Salinas Valley: Forebay 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 Forebay 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.

As described in Chapter 4, the Forebay Subbasin contains the Arroyo Seco Cone Management Area (ASCMA). This chapter does not separate the ASCMA from the greater Forebay Subbasin; instead, groundwater conditions are discussed for the entire Subbasin to reflect the single sustainability goal.

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. Land subsidence
4. Groundwater quality
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.

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). The contour interval is 10 feet, 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 through Figure 5-6). 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 of time 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

Groundwater elevation contour maps representing seasonal high conditions were developed for this GSP because MCWRA does not prepare spring contour maps. The true seasonal high varies year to year, typically occurring between January and March as a result of winter rain recharge and decreased groundwater pumping from agricultural wells. Some wells monitored during this period may become 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.

Similarly, groundwater elevation contour maps representing seasonal low conditions were also developed for this GSP since MCWRA does not produce August contours for the Forebay Subbasin. August groundwater elevations are contoured because this is usually when the aquifer is the most stressed; these elevations represent seasonal low conditions.

The groundwater elevation contours only cover the portions of the Subbasin monitored by MCWRA and do not always extend to Subbasin margins. Contours are reflective of the groundwater elevations for the entire Basin Fill Aquifer as described in the HCM in Chapter 4.

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 in 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 Number	Year	Season
Figure 5-1	GSP Baseline (2019)	Spring
Figure 5-2	GSP Baseline (2019)	August
Figure 5-3	GSP Baseline (2019)	Fall
Figure 5-4	Historical (1995)	Spring
Figure 5-5	Historical (1995)	August
Figure 5-6	Historical (1995)	Fall

