Sierra Valley
Groundwater Basin
Monitoring Program and Data Gaps Analysis

February 2026

Sierra Valley Groundwater Management District

PLUMAS COUNTY 1854 CALIFORNIA

Certification

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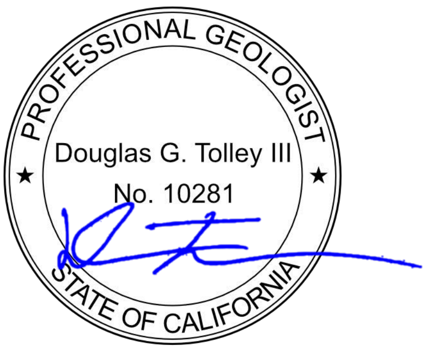

Douglas (Gus) Tolley, PhD, PG
Project Hydrogeologist
gtolley@geo-logic.com
143E Spring Hill Drive
Grass Valley, CA 95945

Hannah Erbele, PG
Project Hydrogeologist
herbele@geo-logic.com
2777 East Guasti Road, Suite 1
Ontario, CA 91761

Date signed:

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List of Acronyms

ACWI	Advisory Committee on Water Information
AFY	Acre-Feet per Year
AMSL	Above Mean Sea Level

BMP	Best Management Practice
BGS	Below Ground Surface
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CIMIS	California Irrigation Management Information System
CGPS	Continuous Global Positioning System
COC	Constituent of Concern
DBS&A	Daniel B. Stephens & Associates
DMS	Database Management System
DQO	Data Quality Objective
DWR	Department of Water Resources
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	Groundwater Dependent Ecosystem
GPM	Gallons Per Minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
InSAR	Interferometric Synthetic Aperture Radar
ISW	Interconnected Surface Water
LESA	Low Energy Spray Application
MAR	Managed Aquifer Recharge
MCL	Maximum Contaminant Level
MESA	Mid-Elevation Spray Application
MFFR	Middle Fork Feather River
MSL	Mean Seal Level
MTBE	Methyl tert-butyl ether
MOU	Memorandum of Understanding
NDVI	Normalized Difference Vegetation Index

OSWCR	Online System for Well Completion Reports
PRMS	Precipitation Runoff Modeling System
RMP	Representative Monitoring Point
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SV	Sierra Valley
SVELC	Sierra Valley Enterprises Loyalton Campus
SVGMD	Sierra Valley Groundwater Management District
SVGSP	Sierra Valley Groundwater Sustainability Plan
SVHSM	Sierra Valley Hydrogeologic System Model
SWBM	Soil-Water Budget Model
SWRCB	State Water Resources Control Board
TAF	Thousand Acre-Feet
TDS	Total Dissolved Solids
WCR	Well Completion Report

1.0 Introduction

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this Sierra Valley (SV) Monitoring Program and Data Gaps Analysis report for the Sierra Valley Groundwater Management District (SVGMD or District) and is under contract to provide updates to their Sustainable Groundwater Management Act (SGMA) of 2014 mandated Groundwater Sustainability Plan (GSP or Plan). A map of the SV groundwater basin is shown in Figure 1.0-1.

SGMA applies to all groundwater basins designated as “medium” and “high” priority by the California Department of Water Resources (DWR). The SV Subbasin is characterized as a medium priority basin. The GSP for SV Subbasin was submitted to DWR on January 28, 2022 (SVGMD, 2022) and was approved by DWR in a determination letter dated July 27, 2023 (DWR, 2023).

1.1 Purpose and Background

This section describes the purpose of this report and provides background information.

1.1.1 Purpose

The purpose of this Monitoring Plan and Data Gaps Analysis report is to summarize monitoring network expansion and modification performed under Grant Agreement #4600015875, Component 2d, Task 4. The Monitoring Network is used to track sustainable management of water resources in the Sierra Valley basin, per SGMA guidelines, and data are used to quantify specific sustainability indicators (as described in Section 1.1.4). This report summarizes the following:

- Datasets used for GSP preparation and periodic updates,
- Existing monitoring networks,
- Analysis of potential data gaps,
- Prioritized recommendations for filling data (knowledge) gaps and recommendations for filling them to optimize the monitoring network.

This report is not intended to impose specific monitoring wells and/or sampling locations on SVGMD with respect to their existing long-standing monitoring programs.

1.1.2 Background

SVGMD was authorized under SB 1391 in 1980 to protect and oversee the management of the groundwater within the SV Subbasin. SVGMD submitted notification to DWR in 2017 to become the exclusive Groundwater Sustainability Agency (GSA) for the portion of the SV Subbasin that lies within the groundwater management district statutory boundary and thereby, became the Lead Agency for the majority of the SV Subbasin. A relatively small area of the northwest corner of the SV Subbasin (approximately 115 acres or <0.1% of total SV Subbasin area) falls outside of the SVGMD boundary and therefore excludes SVGMD from eligibility to be the GSA for that area.

Accordingly, Plumas County submitted notification and became the exclusive GSA for that area, and in accordance with Water Code Section 10723.6, SVGMD and Plumas County established a memorandum of understanding (MOU) to establish their respective roles in GSP development and implementation. The MOU, provided in Appendix 1-2 of the SVGMD GSP, outlines that the two entities will work together to develop and adopt a single SGMA-compliant GSP for the SV Subbasin using sound groundwater science and local expertise.

1.1.3 Technical or Regulatory Guidelines and Guidance

In cooperation with SVGMD, DBS&A has developed this document in accordance with the DWR's SGMA-inspired technical assistance guidance document series *Best Management Practices* (BMP). It has been prepared in general accordance with the DWR's BMP #2 – Monitoring Networks and Identification of Data Gaps (DWR, 2016a). Much of the content contained in the DWR's BMP #2 was directly applicable to the development of this report and BMP content has been largely reproduced. Links to these resources are included in the References Section. Additional sources of technical guidance considered in preparation of this document include, but are not limited to:

- BMP #1 – Monitoring Protocols, Standards, and Sites (DWR, 2016b)
- Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (EPA, 2006)
- Title 23 of the California Code of Regulations (CCR)

This report has been prepared to satisfy, in part, the following criteria contained in 23 CCR Subarticle 4 – Monitoring Networks:

- § 354.32 – Intro to Monitoring Networks
- § 354.34 – Monitoring Networks
- § 354.36 – Representative Monitoring
- § 354.38 – Assessment & Improvement of Monitoring Network (Data Gaps)
- § 354.40 – Reporting Monitoring Data to the Department

Monitoring programs are to be reviewed and modified, as necessary, at least every five years as part of the periodic GSP evaluations required.

1.1.4 SGMA Sustainability Indicators

Six sustainability indicators are defined in the SGMA legislation. These are potential effects caused by groundwater conditions occurring in a basin that, when significant and unreasonable, are considered undesirable results. The basins' GSPs describe sustainable management criteria that serve as metrics for evaluating undesirable results relative to the sustainability indicators. Data must be sufficient to limit uncertainty when used to assess the sustainability indicators (DWR, 2017). The six indicators generally pertain to:

- Groundwater levels
- Groundwater storage
- Seawater intrusion
- Water quality
- Land subsidence
- Interconnected surface water

Seawater intrusion is not an applicable sustainability indicator in the SV due to its geographic location, and therefore is not discussed further in this document.

1.1.5 Historical and Current Groundwater Management in the Basin

Documentation of water resources monitoring preceding the 1960s is relatively limited. Water resources monitoring programs conducted since then and associated studies and findings are summarized below.

Several water resource management programs exist in the Sierra Valley, including surface water rights allocation management/tracking by regional Water Masters, waterway preservation/restoration efforts by the Sierra Valley Resource Conservation District, and groundwater management by SVGMD. The latter involves maintaining a large-capacity well inventory and metering and tracking program, reviewing new well applications, and maintaining a moratorium on new large-capacity wells in the eastern portion of the subbasin. The Upper Feather River Integrated Regional Water Management Plan addresses planning issues and priorities for the larger watershed encompassing the SV Subbasin. In addition, the Natural Resources Conservation Service has worked with many private landowners in the valley to improve water resource management.

A key component of water resources monitoring in the SV Subbasin has been through the study of groundwater conditions and how they have changed over time. The SV Subbasin has been included in several geology and hydrogeology studies and several focused studies and monitoring projects. The first comprehensive study was by DWR (1983) and included a review of all previous studies (e.g., DWR [1963, 1973]) of the area geology, hydrogeology, and natural resources. Since 1983, DWR Northern District has prepared eight annual updates on groundwater conditions in the SV Subbasin extending through 1991, and Kenneth D. Schmidt and Associates has prepared updates for the following time intervals: 1991 to 1994, 1994 to 1998, 1998 to 2003, 2003 to 2005, 2005 to 2011, and 2012 to 2014 (Schmidt, 1999, 2003, 2005, 2012, 2015, and 2017). A comprehensive review of groundwater data was later prepared by Bachand and Associates (2020) which included data extending through 2018.

Studies and monitoring by SVGMD and DWR are ongoing. Studies will be conducted and associated reports will be prepared throughout the implementation horizon of the SVGMD's GSP.

1.2 Basin Hydrogeologic Conceptual Model

The following is a summarized description of the SV Subbasin hydrogeologic conceptual model (HCM). A HCM is a framework for understanding how water moves into, within, and out of a groundwater basin and underlying aquifer system. Development of a basin HCM is an iterative process as data gaps are addressed and new information becomes available. For a more detailed description of the Sierra Valley HCM, see Chapter 2 of the GSP.

1.2.1 Physiography

The Sierra Valley is a large sub-alpine valley located in the eastern Sierra Nevada Mountains in the northern portion of the Sierra Nevada geomorphic province of California and drains nearly 374,000 acres. The groundwater basin covers about 125,900 acres and is comprised of the Sierra Valley (5-012.01) and Chilcoot (5-012.02) Subbasins. Although the Chilcoot Subbasin is currently designated as very low priority by DWR and therefore not required to have a GSP, it has been included in the SVGMD's GSP.

The valley is surrounded by steep mountains and alluvial fans with various slope gradients. Elevations in the watershed range between 4,854 feet above mean sea level (feet amsl) in the valley floor to 8,740 feet amsl at Babbit Peak in the southeastern mountains (Figure 1.2-1). The valley floor is a relatively flat Pleistocene lakebed, with a zero to five percent slope gradient. Volcanic outcrops disrupt the flat topography in various locations throughout the valley. Stream channels cutting through the steep slopes of the surrounding mountains drain precipitation and snowpack into the Sierra Valley from the headwaters of the Middle Fork Feather River (MFFR) (Figure 1.2-2).

1.2.2 Geology

The Sierra Valley lies at the eastern edge of the Sierra Nevada Province, along the western edge of the Great Basins Province. The 400-mile long Sierra Nevada mountain range trends north-northwesterly and is a west-dipping block of granitic and remnant metamorphic rocks. The geologic history of the Sierra Valley is a complex mixture of orogenies, volcanism, rifting, faulting, and deposition. Figure 1.2-3 provides a spatial overview of Sierra Valley geology, and Figure 1.2-4 provides a stratigraphic overview interpreted by DWR (1963). Figure 1.2-5 depicts generalized geologic cross-sections of the SV prepared by DWR (1963). Schmidt and Associates created several additional aquifer cross-sections (Figure 1.2-6) showing more detail using electrical logs (Schmidt, 2003 and 2005).

The SV subbasin is part of a down-dropped fault block, or graben, surrounded by uplifted mountains, or horsts. The valley floor consists of an irregular surface of basement rock, formed by steeply dipping northwest and northeast-trending vertical, normal, and strike-slip faults. Throughout its geologic history, the fault-trough floor gradually subsided, while being occupied by one or several lakes. Lacustrine (lake), fluvial, and alluvial deposits were formed as sediments eroded from the surrounding uplands and volcanic tuffs (ash deposits) filled the space created by the fault-trough floor as it continued to subside.

Sierra Valley geologic units can be divided into three groups: (1) basement complex metamorphic and granitic rocks, (2) Tertiary volcanics, and (3) Quaternary sedimentary deposits of clay, silt, sand, and gravel. Most high-capacity production wells in the basin are screened within the coarse fraction of the Quaternary sediments.

1.2.3 Hydrogeologic Framework

The SV Subbasin is a fault-trough basin that has been filled with various lacustrine, alluvial, and fluvial deposits, which comprise the primary aquifers of the basin and are the source of most of the area's pumped groundwater. The trough floor is characterized by several subsiding fractured volcanic and granitic bedrock blocks. The basin boundaries are generally delineated by the contact between the basin fill and adjacent bedrock units created by deposition or faulting. These two hydrostratigraphic units will be referred to as the "basin fill unit" and "bedrock unit" for the purpose of this report. Well drilling records and geophysical surveys conducted by the USGS (Jackson and others, 1961; Gold and others, 2013; Roberts and others, 2025) indicate depth to bedrock is up to 1,500 feet in the central basin, with sediment thickness along the periphery of the basin being no more than a few hundred feet. Some deeper sediments near centrally located geothermal areas have been lithified by low grade hydrothermal alteration, resulting in a shallower aquifer system in these areas.

