

Salinas Valley: Upper Valley Aquifer Subbasin Groundwater Sustainability Plan – Amendment 1

VOLUME 2

Chapter 5. Groundwater Conditions

Chapter 6. Water Budgets

Chapter 7. Monitoring Networks

Chapter 8. Sustainable Management Criteria

Prepared for:

Salinas Valley Basin Groundwater Sustainability Agency

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5 GROUNDWATER CONDITIONS

Chapter 5 describes the Upper Valley Subbasin groundwater conditions historically and at the beginning of GSP implementation, in accordance with the GSP Regulations § 354.16. This chapter focuses on information required by the GSP regulations and that is important for developing an effective plan to achieve sustainability. Chapter 5 provides a description of groundwater conditions historically and at the start of GSP implementation at a scale and level of detail appropriate for meeting the GSP sustainability requirements under SGMA.

In this GSP, historical conditions are conditions prior to the January 1, 2015, start of SGMA, and current conditions are conditions at the start of GSP implementation – referred to as GSP baseline in this chapter. The GSP baseline includes conditions generally occurring between 2015 and 2019. Where data does not exist for 2015 – 2019, more recent data has been incorporated. Otherwise, more recent data is reported in GSP annual reports and 5-year GSP periodic evaluations.

This chapter is organized to align the groundwater conditions descriptions with the 5 sustainability indicators relevant to this Subbasin, including:

1. Chronic lowering of groundwater levels
2. Changes in groundwater storage
3. Groundwater quality
4. Land subsidence
5. Depletion of ISW due to pumping

In addition, in line with GSP Regulations § 356.4 assessment requirements, this chapter includes a section on water use.

5.1 Groundwater Elevations

5.1.1 Data Sources

The assessment of groundwater elevation conditions is largely based on data collected by MCWRA from 1944 through the present. MCWRA's monitoring programs are described in Chapter 3, which is only in the Upper Valley Subarea (Figure 3-3).

Groundwater elevation data are analyzed and presented with 3 sets of graphics:

- Maps of groundwater elevation contours show the geographic distribution of groundwater elevations at a specific time. These contours represent the elevation of the groundwater in feet, using the North American Vertical Datum of 1988

(NAVD88) vertical datum and are of differing intervals. The contour interval is 10 feet in the area that overlaps with the Upper Valley Subarea, meaning each blue line represents an area where groundwater elevations are either 10 feet higher or 10 feet lower than the next blue line (Figure 5-1 to Figure 5-6). Outside of the Upper Valley Subarea, contours are of differing intervals and are dashed to represent uncertainty. These figures are summarized in Table 5-1.

- Hydrographs of individual wells show the variations in groundwater elevations at individual wells over an extended period (Figure 5-7).
- Vertical hydraulic gradients in a single location assess the potential for vertical groundwater flow direction, as discussed in Section 5.1.4.

5.1.2 Groundwater Elevation Contours and Horizontal Groundwater Gradients

MCWRA annually prepares groundwater elevation contour maps for the Salinas Valley using data collected from mid-November through December, after the irrigation season and before winter recharge raises groundwater levels. These fall measurements represent neutral groundwater conditions in the Subbasin and provide a consistent basis for evaluating groundwater elevations over time. Salinas Valley These contours only extend up to the MCWRA's Upper Valley Subarea, which covers just the northern half of the Upper Valley Subbasin (Figure 3-3). SVBGSA added 5 new wells in the southern half of the Upper Valley Subbasin in 2025 that MCWRA started monitoring in 2026; these wells are further discussed in Chapter 7. However, no historical groundwater elevation data exists for this area. However, no historical groundwater elevation data exists for this area.

To fill this spatial data gap, groundwater elevations in the southern half of the Upper Valley Subbasin were interpolated using Paso Robles Area Subbasin data. Groundwater elevation data in the Paso Robles Area Subbasin are collected by the San Luis Obispo County Flood Control and Water Conservation District (SLOFCWCD) in April and October.

Groundwater elevation contour maps representing seasonal high and seasonal low conditions were developed for this GSP because MCWRA does not prepare spring contour maps and does not produce August contour maps for the Upper Valley Subbasin. The true seasonal high varies from year to year, typically occurring between January and March as a result of winter recharge and reduced groundwater pumping by agricultural wells; however, some wells monitored during this period may be inaccessible during the rainy season. Therefore, although fall measurements do not represent the true seasonal high, they are used as a surrogate for seasonal high conditions. August groundwater elevations were contoured to represent seasonal low conditions because groundwater levels are typically at their lowest and the aquifer is under the greatest stress during this period. Salinas Valley MCWRA's groundwater elevation data was supplemented with data collected by SLOFCWCD to extend the contours into the southern portion of the Subbasin.

The groundwater elevation contours do not always extend to the Subbasin margins; nor do they cover the entire Upper Valley Subbasin. Although the principal aquifer in the Subbasin includes alluvium and the Paso Robles Formation, contour maps are only provided for the alluvium because that is where most extraction occurs. The SVBGSA installed 3 new wells in the Paso Robles Formation which could be used in the future to extend contours across greater portions of the Subbasin.

In this section, groundwater elevations from 2019 are used to illustrate baseline conditions at the start of GSP implementation and 1995 is used for historical conditions. The following 6 maps listed on Table 5-1 present the GSP baseline (2019) and Historical (1995) groundwater elevation contours.

Table 5-1. Figures Showing GSP Baseline and Historical Groundwater Elevation Contours

Figure #	Year	Season
Figure 5-1	GSP Baseline (2019)	Spring
Figure 5-3	GSP Baseline (2019)	August
Figure 5-3	GSP Baseline (2019)	Fall
Figure 5-4	Historical (1995)	Spring
Figure 5-6	Historical (1995)	August
Figure 5-6	Historical (1995)	Fall

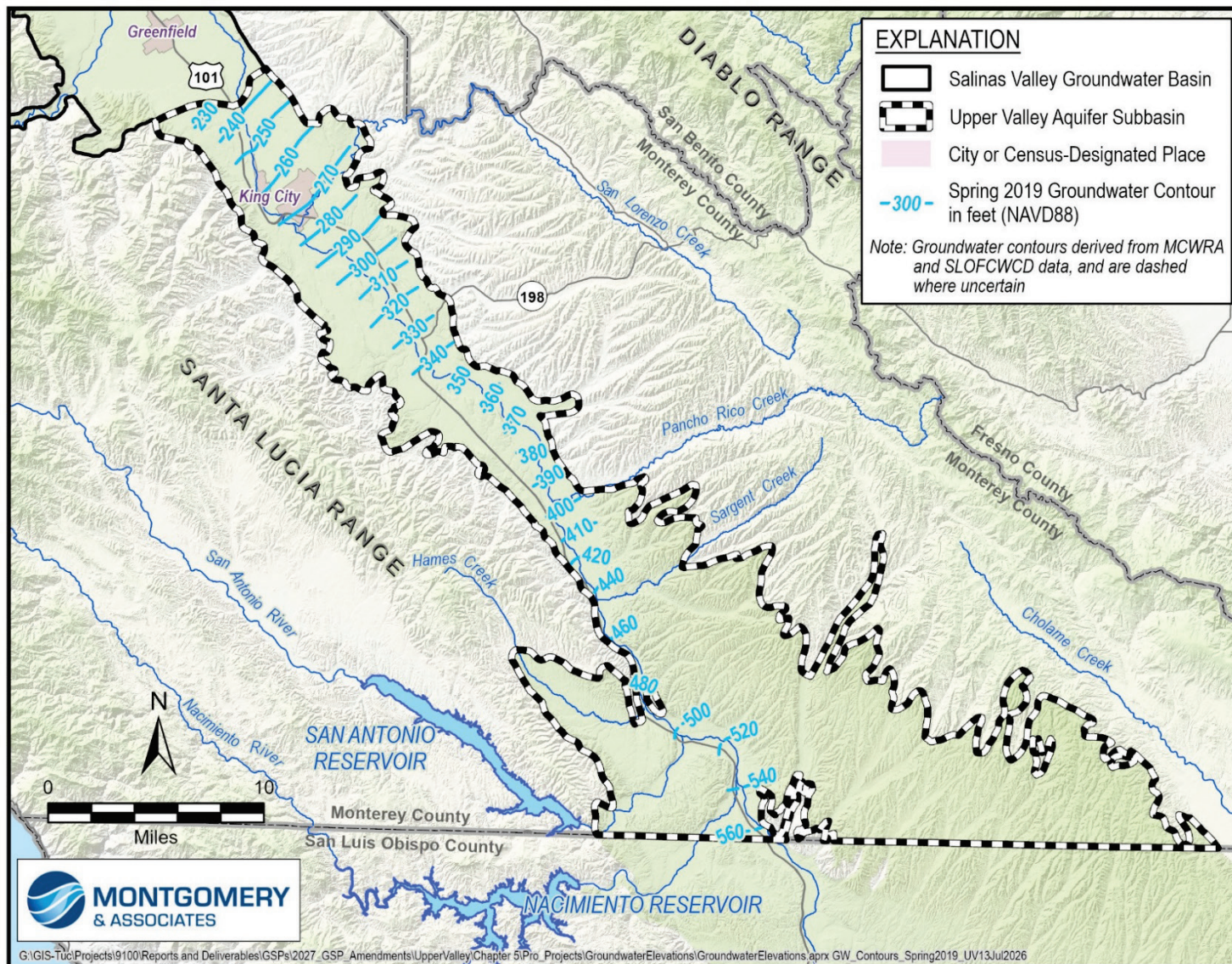


Figure 5-1. Spring 2019 Groundwater Elevation Contours

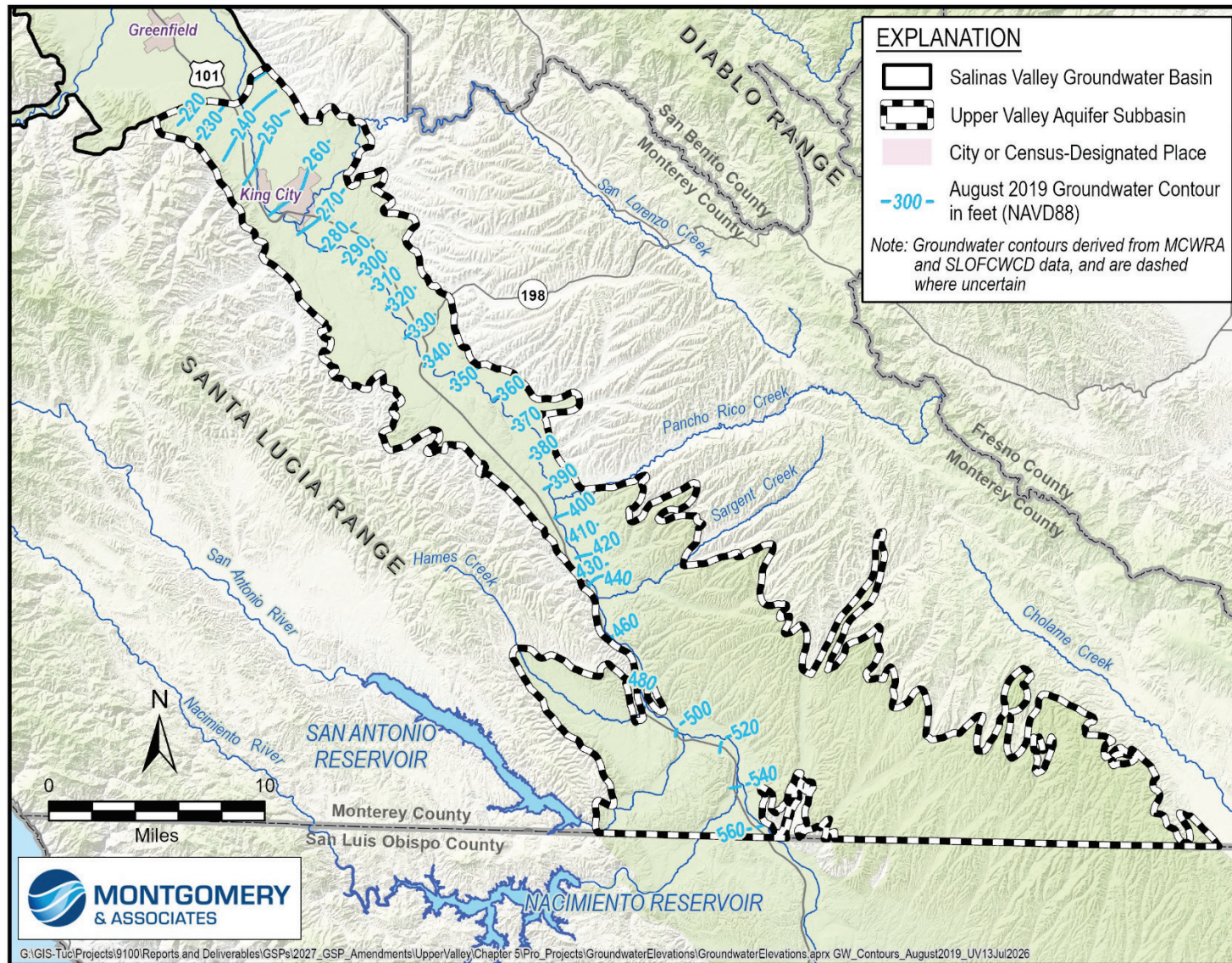


Figure 5-2. August 2019 Groundwater Elevation Contours

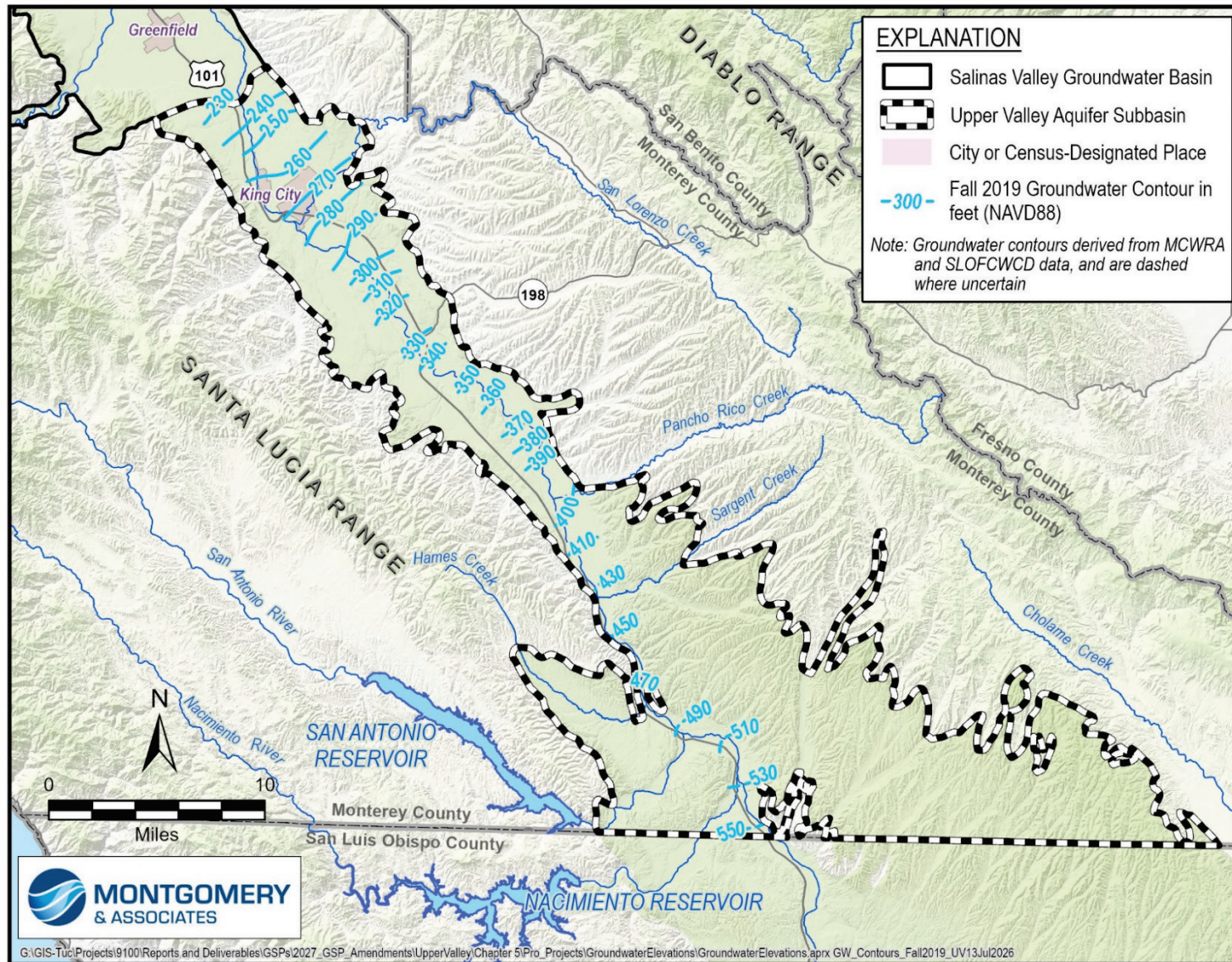


Figure 5-3. Fall 2019 Groundwater Elevation Contours

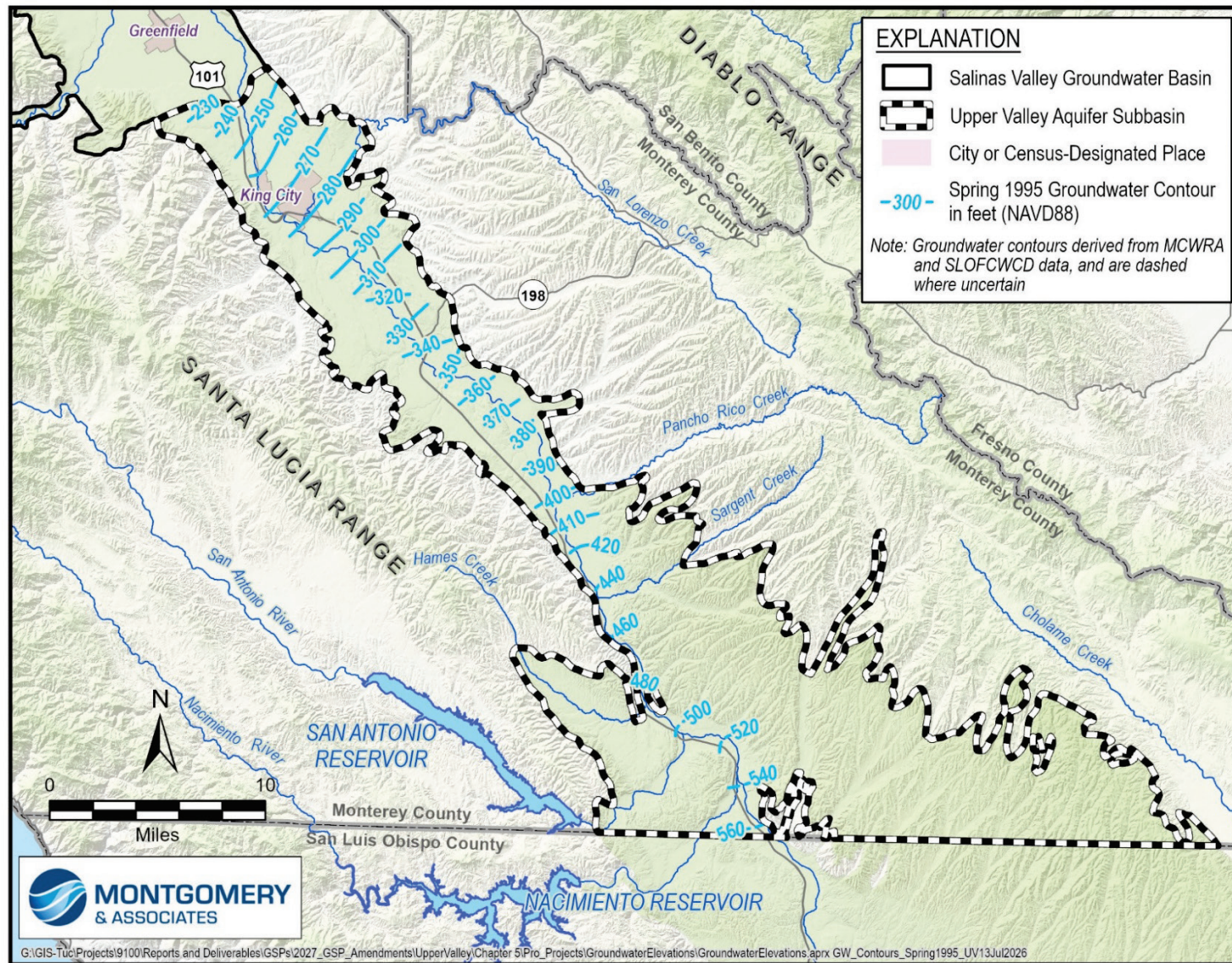


Figure 5-4. Spring 1995 Groundwater Elevation Contours

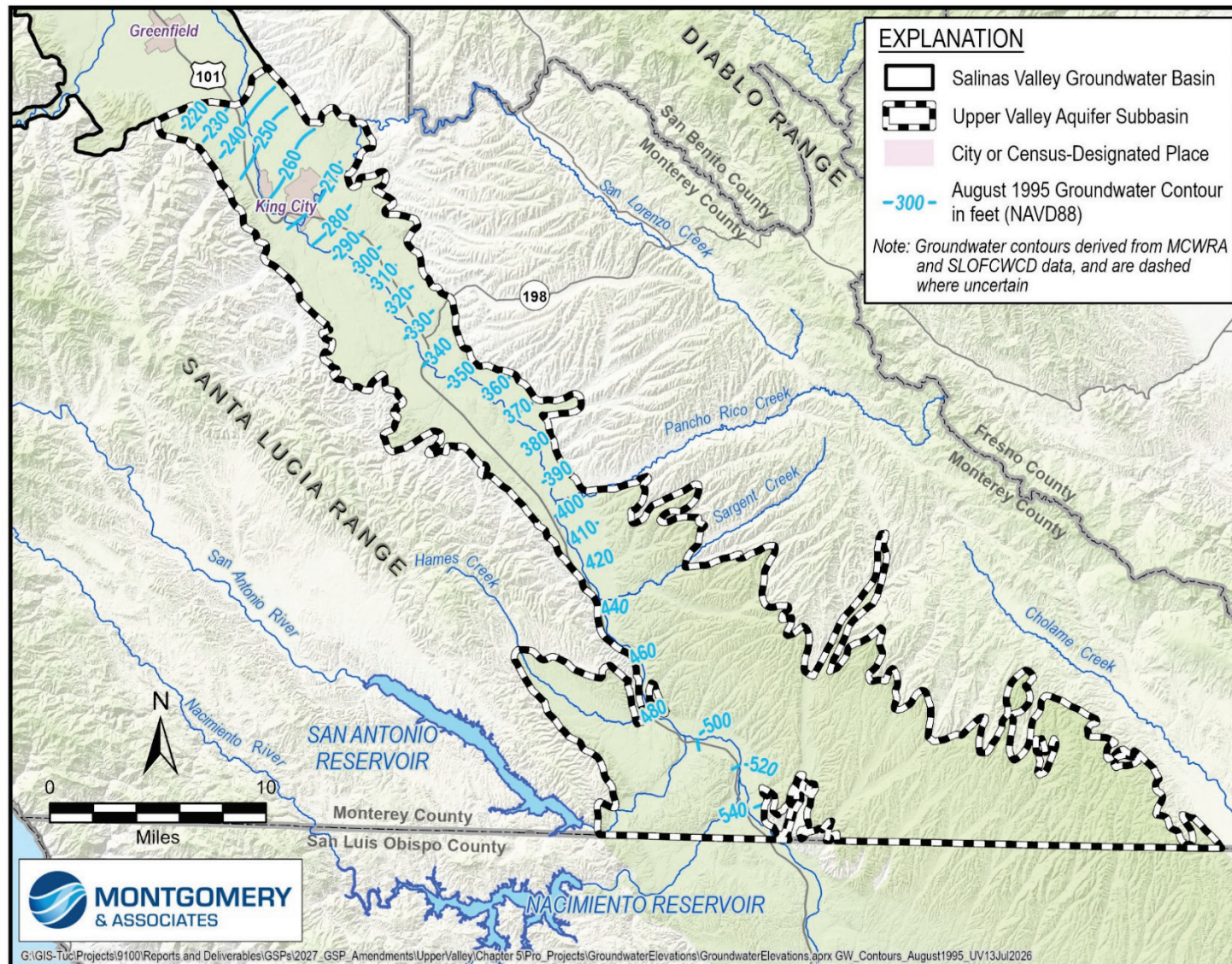


Figure 5-5. August 1995 Groundwater Elevation Contours

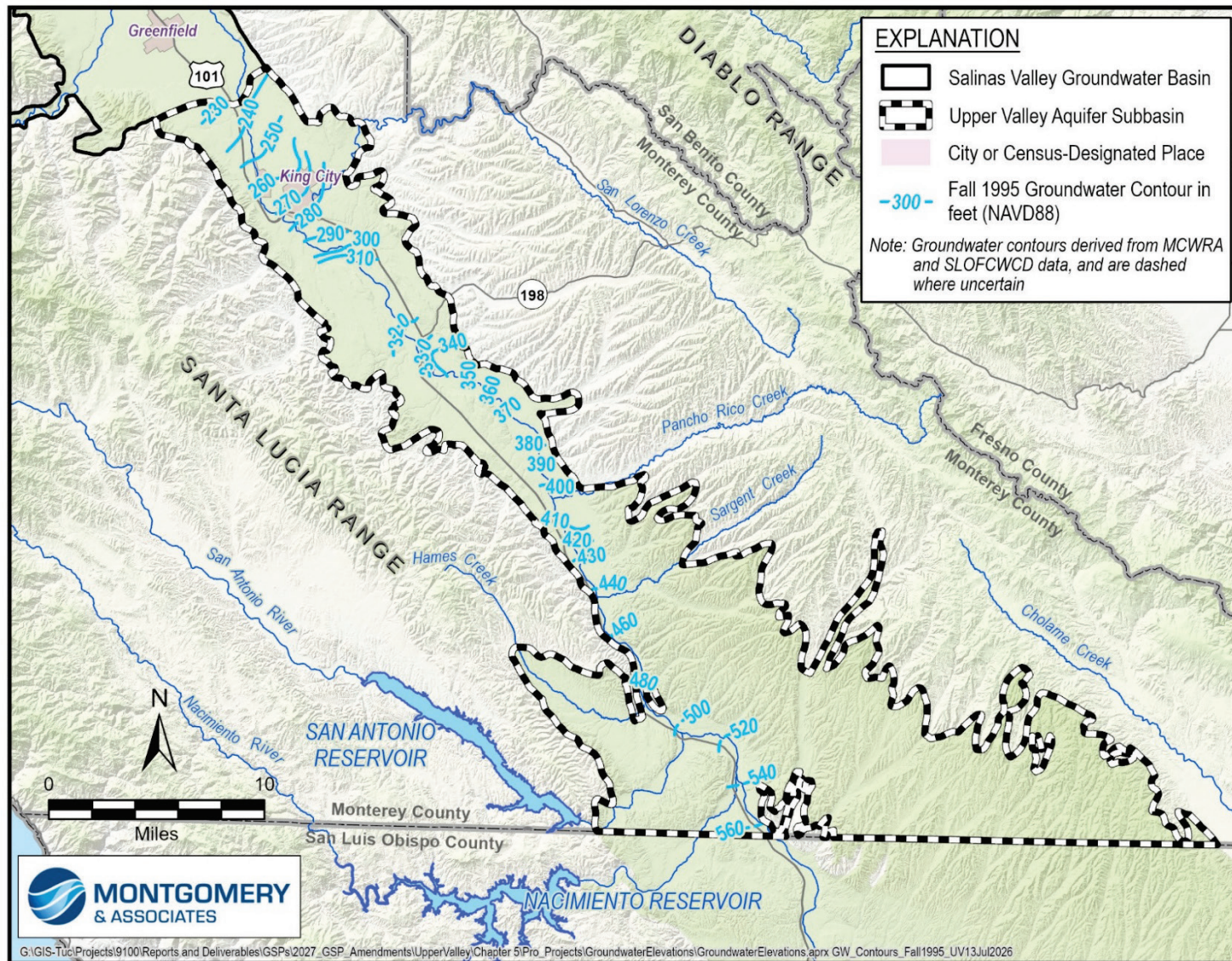


Figure 5-6. Fall 1995 Groundwater Elevation Contours

Groundwater in the Upper Valley Subbasin generally flows parallel to the Subbasin's axis, from south to north-northwest. The lowest groundwater elevations in the Subbasin occur along the boundary with the Forebay Subbasin near King City and are approximately 220 feet NAVD88 during the August measurements. The hydraulic gradient across the alluvium in the Upper Valley Subbasin is approximately 0.001 ft/ft, or 7.6 ft/mile. Groundwater elevations near the southern boundary with the Paso Robles Area Subbasin are greater than 560 feet NAVD88 in both the spring and fall of 2019 and 1995. Examples of historical groundwater elevation changes at specific wells are presented in Section 5.1.3.

5.1.3 dHydrographs

Representative temporal trends in groundwater elevations can be assessed with hydrographs, which plot changes in groundwater elevations over time. Groundwater elevation data from wells within the Subbasin are available from monitoring conducted and reported by MCWRA.

Figure 5-7 depicts the locations and hydrographs of example monitoring wells in the Subbasin. Larger versions of the hydrographs for these wells—and for all Representative Monitoring Sites (RMS)—are included in Appendix 5A. Chapter 7 provides more information specific to the wells and the monitoring system.

All the example hydrographs show seasonal fluctuation from the summer months when groundwater elevations are the lowest to the winter months when groundwater elevations recover. Declines in groundwater elevations over longer periods illustrate times of drought. Droughts have a more pronounced effect on the 2 northern wells on Figure 5-8. These wells show almost complete recovery following extended periods of drought. All wells shown on Figure 5-8 demonstrate a slight decrease in groundwater elevations over time.

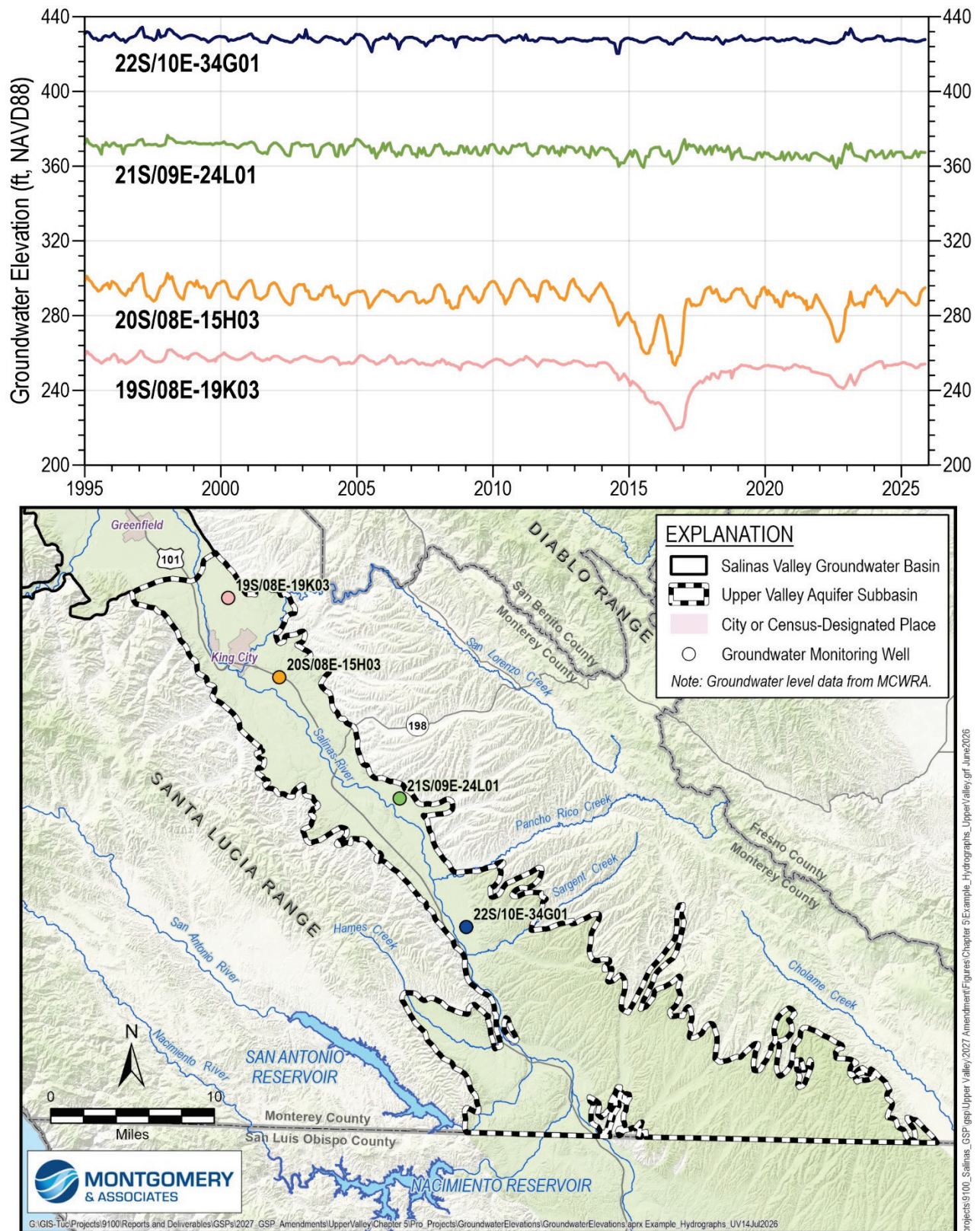


Figure 5-7. Map of Example Hydrographs

Figure 5-8 presents a graph of cumulative groundwater elevation change for the Upper Valley Subbasin. The graph was initially developed by MCWRA and is based on average change in fall groundwater elevations for designated wells in the Upper Valley Subarea each year. The Upper Valley Subarea used by MCWRA for its analyses overlaps approximately half of the Upper Valley Subbasin, along with a small portion of the Forebay Subbasin (Figure 3-3). The figure was adapted to reflect the cumulative change in groundwater elevations specific to the Upper Valley Subbasin.

Fall measurements occur at the end of the irrigation season and before groundwater levels increase due to seasonal recharge by winter rains and/or seasonal decreases in groundwater pumping. These measurements record annual changes in storage reflective of groundwater recharge and withdrawals in the Subbasin. The cumulative groundwater elevation change plot is therefore an estimated average hydrograph for wells in the Subbasin. Although this plot does not reflect the groundwater elevation change at any specific location, it provides a general illustration of how the average groundwater elevation in the Subbasin changes in response to climatic cycles, groundwater extraction, and water resources management at the subbasin scale.

The cumulative elevation change estimates and the specific hydrographs presented in Appendix 5A show that groundwater elevations in the Upper Valley Subbasin have declined slightly after experiencing several discrete declines during dry periods and not fully recovering to pre-drought levels.

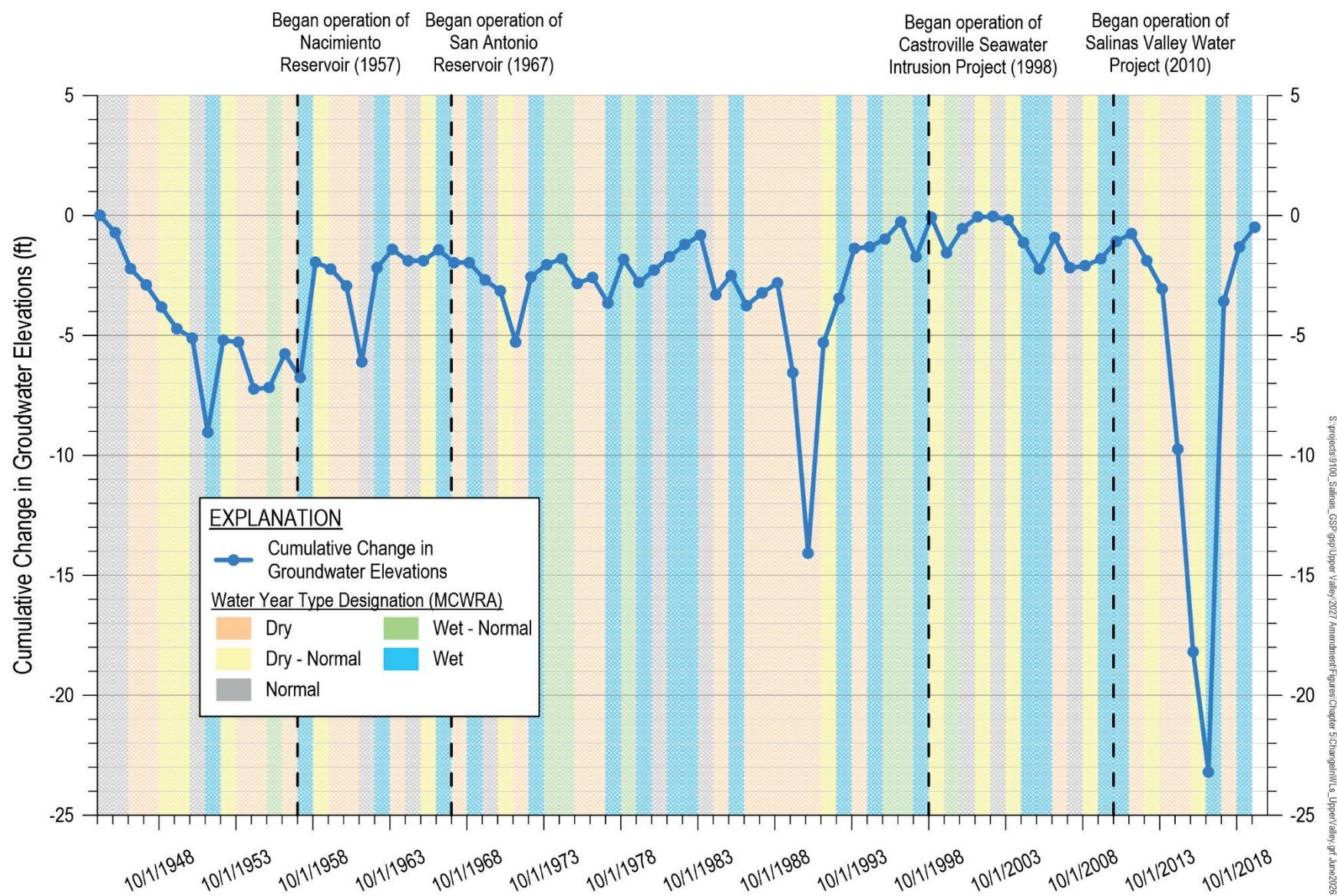


Figure 5-8. Cumulative Change in Groundwater Elevations (Adapted from MCWRA, 2018a, personal communication)

5.1.4 Vertical Groundwater Gradients

The Upper Valley Subbasin comprises a single, unconfined aquifer consisting of the alluvium and Paso Robles Formation. The degree of hydraulic interconnection between the formations is not well defined due to the heterogeneity of the Paso Robles Formation; however, no laterally extensive aquitard exists between the formations. Nevertheless, vertical gradients could still exist due to the cumulative confinement from numerous, small clay lenses. The potential presence of vertical groundwater gradients was investigated by comparing groundwater level measurements from pairs of alluvium wells and Paso Robles Formation wells located closely together. Figure 5-9 shows groundwater elevations at 2 well pairs in the Subbasin. In the northern part of the Subbasin, the groundwater elevations in the alluvium are lower than those in the Paso Robles Formation, indicating an upward gradient. On the other hand, a downward gradient from the alluvium to the Paso Robles Formation exists in the southern well pair. This could be due to pumping from the Paso Robles Formation in the Paso Robles Subbasin, where a similar downward gradient is observed. These wells were installed by the SVBGSA in 2024; therefore, there are no historical groundwater elevation measurements available.