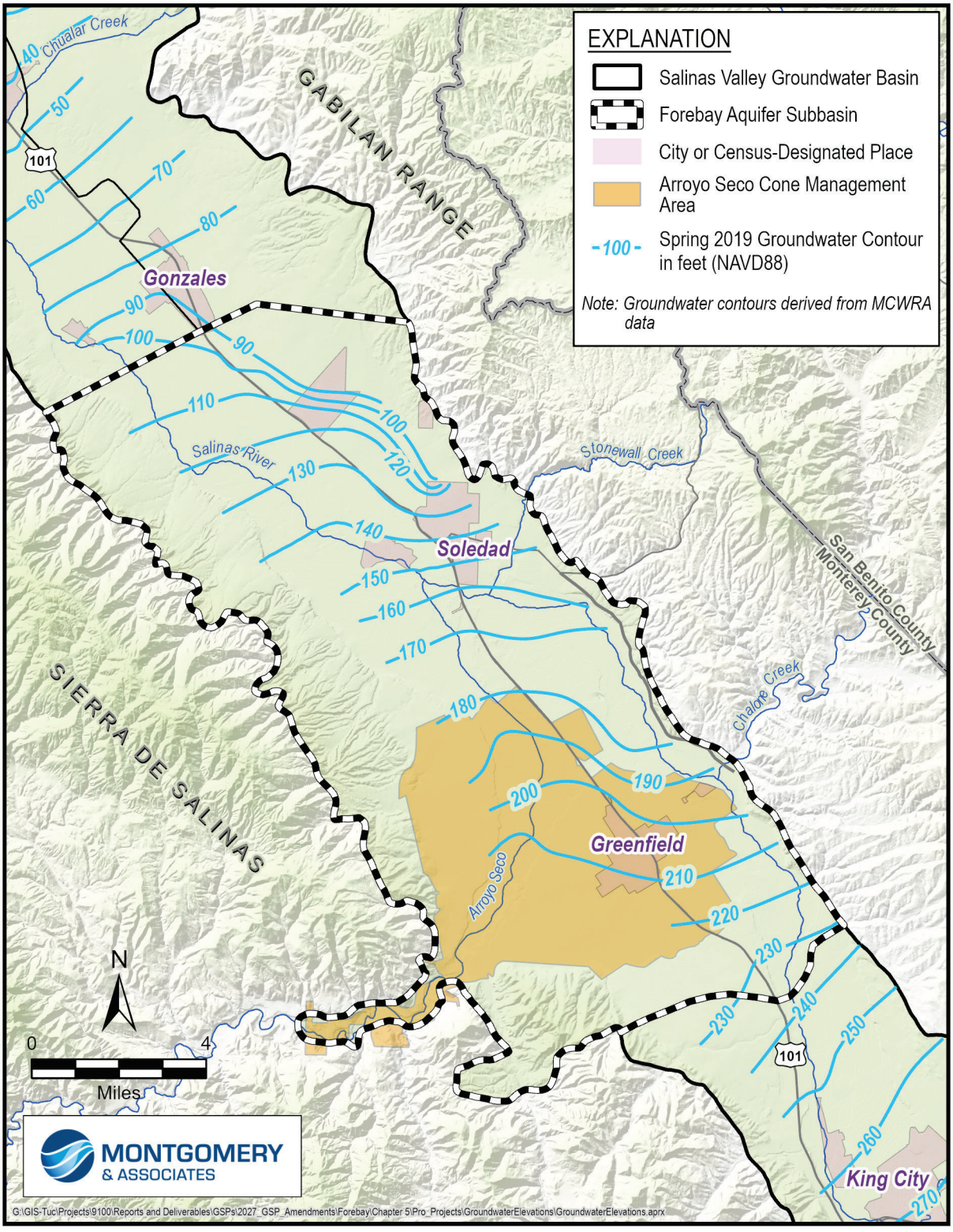


Figure 5-1. Spring 2019 Groundwater Elevation Contours

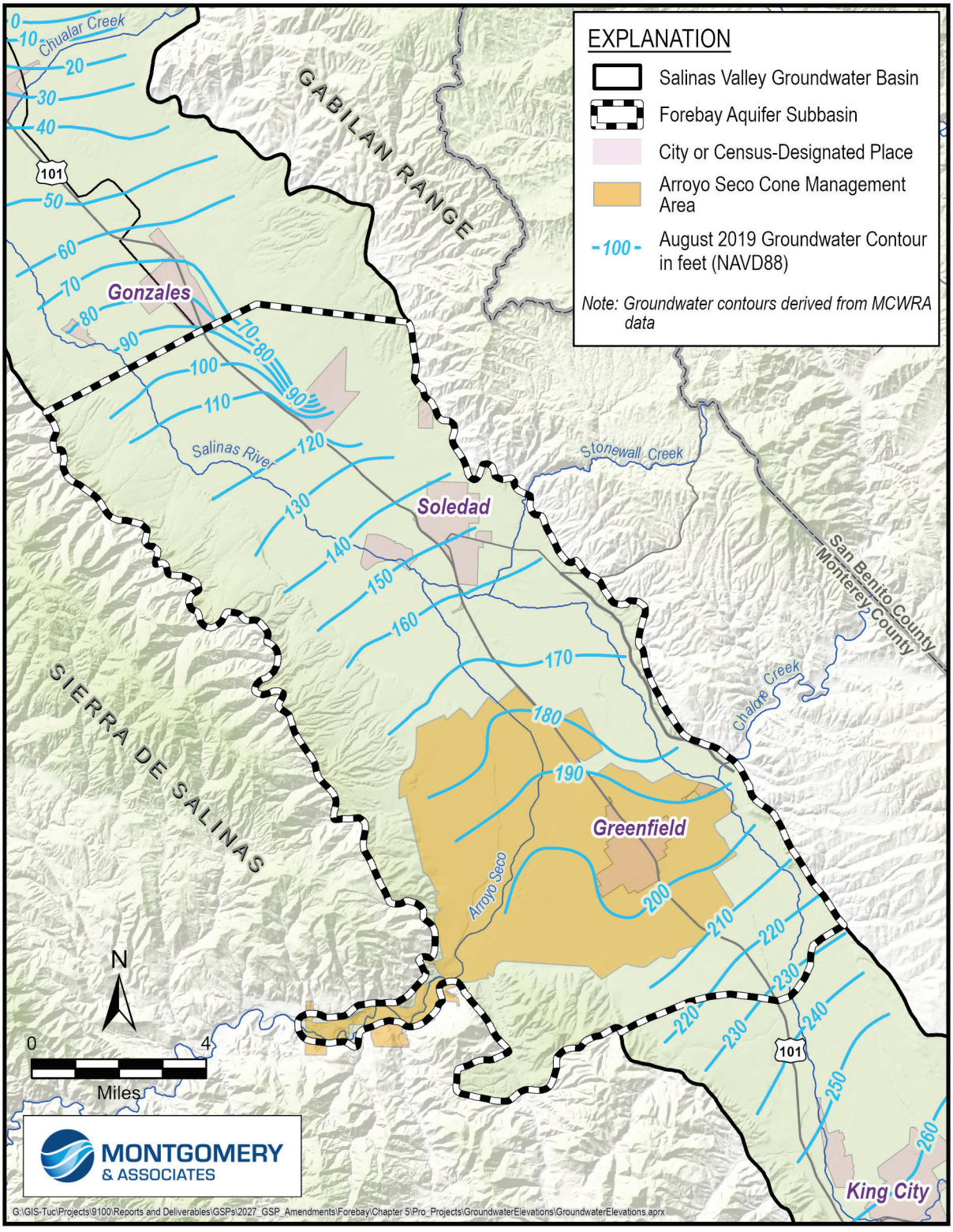


Figure 5-2. August 2019 Groundwater Elevation Contours

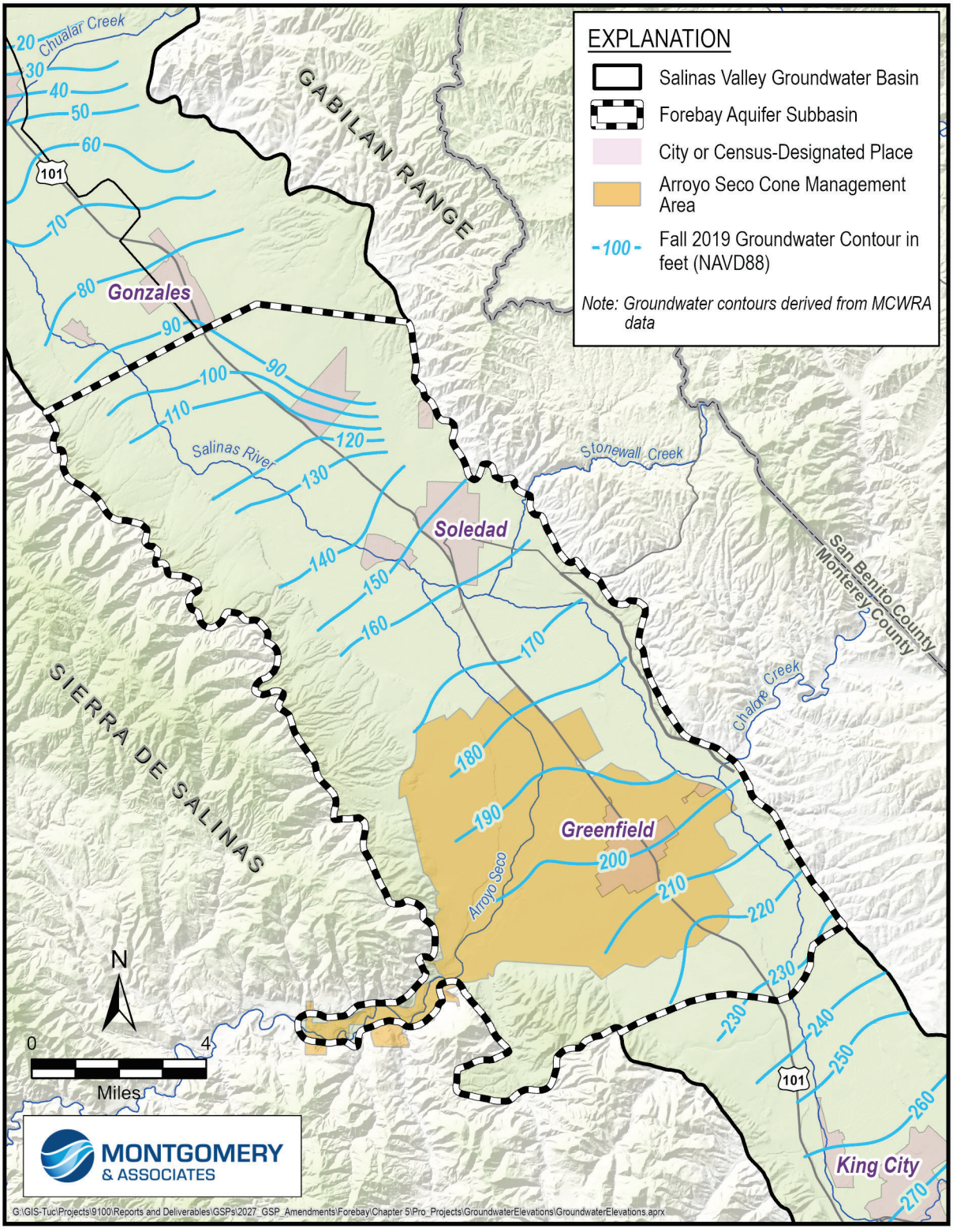


Figure 5-3. Fall 2019 Groundwater Elevation Contours

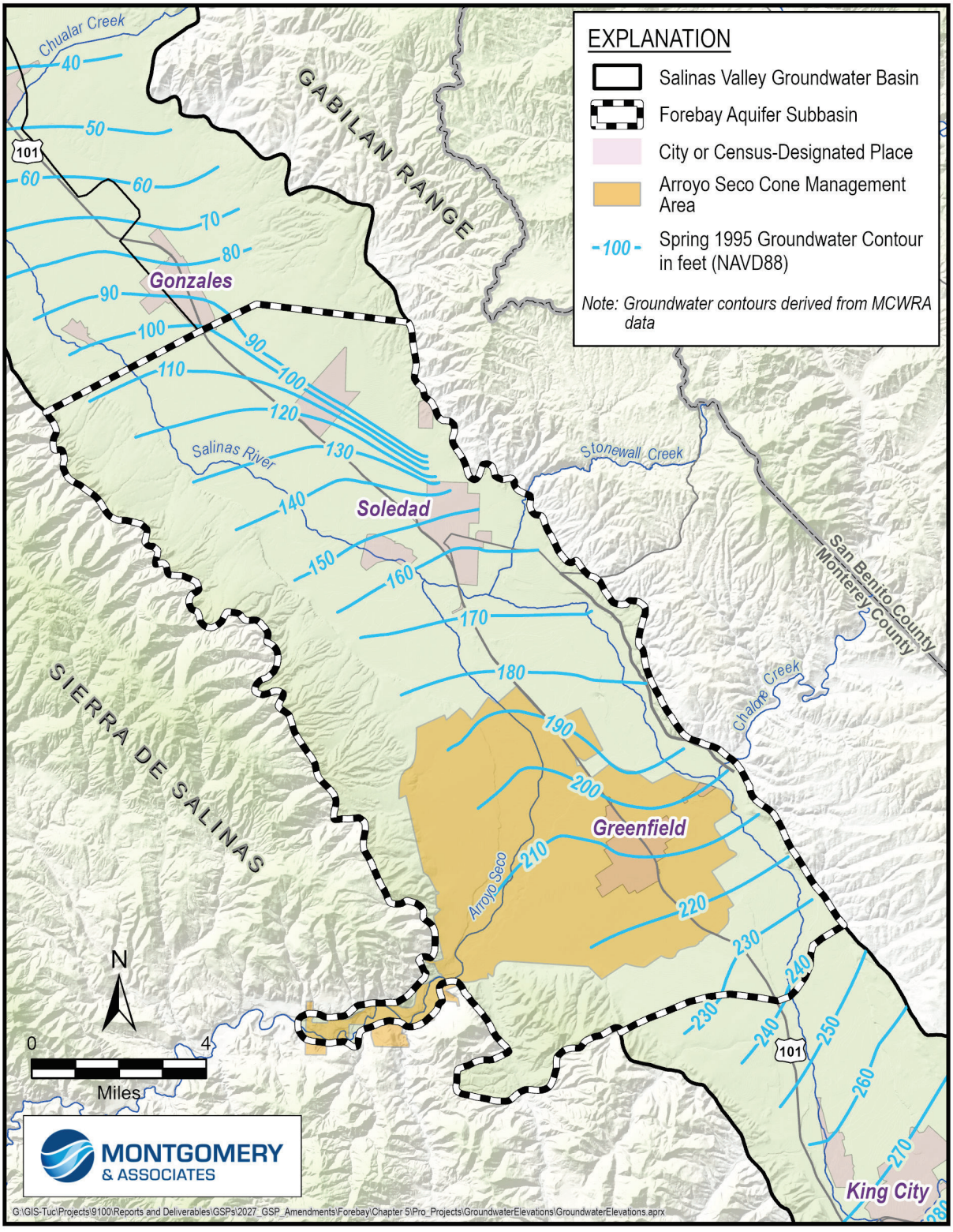


Figure 5-4. Spring 1995 Groundwater Elevation Contours

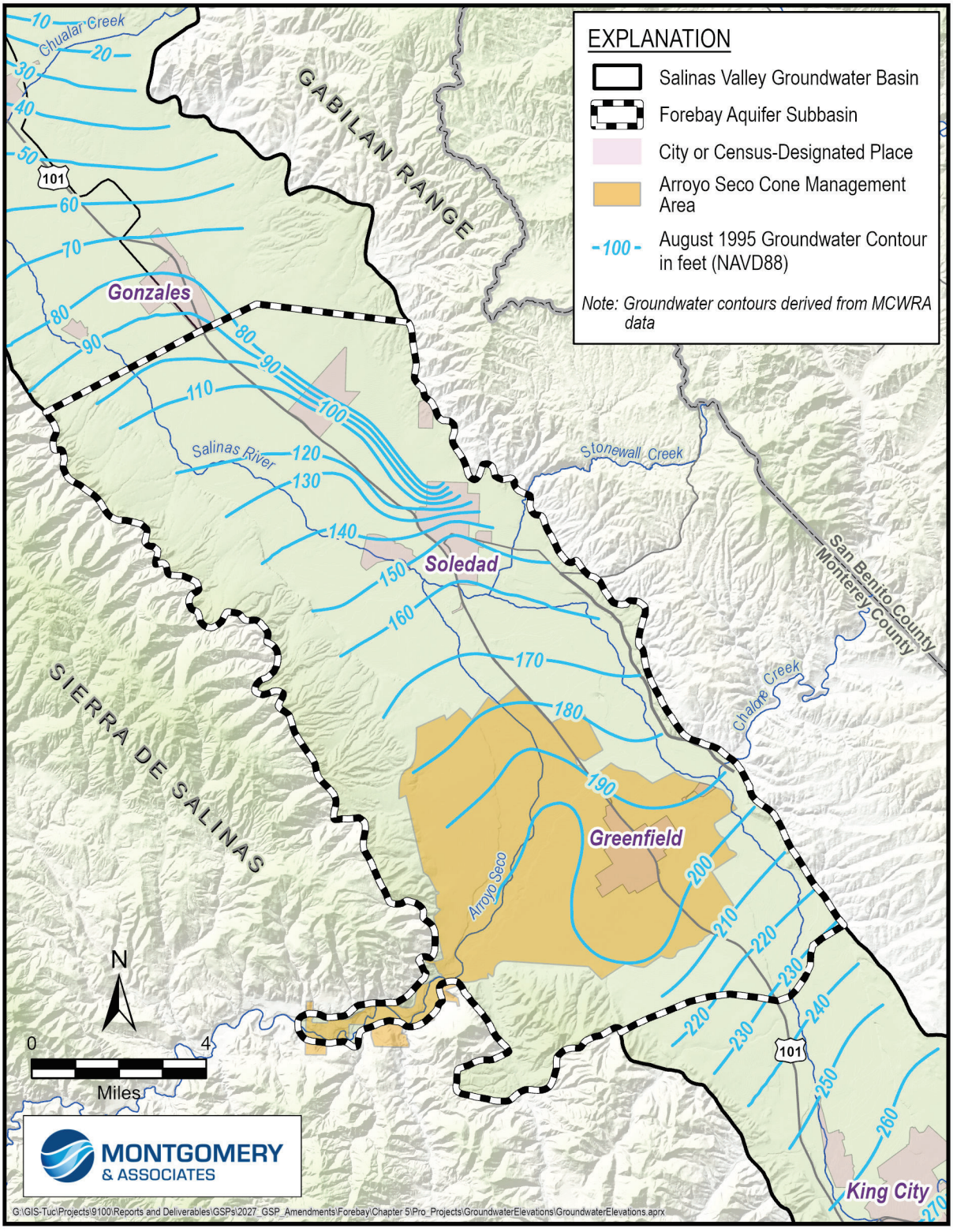


Figure 5-5. August 1995 Groundwater Elevation Contours

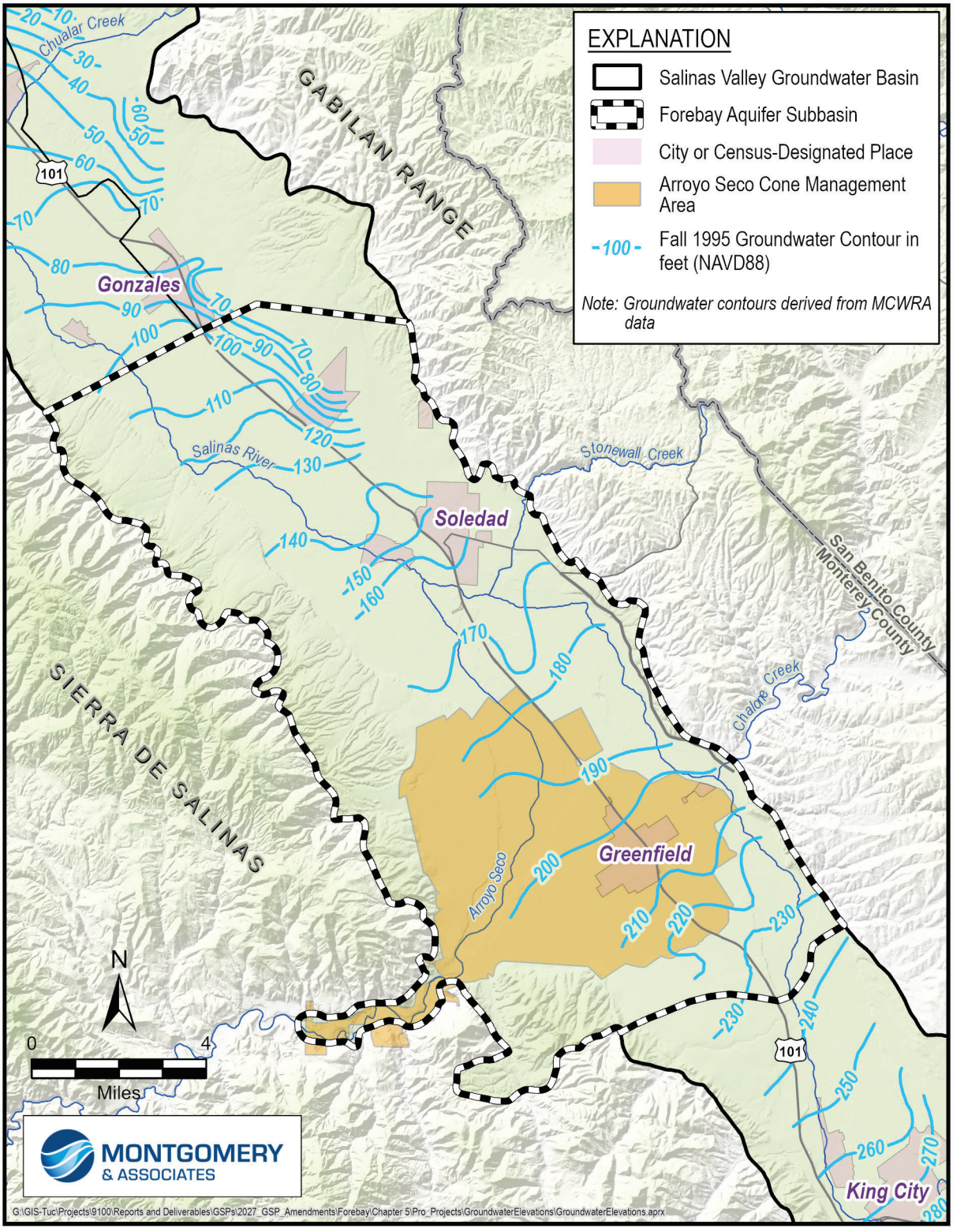


Figure 5-6. Fall 1995 Basin Fill Groundwater Elevation Contours

Groundwater in the Forebay Subbasin generally flows from southern portion of the Subbasin that borders the Upper Valley Subbasin to north/northwestern boundary of the Subbasin with the 180/400 and Eastside Subbasins. The lowest groundwater elevations occur in the northeastern corner of the Subbasin along the boundary with the Eastside Subbasin near Gonzales. In this area, the direction of groundwater flow differs from the western part of the Subbasin and flow toward the Gabilan Range. The minimum groundwater elevations range from approximately 70 to 90 feet NAVD88 between the spring and August 2019 measurements. The hydraulic gradient across the Basin Fill Aquifer was approximately 0.0012 feet/feet, or 6.7 feet/mile. Groundwater elevations in the Subbasin increase toward the boundary with the Upper Valley Subbasin, with groundwater elevations greater than 230 feet NAVD88 at the Subbasin boundary in 2019. Under the historical conditions of 1995, a similar flow pattern to that of GSP baseline conditions was present in the Forebay Subbasin. Examples of historical groundwater elevation changes at specific wells are presented in Section 6.3.

The groundwater elevation contours reflect conditions in the single Basin Fill Aquifer. If individual aquifers are delineated in the future, separate groundwater contour maps will be developed for each aquifer.

5.1.3 Hydrographs

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, as well as all Representative Monitoring Sites (RMS), are included in Appendix 5A. Chapter 7 provides more information specific to the wells and the monitoring system.

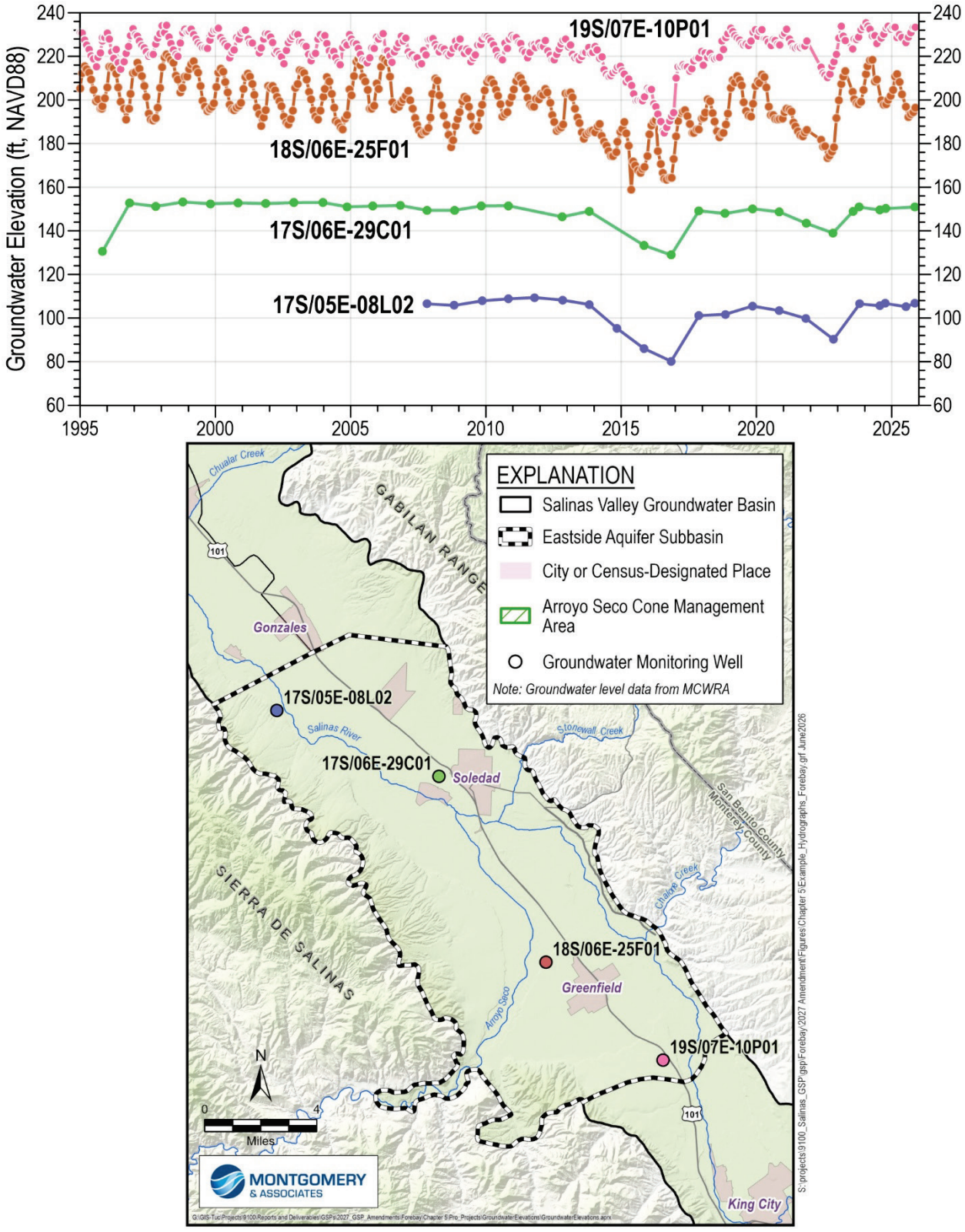
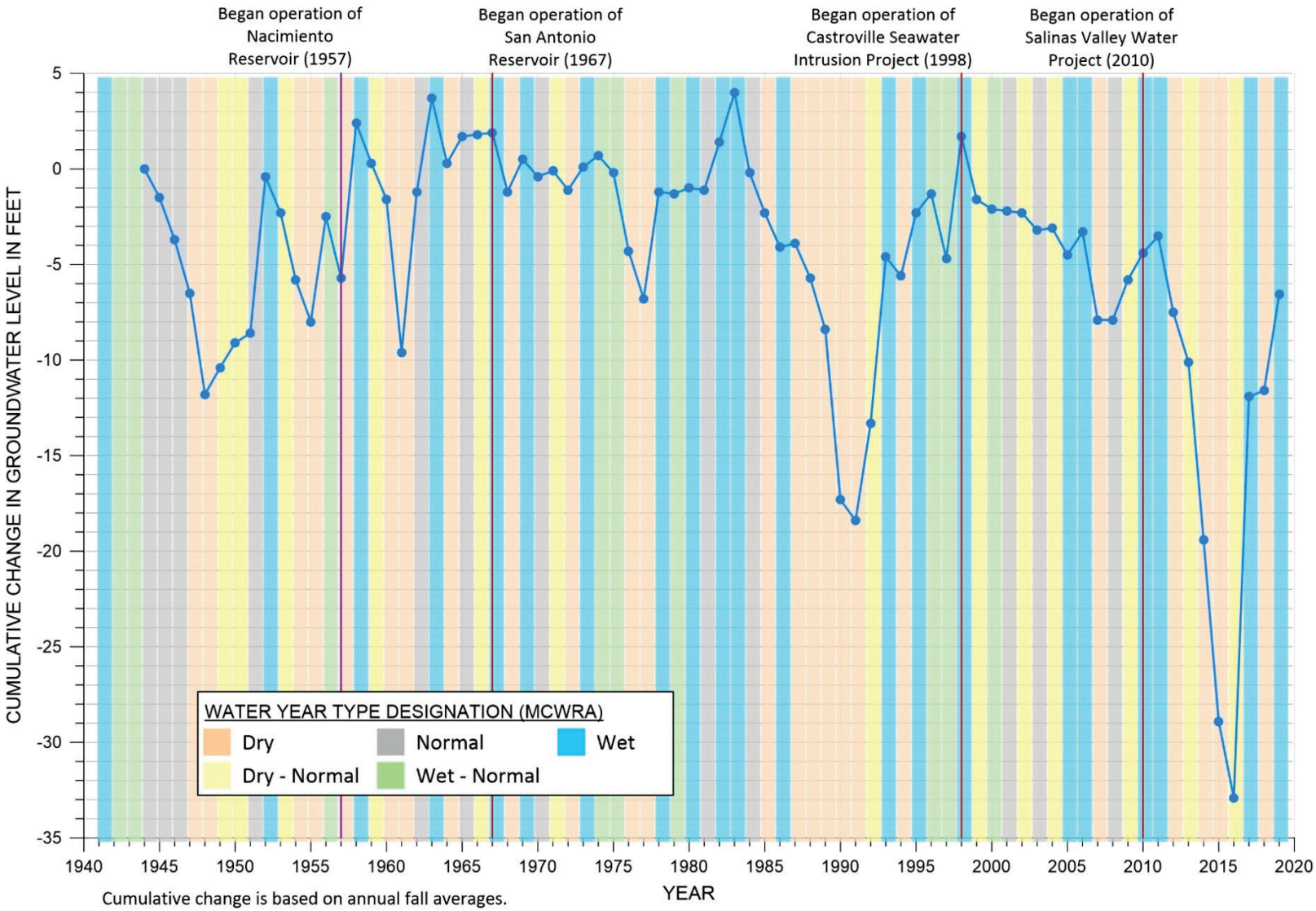


Figure 5-7. Map of Example Hydrographs

Figure 5-8 presents a graph of cumulative groundwater elevation change for the Forebay Subbasin. The graph was initially developed by MCWRA and is based on averaged change in fall groundwater elevations for designated wells in the Forebay Subarea each year. The Forebay Subarea overlaps the Forebay Subbasin, as well as small portions of the 180/400 and the Eastside Subbasins, as shown on Figure 5-9. The figure was adapted to reflect the cumulative change in groundwater elevations specific to the Forebay 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 figure over this period shows a gradual subbasin-wide decline in storage since the late 1990s. However, recovery from the 2013-2016 drought might not have been complete by 2019. Also, the specific hydrographs presented in Appendix 5A show that groundwater elevations in the Subbasin have been relatively stable in part of the Subbasin near the Salinas River, but show a slight declining trend since the late 1990s in other parts of the Subbasin.