The basin fill unit contains the primary water-bearing formations in the Sierra Valley and includes Holocene sedimentary deposits, Pleistocene lake deposits, and Pleistocene lava flows and volcanic tuffs. Fine-grained sediments generally dominate the central portion of the groundwater basin, whereas coarse grained sediments are found along the margins of the valley and represent former lake shoreline (Bohm, 2016). As the faulted basin has continued to subside, the older layers have become increasingly curved with depth, whereas recent (shallow) deposits are relatively flat-lying. Alternating non-contiguous layers of clay, sand, and silt are in lenticular form and do not necessarily cover the entire basin. Low-permeability fine-grained layers separating aquifers are thinner to non-existent near the valley periphery (Bohm, 2016). Although "shallow" and "deep" aquifer terms have been historically adopted by DWR, analysis of data from drilling records, water level response, groundwater chemistry and groundwater temperature studies do not necessarily indicate two distinctive aquifers throughout the groundwater basin. Parts of a deep aquifer zone may be pressurized by confining low-permeability layers (Bohm, 2016), although extent and isolation between shallow and deep aquifer zones likely vary throughout the SV Subbasin (Schmidt, 2005 and Bohm, 2016). Although a laterally continuous confining layer has not been observed, silt and clay units in some areas are estimated to be up to about 860 feet (262 meters) thick and laterally extensive enough to provide confining conditions. Water levels collected from multiple depth completion wells (e.g., DMW 2 and DMW 3) indicate that the hydrologic connection between the upper and

Table 1.2-1. Summary of Basin-Fill Aquifer Parameters.

Location	well #	T, gpd/ft	S	K, gpd/ft2	t-max, hrs	Q, gpm	SWL, ft	h-max, ft	SPC	screen, ft	TD, ft	pw/obs?	comments
Aquifer parameters in valley fill formations													
Pumpingtest results, Sierra Valley													
Lucky Herford Old Well #4	2215.36J1	17,900	nd	36	12	1,800	40	120	22	504	775	p	DWR (1983)
Genasci Well	2115.12P3	19,500	nd	69	23	1,330	35	153	11	284	514	p	DWR (1983)
Lucky Hereford #10	2316.32Q1	110,900	nd	375	20	3,150	69	126	55	296	820	p	DWR (1983)
		98,200	0.00031									o	DWR (1983)
Sposito resid. Well, Calpine		9,825	0.0051	68	72	119	9.8	119	1	145	145	o	Smith(2007)

lower aquifer units on the west side of the basin may vary spatially, but this has yet to be confirmed due to data sparsity in that area. Very few pumping test data are available for the basin fill unit. As shown in Table 1.2-1 from Bohm (2016), reported hydraulic conductivities range from 36 to 375 gallons per day per square foot (gpd/ft^2).

The bedrock units underlying the basin fill units are characterized by secondary (fracture) permeability and porosity. Except for the highly permeable fault zones, the bedrock unit is deemed impermeable for all practical purposes (Bohm, 2016). A number of pumping tests in the bedrock have been conducted in the basin periphery. Aquifer parameters determined are highly variable dependent on the number of fractures intersected and rock's material ability to hold open fractures and joints with seismic activity. The estimated bedrock hydraulic conductivity is about three orders of magnitude smaller than the sedimentary basin fill in the Sierra Valley. Bedrock aquifer parameters are included in Table 1.2-2 from Bohm (2016).

The principal geologic structures affecting groundwater flow are the basin's bedrock boundaries and faults in the valley-fill material. The bedrock underlying the basin is generally impermeable relative to the valley fill sediments, with the exception of zones where faulting has significantly increased the secondary permeability. Faults generally restrict groundwater flow across the fault, but can provide enhanced permeability for flow parallel to the strike direction. Evidence of faults acting as groundwater flow barriers includes emergence of springs along fault traces and changes in water level elevations across faults. Groundwater elevation data suggests the northwest trending Grizzly Valley Fault Zone impedes horizontal flow across it, although the impediment may not be contiguous along the entire length of the lineaments (Bachand and Associates, 2020).

Table 1.2-2. Summary of Bedrock Aquifer Parameters.

Bedrock aquifer parameters									
Sierra Valley bedrock aquifers									
from selected well tests									
			aquifer thickness b, ft	**Transmissivity T**		**Hydraulic Conductivity, K:**			
Well name/project:	location	aquifer formation		gpd/ft		gpd/sq-ft	m/day	m/s	Data Source
Calpine VFD well	Calpine	granite	single fracture	-----	K measured	4.2	0.172	2.0E-06	Bohm (2010)
Anderson test well	Sierraville	T. volcanics	210	1271	K measured	6.1	0.247	2.9E-06	Bohm(2006)
Amodei dom. Well	Sierraville	T. volcanics		1012	K measured	8.3	0.341	3.9E-06	Bohm(2006)
John Amodei, dom well	Sierraville	T. volcanics	50	1000	T measured	20.0	0.816	9.4E-06	Bohm(1998)
test well, "The Ridges"	Chilcoot	granite	185	1440	K measured	7.8	0.318	3.7E-06	Bohm(2006)
Test w. RH-2, Beckw. Pass	Chilcoot	granite	160	4911	T measured	30.7	1.252	1.4E-05	Bohm & Juncal (1989)
SPI well No. 3	Loyalton	T. volcanics	190	787	T measured	4.1	0.169	2.0E-06	Bohm (1997)
River valley Subd.	RV-1	T. volcanics	350	3440	T measured	9.8	0.401	4.6E-06	Bohm (2002)
River valley Subd.	RV-1	T. volcanics	350	6000	T measured	17.1	0.699	8.1E-06	Bohm (2002)
Frenchman Lake Road Esta	FLRE-1	granite	265	1162	T measured	4.4	0.179	2.1E-06	Juncal & Bohm, 1986)
Frenchman Lake Road Esta	FLRE-2	granite	254	27	T measured	0.1	0.004	5.1E-08	Juncal & Bohm, 1986)
Frenchman Lake Road Esta	FLRE-3	granite	96.74	13	T measured	0.1	0.005	6.3E-08	Juncal & Bohm, 1986)
Frenchman Lake Road Esta	FLRE-1	granite	265	2364	T measured	8.9	0.364	4.2E-06	Bohm (1995)
Well 1B, Cedar Crest, 14 day test		granite	433	1380	T measured	3.2	0.130	1.5E-06	Bohm (1997)
		maximum		6000		30.7	1.252	1.4E-05	
		minimum		13		0.1	0.004	5.1E-08	

1.3 Data Quality Objectives

Decisionmakers must have a satisfactory level of confidence in the quality of the data on which they rely to inform their decisions. Two primary data quality attributes are quantity (e.g., spatial and temporal coverage) and accuracy. Evaluations are performed to assure the basin-specific Data Quality Objectives (DQOs) are met, and that the analysis level of confidence is known and documented.

1.3.1 EPA Data Quality Objectives Process

The following excerpt is from DWR's BMP #2 (DWR, 2016a):

> The GSP Regulations require GSAs to develop a monitoring network. The monitoring network must be capable of capturing data on a sufficient temporal frequency and spatial distribution to demonstrate short-term, seasonal, and long-term trends in basin conditions for each of the sustainability indicators, and provide enough information to evaluate GSP implementation. A monitoring network should be developed in such a way that it demonstrates progress toward achieving measurable objectives.
>
> As described in the Monitoring Protocols, Standards, and Sites BMP, it is suggested that each GSP incorporate the Data Quality Objective (DQO) process following the U.S. Environmental Protection Agency (EPA) Guidance on Systematic Planning Using the Data Quality Objectives

Process (EPA, 2006). Although strict adherence to this method is not required, it does provide a robust approach to consider and assures that data is collected with a specific purpose in mind, and efforts for monitoring are as efficient as possible to achieve the objectives of the GSP and compliance with the GSP regulations.

1.3.2 Basin-Specific Data Quality Objectives

The seven steps of the DQO process for this Tech Memo Report are presented in Table 1.3-1.

Table 1.3-1. Data Quality Objectives.

Step 1: State the Problem – Define sustainability indicators and planning considerations of the GSP and sustainability goal.
Step 2: Identify the Goal(s) – Describe the quantitative measurable objectives (MOs) and minimum thresholds (MTs) for each of the sustainability indicators.
Step 3: Identify the Inputs – Describe the data necessary to evaluate the sustainability indicators and other GSP requirements (i.e., water budget).
Step 4: Define the Boundaries of the Study – This is commonly the extent of the Bulletin 118 groundwater basin or subbasin, unless multiple GSPs are prepared for a given basin. In that case, evaluation of the coordination plan and specifically how the monitoring will be comparable and meet the sustainability goals for the entire basin should be described.
Step 5: Develop an Analytical Approach – Determine how the quantitative sustainability indicators will be evaluated (i.e., are special analytical methods required that have specific data needs?).
Step 6: Specify Performance or Acceptance Criteria – Determine what quality the data must have to achieve the objective and provide some assurance that the analysis is accurate and reliable.
Step 7: Develop a Plan for Obtaining Data – Once the objectives are known, determine how these data should be collected. Existing data sources should be used to the greatest extent possible.

1.4 Representative Monitoring Points

Representative monitoring points (RMPs) are a subset of the complete monitoring network within a basin. RMPs "can be used to consolidate reporting of quantitative observations of the sustainability indicators…Agencies can adopt a single network of RMPs or have a unique set of RMPs for each sustainability indicator" (DWR, 2016a).

The following excerpt is from DWR's BMP #2 (DWR, 2016a):

> If RMPs are used to represent groundwater elevations from a number of surrounding monitoring wells, the GSP should demonstrate that each RMP's historical measured groundwater elevations, groundwater elevation trends, and seasonal fluctuations are similar to the historical measurements in the surrounding monitoring wells. If RMPs are used to represent groundwater quality from a number of surrounding monitoring wells, the GSP should demonstrate that each RMP's historical measured groundwater quality and groundwater quality trends are similar to historical measurements in the surrounding monitoring wells.
>
> The use of groundwater levels as a proxy may be utilized where clear correlation can be made for each sustainability indicator. The use of the proxy can facilitate the illustration of where minimum thresholds and measurable objectives occur. A series of RMPs or a single RMP may be adequate to characterize a management area or basin. Use of the RMP should include identification and description of possible interference with the monitoring objective.

2.0 Current and Historical Datasets

This section broadly describes datasets used during GSP preparation and also collected as part of monitoring network expansion and modification activities performed under DWR Grant Agreement #4600015875. Similar datasets are anticipated to be used for the periodic GSP evaluations required at least every 5 years. A detailed description of the monitoring networks that collect the data summarized in this section can be found in Section 3.

2.1 Groundwater

The following sections describe datasets associated with groundwater.

2.1.1 Well Inventory

The District maintains a database management system (DMS; https://sierra-valley.gladata.com) that contains numerous data sets, including well location and construction information. It was initially populated with data from multiple public databases [SGMA Data Viewer, Online System for Well Completion Reports (OSWCR), California Statewide Groundwater Elevation Monitoring (CASGEM), GeoTracker, etc.] and District records. Cross-referencing wells across databases is generally difficult as there is no consistent naming, coordinates can differ, and there are typically only a few shared physical attributes (total depth and screened interval) which are commonly not reported. Although the DMS likely contains both duplicated wells and missing records, significant improvements have been made since initial GSP development. The DMS represents

Table 2.1-1. Well Type Summary.

Well Type	Count
Agricultural Well	187
Domestic Production Well	645
Exploratory Boring	15
Extraction Well	1
Groundwater Monitoring Well	154
Heat Exchange Well	1
Industrial Well	10
Municipal Well	57
Production Well	5
Stockwater Well	53
Unknown	442
Total	**1,570**

Table 2.1-2. Well Location Uncertainty Summary.

Location Uncertainty	Count
< 10 feet	45
10 - 100 feet	111
100 - 200 feet	76
200 - 500 feet	137
500 - 1,000 feet	67
1,000 - 2,000 feet	57
> 2,000 feet	665
Unknown	412
Total	**1,570**

the most accurate well inventory available for the basin and is updated as new records are discovered or made available.

As of the date of this report, the Sierra Valley DMS contains 1,570 monitoring point records related to wells and exploratory borings (Figure 2.1-1 and Table 2.1-1). Two separate well inventory tasks have been conducted since the start of GSP development to populate missing construction information and more accurately identify well locations using non-redacted well log information (e.g., address, parcel number, and/or driller's map, when available). The first inventory was conducted in 2021 as part of the numerical model development and focused on wells with logs that contained legible lithology data. The second well inventory was conducted from 2024 to 2025 and focused on the remaining wells with logs.

A total of 369 wells (23.5 percent) have coordinates that are believed to be within 500 feet of the actual location (Table 2.1-2). This is a significant improvement from the OSWCR database, where only 0.3 percent of wells in the basin had coordinates that were within a half-mile (2,640 feet) of the actual location.

2.1.2 Groundwater Levels

The Sierra Valley DMS currently contains nearly 20,000 water level records since September 1957 at 177 wells. Groundwater monitoring is performed by several entities including the District, DWR, Sierra County, and Sierra Valley Cogen (formerly Sierra Valley Enterprises). Manual measurement frequency varies from monthly to semiannual (spring and fall). Transducers are equipped in 7 wells and collect data at a much higher frequency, typically on the scale of hours. Monitoring frequency of groundwater elevations is summarized in Table 2.1-3.

Table 2.1-3. Groundwater Elevation Monitoring Frequency.