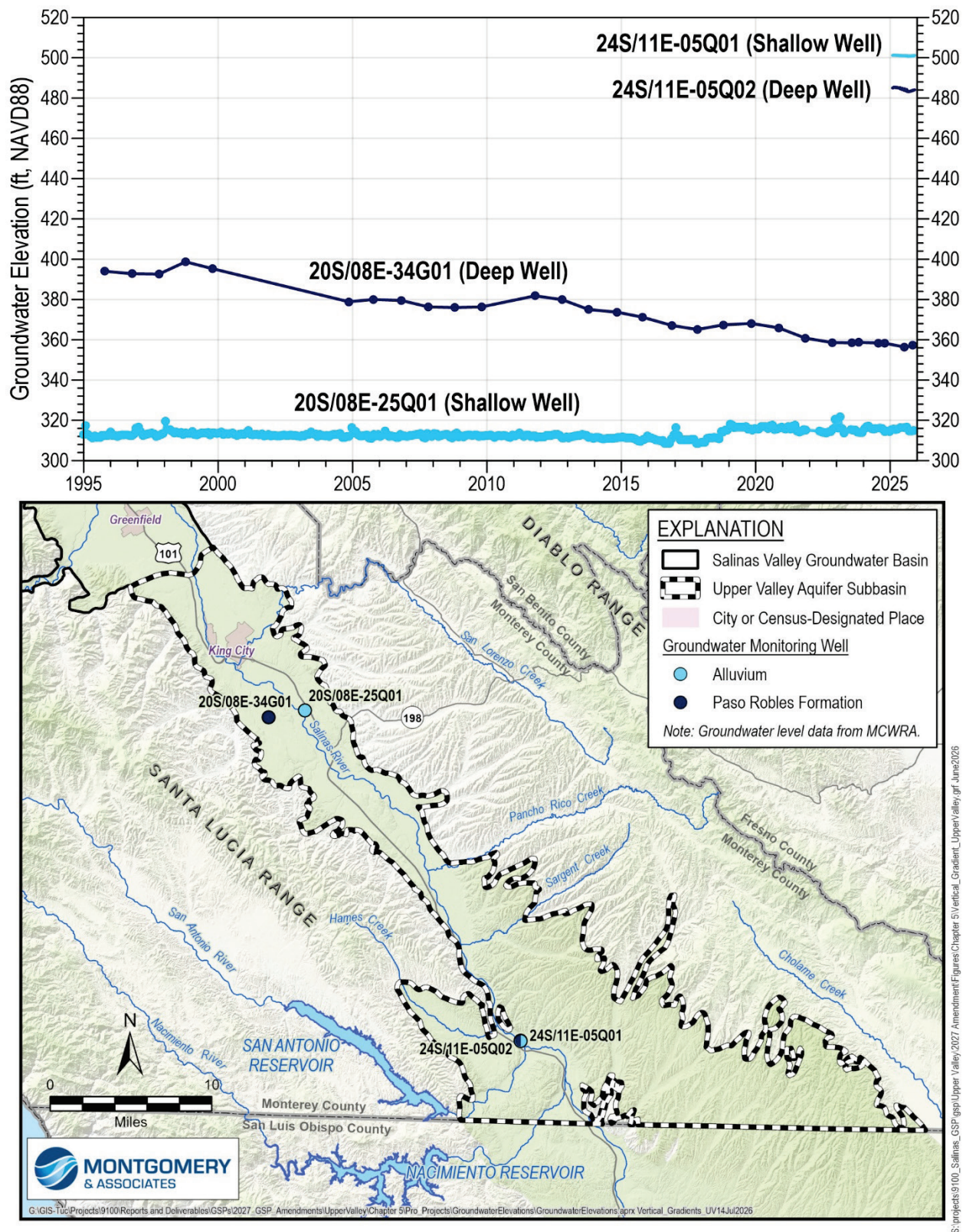


Figure 5-9. Vertical Gradients

5.2 Change in Groundwater Storage

5.2.1 Data Sources

Change in storage is developed based on MCWRA's fall groundwater elevation measurements. Fall groundwater elevations are used because these measurements are taken after groundwater elevations generally recover from the peak irrigation season and before winter precipitation increases groundwater levels. As a result, fall groundwater elevations provide a representative measure of the annual change in groundwater storage. Groundwater elevation measurements are also used to create fall groundwater elevation raster layers that are used to determine the spatial distribution of storage change.

5.2.2 Change in Groundwater Storage Due to Groundwater Elevation Changes

Change in groundwater storage is derived from change in observed groundwater elevations at RMS wells, which are described in more detail in Chapter 7. These groundwater elevation changes are used to estimate the gain and loss of groundwater in storage each year according to the following relationship:

$$\Delta S = \Delta WL \times A \times SC$$

Where: ΔS = Annual change in storage volume in the Subbasin (AF/yr)

ΔWL = Annual change in average groundwater elevation in the Subbasin (ft/yr)

A = Land area of Subbasin (acres)

SC = Storage coefficient (ft³/ft³)

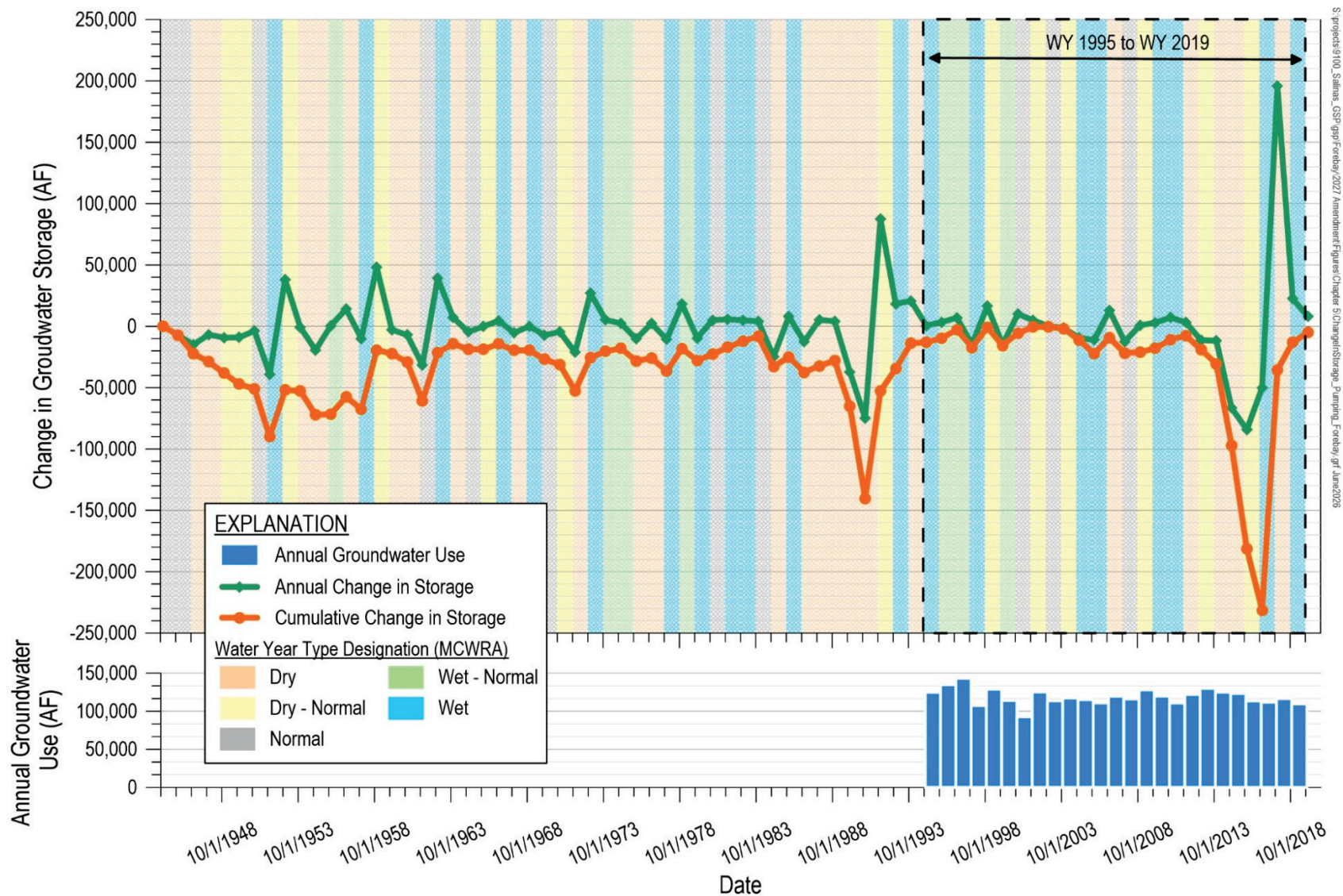
The change in storage is presented below in 2 ways: (1) a timeseries of cumulative and annual change in storage from 1944 through 2019 averaged across the Subbasin (Figure 5-10) and (2) a map showing spatial change in storage across the Subbasin from 1995 to 2019 (Figure 5-11).

The estimated cumulative change in groundwater storage in the Upper Valley Subbasin shown on Figure 5-10 is derived from the cumulative subbasin-wide average change in groundwater elevations (Figure 5-8). The magnitude of the groundwater storage change is calculated by multiplying the annual groundwater elevation change by a storage coefficient and an area. The storage coefficient used to create this plot is the average storativity of layer 1 of the updated SVIHM (0.16 ft³/ft³), which is the best available data source for this aquifer property. Although more than 1 model layer comprises the Upper Valley Subbasin in the SVIHM, only the storage properties of layer 1 are used because most of the storage change occurs in the upper aquifer zone. The area used in this calculation is 62,100 acres, which is the sum of the cells comprising layer 1 within the Upper Valley Subbasin that overlap with the groundwater elevation rasters.

Method 1: For the first method of estimating change in storage, Figure 5-10 shows that groundwater elevations have fluctuated over this historical period, as indicated by annual change in storage, however the Subbasin has experienced a slight decline in groundwater storage due to lowering groundwater elevations. The average annual storage loss due to lowering groundwater elevations in the Subbasin between 1944 and 2019 is approximately 70 AF/yr. However, from 1995 to 2019, storage increased at approximately 200 AF/yr. The storage change calculation is a reflection of groundwater elevations in the start and end years, which does not capture groundwater level fluctuations within that period. Figure 5-10 also shows the annual groundwater extractions starting in 1995, which is when groundwater extraction reporting began.

Method 2: For the second method of estimating change in storage, Figure 5-11 shows the spatial distribution of estimated change in groundwater storage from fall 1995 to fall 2019. To create this map, separate raster layers were generated from interpolated groundwater elevations measured at the RMS wells for fall 1995 and fall 2019. After the rasters were created, groundwater elevations were spatially averaged within each SVIHM grid cell that overlaps with the Upper Valley Subbasin (grid cell size is larger than the raster resolution) and then subtracted from each other. The difference in groundwater elevations was multiplied by the storativity of the top layer (layer 1) of the model, as previously described, and then summed together to estimate total change in storage. This approach yielded an estimated gain in storage of approximately 1,400 AF/yr.

Change in groundwater storage described in this section solely represents alluvium conditions in the Subbasin, which is where most groundwater in the Subbasin is extracted. Groundwater elevations in the Paso Robles Formation in the Subbasin have been declining over time, and further analysis of trends over varying periods was conducted as part of the assessment of overdraft, which determined the subbasin is in overdraft, as shown in Chapter 6.



(Adapted from MCWRA, 2018a, personal communication)

Figure 5-10. Cumulative and Annual Change in Groundwater Storage

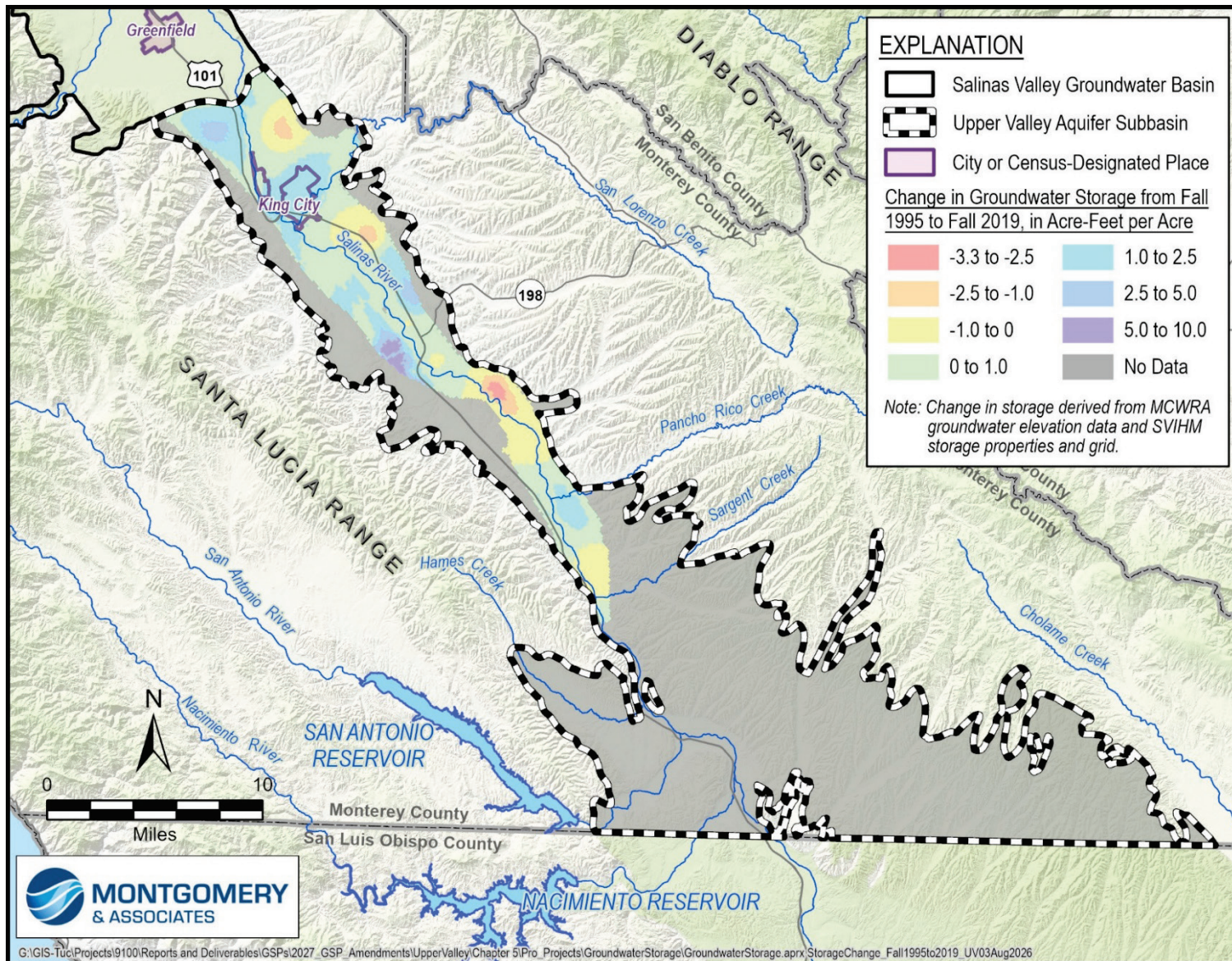


Figure 5-11. Change in Groundwater Storage from Fall 1995 to Fall 2019

5.3 Groundwater Quality Distribution and Trends

The SVBGSA does not have sole regulatory authority over groundwater quality and is not charged with improving groundwater quality in the Salinas Valley. Projects and management actions (PMAs) implemented by the SVBGSA are not required to improve groundwater quality; however, they must not further degrade it.

5.3.1 Data Sources

Groundwater quality samples have been collected and analyzed in the Subbasin for various studies and programs. Groundwater quality samples have also been collected on a regular basis for compliance with regulatory programs. Groundwater quality data for this GSP were collected from:

- The Northern Counties Groundwater Characterization report (CCGC, 2015)
 - The USGS Groundwater Ambient Monitoring and Assessment Program (GAMA) reports (Kulongoski and Belitz, 2005; Burton and Wright, 2018)
 - SWRCB GeoTracker Data Management System (SWRCB, 2026a)
 - SWRCB GAMA Groundwater Information System (SWRCB, 2020)
- The California Department of Toxic Substances Control (DTSC) EnviroStor DMS (DTSC, 2026)
- CCRWQCB ILP data (CCRWQCB, 2024)

5.3.2 Point Sources of Groundwater Contaminants

Clean-up and monitoring of point source pollutants may be under the responsibility of either the CCRWQCB or the DTSC. GeoTracker is the SWRCB's data management system for sites that may affect water quality, particularly groundwater. It tracks locations that require environmental cleanup, such as leaking underground storage tank (LUST) sites, Department of Defense sites, and other cleanup program sites. GeoTracker also includes information on regulated and unregulated facilities and projects, including irrigated lands, oil and gas production sites, permitted underground storage tanks, and land disposal sites.

EnviroStor is used by the DTSC to track hazardous waste facilities and contaminated sites, including the agency's cleanup, permitting, enforcement, and investigation activities. EnviroStor contains information on sites with known contamination as well as locations that may require further environmental investigation.

Table 5-2 and Figure 5-12 provide a summary and map of the active or open contamination sites within the Subbasin. Not all the constituents listed in Table 5-2 are part of the monitoring network described in Chapter 7. However, the status of these constituents at these sites will continue to be monitored by the DTSC or the CCRWQCB.

Table 5-2. Active Contamination Sites

Label	Site Name	Address	City	Site Type	Status	Constituents Found at Site
1	SABEC INC. (VT Petroleum)	412 Metz Rd.	King City	Cleanup Program Site	Open - Site Assessment	Gasoline
2	Chevron San Ardo Waste Pile Management Facility	66575 Sargents Rd	San Ardo	Land Disposal Site	Open - Operating	None Specified
3	San Ardo Oil Field - Chevron Wells/Boring Waste Reuse WPMF	66575 Sargents Road	San Ardo	Land Disposal Site	Open - Operating	None Specified
4	Camp Roberts - Camp Roberts Old Quarry Site (CPRO-33)	Camp Roberts	Camp Roberts	Military Cleanup Site	Open - Site Assessment	Dioxin / Furans, Explosives (UXO, MEC), Munitions Debris (MD), Copper, Lead, Zinc
5	Camp Roberts - CAMP ROBERTS PFAS (T10000016364) - Camp Roberts PFAS Investigation	Camp Roberts	Camp Roberts	Military Cleanup Site	Open - Site Assessment	Per- and Polyfluoroalkyl Substances (PFAS)
6	Chevron U.S.A. INC. - San Ardo Guniting Pond	Sargents Road	San Ardo	Produced Water Ponds	Open - Assessment & Interim Remedial Action	None Specified
7	Orradre 50K Tank Overflow Pond	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
8	Orradre Cogen Waste Pit	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
9	Orradre OTF Relief Tank	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
10	Orradre Pit 1	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
11	Orradre Pit 2	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
12	Orradre Pit 3	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified
13	Orradre Pit 4	Sargents Road	San Ardo	Produced Water Ponds	Active - Unpermitted	None Specified

Label	Site Name	Address	City	Site Type	Status	Constituents Found at Site
14	Aera Energy LLC - San Ardo - Water Disposal UIC Projects 64403001/00000006 and 64403004	San Ardo Oilfield	San Ardo	Underground Injection Control (UIC)	Open - Need Additional Information	None Specified
15	API # 05321607	65012 Sargents Rd	San Ardo	Underground Injection Control (UIC)	Open	None Specified
16	API # 05322016	65012 Sargents Rd	San Ardo	Underground Injection Control (UIC)	Open	None Specified
17	API # 05322140	66575 Sargents Road	San Ardo	Underground Injection Control (UIC)	Open - Need Additional Information	None Specified
18	Chevron - UIC Projects 64403006 & 64406609 - Aurignac Water Disposal, San Ardo Oilfield	None Specified	San Ardo	Underground Injection Control (UIC)	Open - Active	None Specified
19	Eagle Petroleum, LLC - API # 05320795	Unnamed Road	San Ardo	Underground Injection Control (UIC)	Open	None Specified
20	Eagle Petroleum, LLC - API # 05322018	Unnamed Road	San Ardo	Underground Injection Control (UIC)	Open	None Specified
21	Eagle Petroleum, LLC - API # 05322162	Unnamed Road	San Ardo	Underground Injection Control (UIC)	Open	None Specified
22	Fred Cagle - API # 05321118	62397 Sargents Rd	San Ardo	Underground Injection Control (UIC)	Open	None Specified
23	Trio Petroleum LLC - San Ardo - Project No. 64406013	Section 26/T10S/R22E	San Ardo	Underground Injection Control (UIC)	Open - Need Additional Information	None Specified

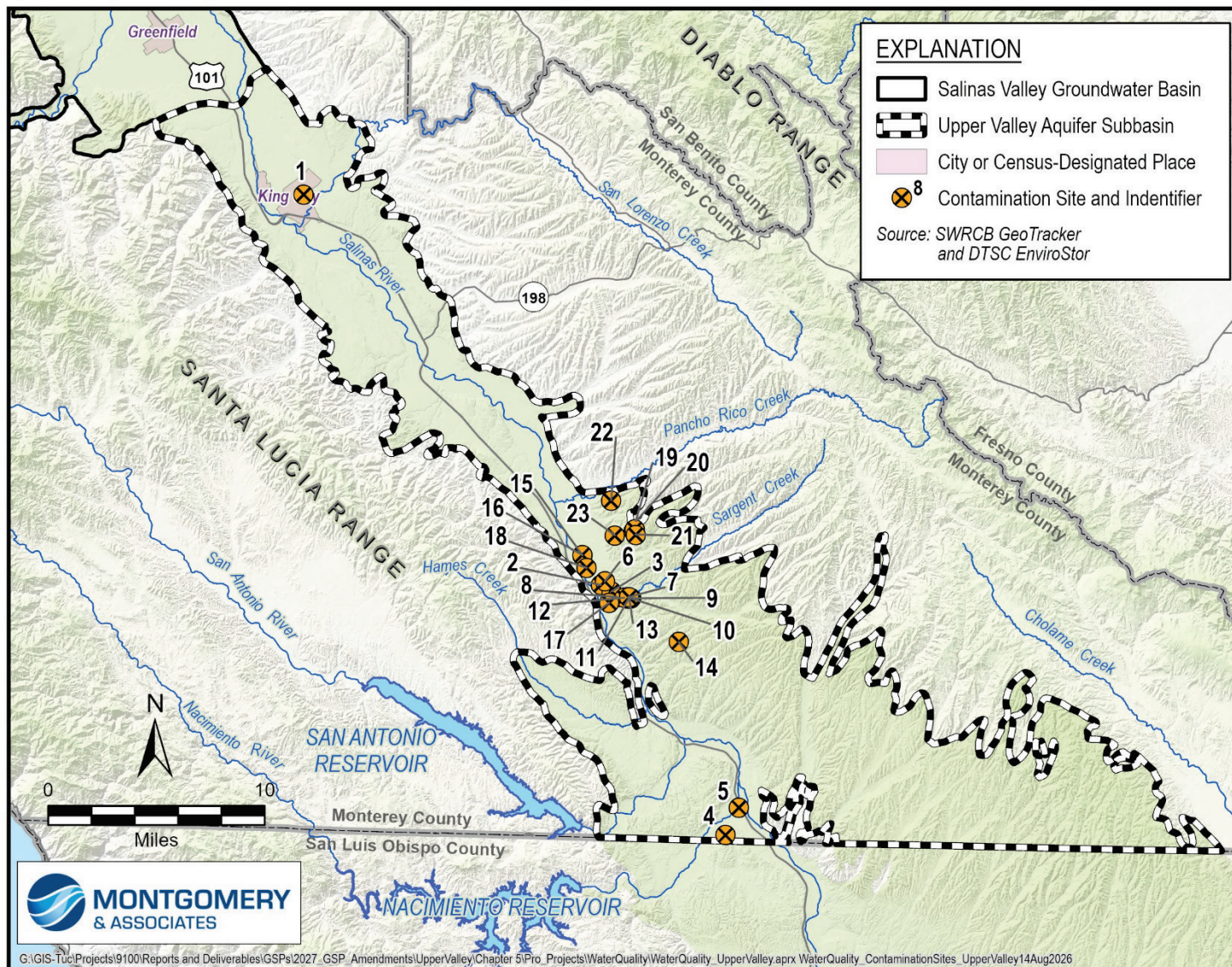


Figure 5-12. Active Contamination Sites as of 2026

5.3.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

In addition to the point sources described above, the CCRWQCB monitors and regulates activities and discharges that can contribute to non-point pollutants that are released to groundwater over large areas.

5.3.3.1 Previous Studies

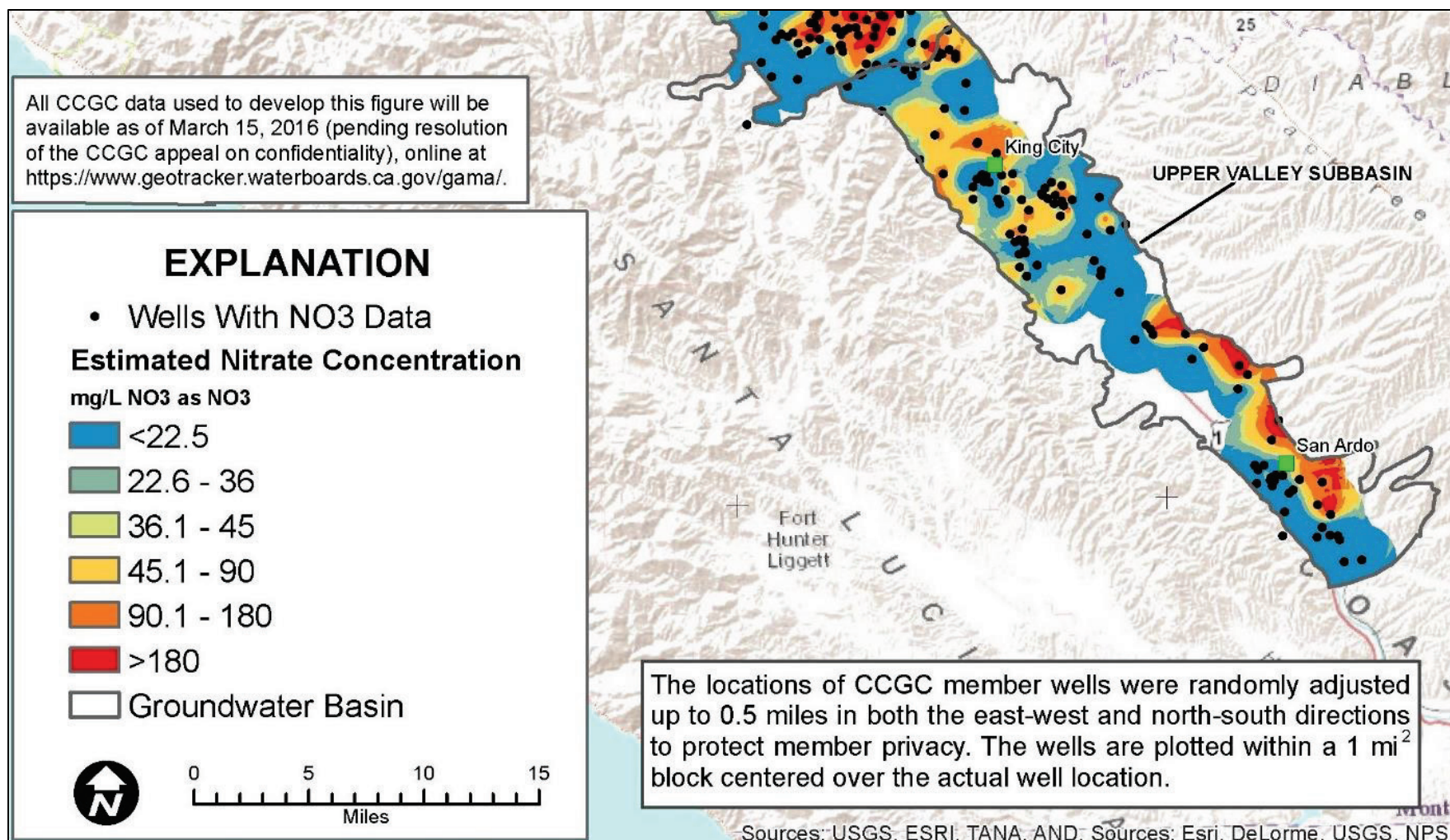
In the Subbasin, the most prevalent non-point water quality concern is nitrate. The recent distribution of nitrate was extensively monitored and evaluated by the CCGC and documented in a report submitted to the CCRWQCB (CCGC, 2015).

Figure 5-13 shows a map of nitrate distribution in the northern part of the Subbasin prepared by CCGC. The orange and red areas around King City and along the eastern boundary of the Subbasin illustrate where groundwater has nitrate concentrations above the drinking water MCL of 45 mg/L NO₃.

Figure 5-14 shows maps of measured nitrate concentration from 6 decades of monitoring for the entire Salinas Valley. These maps, prepared by MCWRA, indicate that elevated nitrate concentrations in groundwater were locally present through the 1960s, but significantly increased in the 1970s and 1980s. Nitrate concentrations above the drinking water MCL have been present for 20 to 30 years, as shown on Figure 5-13.

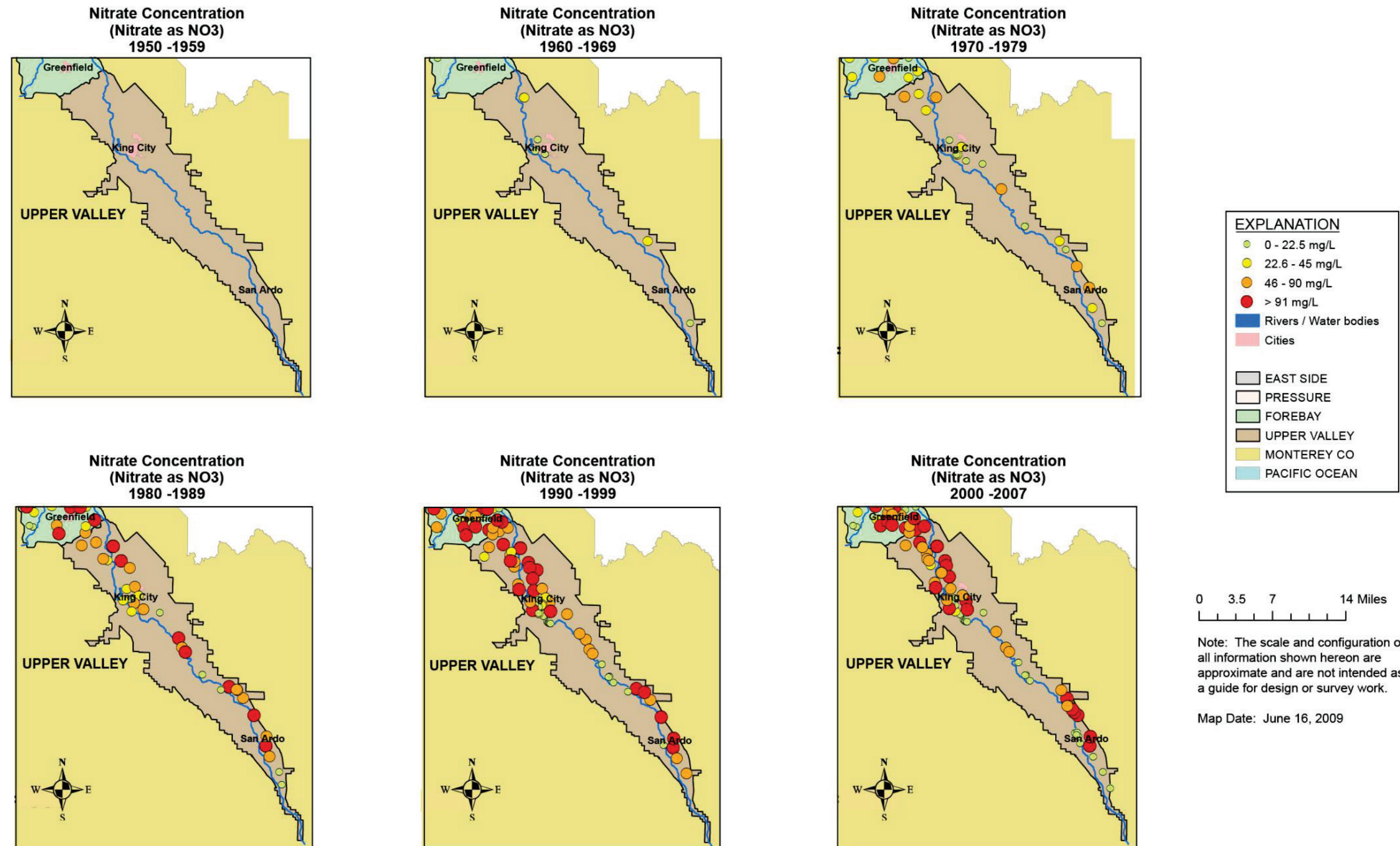
A May 2018 staff report to the CCRWQCB included a summary of nitrate concentrations throughout the Central Coast Region, including the Salinas Valley. This staff report includes data from 2008 to 2018 collected at 2,235 wells in the Salinas Valley, during Agricultural Orders 2.0 and 3.0 sampling events. The report states that 51% of on-farm domestic wells in the Upper Valley Subbasin exceeded the drinking water MCL with a mean concentration of 87.2 mg/L NO₃. In addition, 45% of irrigation supply wells in the Subbasin exceeded this MCL with a mean concentration of 69.9 mg/L NO₃ (CCRWQCB, 2018).

In response to a Recommended Corrective Action from DWR on the original GSP, SVBGSA analyzed whether groundwater extraction and declining groundwater levels are linked to groundwater quality degradation in the Upper Valley Subbasin (Montgomery & Associates, 2026a). Mann-Kendall trend tests and Pearson's correlation were used to analyze 30 years (1995–2024) of nitrate, groundwater elevation, and extraction data. Results show that nitrate trends are mixed across wells (35% increasing, 20% decreasing, 45% stable), and statistical testing found no significant correlation between nitrate trends and groundwater elevation trends ($r_p = -0.1$, $p\text{-value} = 0.7$) or between nitrate trends and annual average extraction rates ($r_p = -0.06$, $p\text{-value} = 0.8$). These findings indicate that, at the subbasin scale, groundwater pumping and groundwater level declines are not driving changes in nitrate concentrations, suggesting that other factors—such as localized land use or management practices—likely control water quality variability.



(from CCGC, 2015)

Figure 5-13. Estimated Nitrate Concentrations



From MCWRA

Figure 5-14. Nitrate Concentrations, 1950 to 2007

Additional groundwater quality conditions in the Basin are summarized in 2 USGS water quality studies in the Salinas Valley. The USGS 2005 GAMA study characterized deeper groundwater resources used for public water supply (Kulongoski and Belitz, 2005). The USGS 2018 GAMA study focused on domestic well water quality (Burton and Wright, 2018). The source data used in these 2 studies and additional publicly available water quality data was accessed through the SWRCB GAMA Groundwater Information System database at https://www.waterboards.ca.gov/water_issues/programs/gama/online_tools.html

5.3.3.2 Water Quality Constituent Assessment

The GAMA Groundwater Information System database includes groundwater quality data for public water system supply wells from the SWRCB DDW, and on-farm domestic wells and irrigation supply wells from CCRWQCB's ILP. This GSP relies on established thresholds for constituents: Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs) established by the State's Title 22 drinking water standards for public water system supply wells and on-farm domestic wells, and levels that may lead to reduced crop production for irrigation supply wells, as outlined in the CCRWQCB's Basin Plan (CCRWQCB, 2019). If a constituent is monitored for Title 22 and the Basin Plan, then the stricter of the 2 limits is used. The Basin Plan only had stricter limits for chloride, sodium, and boron. These drinking water and agricultural water quality criteria are jointly defined herein as concentration level of concern.

Table 5-3 reports the constituents that have historically occurred in the active wells in the Upper Valley Subbasin. The number of wells that exceed the concentration level of concern for any given constituent is based on the last sample for each well in the monitoring network. Not all wells have been sampled for all constituents. Therefore, the percentage of wells with exceedances is the number of wells that exceed the level of concern divided by the total number of wells that have ever been sampled for that constituent. Additionally, Table 5-3 does not report all of the constituents that are monitored, it only includes the constituents that have historically exceeded a Title 22 regulatory standard or Basin Plan water quality objective. Furthermore, it is possible that the exceedances above the level of concern for both sets of ILP wells are overestimated, because historical changes in well-naming conventions may have caused some wells to be counted more than once. ILP has corrected this issue and has consistent naming conventions for data from WY 2022 forward. The locations of wells that exceeded the level of concern for any of the constituents listed in Chapter 7.

Table 5-3 indicates that nitrate and salinity-related constituents exhibit the highest rates of exceedance. Among DDW wells, iron and manganese were the most frequently exceeded constituents, each occurring in 31% of sampled wells, followed by chloride and total dissolved solids (TDS), which exceeded levels of concern in 23% of wells. Specific conductance (15%), sulfate (12%), and aluminum and gross alpha radioactivity (7% each) showed more limited exceedances, while nitrate exceeded the level of concern in only 3% of public supply wells. In

contrast, on-farm domestic wells exhibited substantially higher exceedance rates, with 45% of wells exceeding the specific conductance threshold and 38% exceeding the nitrate plus nitrite standard. Irrigation supply wells showed the greatest overall impacts, with exceedances observed for nitrate plus nitrite in 50% of wells, sodium in 44%, chloride in 38%, specific conductance in 34%, and TDS in 29% of wells. Overall, the results indicate that groundwater quality issues are primarily associated with nitrate contamination and elevated salinity in agricultural areas, while public supply wells are more commonly affected by naturally occurring constituents such as iron and manganese.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSA is dependent on the monitoring density and frequency of the DDW and ILP. The monitoring system is further defined in Chapter 7.

