Form.

NM – No Measurement Codes	QM – Questionable Measurement Codes
0 - unable to reach well	1 - pumping
1 – pumping	2 - nearby pump operating
2 - pump house locked	3 - casing leaking or wet
3 - tape hung up	4 - pumped recently
4 - can't get tape in casing	5 - air or pressure gauge measurement
5 - unable to locate well	6 - other
6 - well has been destroyed	7 - recharge or surface water effects near well
7 - special/other	8 - oil or foreign substance in casing
8 - casing leaking or wet	9 – acoustical sounder
9 - temporarily inaccessible	E - recently flowing
D - dry well	F - flowing
F - flowing artesian	G - nearby flowing
	H - nearby recently flowing

<BUENA VISTA WSD>

Well 1

Date	Military Time	NM Code	QM Code	Depth to Water (feet below RP)	Comments

Well 2

Date	Military Time	NM Code	QM Code	Depth to Water (feet below RP)	Comments

<BUENA VISTA WSD>

Well Name	Well 1	Well 2			Important notes:
Well Depth (ft)					
Screen Top					
Screen Bottom					
Latitude					
Longitude					
RP Elev					
GS Elev					

Location Description:

Map:

Site Photos:

Appendix C - Well Logs

Include completion reports, E-logs, references to video logs or other documentation of well construction and condition