Monitoring Frequency	Number of Wells	Wells
Continuous	7	DMW 7id, DMW 7is, DMW 7s, SVB_604, SVB_605, SVB_606, SVB_607
Monthly	24	DMW 1d, DMW 1s, DMW 2d, DMW 2i, DMW 2s, DMW 3d, DMW 3i, DMW 3s, DMW 4d, DMW 4i, DMW 4s, DMW 5d, DMW 5i, DMW 5s, DMW 6d, DMW 6s, DMW 7d, DMW 7i, W1, W2, W3, W5, W6, W8
Quarterly	7	SVELC WL1, SVELC WL2, SVELC WQ1, SVELC WQ3, SVELC WQ5, SVELC WQ8, SVELC WQ9
Semiannual	53	20N14E13Q002M, 20N14E14R001M, 21N14E25P003M, 21N15E14L001M, 21N16E06H003M, 21N16E07F004M, 21N16E18G002M, 22N15E08Q001M, 22N15E22Q001M, 22N15E34L006M, 22N16E01A002M, 22N16E04A001M, 22N16E17E002M, 22N16E20P002M, 23N15E29H001M, 23N14E35L001M, 23N15E34D001M, 23N16E23F001M, 23N16E27R001M, 23N16E28L001M, 23N16E33A002M, 23N16E36L003M, 23N16E36L004M, 23N16E36N002M, 23N16E36R001M, 23N17E31P001M, 23N17E31Q001M, 23N17E31Q002M, DMS 002 (old), DMS 007 (old), DMS 012, DMS 014, DMS 016, DMS 020, DMS 023 & 024, DMS 027, DMS 028, DMS 029, DMS 030, DMS 032, DMS 034, DMS 035, DMS 037, LSLF MW-10D, LSLF MW-2, LSLF MW-3, LSLF MW-5, LSLF MW-6, LSLF MW-7, LSLF MW-8D, LSLF MW-9D, LSLF MW-MY, Sierra Brooks Well 2

Notes:

1. Only wells with water level records since Jan 1, 2015 are included.

RMPs, the subset of wells that typify groundwater conditions in the basin, were established by the District in the 2022 GSP. Selection was largely based on data availability, known construction information, and spatial location. Preference was given to wells with longer periods of record, greater numbers of observations, and higher likelihoods that monitoring would be continued in the future. Based on the density consideration outlined in the DWR BMPs (DWR, 2016) guidelines, the 2022 GSP established a monitoring network of 36 RMPs (Figure 2.1-2 and Table 2.1-4).

Table 2.1-4. Sierra Valley Groundwater Elevation Representative Monitoring Points.

DMS ID	Well Name	Latitude	Longitude	Aquifer	Minimum Threshold (feet amsl)	Measurable Objective (feet amsl)
12	20N14E14R001M	39.58102	-120.385011	Upper	5,009	5,029
31	21N14E25P003M	39.639143	-120.36667	Upper	4,913	4,921
73	21N16E18G002M	39.6744	-120.2282	Upper	4,972	4,979
93	22N15E08Q001M	39.7667	-120.3238	Lower	4,873	4,878
112	22N15E22Q001M	39.7403	-120.287	Upper and Lower	4,849	4,860
124	22N15E34L006M	39.710592	-120.287832	Lower	4,786	4,833
131	22N16E01A002M	39.7924719	-120.129188	Upper	5,038	5,052
132	22N16E04A001M	39.7945	-120.192	Upper	4,891	4,908
148	22N16E20P002M	39.737163	-120.2127759	Upper	4,929	4,934
161	23N14E35L001M	39.802017	-120.381727	Upper	4,864	4,872
176	23N15E34D001M	39.80936	-120.2932	Upper	4,863	4,872
185	23N16E27R001M	39.810733	-120.165257	Upper	4,955	4,958
187	23N16E28L001M	39.8165	-120.1934	Upper	4,905	4,921
194	23N16E33A002M	39.8058999	-120.1862	Upper	4,904	4,921
206	23N16E36L003M	39.8023999	-120.1370999	Upper	4,987	5,002
209	23N16E36N002M	39.7951	-120.1418	Upper	4,994	5,003
94	DMS 002 (old)	39.7808	-120.289984	Lower	4,730	4,789
190	DMS 012	39.809824	-120.221061	Upper and Lower	4,760	4,812
136	DMS 016	39.783083	-120.224483	Upper and Lower	4,746	4,801
100	DMS 020	39.752845	-120.256851	Lower	4,766	4,809
130	DMS 028	39.708054	-120.244922	Upper and Lower	4,840	4,873
56	DMS 030	39.681398	-120.240644	Upper and Lower	4,865	4,893
70	DMS 034	39.6864239	-120.2298673	Upper and Lower	4,871	4,902
67	DMS 035	39.6934674	-120.2234171	Upper and Lower	4,899	4,916
43	DMS 037	39.69695	-120.291617	Upper	4,801	4,842
289	DMW 2d	39.595064	-120.3910121	Lower	4,950	4,954
291	DMW 2s	39.595064	-120.3910121	Upper	4,943	4,946
292	DMW 3d	39.644446	-120.413754	Upper	4,892	4,912
294	DMW 3s	39.644446	-120.413754	Upper	4,871	4,912
296	DMW 4i	39.672221	-120.4094313	Lower	4,875	4,883
297	DMW 4s	39.672221	-120.4094313	Upper	4,889	4,897
298	DMW 5d	39.795591	-120.141771	Upper	4,998	5,007
300	DMW 5s	39.795591	-120.141771	Upper	4,996	5,001
301	DMW 6d	39.816977	-120.347824	Upper	4,836	4,856
302	DMW 6s	39.816977	-120.347824	Upper	4,835	4,865
78	Sierra Brooks Well 2	39.64997	-120.22301	Upper	5,061	5,072

To enhance the groundwater level monitoring network, three pressure transducers were installed in existing wells off of Smithneck Creek in 2024 and early 2025 that collect water levels at high frequency. In addition, four telemetered monitoring wells were installed surrounding the large wetland meadow complex in the northwest portion of the Basin where no monitoring was previously conducted. Additional groundwater monitoring data have been collected using DWR, GeoTracker, Sierra Valley Enterprises Loyalton Campus (SVELC) and SVGMD groundwater monitoring wells that have recorded groundwater data since 2022.

2.1.3 Groundwater Quality

Groundwater quality in the SV Subbasin is generally good and well-suited for the municipal, domestic, agricultural, and other existing and potential beneficial uses designated for groundwater in the Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin (Basin Plan). The information currently available on Sierra Valley groundwater quality primarily comes from DWR's Groundwater Ambient Monitoring and Assessment (GAMA) program, the GeoTracker database maintained by the State Water Resources Control Board (SWRCB), and the handful of municipal wells that are required to be tested periodically under CCR Title 22 § 64423.1.

A total of 238 wells have associated water quality data going back as far as 1955, but only 57 wells have been sampled since January 1, 2015 and have five or more sampling events associated with them (Figure 2.1-3). Due to the relatively high quality of groundwater in the basin, no basin-wide water quality monitoring program was established prior to adoption of the GSP. Monitoring was typically for a specific purpose and limited to specific constituents of interest, resulting in significant data gaps in both space and time. As available data are sporadic spatially and temporally, all data for a constituent were aggregated and evaluated against water quality objectives or notification levels, as applicable. As described in the 2022 GSP, eight constituents: nitrate, total dissolved solids (TDS), arsenic, boron, pH, iron, manganese, and methyl tert-butyl ether (MTBE) were selected for further evaluation in the GSP; however sustainable management criteria (SMC) are defined for only two constituents: nitrate and TDS.

Arsenic, boron, pH, iron, and manganese are impacted significantly by natural processes and local geological conditions that are not controllable by the GSAs through groundwater management processes. Therefore, SMC are not defined for these constituents. As described in the GSP, the occurrence of MTBE has diminished substantially over the past decades and therefore, no SMC are defined for this constituent; moreover, it is associated with contaminated sites that have dedicated monitoring and cleanup and is not likely a risk for future contamination.

In addition to conducting monitoring for the constituents with SMC (nitrate and TDS), the GSA periodically monitors arsenic, boron, and pH at selected wells to track any potential mobilization of elevated concentrations or exceedances of the maximum contaminant levels (MCLs). Furthermore, project-specific water quality monitoring is performed as part of implementation of SVGMD Pilot Recharge Projects (Grant Action Item #5). Details of recharge-specific water quality monitoring are provided in Section 3.5. Water quality degradation is typically associated with increasing constituent concentration; thus, the GSAs have decided not to use the term “minimum threshold” in the context of water quality, but rather “maximum threshold.”

2.1.4 Groundwater Extractions

Flow meters are required on high-capacity wells (100+ gallons per minute [gpm] or 6+ inch casing diameter) per SVGMD Ordinance 82-03. Agricultural and municipal groundwater extraction volumes were available since 2003 and 2005, respectively. Prior to 2021, agricultural extractions were generally only available on an annual basis. From 2021 onward, the District has monitored agricultural extractions on a monthly basis during the growing season. Annual agricultural pumping volumes fluctuate significantly depending on the water year (WY) type and management factors (e.g., well maintenance). Municipal pumping is also recorded on a monthly basis by the operator and reported to the District.

Historical agricultural groundwater pumping volumes range from about 4,700 to 13,600 acre-feet per year (AFY). Municipal groundwater extractions are a relatively small proportion of total groundwater pumped and show much less interannual variation, with reported values ranging from about 312 to 768 AFY. This includes pumping data from the Sierra County Water Works District #1 (Calpine) despite their wells (Calpine Well 1 and Calpine Well 2) being located outside of the groundwater basin boundary and screened exclusively in bedrock. Annual production volumes for the Calpine wells are about 30 to 40 AFY.

The District reports total groundwater extractions by water use sector (agricultural, municipal and industrial, and domestic) in their GSP Annual Report as required by CCR Title 23, §356.2. Well-specific extraction data are considered proprietary by the District and therefore are not released to the public.

2.2 Surface Water

Surface water inflows entering the groundwater basin have been measured sporadically by DWR at 12 locations (Figure 2.2-1) since 2007. Measurement frequency varies by stream but approximately 2 to 15 flow measurements are recorded for each stream on average every year. Controlled releases from Frenchman Lake and Lake Davis are reported by DWR on a daily or monthly basis. Flow rates for imported water from the Little Truckee River are measured on a daily basis while the diversion is operating, and are available dating back to April 1959. In 2024, the District installed Solinst Leveloggers along Smithneck Creek and Staverville Creek in the southeast region of the Subbasin as part of managed aquifer recharge (MAR) projects to develop rating curves and evaluate flow. In early 2025, telemetry stations were added for continuous data collection (every 15 minutes).

The Sierra Valley Hydrogeologic System Model (SVHSM) includes a precipitation-runoff modeling system (PRMS) component model that simulates surface water hydrology for the portions of the watershed outside the groundwater basin. Simulated annual stream inflows to the groundwater basin are highly variable, ranging from about 26 to 362 thousand acre-feet per

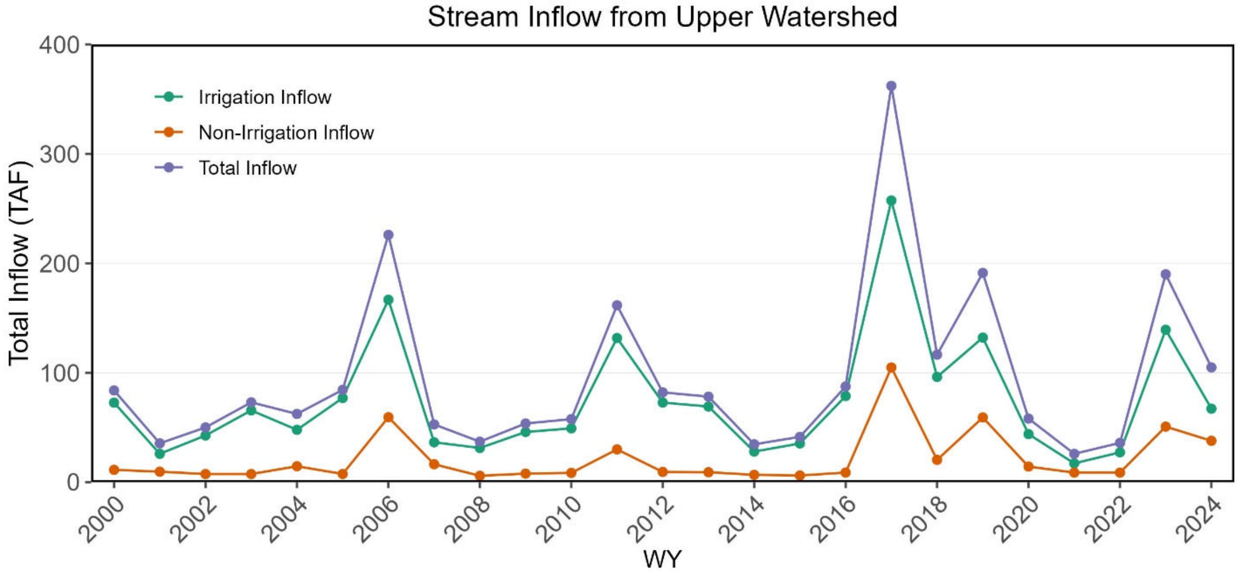

Figure 2.2-2. Annual surface water inflows input to the soil-water budget model (SWBM).

year (TAF/yr) (Figure 2.2-2). Surface water available for irrigation made up about 64 to 91 percent of total inflows, and averaged about 80 percent of total inflows.

The upper Middle Fork Feather River (MFFR) is the only surface water outlet from the basin. A USGS stream gage (MF Feather R NR Portola, CA; 11392100) measured daily discharge from October 1, 1968 to September 29, 1980. DWR took over monitoring at the same location October 31, 2006 (CDEC Site ID: MFP) and continues to monitor every 15 minutes.