(adapted from MCWRA, 2018a, personal communication)

Figure 5-8. Cumulative Groundwater Elevation Change Graph for the Forebay Subbasin

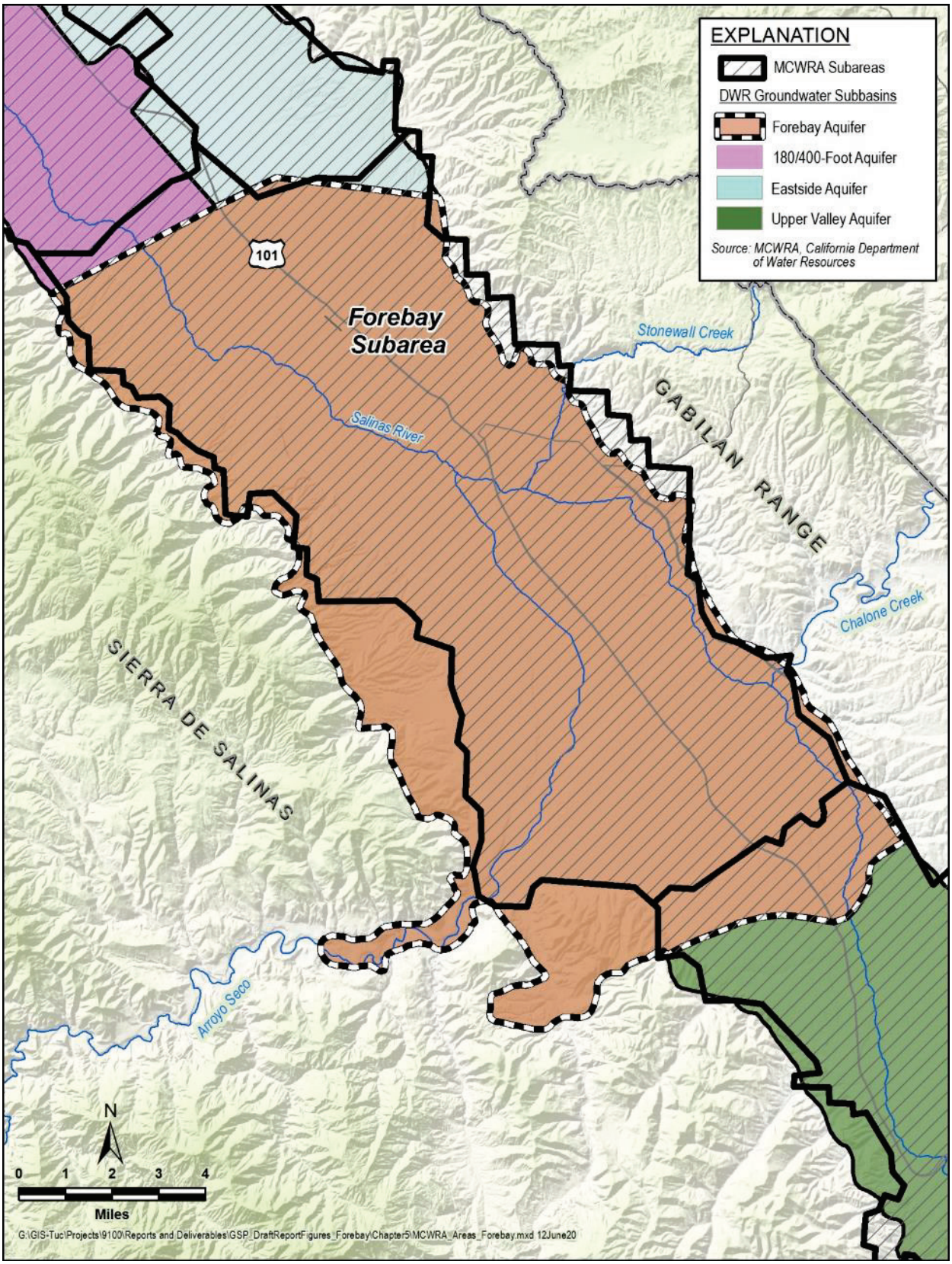


Figure 5-9. MCWRA Management Subareas

5.1.4 Vertical Groundwater Gradients

As discussed in Chapter 4, the Forebay Subbasin has a single principal aquifer—the Basin Fill Aquifer. It is lithologically similar to the neighboring 180/400 and Eastside Subbasins. However, the aquitards that separate the principal aquifers in the 180/400 Subbasin are not present in the Forebay Subbasin, with the exception of the 400/Deep Aquitard that delineates the Deep Aquifers extent. Shallow, discontinuous clay intervals are present in the northern part of the Subbasin; however, hydraulic connection could exist through thin spots or gaps.

Figure 5-10 shows groundwater elevations at 3 well pairs in the Subbasin. The well pairs consist of 2 adjacent wells with different well depths, 1 shallow and the other deep. The northernmost well pair consists of a shallow well (17S/05E-02N04) and a deep well that is potentially tapping into the deeper sediments of the Basin Fill Aquifer (17S/05E-03R50). The similarity in groundwater elevations suggests that these 2 wells are hydraulically connected.

The middle well pair consists of wells that are likely in the Basin Fill Aquifer, which is reflected in the similar trends in groundwater elevations of the shallow well (17S/06E-33R02) and deep well (17S/06E-33R01). The hydrographs suggest a slight upward vertical gradient at this location, as shown by water levels being slightly lower in the shallower well than the deeper well. Groundwater levels at both of these wells are at or above the riverbed at the USGS stream gage at Soledad (station 11151700), indicating a continuous saturated zone between the river and the underlying aquifer.

The southernmost well pair is within the ASCMA. The vertical extent of the Arroyo Seco Cone sediments is unknown, with respect to the relationship of the alluvial fan sediments with the deepest sediments in the subbasin. For this well pair, groundwater elevations in the shallow well (18S/06E-35F02) are generally the same as the groundwater elevations in the deep well (18S/06E-35F01). The noticeably similar trends in groundwater elevations at the 2 depths suggests that these wells are also hydraulically connected despite the difference in depths. The hydrographs for these wells suggest a slight downward vertical gradient in the Arroyo Seco Cone.

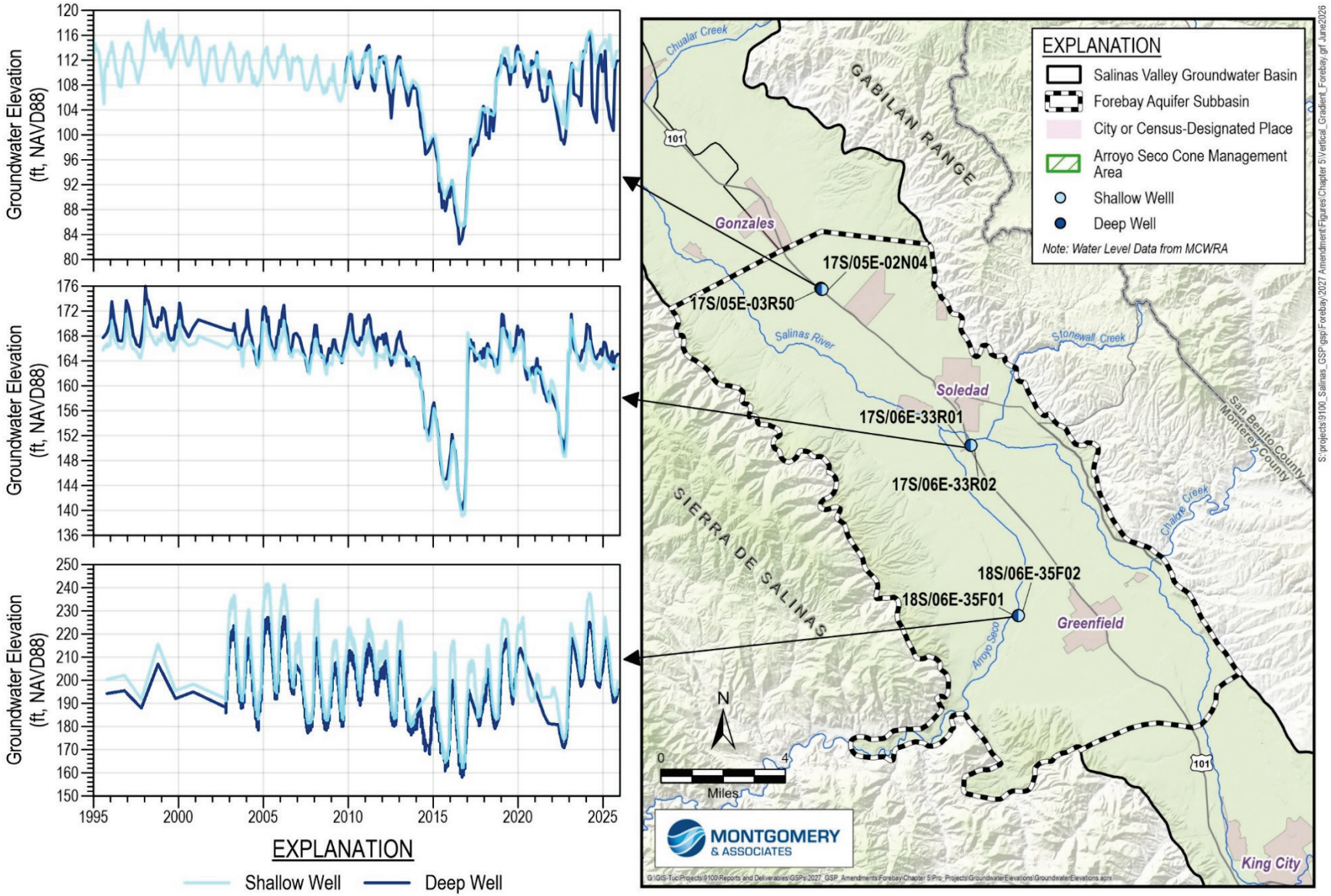


Figure 5-10. Vertical Gradients

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 the peak irrigation season and before winter precipitation increases groundwater levels; therefore, fall groundwater levels are reflective of annual change in storage caused by recharge and withdrawals of groundwater. 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

Change in groundwater storage is derived from change in observed groundwater elevations at RMS wells. 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 (AF/yr)

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

A = Land area (acres)

SC = Storage coefficient (ft^3/ft^3)

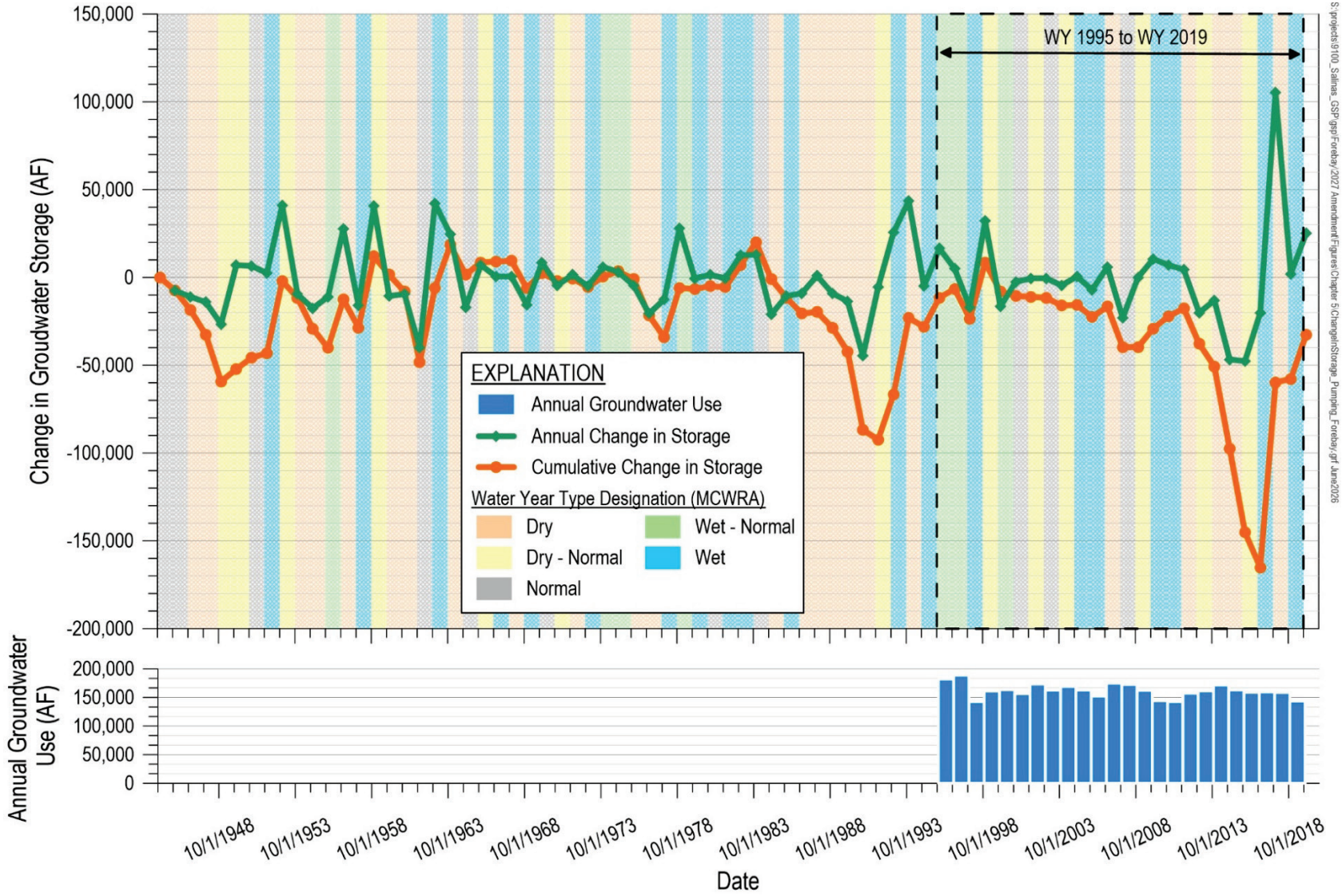
The change in storage is presented below in 2 ways: (1) a timeseries of cumulative and annual change in storage from 1944 through 2019 averaged across the Subbasin (Figure 5-11) and (2) a map showing spatial change in storage across the Subbasin from 1995 to 2019 (Figure 5-12).

The estimated cumulative change in groundwater storage in the Forebay Subbasin shown on Figure 5-11 is based on 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 SVIHM (0.0585 ft^3/ft^3), used due to the model construction of the SVIHM. Although more than 1 layer comprises the Forebay Subbasin in the SVIHM, only the storage properties of layer 1 are used because most of the storage change occurs in this upper layer. The area used in this calculation is 85,800 acres, which is the sum of the cells comprising layer 1 within the Forebay Subbasin.

Method 1: For the first method of estimating change in storage, Figure 5-11 shows groundwater elevations have fluctuated over this historical period in the Forebay Subbasin, as indicated by

annual change in storage. The small cumulative decrease in storage from 1995 to 2019 probably results from ongoing recovery from the 2013-2016 drought as of 2019. The average annual storage loss due to lowering groundwater elevations in the Forebay Subbasin between 1944 and 2019 is approximately 110 AF/yr, most of which occurred after the mid-1980s. From 1995 to 2019, storage decreased at approximately 160 AF/yr, which equals only 0.1% of average annual groundwater extractions (within the margin of error of the extraction estimate). 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 5-11 also shows the annual change in storage and annual groundwater extractions starting in 1995 which is when groundwater extraction monitoring began. The calculated net decrease in storage is not significantly different from zero.

Method 2: For the second method of estimating of change in storage, Figure 5-12 shows the spatial distribution of estimated change in groundwater elevation 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 averaged within each SVIHM grid cell that overlaps with the Forebay Subbasin 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, and then summed together to estimate total change in storage. This yielded an estimated loss in storage of approximately 200 AF/yr.