Table 5-3. Water Quality Constituents and Exceedances

Constituent	Concentration Level of Concern	Standard Units	Data up to WY 2019		
			Number of Wells Sampled	Number of Wells Exceeding Level of Concern in the Last Sample	Percentage of Wells with Exceedances
			DDW Wells (Data from August 1986 to September 2019)		
Aluminum	1,000	µg/l	28	2	7%
Chloride	106	mg/L	26	6	23%
Gross Alpha Radioactivity	15	pci/L	28	2	7%
Iron	300	µg/L	26	8	31%
Manganese	50	µg/L	26	8	31%
Nitrate (as nitrogen)	10	mg/L	32	1	3%
Specific Conductance	1,600	µmhos/cm	26	4	15%
Sulfate	500	mg/L	26	3	12%
Total Dissolved Solids	1,000	mg/L	26	6	23%
Uranium	20	pci/L	16	1	6%
			ILP-On-Farm Domestic Wells (Data From March 2013 to August 2019)		
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	47	18	38%
Specific Conductance	1,600	µmhos/cm	29	13	45%
			OLP-Irrigation Supply Wells (Data From March 2013 to June 2019)		
Chloride	106	mg/L	48	18	38%
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	32	16	50%
Sodium	69	mg/L	48	21	44%
Specific Conductance	1,600	µmhos/cm	44	15	34%
Total Dissolved Solids	1,000	mg/L	48	14	29%

5.4 Subsidence

Land subsidence is the lowering of the ground surface elevation. This is often caused by pumping below thick clay layers. Land subsidence can be elastic or inelastic. Elastic subsidence consists of small lowering and rising of the ground surface that is reversible, while inelastic subsidence is generally irreversible and is the focus of this GSP.

5.4.1 Data Sources

DWR has made Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map to estimate subsidence that is accessible on <https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub>. These are the only data used for estimating subsidence in this GSP.

5.4.2 Subsidence Mapping

Figure 5-15 presents a map showing the average annual InSAR subsidence data in the Upper Valley between June 2015 and June 2019 (DWR, 2020c). The yellow area on the map is the area with measured changes in ground elevation of between -0.1 and 0.1 foot. As discussed in Section 8.8.2.1, because of measurement error in this methodology, any measured ground level changes between -0.1 and 0.1 foot are not considered subsidence. The white areas on the map are areas with no data available. The map shows that no measurable subsidence has been recorded anywhere in the Subbasin.

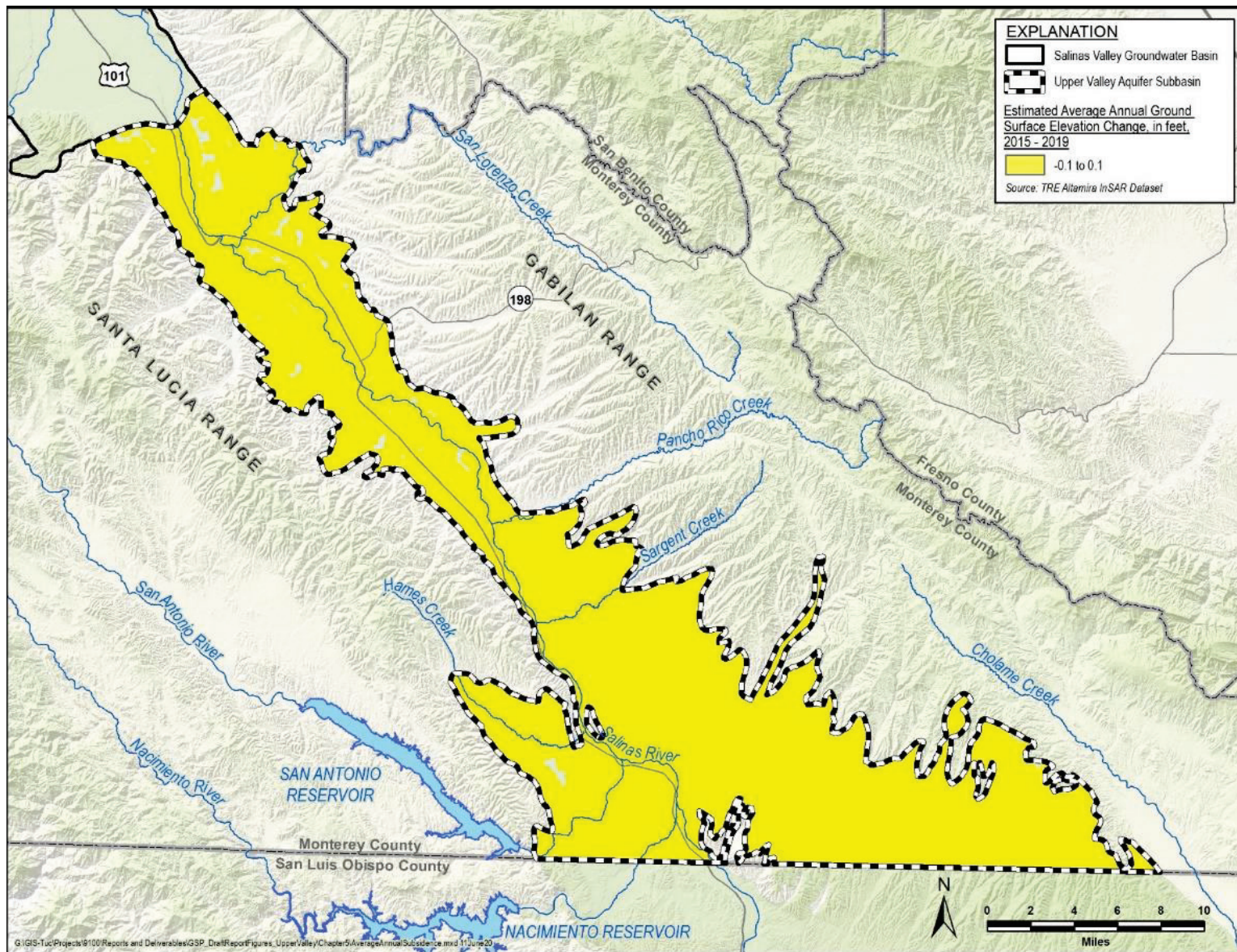
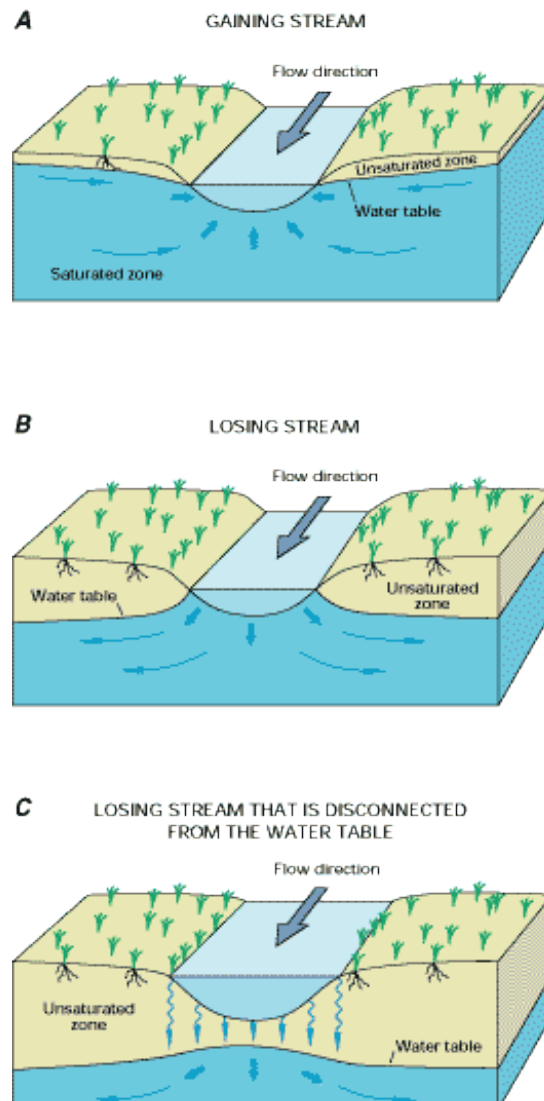


Figure 5-15. Estimated Average Annual InSAR Subsidence in Subbasin

5.5 Interconnected Surface Water

ISW is surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water. If groundwater elevations are higher than the water level in the stream, the stream is said to be a gaining stream because it gains water from the surrounding groundwater. If the groundwater elevation is lower than the water level in the stream, it is termed a losing stream because it loses water to the surrounding groundwater. If the groundwater elevation is below the streambed elevation, the stream and groundwater are disconnected. SGMA does not require that disconnected stream reaches be analyzed or managed. These concepts are illustrated on Figure 5-16.



(Winter *et al.*, 1999)

Figure 5-16. Conceptual Representation of ISW

Historically, the Salinas River has been a losing stream in the Subbasin, as indicated by net stream exchange going from surface water to groundwater in water budgets presented in Chapter 6. For a losing stream, interconnection is substantially dependent on surface water availability. Groundwater levels, stream stage, and streambed conductance are also factors in interconnection; but surface water availability plays a dominant role in a losing stream system. In addition to winter precipitation, surface water availability along the Salinas River is dependent on water released from upstream reservoirs during the April to October conservation release period. During this period, the reservoirs are managed in part for groundwater recharge. Without reservoir releases, the river would be more disconnected, particularly during the summer season when natural surface water flows are minimal.

5.5.1 Data Sources

The updated SVIHM (version 1; Montgomery & Associates, 2025b) is used to map the potential locations of ISW, as described in Chapter 4 and shown on Figure 4-11. There is no measured data that verifies the location and extent of surface water connection to groundwater in most parts of the valley, nor the extent to which groundwater extraction depletes surface water. Therefore, this section describes the hydraulic principles that establish the relationship between surface water and groundwater, upon which the GSP baseline conditions and monitoring network are based, and summarizes the use of the updated SVIHM to estimate and evaluate historical ISW depletions due to pumping.

5.5.2 Evaluation of Surface Water and Groundwater Interconnection

Groundwater extraction can alter flows between surface water and groundwater. Flow changes related to interconnected surface and groundwater could be due to reductions in groundwater discharge to surface water or increases in surface water recharge to groundwater. These 2 changes together constitute the change in the amount of surface water depletion due to pumping. However, as previously described, the hydrology of the Salinas Valley is also influenced by operations of the San Antonio and Nacimiento Reservoirs. Releases from the reservoirs during the MCWRA conservation release period ensure water is available in downstream reaches for re-diversion, environmental purposes, and groundwater recharge. Recharge from reservoir releases is an expected result of reservoir operations and is a substantial component of the subbasin's water budget.

During the conservation release period when reservoir releases provide water in the river, ISW depletion represents the pumping-related change in flow exchange between surface water and groundwater under those managed flow conditions along those locations of ISW. Less water is present along the river during drought years, especially in the summer, when little is released from the reservoirs. This results in less recharge as well. Without the releases, and under the same pumping conditions, there would be less interconnection between surface water and

groundwater. Because reservoir releases affect the amount and timing of water available in the river, they also influence the timing and magnitude of simulated stream leakage and surface water depletion described herein.

For this GSP, ISW depletions are reductions in ISW flows. Depletion of ISW is estimated by evaluating the change in the modeled stream leakage (loss or gain in river flow) with and without pumping. A model simulation without any groundwater pumping (i.e., SVIHM with no pumping) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping). The difference in stream leakage between the two simulations is the depletion attributed to the groundwater pumping. However, this can be misleading because stream leakage, and thus depletions, along the Salinas River is dynamic and depends on both pumping and reservoir releases. During the conservation release period when reservoir releases provide water in the river, the difference in stream leakage represents the pumping-related change in flow exchange between surface water and groundwater under those managed flow conditions. ISW depletions are only estimated for the interconnected segments identified on Figure 4-11.

This analysis evaluates ISW depletions along the Salinas River and other streams as an annual average, as well as monthly average and also during the conservation release period when reservoir releases are made in part for groundwater recharge. Releases also occur during the non-conservation period but for different purposes. Depletion along interconnected sections of the Salinas River is estimated for the conservation release period of April through October, and the non-conservation release period of November through March. Evaluating depletion separately for the conservation release and the non-conservation release period helps distinguish differences in stream leakage (recharge) associated with managed reservoir releases. Table 5-4 shows the estimated water year annual average depletion of the ISW along the ISW stream segments for the historical modeling period from WY 1980 to WY 2022. Annual average rate of depletion along the portion of the Salinas River within the Upper Valley Subbasin is 62,700 AF/yr. Since conservation releases began with the SVWP in 2010, surface water depletion due to pumping during the conservation release period has averaged 37,400 AF/yr along the Salinas River. A relatively small amount of depletion occurs along the Nacimiento and San Antonio Rivers immediately downstream from the respective reservoir. Unlike downstream subbasins, depletions during the conservation release period are larger than during the non-conservation release period.

Table 5-4. Average SVIHM Simulated Depletion of ISW
Due to Pumping in Upper Valley Subbasin

	Annual Average WY 1980-2022 (AF/yr)	Conservation Release Period WY 2010-2022 Average (AF/Yr)	Non-Conservation Release Period WY 2010-2022 Average (AF/Yr)
Salinas River	62,700	37,400	24,900
Other Surface Waters	3,000	N/A	

Figure 5-17 shows annual ISW depletions for the historical model period from WY 1980 to WY 2022. The analysis indicates that annual depletions vary from year to year but generally decreased over time, with large, short-term changes related to droughts. Consistent with trends in ISW extents described in Appendix 4A, ISW depletions sharply declined during drought periods (1990, 2015, 2022) even though groundwater pumping increased slightly during the same time. The expectation is that depletions would increase during droughts due to increased pumping. However, the opposite occurs. This is likely the result of little or no reservoir releases occurring during droughts, leaving very little or no water in the river which results in less leakage (recharge) to the aquifer. Depletions decline because the decrease in surface water availability overwhelms the effects of increased groundwater pumping. Depletions increase dramatically immediately after drought periods when reservoir releases resume and streamflow recovers, as the lower groundwater levels can increase the downward gradient between stream and aquifer and thus result in more recharge and ultimately more depletions. This relationship illustrates the important role that reservoir releases have on ISW and depletions.

In addition to annual variability, seasonal conditions influence ISW depletions in the Subbasin. Figure 5-18 compares average monthly depletions with average monthly groundwater pumping in the Subbasin. ISW depletions increase during the conservation release period, which coincides with the irrigation pumping season in the Valley. Groundwater pumping during the irrigation pumping season lowers water levels which results in increased seepage from the river. The river in the Subbasin has greater surface water availability than in downstream subbasins. Depletions decline during the winter months when water levels rebound after the irrigation pumping season and seepage declines.

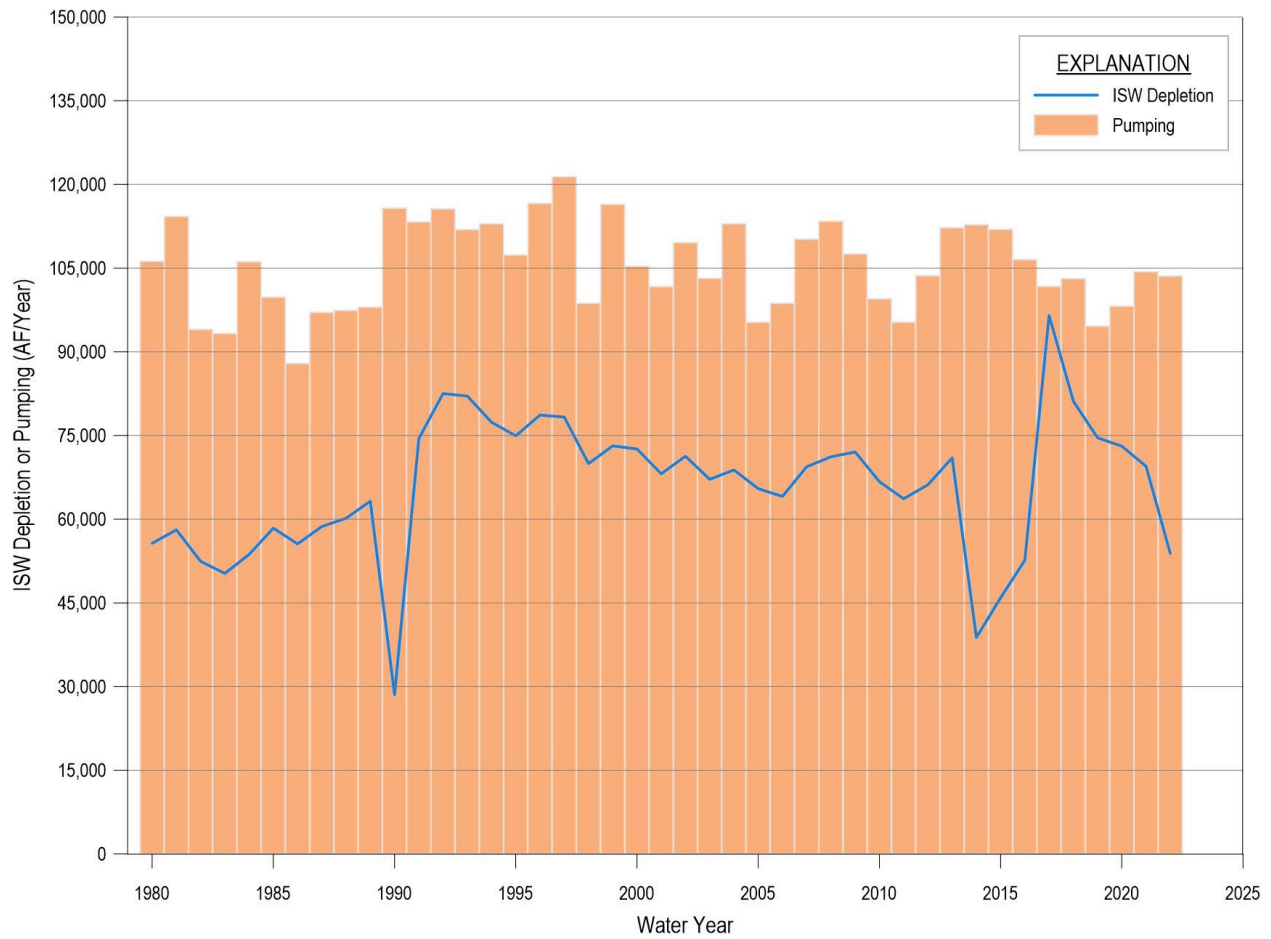


Figure 5-17. Average Annual ISW Depletions and Annual Groundwater Pumping in Upper Valley Subbasin from WY 1980 to WY 2022

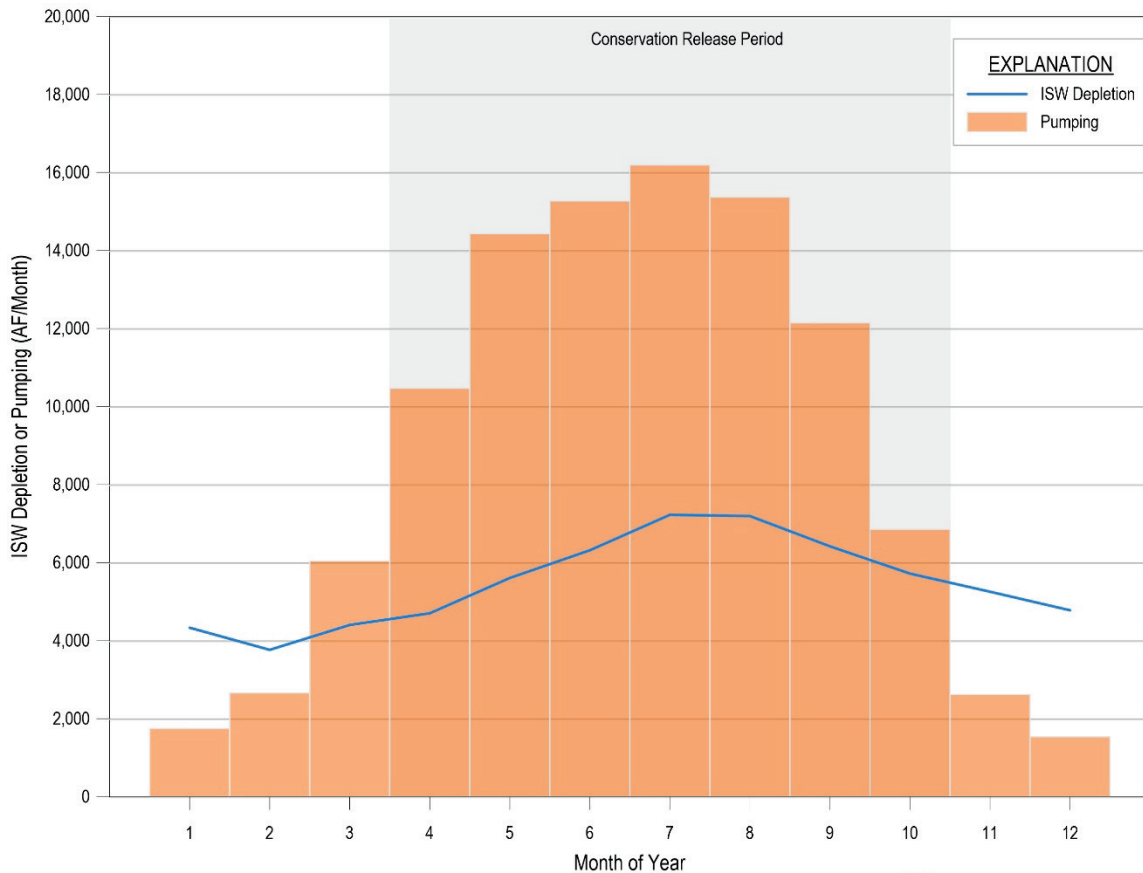


Figure 5-18. Monthly Average Pumping and ISW Depletion in Upper Valley Subbasin from WY 1980 to WY 2022

5.6 Water Use and Supply

Agricultural use accounts for the majority of water demand within the Subbasin, followed by urban and industrial uses, and then rural domestic use. Water use by wetlands and native vegetation represents a relatively small portion of total demand.

Water supplies in the Upper Valley Subbasin are derived from a combination of groundwater and surface water sources, with groundwater providing the majority of supply. Some agricultural users also report surface water diversions to the SWRCB. Recycled water was used in the San Ardo Oil Field, where Chevron U.S.A. Inc. operated a reverse osmosis plant that treats a portion of the produced water generated during oil production until it was taken offline on June 16, 2025.

5.6.1 Data Sources

The extraction data presented in this section was collected by MCWRA through GEMS, which is part of the GMP, under which groundwater extraction data from non-*de minimis* wells within the SVBGSA subbasins are reported to MCWRA. Until WY 2025, agricultural and urban

groundwater extraction data was collected for wells with discharge pipes with an internal diameter greater than 3 inches within Zones 2, 2A, and 2B. The groundwater extraction reporting area only covered the northern half of the Subbasin where most of the pumping occurs. The GMP expanded its coverage to the entire Subbasin, however, a lag in reporting is expected while areas outside the historical GEMS area get acquainted with reporting requirements.

Rural domestic pumping is estimated using the number of drinking water connections based on data compiled for water systems and 2024 County of Monterey parcel data. To estimate water use, the approximate number of connections is multiplied by a constant pumping rate of 0.35 acre-feet per year (AF/yr) per connection.

Surface water diversions from the Salinas River collected by eWRIMS make up the surface water supplies in the Subbasin. In 2025, eWRIMS was replaced by the CalWATRS. The recycled water use was provided directly by Chevron.

5.6.2 Groundwater Use

Table 5-5 provides groundwater extraction by water use sector for the Upper Valley Subbasin from 2021 to 2025. Agricultural pumping was historically reported by MCWRA for the period November 1 through October 31, whereas urban pumping was reported on a calendar-year basis. As of WY 2025, groundwater extraction reported under the GMP aligns with the WY (October 1 through September 30). Rural domestic pumping is estimated on a calendar year basis.

Urban use data from MCWRA aggregates municipal wells, small public water systems, and industrial wells. On average, agricultural use accounted for 95% of groundwater extraction; urban and industrial use accounted for 5%. The GMP allows 3 different reporting methods: water flowmeter, electrical meter, or hour meter. On average, 85% of extractions from 2017 to 2020 were calculated using a flowmeter, 15% electrical meter, and <1%-hour meter. MCWRA ordinance number 5426 requires flowmeters be calibrated every 5 years and be accurate to within +/- 10%. The same ordinance requires annual pump efficiency tests for wells using the electrical meter method. SVBGSA assumes an electrical meter accuracy of +/- 5%.

No groundwater was extracted for managed wetlands or managed recharge. Groundwater use by natural vegetation is assumed to be small and was not estimated for this report.

Table 5-5. WY 2021 to 2025 Groundwater Use

	Groundwater Use (AF/yr)				
	2021	2022	2023	2024	2025
Rural Domestic	320	320	320	320	320
Urban (includes industrial)	3,000	2,800	2,700	2,660	2,180
Agricultural	119,300	123,100	99,700	102,390	106,920
Managed Wetlands	0	0	0	0	0
Managed Recharge	0	0	0	0	0
Natural Vegetation	0	0	0	0	0
Total	122,620	126,220	102,720	105,370	109,420

5.6.3 Surface Water Use

Annual Salinas River watershed diversion data can be obtained from the SWRCB's eWRIMS website, which was replaced by CalWATRS in 2025 (SWRCB, 2024 and 2026b). Table 5-6 shows the surface water diversions from 2021 to 2025 in the Upper Valley Subbasin. All surface water is used for irrigation and are mainly reported as Statement of Diversion and Use. Less than 1% of diversions in the Subbasin are appropriative and are excluded from Table 5-6.

Table 5-6. WY 2021 to 2025 Surface Water Diversions

	eWRIMS/CalWATRS Diversions (AF/yr)				
	2021	2022	2023	2024	2025
Statement of Diversion and Use	64,800	69,100	52,600	46,540	35,020

5.6.4 Recycled Water Use

The City of Soledad uses recycled water to irrigate schools and turfs. On average, approximately 170 AF are used for irrigation annually.

5.6.5 Total Water Use

Total water use is the sum of groundwater extractions, surface water use, and recycled water use and is summarized in Table 5-7 and Figure 5-19.

Many growers and residents have noted that some irrigation water use is reported both to the SWRCB as Salinas River diversions and to the MCWRA as groundwater pumping. For WY 2024 and earlier, because no direct information on reporting overlap was available, all surface water reported as a Statement of Diversion and Use was assumed to be duplicative and was excluded from the Subbasin total water use calculation. It is possible that not all of the surface water diversions excluded are being reported to both SWRCB and MCWRA, in which case total water use may be up to that amount greater than calculated here. This accounting is done to calculate the total water use and is not meant to imply that SVBGSA classifies any or all the reported diversions as groundwater.

Beginning in WY 2025, MCWRA revised its GMP reporting process to allow reporters to indicate whether they also report surface water use to SWRCB. Based on this self-reported data, approximately 25,530 AF/yr out of the total agricultural groundwater extraction reported to MCWRA was also reported to the SWRCB. This amount is less than the total surface water diversions reported within the Upper Valley Subbasin to the SWRCB (35,020 AF/yr), so it is assumed that it does not include all of the surface water diversions reported above. Therefore, the difference of 9,500 AF/yr between the total surface water diversions reported to the SWRCB (35,020 AF/yr) and the reported overlap amount (25,530 AF/yr) is assumed to represent the Subbasin's total surface water use. It is possible that this assumption is incorrect, in which case total water use may be up to 9,500 AF/yr less than calculated here.

SVBGSA will continue to work with stakeholders to refine the method used to resolve double counting.

Table 5-7. WY 2021 to 2025 Total Water Use by Water Source Type and Water Use Sector

	Total Water Use (AF/yr)														
	2021			2022			2023			2024			2025		
Water Use Sector	Groundwater	Surface Water	Recycled Water	Groundwater	Surface Water	Recycled Water	Groundwater	Surface Water	Recycled Water	Groundwater	Surface Water	Recycled Water	Groundwater	Surface Water	Recycled Water
Rural Domestic	320	0	0	320	0	0	320	0	0	320	0	0	320	0	0
Urban	3,000	0	0	2,800	0	0	2,700	0	0	2,660	0	0	2,180	0	0
Agricultural	119,300	0	1,600	123,100	0	1,400	99,700	0	1,400	102,390	0	2,010	106,920	9,500	1,080
SUBTOTALS	122,620	0	1,600	126,220	0	1,400	102,720	0	1,400	105,370	0	2,010	109,420	9,500	1,080
TOTAL	124,220			127,620			104,120			107,380			120,000		

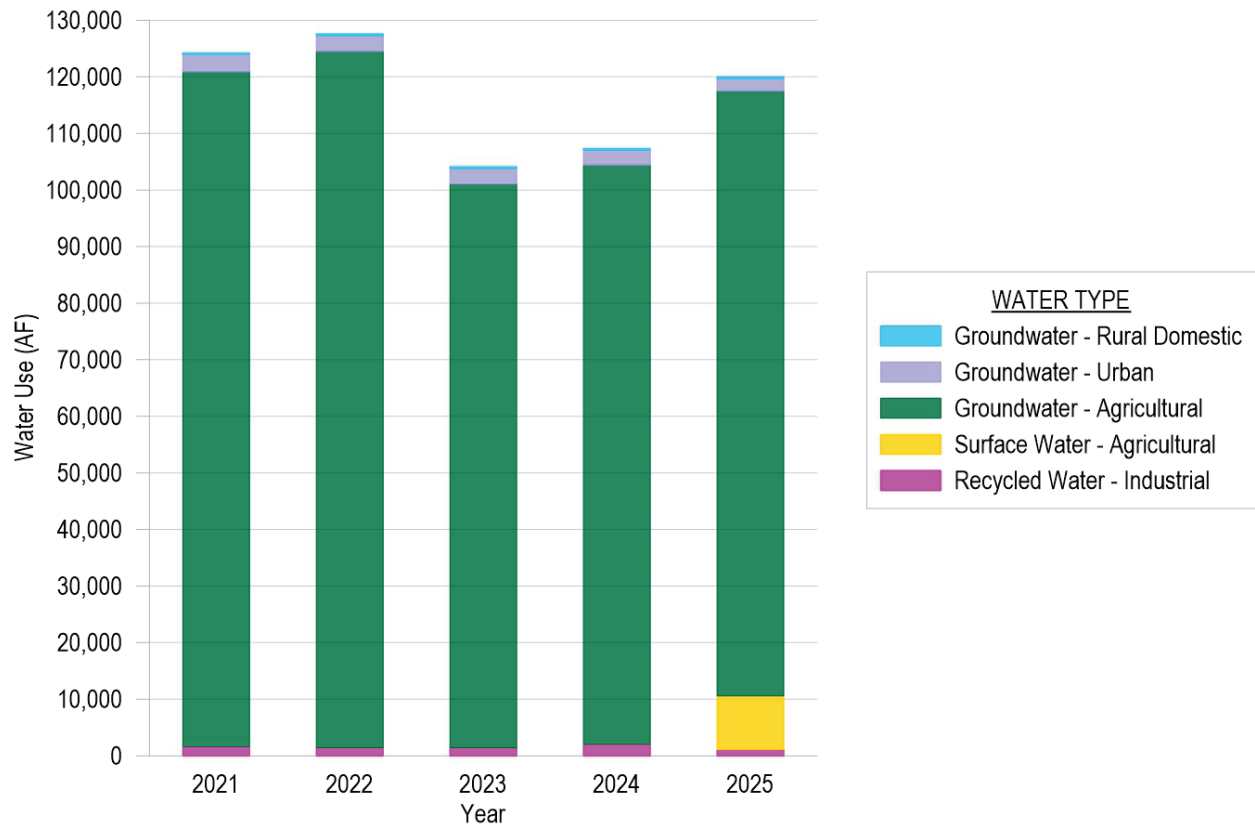


Figure 5-19. WY 2021 to 2025 Total Water Use by Water Source Type and Water Use Sector

6 WATER BUDGETS

This chapter summarizes the estimated water budgets for the Upper Valley Subbasin, including information required by the GSP Regulations and additional content needed to support effective groundwater sustainability planning. In accordance with the GSP Regulations § 354.18, this water budget provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of groundwater in storage. For the purposes of this chapter, historical is WY 2003-2020 and current is the last 2 years in the SVIHM, WY 2021-2022. Water budgets are reported in graphical and tabular formats, where applicable.

The previous water budgets described in the approved GSP were developed using best tools and methods available at the time. Since the release and approval of the original GSP, groundwater models were updated. Updating the water budgets for this Subbasin using these new, best available tools is important for maintaining consistency with adjacent Subbasins managed by the SVBGSA. This section describes the water budgets for this Subbasin in a manner consistent with GSPs for other subbasins in the Valley.

6.1 Overview of Water Budget Development

The water budgets are presented in 2 subsections: (1) historical and current water budgets and (2) future water budgets. Historical/current and projected water budgets are developed using similar methods, but with different groundwater models. For each period, surface water and groundwater budgets are developed together but evaluated and presented separately.

Within each subsection a surface water budget and groundwater budget are presented.

Historical and current water budgets are created using the SVIHM initially developed by the USGS and MCWRA and subsequently updated by the SVBGSA. The historical and current water budgets presented herein are based on results from the SVIHM version 1 (Montgomery & Associates, 2025b). The SVIHM is a numerical groundwater-surface water model that is constructed using version 2 of the MODFLOW-OWHM code (Boyce *et al.*, 2020). This code is a version of the USGS groundwater flow code MODFLOW that estimates the agricultural supply and demand through the Farm Process (USGS, 2026).

The model area covers the Salinas Valley from the Monterey-San Luis Obispo County Line in the south to the Pajaro Basin in the north, including the offshore extent of the major aquifers. The model includes operations of the San Antonio and Nacimiento Reservoirs. The SVIHM is supported by 2 sub models: a geologic model known as the Salinas Valley Geologic Model (SVGM) and a watershed model known as the Salinas Valley Watershed Model (SVWM) which uses the Hydrologic Simulation Program – Fortran (HSPF) code. Details of the development and

calibration of the original SVIHM are included in USGS (2026) and a summary of model updates and recalibration is available from Montgomery & Associates (2025b).

Future water budgets were developed using the Salinas Valley Operational Model (SVOM), which was initially developed by the USGS and MCWRA and subsequently updated by SVBGSA. The SVOM uses a similar framework and processes as the SVIHM, but is specifically designed to simulate future scenarios. It incorporates complex surface water operations through the Surface Water Operations module. Information on model inputs, design, and results is summarized in USGS (2026), and initial updates are documented by Montgomery & Associates (2026b).

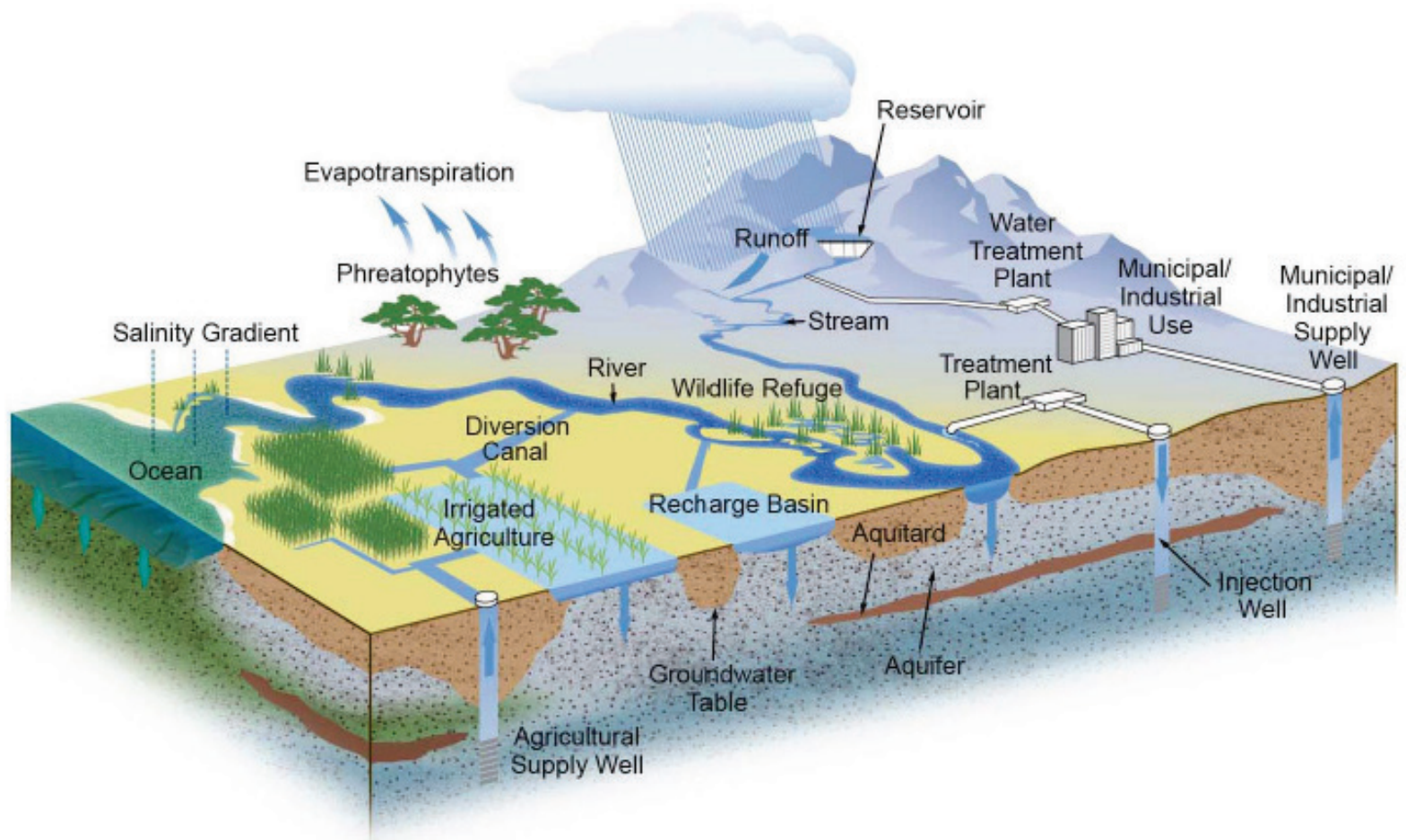
Consistent with GSP Regulations §354.18, an integrated groundwater budget is developed for each principal aquifer for each water budget period. Groundwater in the Upper Valley Subbasin is pumped from the 1 principal aquifer.

6.1.1 Water Budget Components

The water budget is an inventory of the Subbasin's surface water and groundwater inflows and outflows. Some components of the water budget can be measured, such as groundwater pumping from metered wells, precipitation, and surface water diversions. Other components are not easily measured and can be estimated using groundwater models such as the SVIHM. These include unmetered agricultural pumping, recharge from precipitation and applied irrigation, and change of groundwater in storage. Figure 6-1 presents a general schematic diagram of the HCM that is included in the water budget (DWR, 2020d).