2.3 Meteorological

Daily precipitation and temperature observations at the Sierraville ranger station (Figure 2.3-1) were used as inputs for the PRMS sub-model. Days with missing data were filled in using nearby meteorological stations (Vinton and Portola). In October 2020, a California Irrigation Management Information System (CIMIS) station (264 - Sierra Valley Center) was installed in the basin. Data from this station were of limited use during GSP development due to the short period of record available, but it is anticipated that data from this station will be the primary source of climate data in the future. Precipitation, minimum daily temperature, and maximum daily temperature are the three timeseries inputs to the PRMS model.

Long-term total mean annual precipitation (1981 to 2010) in the watershed ranges from 62.4 inches in the southwest mountain slopes to 13.6 inches in the eastern part of the Chilcoot Subbasin (PRISM Climate Group, n.d.). Most areas of the Sierra Valley watershed receive an average of approximately 15 to 20 inches of precipitation per year. Precipitation follows a Mediterranean climate pattern with 75 percent of the annual total falling between November and

March. Less than five percent of precipitation falls during the summer months (July through September).

Long-term averages of mean annual temperatures (1981 to 2010) range from 40.4°F in the mountain slopes in the southwest portion of the watershed to 48.5°F in the eastern part of the basin. Monthly averages are lowest from December through February and highest in July and August (PRISM Climate Group, n.d.).

2.4 Land Use

Land use in the basin is primarily forest and woodland in the upper watershed and a mixture of agricultural fields, native desert scrub and grassland, and wetlands (Figure 2.4-1).

3.0 SGMA Monitoring Networks

Based on the available datasets outlined in Section 2, the District has developed four primary monitoring networks capable of providing sustainability indicator data of sufficient accuracy and quantity to demonstrate that the basin is being sustainably managed:

- Groundwater monitoring
- Surface water monitoring
- Land subsidence monitoring
- Soil moisture monitoring

Groundwater level and groundwater quality monitoring are independent of each other but utilize some of the same wells. Surface water monitoring is largely conducted by DWR, but the District maintains some streamflow monitoring stations as part of managed aquifer recharge (MAR) projects. Land subsidence monitoring utilizes remotely sensed (collected by satellite) interferometric synthetic aperture radar (InSAR) data along with land-based survey monuments. A summary of which monitoring network is used in relation to each sustainability indicator is provided in Table 3.0-1. More details for each monitoring network are provided in the following sections, with evaluations of potential data gaps discussed in Section 4.

Table 3.0-1. Summary of Sustainability Indicators and Associated Monitoring Network(s).

Sustainability Indicator	Monitoring Network(s)	Metric	Number of Representative Monitoring Points	Representative Monitoring Points
Chronic Lowering of Groundwater Levels	Groundwater	Groundwater levels	36	20N14E14R001M, 21N14E25P003M, 21N16E18G002M, 22N15E08Q001M, 22N15E22Q001M, 22N15E34L006M, 22N16E01A002M, 22N16E04A001M, 22N16E20P002M, 23N14E35L001M, 23N15E34D001M, 23N16E27R001M, 23N16E28L001M, 23N16E33A002M, 23N16E36L003M, 23N16E36N002M, DMS 002 (old), DMS 012, DMS 016, DMS 020, DMS 028, DMS 030, DMS 034, DMS 035, DMS 037, DMW 2d, DMW 2s, DMW 3d, DMW 3s, DMW 4i, DMW 4s, DMW 5d, DMW 5s, DMW 6d, DMW 6s, Sierra Brooks Well 2
Reduction of Groundwater Storage	Groundwater Soil Moisture	Groundwater levels as proxy for volume in storage; Soil moisture network data improves irrigation timing and efficiency, resulting in reduced groundwater pumping	36	20N14E14R001M, 21N14E25P003M, 21N16E18G002M, 22N15E08Q001M, 22N15E22Q001M, 22N15E34L006M, 22N16E01A002M, 22N16E04A001M, 22N16E20P002M, 23N14E35L001M, 23N15E34D001M, 23N16E27R001M, 23N16E28L001M, 23N16E33A002M, 23N16E36L003M, 23N16E36N002M, DMS 002 (old), DMS 012, DMS 016, DMS 020, DMS 028, DMS 030, DMS 034, DMS 035, DMS 037, DMW 2d, DMW 2s, DMW 3d, DMW 3s, DMW 4i, DMW 4s, DMW 5d, DMW 5s, DMW 6d, DMW 6s, Sierra Brooks Well 2, Roberti P-10 MESA, Roberti P-10 MESA, Roberti P-13 LESA, Roberti P-13 LESA, Grandi P-3 LESA, Grandi P-3 LESA, Grandi P-3 MESA, Grandi P-3 MESA, DS Ranch P-11, Roberti P-2, Bar One Indian Pivot, Diamond G East Pivot
Depletion of Interconnected Surface Waters (ISW)	Groundwater Surface Water	Groundwater levels as proxy for ISW depletion rate and volume; Additionally, vertical hydraulic gradients will be measured at multi-completion wells and streamflow will be measured at stream gages.	13	20N14E14R001M, 21N14E25P003M, 21N16E18G002M, 23N14E35L001M, 23N15E34D001M, 23N16E36N002M, DMW 1s, DMW 2s, DMW 3s, DMW 4s, DMW 5s, DMW 6s, DMW 7s

Table 3.0-1 (cont.). Summary of Sustainability Indicators and Associated Monitoring Network(s)

Sustainability Indicator	Monitoring Network(s)	Metric	Number of Representative Monitoring Points	Representative Monitoring Points
Groundwater Quality	Groundwater	Concentration of selected water quality parameters	17 confirmed; 14 pending	21N14E15J001M, 21N14E32G001M, 21N15E05D001M, 22N15E21K001M, 22N15E35H001M, CA3200020-001, CA3200138-001, CA3200171-001, CA3200193-001, CA3200618-002, CA4600003-001, CA4600009-002, CA4600037-001, CA4600083-001, CA4600092-001, CA4610001-004, Loyalton Well 1
Land Subsidence	Land Subsidence Monitoring	InSAR data; Land surface elevation monuments	Spatially continuous (InSAR); 11 ground elevation survey control points	SCP 1, SCP 2, SCP 4, SCP 6, SCP 10, SCP 11, SCP 12, SCP 13, SCP 14, SCP 15, SCP 16

3.1 Groundwater Monitoring

3.1.1 Groundwater Levels

DWR BMP #2 advises that “Professional judgement should be used to refine the monitoring frequency and density” (DWR, 2016a). The following are four factors proposed by DWR (adapted from ACWI, 2013) for GSA consideration when determining long-term monitoring (i.e., measurement):

- Aquifer type and position (e.g., shallow and unconfined vs. deep and confined)
- Groundwater flow and recharge rate (rapid vs. slow)
- Aquifer development (greater vs. less withdrawal)
- Climatic conditions (more vs. less variable)

The following excerpt from DWR’s BMP #2 (DWR, 2016a) includes monitoring site frequency and density requirements for SGMA-compliant water level monitoring programs:

- Groundwater level data will be collected from each principal aquifer in the basin.
- Groundwater level data must be sufficient to produce seasonal maps of potentiometric surfaces or water table surfaces throughout the basin that clearly identify changes in groundwater flow direction and gradient.
- Groundwater levels will be collected during the middle of October and March for comparative reporting purposes.

- While semi-annual monitoring is required, more frequent, quarterly, monthly, or daily monitoring may be necessary to provide a more robust understanding of groundwater dynamics within the system.
- Agencies will need to adjust the monitoring frequency to address uncertainty, such as in specific places where sustainability indicators are of concern, or to track specific management actions and projects as they are implemented.
- Select wells should be monitored frequently enough to characterize the season high and low within the basin.

- Data must be sufficient for mapping groundwater depressions, recharge areas, and along margins of basins where groundwater flow is known to enter or leave a basin.
- Well density must be adequate to determine changes in storage.
- Data must be able to demonstrate the interconnectivity between shallow groundwater and surface water bodies, where appropriate.
- Data must be able to map the effects of management actions, i.e., managed aquifer recharge or hydraulic seawater intrusion barriers.
- Data must be able to demonstrate conditions at basin boundaries.
    - Agencies may consider coordinating monitoring efforts with adjacent basins to provide consistent data across basin boundaries.
    - Agencies may consider characterization and continued impacts of internal hydraulic boundary conditions, such as faults, disconformities, or other internal boundary types.
- Data must be able to characterize conditions and monitor adverse impacts as they may affect the beneficial uses and users identified within the basin.

The District's current groundwater level monitoring network consists of a total of 91 wells, of which 36 are RMPs, measured at least semiannually (Figure 3.1-1 and Table 2.1-3). Lateral spatial coverage of wells is generally very good in the eastern portion of the valley, where the majority of groundwater pumping occurs. The western portion of the basin has lower monitoring well density, although it does benefit from three nested monitoring wells with three completions each (DMW 2, DMW 3, and DMW 4) installed by DWR.

Groundwater levels and lithology data from well completion reports support the District's assertion that the Sierra Valley groundwater basin is comprised of two aquifers: an upper unconfined aquifer and a lower confined to semi-confined aquifer. Due to the large proportion of clays in the basin, a single confining layer has not been identified and therefore makes it difficult to assign wells to specific aquifers. Currently, layers 4 through 12 in SVHSM are simulated as confined and are assumed to be representative of the lower aquifer. Therefore, wells screened above about 400 to 600 feet below ground surface are considered to be completed in the upper

Table 3.1-1. Groundwater Elevation Monitoring Wells Grouped by Screened Aquifer.

Aquifer	Number of Wells	Well Name
Upper Aquifer	70	20N14E13Q002M, 20N14E14R001M, 21N14E25P003M, 21N15E04Q001M, 21N15E14L001M, 21N16E06H003M, 21N16E07F004M, 21N16E18G002M, 22N16E01A002M, 22N16E04A001M, 22N16E17E002M, 22N16E20P002M, 23N14E35L001M, 23N15E27E001M, 23N15E29H001M, 23N15E34D001M, 23N16E23F001M, 23N16E27R001M, 23N16E28L001M, 23N16E33A002M, 23N16E36L003M, 23N16E36L004M, 23N16E36N002M, 23N16E36R001M, DMS 004, DMS 009, DMS 014, DMS 018, DMS 019, DMS 021 & 040, DMS 023 & 024, DMS 025, DMS 029, DMS 031, DMS 033, DMS 036, DMS 037, DMS 039, DMS 045, DMS 046, DMS 047, DMW 1s, DMW 2i, DMW 2s, DMW 3d, DMW 3i, DMW 3s, DMW 4s, DMW 5d, DMW 5i, DMW 5s, DMW 6d, DMW 6s, DMW 7s, LSLF MW-10D, LSLF MW-2, LSLF MW-3, LSLF MW-5, LSLF MW-6, LSLF MW-7, LSLF MW-8D, LSLF MW-9D, LSLF MW-MY, SVB_604, SVB_605, SVB_606, SVB_607, Sierra Brooks Well 2, W1, W6
Upper and Lower Aquifer	23	22N15E22Q001M, DMS 001, DMS 003, DMS 008, DMS 010, DMS 011, DMS 012, DMS 013, DMS 016, DMS 017, DMS 022, DMS 026, DMS 027, DMS 028, DMS 030, DMS 032, DMS 034, DMS 035, DMS 041, DMS 042, DMS 043, DMS 044, DMW 7is
Lower Aquifer	13	22N15E08Q001M, 22N15E34L006M, DMS 002 (old), DMS 020, DMW 1d, DMW 2d, DMW 4d, DMW 4i, DMW 7d, DMW 7i, DMW 7id, W5, W8
Fractured Bedrock	5	23N17E31P001M, 23N17E31Q001M, 23N17E31Q002M, W2, W3

aquifer, with wells screened below that completed in the lower aquifer (Figure 3.1-2 and Table 3.1-1).

3.1.2 Groundwater Quality

From DWR's BMP #2 (DWR, 2016a):

The following represent specific practices to be employed in the execution of the GSP:

- Monitor groundwater quality data from each principal aquifer in the basin that is currently, or may be in the future, impacted by degraded water quality.
  - The spatial distribution must be adequate to map or supplement mapping of known contaminants.
  - Monitoring should occur based upon professional opinion, but should generally correlate to the seasonal high and low water levels, or more frequently as appropriate.
- Collect groundwater quality data from each principal aquifer in the basin that is currently, or may be in the future, impacted by degraded water quality.
- Define the three-dimensional extent of any existing degraded water quality impact.

- Data should be sufficient for mapping movement of degraded water quality.
- Data should be sufficient to assess groundwater quality impacts to beneficial uses and users.
- Data should be adequate to evaluate whether management activities are contributing to water quality degradation.

The District did not maintain a water quality monitoring network prior to SGMA. Water quality monitoring was performed either by DWR or as part of other regulatory programs required by the SWRCB (e.g., Safe Drinking Water Acts, Irrigated Land Regulatory Program, etc.). The District will continue to incorporate water quality data made available by these existing regulatory programs into the DMS.

In addition to this existing monitoring, the District has committed to performing water quality sampling for the following analytes:

- Nitrate*
- Total dissolved solids (TDS)*
- Arsenic*
- Boron*
- Iron*
- Manganese*
- pH*
- Sodium
- Potassium
- Bromide
- Volatile Organic Compounds (VOCs)
- Pesticides
- Zeta-cypermethrin

*Constituent of concern (COC) identified in Section 2.1.3 of this report.