(Adapted from MCWRA, 2018a, personal communication)

Figure 5-11. Annual and Cumulative Change in Groundwater Storage and Total Groundwater Extraction in the Forebay Subbasin, Based on Groundwater Elevations

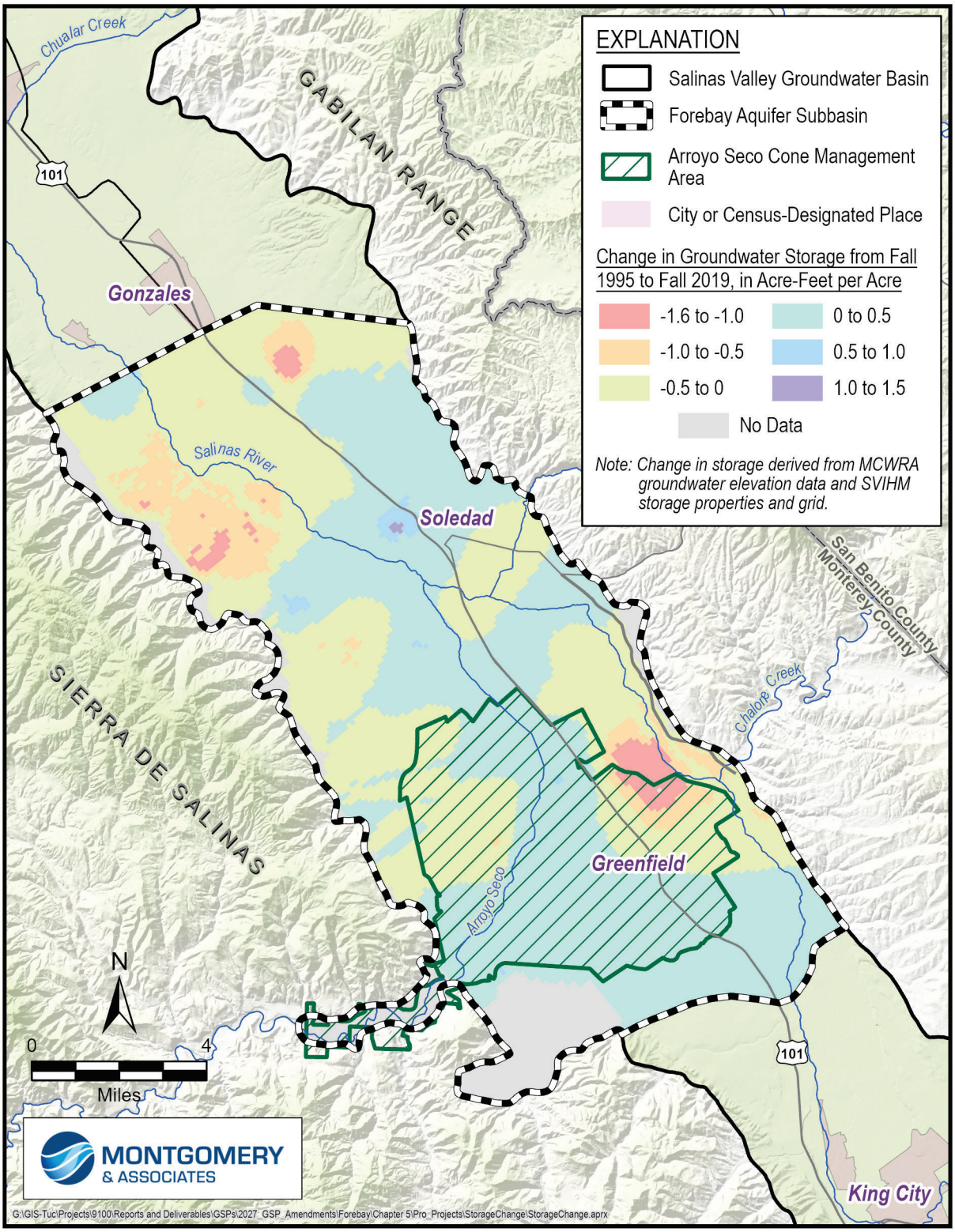


Figure 5-12. Change in Groundwater Storage from Fall 1995 to Fall 2019

5.3 Groundwater Quality Distribution and Trends

SVBGSA and ASGSA do not have sole regulatory authority over groundwater quality and are not charged with improving groundwater quality in the Salinas Valley. Projects and actions implemented by SVBGSA and ASGSA are not required to improve groundwater quality; however, they must not further degrade groundwater quality.

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's Groundwater Ambient Monitoring and Assessment Program (GAMA) reports (Kulongoski and Belitz, 2005; Burton and Wright, 2018)
- SWRCB's GeoTracker Data Management System (SWRCB, 2026a)
- SWRCB's GAMA Groundwater Information System (SWRCB, 2020)
- The California Department of Toxic Substances Control's (DTSC) EnviroStor data management system (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 5-13 provide a summary of the active clean-up site within the Subbasin.

Not all constituents listed in Table 5-2 are part of the monitoring network described in Chapter 7. However, the status of the constituents at this site will continue to be monitored by the DTSC or the CCRWQCB.

Table 5-2. Active Cleanup Sites

Site Name	Site Type	Status	Constituents Found at Site	Address	City
Reconstruction of Mary Chapa and El Camino Real Schools Site	School	Active	Metals, organochlorine pesticides, petroleum, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons, volatile organics (VOCs)	490 El Camino Real	Greenfield

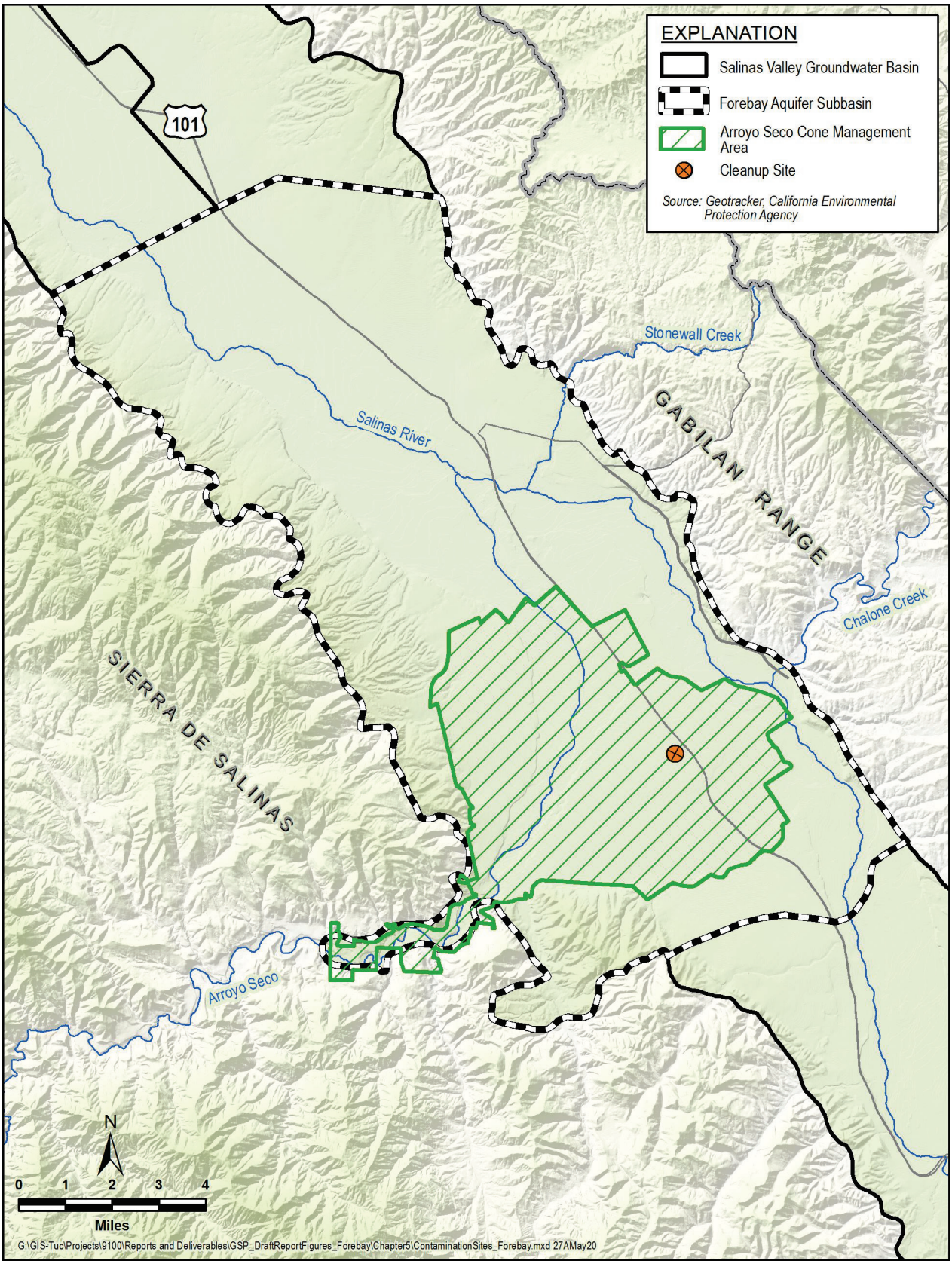


Figure 5-13. Active Cleanup Sites

5.3.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

In addition to the single point source of groundwater contamination 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. These include nitrate from fertilizers and salinity from evaporative concentration of applied irrigation water.

5.3.3.1 Previous Studies

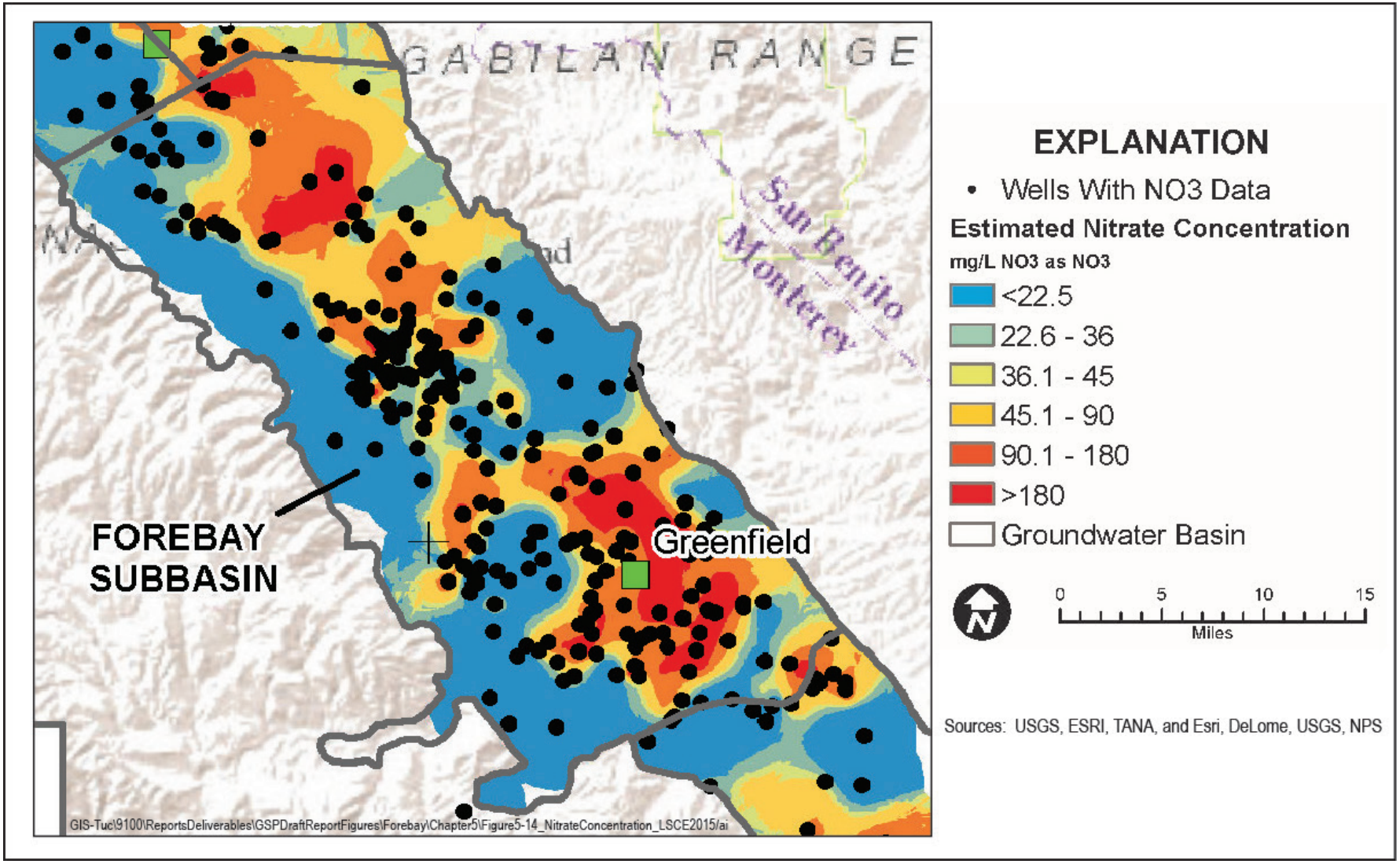
In the Subbasin, the most prevalent non-point water quality concern is nitrate. The current distribution of nitrate was extensively monitored and evaluated by the CCGC and documented in a report submitted to the CCRWQCB (CCGC, 2015).

Figure 5-14 shows a map of nitrate distribution in the Subbasin prepared by CCGC. The orange and red areas shown on the figure illustrate the portions of the Subbasin where groundwater has nitrate concentrations above 45 mg/L NO3, which is the drinking water MCL for NO3.

Figure 5-15 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 in the 1960s, but significantly increased in the 1970s and 1980s. Extensive distribution of nitrate concentrations above the drinking water MCL, as shown on Figure 5-14, has been present in the Forebay Subbasin for 20 to 30 years.

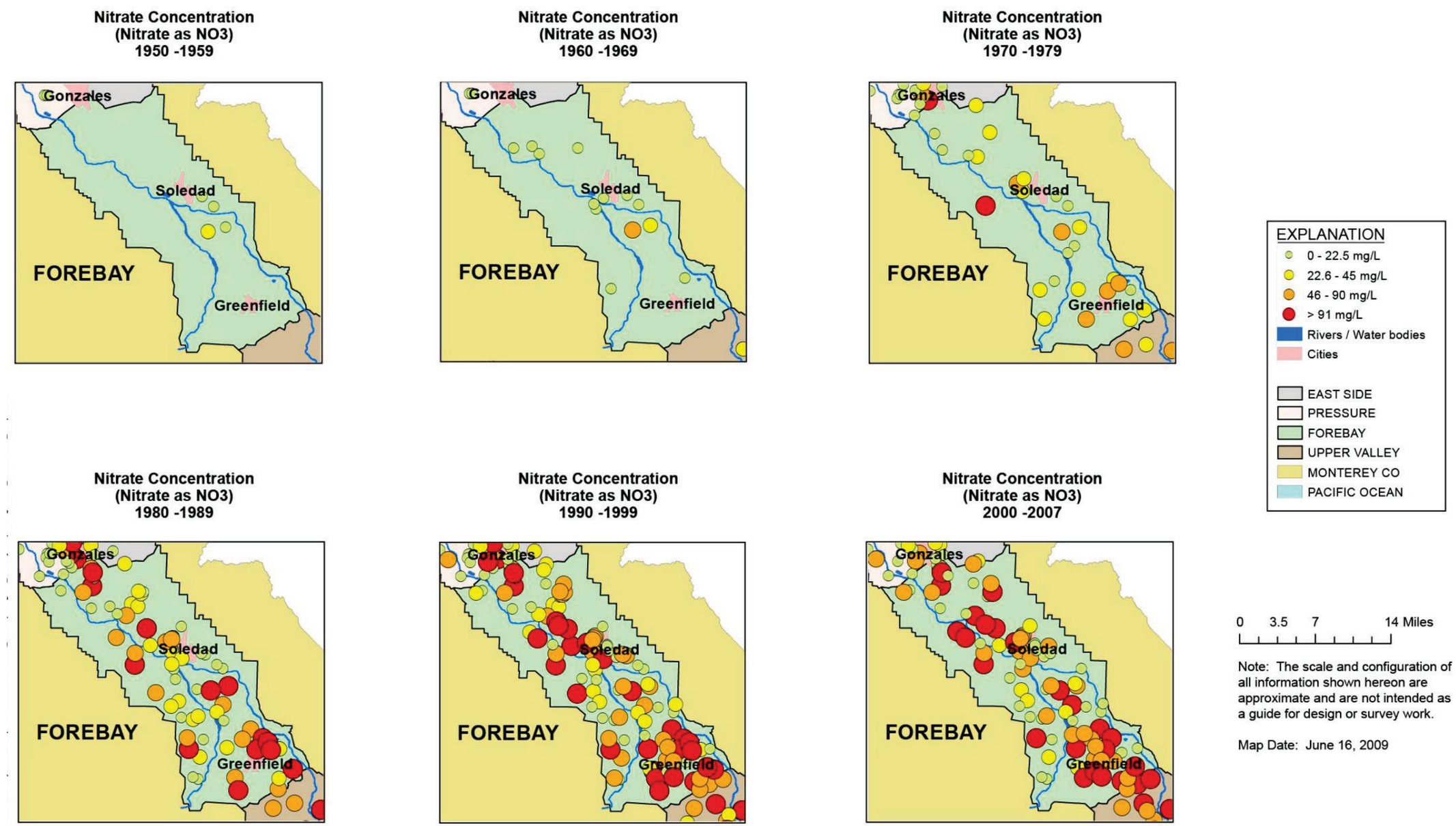
A May 2018 staff report to the CCRWQCB included a summary of nitrate concentrations throughout the Central Coast Region, including the Salinas Valley. The staff report includes data from 2008 to 2018 collected at 2,235 wells in the Salinas Valley, during Agricultural Orders 2.0 and 3.0 sampling events. The report states that 66% of on-farm domestic wells in the Forebay Subbasin exceeded the drinking water MCL with a mean concentration of 112 mg/L NO3. In addition, 45% of irrigation supply wells in the Subbasin exceeded this MCL with a mean concentration of 66 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 Forebay Subbasin (Montgomery & Associates, 2026a). The analysis analyzed 30 years (1995–2024) of nitrate, groundwater elevation, and extraction data using Mann-Kendall trend tests and Pearson's correlation. 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 = 0.7) or between nitrate trends and annual average extraction rates (r_p = -0.06, p = 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 5-14. Estimated Nitrate Concentrations



(received from MCWRA)

Figure 5-15. Nitrate Concentrations, 1950 to 2007

Additional groundwater quality conditions in the Subbasin 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 includes groundwater quality data for public water system supply wells from the SWRCB Division of Drinking Water (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 the 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 hat have historically occurred in the active wells in the Forebay Subbasin. The number of wells that exceed the concentration level of concern for any given constituents is based on the latest 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 Table 5-3 are provided in Appendix 5B.