The water budgets for the Subbasin are calculated within the following boundaries:

- **Lateral boundaries.** The perimeter of the Upper Valley Subbasin within the SVIHM is shown on Figure 6-2. The southeast portion of the Subbasin is not included in the groundwater model area.
- **Bottom.** The base of the groundwater subbasin described in the HCM—which has now been updated with new data—is now defined as the base of the usable and productive unconsolidated sediments (Durbin *et al.*, 1978). This ranges from less than 200 feet below ground surface along parts of the Salinas River to almost 1,800 feet deep along at the northern edge of the Subbasin. The base of the usable aquifer as defined by Durbin *et al.* is supplemented with the base of aquifer contours included in the *Paso Robles Groundwater Basin Study Phase II* report (Fugro West, Inc. *et al.*, 2005). The water budget is not sensitive to the exact definition of this base elevation because the base is defined as a depth below where there is not significant inflow, outflow, or change in storage.
- **Top.** The top of the water budget area is above the ground surface, so surface water is included in the water budget.



(From DWR, 2020d)

Figure 6-1. Schematic Hydrogeologic Conceptual Model

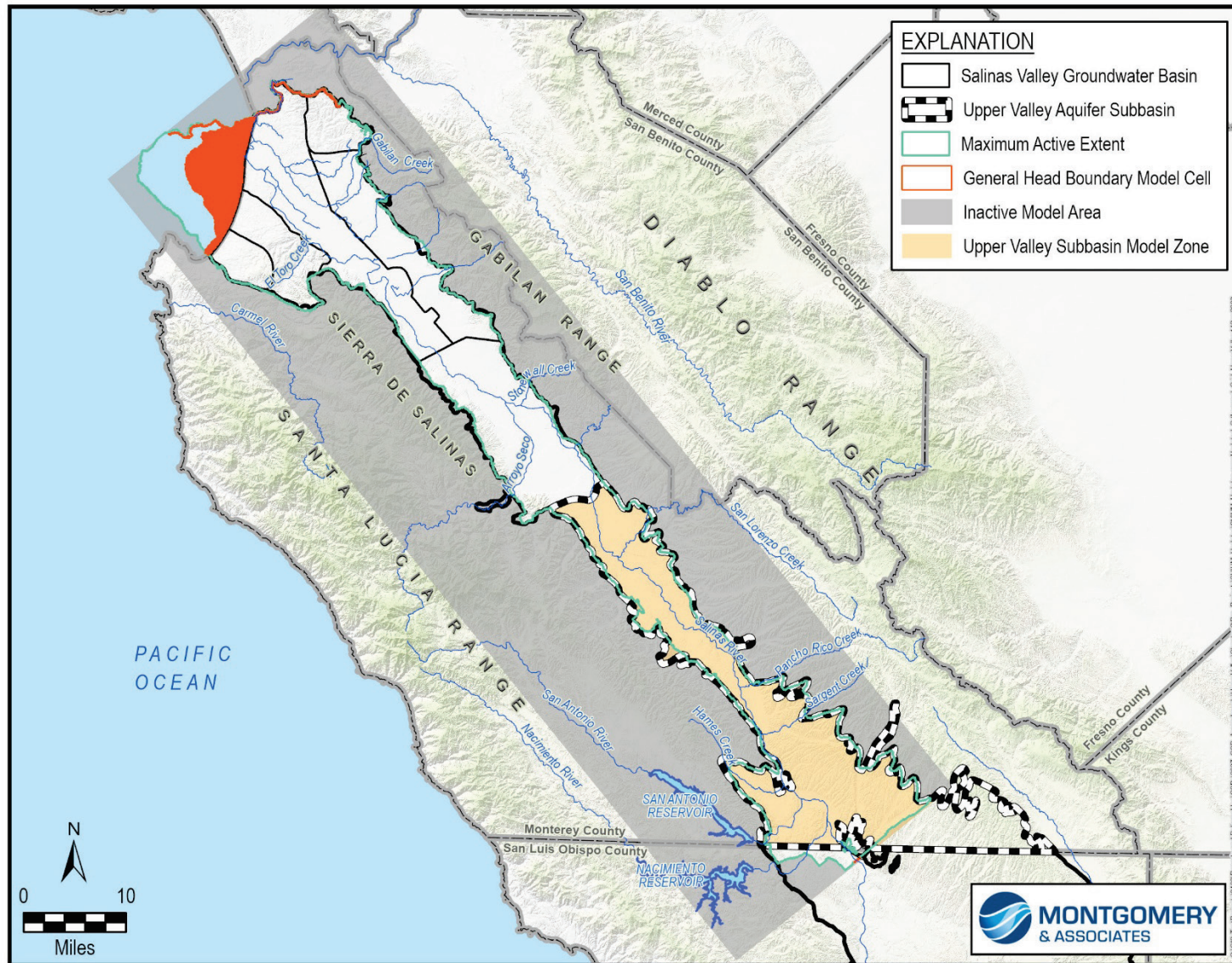


Figure 6-2. Zones and Boundary Conditions for the SVIHM

The Upper Valley Subbasin water budget includes the following components:

Surface Water Budget

- Inflows
 - Precipitation runoff
 - Surface water inflows from streams that enter the subbasin, including the Salinas River, San Lorenzo Creek, Pancho Rico Creek, Sargent Creek, Hames Creek, and the San Antonio and Nacimiento Rivers. Reservoir operations influence portions of Salinas River inflow north of its confluence with the Nacimiento River; however, reservoir operations are not under the purview of the GSA.
 - Groundwater discharge to streams
- Outflows
 - Stream discharge to groundwater
 - Outflow to neighboring subbasins, principally the Salinas River

Groundwater Budget

- Inflows
 - Deep percolation from precipitation and applied irrigation
 - Stream discharge to groundwater
 - Subsurface inflows including from:
 - The Forebay Subbasin
 - The Paso Robles Area Subbasin
- Outflows
 - Groundwater pumping, including urban, industrial, domestic, and agricultural
 - Evapotranspiration (ET) from groundwater (crop and native vegetation)
 - Groundwater discharge to streams
 - Subsurface outflows including to:
 - The Forebay Subbasin
 - The Paso Robles Area Subbasin

The difference between groundwater inflows and outflows is equal to the change of groundwater in storage.

6.1.2 Water Budget Time Frames

- The GSP Regulations require development of water budgets for 3 periods: historical, current, and projected. These timeframes are defined as follows: The historical water budget evaluates how past water use and supply availability has affected aquifer conditions and the ability of groundwater users to operate within the sustainable yield. GSP Regulations require that the historical water budget start with the most recently available information and extend back a minimum of 10 years of water budget information. DWR's Water Budget BMP document further states that the historical water budget should help develop an understanding of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the basin within the sustainable yield. Accordingly, historical conditions should include the most reliable historical data that are available for GSP development and water budgets calculations.
- The current water budget characterizes recent conditions, helping the GSA and DWR understand existing supply, demand, and change in storage under recent population, land use, and hydrologic conditions. While DWR does not define a specific timeframe, current conditions are generally the most recent conditions for which adequate data are available and may include an average over a few recent years with various climatic and hydrologic conditions. The last 2 years in the SVIHM, WY 2021 and WY 2022, were drier than normal and do not represent average hydrologic conditions. Current, as used here in this GSP Amendment 2, is defined by the last 2 years in the SVIHM, WY 2021 and WY 2022. These years were drier than normal and do not represent average hydrologic conditions. More recent periods during GSP implementation will be included in 5-year GSP periodic evaluations.
- The projected water budget is intended to quantify the estimated future baseline conditions without additional PMAs. The projected water budget estimates the future baseline conditions concerning hydrology, water demand, and surface water supply over a 50-year planning and implementation horizon. It is based on historical trends in hydrologic conditions that are used to project forward 50 years without climate change. Uncertainty associated with climate change is addressed at the end of the chapter.

Although there is a significant variation between wet and dry seasons, the GSP does not consider separate seasonal water budgets for the groundwater budget. All water budgets are developed for complete WYs. Selected periods for the historical and current water budgets are summarized in Table 6-1 and on Figure 6-3 and described in Sections 6.1.2.1 and 6.1.2.2.

Table 6-1. Summary of Historical and Current Water Budget Periods

Time Period	Proposed Date Range	Water Year Types Represented in Time Period	Rationale
Historical	Water years 2003 through 2020	Dry: 5 Dry-Normal: 5 Normal: 2 Wet-Normal: 0 Wet: 6	Provides insights on water budget response to a wide range of variations in climate and groundwater use over an extensive period of record. Throughout this period, changes in water use efficiency and cropping patterns remain relatively stable.
Current	Water years 2021 and 2022	Dry: 1 Dry-Normal: 1	Last years in SVIHM. Best reflection of current land use and water use conditions based on best available data.

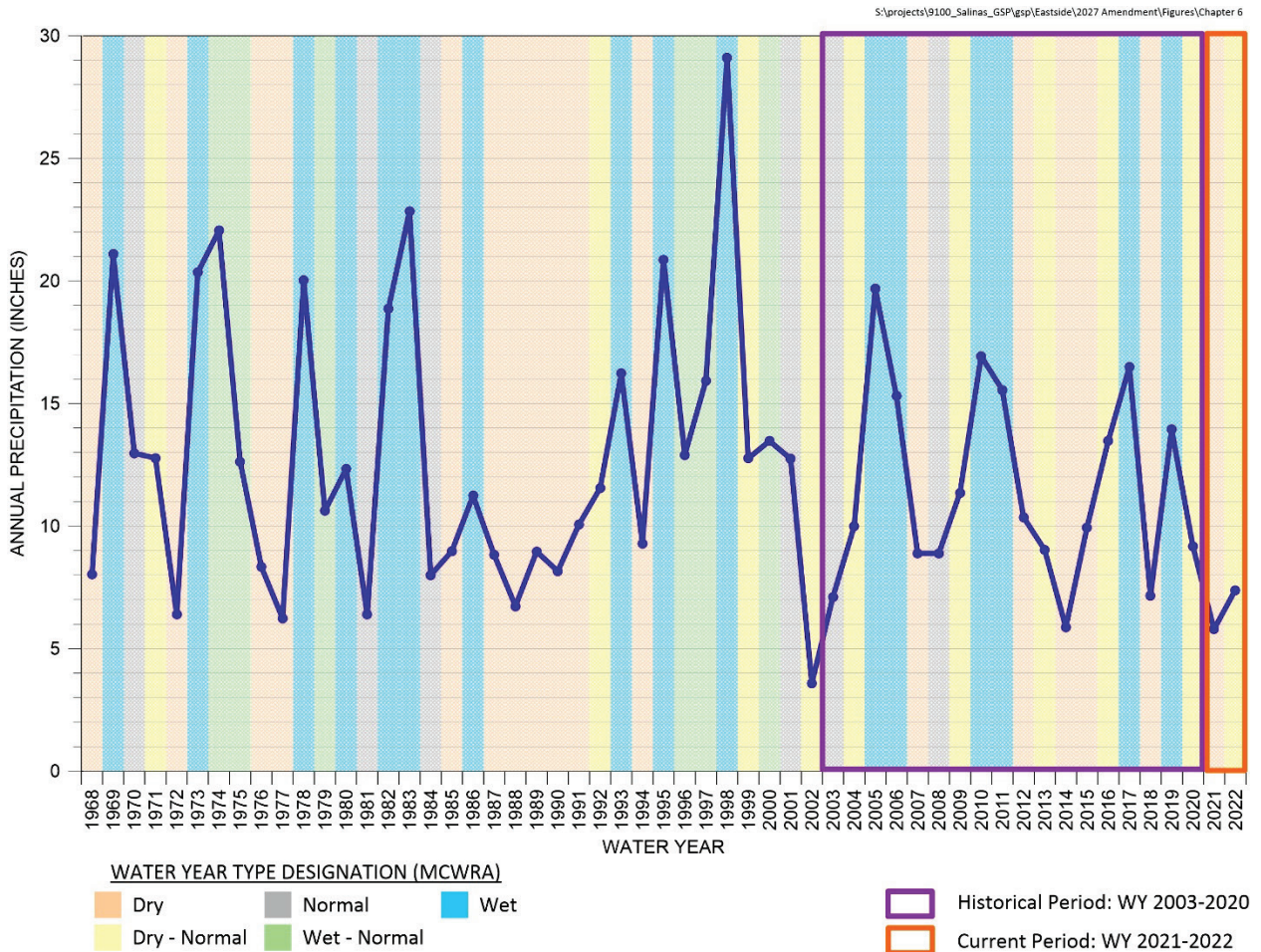


Figure 6-3. Climate and Precipitation for Historical and Current Water Budget Time Periods

6.1.2.1 Historical Water Budget Time Period

The historical water budget is developed for WY 2003 – WY 2020 (October 2002 through September 2020). Although the SVIHM simulation covers WY 1968 through WY 2022, the water budget focuses on WY 2003 through WY 2020 because this period includes relatively stable water use efficiency and cropping patterns across the Salinas Valley. Therefore, this historical period more closely represents current water use practices. WY 2003 through WY 2020 comprise a representative time period with both wet and dry periods in the Subbasin (Table 6-1, Figure 6-3).

6.1.2.2 Current Water Budget Time Period

The current water budget covers WY 2021 and WY 2022, the last 2 years included in the SVIHM. While these years appropriately meet the regulatory requirement for using the most recent hydrology, water supply, water demand, and land use information for which there is data available, the years are classified as dry and dry-normal, respectively, and thus do not represent average hydrology.

6.1.2.3 Future Projected Water Budgets Time Period

Future projected conditions are based on model simulations using the updated SVOM groundwater flow model, which incorporates current reservoir operation rules and a baseline climate sequence derived from historical conditions. A repeating 25-year projected climate sequence is used to represent long-term variability during the 50-year model period. Using this approach, Montgomery & Associates developed a projected baseline scenario that represents status quo conditions. This scenario includes estimated sea level rise but does not incorporate broader climate change effects, which are incorporated later in the chapter. The projected baseline serves as the reference for assessing potential PMAs.

6.2 Overview of Data Sources for Water Budget Development

Table 6-2 provides the detailed water budget components and known model assumptions and limitations for each. A few water budget components are directly measured, but most water budget components are either estimated as input to the model or simulated by the model. Both estimated and simulated values are underpinned by certain assumptions, which can lead to uncertainty in the water budget. However, inputs to the SVIHM were carefully selected using best available data, reducing the level of uncertainty.

No model is a perfect representation of natural condition and level of calibration. However, the updated SVIHM's calibration error is within reasonable bounds, and it is the best available scientific tool for estimating water budgets for the GSP.

Table 6-2. Summary of Historical Water Budget Component Data Source from the SVIHM

Water Budget Component	Source of Component Data	Limitations
Precipitation	Incorporated in calibrated model as part of land use process	
Surface Water Inflows		
Inflow from Streams Entering Basin	Inputs from watershed models for all creeks	Not all creeks are gaged
Groundwater Discharge to Streams	Estimated by calibrated model	Based on calibration of streamflow to available data from gaged creeks
Overland Runoff	Estimated by models	Based on land use, precipitation, and soils specified in models
Surface Water Outflows		
Streambed Recharge to Groundwater	Estimated by calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Diversions	Reported and simulated from original model	Some input data are uncertain
Outflow to Streams Leaving Basin	Simulated from calibrated model for all creeks	Not all creeks are gaged
Groundwater Inflows		
Streambed Recharge to Groundwater	Estimated by calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Deep percolation of irrigation water	Estimated by calibrated model based on demands based on crop, acreage, temperature, and soil zone processes	No measurements available; based on assumed parameters for crops and soils
Subsurface Inflow from neighboring basins	Estimated by calibrated model	Limited groundwater calibration data at adjacent subbasin boundaries
Subsurface Inflow from surrounding watershed other than neighboring basins	Estimated by calibrated model	Limited groundwater calibration data at adjacent subbasin boundaries
Groundwater Outflows		
Groundwater Pumping	Reported GEMS data for historical urban pumping, and some small water systems. Estimated data for urban pumping pre-1995. Simulated agricultural pumping calibrated to reported data. Rural domestic pumping for Upper Valley Subbasin is estimated based on population and per capita assumptions.	Rural pumping within MCWRA Zone 2A is not simulated in model
Groundwater Discharge to Streams	Estimated by calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Subsurface Outflow to Adjacent Basins	Estimated by calibrated model	Limited calibration data at adjacent subbasin boundaries
ET from groundwater	Estimated by calibrated model	Based on representative plant group and uniform extinction depth

6.3 Historical and Current Water Budgets

Water budgets for the historical and current periods are presented below. The surface water budgets are presented first, followed by the groundwater budgets. Water budgets will be updated in future GSP periodic evaluations.

6.3.1 Historical and Current Surface Water Budget

The surface water budget accounts for the inflows and outflows for the streams within the Subbasin. This includes flow from rivers and tributaries entering and exiting the Subbasin, precipitation that falls directly onto streams, overland runoff to streams, and stream-aquifer interactions. ET by riparian vegetation along stream channels is estimated by the SVIHM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-4 shows the model grid cells for the surface water network simulated in the SVIHM. The network includes the Salinas River and other streams in the subbasin. The model accounts for surface water flowing in and out across the subbasin boundary. For this water budget, boundary inflows and outflows are the sum of all locations that cross the Subbasin boundary. In some instances, a simulated stream might enter and exit the Subbasin boundary at multiple locations, such as along the southern boundary of the Upper Valley Subbasin. Boundary inflows include releases from the San Antonio and Nacimiento Reservoirs. The principal boundary outflow in the Subbasin is the Salinas River.

Figure 6-5 shows the surface water budget for the historical period and current period in AF/yr. Table 6-3 shows the average values for components of the surface water budget for the historical and current periods. Positive values are inflows to the stream system, and negative values are outflows from the stream system. Boundary inflows and outflows dominate the surface water budget in all but the driest years. The flow between surface water and groundwater in the Subbasin is generally net negative, which indicates more seepage from the streams to groundwater (streamflow extreme), rather than discharge of groundwater to streams. The current water budget inflow and outflow from streams is much smaller than the historical water budget because WY 2021 and WY 2022 were dry years.

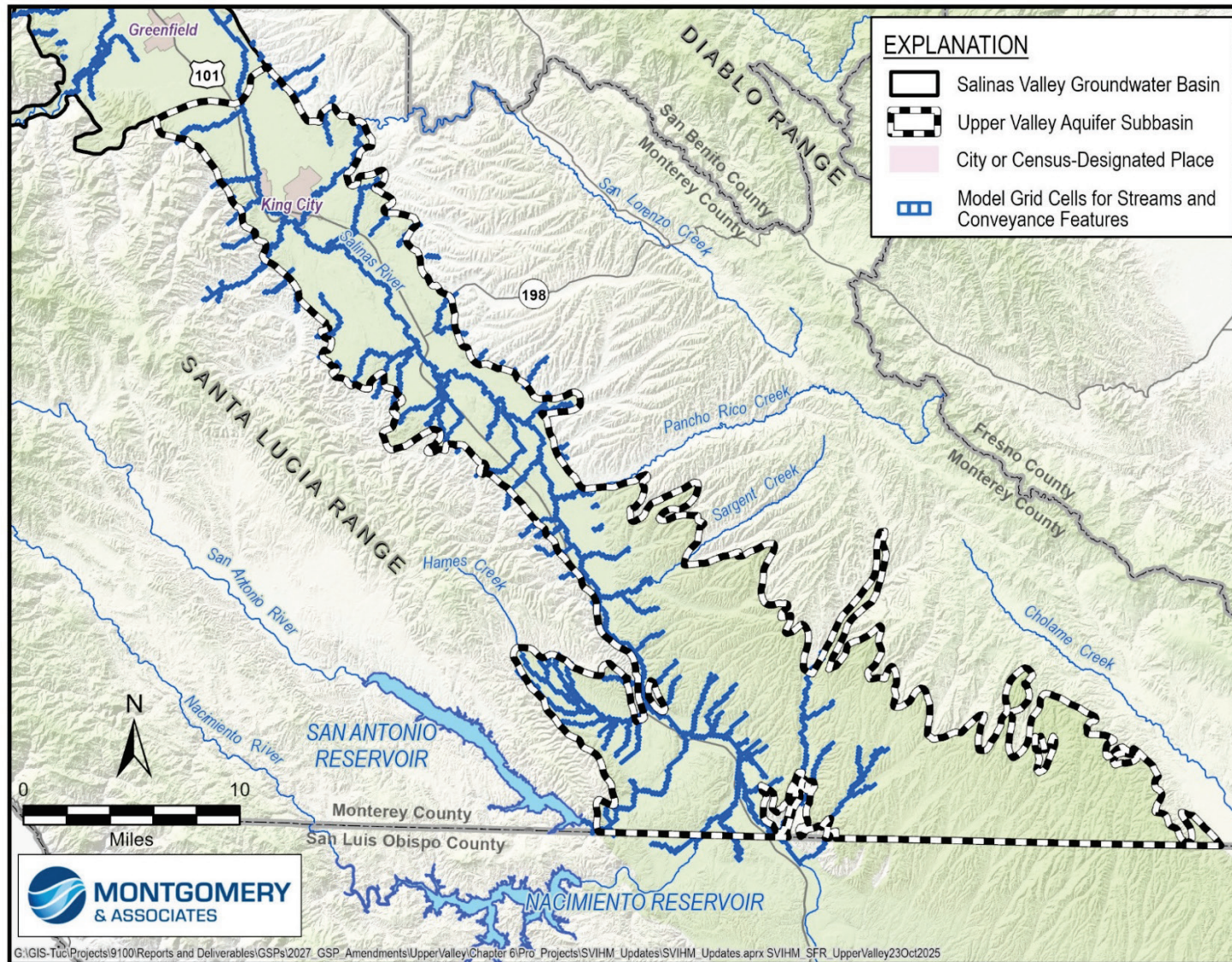


Figure 6-4. Surface Water Network in Upper Valley Subbasin from the SVIHM

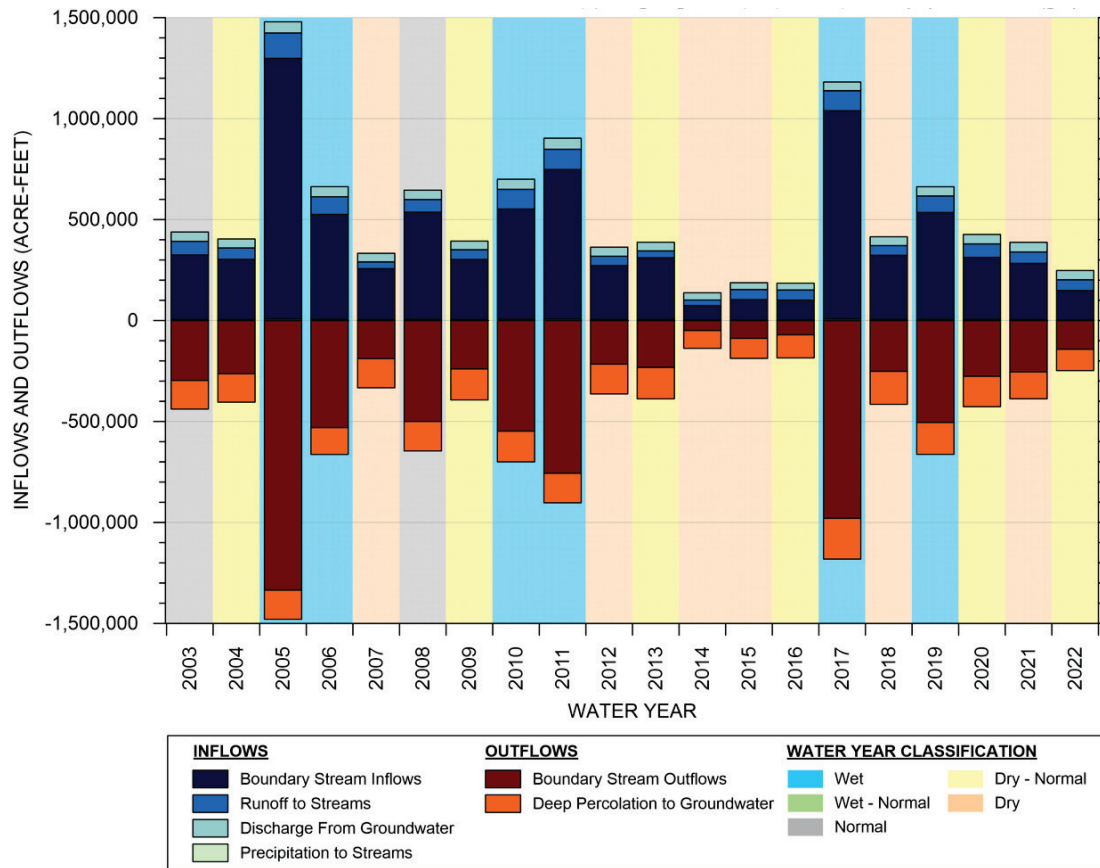


Figure 6-5. Historical and Current Surface Water Budget

Table 6-3. SVIHM-Simulated Surface Water Budget Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Boundary Stream Outflows	-407,200	-198,500
Precipitation to Streams	5,300	4,000
Net Flow between Surface Water and Groundwater	-98,700	-72,100
Overland Runoff to Streams	65,900	54,600
Boundary Stream Inflows	434,600	212,000

6.3.2 Historical and Current Groundwater Budget

Based on results from the SVIHM, the groundwater budget accounts for the inflows and outflows to and from the Subbasin's aquifers. This includes subsurface inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net flow between surface water and groundwater. The net effect of these inflows and outflows is reflected in the change in storage.

6.3.2.1 Groundwater Inflow and Outflow Components

The main groundwater inflow into the Subbasin is deep percolation of streamflow. Other inflows include deep percolation of precipitation and applied agricultural irrigation water and subsurface inflow from adjacent subbasins. Groundwater pumping is the predominant groundwater outflow, followed by subsurface outflow to adjacent subbasins. The smaller outflow terms are ET and discharge to streams.

SVIHM-estimated annual groundwater inflows for the historical and current time periods are shown on Figure 6-6. Table 6-4 provides average groundwater inflows for the historical and current period. Total average inflow for the historical period is about 245,200 AF/yr. WY 2014 to WY 2016 had exceptionally low deep percolation of streamflow. These dry years were followed by a wet WY 2017 that had high streambed recharge. Deep percolation of streamflow decreased again during the 3-year dry period from WY 2020 to WY 2022. This illustrates the Subbasin's sensitivity to changes in streamflow and climate patterns. Prior to WY 2014, deep percolation of streamflow is relatively stable. The other 2 inflows—subsurface inflows from adjacent subbasins and deep percolation of precipitation and applied irrigation—remain relatively stable through the historical and current time periods. Subsurface inflows from deep percolation of streamflow accounts for more than half of all inflows historically and during the current period. The current period has less deep percolation of streamflow than the historical period but more deep percolation of precipitation and applied irrigation.

Figure 6-7 shows the SVIHM-estimated groundwater outflows from for the historical and current time periods. Table 6-5 provides SVIHM-estimated annual averages for groundwater outflows of the historical and current period. Total average outflow for the historical period is about -248,300 AF/yr. The largest groundwater outflow components in the Subbasin are pumping and subsurface flows to adjacent subbasins, making up about 67% of total outflows. Outflows for the current period are similar to those of the historical period. All outflows are shown as negative values in Table 6-5.

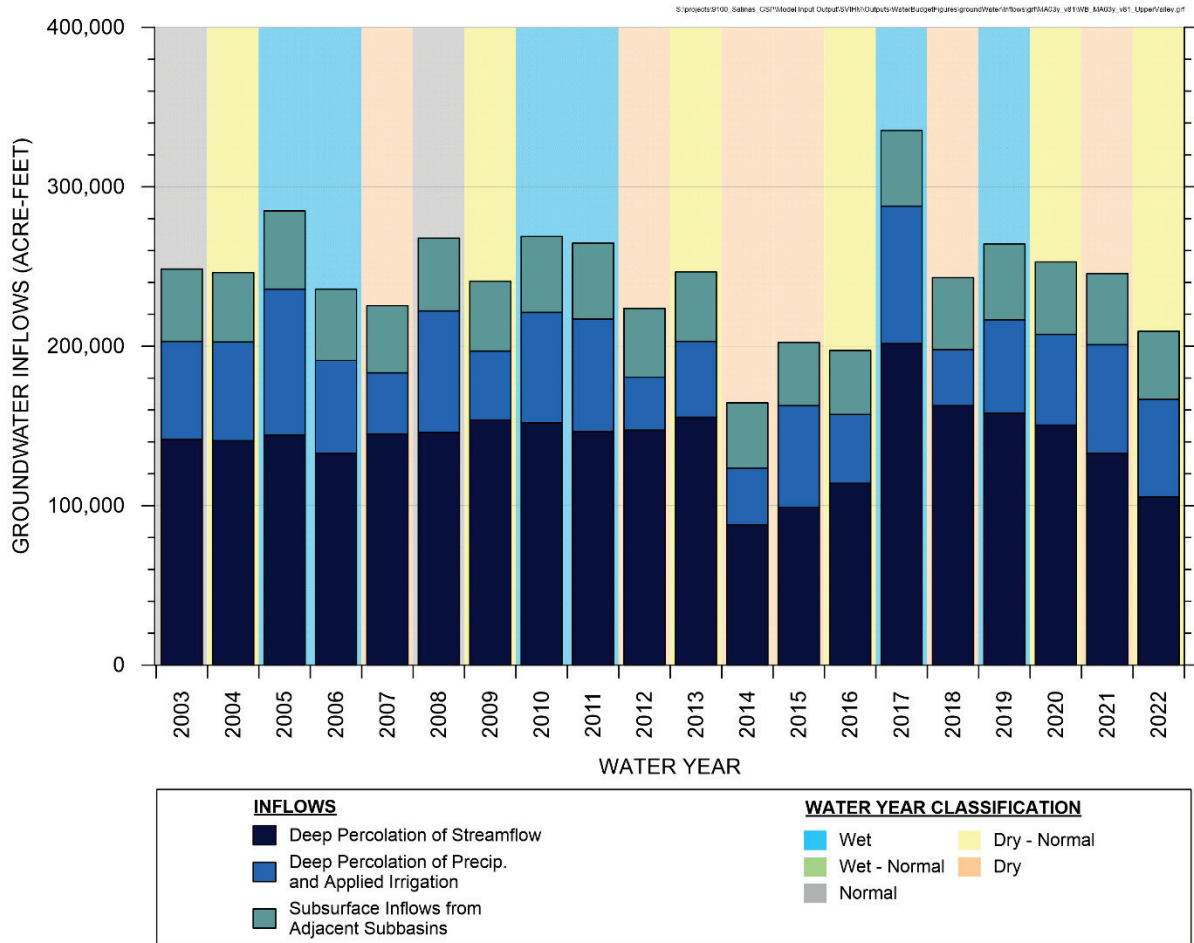


Figure 6-6. SVIHM-Simulated Inflows to the Groundwater System

Table 6-4. SVIHM-Simulated Groundwater Inflows Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Deep Percolation of Precipitation and Applied Water	57,300	64,700
Deep Percolation of Streamflow	143,300	119,200
Subsurface Inflow from Adjacent Subbasins/Basins	44,600	43,700

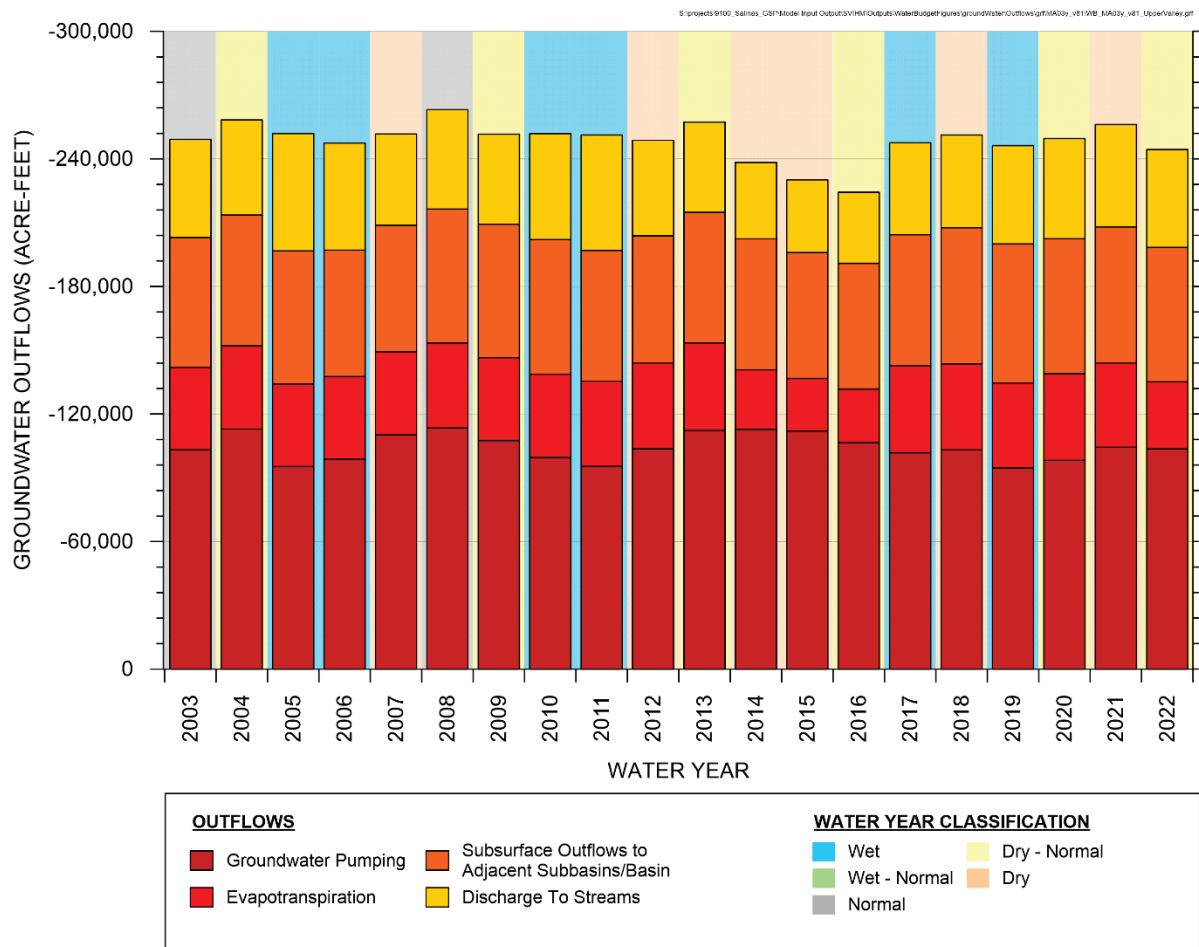


Figure 6-7. SVIHM-Simulated Outflows from the Groundwater System

Table 6-5. SVIHM-Simulated and Adjusted Groundwater Outflows Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-104,600	-104,000
ET from Groundwater	-37,500	-35,600
Subsurface Outflow to Adjacent Subbasins/Basins	-61,700	-63,600
Discharge to Streams	-44,600	-47,100

SVIHM-simulated groundwater pumping by water use sector is summarized on Figure 6-8 and in Table 6-6. Groundwater pumping remained relatively stable over the historical period. Current period groundwater pumping is similar to the historical average. More than 97% of groundwater pumping in the Subbasin is used for agricultural purposes. Urban and agricultural pumping are simulated in the SVIHM. Urban pumping includes municipal and industrial pumping. However, rural domestic pumping, most of which is likely *de minimis* pumping, is not simulated in the model or included in this water budget. Rural domestic groundwater use is assumed to be negligible in the Upper Valley Subbasin and therefore is not simulated in the model or included in this water budget.

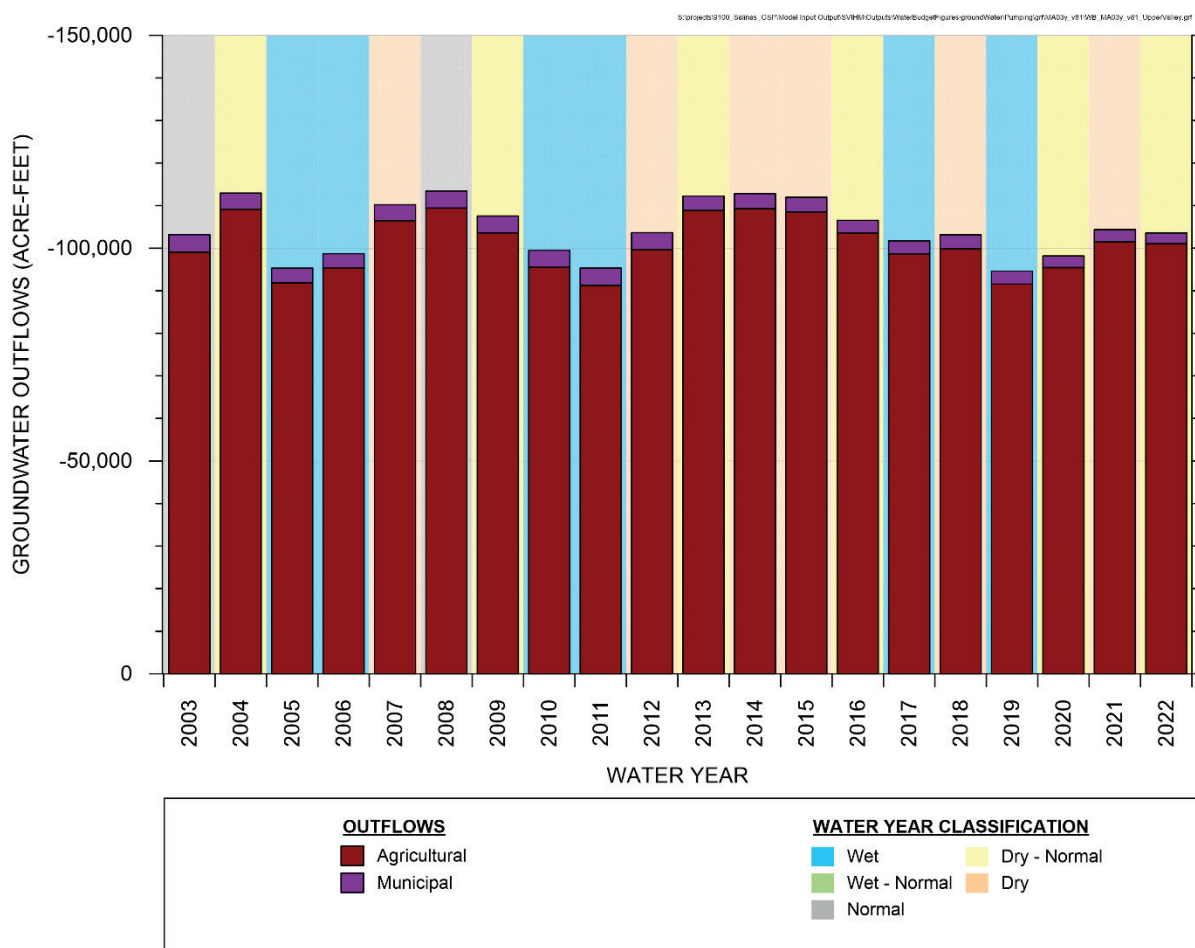


Figure 6-8. SVIHM-Simulated Groundwater Pumping by Water Use Sector

Table 6-6. SVIHM-Simulated and Adjusted Groundwater Pumping by Water Use Sector

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Municipal	-3,600	-2,700
Agricultural	-101,000	-101,300
Total Pumping	-104,600	-104,000

Figure 6-9 shows net subsurface flows entering and exiting the Subbasin by watershed and neighboring subbasins. Table 6-7 shows historical average and current year subsurface flows. For the entire historical and current period, the Subbasin's subsurface outflows are approximately 5,000 AF greater than inflows. The largest source of inflow comes from areas not mapped as DWR subbasins and the largest sink for outflow is the Forebay Subbasin, followed closely by areas not mapped as DWR subbasins. The amount of simulated flow to and from areas not mapped as DWR subbasins may be partially due to how the Subbasin zone relates to the SVIHM area (Figure 6-2) and the accounting methods used for developing the water budgets. There is a net inflow from the upgradient Paso Robles Area Subbasin.