This additional water quality sampling for the COCs identified above will be performed by the District at six additional wells (five domestic and one monitoring) every two years starting in 2026. If no water quality impacts are identified after the first two sampling events, the sampling frequency will decrease to once every three years. Final selection of wells the District will sample for COCs has yet to be completed, but candidate wells are listed in Table 3.1-2 and shown in Figure 3.1-3.

Table 3.1-2. Candidate Wells for District Water Quality Monitoring.

DMS ID	Well Name	Latitude	Longitude	Well Type	Sampled by UCCE[1]
124	22N15E34L006M	39.710597	-120.287583	Stockwater Well	Yes
175	23N15E33E002M	39.807	-120.313	Unknown	No
213	CA3200020-001	39.823892	-120.41334	Municipal Well	No
215	CA3200085-003	39.79785	-120.13905	Municipal Well	No
216	CA3200138-001	39.800722	-120.168916	Municipal Well	No
217	CA3200138-003	39.799161	-120.167854	Municipal Well	No
218	CA3200138-004	39.799589	-120.171864	Municipal Well	No
219	CA3200171-001	39.817967	-120.372299	Municipal Well	No
221	CA3200211-001	39.817559	-120.3609	Municipal Well	No
222	CA3200276-001	39.79784	-120.139098	Municipal Well	No
224	CA3200618-002	39.7984	-120.139753	Municipal Well	No
225	CA3901360-001	39.798028	-120.139028	Municipal Well	No
226	CA4600003-001	39.561824	-120.372405	Municipal Well	No
230	CA4600018-001	39.561531	-120.371948	Municipal Well	No
233	CA4600037-001	39.574493	-120.341705	Municipal Well	No
358	Calpine Well 1	39.663636	-120.446014	Municipal Well	No
359	Calpine Well 2	39.665162	-120.444127	Municipal Well	No
128	DMS 022	39.71136	-120.240584	Agricultural Well	Yes
1	DMS 039	39.6242	-120.363177	Agricultural Well	Yes
165	DMS 046	39.827812	-120.319416	Agricultural Well	Yes
1464	DMS 053	39.686222	-120.249883	Agricultural Well	Yes
287	DMS 082	39.654511	-120.402564	Agricultural Well	Yes
288	DMS 083	39.625654	-120.358662	Agricultural Well	Yes
302	DMW 6s	39.816977	-120.347824	Groundwater Monitoring Well	No
241	Loyalton Well 1	39.665034	-120.238757	Municipal Well	No
243	Loyalton Well 3	39.679219	-120.244265	Municipal Well	No
1647	Nervino Airport Well	39.819936	-120.357199	Municipal Well	No
316	SVWQC00010	39.6903	-120.2501	Groundwater Monitoring Well	No
227	Sierra Brooks Well 1	39.64229	-120.22451	Municipal Well	No
78	Sierra Brooks Well 2	39.64997	-120.22301	Municipal Well	No
1731	Sierra Brooks Well 3	39.64678	-120.22581	Municipal Well	No
2272	W BAR ONE	39.737909	-120.218282	Domestic Production Well	Yes
616	WCR0104906	39.831771	-120.32357	Unknown	Yes
1281	WCR1989-005169	39.686379	-120.233948	Domestic Production Well	Yes
1291	WCR1989-015511	39.733881	-120.377911	Domestic Production Well	Yes
1415	WCR2000-001456	39.624251	-120.424585	Domestic Production Well	Yes
1489	WCR2002-010381	39.74429	-120.30629	Domestic Production Well	Yes
1545	WCR2004-010040	39.755203	-120.275847	Agricultural Well	Yes
1620	WCR2008-008881	39.773279	-120.279932	Agricultural Well	Yes

[1]One of 15 wells sampled by UC Cooperative Extension in 2021 and 2025.

3.1.3 Groundwater Extractions

The SVGMD meters all active large-capacity non-municipal wells (defined as wells that produce 100+ gpm or wells with a casing diameter of 6 inches or greater) in the Basin. Agricultural pumping is measured on a monthly basis during the growing season. Municipal pumping is measured on a monthly basis by the respective water provider entity and reported to the SVGMD. Municipal pumping from Sierra County Water Works District #1 (Calpine) is included in the groundwater extraction volumes presented in this annual report despite the wells being located just outside of the Basin boundary and predominantly screened in bedrock. Inclusion or exclusion of annual groundwater extractions from the Calpine municipal wells do not materially change any conclusions due to the relatively small annual extraction volume of approximately 50 AFY. Metered extraction wells are listed in Table 3.1-3 and shown in Figure 3.1-4.

Groundwater extractions from private domestic wells are not metered nor are they subject to SGMA if they extract two AFY or less. The District has estimated the number of active domestic pumping wells in the basin to be about 379, using information from OSWCR and parcel data from Plumas and Sierra counties.

Table 3.1-3. Metered Wells.

DMS ID	Well Name	Latitude	Longitude	Well Type
358	Calpine Well 1	39.663636	-120.446014	Municipal Well
359	Calpine Well 2	39.665162	-120.444127	Municipal Well
95	DMS 001	39.782006	-120.277265	Agricultural Well
1678	DMS 002	39.7808	-120.289984	Agricultural Well
403	DMS 007	39.81028	-120.25833	Agricultural Well
166	DMS 010	39.816788	-120.211402	Agricultural Well
189	DMS 011	39.8228028	-120.2345233	Agricultural Well
190	DMS 012	39.809824	-120.221061	Agricultural Well
1641	DMS 013	39.813407	-120.240665	Agricultural Well
193	DMS 014	39.797902	-120.209988	Agricultural Well
136	DMS 016	39.783083	-120.224483	Agricultural Well
100	DMS 020	39.752845	-120.256851	Agricultural Well
1753	DMS 021	39.739868	-120.236593	Agricultural Well
1755	DMS 024	39.722611	-120.28347	Agricultural Well
121	DMS 025	39.715698	-120.28411	Agricultural Well
127	DMS 026	39.715254	-120.244917	Agricultural Well
129	DMS 027	39.708201	-120.257434	Agricultural Well
130	DMS 028	39.708054	-120.244922	Agricultural Well
58	DMS 029	39.679773	-120.252774	Agricultural Well
56	DMS 030	39.681398	-120.240644	Agricultural Well
55	DMS 031	39.686337	-120.242751	Agricultural Well
71	DMS 032	39.686215	-120.239956	Agricultural Well

Table 3.1-3. Metered Wells (cont.)

DMS ID	Well Name	Latitude	Longitude	Well Type
43	DMS 037	39.69695	-120.291617	Agricultural Well
1	DMS 039	39.6242	-120.363177	Agricultural Well
83	DMS 043	39.739282	-120.416334	Agricultural Well
181	DMS 045	39.826889	-120.236195	Agricultural Well
165	DMS 046	39.827812	-120.319416	Agricultural Well
192	DMS 047	39.801999	-120.20649	Agricultural Well
251	DMS 048	39.669748	-120.240042	Industrial Well
252	DMS 049	39.784486	-120.300427	Agricultural Well
1399	DMS 050	39.696989	-120.287595	Agricultural Well
1464	DMS 053	39.686222	-120.249883	Agricultural Well
258	DMS 054	39.77996	-120.301212	Agricultural Well
259	DMS 055	39.750099	-120.273241	Agricultural Well
260	DMS 056	39.820471	-120.285256	Agricultural Well
261	DMS 057	39.820429	-120.273931	Agricultural Well
262	DMS 058	39.668581	-120.36802	Agricultural Well
263	DMS 059	39.689442	-120.235687	Agricultural Well
265	DMS 060	39.643583	-120.413013	Agricultural Well
266	DMS 061	39.823906	-120.211173	Agricultural Well
267	DMS 062	39.812233	-120.332435	Agricultural Well
268	DMS 063	39.820577	-120.330321	Agricultural Well
1650	DMS 064	39.77287	-120.24499	Agricultural Well
1649	DMS 065	39.691947	-120.249932	Agricultural Well
1603	DMS 066	39.653842	-120.220577	Agricultural Well
1664	DMS 067	39.710736	-120.237401	Agricultural Well
1665	DMS 068	39.741614	-120.223801	Agricultural Well
1677	DMS 069	39.808947	-120.219493	Agricultural Well
1679	DMS 070	39.808153	-120.206918	Agricultural Well
276	DMS 071	39.722832	-120.261179	Agricultural Well
1682	DMS 072	39.827873	-120.313728	Agricultural Well
1697	DMS 073	39.757732	-120.255118	Agricultural Well
373	DMS 084	39.725737	-120.227159	Agricultural Well
1710	DMS 085	39.824365	-120.30036	Agricultural Well
1729	DMS 086	39.827952	-120.286415	Agricultural Well
1534	Loyalton Park Well	39.680998	-120.247641	Municipal Well
243	Loyalton Well 3	39.679219	-120.244265	Municipal Well
227	Sierra Brooks Well 1	39.64229	-120.22451	Municipal Well
78	Sierra Brooks Well 2	39.64997	-120.22301	Municipal Well
1731	Sierra Brooks Well 3	39.64678	-120.22581	Municipal Well

3.2 Surface Water Monitoring

As described in Section 2.2, surface water inflows entering the groundwater basin have been measured sporadically by DWR at 12 locations (Figure 2.2-1) since 2007. In addition to the surface water monitoring performed by DWR, the District added the following four continuous flow gaging stations within the valley for continuous monitoring:

- Little Last Chance Creek (North Branch)
- Staverville Creek
- Griffin Drainage Gage
- Smithneck Creek

These stations measure the depth to water in the channel and convert it to flow rate using a rating curve specific to each station. Locations of the SVGMD continuous monitoring locations are shown in Figure 3.2-1 along with the locations measured periodically by DWR.

3.3 Land Subsidence Monitoring

The Sierra Valley groundwater basin is highly susceptible to land subsidence and the potential undesirable results that can result from it due to the presence of thick clays. The two different monitoring networks used to quantify subsidence are discussed below.

3.3.1 Surveyed Control Points

In October 2022 the District contracted US Geomatics based out of Reno, NV to establish four permanent survey monuments and seven non-permanent locations (Figure 3.3-1) for monitoring subsidence using funds provided through DWR Grant Agreement #4600015875. US Geomatics resurveyed in October 2023, 2024, and 2025. The maximum change in elevation from the initial survey was -0.13 feet at SCP 12 and +0.13 feet at SCP 11. This indicates that elastic subsidence processes are present in the basin.

Given the relatively small change in surveyed elevations, it is difficult to determine if inelastic subsidence has occurred since October 2022. Monitoring of this network is expected to be periodic, with the next monitoring event following a dry year.

3.3.2 InSAR

DWR provides spatially distributed annual rates of subsidence and total observed displacement since June 2015 from remotely sensed InSAR data. These data are generally available two to four months after they have been collected.

3.4 Soil Moisture Monitoring

The District installed 12 soil moisture monitoring stations in 2025 (Table 3.4-1 and Figure 3.4-1) as part of its Tier II agricultural efficiency improvements project and management actions (see Section 4.3.1 of the GSP). These stations were installed to support irrigation efficiency studies that document soil moisture conditions and irrigation losses using side-by-side comparative

Table 3.4-1. Soil Moisture Monitoring Stations.

Location Name	Device Name	Latitude	Longitude	Manager	Sensor
Roberti P-10 MESA	F1 MESA W3	39.76533132	-120.2632399	DRI	Valley AgSense365
Roberti P-10 MESA	F1 MESA W6	39.76466322	-120.2641349	DRI	Valley AgSense365
Roberti P-13 LESA	F1 LEPA W3	39.75284923	-120.2853619	DRI	Valley AgSense365
Roberti P-13 LESA	F1 LEPA W6	39.75421513	-120.2858839	DRI	Valley AgSense365
Grandi P-3 LESA	F2 LESA 2OCLOCK	39.69147153	-120.2428629	DRI	Valley AgSense365
Grandi P-3 LESA	F2 LESA 4OCLOCK	39.68793633	-120.2428539	DRI	Valley AgSense365
Grandi P-3 MESA	F2 MESA 2OCLOCK	39.69123013	-120.2432569	DRI	Valley AgSense365
Grandi P-3 MESA	F2 MESA 4OCLOCK	39.68827053	-120.2431989	DRI	Valley AgSense365
DS Ranch P-11	DS Ranch Pivot 11	39.77959472	-120.2106769	Stetson	WiseConn
Roberti P-2	Roberti Ranch Pivot 2	39.78400472	-120.2896969	Stetson	WiseConn
Bar One Indian Pivot	Bar One - Indian Pivot	39.73501	-120.230926	Stetson	WiseConn
Diamond G East Pivot	Diamond G - East Pivot	39.82456	-120.29882	Stetson	WiseConn

Notes:
1. MESA = Mid Elevation Spray Application
2. LESA = Low Elevation Spray Application
3. LEPA = Low Energy Precision Application
4. DRI = Desert Research Institute

analysis of the two irrigation systems during the same year and growing conditions. The objective of the these studies is to quantitatively document water savings, if any, from the use of Low Energy Spray Application (LESA) irrigation systems over traditional Mid-Elevation Spray Application (MESA) systems used in the Valley. These stations collected soil moisture data at both LESA and MESA pivot irrigation systems for the 2024 and 2025 irrigation seasons and monitoring will continue through the 2026 irrigation season.

In addition to the 12 soils moisture stations described above, an additional 11 stations were installed in 2025-2026 for use by individual land owners to improve irrigation scheduling and efficiency. These 11 stations are not listed in Table 3.4-1 or shown in Figure 3.4-1 as they are utilized at the farm level and participating landowners requested their locations not be made publicly available. All soil moisture stations are equipped with telemetry so that growers can view conditions in real time, allowing growers the best opportunity possible to utilize soil moisture conditions to inform irrigation scheduling and improve efficiency. Growers consider soil moisture data proprietary and therefore raw station data are not made publicly available.