Table 5-3 indicates that nitrate is the most prevalent constituent. Among DDW wells, exceedances were relatively limited, with chloride occurring most frequently (17% of wells), followed by iron and manganese (12% each), and nitrate (9%). Exceedances of specific conductance, total dissolved solids (TDS), and 1,2,3-TCP were uncommon, and no wells exceeded the gross alpha radioactivity standard. In contrast, on-farm domestic wells exhibited substantially higher nitrate impacts, with 54% of wells exceeding the nitrate+nitrite concentration level of concern, while 16% exceeded the specific conductance threshold. Irrigation supply wells also showed widespread water quality concerns, with exceedances for nitrate plus nitrite in 40% of wells, sodium in 27%, and chloride and TDS in 22% of wells each. Overall, groundwater quality impacts are primarily related to nutrient loading and salinity associated with agricultural land use, while exceedances of other regulated constituents in public supply wells are comparatively limited and localized.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSAs are 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 Latest Sample	Percentage of Wells with Exceedances
DDW Wells (Data from August 1986 to September 2019)					
1,2,3-Trichloropropane (1,2,3-TCP)	0.005	µg/l	34	1	3%
Chloride	106	mg/l	35	6	17%
Gross Alpha radioactivity	15	pci/l	34	0	0%
Iron	300	µg/l	33	4	12%
Manganese	50	µg/l	33	4	12%
Nitrate (as nitrogen)	10	mg/l	43	4	9%
Specific Conductance	1600	µmhos/cm	36	2	6%
Total Dissolved Solids	1000	mg/l	34	2	6%
ILP On-Farm Domestic Wells (Data from May 2013 to September 2019)					
Nitrate + Nitrite (sum as nitrogen)	10	mg/l	151	81	54%
Specific Conductance	1600	µmhos/cm	97	16	16%
ILP Irrigation Supply Wells (Data from November 2012 to September 2019)					
Chloride	106	mg/L	164	36	22%
Nitrate + Nitrite (sum as nitrogen)	10	mg/l	75	30	40%
Sodium	69	mg/L	164	44	27%
Specific Conductance	1600	µmhos/cm	118	14	12%
Total Dissolved Solids	1000	mg/l	139	30	22%

5.4 Subsidence

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

5.4.1 Data Sources

To estimate subsidence, DWR has made Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map: 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 5-16 presents a map showing the average annual InSAR subsidence data in the Forebay Subbasin between June 2015 and June 2019 (DWR, 2020c). The yellow area on the map shows measured changes in ground elevation of between -0.1 and 0.1 feet per year. 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 feet per year are not considered subsidence. The white areas on the map are areas with no data available. The map illustrates that no measurable subsidence has been recorded anywhere in the Subbasin.

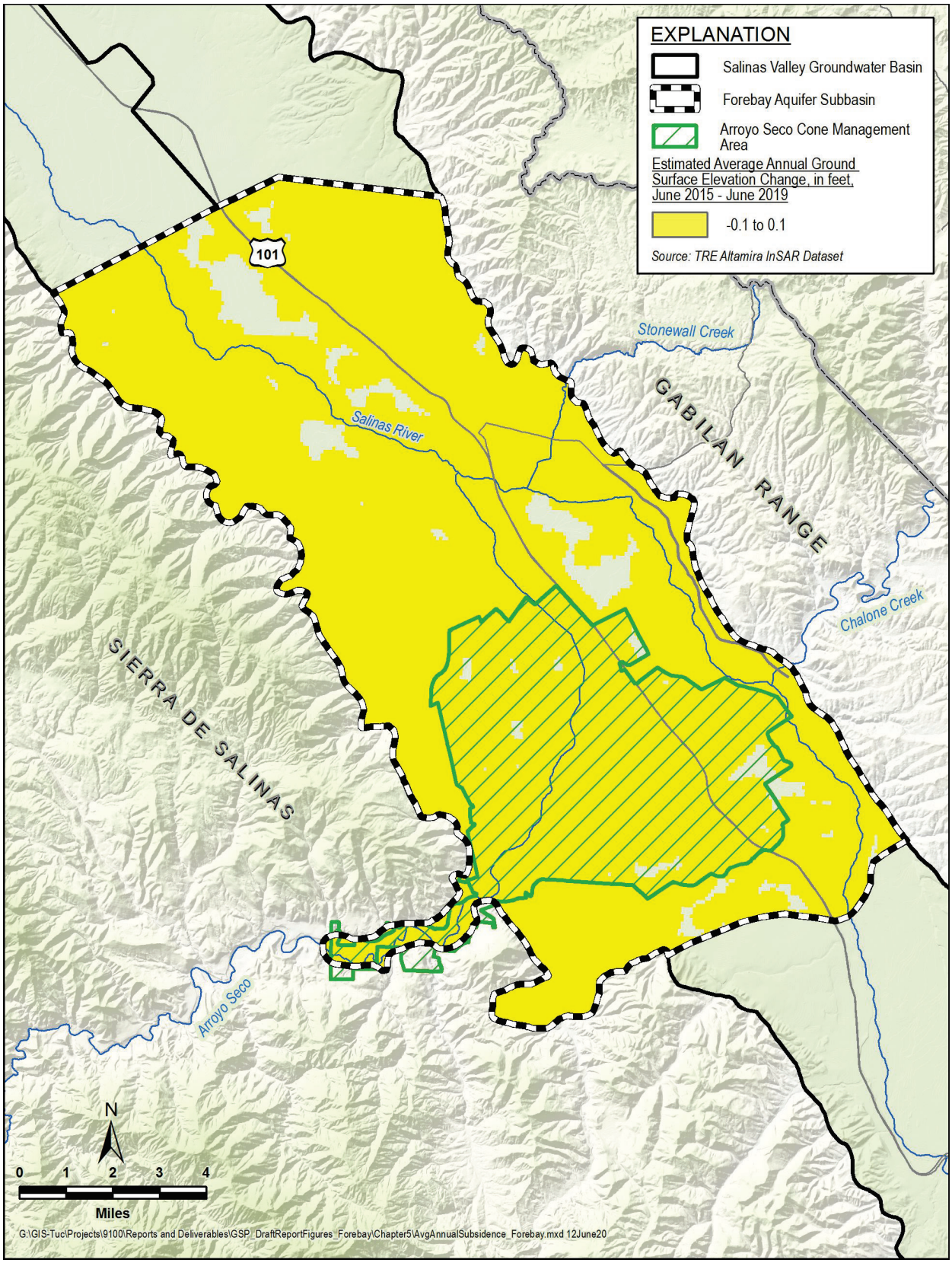
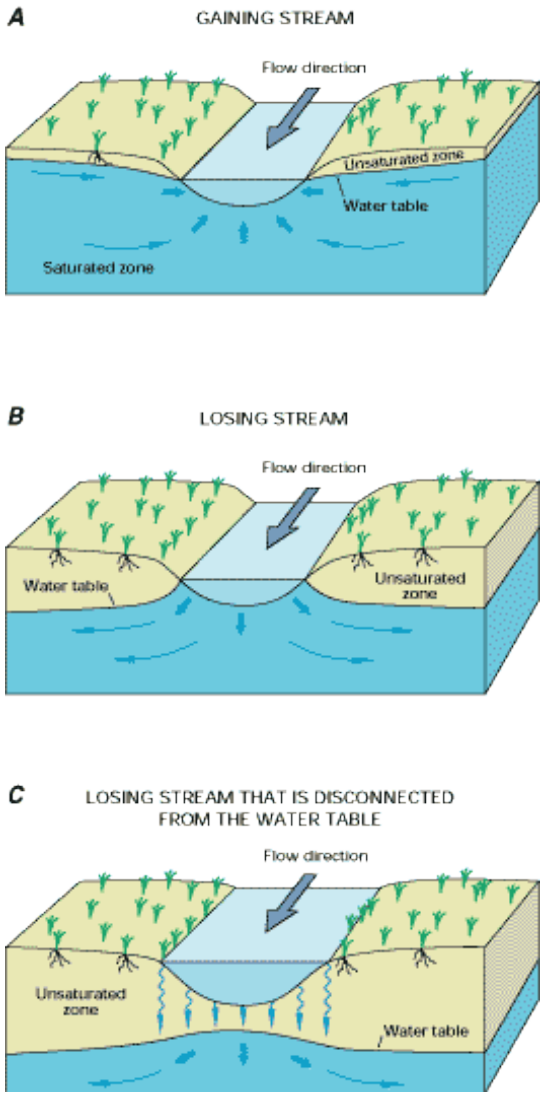


Figure 5-16. Estimated Average Annual InSAR Subsidence in Subbasin

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 considered to be disconnected. SGMA does not require that disconnected stream reaches be analyzed or managed. These concepts are illustrated on Figure 5-17.



(Winter *et al.*, 1999)

Figure 5-17. 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 4-14. There is no observed 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 SVIHM to estimate and evaluate 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, 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 ensures water is available in downstream reaches for re-diversion, environmental purposes, and groundwater recharge.

During the conservation release period when reservoir releases provide water in the river, depletion represents the pumping-related change in flow exchange between surface water and groundwater under those managed flow conditions. 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 due to groundwater pumping. 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 but with the normal reservoir releases) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping and normal reservoir releases). The difference in stream leakage between the 2 simulations is the depletion caused by 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 4-13.

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 MCWRA conservation release period when reservoir releases are made in part for groundwater recharge and diversion at the SRDF. Releases also occur during the non-conservation period but for different purposes. Depletion along interconnected sections of the Salinas River is estimated separately 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 in Forebay Subbasin for WY 1980 to WY 2022. Annual average rate of depletion along Salinas River is 64,000 AF/yr Since conservation releases began with the SVWP in 2010, surface water depletion due to pumping during the conservation release period has averaged 26,800 AF/yr along the Salinas River. Smaller amounts of depletion occur along other stream reaches, principally the Arroyo Seco ISW reach. Estimated monthly depletions during the conservation release period are less than during the non-conservation release period for the Salinas River.

Table 5-4. Average SVIHM Simulated Depletion of ISW due to Pumping in Forebay 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	64,000	26,800	34,400
Other Surface Waters	16,800	N/A	N/A

Figure 5-18 shows annual ISW depletions for the historical model period from WY 1980 through WY 2022. The analysis indicates that annual depletions vary from year to year but gradually increased over time. Consistent with trends in ISW extents described in Appendix 4A, ISW depletions sharply declined during drought periods 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 on 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 following a drought when reservoir releases resume and streamflow recovers, 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 5-19 compares average monthly depletions with average monthly groundwater pumping in the Subbasin. ISW depletions are relatively consistent throughout the year, with a slight increase occurring during the non-conservation release period because the increase of surface water availability from reservoir releases mitigates the effects of pumping.

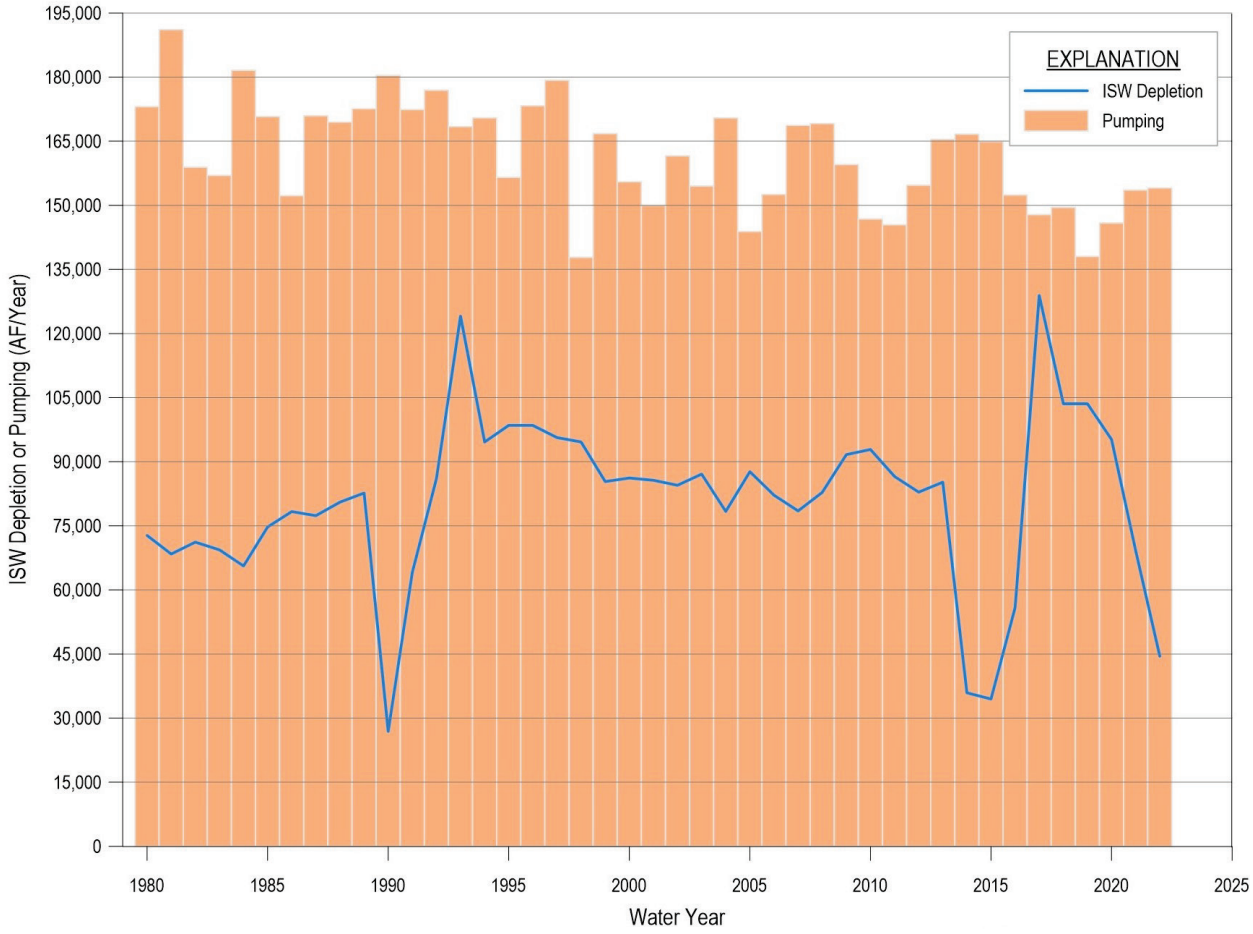


Figure 5-18. Average Annual ISW Depletions and Annual Groundwater Pumping in Forebay Subbasin from WY 1980 to WY 2022

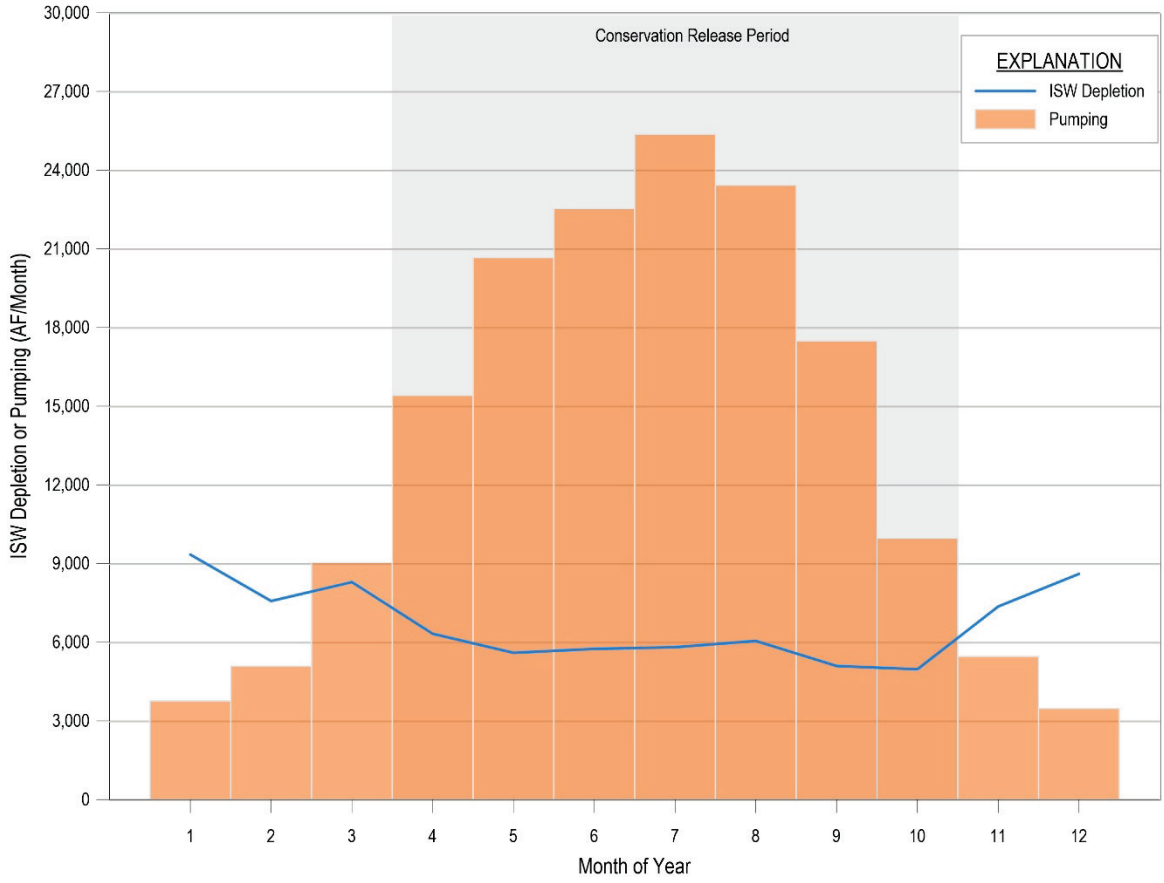


Figure 5-19. Monthly Average Pumping and ISW Depletion in Forebay Subbasin from WY 1980 to WY 2022

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 Forebay 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. Surface water from the Arroyo Seco River is diverted for CCWC deliveries in some years. In addition, the City of Soledad uses recycled water for school and landscape irrigation.