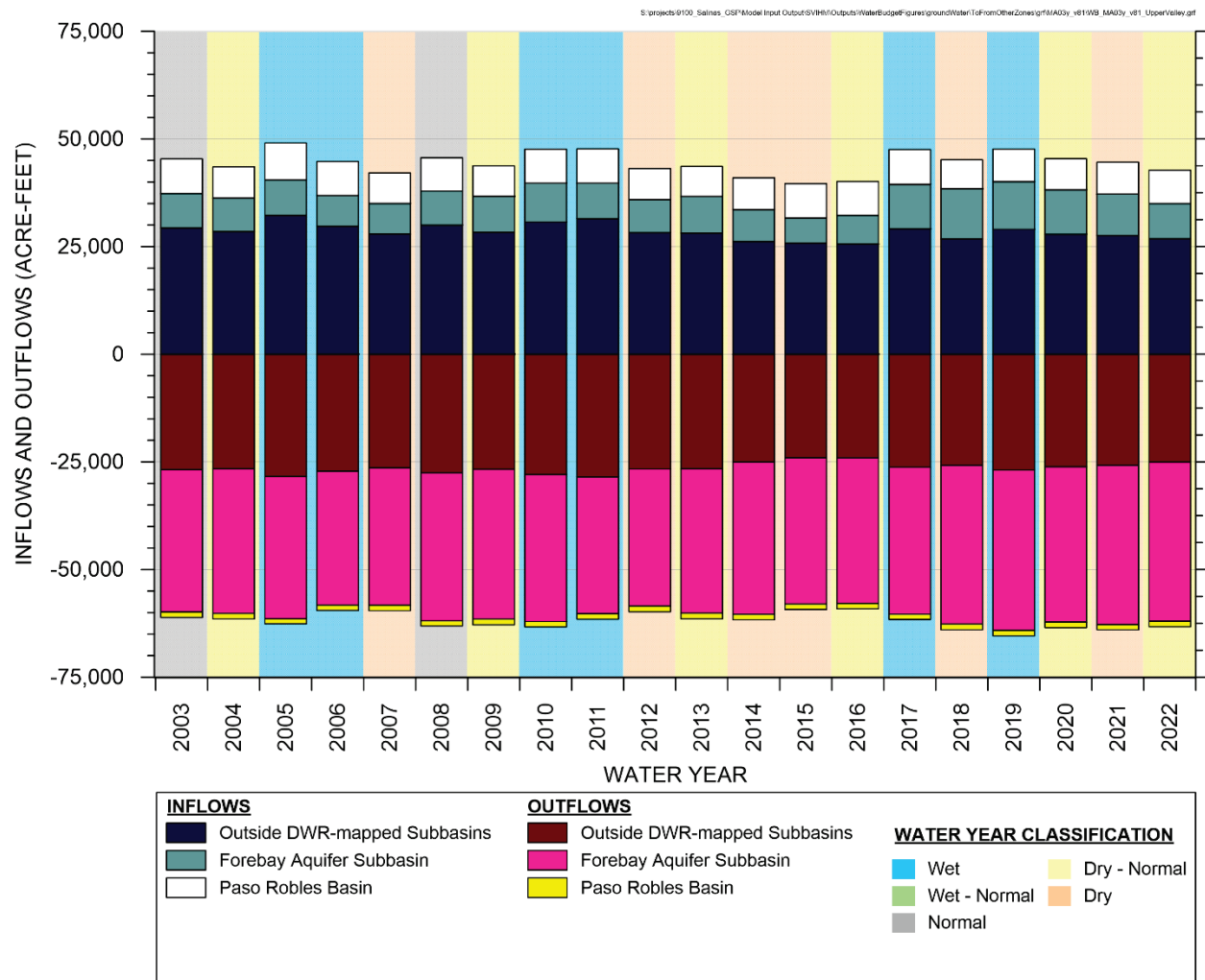


Figure 6-9. SVIHM-Simulated Subsurface Inflows and Outflows from Watershed Areas and Neighboring Basins/Subbasins

Table 6-7. SVIHM-Simulated Net Subbasin Boundary Flows

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Forebay Subbasin	-25,500	-28,100
Paso Robles Area Subbasin	6,300	6,400
Outside Areas	2,100	1,800

6.3.2.2 Change in Groundwater in Storage

Figure 6-10 shows the cumulative and annual change in storage along with the entire groundwater water budget from the SVIHM. A comparison of the historical and current groundwater budgets is shown in Table 6-8. The values in the table are based on the inflows and outflows presented in previous tables. Negative values indicate outflows or depletions. Particularly, a negative change in groundwater storage value in Table 6-8 indicates groundwater storage depletion associated with lower groundwater levels; while a positive value indicates groundwater storage accretion associated with higher groundwater levels. However, in the Upper Valley Subbasin change in groundwater in storage is also greatly influenced by streamflow depletion, which varies depending on the timing of surface water flows and groundwater levels. Averaged over the historical period, the SVIHM estimates that the Upper Valley Subbasin is in overdraft (loss of storage) by about 3,200 AF/yr.

Previously, the Upper Valley Subbasin has not been considered to be in overdraft. However, there has been a gradual decline in groundwater elevations that is attributed in part to the Subbasin's sensitivity to streamflow. This is evident in the cumulative simulated change in storage line shown on Figure 6-10, which indicates that storage is yet to fully recover from the WY 2012-2016 drought when inflow from deep percolation of streamflow was at its lowest. This illustrates how groundwater elevations are highly dependent on deep percolation of streamflow and significantly impacted by prolonged dry periods in the Upper Valley Subbasin.

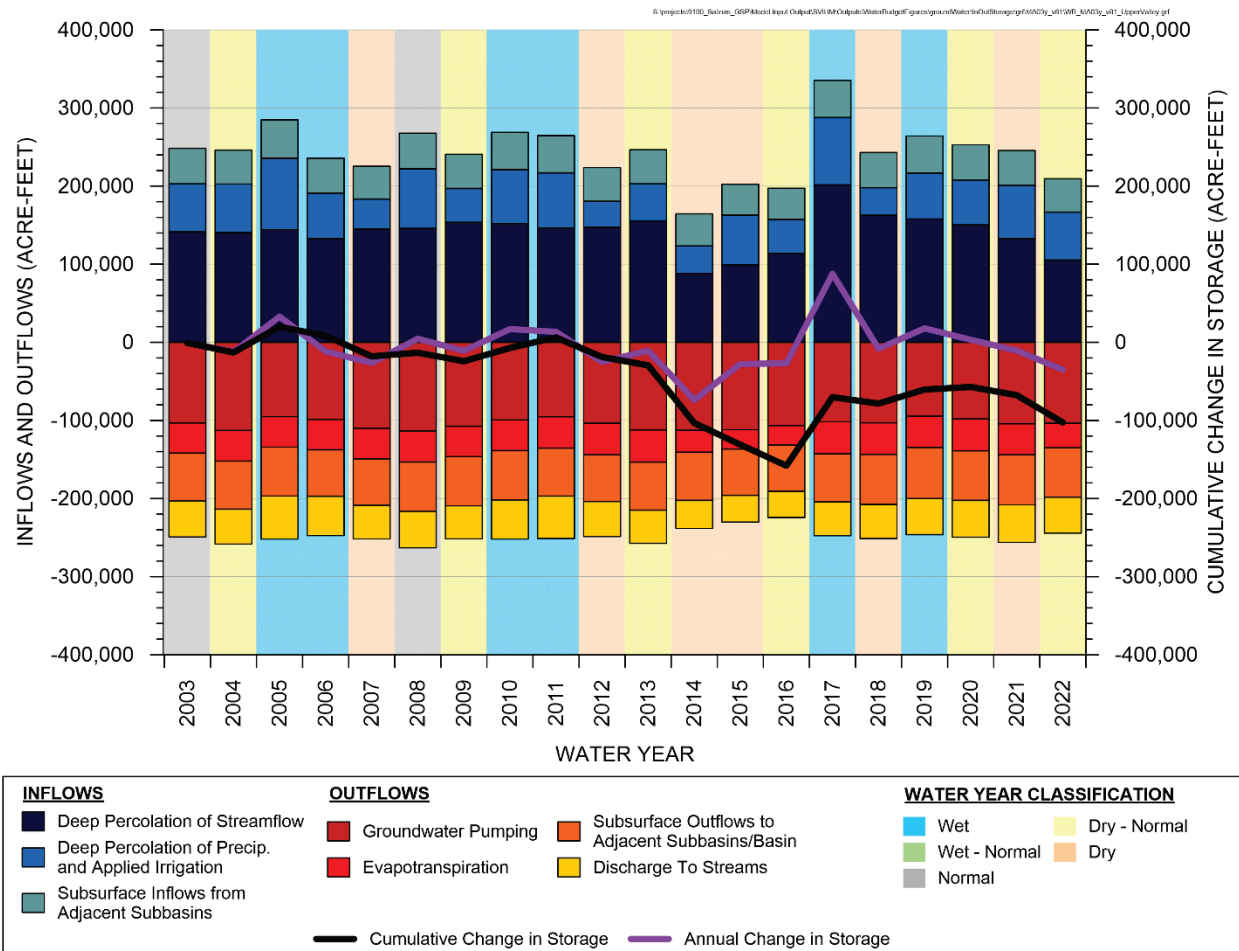


Figure 6-10. SVIHM-Simulated Historical and Current Groundwater Budget

Table 6-8. Summary of Groundwater Budget

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-104,600	-104,000
Net Stream Exchange (gain from streams)	98,700	72,100
Deep Percolation of Precipitation and Applied Irrigation	57,300	64,700
Net flow to Adjacent Subbasins/Basin	-17,100	-19,900
Groundwater ET	-37,500	-35,600
Net Storage Gain (+) or Loss (-) (Change in Storage)	-3,200	-22,800

Notes: Due to rounding, net storage values may differ by 100-200 AF/yr from sum of inflows and outflows.

6.3.3 Historical and Current Sustainable Yield

The sustainable yield is the amount of groundwater that can be withdrawn without causing long-term harm to the aquifer. Thus, when undesirable results are avoided, it is the pumping that can be sustained without causing a net decrease in storage. There is no true estimate of the historical and current sustainable yield because elimination of pumping would have caused other flows to change. However, an approximation of the subbasin-wide historical and current sustainable yields can be calculated based on water budget components. The historical and current sustainable yields reflect the amount of Subbasin-wide pumping reduction needed to balance the water budget, resulting in no net decrease in storage. The sustainable yield can be estimated as:

$$\text{Sustainable yield} = \text{pumping} + \text{change in storage}$$

This estimate does not account for the dynamic interaction between pumping, groundwater levels, and recharge. If there had been less pumping near the Salinas River, there likely would have been less recharge (stream exchange). However, groundwater levels over the historical period show a decline, which results in high storage changes since these are unconfined aquifer systems. As a subbasin-wide calculation, the sustainable yield obscures geographic differences within the Subbasin. To avoid undesirable results, greater pumping reductions may need to occur in some parts of the Subbasin and less in other parts. More refined analysis of the projected sustainable yield will be done in conjunction with demand management feasibility studies.

For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-9 shows the historical and current sustainable yields for the Subbasin, both of which are less than historical and current period pumping. These estimates reflect total simulated storage change in the Subbasin, and do not relay geographic variability in groundwater levels, nor the ability to meet SMC.

Table 6-9. Historical and Current Sustainable Yield

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Total Subbasin Pumping	104,600	104,000
Change in Storage	-3,200	-22,800
Estimated Sustainable Yield	101,400	81,200

Note: Pumping is shown as positive value for this computation

6.4 Projected Water Budgets

Projected water budgets are extracted from the updated SVOM, which simulates future hydrologic conditions for a representative sequence of potential climate years. Using a repeating 25-year projected climate period, a projected baseline scenario represent status quo conditions. The SVOM simulation period extends from the end of the historical model and runs from water year (WY) 2023 through WY 2072.

The baseline averaging period is defined as WY 2040 through 2064, a 25-year window during which PMAs are anticipated to be operational. This baseline water budget serves as the reference condition against which potential PMAs are evaluated. The baseline scenario reflects a single plausible climate sequence. Although evaluating multiple climate sequences would provide a broader understanding of potential future variability, this approach establishes a consistent baseline that allows project simulations to be directly compared and differenced to isolate project-specific effects.

6.4.1 Model Information and Assumptions are Summarized in a Model Update Summary Report by Montgomery & Associates (2026b). Assumptions Used in Projected Water Budget Development

The assumptions incorporated into the SVOM for the projected water budget simulations include:

- **Land Use:** Agricultural land use is assumed to be static, aside from a semi-annual change to represent crop seasonality. The annual pattern repeats 2022 land use every year in the model.
- **Urban growth** according to AMBAG projections is included in this simulation. It assumes urban growth is infill, keeping the same urban footprint. If urban growth replaces agriculture, the effect on extraction will also depend on the location of agricultural water use replaced.
- **Reservoir Operations:** The reservoir operations reflect MCWRA's current approach to reservoir management, as described in MCWRA's Nacimiento Dam Operation Policy (MCWRA, 2018b). The implementation of MCWRA operational rules in the previous SVOM is described in Wood Environment & Infrastructure Solutions (2023); only minor modifications were made in the current update. Those refinements were intended to better represent natural variability in stream inflow, align operational rules with MCWRA's operational approach, and remain consistent with MCWRA's preparation of the Salinas River Operations HCP.
- **Stream Diversions:** The SVOM explicitly simulates only 2 stream diversions in the Salinas Valley Basin: Clark Colony and the SRDF. The Clark Colony diversion is located

along Arroyo Seco and diverts stream water to an agricultural area nearby. The SRDF came online in 2010 and rediverts stored water to the Castroville Seawater Intrusion Project (CSIP) area. Clark Colony diversions are repeated from the historical record to match the WY. Rediversions at the SRDF are made throughout the duration of the SVOM whenever reservoir storage and streamflow conditions allow during the period from April through October. For purposes of the projected water budgets, SRDF rediversions occur at up to a rate of 36 cubic feet per second.

- **Recycled Water Deliveries:** Recycled water has been delivered as irrigation supply to the CSIP area since 1998. The SVOM continued these recycled water deliveries throughout the duration of the model, similar to the last years of the historical.

6.4.2 Projected Surface Water Budget

As with the historical and current periods, the projected surface water budget accounts for the inflows and outflows for the streams within the Subbasin. This includes flow from rivers and tributaries entering and exiting the Subbasin, precipitation that falls directly onto streams, overland runoff to streams, and stream-aquifer interactions. ET by riparian vegetation along stream channels is estimated by the SVOM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-11 shows the surface water budget for the projected period. Table 6-10 shows the average values for components of the surface water budget for the projected period. Positive values are inflows to the stream system, and negative values are outflows from the stream system. Overall trends are the same as the historical surface water budget. Boundary inflows and outflows dominate the surface water budget in all but the driest years. The flow between surface water and groundwater in the Subbasin is generally net negative, which indicates more flow from surface water to groundwater than vice versa; this occurs through seepage from the streams to groundwater.

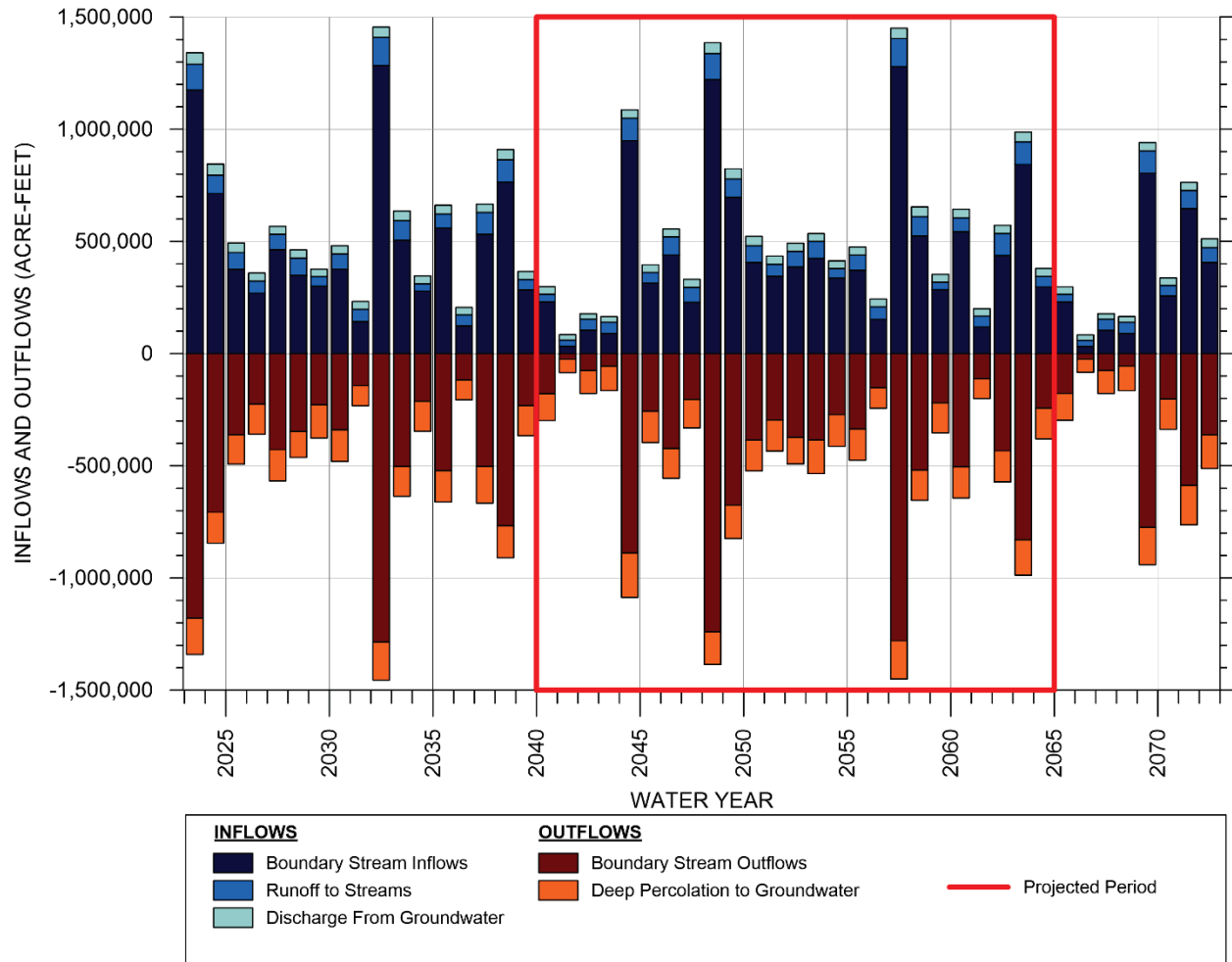


Figure 6-11. SVOM-Simulated Projected Surface Water Budget

Table 6-10. SVOM-Simulated Projected Surface Water Budget Summary

Surface Water Budget Components	Average Flow WY 2040-2064 (AF/yr)
Boundary Inflows	442,200
Boundary Outflows	-414,600
Net Flow Between Surface Water and Groundwater	-95,300
Overland Runoff to Streams	67,700
Diversions from Streams	0

6.4.3 Projected Groundwater Budget

Figure 6-12 shows the SVOM-simulated projected groundwater budget. Average groundwater budget components for the projected period are quantified in Table 6-11. The largest inflow, net stream exchange, is approximately equal in magnitude to the largest outflow, groundwater pumping. Similarly, the inflow from deep percolation of precipitation and irrigation is a similar magnitude to the combined outflows of Groundwater ET and net flows to areas outside Upper Valley Subbasin. Overall, average projected change in groundwater storage is -200 AF/yr.

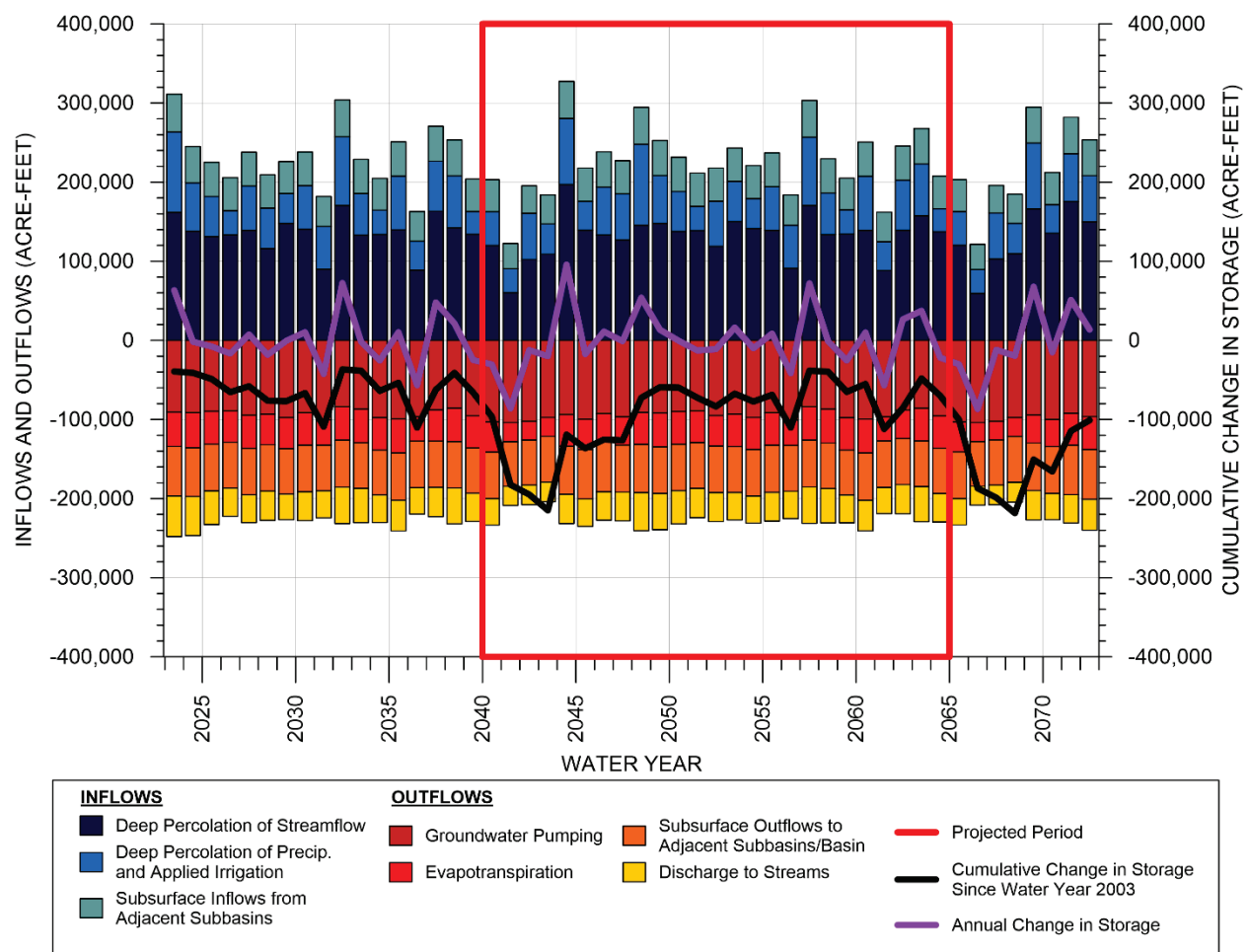


Figure 6-12. SVOM-Simulated Projected Groundwater Budget

Table 6-11. SVOM-Simulated Projected Groundwater Budget Summary

Groundwater Budget Components	Average Flow WY 2040-2064 (AF/yr)
Net Stream Exchange	95,300
Groundwater Pumping	-94,500
Deep Percolation of Precipitation and Irrigation	53,600
ET from Groundwater	-37,400
Net Flow to Forebay Subbasin	-25,600
Net Flow from Paso Robles Basin	6,800
Net Flow from Outside Areas	1,700
Net Storage Gain (+) or Loss (-)	-200

Note: provisional data subject to change.

SVOM projected groundwater pumping by water use sector is summarized in Table 6-12. As in the historical and current periods, agricultural use is expected to account for more than 96% of pumping. Municipal & Industrial pumping decreased from the historical period to the current period and is expected to decrease further in the projected period. King City's population is projected to increase only slightly, and the municipal and industrial pumping outside of King City is based on the 2020-2023 average, which was lower than it had been historically.

Table 6-12. SVOM-Simulated Projected Groundwater Pumping

Water Use Sector	Average Pumping WY 2040-2064 (AF/yr)
Agricultural	-92,300
Municipal & Industrial	-2,200
Total Pumping	-94,500

6.4.4 Projected Sustainable Yield

The projected sustainable yield is the amount of groundwater that can be withdrawn without causing long-term harm to the aquifer. Thus, when undesirable results are avoided, it is the pumping that can be sustained without causing change in storage to decrease. The Upper Valley Subbasin groundwater conditions depend greatly on precipitation, streamflow, and reservoir releases. The actual amount of pumping that can be sustained in the future will depend on climate, reservoir operations, and the success of PMAs.

To retain consistency with the historical sustainable yield, projected sustainable yield can be estimated by summing all the average groundwater extractions and subtracting the average change in storage. This represents the change in pumping that results in no change in storage, assuming no other projects or management actions are implemented. For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-13 provides an estimate of the future sustainable yield using estimated future pumping and storage values in Table 6-11. It is based on the climate, streamflow, and land use assumptions within the baseline modeling scenario, and if future conditions vary, the projected sustainable yield may differ. Although the sustainable yield values provide guidance for achieving sustainability, simply pumping within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through the SMC. This approximation of the subbasin-wide projected sustainable yield does not capture geographic variation, nor account for the dynamic interaction between pumping, groundwater levels, and recharge.

Table 6-13. Projected Period Sustainable Yield

	Average Flow WY 2040-2064 (AF/yr)
Groundwater Pumping	94,500
Change in Storage	-200
Projected Sustainable Yield	94,300

Note: Pumping is shown as positive value for this computation

6.5 Climate Change Scenarios

To better understand the sensitivity of future conditions to climate change, SVBGSA applied the DWR (2018) 2070 climate scenarios to the projected baseline scenario.

6.5.1 Climate Change Method

The projected water budget was developed based on future hydrologic conditions representative of historical conditions. To help understand the potential effect of climate change on future conditions, 3 sets of climate change factors were applied to the projected baseline:

1. Central Tendency
2. Wet-Moderate Warming
3. Dry-Extreme Warming

These future climate change scenarios used DWR-provided datasets consisting of monthly scaling factors for precipitation, reference evapotranspiration (ET_o), and streamflow. Scaling factors were also applied to tributary inflows and reservoir inflows to maintain alignment across all hydrologic inputs. These factors were applied multiplicatively to the future baseline model climate (precipitation and ET_o) or hydrologic (tributary and reservoir inflows) inputs. These scaling factors vary both spatially and temporally (year to year). This approach preserves the temporal sequencing of wet and dry periods from the baseline model while adjusting the magnitude of precipitation, ET_o, and surface water inputs to reflect projected future conditions. Since the DWR scaling factors are provided for climate change at 2070, the scaling factor

applied in a given WY was calculated as a linear interpolation between baseline and 2070 conditions. The linearized monthly precipitation and ETo change factors from DWR were provided spatially as a grid with a lower resolution than the future baseline model grid whereas surface water inputs were scaled based on HUC-8 watersheds, which are much larger than the baseline model grid resolution.

6.5.2 Results of Climate Change Scenarios

Table 6-14 shows the average annual water budget for the Upper Valley Subbasin for WY 2040-2064 for the projected baseline and 3 climate scenarios run with the SVOM. Positive values represent groundwater inflows and negative values represent groundwater outflows from the subbasin. All 3 climate scenarios have greater deep percolation, ET from groundwater and groundwater extraction than the baseline scenario. Of the 4 climate scenarios tested, the Dry-Extreme Warming scenario represents the worst-case scenario for sustainability. Increased pumping and ET from groundwater drive a significantly greater loss in storage than the other 3 scenarios. Deep percolation is greater in the Dry-Extreme scenario due to higher overall precipitation, as well as increased return flow from increased irrigation pumping. Lower water levels allow for more inflows from streams. The Wet-Moderate Warming and Central Tendency scenarios show a similar but slightly increased annual change in storage compared to the baseline. However, regardless of the scenario, the annual change in storage is a small percentage of the total inflows and outflows. These scenarios represent potential futures to help understand the uncertainty associated with climate change; however, the exact variation of future years is unknown.

Table 6-14. Average Water Budget Comparison for Climate Change Scenarios
for WY 2040-2064 in Upper Valley Subbasin

Water Budget Component	WY 2040 – 2064 Average (AF/yr)			
	Baseline	Central Tendency	Dry-Extreme Warming	Wet-Moderate Warming
Deep Percolation	53,600	57,700	58,300	66,600
Net Stream Exchange	95,300	98,200	101,000	85,000
Net Seawater Exchange	0	0	0	0
Net Subsurface Inflows	-17,100	-17,100	-18,000	-14,900
ET from Groundwater	-37,400	-39,800	-39,300	-41,300
Groundwater Extraction	-94,500	-98,900	-103,100	-95,300
Net Storage Change	-200	0	-1,200	0

6.6 Overdraft Assessment

Water level observations indicate that the Upper Valley Subbasin is experiencing overdraft, though conditions vary across the subbasin. Trends were evaluated using several annual metrics over the most recent 15 and 20 years. This window is long enough to give a dependable view of long-term trends rather than the drought recovery reflected in the last 10 years, yet short enough to represent current conditions, including declining pumping in the adjacent Forebay Subbasin and the effects that changes in reservoir operations may have on stream seepage.

Water level patterns vary spatially, with a transition occurring roughly between King City and San Lucas. North of that line, wells generally follow a pattern like Forebay's with a steady early period, a sharp decline during the drought, and post-drought recovery. Wells in the Upper Valley, however, are less likely to show a full post-drought recovery than in the Forebay Subbasin. In the southern part of the Upper Valley, wells follow different temporal patterns and are more likely than not to show declining trends. This assessment did not account for potential differences between trends at wells installed in the alluvium versus the Paso Robles Formation.

Of the 31 wells with sufficient data to support a trend analysis, 12 showed clear declining trends and 3 showed more subtle declines — almost half of all wells evaluated. Five wells showed clear increasing trends, and no trend was identified at the remaining 11. Rates of change were generally modest, mostly between 0.1 and 0.5 feet per year. The volume of overdraft was not estimated. Taken together, the high proportion of wells showing declining trends indicates that the Upper Valley Subbasin is experiencing overdraft.

6.7 Subbasin Water Supply Availability and Reliability

Water is not imported into the Upper Valley Subbasin. However, a significant portion of the Subbasin's recharge is derived from reservoir releases that regulate a portion of Salinas River streamflow. The historical water budget incorporates years when there was little availability of surface water flow and groundwater elevations declined as a result. Figure 6-5 shows that when Salinas River flows were low, deep percolation to groundwater was also low. Declines during these years generally did not affect the ability to operate within the sustainable yield, as groundwater elevations rebounded during years when there was greater surface water flow. The projected water budgets are developed with the SVOM, which is based on historical surface water flows and groundwater conditions; therefore projected water budgets incorporate reasonable fluctuations in water supply availability. MCWRA is preparing the Salinas River Operations HCP, which may change the current reservoir release schedule and could influence the reliability of groundwater recharge.

6.8 Uncertainties in Water Budgets and Climate Change Scenarios

Models are mathematical representations of physical systems, and as such cannot perfectly replicate real-world conditions. Their accuracy is limited both by the simplifications inherent in representing complex physical processes and by constraints in the available input data. There is also inherent uncertainty in groundwater flow modeling itself, models can only approximate physical systems and have limitations in how they compute data. However, as recognized by DWR (2018), despite these limitations, models remain powerful tools that provide valuable insights into system behavior and support informed water resource management decisions.

The level of accuracy and certainty is highly variable between water budget components. A few water budget components are directly measured, but most water budget components are either estimated inputs to the model or simulated by the model. Additional model uncertainty stems from an imperfect representation of natural conditions and this is reflected in model calibration error. However, inputs to the models are carefully selected using best available data, the model's calculations represent established science for groundwater flow. The model calibration error is within acceptable bounds.

There is additional inherent uncertainty involved in projecting water budgets given that actual future climate conditions and the sequence of wet and dry years are unknown. The 25-year repeated projected climate sequence was based on historical data. Because the SVOM is not intended to forecast specific future weather events, model projections should not be interpreted as year-by-year predictions; instead, multi-year averages should be used to evaluate how groundwater levels and basin water budgets may respond to average future climate conditions. The model only represents a single climate realization. This baseline serves as a best-available reference against which potential PMAs can be evaluated.

7 MONITORING NETWORKS

This chapter describes the networks that will monitor the SMC discussed in Chapter 8. This description of the monitoring networks has been prepared in accordance with the GSP Regulations § 354.32 *et seq.* to include monitoring objectives, monitoring protocols, and data reporting requirements.

7.1 Introduction

7.1.1 Monitoring Network Objectives

SGMA requires monitoring networks collect data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Demonstrate progress toward achieving measurable objectives
- Monitor impacts to the beneficial uses or users of groundwater
- Quantify annual changes in water budget components

7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the 5 sustainability indicators that are relevant to the Upper Valley Subbasin:

1. Chronic lowering of groundwater levels
2. Reduction in groundwater storage
3. Degraded water quality
4. Land subsidence
5. Depletion of ISW

Other monitoring networks—such as groundwater extraction—that are necessary to comply with GSP Regulations are also included in this chapter. RMS wells, which are a subset of the monitoring network to provide the most representative information about groundwater conditions in the Subbasin.

The SVBGSA estimated the density of monitoring sites and the frequency of measurements required to demonstrate short-term, seasonal, and long-term trends. If the required monitoring site density does not currently exist, the SVBGSA will expand monitoring networks during GSP implementation. Filling data gaps and developing more extensive and complete monitoring networks will improve the SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. The SVBGSA will review the monitoring network in each 5-year assessment, including a determination of uncertainty and whether there are remaining data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin.

7.1.3 Management Areas

No management areas are defined within the Upper Valley Subbasin.

7.2 Groundwater Level Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by assessing groundwater elevations in a designated monitoring wells. The GSP Regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

Figure 7-1 shows the 31 wells in the Subbasin monitored by MCWRA for groundwater elevations that are used to develop groundwater elevation contours and that have publicly available data on the SVBGSA Web Map. Of these wells, 20 are selected as groundwater level monitoring network as RMS wells. As agreed to by DWR, RMS wells are monitored biannually in the fall and August. SVBGSA will report spring groundwater level measurements, but will not monitor all RMS wells in the spring. Generally, the criteria for selecting RMS wells include the following:

- RMS wells must have known depths and well completion data.
- RMS wells should have a relatively long period of historical data. If no other nearby wells exist, wells that do not meet this requirement may be used.
- Hydrographs of RMS wells should be visually representative of the hydrographs from surrounding wells.
- RMS locations must cover the basin and provide data near basin boundaries.
- RMS should be selected for each aquifer. There is only 1 principal aquifer in the Upper Valley Subbasin

- Data from RMS wells is public data and will be used for groundwater elevation maps and analysis. SVBGSA notified well owners of intent to include their well in the monitoring network.

The RMS wells in the groundwater level monitoring network are shown in Table 7-1 and on Figure 7-1. Only RMS wells are labeled on Figure 7-1. Both the table and map include the 4 new monitoring wells the SVBGSA installed and 1 existing well that was added to the network since the original 2022 GSP. They are marked with an asterisk in Table 7-1. For simplicity, the new wells will also be referred to as RMS wells although they do not have SMC yet. Appendix 5A provides well construction information and historical hydrographs for each RMS well.