3.5 Managed Aquifer Recharge Monitoring

The SVGMD GSP includes a Tier II PMA to develop and implement Managed Aquifer Recharge (MAR) projects. MAR project locations were evaluated and identified near Smithneck, Staverville and Little Last Chance Creeks. Monitoring associated with project development and implementation included infiltration testing, streamflow and groundwater level monitoring and water quality monitoring.

Infiltration testing was used to identify suitable locations for recharge. Thirty-two test pits were dug in total around potential recharge areas; seven off of Little Last Chance Creek, 17 within an ephemeral drainage area north of Smithneck Creek, and eight along a diversion ditch off of Staverville Creek. Of the 32 test pits performed, 11 indicated good infiltration (four along Little Last Chance Creek, three in the diversion ditch off of Staverville Creek, and four along ephemeral drainages to Smithneck Creek), 6 showed neutral infiltration, and 15 showed poor infiltration. In addition to test pits, 2 soil borings were performed near Little Last Chance Creek to determine proximity to the confining clay layer within the Subbasin. While soil borings and test pits performed off of Little Last Chance Creek successfully identified potential recharge locations, the high-infiltration areas were too far from points of diversion along the creek for projects to be deemed cost effective (i.e. the projects would require significant infrastructure to transport water from the creek to the high-infiltration areas). Test pits performed off of Smithneck and Staverville Creeks identified project areas that had high infiltration rates and were cost effective.

Ultimately three sites were selected to perform recharge within the ephemeral drainage area north of Smithneck Creek, and one site was selected to perform recharge off of Staverville Creek. For the selected MAR projects, stream gages were installed (see Sections 2.2 and 3.2) upstream of diversions and rating curves were developed for Smithneck and Staverville Creeks to monitor streamflow during the recharge season (December 1 – March 14). Stream gages were telemetered to enable daily evaluation of flow conditions during the recharge season, and telemetered data are now available for public access through a recharge data dashboard.

Approximately 6 monitoring wells near the MAR projects have been instrumented to allow evaluation of MAR project effectiveness on groundwater levels. In addition, water quality monitoring is also being conducted for these wells.

The wells and stream gages that comprise the MAR monitoring network are shown in Figure 3.5-1.

3.6 Adjacent Basins Monitoring Networks and Coordination

The Chilcoot subbasin (5-12.02) is the only adjacent groundwater basin believed to have a significant hydrogeologic connection to the SV subbasin. While technically a low-priority basin and therefore not subject to SGMA, it is completely contained within the District's jurisdictional boundary. The distinction between the SV and Chilcoot subbasins appears to be primarily clerical as no evidence of a hydrogeologic flow barrier was discovered during GSP development. Therefore, the District makes no distinction between the SV subbasin and the Chilcoot subbasin and instead treats them as a single subbasin.

4.0 Analysis of Potential Data Gaps

A data (or knowledge) gap is defined in the SGMA regulations as a "lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of the Plan implementation, and could limit the ability to assess whether a basin is being sustainably managed" [23 CCR § 351 (l)]. Data gaps are addressed in the SGMA regulations regarding Assessment and Improvement of Monitoring Network (a)-(e) contained in 23 CCR § 354.38. The regulations are reproduced below:

(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.

(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.

(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:

  (1) The location and reason for data gaps in the monitoring network.

  (2) Local issues and circumstances that limit or prevent monitoring.

(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including location and purpose of newly added or installed monitoring sites.

(e) Each Agency shall adjust the monitoring frequency and distribution of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:

  (1) Minimum threshold exceedances.

  (2) Highly variable spatial or temporal conditions.

  (3) Adverse impacts to beneficial uses and users of groundwater.

  (4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.

The term "potential data gaps" is used in this section to acknowledge both uncertainty and the evolving nature of the basin's hydrogeologic conceptual model. SGMA requires GSAs to make management decisions based on the best available information, even when monitoring networks, historical records, and/or hydrogeologic characterization are incomplete. This recognizes that some missing or limited data may not ultimately affect sustainability determinations or management actions. The term also reflects SGMA's emphasis on iterative improvement: as monitoring expands and analyses are updated through periodic plan assessments, areas initially identified as data gaps may be resolved or deemed non-critical, while new needs may emerge.

In addition to identification of potential data gaps, comparison of data collection cost with respect to significance to GSP implementation should be considered when determining priority data gaps. Not all gaps must be filled in order to implement a SGMA-compliant GSP. The flow chart shown in Figure 4.0-1 is from BMP #2 and lays out the path GSAs should follow to identify and address data gaps in their sustainability planning (DWR, 2016a). In the same document, DWR identifies four types of temporal data gaps:

- Long gap(s) between measurements
- No recent observations
- Short observation record
- High percentage of questionable measurements

From the available data in the SV Subbasin reviewed in preparing this report, data are generally of high quality and expected to be of sufficient or nearly sufficient quantity and quality for use in assessing many of the SGMA sustainability indicators. Existing monitoring networks include substantial annual data collection activities in the subbasin. A number of potential data gaps ranging in sustainability evaluation significance are presented in this section, with suggested prioritizations and recommendations for filling them presented in Section 5.

4.1 Well Inventory

The sections below describe potential data gaps related to the District's well inventory and approaches for filling them. There is a lower density of wells on the western side of the basin, partially due to the increased availability of surface water, however no other spatial correlations were observed in any of the well inventory data gaps.

4.1.1 Well Locations

The District has reviewed all available well completion reports (Figure 4.1-1) to refine locations beyond the centroid of the section. Despite this substantial effort, most of the well records in the District's DMS have poor spatial accuracy (Figure 4.1-2). Nearly one-third of wells in the basin do not have a digital copy of the well completion report (WCR), making it impossible to refine their location and construction data without additional data sources or field collection. Of the wells that do have WCRs, only 260 (24 percent) contain sufficient information (e.g., coordinates, parcel numbers, addresses, driller's maps) to refine their location to within 500 feet. While spatial accuracy of wells in the basin is generally poor, location accuracy of key monitoring and extraction wells is very high.

Most of the wells with poor location accuracy are used for domestic water supply or are assumed to be an "unknown well type." Refinement of their location is not expected to materially change the hydrogeologic conceptual model or management of the basin, although it could improve drought vulnerability assessments. However, that is a particularly complex issue in the Sierra Valley as most of the domestic wells are located along the margins of the basin and predominantly screened in fractured bedrock, which is not included under SGMA regulations.

Since the District has exhausted all publicly available datasets, filling this data gap would likely require significant time, effort, and expense. If the missing WCRs are not available in hardcopy from DWR, then engagement with individual landowners and possibly drillers would be necessary to investigate whether other records still exist. While it is relatively easy to obtain new coordinates for a given landowner's well, knowing which well record in the DMS to associate those coordinates with is nearly impossible without additional construction information.

4.1.2 Well Construction

Excluding destroyed wells, exploratory borings, and heat exchange wells results in a total of 1,487 well records expected to have screened intervals. Of these, 587 (40 percent) have both total depth and screened interval reported, 374 (25 percent) have a reported total depth only, and 526 (35 percent) are missing basic construction information such as total depth and screened interval(s) (Figure 4.1-3).

Construction information from 164 wells with pumping and water level observations since Jan 1, 2015 in the basin is generally good, with 84 (51 percent) having both total depth and screened interval reported and 42 (26 percent) having only total depth reported (Table 4.1-1). No construction information was found for 38 wells (23 percent), although it is possible that construction records exist for a portion of these wells (e.g., SVELC wells) as the District is still pursuing public records requests.

Similar to challenges associated with filling certain well location data gaps (Section 4.1.1 above), the District has reviewed all publicly available well construction records and would likely require significant time, effort and expense to resolve outstanding well construction data gaps. Engagement with individual landowners and possibly drillers would be necessary to investigate whether other records still exist, which could be done in conjunction with locating the well spatially. Unlike well locations that can be obtained relatively inexpensively, obtaining construction information if owners do not have well records usually requires pumps to be pulled and specialized camera equipment to be lowered into the well casing. This not only presents a significant cost to the District, but also exposes the District to significant risk should an owner's well get damaged or show reduced performance following data collection.

Table 4.1-1. Summary of Key Monitoring and Extraction Well Construction Information.

Construction Information	Number of Wells	Well Names
Total Depth and Screened Interval	86	Calpine Well 1, Calpine Well 2, DMW 1d, DMW 1s, DMS 030, DMS 036, DMS 033, DMS 034, Sierra Brooks Well 2, DMS 002 (old), DMS 020, DMS 027, DMS 028, DMS 016, DMS 17, DMS 018, W1, DMS 042, 22N16E20P002M, DMS 046, DMS 010, DMS 008, DMS 007 (old), DMS 009, DMS 011, DMS 012, DMS 047, DMS 014, 23N16E33A002M, 23N16E36R001M, Sierra Brooks Well 1, Loyalton Well 1, DMS 052, DMS 056, DMS 057, DMS 063, W5, DMS 071, DMW 2d, DMW 2i, DMW 2s, DMW 3d, DMW 3i, DMW 3s, DMW 4d, DMW 4i, DMW 4s, DMW 5d, DMW 5i, DMW 5s, DMW 6d, DMW 6s, LSLF MW-7, LSLF MW-MY, DMW 7s, DMW 7i, DMW 7d, DMS 007, LSLF MW-2, LSLF MW-3, LSLF MW-6, DMS 050, DMS 053, Loyalton Park Well, DMS 066, LSLF MW-5, DMS 013, DMS 065, DMS 064, DMS 067, DMS 068, DMS 069, DMS 002, DMS 070, DMS 072, DMS 073, DMS 086, LSLF MW-10D, LSLF MW-8D, LSLF MW-9D, DMW 7is, DMW 7id, SVB_604, SVB_605, SVB_606, SVB_607
Total Depth Only	42	DMS 039, 20N14E13Q002M, 20N14E14R001M, 21N14E25P003M, DMS 037, DMS 029, 21N15E14L001M, 21N16E06H003M, DMS 35, 21N16E07F004M, DMS 032, 21N16E18G002M, DMS 043, 22N15E08Q001M, DMS 001, 22N15E22Q001M, DMS 025, 22N15E34L006M, DMS 026, DMS 022, 22N16E01A002M, 22N16E04A001M, DMS 041, 22N16E17E002M, DMS 019, DMS 021 & 040, 23N14E35L001M, DMS 003, 23N15E29H001M, DMS 004, 23N15E34D001M, 23N16E23F001M, 23N16E27R001M, 23N16E28L001M, 23N16E36D002M, 23N16E36L003M, 23N16E36L004M, 23N16E36N002M, 23N17E31Q002M, DMS 084, DMS 085, Sierra Brooks Well 3
No Construction Information	36	DMS 031, DMS 044, DMS 023 & 024, DMS 045, Loyalton Well 3, DMS 038, DMS 048, DMS 049, DMS 005, DMS 051, DMS 054, DMS 055, DMS 058, DMS 059, DMS 006, DMS 060, DMS 061, DMS 062, 23N17E31P001M, W8, DMS 074, W3, W2, W6, 23N17E31Q001M, DMS 021, DMS 024, DMS 075, DMS 087, SVELC WL1, SVELC WL2, SVELC WQ1, SVELC WQ3, SVELC WQ5, SVELC WQ8, SVELC WQ9
Total	164	

4.1.3 Well Lithology

Lithology data are available for 514 wells within and adjacent to the groundwater basin (Figure 4.1-4). The eastern portion of the basin generally has good coverage both laterally and vertically, but there are some areas with no well logs within about 1.0 to 1.5 miles. Well density on the western side of the basin is noticeably lower, with large gaps along the valley axis where no lithology data is available for approximately 1.5 to 2.0 miles laterally. Wells with lithology data

Table 4.2-1. Summary of Groundwater Elevation Records.

Decade	Number of Wells	Number of Groundwater Elevations
1950	23	84
1960	24	220
1970	16	216
1980	97	1,556
1990	121	2,057
2000	98	3,094
2010	89	3,303
2020	85	7,501

on the western side also tend to be shallower, which limits aquifer characterization. The quality of lithology data contained within driller's logs vary significantly.

Additional lithology data collection in areas where no data are currently present would help improve the 3D geologic model and HCM as a whole. Unless missing well logs are discovered, new data collection is the only approach for filling this data gap. Although direct data collection (i.e., drilling) is preferred, it is also prohibitively expensive.

4.2 Historical Groundwater Elevation Data

Groundwater elevation data have been collected in the Sierra Valley since September 1957 (Table 4.2-1), with most water levels available from about 1980 onwards. The subsections below summarize potential data gaps related to this dataset.

4.2.1 Sources and Quality

The major sources of groundwater elevation data in the basin are from DWR periodic (spring/fall) measurements, District monitoring, or SWRCB regulatory programs. Most records have been collected by trained field staff and are considered to be of high quality. The main source of uncertainty is in reference point and ground surface elevation data, as approximately 72 percent of wells with water level elevations do not have a confirmed elevation survey method or quantification of accuracy. Note that this does not necessarily mean that the elevations used are inaccurate, only that they have not been positively confirmed. Reference point elevations have been compared with elevations from digital elevation models and found them to be reasonable.