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.

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 estimate is directly from the City of Soledad.

5.6.2 Groundwater Use

Table 5-5 provides groundwater extraction by water use sector for the Forebay 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 water year (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. 2021 to 2025 Groundwater Use (AF/yr)

	2021	2022	2023	2024	2025
Rural Domestic	150	150	150	150	150
Urban (includes industrial)	7,600	7,500	6,700	6,880	6,750
Agricultural	142,800	136,700	109,400	111,120	120,500
Managed Wetlands	0	0	0	0	0
Managed Recharge	0	0	0	0	0
Natural Vegetation	0	0	0	0	0
Total	**150,550**	**144,350**	**116,250**	**118,150**	**127,400**

5.6.3 Surface Water Use

Annual Salinas River and Arroyo Seco River 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 Forebay Subbasin. Clark Colony stopped reporting diversion in 2023 due to flood damage and ongoing repairs. All surface water is used for irrigation.

Table 5-6. 2021 to 2025 Surface Water Diversions (AF/yr)

eWRIMS/CalWATRS Diversions	2021	2022	2023	2024	2025
Statement of Diversion and Use	14,900	11,900	9,700	11,720	37,500
Clark Colony Water Company Diversions	1,500	2,600	0	0	0
Total	**16,400**	**14,500**	**9,700**	**11,720**	**37,500**

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 5-20.

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. As a result, total surface water use includes only the CCWC diversions reported to SWRCB. 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 32,890 AF/yr out of the total agricultural groundwater extraction reported to MCWRA was also reported to the SWRCB. Because this amount exceeds the total surface water

diversions reported within the Forebay Subbasin to SWRCB, it is assumed that it encompasses those diversions. However, it is possible that this assumption is incorrect, in which case total water use may be up to 11,090 AF/yr greater than calculated here.

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

Table 5-7. 2021 to 2025 Total Water Use by Water Source Type and Water Use Sector (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	150	0	0	150	0	0	150	0	0	150	0	0	150	0	0
Urban	7,600	0	0	7,500	0	0	6,700	0	0	6,880	0	0	6,750	0	0
Agricultural	142,800	1,500	170	136,700	2,600	170	109,400	0	170	111,120	0	170	120,500	0	170
SUBTOTALS	**150,550**	**1,500**	**170**	**144,350**	**2,600**	**170**	**116,250**	**0**	**170**	**118,150**	**0**	**170**	**127,400**	**0**	**170**
TOTAL	**152,220**			**147,120**			**116,420**			**118,320**			**127,570**		

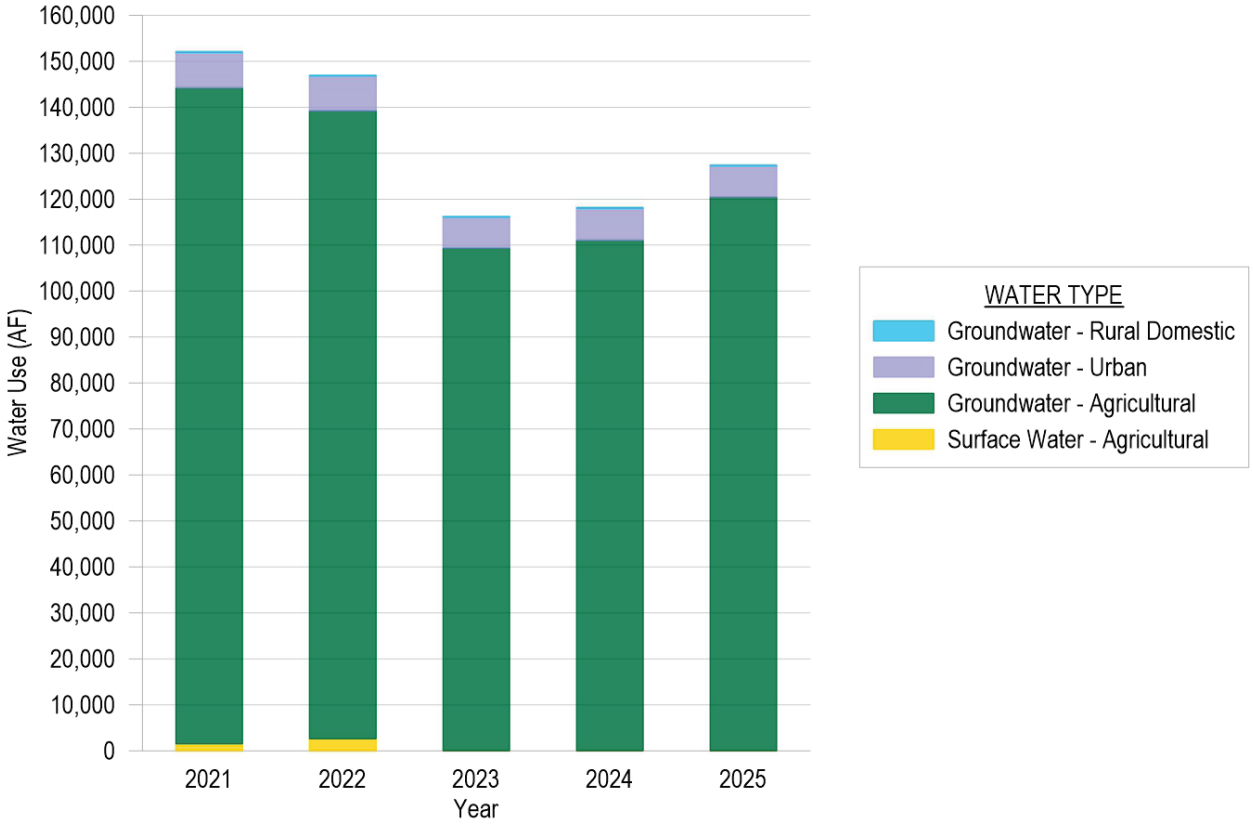


Figure 5-20. 2021 to 2025 Total Water Use by Water Source Type and Water Use Sector

6 WATER BUDGETS

This chapter summarizes the estimated water budgets for the Forebay 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, a 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 and ASGSA. This section describes the water budgets for this Subbasin in a manner consistent with GSPs for other subbasins in the Valley.

Water budgets are developed for the entire Forebay Subbasin and for the ASCMA, with the ASCMA representing a portion of the larger Subbasin. Following the Subbasin-wide sections, corresponding water budgets for the ASCMA are presented.

6.1 Overview of Water Budget Development

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.

Historical and current water budgets are developed using the SVIHM, initially developed by the USGS and subsequently updated by the SVBGSA. The water budgets presented herein are based on results from the updated SVIHM. The SVIHM is a numerical groundwater-surface water model that was 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 (U.S. Geological Survey, 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), the latter of which uses the Hydrologic Simulation Program – Fortran (HSPF) code. Additional details on the original model development and calibration are provided by U.S. Geological Survey (2026) and a summary of model updates and recalibration is described in Montgomery & Associates (Montgomery & Associates, 2025b).

Future water budgets are developed using the 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 or alternative reservoir operations. It incorporates complex surface water operations through the Surface Water Operations module. Information on model inputs, design, and results is summarized in U.S. Geological Survey (2026), and initial updates are documented by Montgomery & Associates (2026b).

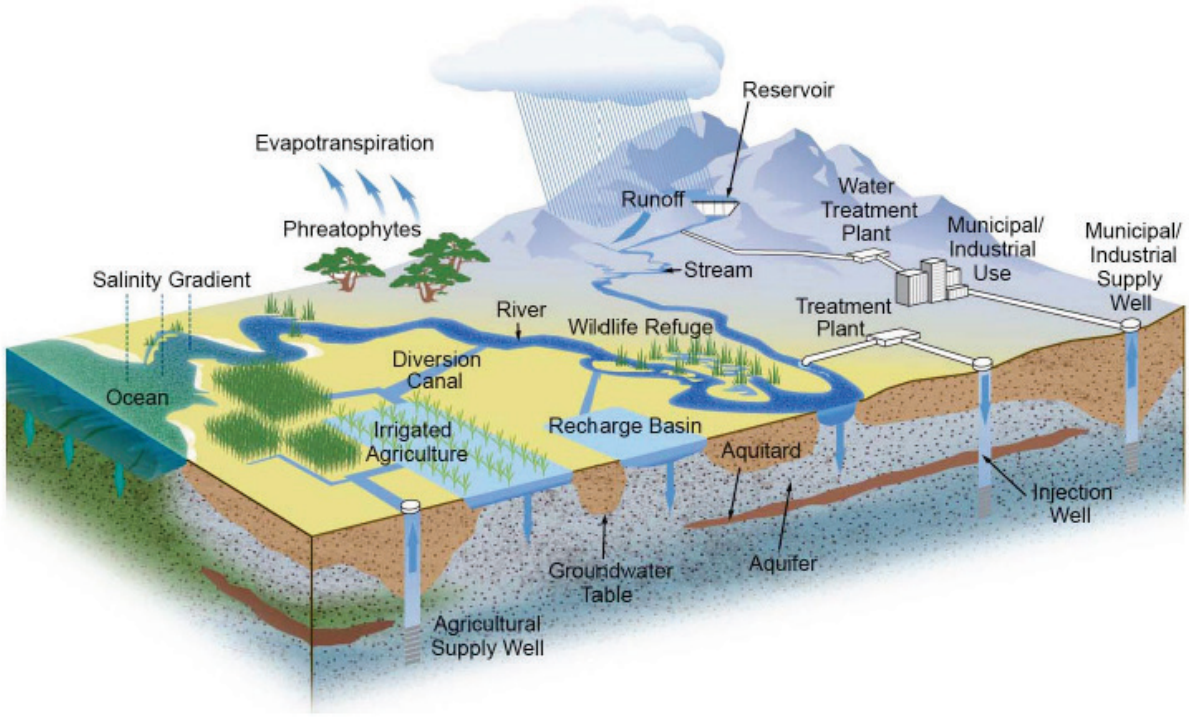
Consistent with GSP Regulations § 354.18, a complete groundwater budget is developed for each principal aquifer for each water budget period. In the Forebay Subbasin, there is a single principal aquifer.

6.1.1 Water Budget Components

The water budget is an inventory of surface water and groundwater inflows and outflows from the Subbasin. A few components of the water budget can be measured, such as groundwater pumping from a metered wells and streamflow at a gaging station. Other components of the water budget are simulated by the groundwater models, such as recharge from precipitation and applied irrigation, and change of groundwater in storage. Figure 6-1 presents a general schematic diagram of the hydrologic cycle 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 Forebay Subbasin within the SVIHM is shown on Figure 6-2. The model zone for the ASCMA is also shown on this figure.
- **Bottom.** The base of the groundwater subbasin is described in the HCM, which has been updated with new data, is now defined as the contact with the crystalline rocks for the portion of the Subbasin that is near the Gabilan Range, and the “usable” portion of the Basin according to the previous model developed by Durbin *et al.* in 1978. In this way, the conceptual model remains focused on the primary areas of groundwater extraction, while acknowledging the very physical boundaries that impact extraction where they are observed. 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 that surface water is included in the water budget.



(from DWR, 2020d)

Figure 6-1. Schematic Hydrogeologic Conceptual Model

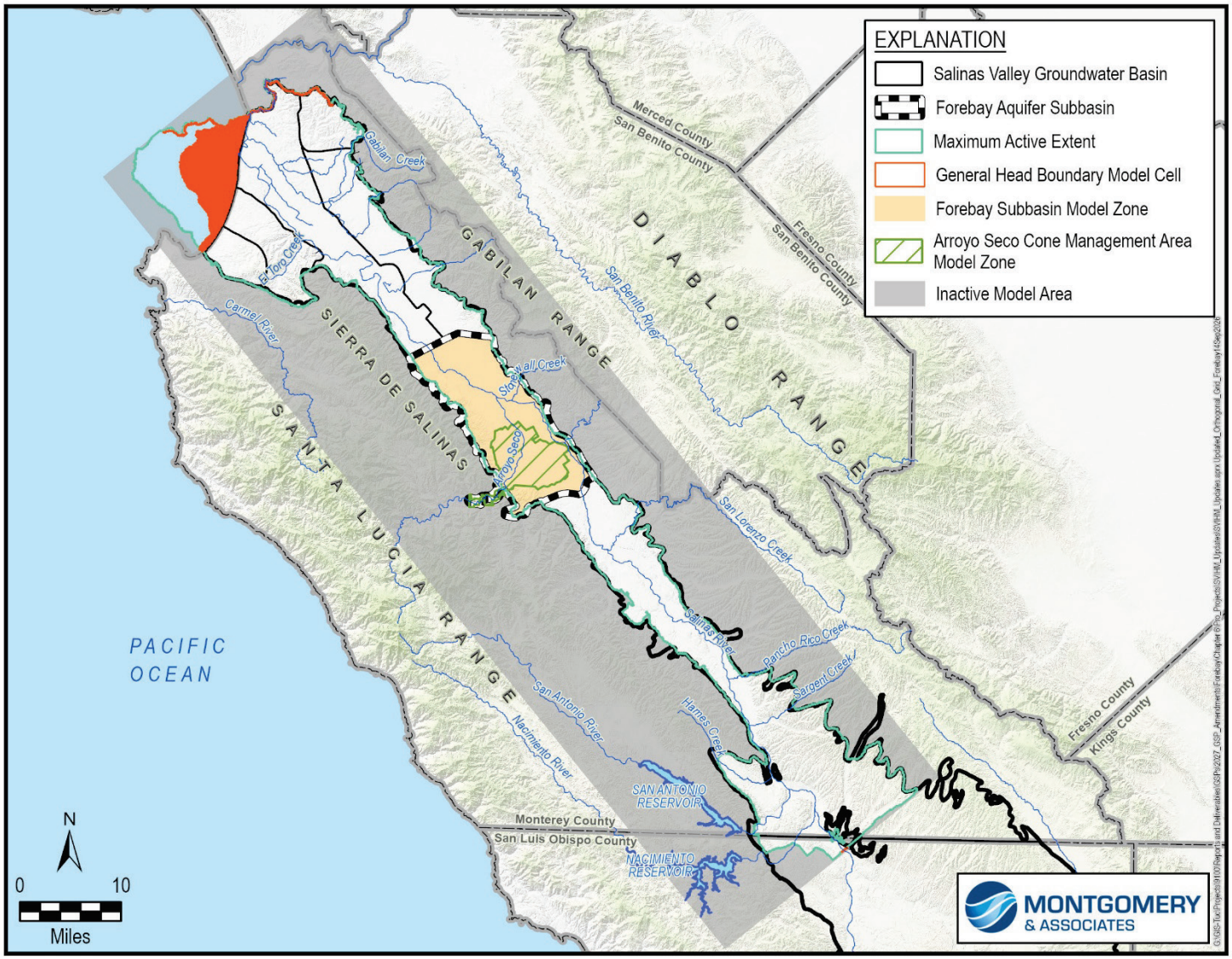


Figure 6-2. Zone and Boundary Conditions for the SVIHM

The Forebay 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, Arroyo Seco, Chalone Creek, Stonewall Creek, and other smaller streams that enter the Subbasin. Reservoir operations influence Salinas River inflow; however, reservoir operations are not under the purview of the GSAs.
  - Groundwater discharge to streams
- Outflows
  - Surface water outflow to neighboring subbasins along Salinas River and other smaller streams
  - Streambed recharge to groundwater
  - Direct diversions

Groundwater Budget:

- Inflows
  - Deep percolation from precipitation and applied irrigation
  - Streambed recharge to groundwater
  - Subsurface inflows including:
    - Inflow from the Upper Valley Subbasin
    - Inflow from surrounding watershed that are not in other DWR subbasins
- Outflows
  - Evapotranspiration (ET) from groundwater (crop and native vegetation)
  - Groundwater pumping, including both urban and agricultural
  - Groundwater discharge to streams
  - Subsurface outflows including:
    - Outflow to the Eastside Subbasin
    - Outflow to the 180/400 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, and the specific periods selected are described in Sections 6.1.2.1 to 6.1.2.3:

- The historical water budget evaluates how past water use and supply availability 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. 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 budget 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. 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 seasonal variation between wet and dry seasons, the GSP does not consider 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	WY 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	WY 2021 and 2022	Dry: 1 Dry-Normal: 1	Last years in SVIHM. Best reflection of current land use and recent water use conditions based on best available data.