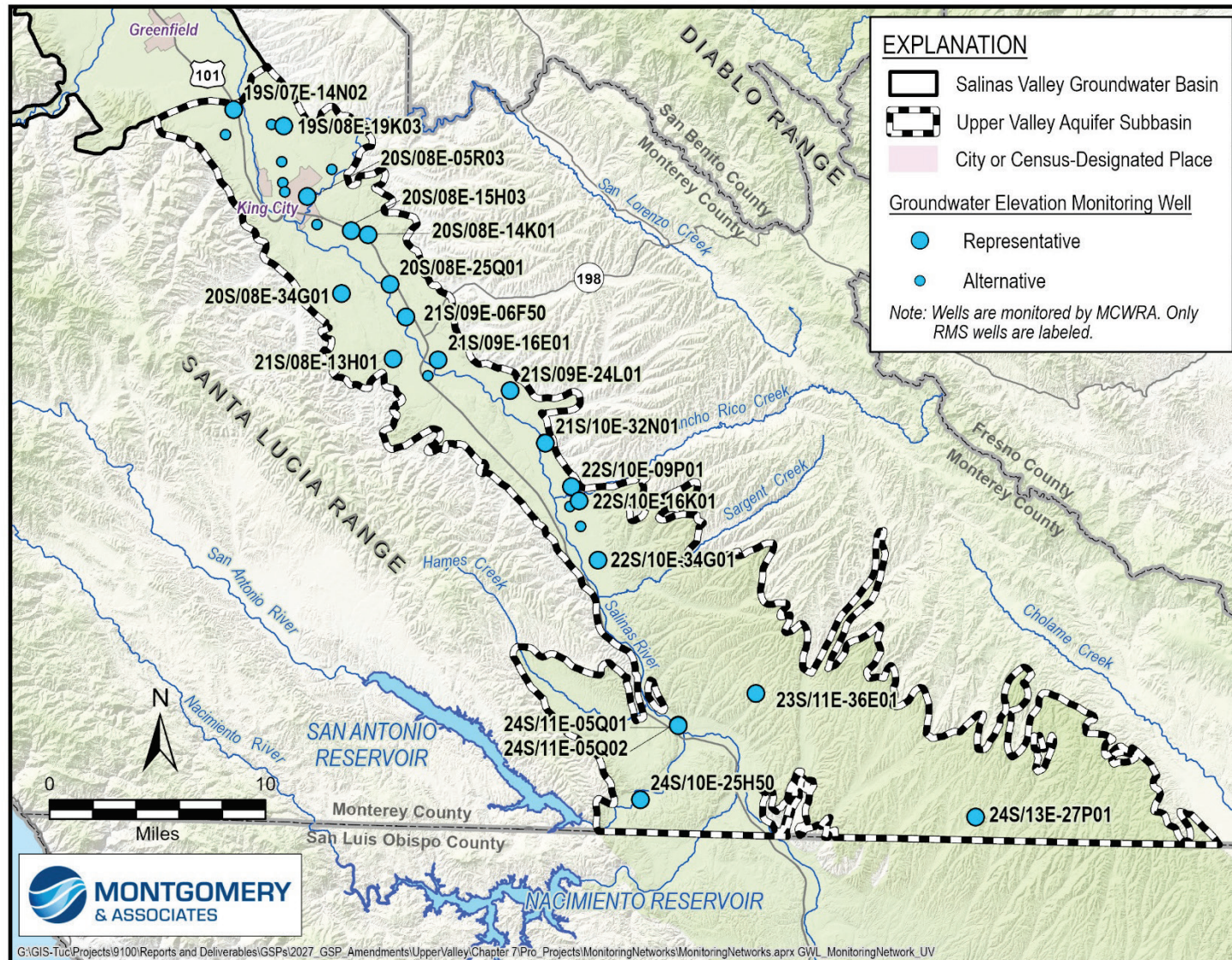


Figure 7-1. Groundwater Levels Monitoring Network

Table 7-1. Upper Valley Groundwater Level Representative Monitoring Site Network

State Well Number	SGMA Site Code	Local Well Designation	Well Use	Total Well Depth (ft)	Reference Point (ft, NAVD88)	Latitude (NAD 83)	Longitude (NAD 83)
19S/07E-14N02	362719N1211849W001	1822	Irrigation	228	322.2	36.27197	-121.18495
19S/08E-19K03	362614N1211432W001	1379	Irrigation	212	279.5	36.26142	-121.14319
20S/08E-05R03	362147N1211221W001	1453	Irrigation	189	340.7	36.20795	-121.14653
20S/08E-14K01	361903N1210713W001	1735	Irrigation	236	349.6	36.19034	-121.07133
20S/08E-15H03	361921N1210850W001	355	Irrigation	170	322.7	36.19219	-121.08509
20S/08E-25Q01	361567N1210522W001	2595	Irrigation	80	336.0	36.15672	-121.05221
20S/08E-34G01	361498N1210920W001	10077	Domestic	432	438.3	36.14981	-121.09201
21S/08E-13H01	361068N1210482W001	26413	Irrigation	N/A	483.3	36.10682	-121.04824
21S/09E-06F50	361349N1210385W001	23311	Irrigation	65	343.9	36.13490	-121.03857
21S/09E-16E01	361067N1210108W001	555	Irrigation	100	355.1	36.10673	-121.01083
21S/09E-24L01	360869N1209507W001	2611	Irrigation	120	400.5	36.08697	-120.95076
21S/10E-32N01	360522N1209206W001	733	Irrigation	N/A	407.6	36.05220	-120.92062
22S/10E-09P01	360233N1208983W001	1137	Irrigation	N/A	465.8	36.02334	-120.89832
22S/10E-16K01	360137N1208920W001	189	Irrigation	N/A	480.2	36.01370	-120.89202
22S/10E-34G01	359742N1208754W001	1761	Irrigation	182	487.3	35.97422	-120.87543
24S/10E-25H50*	N/A	23706	Irrigation	365		35.81382	-120.83634
24S/11E-05Q01*	N/A	UV-ISW-1	Observation	90	535.7	35.86420	-120.80631
24S/11E-05Q02*	N/A	UV-GWL-1	Observation	190	536.3	35.86423	-120.80646
24S/13E-27P01*	N/A	UV-GWL-2	Observation	555	1312.2	35.80595	-120.55960
23S/11E-36E01*	N/A	UV-GWL-3	Observation	495	901.0	35.88669	-120.74275

Note: Asterisk symbolizes new monitoring wells, either recently installed or existing wells, that do not have SGMA Site Codes because RMS wells must have established SMC to be entered into SGMA Portal.

N/A = Not available

7.2.1 Groundwater Level Monitoring Protocols

Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of existing groundwater elevation monitoring procedures (MCWRA, 2015b). The CASGEM groundwater elevation monitoring protocols established by MCWRA are adopted by this GSP and are included in Appendix 7A. Groundwater elevation measurements are collected at least 2 times per year to characterize seasonal low and seasonal high groundwater conditions. The monitoring protocols described in Appendix 7A cover multiple monitoring methods for collecting data by hand and by automated pressure transducers. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.2.2 Groundwater Level Monitoring Network Data Gaps

Based on the GSP Regulations and BMPs published by DWR on monitoring networks (DWR, 2016b), a visual analysis of the existing monitoring network was performed using professional judgment to evaluate whether there are data gaps in the groundwater level monitoring network.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins and Anderson, 2016) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgment should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The Upper Valley Subbasin encompasses 371 square miles. Applying the BMP guidance recommendations to the Subbasin, the well network should include between 1 and 37 wells. The RMS network includes 20 wells— within the BMP-recommended range. Furthermore, visual inspection of Figure 7-1 indicates the geographic distribution of the RMS network is sufficient and there is no significant spatial data gap in the network.

Some of the wells in the monitoring network have unknown well construction information. SVBGSA will work with MCWRA to identify well construction information during GSP implementation through MCWRA's well registration effort.

7.3 Groundwater Storage Monitoring Network

As discussed in Chapter 8, the sustainability indicator for reduction of groundwater storage is measured using groundwater elevations as proxies. Therefore, the groundwater storage monitoring network is the same as the groundwater level monitoring network.

7.4 Groundwater Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated at wells monitored for established water quality regulatory programs. The SVBGSA adopts the active public water system supply wells monitored under SWRCB DDW, and all wells monitored under the CCRWQCB ILP. The Subbasin's groundwater quality network is shown on Figure 7-2 and the wells in the network are listed in Appendix 7D.

The public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. The SWRCB collects data for municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. Only active DDW wells are included in the SVBGSA's groundwater quality network.

Water quality for agricultural supply wells are monitored through the CCRWQCB ILP regulates discharge from irrigated agricultural lands through the Ag Orders. Ag Order 4.0 established 2 main monitoring requirements: 1) the creation of a monitoring plan to assess groundwater quality trends and 2) monitoring of all on-farm domestic wells for the presence of 1,2,3-trichloropropane (1,2,3-TCP) and nitrate. The Central Coast Water Quality Preservation Inc., the third-party that conducts most CCRWQCB ILP compliance sampling in the Salinas Valley, is developing the Groundwater Quality Trend Monitoring (GQTM) Workplan to address the trend monitoring requirement of the Ag Order 4.0 requirements. The GQTM Workplan will evaluate nitrate and major cations and anions trends in select wells. All ILP wells sampled by Preservation Inc. as of GSP Amendment 1 are provisionally included in the Subbasin's monitoring network until the GQTM Workplan is approved by the CCRWQCB. Once it's approved, the SVBGSA's monitoring network will comprise the wells in the GQTM Workplan and additional on-farm domestic wells sampled for 1,2,3-TCP and nitrate.

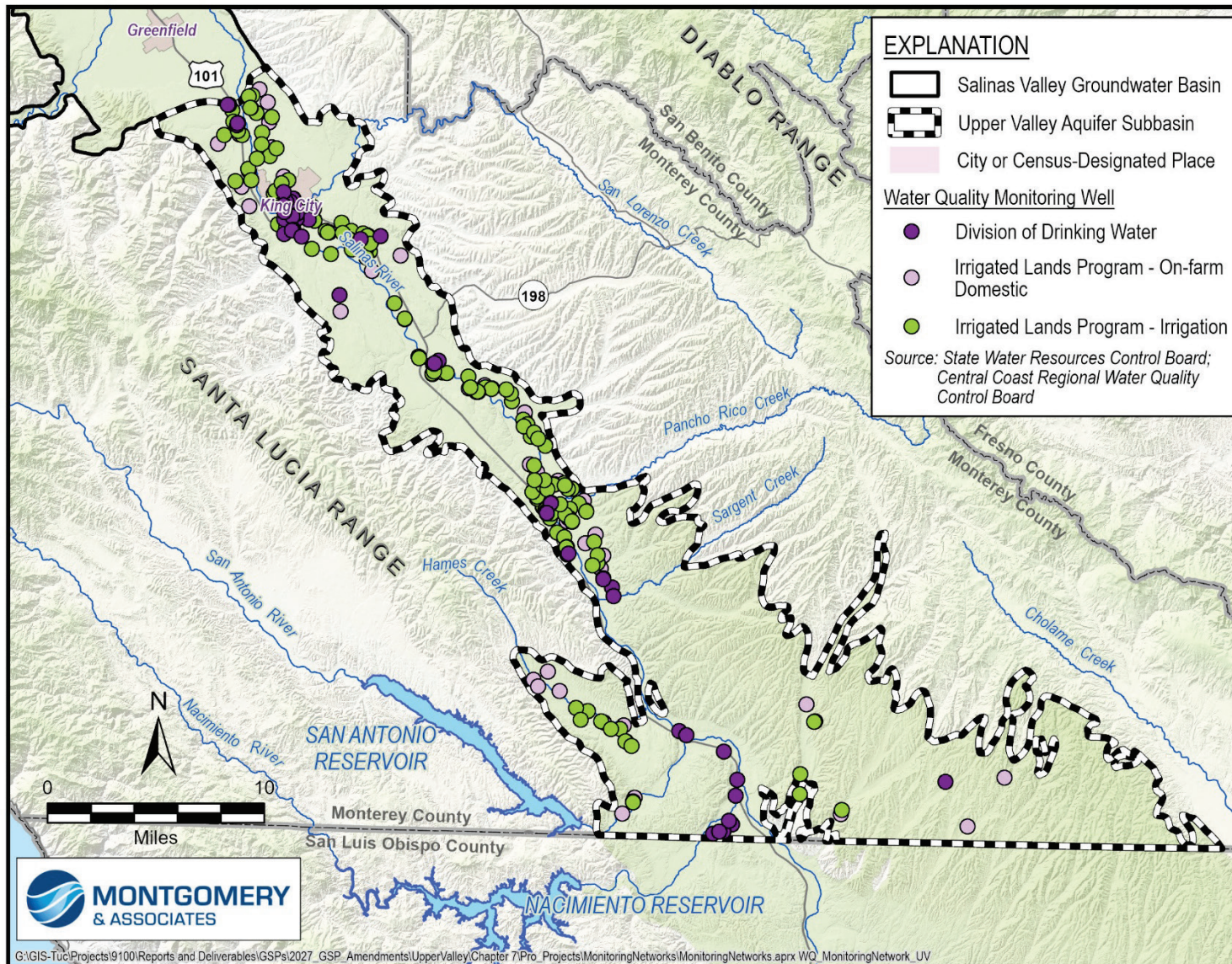


Figure 7-2. Groundwater Quality Monitoring Network

7.4.1 Groundwater Quality Monitoring Protocols

The SVBGSA does not independently sample wells. Instead, the GSA analyzes water quality data that are collected through the DDW and ILP. Therefore, the GSA is dependent on the monitoring density and frequency of DDW and ILP.

Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB DDW, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

The ILP data are collected annually under CCRWQCB Ag Order 4.0. A copy of the Ag Order 4.0 monitoring and reporting programs are included in Appendix 7C and are incorporated into this GSP. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.4.2 Groundwater Quality Monitoring Data Gaps

The DDW and GQTM Workplan monitoring network provide sufficient spatial and temporal data to determine groundwater quality trends for water quality indicators to address known water quality issues. Additionally, there is adequate spatial coverage in the water quality monitoring network to assess impacts to beneficial uses and users.

7.5 Land Subsidence Monitoring Network

As described in Section 5.4, DWR collects land subsidence data using InSAR satellite data and makes these data available to GSAs. This subsidence dataset represents the best available science for the Upper Valley Subbasin and is therefore used as the subsidence monitoring network.

7.5.1 Land Subsidence Monitoring Protocols

Land Subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. DWR adapted their methods to measure subsidence on hard surfaces only and interpolate between them to minimize the change in land surface elevation captures in soft surfaces that are likely not true subsidence. The cell size of this interpolated surface is 302 feet by 302 feet. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be correlated to groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.5.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

7.6 Interconnected Surface Water Monitoring Network

The sustainability indicator for the depletion of ISW due to groundwater pumping is evaluated by monitoring shallow groundwater levels in monitoring wells adjacent to the Salinas River. The ISW monitoring network in the Salinas Valley is based on the approach recommended by the Environmental Defense Fund (EDF, 2018), which uses groundwater elevations as surrogates for streamflow depletion rates. EDF notes that the change in hydraulic gradient between stream stage and surrounding groundwater elevations is representative of variance in interconnection between surface water and groundwater. Thus, monitoring the gradient also monitors interconnection. The gradient will be monitored by measured shallow groundwater elevations.

Table 7-2 and Figure 7-3 show the ISW monitoring network. These shallow monitoring wells were chosen based on proximity to a USGS stream gage or MCWRA River Series measurement site, well depth, and proximity to the Salinas River. Furthermore, the wells are also located near locations of ISW determined by the SVIHM. This allows for monitoring of groundwater elevations near the rivers in the Subbasin and may provide insight on the relationship between streamflow and groundwater elevations. Additionally, the combined use of groundwater elevation and streamflow data will allow SVBGSA to assess temporal changes in conditions due to variations in stream discharge and regional groundwater extraction. This can also help evaluate other factors other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water as discussed in Chapter 8. All ISW monitoring wells are RMS and 2 of these wells are also RMS for the groundwater level sustainability indicator.

Following the 2022 GSP, SVBGSA installed a new ISW well indicated with an asterisk in Table 7-2. For simplicity, these new wells will also be referred to as RMS wells although they do not have SMC yet.

Table 7-2. Shallow Wells in the ISW Monitoring Network

State Well Number	SGMA Site Code	Local Well Designation	Well Use	Total Well Depth (feet)	Latitude (NAD 83)	Longitude (NAD 83)
19S/07E-14H01	362815N1211715W001	25033	Irrigation	200	36.28154	-121.17159
20S/08E-25Q01	361567N1210522W001	2595	Irrigation	80	36.15673	-121.05223
21S/09E-16E01	361067N1210108W001	555	Irrigation	100	36.10674	-121.01084
23S/10E-14D01	359362N1208661W001	SArdoS19450	Observation	142	35.93624	-120.86607
24S/11E-05Q01*	N/A	UV-ISW-1	Observation	90	35.86420	-120.80631
21S/10E-31R02*	N/A	UV-ISW-2	Observation	40	36.05442	-120.92233

Note: Asterisk symbolizes new monitoring wells that do not have SGMA Site Codes because RMS wells must have established SMC to be entered into SGMA Portal.

N/A = Not available

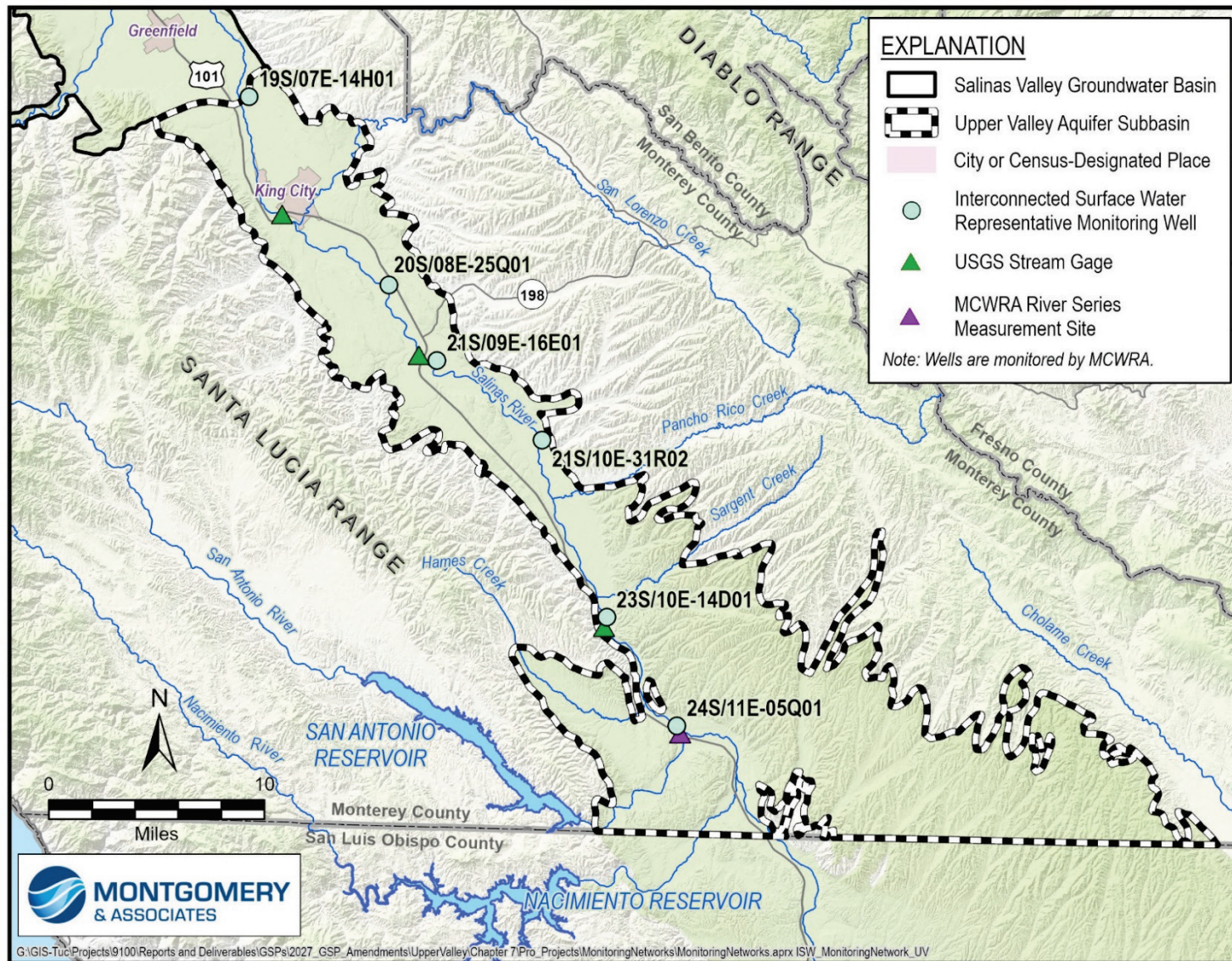


Figure 7-3. ISW Monitoring Network

7.6.1 Interconnected Surface Water Monitoring Protocols

Monitoring protocols for shallow wells monitoring ISW will be identical to MCWRA's groundwater elevation monitoring protocols, included in Appendix 7A. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4. The SVBGSA recently installed 2 ISW monitoring wells that are both equipped with a datalogger that allow SVBGSA to access if seasonal pumping is resulting in streamflow depletions.

7.6.2 Interconnected Surface Water Data Gaps

There are no data gaps in the ISW monitoring network in the Upper Valley Subbasin.

7.7 Other Monitoring Networks

The following monitoring networks are needed in addition to the monitoring networks outlined above for sustainability indicators. S These include monitoring of GDEs at identified locations throughout the Subbasin, as well as monitoring and reporting of annual groundwater extractions and surface water diversions, which are required under SGMA to document total water use within the Subbasin.

7.7.1 Groundwater Dependent Ecosystems Monitoring Network

Central Coast Wetlands Group will monitor and assess GDEs to detect if their conditions are declining. When such declines in condition are detected, the GDE must be flagged for further investigation into the root cause of the decline to determine if it is related to groundwater management activities. For the purposes of GDE monitoring in the Salinas Valley, ecosystem condition is primarily defined through vegetation health and vigor since this metric can be most readily tied to groundwater conditions. If groundwater levels are lowered below a depth that vegetation roots can access, a decline in vegetation vigor due to the loss of the water source would be an expected result and defined as an adverse impact.

7.7.1.1 Groundwater Dependent Ecosystems Monitoring Protocols

The GDE monitoring methodology uses a 2-pronged approach including an annual desktop-based component and a 5-year interval field-based component. A change in GDE vegetation vigor could be related to many factors, so a subsequent hydrogeological analysis is required to investigate groundwater level trends around potential GDEs to understand if GDE health is related to groundwater management.

7.7.1.2 Groundwater Dependent Ecosystems Monitoring Data Gaps

There are no GDE monitoring data gaps in the Upper Valley Subbasin.

7.7.2 Groundwater Extraction Monitoring Network

MCWRA's GEMS is part of the GMP used to monitor extraction in the Salinas Valley. Monthly extractions for agricultural and urban water use are reported annually to MCWRA pursuant to MCWRA Ordinance No. 5426. Urban water use includes larger public water systems and industrial water use. Historically, most pumping in the Salinas Valley was only reported for Zones 2, 2A, and 2B, which only overlapped with roughly half of the Subbasin as depicted on Figure 3-3. Starting in WY 2025, groundwater pumping was reported for the entirety of the Subbasin. Additionally, small public water systems will be required to report extraction starting in WY 2026. Extraction is self-reported by well owners or operators on a WY basis (October 1 to September 30).

SVBGSA will work with MCWRA to obtain the GMP data through a coordinated reporting program such that well owners can provide a single annual reporting to fulfill the requirements of both the GSP and the existing MCWRA Ordinance 5426.

SVBGSA prepared an estimate of rural domestic pumping across the Valley. Rural domestic pumping is estimated using the number of drinking water connections based on data compiled for water systems and 2024 Monterey County parcel data. After estimating the number of connections, the connections were multiplied by a constant value 0.35 AF/yr per connection across all subbasins to estimate water use. This constant was verified using reported urban pumping to assess the accuracy of the connections and water use estimates. This estimate will be revised during GSP implementation based on the results of MCWRA well registration and GMP reporting. Once all non-de minimis extractors are reporting through GEMS, the estimates will be replaced with reported data.

7.7.2.1 Groundwater Extraction Monitoring Protocols

Groundwater extraction monitoring is accomplished using the GMP data provided by MCWRA.

7.7.2.2 Groundwater Extraction Monitoring Data Gaps

Accurate assessment of the amount of pumping requires an complete account of the number of municipal, agricultural, and domestic wells in the GSP area. As discussed in Chapter 3, MCWRA has an ongoing well registration program to catalogue existing and active groundwater wells, including their locations, depths, and whether the well is active, abandoned, or destroyed.

The accuracy and reliability of groundwater pumping reported through the GMP is constantly being updated. SVBGSA will continue to work with MCWRA to assure data quality control

7.7.3 Salinas River Watershed Diversions

Salinas River watershed monthly diversion data are collected annually by SWRCB. Prior to WY 2025, the SWRCB used eWRIMS which has been replaced with CalWATRS. CalWATRS is used to track information of water rights in the state on a WY basis and is publicly accessible at <https://calwatrs.waterboards.ca.gov/portal/s/search-information>. These data include diversions from the Salinas River and its tributaries.

These data are used in the Annual Reports to account for surface water use in the Salinas Valley. However, many stakeholders have noted that a portion of the agricultural water use in the Valley has been reported to MCWRA as groundwater extraction and to the SWRCB as surface water diversions as mentioned in Chapter 3. To help reduce any potential double-counting in the Annual Reports, the GMP requires every well owner or well operator reporting groundwater extraction to the SWRCB to report that same information to MCWRA and indicate whether those data are reported to both agencies.

7.7.3.1 Salinas River Watershed Diversions Monitoring Protocols

Salinas River watershed diversion monitoring protocols are those that the SWRCB has established for the collection of water right information. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.7.3.2 Salinas River Watershed Diversions Monitoring Data Gaps

There are no data gaps in the Salinas River watershed diversion monitoring network in the Upper Valley Subbasin.

7.8 Data Management System and Data Reporting

The SVBGSA has developed a DMS in adherence to GSP Regulations §352.6 and §354.40 that is used to store, review, and upload data collected as part of the GSP development and implementation.

The SVBGSA DMS consists of 2 SQL databases. The HydroSQL database stores information about each well and timeseries data for water level and extraction. Fields in the HydroSQL database include:

- Subbasin
- Cadastral coordinates
- Planar coordinates
- Well owner

- Well name
- Well status
- Well depth
- Screened interval top and bottom
- Well type
- Water level elevation
- Annual pumping volume

Well owner and annual pumping information will be stored in HydroSQL, however, neither will be publicly accessible due to confidentiality requirements. Real-time streamflow data for USGS gages is automatically uploaded to the HydroSQL database via a live link to the USGS website.

Water quality data are stored in the EnviroData SQL database, which is linked to the HydroSQL for data management purposes. EnviroData SQL contains fields such as:

- Station
- Parameter
- Sample Date
- Detection (detect or non-detect)
- Value
- Unit

The data used to populate the SVBGSA DMS are listed in Table 7-3. Categories marked with an X indicate datasets that are used in populating the DMS, including data that are publicly accessible or that are available to SVBGSA from MCWRA. Some data—such as groundwater extraction—is confidential and cannot be made publicly accessible by SVBGSA unless aggregated, and additional datasets like recharge or diversion data will be added in the future as appropriate.

Table 7-3. Datasets Available for Use in Populating DMS

Data Category						
Data Sets	Well and Site Information	Well Construction	Water Level	Pumping ¹	Streamflow	Water Quality
MCWRA	X	X	X	X		
GAMA Groundwater Information System (DDW)	X					X
CCRWQCB (GQTM)						X
USGS Gage Stations					X	

¹ Pumping data not publicly accessible

Data were compiled and reviewed to comply with quality objectives. The review included the following checks:

- Removing or flagging questionable data being uploaded in the DMS. This includes identifying outliers that may have been introduced during the original data entry process and plotting each well hydrograph to identify and remove anomalous data points.
- Loading into the database and checking for errors and missing data.

To satisfy the requirements of the SGMA regulations, well log information is entered for selected wells and other information will be added as it is acquired.

The DMS includes a publicly accessible web map hosted on the SVBGSA website; accessible at <https://svbgsa.org/gsp-web-map-and-data/>. This web map allows users to visualize and interact with the data stored in the DMS. The web map provides interested parties with access non-confidential technical information used in the development of the GSP and annual reports, and includes public well data and analysis such as water level contour maps and various local administrative boundaries. In addition, the web map has functionalities to be able to graph timeseries of water levels and search for specific wells in the database. This web map is regularly updated as new information is made available to the SVBGSA.

8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management and establishes minimum thresholds, measurable objectives, and undesirable results for each sustainability indicator. The minimum thresholds, measurable objectives, and undesirable results detailed in this chapter define how the Subbasin's sustainability is measured, informing the PMAs that may be needed to achieve these criteria. This chapter includes adequate data to explain how SMC were developed and how they influence all beneficial uses and users.

The chapter is structured to address all the GSP Regulations § 354.22 *et. seq.* regarding SMC. To retain an organized approach, the SMC are grouped by each sustainability indicator. The discussion follows a consistent format that contains all the information required by the GSP Regulations, and as further clarified in the SMC BMP (23 California Code of Regulations § 352.22 *et seq.*; DWR, 2017).

8.1 Definitions

Key terms relevant to the SMC are repeated from the SGMA legislation and GSP Regulations below. When there is no definition in the Regulations, additional explanatory text is added.

- **Sustainability indicator** refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). The 5 sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; and depletion of ISW.
- **Significant and Unreasonable** is not defined in the Regulations. However, the definition of undesirable results states, “Undesirable results occur when significant and unreasonable effects ... are caused by groundwater conditions....” This GSP adopts the phrase significant and unreasonable to be the qualitative description of undesirable conditions due to inadequate groundwater management. Minimum thresholds are the quantitative measurement of the significant and unreasonable conditions.
- **Minimum threshold** refers to numeric value(s) for each sustainability indicator used to define undesirable results. Minimum thresholds are indicators of an unreasonable condition.
- **Measurable objective** refers to specific, quantifiable goal(s) for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin. Measurable objectives are goals that the GSP is designed to achieve for each sustainability indicator.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of 5 years, set by an Agency as part of a Plan. Interim milestones are targets such as groundwater elevations that will be achieved every 5 years to demonstrate progress toward the sustainability goal.
- **Undesirable Result** is not defined in the Regulations. However, the description of undesirable result states that it should be a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the subbasin. An example undesirable result is more than 10% of the measured groundwater elevations being lower than the minimum thresholds. Undesirable results should not be confused with significant and unreasonable conditions. Significant and unreasonable conditions are qualitative descriptions of conditions to be avoided; an undesirable result is a quantitative assessment based on minimum thresholds.

8.2 Sustainability Goal

The sustainability goal of the Upper Valley Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

Several PMAs are included in this GSP and detailed in Chapter 9. It is not necessary to implement all PMAs listed in this GSP to achieve sustainability. However, some combination of these may be implemented throughout the planning and implementation horizon to ensure the Subbasin continues to operate within its sustainable yield and meet the sustainability goal. Chapter 10 describes the prioritized PMAs as of GSP Amendment 2. This portfolio of PMAs provide sufficient options to achieve sustainability in the Upper Valley Subbasin throughout GSP implementation.

The PMAs are designed to achieve sustainability for the next 20 years by one or more of the following means:

- Educating stakeholders and prompting changes in behavior to improve chances of achieving sustainability
- Increasing awareness of groundwater pumping impacts to promote voluntary reductions in groundwater use through improved water use practices or fallowing crop land
- Increasing basin recharge
- Developing new alternative water supplies for use in the Subbasin to offset groundwater pumping

8.3 Achieving Long-Term Sustainability

The GSP addresses long-term groundwater sustainability. Correspondingly, the SVBGSA has developed SMC to avoid undesirable results under future hydrologic conditions. The understanding of future conditions is based on historical precipitation, ET, streamflow, and reasonable anticipated climate change, which have been estimated based on the best available climate science (DWR, 2018). These parameters underpin the estimated future water budget over the planning horizon (see Section 6.4). The average hydrologic conditions include reasonably anticipated wet and dry periods. Groundwater conditions that are the result of extreme climatic conditions and are worse than those anticipated do not constitute an undesirable result. However, SMC may be modified in the future to reflect observed future climate conditions.

The GSA tracks hydrologic conditions as an ongoing GSP implementation activity. These observed hydrologic conditions are used to develop values for average hydrologic conditions, which are compared to predicted future hydrologic conditions. This information will be used to interpret the Subbasin's performance against SMC. The intent of this GSP is to avoid undesirable results by employing long-term, deliberate groundwater management, not with continual micro-management. For example, groundwater extractions may experience variations caused by reasonably anticipated hydrologic fluctuations. However, under average hydrologic conditions, and GSP PMAs consider these factors. Because the GSP addresses long-term groundwater sustainability, exceedance of some SMC during an individual year does not constitute an undesirable result by itself. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), "Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." Therefore, groundwater levels may temporarily fall below minimum thresholds during prolonged droughts, which could be more extreme than those that have been anticipated based on historical data and anticipated climate change conditions. Such temporary exceedances do not constitute an undesirable result.

The SMC presented in this chapter are developed based on historically observed hydrologic conditions and, in most cases, reasonably anticipated climate change. These SMC may be updated in future amendments to reflect changes in anticipated climate conditions and climate change based upon groundwater modeling results or changes in anticipated monitoring trends.

8.4 General Process for Establishing Sustainable Management Criteria

The SMC presented in this chapter were developed using publicly available information during development of the original GSP and subsequent amendments. The process has included

feedback gathered during public meetings, hydrogeologic analysis, and coordination with other agencies. The general process included:

- Presenting to the Upper Valley Subbasin Committee on the general SMC requirements and implications. These presentations outlined the approach to developing SMC and discussed initial SMC ideas.
- Providing supplemental data to the subbasin committee to guide the approach to setting SMC.
- Polling and receiving feedback from the subbasin committee to establish preferences for establishing SMC.
- Obtaining additional input on SMC from GSA staff and GSA Board Members.
- Modifying minimum thresholds and measurable objectives based on input from the public, GSA staff, and GSA Board Members, as needed.

During GSP Amendment 1, the process included:

- Presenting to the Subbasin Committee on the general SMC requirements and implications. These presentations outlined the original approach to developing SMC.
- Presenting to the Subbasin Committee on lessons learned on SMC since 2020, including DWR's review and assessment of the original Salinas Valley GSPs. Amendment 1 incorporates DWR's suggested corrective actions into the SMC where appropriate.
- Discussions on updates to the approach to SMC in the GSP Amendments and receiving feedback from the Subbasin Committees and public.
- Modifying SMC approach for the storage and ISW SMC based on input from the Subbasin Committee and Board approval of the amendments.
- Receiving public comments on the GSP Amendment SMC updates, and discussing public comments with the Subbasin Committee and Board.
- Considering the preferred portfolio of PMAs to be able to achieve SMC within SGMA timeframes.¹

The SMC presented in this chapter are intended to address GSP Regulations, not other laws and regulations; however, they are developed so as to be compatible with existing laws.

8.5 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the SMC for each of the 5 sustainability indicators. Measurable objectives are the goals that reflect SVBGSA's desired groundwater conditions in the Subbasin for each sustainability indicator. The measurable objectives provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. An undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole. This GSP is designed to not only avoid undesirable results, but to achieve the sustainability goals within 20 years, along with interim milestones every 5 years to demonstrate progress. The preferred portfolio of PMAs is selected to maintain conditions above minimum thresholds or reach the measurable objectives within 20 years and maintaining those conditions for 30 years for all 5 sustainability indicators. Chapter 9 also includes contingency PMAs to provide sufficient options for reaching and maintaining sustainability as defined by the SMC. The rationale and background for developing these criteria are described in detail in the following sections.

Minimum thresholds are selected to avoid undesirable results for other sustainability indicators. The SMC presented in Table 8-1 are part of the GSA's 50-year management plan: SGMA allows for 20 years to reach sustainability and requires the Subbasin have no undesirable results for the subsequent 30 years.

Table 8-1. Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Chronic lowering of groundwater levels	Measured through groundwater elevation representative monitoring well network.	Minimum thresholds are set to 5 feet below the lowest groundwater elevation between 2012 and 2016 at each representative monitoring well. See Table 8-2.	Measurable objectives are set to 2011 groundwater elevations.	More than 15% of groundwater elevation minimum thresholds are exceeded.
Reduction in groundwater storage	Measured by proxy through groundwater level representative monitoring well network.	Minimum thresholds are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical the chronic lowering of groundwater levels minimum thresholds.	Measurable objectives are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives are identical to the chronic lowering of groundwater levels measurable objectives.	More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.
Degraded groundwater quality	Groundwater quality data downloaded annually from GAMA groundwater information system for DDW wells and requested annually from CCRWQCB for ILP wells.	Minimum thresholds are zero additional exceedances of the regulatory drinking water standards or the Basin Plan objectives for groundwater quality constituents of concern. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells. See Table 8-4	Measurable objectives are identical to the minimum threshold.	Future or new minimum thresholds exceedances are caused by a direct result of extraction or GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction, unless minimum threshold exceedances are managed to provide a water supply (i.e. treated, blended, or replaced) or beneficial users are not potentially harmed.
Land subsidence	Measured using DWR provided InSAR data.	Minimum threshold is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors.	Measurable objective is identical to the minimum threshold, resulting in zero net long-term subsidence.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations.
Depletion of interconnected surface water	Groundwater elevations in shallow wells adjacent to locations of ISW identified using the SVIHM.	Minimum thresholds are established by proxy using shallow groundwater elevations observed in 2016 near locations of ISW.	Measurable objectives are established by proxy using shallow groundwater elevations observed in 2011 near locations of ISW.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring wells used to monitor ISW.

8.6 Chronic Lowering of Groundwater Levels SMC

8.6.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable groundwater elevations in the Subbasin are those that:

- Are at or below the observed groundwater elevations during the 2012 to 2016 drought. Public and stakeholder input identified these historical groundwater elevations as significant and unreasonable
- Cause significant financial burden to local agricultural interests
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined during development of the original GSP. During GSP development, the Subbasin Committee opted to establish minimum thresholds 5 feet below the levels identified as significant and unreasonable. This was done to ensure a minimum 5-foot span between the minimum threshold and measurable objective to provide operational flexibility. Setting the minimum threshold at the observed low would have pushed measurable objectives to an unreasonably high groundwater level, based on historical hydrographs, as shown in Appendix 5A. Therefore, the minimum threshold was lowered to provide operational flexibility. The goal is still to reach the measurable objective.

8.6.2 Minimum Thresholds

The minimum thresholds for chronic lowering of groundwater levels are set to 5 feet below the lowest groundwater elevation between 2012 and 2016 at each representative monitoring well.

Since there is very little fluctuation in groundwater elevations for most wells in the Upper Valley, the 5-foot buffer helps allow for operational flexibility and provides a better threshold for distinguishing minimum thresholds. The minimum threshold values for each well within the groundwater level monitoring network are provided on Figure 8-1. The minimum threshold contour maps, along with the RMS well locations for the single principal aquifer in the Upper Valley Subbasin, are shown on Figure 8-1.

The tables and maps shown below do not include the 5 new monitoring wells SVBGSA added to the monitoring network in 2025. Once these wells have approximately 5 years of groundwater elevation measurements, SMC will be established for each and will be documented through annual reports. When the new RMS wells have established SMC, the contours will be extended into the southern half of the Subbasin.