4.2.2 Spatial Data Gaps

Historical groundwater elevation data generally cover most of the basin both laterally and vertically (Figure 4.2-1). Monitoring density on the west side is noticeably lower than on the east side, but groundwater usage is also significantly higher on the east side of the basin due to lack of surface water supplies. The most apparent spatial data gap in groundwater elevation data is southwest of the central portion of the basin, where few wells have been drilled.

4.2.3 Temporal Data Gaps

Table 4.2-2 summarizes the number of wells with water level observations that fall into the above categories. Lack of recent observations is by far the largest temporal data gap, however there are still a large number of wells (88) that have not been measured since the GSP was submitted in Jan 2022.

4.3 Historical Groundwater Quality Data

Groundwater quality data have been collected in the Sierra Valley since May 1955 for various purposes, predominantly basin characterization and compliance with various SWRCB regulatory programs. The District's DMS contains over 24,000 water quality records from 245 wells and a total of 178 different analytes. To simplify the water quality data gaps analysis, only the following eight constituents of concern (COCs) identified by the District in the GSP are being evaluated:

- Nitrate
- Total Dissolved Solids (TDS)
- Arsenic
- Boron
- Iron
- Manganese
- pH
- Methyl Tert-Butyl Ether (MTBE)

Table 4.2-2. Summary of Groundwater Elevation Temporal Data Gaps.

Data Gap Category	Number of Wells	Percentage of Wells (%)	Well Names
Long gap(s) between measurements[1]	27	15.6%	20N14E04G002M, 20N14E11A002M, 21N14E29J001M, 21N14E32B001M, 21N15E03J002M, 21N15E10C001M, 21N15E18F002M, 22N15E34L002M, 22N16E20G002M, 23N14E35L001M, 23N16E17M001M, 23N16E23F001M, 23N16E27R001M, 23N16E28L001M, 23N17E30M001M, DMS 021 & 040, DMS 022, DMS 029, DMS 030, DMS 031, DMS 035, DMS 036, LSLF MW-2, LSLF MW-3, LSLF MW-5 (old), LSLF MW-6, W6
No Recent Observations[2]	88	50.9%	20N14E04G002M, 20N14E04G006M, 20N14E11A002M, 20N14E11A003M, 20N15E07M002M, 21N14E20A003M, 21N14E29J001M, 21N14E32B001M, 21N14E36Q002M, 21N15E03J002M, 21N15E03L001M, 21N15E04Q001M, 21N15E07R001M, 21N15E09N006M, 21N15E09Q003M, 21N15E10C001M, 21N15E11M003M, 21N15E14D002M, 21N15E18F002M, 21N16E08D002M, 21N16E18H001M, 21N16E30J001M, 22N14E21Q002M, 22N14E26L001M, 22N15E15Q001M, 22N15E16L001M, 22N15E17H001M, 22N15E17R001M, 22N15E26K001M, 22N15E26K003M, 22N15E28L001M, 22N15E34L002M, 22N15E34L005M, 22N16E19K001M, 22N16E20G002M, 22N16E30Q001M, 23N14E25G001M, 23N14E25K001M, 23N14E25K004M, 23N15E27E001M, 23N15E29H001M, 23N16E17M001M, 23N16E25J001M, 23N16E34G003M, 23N16E35Q001M, 23N16E36A001M, 23N16E36B001M, 23N16E36D001M, 23N16E36D002M, 23N16E36H001M, 23N17E30M001M, 23N17E31P001M, 23N17E31Q001M, 23N17E31Q002M, DMS 001, DMS 003, DMS 004, DMS 007 (old), DMS 008, DMS 009, DMS 010, DMS 011, DMS 013, DMS 013 (old), DMS 017, DMS 018, DMS 019, DMS 021 & 040, DMS 022, DMS 025, DMS 026, DMS 031, DMS 033, DMS 036, DMS 041, DMS 042, DMS 043, DMS 044, DMS 045, DMS 047, LSLF MW-5 (old), SVELC WL3, SVELC WL4, SVELC WQ2, SVELC WQ4, SVELC WQ6, SVELC WQ7, Sierra Brooks Well 2
Short Observation Record[3]	16	9.2%	20N14E04G006M, 20N14E11A003M, 21N15E09Q003M, 22N14E21Q002M, 22N15E17R001M, DMS 033, DMS 043, DMS 044, DMS 045, DMS 047, DMW 7id, DMW 7is, SVB_604, SVB_605, SVB_606, SVB_607
High percentage of questionable measurements[4]	16	9.2%	22N16E30Q001M, 23N16E34G003M, DMS 001, DMS 003, DMS 008, DMS 009, DMS 010, DMS 013, DMS 013 (old), DMS 014, DMS 019, DMS 022, DMS 042, DMS 045, DMS 047, DMW 3d

1. Five or more years between measurements.
2. Since January 2022.
3. Period of record less than five years.
4. Questionable measurements make up 20% of more of observations.

Table 4.3-1. Summary of Water Quality Data for GSP Constituents of Concern.

Analyte	First Sample Date	Last Sample Date	Number of Wells	Sampling Events	Total Number of Records
Nitrate[1]	1955-05-11	2025-06-17	152	303	856
Total Dissolved Solids (TDS)[2]	1955-06-01	2025-06-17	114	135	541
Arsenic	1957-10-14	2025-06-17	89	142	393
Boron	1955-05-11	2025-06-17	182	101	495
Iron	1957-10-14	2024-02-27	97	97	323
Manganese	1957-10-14	2020-04-24	69	77	171
pH	1955-05-11	2024-02-27	155	122	605
Methyl Tert-Butyl Ether (MTBE)	1998-11-03	2020-06-07	61	137	593

1. Includes Nitrate as N, Nitrate + Nitrite as N, and NO2+NO3 as N analytes.
2. Includes Total Dissolved Solids and TDS SUM analytes.

A summary of water quality records in the DMS for these COCs is shown in Table 4.3-1.

4.3.1 Sources and Quality

Due to the generally low concentrations of constituents in the basin and most of the COCs requiring an analytical lab to quantify concentrations, water quality records in the basin are considered to be of high quality except as indicated by analytical flags.

4.3.2 Spatial Data Gaps

Water quality sampling of GSP COCs has been performed throughout most of the basin (Figure 4.3-1), although most locations have only analyzed a subset of the GSP COCs during a given sampling event. This is expected due to the lack of a basin-wide water quality monitoring program prior to SGMA.

4.3.3 Temporal Data Gaps

A summary of temporal data gaps for GSP COCs is shown in Table 4.3-2. The lack of recent monitoring is the largest of the temporal data gaps, followed by short observation records at wells and then long periods of time between measurements. As expected, the number of wells where questionable results make up a large fraction of the analyses is relatively small.

Table 4.3-2. Summary of Temporal Data Gaps for GSP Constituents of Concern.

Data Gap Category	Analyte	Number of Wells	Percentage of Wells (%)
Long gap(s) between measurements[1]	Nitrate	25	17.2
	TDS	34	32.1
	Arsenic	24	29.6
	Boron	50	29.2
	Iron	26	28.9
	Manganese	22	31.9
	pH	51	34.5
	Methyl Tert-Butyl Ether (MTBE)	8	13.1
No Recent Observations[2]	Nitrate	105	72.4
	TDS	81	76.4
	Arsenic	54	66.7
	Boron	170	99.4
	Iron	80	88.9
	Manganese	59	85.5
	pH	139	93.9
	MTBE	43	70.5
Short Observation Record[3]	Nitrate	85	58.6
	TDS	58	54.7
	Arsenic	44	54.3
	Boron	114	66.7
	Iron	52	57.8
	Manganese	39	56.5
	pH	87	58.8
	MTBE	29	47.5
High percentage of questionable measurements[4]	Nitrate	24	16.6
	TDS	2	1.9
	Arsenic	10	12.3
	Boron	28	16.4
	Iron	1	1.1
	Manganese	12	17.4
	pH	0	0
	MTBE	1	1.6

1. Five or more years between measurements.
2. Since January 2020.
3. Period of record less than five years.
4. Questionable records make up 20% of more of analyses.

4.4 Historic Groundwater Extractions

The District meters all active large-capacity non-municipal wells (defined as wells that produce 100+ gallons per minute or wells with a casing diameter of 6 inches or greater) in the Basin. The sections below discuss potential data gaps related to this dataset.

4.4.1 Sources and Quality

All agricultural and municipal groundwater extraction data are collected by District staff or reported to the District by municipal water system operators. Domestic groundwater pumping is not measured, nor is it required to be under SGMA if annual extractions are two AFY or less per well. All flow meter installations for agricultural and municipal wells were inspected during GSP development and brought into compliance with the manufacturer's specifications (e.g., run lengths upstream and downstream of the meter), and therefore are considered to be of very high quality.

4.4.2 Spatial Data Gaps

No spatial data gaps exist for agricultural and municipal pumping as all large-capacity wells are required to be metered by the District. Domestic pumping remains a potential spatial data gap as there has been no confirmation of which domestic wells in the DMS are currently active.

4.4.3 Temporal Data Gaps

The earliest pumping records the District was able to locate start in 2003, so no pumping data are currently available before then. Prior to 2021, the District typically monitored extractions twice a year: before and after the growing season. While this is extremely valuable information, the current version of SVIHM uses monthly stress periods. The bi-annual monitoring approach required the observed pumping volumes to be subdivided, which introduces some uncertainty. To remove this unnecessary uncertainty, the District transitioned to collecting extraction volumes on a more or less monthly basis during the growing season since 2021.

4.5 SGMA Groundwater Level Monitoring Network

Groundwater level data collected from existing monitoring networks are described in Section 3 of this report. This section addresses SVGSP monitoring program potential data gaps that may be present if the District's monitoring network is the only source of active data collection in the basin.

SGMA regulations regarding the groundwater monitoring program design goals with respect to the sustainability indicator of chronic lowering of groundwater level from 23 CCR §354.34(c) include the ability to:

1) Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:

    (A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.

    (B) Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.

Potential spatial and temporal data gaps that may exist in the SVGSA's groundwater level monitoring program are identified in this Section in order to address the SGMA legislation requirements presented herein.

The initial list of groundwater level monitoring wells in the SV Subbasin included 130 wells. These wells were narrowed down based on the following criteria:

- Either depth or perforated interval are known, preferably both;
- Measured water level data are available through at least 2019 (this criterion was relaxed in locations where spatial coverage is lacking);
- A preference was given to wells with data prior to 2005; and,
- The well has at least five historical measurements.

4.5.1 Sources and Quality

Water level data are collected by trained field staff using modern methods and therefore are considered to be of very high quality. The District purchased two sonic water level meters to allow domestic well owners to monitor water levels in their wells and will be making them available for use by March 2026. These data will be reviewed for quality and consistency before being assimilated into the DMS or used in any analyses.

4.5.2 Spatial Data Gaps

As described in Section 1.1.3, BMP #2 identified existing references to assess the monitoring well density adequacy per hundred square miles (these references are considering basins that are large in geographic area). "While these estimates may provide guidance, the necessary monitoring point density for GSP depends on local geology, extent of groundwater use, and how the GSPs define undesirable results" (DWR, 2016a). Table 1 in BMP #2 suggests a range of 0.2 to 10 wells per 100 square miles depending on the source and annual groundwater extraction volume, which would be equivalent to about 1 to 20 wells for the 195.1 square mile Sierra Valley basin (including the Chilcoot subbasin). There are 36 representative monitoring points in the basin (Figure 2.1-2), seven of which are nested multi-completion wells. Therefore, from a basin perspective monitoring well density exceeds the recommendations set forth in BMP #2. Monitoring well density is not uniformly distributed throughout the basin, but is generally consistent with groundwater extraction volumes. In other words, while monitoring well density is much lower on the west side of the basin, there is also less groundwater pumping in that area.

As discussed in Section 1.2.3, there is evidence for an upper and lower aquifer in the basin (primarily the presence of flowing artesian wells and water level differences in nested monitoring wells) but no clear vertical delineation between the two has been identified due to the significant proportion of clays in aquifer sediments. Six of the RMPs are believed to be screened exclusively in the lower aquifer, 23 exclusively in the upper aquifer, and seven potentially across both. Vertical distribution of screened intervals is generally considered to be adequate for GSP implementation.

4.5.3 Temporal Data Gaps

All RMPs in the basin are monitored at least twice per year in the spring and fall, and many of those wells are monitored on a more frequent basis (e.g., monthly or continuously using telemetered pressure transducers). Therefore, the only temporal data gaps anticipated will be related to the inability to access wells or equipment failures.

4.6 SGMA Groundwater Quality Monitoring Network

Groundwater quality data collected from existing monitoring networks are described in Section 3.1 of this report. This Section addresses SVGSP monitoring program potential data gaps that may be present according to SGMA requirements if SVGMD's existing monitoring network is the only source of active data collection in the basin. From 23 CCR § 354.34(c) (4), groundwater monitoring programs, with respect to the SGMA sustainability indicators of degraded water quality, should "collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues."

Although water quality degradation is one of the six sustainability indicators, SGMA did not grant any additional authority to GSAs for regulating water quality impacts; those remain solely with the SWRCB and the nine Regional Water Quality Control Boards under its purview. As discussed in Section 2.1.3, water quality in Sierra Valley is generally good. Most of the water quality impacts are due to naturally occurring constituents over which the District has no control. While the basin is dominated by agricultural uses, risk of nitrate contamination is low due to the primary crop types being pasture and alfalfa, which both require little to no application of fertilizers. Pesticides and herbicides may pose a risk to groundwater quality, and the District is considering adding them to the list of GSP COCs they will monitor.