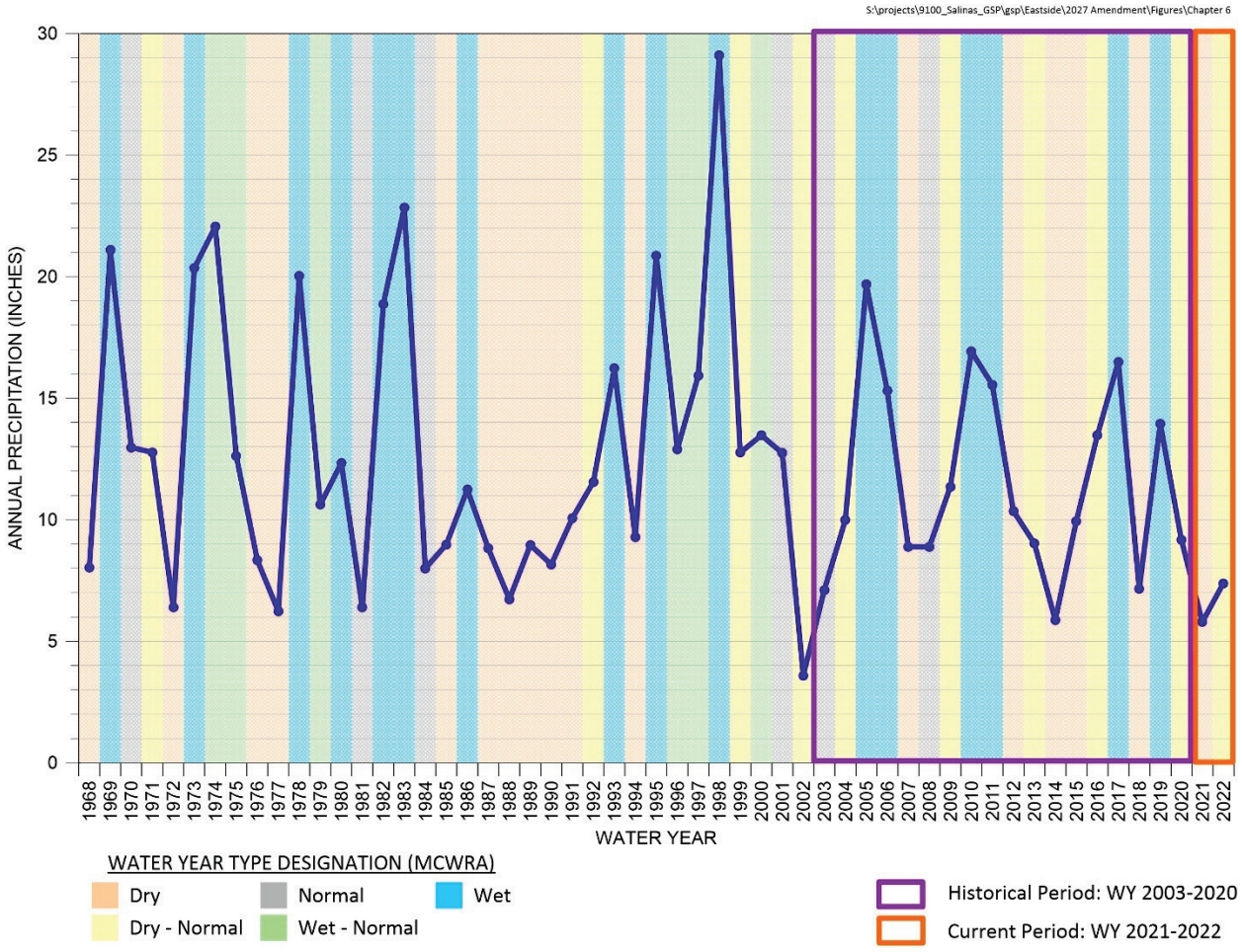


Figure 6-3. Climate and Precipitation for Historical and Current Water Budget Time Periods

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 WYs 1968 through 2022, the water budget focuses on WY 2003 through 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. WYs 2003 through 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 WYs 2021 and 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. 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 Model Assumptions 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 in the water budgets are underpinned by certain assumptions. These assumptions 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 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	Simulated from watershed model for all creeks	Not all creeks are gaged
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gaged creeks
Overland Runoff	Simulated from calibrated model	Based on land use, precipitation, and soils specified in model
Surface Water Outflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gaged creeks and groundwater level data from nearby wells
Diversions	Reported data and estimates 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. No gages exist at subbasin boundary.
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 Adjacent 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 the Langley Subbasin is estimated based on population and per capita assumptions.	Rural residential pumping within MCWRA Zone 2A is not simulated in model
Groundwater Discharge to Streams	Estimated from 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 from calibrated model	Limited calibration data at adjacent subbasin boundaries
ET from Groundwater	Estimated from 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.

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 flows from rivers and tributaries entering and exiting the Subbasin, precipitation that falls directly onto streams, overland runoff to streams, diversions from 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 6-4Figure 6-4 shows the model grid cells for the surface water network simulated in the SVIHM. The network includes the Salinas River, Arroyo Seco, and other streams in the Subbasin. For this water budget, boundary inflows and outflows are the sum of all locations that cross the Subbasin boundary.

Figure 6-5 shows the surface water budget for the historical period and current period, and Table 6-3 shows the average values for components of the surface water budget for the historical and current periods. Positive values are inflows into 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 (streamflow exchange) in the Subbasin is net negative, which indicates more seepage from the streams to groundwater than discharge of groundwater to streams.

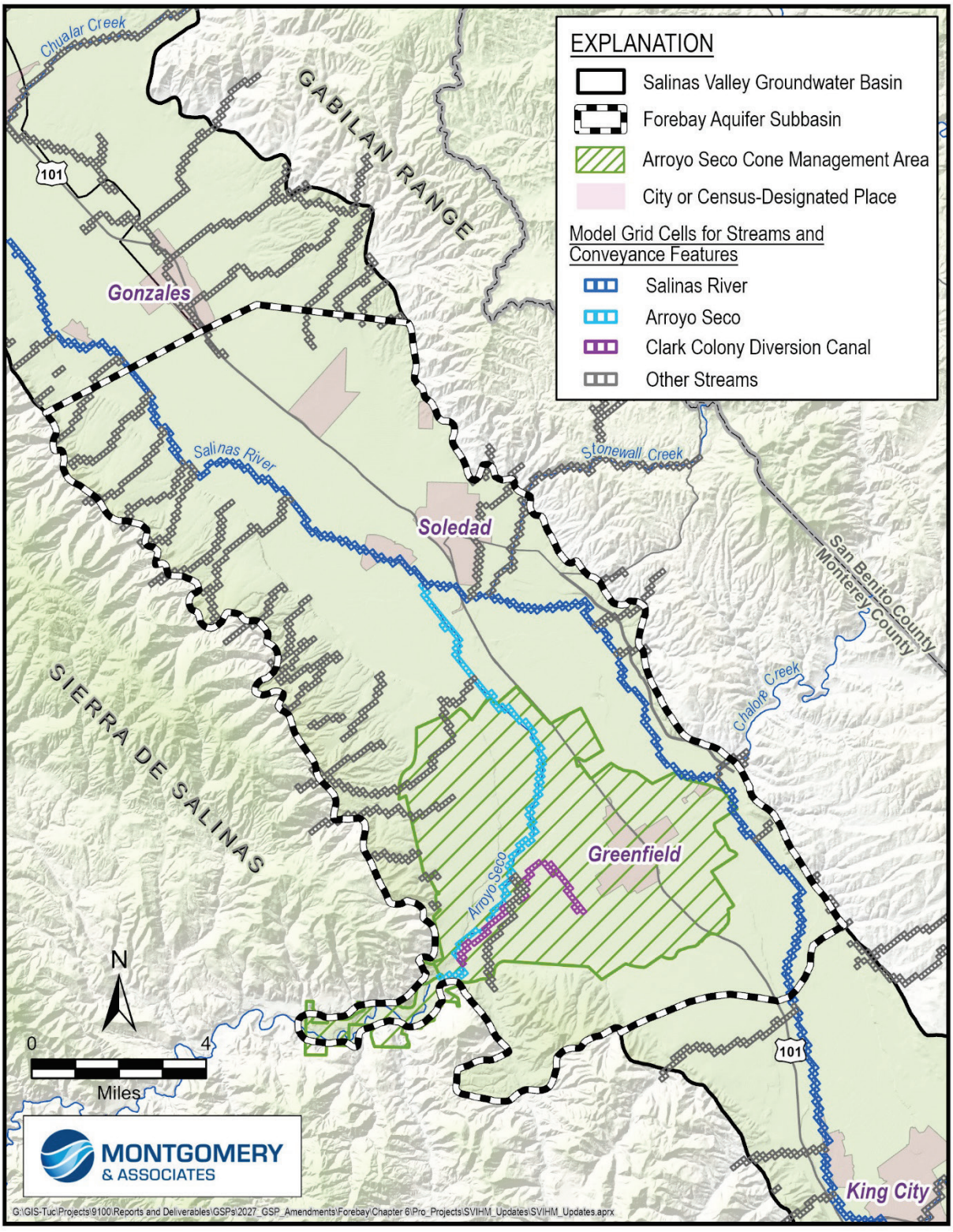


Figure 6-4. Surface Water Network in Forebay Subbasin from the SVIHM

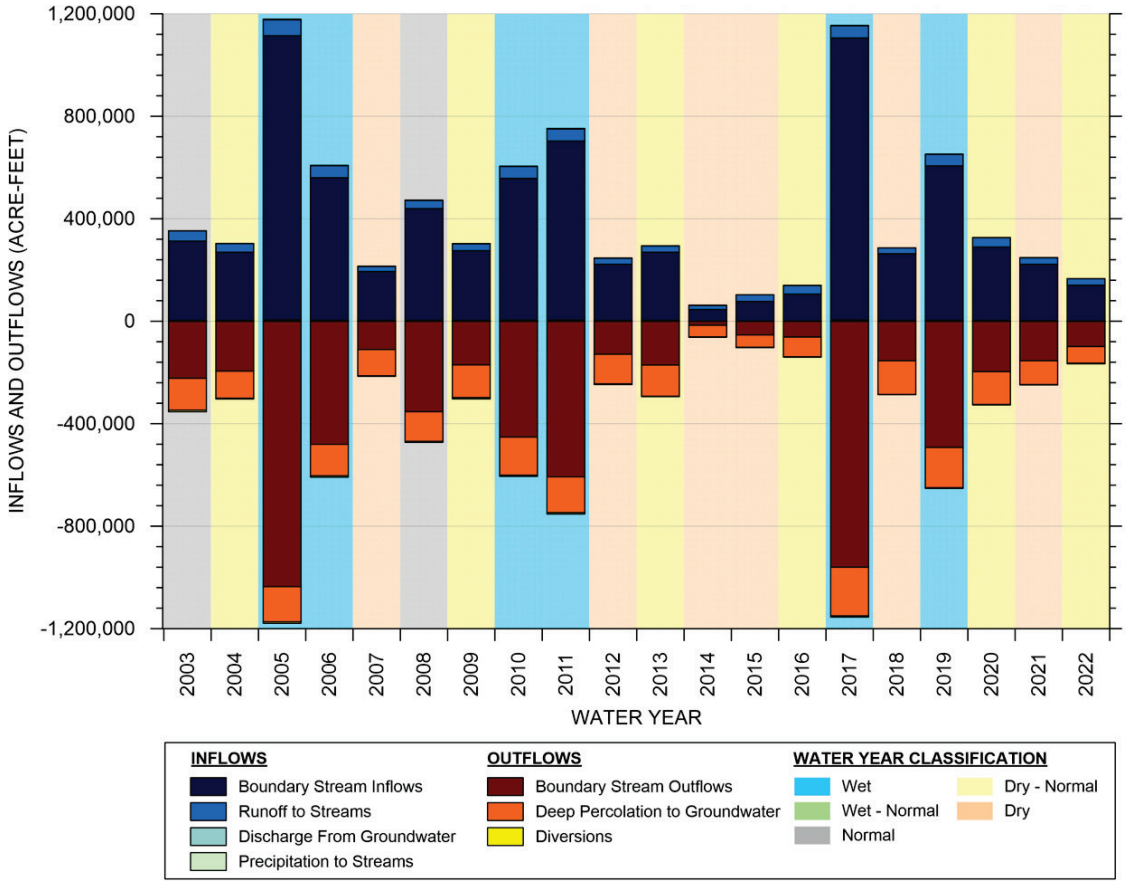


Figure 6-5. Historical and Current Surface Water Budget

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

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Boundary Stream Inflows	408,800	180,000
Precipitation on Streams	3,100	1,600
Net Flow between Surface Water and Groundwater	-117,700	-78,300
Overland Runoff to Streams	35,100	25,400
Diversions from Streams	-3,400	-2,000
Boundary Stream Outflows	-325,800	-126,700

Table 6-4 summarizes the average net flow between surface water and groundwater along selected streams in the Subbasin. Selected streams include the Salinas River, Arroyo Seco, Clark Colony canal, and the sum of other small tributaries to the river. According to results of the SVIHM, most streambed seepage in the Subbasin occurs along the Salinas River and Arroyo Seco channels, with relatively minor amounts of seepage from Clark Colony diversions or other streams. Net flows were smaller during the current period because dry climate conditions produced less stream flow.

Table 6-4. SVIHM Simulated Net Flow Between Surface Water and Groundwater for Selected Streams

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Salinas River	-85,500	--57,800
Arroyo Seco	-28,000	-17,000
Clark Colony Diversion	-200	-200
Other Streams	-4,100	-3,300

Table 6-5 summarizes the average net flow between surface water and groundwater along the Salinas River for periods of reservoir releases during the water year. Conservation releases from the reservoirs—made to supply the basin with groundwater recharge and surface water diversions at the SRDF—occur from April through October (7 months), and flows during the non-conservation release period of November through March (5 months) are generally not associated with conservation releases. The estimated historical average rates of flow from surface water to groundwater (seepage along the Salinas River channel in the Subbasin) are about 8,500 AF/month (59,400 AF/yr) and 11,700 AF/month (58,300 AF/yr) during conservation and non-conservation release periods, respectively. Similarly, the current rate of seepage to groundwater is larger during the non-conservation release period than the conservation release period: 9,900 AF/month (49,600 AF/yr) and 4,100 AF/month (28,700 AF/yr), respectively.

Table 6-5. SVIHM Simulated Net Flow Between Surface Water and Groundwater for Salinas River for Reservoir Release Periods

Reservoir Release Period	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Conservation Release Period (April through October)	-59,400	--28,700
Non- Conservation Release Period (November through March)	--58,300	--49,600

6.3.2 Historical and Current Groundwater Budget

The groundwater budget accounts for the inflows and outflows to and from the Subbasin's aquifers, based on results from the SVIHM. This includes 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 from streamflow. Other inflows include the percolation of precipitation and applied agricultural irrigation water and subsurface inflow from adjacent subbasins. Groundwater pumping is the predominant groundwater outflow. The smaller outflow terms in order of magnitude are subsurface outflows to adjacent subbasins, ET, and discharge to streams.

SVIHM-simulated annual inflows to the groundwater system for the historical and current time periods are shown on Figure 6-6. Table 6-6 provides average groundwater inflows for the historical and current period. Total average inflow for the historical period is about 214,800 AF/yr. Exceptionally low deep percolation of streamflow occurred from WY 2014 to 2016. These dry years were followed by a wet WY 2017 that resulted in high streambed recharge. Deep percolation of streamflow decreased again during the 3-year dry period from WY 2020 to 2022. This illustrates the Subbasin's sensitivity to changes in streamflow and climate patterns. In all other years, deep percolation of streamflow is relatively stable. The 2 other 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 account for roughly half of all inflows historically and during the current period. The current period has less deep percolation of precipitation and less deep percolation of streamflow than the historical period.

Figure 6-7 shows the SVIHM-simulated outflows from the groundwater system for the historical and current time periods. Table 6-5 provides annual averages for SVIHM-simulated groundwater outflows of the historical and current period. Total average annual outflow for the historical period is about -220,900 AF/yr. Groundwater pumping, which includes municipal, industrial, and agricultural water users, is the largest outflow in the Subbasin. Subsurface outflows and agricultural pumping for the current period are similar to the historical average; however, the decrease in estimated discharge to streams and ET from riparian vegetation suggests that groundwater levels along the streams are lower during the current period than historical average conditions.