Table 8-2. Chronic Lowering of Groundwater Levels Minimum Thresholds and Measurable Objectives

Monitoring Site	Minimum Threshold (feet)	Measurable Objective (feet)
19S/07E-14N02	187.7	232.6
19S/08E-19K03	215.5	256.1
20S/08E-05R03	223.6	267.8
20S/08E-14K01	261.6	297.8
20S/08E-15H03	253.7	297.1
20S/08E-25Q01	307.3	312.3
20S/08E-34G01	362.1	381.8
21S/08E-13H01	387.9	397.1
21S/09E-06F50	316.1	325.9
21S/09E-16E01	333.9	343.6
21S/09E-24L01	361.0	370.7
21S/10E-32N01	375.6	385.7
22S/10E-09P01	380.9	399.0
22S/10E-16K01	372.4	397.7
22S/10E-34G01	423.4	428.5

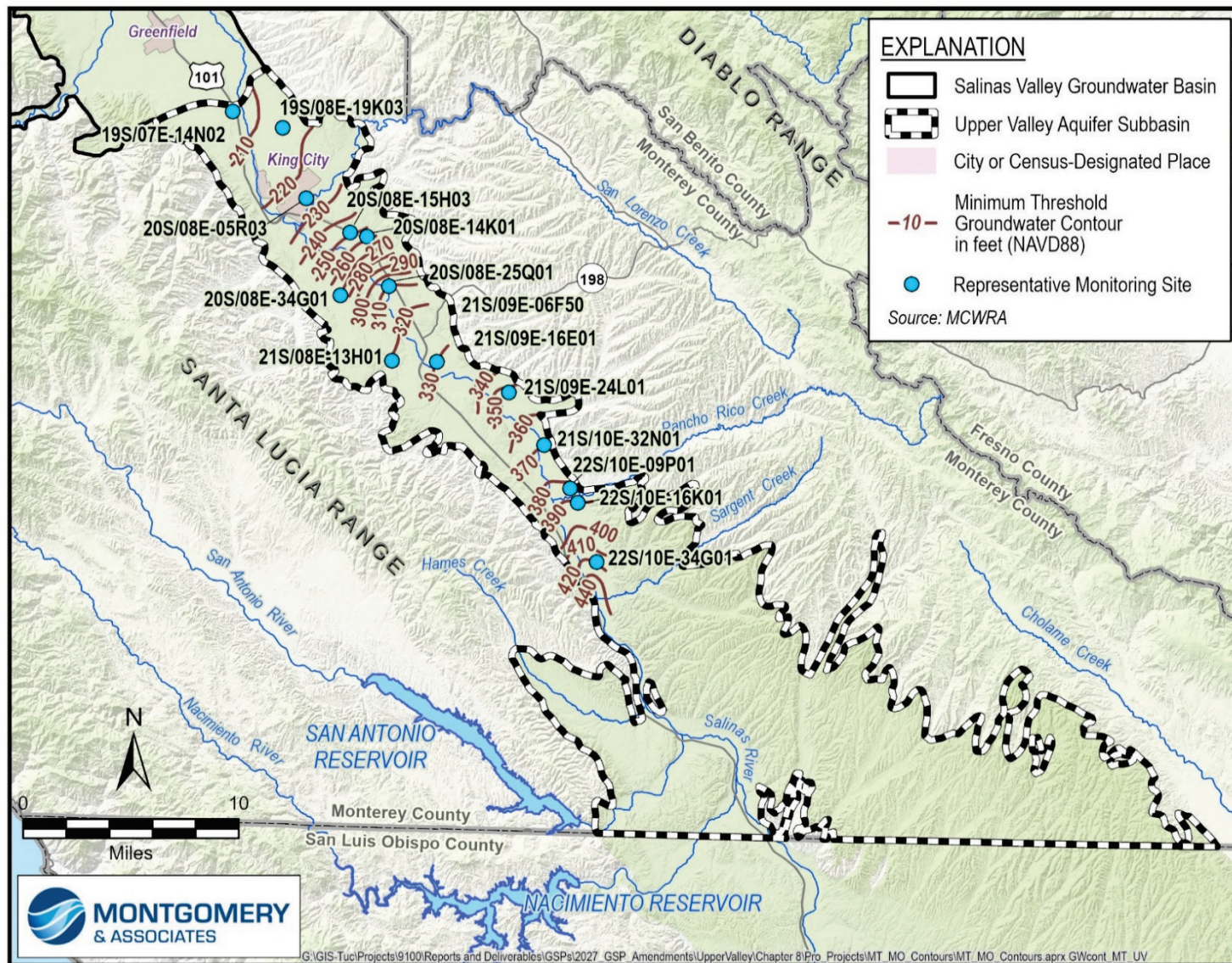


Figure 8-1. Groundwater Level Minimum Threshold Contour Map

8.6.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The development of both minimum thresholds and measurable objectives followed similar processes, which is described in this section. The information used includes:

- Feedback from discussions with the Subbasin Committee on challenges and goals
- Historical groundwater elevation data and hydrographs from wells monitored by the MCWRA
- Maps of GSP baseline and historical groundwater elevation data
- Analysis of the impact groundwater elevations on domestic wells

The following were general steps for developing minimum thresholds and measurable objectives during development of the original GSP included the following:

1. SVBGSA presented options to the Subbasin Committee and recommended an approach and criteria to set the groundwater level minimum thresholds and measurable objectives, which was approved by the Board through GSP adoption. SVBGSA used MCWRA's average groundwater elevation change hydrographs to select representative years that could define minimum thresholds and measurable objectives for the Subbasin. Groundwater elevations like those experienced during the representative climatic cycle between 1967 and 1998 were used to identify minimum thresholds and measurable objectives to ensure that they were achievable under reasonably expected climatic conditions. This representative period corresponds to important water management milestones for the Salinas Valley; WY 1967 marks the beginning of operations at San Antonio Reservoir. CSIP began operating in 1998.
2. The average groundwater elevation change hydrograph with minimum threshold and measurable objective lines for the Upper Valley Subbasin. The groundwater elevations during the 2012 to 2016 drought in the Upper Valley Subbasin are the lowest groundwater elevations seen in the Subbasin and are considered significant and unreasonable. The minimum thresholds were therefore set to 5 feet below the lowest groundwater elevation between 2012 and 2016. The measurable objective is set to 2011 groundwater elevations, which is an achievable goal for the Subbasin under reasonably expected climatic conditions shown on Figure 8-2. Additionally, average 2011 groundwater elevations are similar to those average groundwater elevations experienced during the representative climatic cycle.
3. SVBGSA identified the appropriate minimum thresholds and measurable objectives on the respective monitoring well hydrographs. Each hydrograph was visually inspected to check if the minimum threshold and measurable objective was reasonable. If an RMS did

not have measurements from the minimum threshold or measurable objective years, the SMC were interpolated from the groundwater elevation contours. The RMS location was intersected with groundwater elevation contour maps to estimate the initial minimum thresholds and measurable objectives. Moreover, if the SMC seemed unreasonable for an RMS, they were adjusted based on historical water levels and on groundwater elevation trends seen in surrounding wells. The interpolated or adjusted minimum thresholds and measurable objectives are indicated by an asterisk in Table 8-2.

Hydrographs with well completion information showing minimum thresholds for each RMS are included in Appendix 5A.

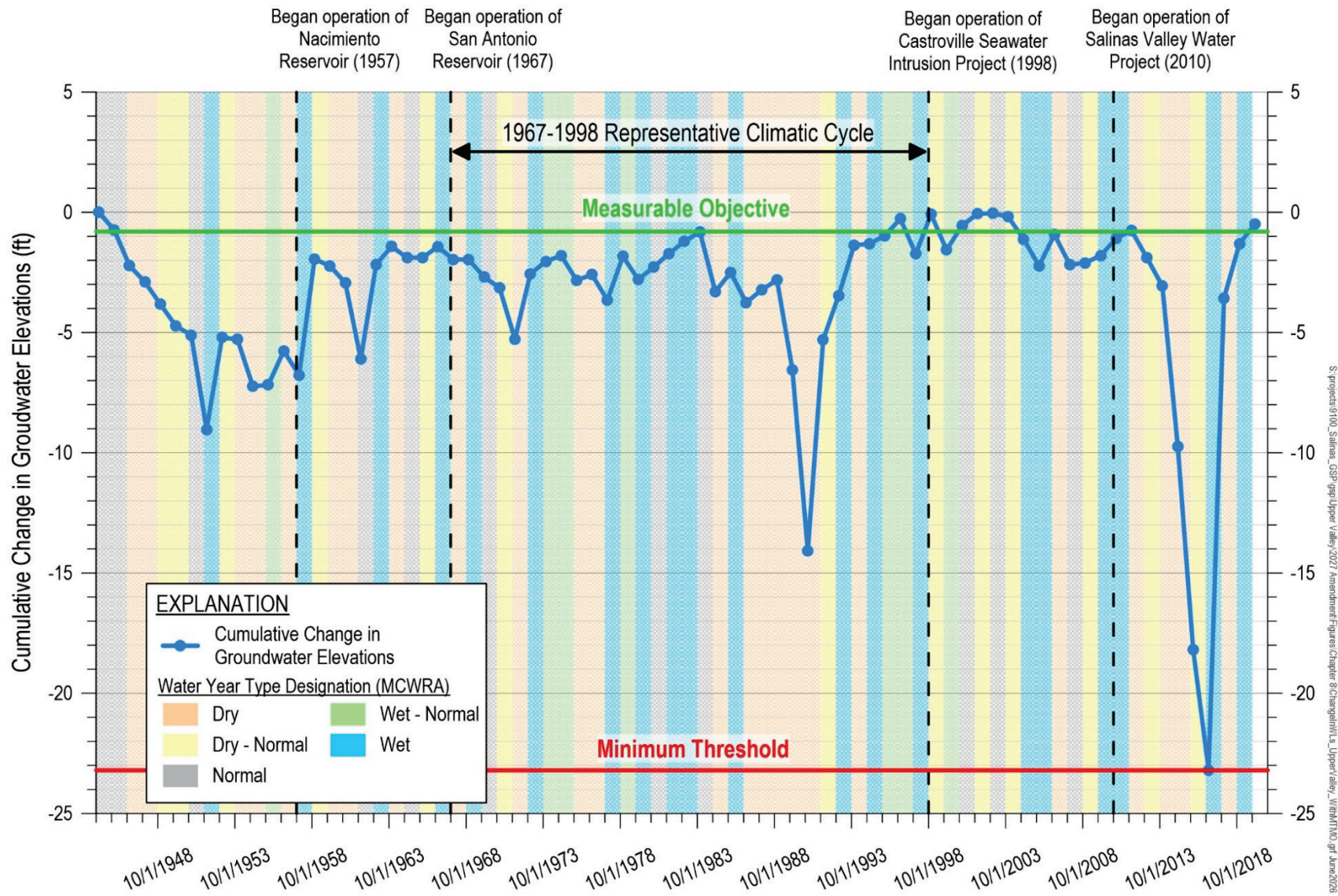


Figure 8-2. Cumulative Groundwater Elevation Change Hydrograph with Selected Minimum Threshold and Measurable Objective for the Upper Valley Subbasin

8.6.2.2 Minimum Thresholds Impact on Domestic Wells

SVBGSA assessed the Human Right to Water with respect to the groundwater level SMC through a domestic well analysis. An analysis was completed using MCWRA well database, which includes 27 active domestic wells. Of these, 10 wells had construction information and were used to compare to the minimum thresholds. All 10 domestic wells will have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds; and will also have at least 25 feet of water in them when measurable objectives are achieved. If more wells with construction information are registered, the assessment may be redone.

The depth to water is derived from a smoothly interpolated groundwater elevation contour map and a digital elevation model of land surface elevation. Such regional interpolation maps are the best estimate of the groundwater elevations between measured points in the subbasin; however, site-specific groundwater elevations may not match it precisely. Uncertainty in the regional map may result in discrepancies in groundwater elevations at the selected domestic wells.

For the other SVBGSA subbasins, a similar analysis was conducted using the domestic wells included in DWR's OSWCR database. Of the 145 domestic wells, only 4 wells had accurate location information. However, none of these wells were located within areas that overlap with the minimum threshold or measurable objective contours. Therefore, the analysis could not be completed for the Upper Valley Subbasin using the available OSWCR data.

8.6.2.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

SVBGSA compared minimum thresholds between RMS to understand the relationship between RMS wells (i.e., describe why or how a groundwater level minimum threshold set at a particular RMS is similar to or different from groundwater level thresholds in nearby RMS). The minimum thresholds are unique at every well, but when combined represent a reasonable and potentially realistic groundwater elevation map. Because the underlying groundwater elevation map is a reasonably achievable condition, the individual minimum thresholds at RMS wells do not conflict with each other.

Groundwater level minimum thresholds are set to avoid undesirable results for other sustainability indicators. Relationships between groundwater level minimum thresholds and the other sustainability indicators are:

- **Reduction in groundwater storage.** The chronic lowering of groundwater levels minimum thresholds are identical to the groundwater storage minimum thresholds. Thus, the groundwater level minimum thresholds will not result in an undesirable loss of groundwater storage.

- **Degraded water quality.** The chronic lowering of groundwater levels minimum threshold could affect groundwater quality through 2 processes:
 1. Changes in groundwater elevation could change groundwater gradients, which could cause poor quality groundwater to flow toward production and domestic wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold groundwater levels do not directly lead to a significant and unreasonable degradation of groundwater quality in production and domestic wells.
 2. Decreasing groundwater elevations may mobilize COC that are concentrated at depth, such as arsenic. The groundwater level minimum thresholds are near historical lows at the start of SGMA. Therefore, any depth dependent constituents have previously been mobilized by historical groundwater levels. Maintaining groundwater elevations above the minimum thresholds is intended to assure that no new depth dependent constituents of concern are mobilized and are therefore protective of beneficial uses and users.
- **Land subsidence.** The chronic lowering of groundwater levels minimum thresholds are set at or above recent low groundwater elevations. Thus, avoiding the dewatering and compaction of clay-rich sediments that causes subsidence in response to lowering groundwater elevations. Where groundwater levels are consistently below minimum thresholds, such as in the Deep Aquifers, land subsidence is a risk.
- **Depletion of ISW.** The chronic lowering of groundwater levels minimum thresholds are lower than recent groundwater elevations, which could cause significant and unreasonable depletion rates if groundwater elevations near interconnected water bodies fall to the groundwater level minimum threshold. However, stakeholders locally defined significant and unreasonable conditions differently for chronic lowering of groundwater levels and depletion of ISW due to groundwater use. The groundwater level minimum threshold is set to provide operational flexibility across the entire Subbasin, not just near locations of ISW. Therefore, the minimum threshold for ISW will govern acceptable groundwater elevations in monitoring wells adjacent to surface water bodies.

8.6.2.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Upper Valley Subbasin has 2 neighboring subbasins. The Forebay Subbasin is within the SVBGSA jurisdiction to the north and the Paso Robles Area Subbasin is a neighboring subbasin to the south that lies outside of SVBGSA jurisdiction.

The SVBGSA is one of the coordinating GSAs for the adjacent Forebay Subbasin. Because SVBGSA's jurisdiction includes both these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for the 2 subbasins. Both the

Upper Valley and Forebay Subbasin GSPs (January 2022) were approved by DWR. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasin's GSP to ensure that these minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Paso Robles Area Subbasin lies directly to the south of the Subbasin. Because the minimum thresholds in the Upper Valley Subbasin are above historical low groundwater elevations, it is likely that the minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. The SVBGSA will coordinate closely with the Paso Robles Area Subbasin GSAs to ensure that the basins do not prevent each other from achieving sustainability.

8.6.2.5 Effects on Beneficial Users and Land Uses

The groundwater level minimum thresholds may have several effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The groundwater level minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. This may have the effect of limiting the amount of groundwater pumping in the Subbasin and the amount and type of crops that can be grown in the Subbasin. The groundwater level minimum thresholds could therefore limit expansion of the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not under irrigation may become less valuable or converted to another land use because it may be too difficult and expensive to irrigate.
- Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Urban land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin. This may limit urban growth or result in urban areas obtaining alternative sources of water. This may result in higher water costs for urban water system users. Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Domestic land uses and users. The groundwater level minimum thresholds are intended to protect most domestic wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic

wells. However, domestic wells may become dry, if they are shallow, groundwater elevations in their vicinity are very low, or pump capacity is low, which may require deeper wells, higher capacity pumps, or joining a water system, if capacity is available. Maintaining groundwater levels above historical lows also helps prevent problems associated with elevations below well screens, such as mechanical damage to wells such as cavitation, reduced pump efficiency, and microbial growth. Additionally, the groundwater level minimum thresholds may limit the number of new domestic wells that can be drilled to limit future declines in groundwater elevations caused by more domestic pumping.

Ecological land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations. Maintaining groundwater levels above historical lows helps protect GDEs whose rooting depths may be exceeded at deeper levels.

8.6.2.6 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater levels.

8.6.2.7 Method for Quantitative Measurement of Minimum Thresholds

Groundwater level minimum thresholds will be directly measured from the representative monitoring well network. The groundwater elevation monitoring will be conducted according to the monitoring plan outlined in Chapter 7. Furthermore, the groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Regulations.

As noted in Chapter 7, the groundwater level representative monitoring network in the Subbasin includes 20 wells as of GSP Amendment 1. This includes 5 new monitoring wells that are not discussed in Chapter 8 because they do not have established SMC yet.

8.6.3 Measurable Objectives

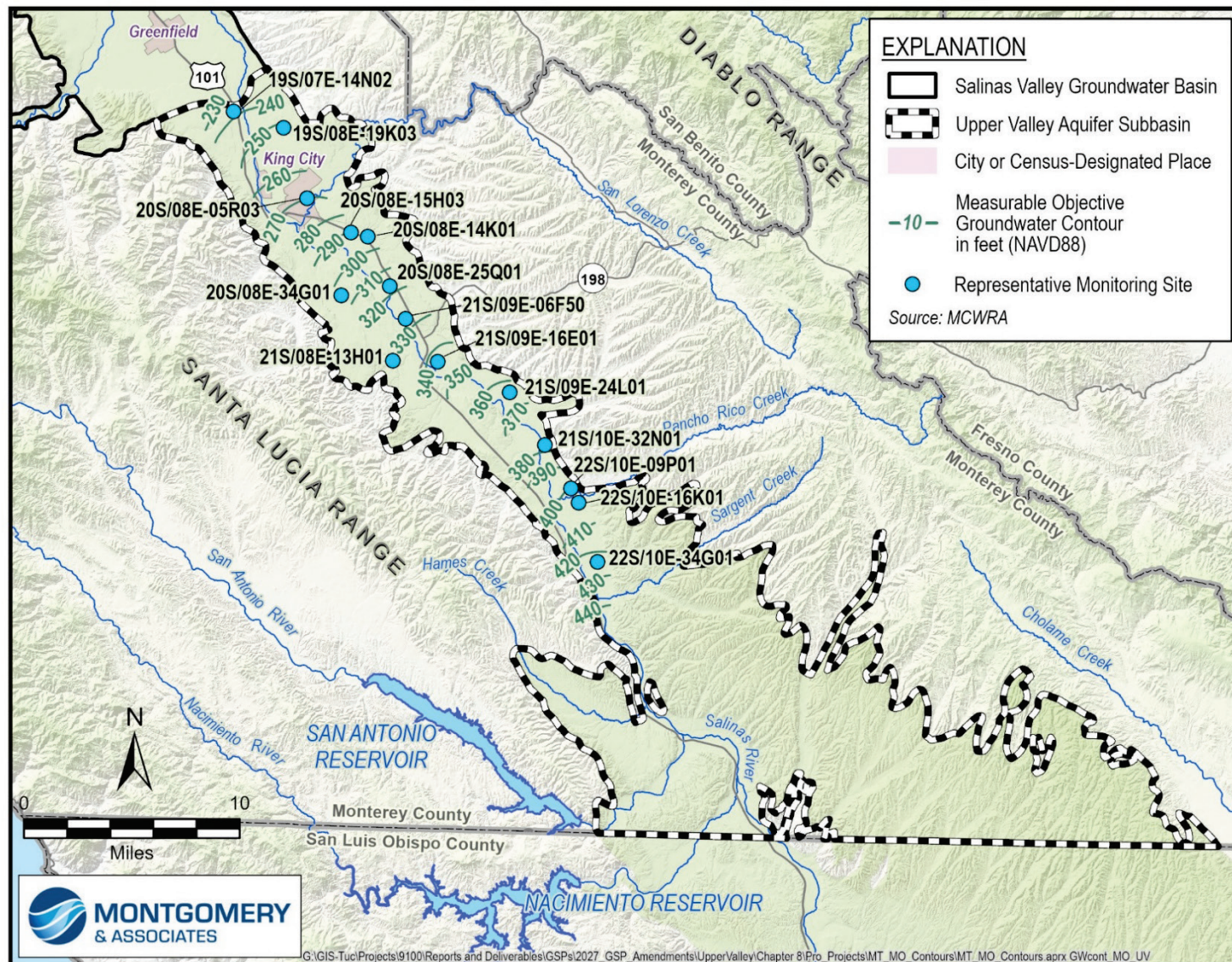
The measurable objectives for chronic lowering of groundwater levels represent target groundwater elevations that are higher than the minimum thresholds, but still reasonably achievable given historical levels. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability.

The measurable objectives for the chronic lowering of groundwater levels are set to 2011 groundwater elevations.

The measurable objectives are summarized in Table 8-2 and are also shown on the hydrographs for each RMS in Appendix 5A.

8.6.3.1 Methodology for Setting Measurable Objectives

The methodology for establishing measurable objectives is described in detail in Section 8.6.2.1. A year from the relatively recent past was selected for setting measurable objectives to ensure that objectives are achievable. Groundwater elevations from 2011 were selected as representative of the measurable objectives for the Upper Valley Subbasin. The measurable objective contour map along with the representative monitoring network wells are shown on Figure 8-3 for the Upper Valley Subbasin. When the new RMS wells have established SMC, the contours will be extended into the southern half of the Subbasin.



8.6.3.2 Interim Milestones

Interim milestones for groundwater levels are shown in Table 8-3. These are only initial estimates of interim milestones. Interim milestones for groundwater levels will be modified as better data, analyses, and project designs become available.

Table 8-3. Chronic Lowering of Groundwater Levels Interim Milestones

Monitoring Site	GSP Baseline Groundwater Elevation (feet) (Fall 2019)	Interim Milestone at Year 2027 (feet)	Interim Milestone at Year 2032 (feet)	Interim Milestone at Year 2037 (feet)	Measurable Objective (feet) (goal to reach at 2042)
19S/07E-14N02	240.7	233.9	233.5	233.0	232.6
19S/08E-19K03	252.4	255.2	255.5	255.8	256.1
20S/08E-05R03	273.6	273.7	273.8	273.8	267.8
20S/08E-14K01	296.5	296.6	296.8	296.9	297.8
20S/08E-15H03	294.3	294.3	294.3	294.2	297.1
20S/08E-25Q01	315.1	314.4	313.7	313.0	312.3
20S/08E-34G01	368.1	372.6	377.1	381.6	381.8
21S/08E-13H01	396.4	397.1	397.1	397.1	397.1
21S/09E-06F50	323.2	323.9	324.6	325.2	325.9
21S/09E-16E01	342.7	342.9	343.1	343.3	343.6
21S/09E-24L01	364.8	365.5	366.3	367.0	370.7
21S/10E-32N01	384.8	385.0	385.2	385.3	385.7
22S/10E-09P01	403.8	402.6	401.7	401.0	399.0
22S/10E-16K01	408.3	408.5	408.7	408.8	397.7
22S/10E-34G01	428.3	428.4	428.4	428.5	428.5

*Groundwater elevation was estimated.

8.6.4 Undesirable Results

8.6.4.1 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

The chronic lowering of groundwater level undesirable result is a quantitative combination of groundwater level minimum threshold exceedances. The undesirable result is:

More than 15% of the groundwater elevation minimum thresholds are exceeded.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater levels minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels

or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

Undesirable results provide flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances provides more flexibility but may lead to significant and unreasonable conditions for some beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces flexibility due to unanticipated hydrologic conditions. The undesirable result was set at 15% to balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty.

Based on the RMS wells that have SMC as of GSP Amendment 1, the 15% limit on minimum threshold exceedances in the undesirable result allows for 2 exceedances in the 15 existing representative monitoring wells; the percentage of minimum threshold exceedances will be adjusted in any given year based on the RMS wells monitored that have SMC set. This was considered a reasonable number of exceedances given the hydrogeologic uncertainty of aquifer characteristics of the Subbasin. As the monitoring system grows, additional exceedances will be allowed.

8.6.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Localized pumping clusters.** Even if regional pumping is maintained within the sustainable yield, clusters of high-capacity wells may cause excessive localized drawdowns that lead to undesirable results.
- **Departure from the GSP’s climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future climatic conditions and groundwater elevations. Departure from the GSP’s climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations and undesirable results.
- **Reservoir operations.** Operation of Nacimiento and San Antonio Reservoirs affect the timing and quantity of surface water flows. This affects groundwater levels in the subbasin both directly from recharge of surface water in the Subbasin and indirectly from subsurface flows after recharge in adjacent subbasins. In addition, surface water redirection at the SRDF, along with recycled water availability, affect CSIP groundwater demand.

- **Subsurface flows with adjacent subbasins.** The Upper Valley Subbasin is hydraulically connected with the Forebay and Paso Robles Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Upper Valley Subbasin.

8.6.4.3 Effects on Beneficial Users and Land Uses

Undesirable results for groundwater levels could have negative effects on beneficial users and land uses. Domestic wells are the most vulnerable due to their shallower depths. Low groundwater levels may result in higher pumping costs, the need to lower well pumps, mechanical problems, microbial contamination, or the need to drill deeper replacement wells. While municipal and agricultural production wells tend to be deeper, their electricity demand and the cost of pumping still increases at lower groundwater levels. Lowering the pump or drilling a deeper well in the same location is not a solution as the levels will only continue to drop, unless it is replaced in a deeper portion of the aquifer. Rural residential domestic users are the most vulnerable, as they tend to have the shallowest wells that are the first to be affected.

8.7 Reduction in Groundwater Storage SMC

8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions in groundwater storage in the Subbasin are those that:

- Lead to chronic, long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined based on input from the Subbasin Committee and discussions with GSA staff.

8.7.2 Minimum Thresholds

The minimum thresholds for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.

Although not the metric for establishing change in groundwater storage, the GSAs are committed to pumping at or less than the Subbasin's long-term sustainable yield. The projected long-term sustainable yield within Chapter 6 is based on the anticipated climate; however, if the climate or other conditions that occur differ, the long-term amount that can be pumped while maintaining stable groundwater level trends may also differ. This will be further analyzed during GSP

implementation as PMAs are refined and modeling is updated to assess groundwater storage effects and benefits. SGMA allows 20 years to reach sustainability.

8.7.2.1 Information and Methodology Used to Establish Minimum Thresholds

Since groundwater storage and groundwater elevation minimum thresholds are identical, the methodology used to establish minimum thresholds for reduction in groundwater storage are detailed in Section 8.6.2.1.

The general relationship between groundwater storage and groundwater elevations is described in greater detail in Chapter 4, Section 4.4.2. The Subbasin-specific data analysis to establish the proxy relationship between groundwater storage and groundwater elevations is discussed below.

The GSP Regulations § 354.28 (d) states that: “an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.”

Figure 8-4 compares the Subbasin’s cumulative change in storage, plotted on the black line, with the average annual change in groundwater elevation, plotted on the blue line. Groundwater elevation change data are derived from the groundwater elevation network; the cumulative change in groundwater storage is derived from the SVIHM. Although the data come from 2 sources, the data show similar patterns between 1998 and 2022. The decrease in storage modeled by the SVIHM from 1983 to 1998 is not reflected in the change in groundwater elevations blue line, because the modeled storage is dependent on the simulated groundwater elevations in the SVIHM.

Figure 8-5 shows a scatter plot of cumulative change in storage and average change in groundwater elevation. The blue data points show data for the entire model period from 1980 to 2022, and the brown data points show data from 1998 to 2022. Although the data for the entire model period demonstrate a weak correlation ($R^2=0.463$), a more significant positive correlation exists between groundwater elevations and the amount of groundwater in storage between 1998 and 2022 ($R^2=0.725$). The correlation for the 1998 to 2022 period is sufficient to show that groundwater elevations are an adequate proxy for groundwater storage.

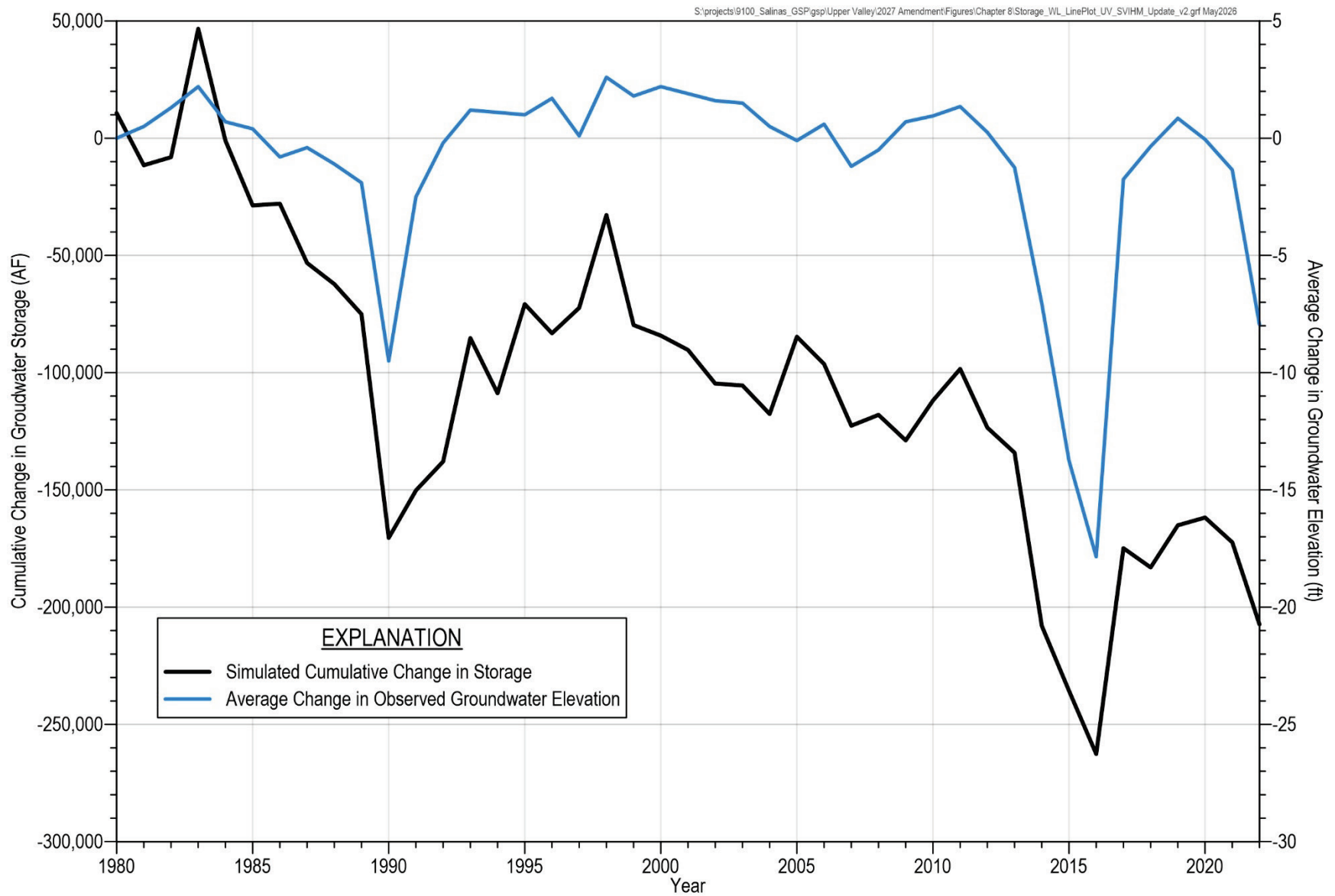


Figure 8-4. Cumulative Change in Storage and Average Change in Groundwater Elevation in the Upper Valley Subbasin

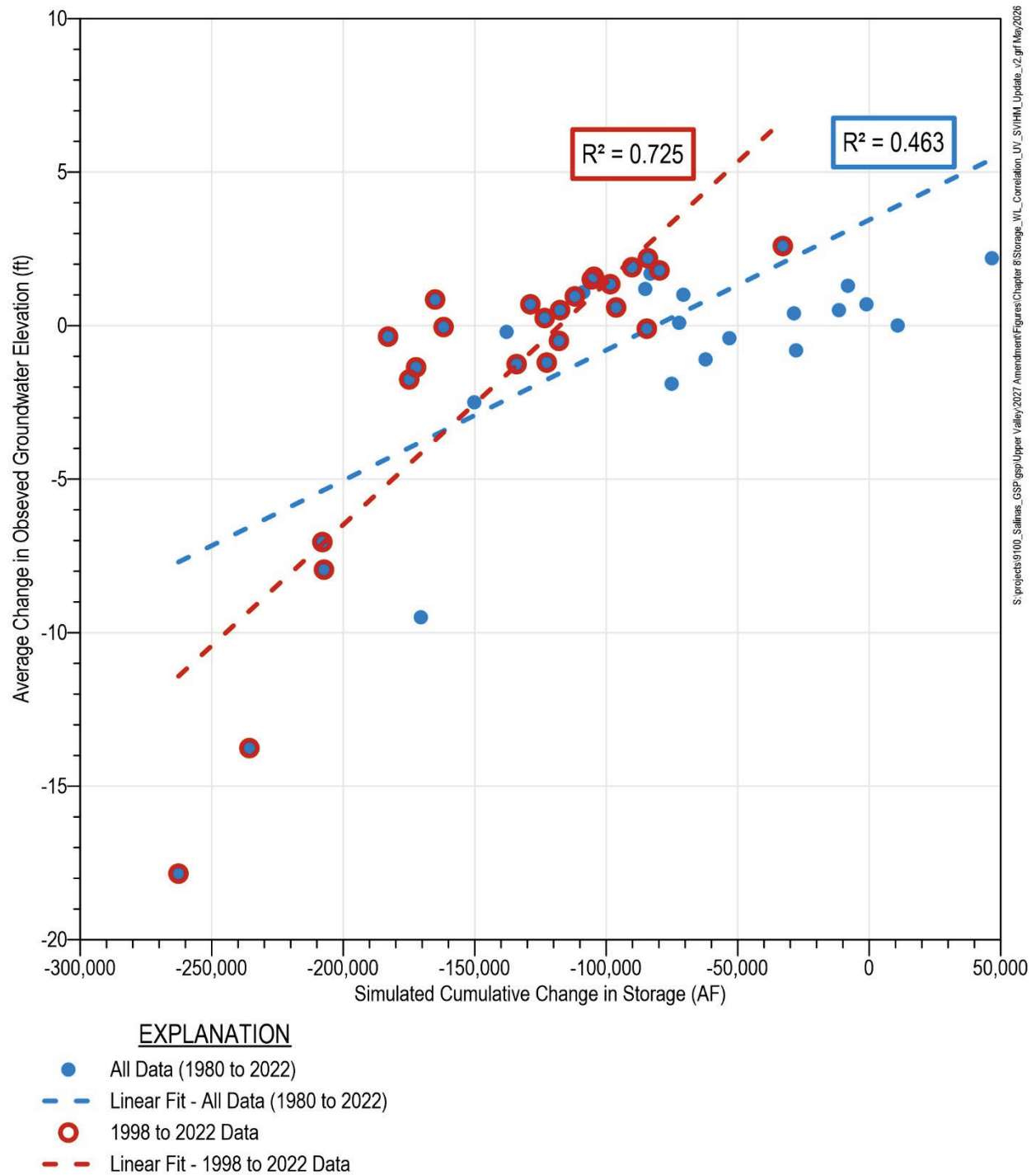


Figure 8-5. Correlation Between Cumulative Change in Storage and Average Change in Groundwater Elevation

8.7.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The groundwater storage minimum thresholds are identical to groundwater level minimum thresholds, which are consistent with other sustainability indicators, as described in Section 8.6.2.3.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Upper Valley Subbasin has 2 neighboring subbasins. The Forebay Subbasin is within the SVBGSA jurisdiction to the north, and the Paso Robles Area Subbasin is a neighboring subbasin to the south that lies outside of SVBGSA jurisdiction.

The SVBGSA is one of the coordinating GSAs for the adjacent Forebay Subbasin. Because SVBGSA's jurisdiction includes both these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for the subbasins. Both the Upper Valley and Forebay Subbasin GSPs (January 2022) were approved by DWR. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this were reviewed relative to information developed for the neighboring subbasin's GSP to ensure that these minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Paso Robles Area Subbasin lies directly to the south of the Subbasin. Because the minimum thresholds in the Upper Valley Subbasin are set to avoid dropping below recent storage levels, it is likely that the minimum threshold will not prevent the neighboring subbasin from achieving or maintaining sustainability. The SVBGSA will coordinate closely with the Paso Robles Area Subbasin GSAs to ensure that the basins do not prevent each other from achieving sustainability.

8.7.2.4 Effect on Beneficial Uses and Users

Because the groundwater storage minimum thresholds are defined based on groundwater level minimum thresholds, the effects of groundwater storage minimum threshold on beneficial uses and users are identical to those described in Section 8.6.2.5. Relation to State, Federal, or Local Standards

8.7.2.5 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

8.7.2.6 Method for Quantitative Measurement of Minimum Threshold

The groundwater level minimum thresholds will be used as proxies for reduction of groundwater storage. Therefore, the measurement of change in groundwater storage will be measured as outlined in Section 8.6.2.7 using the groundwater level monitoring network described in Chapter 7.

8.7.3 Measurable Objectives

The measurable objectives for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives are identical to the chronic lowering of groundwater levels measurable objectives.

8.7.3.1 Methodology for Setting Measurable Objectives

As stated in Section 8.6.3, the groundwater level measurable objectives for chronic lowering of groundwater levels provide an adequate margin of operational flexibility for managing the Subbasin. Therefore, the change in storage measurable objectives were set to be identical to the groundwater level measurable objectives: providing the same margin of operation flexibility.

8.7.3.2 Interim Milestones

The groundwater level interim milestones described in Table 8-3 and Section 8.6.3.2 will serve as proxies for the reduction of groundwater storage interim milestones.

8.7.4 Undesirable Results

8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The criteria used to define undesirable results for reduction of groundwater storage are based on minimum thresholds established for chronic lowering of groundwater levels. The reduction of storage undesirable result is:

More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater storage minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), “Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels

or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.” Therefore, groundwater storage may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

8.7.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the reduction in groundwater storage sustainability indicator include the following:

- **Expansion of agricultural or municipal pumping.** Additional agricultural or municipal pumping may result in lowered groundwater elevations, lower recharge of the principal aquifers from precipitation or streamflow that reduce groundwater in storage to an undesirable result. **Departure from the GSP’s climatic assumptions, including extensive, unanticipated drought.** The undesirable result is established based on reasonable anticipated future climatic conditions. Departure from the GSP’s climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater recharge and unanticipated high pumping rates that could reduce groundwater in storage to an undesirable result.
- **Reservoir operations.** Operation of Nacimiento and San Antonio Reservoirs affect the timing and quantity of surface water flows. This affects groundwater levels and storage in the subbasin both directly from recharge of surface water in the Subbasin and indirectly from subsurface flows after recharge in adjacent subbasins.
- **Subsurface flows with adjacent subbasins.** The Upper Valley Subbasin is hydraulically connected with the Forebay and Paso Robles Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Upper Valley Subbasin.

8.7.4.3 Effects on Beneficial Users and Land Use

The practical effect of the reduction in groundwater storage undesirable result is a chronic, long-term net loss of groundwater in storage. Therefore, beneficial uses and users would not have access to a similar amount of water in storage, and the undesirable result would have an additional negative effect on the beneficial users and uses of groundwater.

8.8 Degraded Water Quality SMC

8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable changes in groundwater quality that is a direct result of extraction or GSA groundwater management action that either:

- Increase the number of potable water supply wells in which above an established MCL or SMCL, or
- Increase in the number of agricultural supply wells in which COC concentrations may lead to significantly reduced crop production based on the water quality objectives from the Water Quality Basin Plan for the Central Coastal Basin (CCRWQCB, 2019).