The District has prioritized projects and management actions such as irrigation efficiency improvements, managed aquifer recharge (MAR), and a detailed well inventory since submission of the GSP. Because of this, the water quality monitoring network is expected to be finalized in 2026.

4.6.1 Sources and Quality

Samples will be collected by trained field staff and analyzed at analytical water quality labs certified by the SWRCB's Environmental Laboratory Accreditation Program (ELAP). Therefore, data obtained from this monitoring program are expected to be of high quality.

4.6.2 Spatial Data Gaps

Candidate wells for water quality monitoring are listed in Table 3.1-2 and shown in Figure 3.1-3. Overall, there is very good spatial distribution of wells, both laterally and vertically, from which water quality samples can be collected.

4.3.1.1 Temporal Data Gaps

The District is planning to collect water quality samples at least every three years. Given the low risk of groundwater quality contamination that is not already monitored by other programs, no temporal data gaps are anticipated.

4.7 SGMA Subsidence Monitoring Network

The sections below discuss data gaps associated with the subsidence monitoring network described in Section 3.3.

4.7.1 Sources and Quality

Measurements at the subsidence control points are collected using modern survey technology by a licensed contractor and are highly precise, generally providing ± 0.01 ft (0.12 in) accuracy. Vertical accuracy of InSAR data can vary depending on multiple different factors (processing methods, calibration, local conditions, etc.) but is stated to be ± 20 mm, or ± 0.066 ft (0.79 in), at 95% confidence (Towill, 2025). Therefore, both sources of subsidence data are considered to be very high quality.

4.7.2 Spatial Data Gaps

The surveyed subsidence control points (Figure 4.7-1) are limited to the north central and northeast portion of the basin, coincident with where a large portion of groundwater pumping occurs and subsidence has been observed previously. In the southeast portion of the basin near Loyalton is another area with significant pumping, but the nearest subsidence control point is approximately four miles to the north-northwest. The aquifer in this area tends to be thinner and has a lower proportion of clay sediments, so it may not be as susceptible to subsidence as the area where the subsidence control points were established. However, this still represents a potential data gap and installation of subsidence control points near Loyalton should be considered. The lack of subsidence monitoring stations in the western portion of the basin is not considered a significant data gap at this time due to limited pumping in that area.

Although InSAR data is collected monthly across the entire Sierra Valley subbasin (excluding the Chilcoot subbasin), the processed spatial datasets provided by DWR showing displacement since June 2015 have significant spatial data gaps. As shown in Figure 4.7-2, recent coverages are missing values for approximately 60-70% of the basin. More importantly, the areas missing data coincide with areas of high subsidence potential. The District is incapable of filling this important data gap on its own, but has notified DWR in the hopes it will be corrected in the future.

4.7.3 Temporal Data Gaps

InSAR subsidence data are collected monthly but typically have a lag time of three to four months before they are published. Surveying of the subsidence control points has been performed once per year for the last four years (including installation) in October. Neither of these subsidence monitoring methods allow for real-time observations. While surveys of the subsidence control points could be conducted on a more frequent basis, it is considered infeasible due to the prohibitive cost and the District's lack of financial resources. If continued monitoring indicates that subsidence is significant and unreasonable, other measurement techniques that can provide more real-time assessments may need to be considered.

5.0 Data Gaps and Monitoring Program Recommendations

This final section summarizes and prioritizes recommendations on how refinement and or expansion of the existing monitoring networks in the basin might minimize or eliminate data gaps, especially in critical areas. From BMP #2 (DWR, 2016a), direct actions GSAs can take to fill data gaps include:

- Increasing the frequency of monitoring,
- Increasing the spatial distribution and density of the monitoring network,
- Increasing the quality of data through improved collection methods and data management methods.

5.1 Data Gaps Priority Ranking

A simple priority ranking system, ranging from very high to very low, is used to categorize the identified monitoring program recommendations. Each recommendation is evaluated based on its "value added" relative to its cost when determining prioritization. For example, it would be beneficial to rely solely on groundwater data collected from properly constructed multi-completion monitoring facilities with short screened intervals in each aquifer zone. Constructing approximately 10-20 such monitoring wells, evenly distributed throughout the basin, would substantially reduce uncertainty in GSP analyses and align with DWR data quality recommendations. However, the associated costs to construct such a robust monitoring network are currently beyond the District's financial resources.

It should be noted that several data gaps, also described elsewhere in this document, have been addressed since the initial GSP submittal including:

- Significant improvements to the well inventory database to populate missing construction information and more accurately identify well locations using non-redacted well log information,
- Four new continuous flow gaging stations within SV,
- Continued water level measurements at most RMPs,
- Initiation of a bi-annual groundwater quality monitoring program at six additional wells (five domestic and one monitoring),
- Installation of 11 subsidence monitoring stations in the northeastern portion of the basin where a large fraction of total groundwater extractions occurs.

Table 5.1-1 summarizes identified data gaps, recommendations for filling them, and suggested priority ranking. The priority level designations are largely subjective and provided to assist in understanding the relative importance of potential data gaps. Ultimate data gap prioritization is up to the District's discretion and may change over time.

5.2 Groundwater Elevation Monitoring Network Recommendations

Installing pressure transducers in wells that are currently monitored only during spring and fall measurement events would substantially improve understanding of groundwater system dynamics at a relatively low cost. Continuous water-level data would fill critical temporal gaps, capturing short-term responses to recharge, pumping, and seasonal climatic variability that discrete measurements miss. This higher-resolution record would allow for more accurate characterization of hydraulic gradients, timing of peak and trough conditions, and lag responses between aquifer zones or adjacent surface-water features. In turn, the higher resolution dataset would support more robust trend analyses, model calibration, and sustainability evaluations. Because modern pressure transducers are compact, durable, and capable of long deployment intervals with minimal maintenance, the incremental installation and data management costs are modest compared to the significant value added through improved hydrogeologic interpretation and management decision-making.

Installation of additional monitoring wells in select portions of the groundwater basin would improve spatial coverage and help address existing data gaps in areas where groundwater conditions are not well characterized. Expanded monitoring in these locations could refine understanding of localized groundwater levels, gradients, and potential water quality trends. However, because groundwater extraction in these areas is currently minimal, the relative management benefit of near-term well installation is limited. As a result, while additional monitoring would be useful for long-term basin assessment and adaptive management, it is considered a low priority compared to other programs and management actions in the basin (e.g., managed aquifer recharge).

5.3 Groundwater Quality Monitoring Network Recommendations

The District is already advancing groundwater quality monitoring network improvements to improve basin understanding and management for long-term sustainability. Ongoing efforts include the development of a basin-wide groundwater quality monitoring program for COCs identified in the GSP. The goal of this program is to improve spatial and temporal data coverage to support more robust groundwater quality assessments. Current recommendations are to continue implementing the water quality monitoring program proposed in the GSP.

Table 5.1-1. Potential Data Gaps and Recommended Actions.

Sustainability Indicator	Potential Data Gap	Recommended Action	Priority
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	No recent monitoring of wells that have a long historical record.	Efforts should be made to collect water level measurements for these wells (DMS 034, 23N17E31P001M, 23N17E31Q001M, and 23N17E31Q002M) or replacement wells should be considered.	Very High
Land Subsidence	Large gaps in InSAR total displacement datasets provided by DWR, especially in areas that are at significant risk of subsidence.	The District is unable to fill this data gap on its own due to the highly specialized and technical workflows required to process InSAR data. The District will work with DWR to find a suitable solution.	Very High
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	General uncertainty in groundwater storage estimates.	Continued updates and refinements to SVHSM.	High
Interconnected surface waters (ISWs) and Groundwater Dependent Ecosystems (GDEs)	Shallow groundwater monitoring near GDEs.	Installation of additional shallow groundwater monitoring wells/piezometers near GDEs that may be impacted by nearby pumping wells.	Medium
Interconnected surface waters (ISWs) and Groundwater Dependent Ecosystems (GDEs)	Lack continuous streamflow data for streams entering Sierra Valley.	Installation of continuous stream gaging stations for Berry Creek, Cold Stream, Antelope Creek, and East Fork Carman Creek. Streamflow gages for Smithneck and Staverville Creeks were installed by the District in 2025.	Medium
Interconnected surface waters (ISWs) and Groundwater Dependent Ecosystems (GDEs)	Lack of established correlation between groundwater levels, NDVI, and the health of GDEs.	Additional studies to better understand relationship between shallow groundwater levels and timing, NDVI, health of GDEs, and overall ecosystem functioning.	Medium
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	Lack of subsurface lithology data in western portion of the basin.	Ensure lithology data is collected for any new wells that are drilled. If funds are available, the District should consider of drilling test holes and installing temporary wells to perform aquifer testing at a limited number of locations.	Medium
Degraded Water Quality	Irregular frequency of groundwater quality data collection that makes it difficult to determine temporal trends. Additionally, constituents listed in the GSP are not analyzed at every GAMA well.	Collection of groundwater quality samples from six wells that will be monitored once every year for nitrate, total dissolved solids (TDS), arsenic, boron, iron. manganese, pH, and methyl tert-butyl ether (MTBE). If no problems are observed, the monitoring frequency will decrease to once every 3 years. Monitoring will be augmented as needed if constituents exceed criteria or if increasing trends are observed.	Medium
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	Measurements collected only twice per year (spring/fall) for many monitoring wells.	Install pressure transducers that can collect data more frequently, preferably with telemetry. Manual measurements once or twice per year should still be performed in order to correct sensor drift.	Low
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	Vertical coverage of shallow and deep aquifers may potentially be inadequate.	Installation of deep multi-completion (nested) monitoring wells with short screened intervals.	Low
Land Subsidence	Limited spatial extent of surveyed subsidence control points.	Additional monument-based land surface elevation stations could be installed near Loyalton where a large portion of groundwater pumping in the basin occurs. Installation of subsidence monitoring stations in the western portion of the basin is considered to be a very low priority data gap due to limited pumping in that area.	Low
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	General lack of understanding around mountain front recharge.	Further evaluation of mountain front recharge in SVHSM, including testing of different parameterizations in space and time	Low
Chronic Lowering of Groundwater Levels and Reduction of Groundwater Storage	Limited construction information (location, screened interval, pump intake depth, etc.) available for domestic wells.	This data gap is unable to be filled by the District, as all publicly available data sources with well construction information have been reviewed. Property owners are encouraged to visit the District's DMS (https://sierra-valley.gladata.com/) to see what information is available for their well and to provide construction documentation if available. The local well permitting agencies as well as DWR should require drillers to submit well completion reports with all sections completed.	Very Low

5.4 Groundwater Extraction Monitoring Network Recommendations

Groundwater extraction monitoring in Sierra Valley is very good, with monthly extraction volumes measured at individual wells during the irrigation season. More frequent data collection (e.g., bi-weekly, weekly, or even daily) could help improve understanding of aquifer dynamics and processes and support future model refinements to better represent interactions between groundwater and surface water, but is not considered necessary at this time.

5.5 Subsidence Monitoring Network Recommendations

Installing one or more additional subsidence monitoring stations near Loyalton could improve both the technical understanding of aquifer system response and the ability to demonstrate SGMA compliance. Localized subsidence measurements would allow for better correlation of pumping patterns with land surface deformation and distinguish between elastic and inelastic aquifer compaction. Enhanced spatial coverage could also reduce uncertainty if basin-wide deformation models were to be developed, support calibration of InSAR datasets, and improve the defensibility of sustainable yield and minimum threshold determinations. From a compliance perspective, targeted monitoring in high-stress areas provides early warning of undesirable results, enabling timely management actions and adaptive pumping strategies to avoid exceedances of subsidence criteria established in the GSP.

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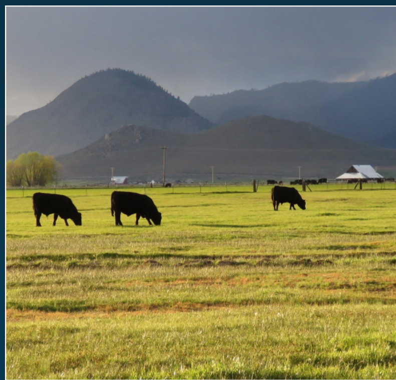





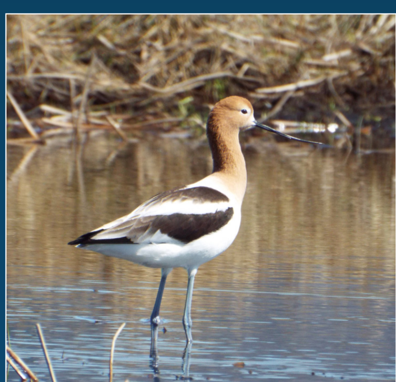
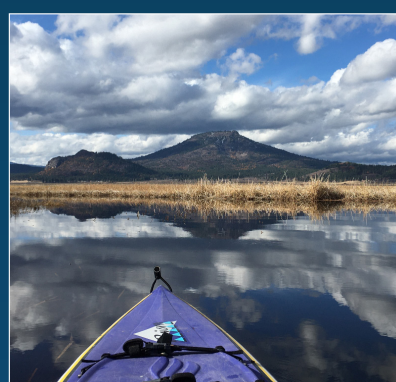


Groundwater Sustainability Agencies
Contact Information

Sierra Valley Groundwater Management District
PO Box 88
Chilcoot CA 96105
svgmd@sierravalleygmd.org
www.sierravalleygmd.org

Plumas County
520 Main Street, Room 309
Quincy, CA 95971
530-283-6170
www.plumascounty.us