These are not considered significant and unreasonable if they are not managed to provide drinking water supply (i.e. treated, blended, or replaced) or if beneficial users are not potentially impacted. Significant and unreasonable conditions were determined with input from the Subbasin Committee, other coordinating GSAs, and discussions with GSA staff, and for GSP Amendment 1, the CCRWQCB. These conditions were determined to be significant and unreasonable because groundwater quality in exceedance of these could cause a financial burden on groundwater users or otherwise harm them. Public water systems with COC concentrations above the MCL or SMCL are required to add treatment to the drinking water supplies or drill new wells. Agricultural wells with COCs that significantly reduce crop production will reduce grower's yields and profits.

8.8.2 Minimum Thresholds

The minimum thresholds for degraded water quality are zero additional exceedances of the regulatory drinking water standards or Basin Plan objectives beyond those observed in 2019 for groundwater quality constituents of concern.

The minimum thresholds for all wells in the monitoring network reflect California's Title 22 drinking water standards and the water quality objectives listed in the Basin Plan (CCRWQCB, 2019). The minimum threshold values are based on data up to September 30, 2019. While SGMA states that undesirable results that occur after January 1, 2015, should be addressed for groundwater quality, 2019 was selected because it was the last year of data available when the original GSP was drafted and there was no substantial difference from 2015 water quality data. Full discussion of these GSP baseline conditions is included in Chapter 5 and comparison between 2015 and 2019 quality is included in the 2027 GSP Periodic Evaluation. Because the minimum thresholds reflect no additional exceedances, the minimum thresholds are set to the percentage of exceedances in 2019. Surpassing the percentage of existing exceedances for any of the listed constituents will lead to an undesirable result. Not all wells in the monitoring network are sampled for every COC.

The constituents listed in Table 8-4 comprise the constituent watchlist for the Upper Valley Subbasin. This table expands upon the water quality assessment presented in Table 5-3. A subset of these constituents defines the constituents of concern (COC) for which SMC are established. Several constituents were not sampled prior to WY 2019; however, these constituents exceed the Title 22 regulatory standard or Basin Plan water quality objective during the WY 2021 to

WY 2025 period. Therefore, this amendment updates what needs to be included in the constituent watchlist.

The table shows the criteria used to select COC in the fourth to sixth columns. To be a COC, a constituent had to be found above the level of concern in 3 out of 5 years from WY 2021 to WY 2025, exist in at least 10% of wells, and occur in at least 5 wells averaged over this period (Section 8.8.2.1). The constituents that meet the COC criteria for the purpose of this GSP are highlighted in orange in Table 8-4.

Only constituents that meet the criteria in Section 8.8.2.1 are designated as COC; however, all monitored constituents included in the watchlist are reviewed as part of annual reports. As part of 5-year periodic evaluations, the list of COCs are reassessed and SMC are added for additional constituents if they meet the COC criteria. This enables identification of persistent constituents, rather than year-to-year fluctuations. If any new COC are identified during the periodic evaluation, the minimum threshold is either: 1) set to 0% if it was sampled for and there were no exceedances of the level of concern for the COC in WY 2019, or 2) set after initial years of monitoring if it was not historically sampled.

Table 8-4. Water Quality Constituent Watchlist and Minimum Thresholds

Constituent	Concentration Level of Concern	Standard Units	Data from WY 2021 to WY 2025 for COC Criteria			Data up to WY 2019		
			Number of Years with Level of Concern Exceedances (COC >3)	Average Percentage of Wells with Exceedances (COC >10%)	Average Number of Wells with Exceedances (COC >5)	Number of Wells Sampled	Number of Wells Exceeding Level of Concern in the Last Sample	Minimum Threshold/ Measurable Objective - Percent of Wells Exceeding Level of Concern
DDW Wells								
Aluminum	1,000	µg/l	0	0%	0	28	2	7%
Boron	1	mg/L	3	38%	1	17	0	0%
Chloride	106	mg/L	5	24%	2	26	6	23%
Gross Alpha Radioactivity	15	pci/L	1	3%	1	28	2	7%
Iron	300	µg/L	5	25%	2	26	8	31%
Manganese	50	µg/L	4	28%	2	26	8	31%
Nitrate (as nitrogen)	10	mg/L	0	0%	0	32	1	3%
Specific Conductance	1600	µmhos/cm	3	9%	1	26	4	15%
Sulfate	500	mg/L	0	0%	0	26	3	12%
Sodium	69	mg/L	2	44%	3	0	0	-
Total Dissolved Solids	1,000	mg/L	2	6%	1	26	6	23%
Uranium	20	pci/L	0	0%	0	16	1	6%
ILP On-Farm Domestic Wells								
1,2,3-Trichloropropane (1,2,3-TCP)	0.005	µg/l	2	13%	1	0	0	-
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	5	43%	19	47	18	38%
Specific Conductance	1,600	µmhos/cm	4	34%	19	29	13	45%
ILP Irrigation Supply Wells								
Chloride	106	mg/L	1	100%	1	48	18	38%
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	5	44%	43	32	16	50%
Sodium	69	mg/L	1	100%	1	48	21	44%
Specific Conductance	1,600	µmhos/cm	5	25%	25	44	15	34%
Total Dissolved Solids	1,000	mg/L	5	27%	27	48	14	29%

8.8.2.1 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

As noted in the GSP Regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality (23 California Code of Regulations §354.28 (c)(4)). Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents already in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. The constituents that have historically occurred in the Subbasin up to 2025 were reviewed and were included as COCs if they met the following criteria:

1. They must have an established level of concern such as an MCL or SMCL, or a level known to affect crop production.
2. They must have been found in the Subbasin at levels above the level of concern in at least 3 years from WY 2021 to WY 2025.
3. They must have been found in the Subbasin at levels above the level of concern in 10% or more of the wells sampled on average between WY 2021 and WY 2025.
4. They must occur at levels above the level of concern in at least 5 wells in the monitoring network averaged from WY 2021 to WY 2025

Based on the review of groundwater quality in Chapter 5, the COC that may affect drinking water supply wells or are known to cause reductions in crop production are listed in Table 8-4. The other constituents discussed in Chapter 5 that do not meet the COC criteria will be monitored under the constituent watchlist but are not used to define the SMC.

8.8.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Preventing migration of poor groundwater quality may limit activities needed to achieve minimum thresholds for other sustainability indicators.

- **Chronic lowering of groundwater levels.** The degradation of groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations.
- **Reduction in groundwater storage.** The degradation of groundwater quality minimum thresholds could influence groundwater storage minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations.
- **Land subsidence.** The degradation of groundwater quality minimum thresholds do not promote additional pumping that could cause subsidence. Therefore, the groundwater

quality minimum thresholds will not result in an exceedance of the subsidence minimum threshold.

- **Depletion of ISW.** The degradation of groundwater quality minimum thresholds do not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.8.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Upper Valley Subbasin has 2 neighboring subbasins. The Forebay Subbasin is within the SVBGSA jurisdiction to the north and the Paso Robles Area Subbasin is a neighboring subbasin to the south that lies outside of SVBGSA jurisdiction.

The SVBGSA is one of the coordinating GSAs for the adjacent Forebay Subbasin. Because SVBGSA's jurisdiction includes both these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for the subbasins. Both the Upper Valley and Forebay Subbasin GSPs (January 2022) were approved by DWR. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasin's GSP to ensure that these minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Paso Robles Area Subbasin lies directly to the south of the Subbasin. Because the minimum thresholds in the Upper Valley Subbasin are to prevent degradation of water quality, it is likely that the minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. The SVBGSA will coordinate closely with the Paso Robles Area Subbasin GSAs to ensure that the basins do not prevent each other from achieving sustainability.

8.8.2.4 Effect on Beneficial Uses and Users

Agricultural land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would reduce crop production. This helps protect groundwater supplies for agricultural production.

Urban land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's urban water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would cause more drinking water wells to violate drinking water standards. This helps provide adequate groundwater quality for public water system supplies.

Domestic land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's domestic water users by helping ensure extraction and GSA actions do not degrade groundwater quality such that it would cause more drinking water wells to violate drinking water standards. This helps provide adequate groundwater quality for domestic supplies.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. GDEs could potentially become impacted if contaminated groundwater is taken up by GDEs. Some effects may be indirect, such as elevated nitrates stimulating additional aquatic growth, resulting in depressed dissolved oxygen levels. Species-specific tolerance levels for each COC is unknown, so minimum thresholds help protect ecological uses by preventing further degradation due to extraction or GSA action.

8.8.2.5 Relation to State, Federal, or Local Standards

The groundwater quality minimum thresholds specifically incorporate state and federal water quality standards for drinking water and basin plan objectives.

8.8.2.6 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from active wells in the Subbasin. Groundwater quality will be evaluated based on SWRCB GAMA groundwater information system data submitted through DDW and data received from CCRWQCB ILP and GQTM Workplan once approved, as discussed in Chapter 7.

Exceedances of MCLs and SMCLs and water quality objectives for crop production will be reviewed annually. This review will be centered around the COC identified above. Every 5 years, in line with Periodic Evaluations, water quality data will be reassessed to determine whether any additional constituents meet the COC criteria listed above. If so, these additional constituents will be added to the list of constituents of concern for the Subbasin.

8.8.3 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, the measurable objectives are based on no groundwater quality degradation and are identical to the minimum thresholds, as defined in Section 8.8.2.

The measurable objectives for degraded water quality are zero additional exceedances of the regulatory drinking water standards or Basin Plan objectives beyond those observed in 2019 for groundwater quality constituents of concern.

8.8.3.1 Methodology for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.8.2.1.

8.8.3.2 Interim Milestones

There is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of PMAs as described in Chapter 9. Therefore, the expected interim milestones are identical to GSP baseline conditions.

8.8.4 Undesirable Results

8.8.4.1 Criteria for Defining Undesirable Results

Water quality degradation that results in a minimum threshold exceedance becomes an undesirable result when it is a direct result of extraction or GSA groundwater management. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities or GSA management, they do not constitute an undesirable result. Additionally, SGMA states that GSAs are not responsible for addressing water quality degradation that was present before January 1, 2015 (California Water Code § 10727.2(b)(4)). Therefore, the degradation of groundwater quality reaches an undesirable result when:

Future or new minimum thresholds exceedances are caused by a direct result of extraction or GSA groundwater management, including projects or management actions and regulation of groundwater extraction, unless minimum threshold exceedances are managed to provide a water supply (i.e. treated, blended, or replaced) or beneficial users are not potentially harmed.

The groundwater level SMC is designed and intended to help protect groundwater quality. Setting the groundwater level minimum thresholds at or above historical lows assures that no new depth dependent constituents of water quality concern are mobilized. The GSA may pursue projects or management actions to ensure that groundwater levels do not fall below groundwater level minimum thresholds.

This undesirable result recognizes there is an existing regulatory framework in the form of the California Porter Cologne Act and the federal Clean Water Act that addresses water quality management; and considers existing federal, state, and local groundwater quality standards,

which were used in the development of minimum thresholds in the GSP. SVBGSA is not responsible for enforcing drinking water requirements or for remediating violations of those requirements that were caused by others (Moran and Belin, 2019). The existing regulatory regime neither requires nor obligates SVBGSA to take any affirmative actions to manage or control existing groundwater quality. However, SVBGSA is committed to monitoring and disclosing changes in groundwater quality and ensuring its groundwater management actions do not cause drinking water or irrigation water to be unusable.

SVBGSA will work closely with the CCRWQCB and other entities that have regulatory authority over water quality. SVBGSA will lead the Water Quality Coordination Group, as described in Chapter 9, which includes meeting annually with these partner agencies to review the status of water quality data and discuss any action needed to address water quality degradation.

If minimum thresholds are exceeded, SVBGSA will review the potential causes, groundwater quality, and groundwater gradients in and around the project areas to assess if the exceedance resulted from extraction or GSA action, or was independent of GSA activities. Both the implementation of actions and assessment of exceedances will occur throughout the GSP timeframe of 50 years as required by SGMA. The evaluation of whether a minimum threshold exceedance constitutes an undesirable result includes:

- **Step 1: Desktop Assessment**

Conduct initial screening of whether the exceedance is likely caused by extraction or GSA groundwater management action, is not managed.

- **Step 2: Coordination and Verification**

Consult with the Water Quality Coordination Group.

Step 3: Evaluate Potential Impacts on Beneficial Uses and Users

If the exceedance is likely attributable to extraction or GSA actions, assess whether there are beneficial users that could potentially be harmed.

Step 4: Assess Data Needs

Evaluate whether additional sampling is needed to confirm conditions or better understand causes, considering existing monitoring programs (e.g., Preservation, Inc., MCWRA, SWRCB reporting).

Step 5: Identify Potential Actions to Address Water Quality Degradation

If degradation is linked to extraction or GSA actions, consider appropriate responses, such as:

- Additional data collection and/or analysis
- Modifications to projects or management actions
- Extraction management

- Well mitigation measures

Figure 8-6 outlines these steps and some of the specific considerations within them. Steps 1-3 will be conducted as part of the GSP annual report process. Steps 4 and 5 require more time and will be conducted afterwards. GSP 5-year periodic evaluations will summarize results of all steps, as well as if any management was added after annual reports to address undesirable results.

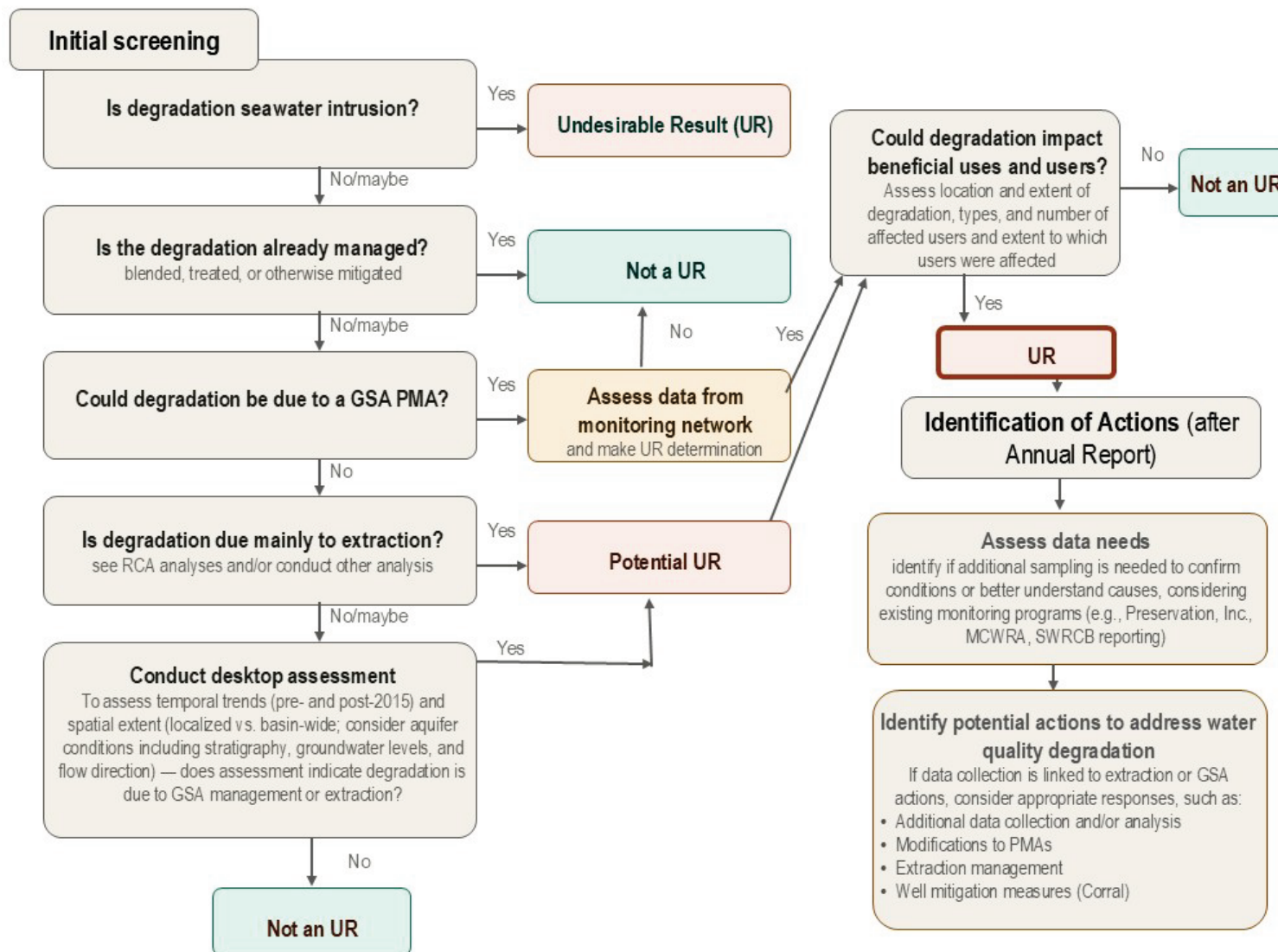


Figure 8-6. Process to Determine if Minimum Threshold Exceedances Constitute an Undesirable Result

For SGMA compliance, undesirable results for groundwater quality are not caused by (1) lack of action, unless due to pumping; (2) GSA required reductions in pumping; (3) exceedances in groundwater quality minimum thresholds that occur if there are fewer exceedances than if there had been a lack of management; (4) exceedances in groundwater quality minimum thresholds that would have occurred independent of pumping or GSA action; or (5) past harm.

8.8.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Required Changes to Subbasin Pumping.** If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of one of the constituents of concern toward a supply well at concentrations that exceed relevant standards.
- **Groundwater Recharge.** Active recharge of imported water or captured runoff could modify groundwater gradients and move one of the constituents of concern toward a supply well in concentrations that exceed relevant limits.
- **Recharge of Poor-Quality Water.** Recharging the Subbasin with water that exceeds an MCL, SMCL, or level that reduces crop production will lead to an undesirable result.

8.8.4.3 Effects on Beneficial Users and Land Use

Groundwater quality degradation caused by pumping or GSA action could negatively affect beneficial users. Degradation could necessitate treatment for drinking water, reduce crop yields, or limit the types or amount of crops that can be grown. These could increase the cost of water or production. This undesirable result does not apply to groundwater quality changes that occur due to other causes.

8.9 Land Subsidence SMC

8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that is caused by lowering of groundwater elevations in the Subbasin or
- Any inelastic subsidence that causes an increase of flood risk

These significant and unreasonable conditions were determined based on input from the Subbasin Committee and discussions with GSA staff.

Subsidence can be elastic or inelastic. Inelastic subsidence is generally irreversible. Elastic subsidence is the small, reversible lowering and rising of the ground surface. This SMC only concerns inelastic subsidence.

8.9.2 Minimum Threshold

The minimum threshold for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of measured subsidence to account for InSAR measurement errors.

The 2019 subsidence data from the original GSP, described in Chapter 5, did not exceed the minimum threshold.

8.9.2.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

The minimum threshold was established using InSAR data available from DWR. The general minimum threshold is for no long-term irreversible subsidence in the Subbasin. The InSAR data provided by DWR are subject to measurement error. DWR stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2019, the errors are as follows (DWR, 2019, personal communication):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level.
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

By adding errors 1 and 2, the combined error is 0.1 foot. While this is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggest that elastic subsidence is largely seasonal. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

8.9.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The subsidence minimum threshold has little or no impact on other minimum thresholds, as described below.

- **Chronic lowering of groundwater levels.** The land subsidence minimum threshold will not decrease groundwater elevations and therefore will not result in significant or unreasonable groundwater elevations.
- **Reduction in groundwater storage.** The land subsidence minimum threshold will not change the amount of pumping and therefore will not result in a significant or unreasonable change in groundwater storage.
- **Degraded water quality.** The land subsidence minimum threshold does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds and therefore will not result in significant or unreasonable degradation of water quality.
- **Depletion of ISW.** The land subsidence minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the subsidence minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.9.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Upper Valley Subbasin has 2 neighboring subbasins. The Forebay Subbasin is within the SVBGSA jurisdiction to the north, and the Paso Robles Area Subbasin is a neighboring subbasin to the south that lies outside of SVBGSA jurisdiction.

The SVBGSA is one of the coordinating GSAs for the adjacent Forebay Subbasin. Because SVBGSA's jurisdiction includes both these subbasins, SVBGSA coordinates development of the minimum thresholds and measurable objectives for the subbasins. Both the Upper Valley and Forebay Subbasin GSPs (January 2022) were approved by DWR. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasin's GSP to ensure that these minimum thresholds will not prevent the neighboring subbasin from achieving or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Paso Robles Area Subbasin lies directly to the south of the Subbasin. Because the minimum threshold in the Upper Valley Subbasin is zero subsidence, it is likely that the minimum threshold will not prevent the neighboring subbasin from achieving or maintaining sustainability. The SVBGSA will coordinate closely with the Paso Robles Area Subbasin GSAs to ensure that the basins do not prevent each other from achieving sustainability.

8.9.2.4 Effects on Beneficial Uses and Users

The subsidence minimum threshold is set to prevent any inelastic land subsidence. Available data indicate that as of GSP Amendment 1, there has been no inelastic subsidence occurring in the Subbasin. The subsidence minimum threshold helps prevent damage to critical infrastructure,

such as roads, drinking water systems, and supply wells. Due to the geology of the Upper Valley Subbasin, this is very unlikely.

8.9.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

8.9.2.6 Method for Quantitative Measurement of Minimum Threshold

The minimum threshold will be assessed using DWR-supplied InSAR data.

8.9.3 Measurable Objective

The measurable objective for subsidence represents a target subsidence rates in the Subbasin. Because the minimum threshold of zero net long-term subsidence is the best achievable outcome, the measurable objective is identical to the minimum threshold.

The measurable objective for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors.

8.9.3.1 Methodology for Setting Measurable Objectives

The measurable objective will be assessed using DWR-supplied InSAR data.

8.9.3.2 Interim Milestones

The subsidence measurable objective is set at GSP baseline conditions of no long-term subsidence. There is no change between GSP baseline conditions and sustainable conditions. Therefore, the interim milestones are identical to GSP baseline conditions of zero long-term subsidence, and annual measurements of no more than 0.1 foot of subsidence per year.

8.9.3 Undesirable Results

8.9.3.1 Criteria for Defining Undesirable Results

By regulation, the subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the Subbasin, no long-term subsidence is acceptable. Therefore, the land subsidence undesirable result is:

There is an exceedance of the minimum threshold for land subsidence due to lowered groundwater elevations.

Should potential subsidence be observed, the SVBGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the SVBGSA will undertake a program to assess whether the subsidence is caused by lowered groundwater elevations. The first step in the assessment will be to check if groundwater elevations have dropped below historical lows. If groundwater elevations remain above historical lows, the GSA shall assume that any observed subsidence was not caused by lowered groundwater elevations. If groundwater elevations have dropped below historical lows, the GSA will attempt to correlate the observed subsidence with measured groundwater elevations. Additionally, if the Subbasin experiences subsidence in multiple consecutive years that are due to InSAR measurement error, the GSAs will confirm if the error is not actually net long-term subsidence.

8.9.3.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include a shift in pumping locations. Increasing pumping in an area that is susceptible to subsidence could trigger subsidence that has not been observed before. Although unlikely because of the Upper Valley Subbasin's geology, future increases in pumping could initiate subsidence.

8.9.3.3 Effects on Beneficial Users and Land Use

An undesirable result for subsidence would occur if any subsidence were to occur in the Subbasin. Land subsidence can harm critical infrastructure that affects land use and water use, such as roads, drinking water supply systems, and wells.

8.10 Depletion of Interconnected Surface Water SMC

Areas with ISW occur where shallow groundwater may be connected to the surface water system. This SMC applies only to locations of ISW, as shown on Figure 4-11.

The SVIHM is used to identify the locations of ISW and to develop an estimate of the quantity and timing of stream depletions due to pumping during current and historical groundwater conditions. Shallow groundwater and surface water levels simulated by the SVIHM are used to identify the location of interconnection and evaluate the frequency with which different stream reaches are connected with groundwater in the underlying aquifer. The magnitude of stream depletions in relation to shallow groundwater elevations in interconnected reaches are evaluated in Chapter 5.

As described in Chapter 7, depletion of ISW due to pumping is monitored and assessed based on shallow groundwater levels near locations of ISW.

8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable depletion of ISW in the Subbasin is defined as:

- Depletions from groundwater extraction that would result in a significant and unreasonable impact on other beneficial uses and users such as riparian water rights holders, appropriative surface water rights holders, ecological surface water users, and recreational surface water uses.
- Shallow groundwater levels near locations of ISW below those observed in 2015. While a documented determination of whether past depletions were significant is not available, staying above 2015 groundwater levels was determined to be a reasonable balance for all the beneficial uses and users.

These significant and unreasonable conditions were determined based on input collected Subbasin Committee meetings and discussions with GSA staff. There is no data that determines what level of depletion from groundwater extraction or what groundwater levels have a significant adverse effect on steelhead trout or other beneficial use or user of ISW. Should there be a determination regarding what level of depletion from groundwater extraction is significant, SVBGSA will take that into consideration as it reviews how it locally defines significant and unreasonable conditions for the SMC in the 5-Year periodic evaluation.

8.10.2 Minimum Thresholds

The minimum thresholds are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

The minimum thresholds for depletion of ISW are established by proxy using shallow groundwater elevations observed in 2016 near locations of ISW.

As discussed in Chapter 7, the monitoring network for ISW is composed of shallow groundwater monitoring well(s). The monitoring network is dependent on the location of ISW established in Chapter 4. Table 8-5 shows the proxy groundwater levels for minimum thresholds and measurable objectives for the ISW RMS wells in the Upper Valley Subbasin. This table does not include the 2 new monitoring wells SVBGSA added to the monitoring network in 2025. Once these wells have approximately 5 years of groundwater elevation measurements, SMC will be established.

Table 8-5. Depletion of ISW Minimum Thresholds and Measurable Objectives

Monitoring Site	Minimum Threshold (feet)	Measurable Objective (feet)
19S/07E-14H01	230.0	240.0
20S/08E-25Q01*	307.3	312.3
21S/09E-16E01*	333.9	343.6
23S/10E-14D01	438.1	441.1

*Well is an RMS for groundwater levels and ISW.

No minimum thresholds are established for times when flow in a river is due to conservation releases from a reservoir. One purpose for these conservation releases is to recharge the Salinas Valley. Therefore, depletion of conservation releases is a desired outcome, and the minimum thresholds and measurable objectives do not apply to these flows.

8.10.2.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds and Measurable Objectives

8.10.2.1.1 Establishing Groundwater Elevations as Proxies

The GSP Regulations § 354.28(d) states that: “an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.”

The evaluation of ISW in the Salinas Valley is based on an approach recommended by the Environmental Defense Fund (EDF, 2018) that uses groundwater elevations as surrogates for streamflow depletion rates caused by groundwater use. Basic hydraulic principles state that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream, or conversely seepage from a stream to the underlying aquifer, is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Assuming the elevation in the stream is relatively stable, changes in interconnectivity between the stream and the underlying aquifer is determined by changes in groundwater levels in the aquifer. Thus, the change in hydraulic gradient between stream elevation and surrounding groundwater elevations is representative of change in interconnection between surface water and groundwater. Monitoring the hydraulic gradient in the aquifer adjacent to the stream monitors the interconnectivity between stream and aquifer. Therefore, the gradient can be monitored by measuring and evaluating groundwater elevations at selected shallow monitoring wells near streams. No existing estimations of the quantity and timing of depletions of ISW exist, nor data available to make estimations, so the hydraulic principles provide the best available information.

8.10.2.1.2 Review of Beneficial Uses and Users of Surface Water

The various beneficial uses and users of surface waters were addressed when setting the ISW depletion minimum thresholds. The classes of beneficial uses and users that were reviewed include riparian rights holders, appropriative rights holders, ecological surface water users, and recreational surface water users. This is not a formal analysis of public trust doctrine, but it is a reasonable review of all uses and users in an attempt to balance all interests. This is not an assessment about what constitutes a reasonable beneficial use under Article X, Section 2 of the California Constitution. The minimum thresholds for depletion of ISW are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, locations of ISW derived from the SVIHM, and public information about water rights described below.

Riparian water rights holders. The second line of data in Table 8-6 provides a summary of water diversions reported to the SWRCB by riparian water rights holders on the Salinas River and its tributaries within the Upper Valley Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system. The diversions are self-reported by water-rights holders within the Subbasin. Some of the diversions shown in Table 8-6 are also reported to MCWRA as groundwater pumping.

The SVBGSA is not aware of any current riparian water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Therefore, SVBGSA assumes that the minimum threshold level of depletion has not injured any riparian water rights holders in the Subbasin.

Table 8-6. Reported Annual Surface Water Diversions in the Upper Valley Subbasin

Diversions (Acre-Feet)	2011	2012	2013	2014	2015	2016	2017	2018	2019
Appropriation per Permit	4	4	4	6	4	4	4	4	3
Statement of Diversion and Reported Riparian Diversions	61,493	100,004	107,694	76,359	46,502	39,576	35,649	53,010	46,246
Total	61,497	100,008	107,698	76,365	46,506	39,580	35,653	53,014	46,249

Appropriative water rights holders. There are 4 permitted appropriative water right holders in the Upper Valley Subbasin, whose reported diversions are shown in Table 8-6. These reported surface water diversions are not a determination of water rights and may not include all pre-1914

water rights. In addition, MCWRA releases water from upstream appropriative diversion points, the Nacimiento Reservoir and San Antonio Reservoir, which flows through the Subbasin.

The SVBGSA is not aware of any current appropriative water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Therefore, SVBGSA assumes that the minimum threshold level of depletion has not injured any appropriative water rights holders in the Subbasin.

Ecological surface water users. Review of MCWRA's Nacimiento Dam Operation Policy (MCWRA, 2018b) and MCWRA's water rights indicates MCWRA operates the Dam in a manner that meets downstream demands and considers ecological surface water users. Since the reservoir operations consider ecological surface water users and reflect reasonable existing surface water depletion rates, this GSP infers that stream depletion from existing groundwater pumping is not unreasonable. If further river management guidelines are developed to protect ecological surface water users, the SMC in this GSP will be revisited.

Recreational surface water users. No recreational activities such as boating regularly occur on surface water bodies in the Subbasin.

As shown by the analysis above, the minimum threshold rate of surface water depletion is not having an unreasonable impact on the various surface water uses and users in the Subbasin. Therefore, the minimum thresholds are based on 2016 groundwater elevations, when surface water depletions were not unreasonable.

8.10.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum thresholds for depletion of ISW are set to 2016 groundwater elevations in the shallow monitoring wells within the Subbasin. The minimum thresholds all reference the same historical year and have existed simultaneously in the past. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

The depletion of ISW minimum thresholds could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels.** The depletion of ISW minimum thresholds are set higher than the groundwater level minimum thresholds. Therefore, the ISW minimum thresholds will not result in chronic lowering of groundwater elevations.
- **Reduction in groundwater storage.** The depletion of ISW minimum thresholds are set higher than the change in storage minimum thresholds, which are the same as the groundwater level minimum thresholds. Therefore, the ISW minimum thresholds will not result in an undesirable loss of groundwater storage.

- **Degraded water quality.** The depletion of ISW minimum thresholds do not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds. Therefore, groundwater quality will not be affected by the ISW minimum thresholds.
- **Land subsidence.** The depletion of ISW minimum thresholds do not promote additional pumping that could cause subsidence. Therefore, subsidence will not be affected by the ISW minimum thresholds.

8.10.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Upper Valley Subbasin has 2 neighboring subbasins. The Forebay Subbasin is within the SVBGSA jurisdiction to the north and the Paso Robles Area Subbasin is a neighboring subbasin to the south that lies outside of SVBGSA jurisdiction.

The SVBGSA is one of the coordinating GSAs for the adjacent Forebay Subbasin. Because SVBGSA's jurisdiction includes both these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for the subbasins. Both the Upper Valley and Forebay Subbasin GSPs (January 2022) were approved by DWR. Amendments for all Salinas Valley subbasins have been developed together for submittal in 2027. Minimum thresholds for this Subbasin were reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

The Paso Robles Area Subbasin lies directly to the south of the Subbasin. Because the Paso Robles Subbasin is upstream of the Upper Valley Subbasin, depletion of ISW minimum thresholds in the Upper Valley Subbasin will not prevent the neighboring subbasin from achieving or maintaining sustainability. The SVBGSA will coordinate closely with the Paso Robles Area Subbasin GSAs to ensure that the basins do not prevent each other from achieving sustainability.

8.10.2.4 Effect on Beneficial Uses and Users

Table 3-9 of the *Salinas River Long-Term Management Plan* (MCWRA, 2019a) includes a list of 18 different designated beneficial uses on certain reaches of the river. In general, the major beneficial uses on the Salinas River are:

- Surface water diversions for agricultural, urban/industrial, and domestic supply
- Groundwater pumping from recharged surface water
- Freshwater habitat
- Rare, threatened, or endangered species, such as the Steelhead Trout

The depletion of ISW minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams and rivers beyond historical lows. While the measurable objectives are higher than the minimum thresholds, provides flexibility for groundwater extraction needed during droughts or periods of low reservoir releases. The minimum thresholds are considered less restrictive for agricultural land users than higher thresholds and help protect downstream users. However, pumping limitations may be needed to maintain levels above minimum thresholds if there are insufficient PMAs available.

Urban land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams and rivers below historical lows. The measurable objective is higher than the minimum threshold, providing flexibility for groundwater extraction needed during droughts or periods of low reservoir releases. Minimum thresholds higher than historical levels help protect downstream users, but they may limit the amount of urban pumping near rivers and streams. However, pumping limitations may be needed to maintain groundwater levels above minimum thresholds if there are insufficient PMAs implemented. If pumping is limited beyond historical levels, municipalities may have to obtain alternative sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

Domestic land uses and users. The depletion of ISW minimum thresholds help protect existing domestic land users and uses near locations of ISW from groundwater elevation declines below historical lows by maintaining shallow groundwater elevations near streams and protecting the operability of relatively shallow domestic wells.

Ecological land uses and users. The depletion of ISW minimum thresholds help addresses ecological uses and users by preventing groundwater elevation declines due to groundwater pumping near locations of ISW below recent historical lows by maintaining shallow groundwater elevations near streams. Additionally, by setting future groundwater levels at or above recent lows, there should be less impact to ecological users than experienced at the start of SGMA.

8.10.2.5 Relation to State, Federal, or Local Standards

There are no explicit federal, state, or local standards for depletion of ISW. However, both state and federal provisions call for the protection and restoration of conditions necessary for endangered and threatened species.

8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

The SVIHM is used to preliminarily identify areas of ISW and will help determine when any flow in a river is primarily due to conservation releases from Nacimiento and San Antonio reservoirs. Groundwater elevations measured in shallow wells adjacent to these areas of ISW will serve as the primary approach for monitoring depletion of ISW. As discussed in Chapter 7, existing shallow wells will be added, or new shallow wells will be installed to monitor groundwater elevations adjacent to surface water bodies during GSP implementation.

New shallow monitoring wells installed pursuant to the GSP do not have data from 2016. Minimum thresholds for those wells will be estimated based on the first few years of groundwater elevation measurements.

8.10.3 Measurable Objectives

The measurable objectives for depletion of ISW target groundwater elevations that are higher than the minimum thresholds. The measurable objectives are consistent with the chronic lowering of groundwater elevation and reduction in groundwater storage measurable objectives.

The measurable objectives for depletion of ISW are shallow groundwater elevations observed in 2011 near locations of ISW.

8.10.3.1 Methodology for Setting Measurable Objectives

The depletion of ISW measurable objectives are set to be identical to the groundwater level measurable objectives. The methodology for establishing measurable objectives is outlined in Section 8.6.2.1. Groundwater elevations from 2011 were selected as representative of the measurable objectives for the Upper Valley Subbasin.

8.10.3.2 Interim Milestones

The interim milestones leading to the depletion of ISW measurable objectives are shown in Table 8-7.

Table 8-7. Depletion of ISW Interim Milestones

Monitoring Site	2019 Groundwater Elevation (feet)	Interim Milestone at Year 2027 (feet)	Interim Milestone at Year 2032 (feet)	Interim Milestone at Year 2037 (feet)	Measurable Objective (feet) (goal to reach at 2042)
19S/07E-14H01	242.0	241.5	241.0	240.5	240.0
20S/08E-25Q01*	315.1	314.4	313.7	313.0	312.3
21S/09E-16E01*	342.7	342.9	343.1	343.3	343.6
23S/10E-14D01	442.5	442.2	441.8	441.5	441.1

*Well is an RMS for groundwater levels and ISW.

8.10.4 Undesirable Results

8.10.4.1 Criteria for Defining Undesirable Results

By regulation, the depletion of ISW undesirable result is a quantitative combination of minimum threshold exceedances. The undesirable result for depletion of ISW is:

There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW depletion.

Streamflow depletion in the Subbasin is complicated by many factors, such as reservoir releases, recharge of the aquifer from streamflow, losses to vegetation, and ET. The ISW SMC applies to depletion of ISW from groundwater use and is monitored by proxy through groundwater elevations. For SGMA compliance purposes, the default assumption is that groundwater elevations below the levels that occurred in 2016, represent depletions that are significant and unreasonable. Any additional depletions of surface water flows caused by groundwater conditions in excess of conditions as they were in 2016 would likely be an undesirable result that must be addressed under SGMA. There is no biological opinion or HCP as of GSP Amendment 1 that indicates additional protection is needed for species protected under the Endangered Species Act; however, if it is determined that additional protection is needed and streamflow loss is due to groundwater extraction, not surface water flows, SVBGSA will adapt as necessary to adhere to environmental laws.

8.10.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the depletion of ISW include the following:

- **Localized pumping increases.** Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping near ISW bodies could unreasonably increase surface water depletion.

- **Expansion of riparian water right water use.** Riparian water rights holders often pump from wells adjacent to the Salinas River. Pumping by riparian water rights holder users is not regulated under this GSP. Additional riparian pumping near interconnected reaches of rivers and streams may result in excessive localized surface water depletion.
- **Changes in Nacimiento and San Antonio Reservoir Releases.** Since the Salinas River is dependent on reservoir releases for sustained flows for SRDF operations and minimum flow requirements for environmental purposes, changes in releases could cause undesirable results. The ability to avoid undesirable results for ISWs is partially dependent on reservoir operations.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on anticipated future climatic conditions. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations that increase surface water depletion rates.

8.10.4.3 Effects on Beneficial Users and Land Use

Undesirable results for depletion of ISW due to pumping could have negative effects on beneficial users and land uses. Groundwater levels below historical lows near locations of ISW could reduce surface water available for riparian water rights holders, appropriative water rights holders, ecological water uses, and recreational water uses.

SVBGSA will work with MCWRA and state and federal agencies, including National Marine Fisheries Service (NMFS), to further evaluate the effects of shallow groundwater levels near locations of ISW on surface water users and land uses.