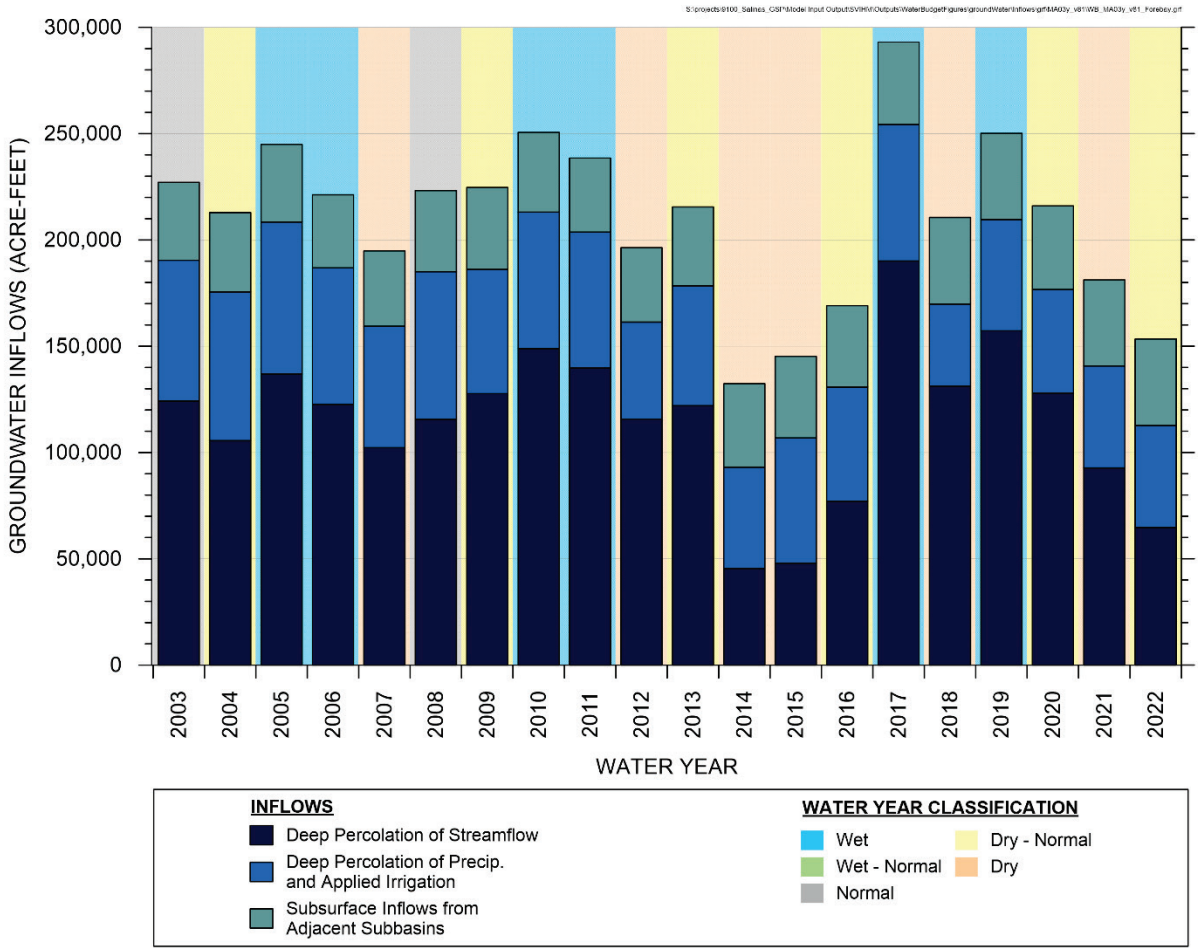


Figure 6-6. SVIHM-Simulated Inflows to the Groundwater System

Table 6-6. 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	58,400	48,000
Deep Percolation of Streamflow	118,800	78,700
Subsurface Inflow from Adjacent Subbasin	37,600	40,600

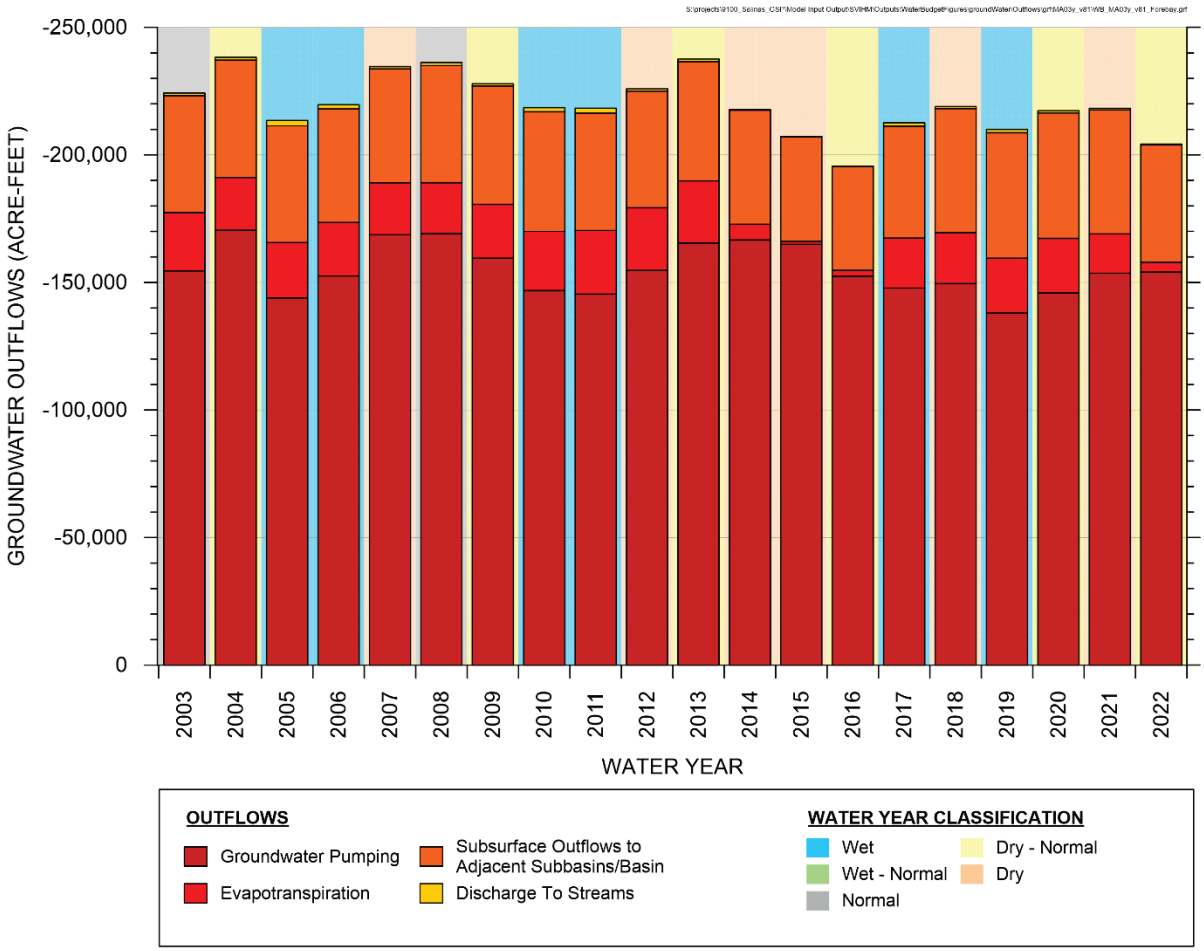


Figure 6-7. SVIHM Simulated Outflows from the Groundwater System

Table 6-5. SVIHM-Simulated Groundwater Outflows Summary

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-155,400	-153,800
ET from Groundwater	-18,700	-9,700
Subsurface Outflow to Adjacent Subbasins/Basin	-45,700	-47,300
Discharge to Streams	-1,100	-500

Figure 6-8 and Table 6-6 show SVIHM-simulated groundwater pumping by water use sector. Groundwater pumping remained relatively stable over the historical period. Current period groundwater pumping is similar to the historical average. About 95% of pumped groundwater is used for agricultural purposes. Municipal and agricultural pumping are simulated in the SVIHM. Municipal includes industrial pumping. Rural domestic groundwater use—including *de minimis* pumping from privately owned wells—is assumed to be negligible in the Forebay Subbasin; therefore, it is not simulated in the model or included in this water budget.

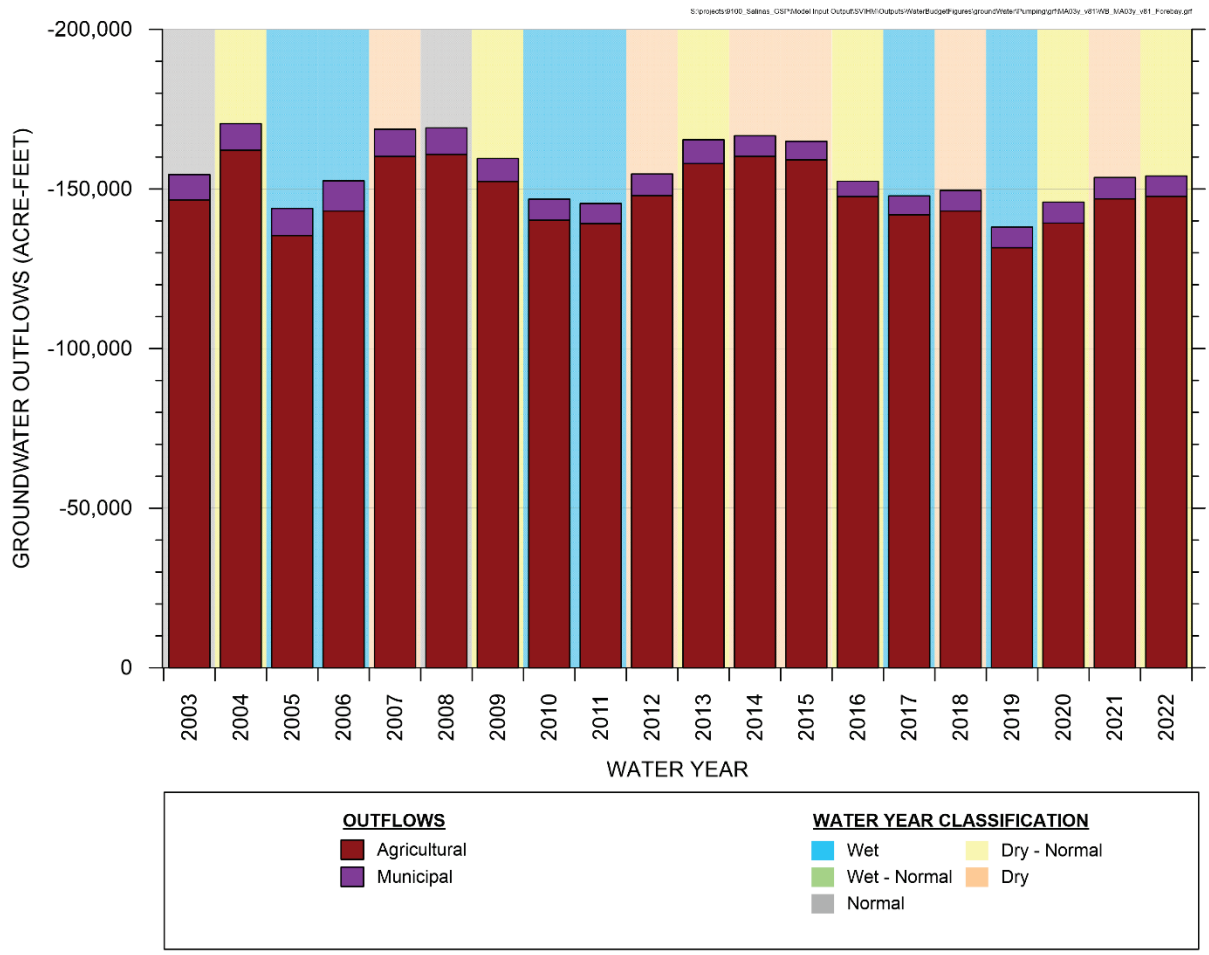


Figure 6-8. SVIHM-Simulated Groundwater Pumping by Water Use Sector

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

	Historical Average WY 2003-2020 (AF/yr)	**Current WY 2021-2022** (AF/yr)
Municipal	-7,100	-6,500
Agricultural	-148,300	-147,300
Total Pumping	-155,400	-153,800

Figure 6-9 shows SVIHM-simulated net subsurface flows entering and exiting the Subbasin boundary by watershed and neighboring subbasin. Table 6-7 shows SVIHM-simulated historical and current period subsurface flows. Subsurface inflows to the Subbasin are slightly less than outflows from the Subbasin. During the historical period, the largest net subsurface inflow is from the Upper Valley Subbasin averaging 25,500 AF/yr and the largest net subsurface outflow is to the 180/400 Subbasin averaging -28,800 AF/yr.

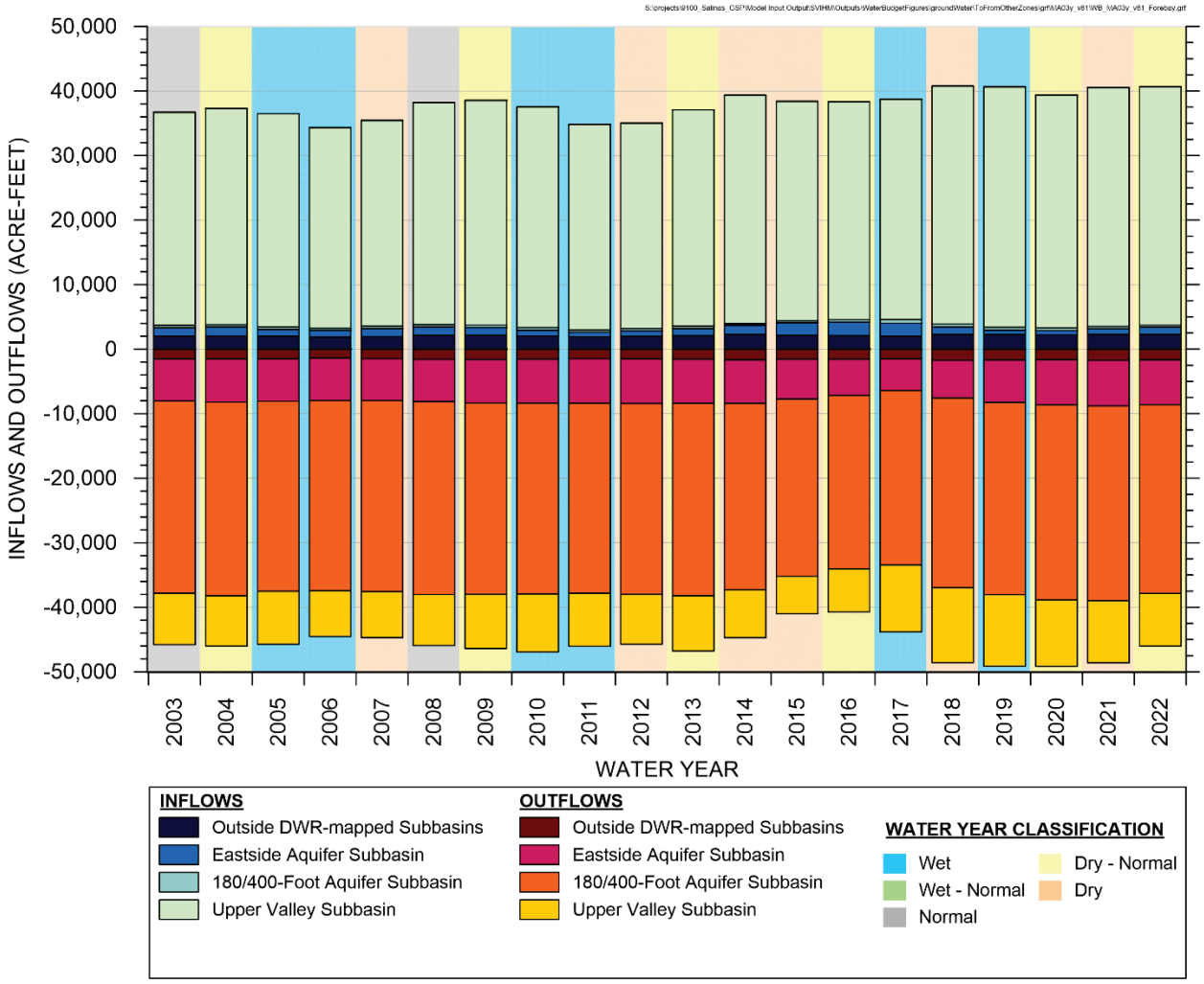


Figure 6-9. SVIHM-Simulated Subsurface Inflows and Outflows from Watershed Areas and Neighboring Subbasin

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

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Upper Valley Subbasin	25,500	28,100
Eastside Subbasin	-5,300	-6,000
180/400 Subbasin	-28,800	-29,400
Outside Areas	500	600

6.3.2.2 Change in Groundwater in Storage

Figure 6-10 shows the cumulative and annual simulated change in groundwater storage along with the entire groundwater budget from the SVIHM. Change in groundwater storage is equal to total groundwater inflow minus total groundwater outflows. 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 indicates groundwater storage depletion typically associated with lower groundwater levels; while a positive value indicates groundwater storage accretion typically associated with higher groundwater levels. However, in the Forebay 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 Forebay Subbasin is in overdraft (loss in storage) by -6,000 AF/yr. However, review of the groundwater level calibration indicates that simulated groundwater levels underpredicted the observed water level rebound following the drought ending in 2016. As a result, the simulated change in storage is likely an overestimate of the amount of storage loss in the Forebay Subbasin. Change in storage calculated using change in observed water levels between 2003 and 2020 yields a change in storage of approximately -500 AFY, using the same method as described in Chapter 5.

Groundwater levels primarily fluctuate in response to variations in streamflow recharge, precipitation, groundwater pumping, and reservoir releases. Analysis of groundwater levels through 2025 show that trends in the Forebay Subbasin over recent decades have been relatively stable, although they vary depending on the specific period analyzed. For example, water levels increased significantly in the winter of 2023, after the historical and current water budget periods. Including this year in the simulation and reporting periods would have yielded a more favorable change in storage. In general, groundwater levels tend to rebound in response to deep percolation of streamflow, which varies greatly year to year. While there was a net decline of groundwater in storage during the historical and current water budget periods, the Subbasin is not considered to be in overdraft.

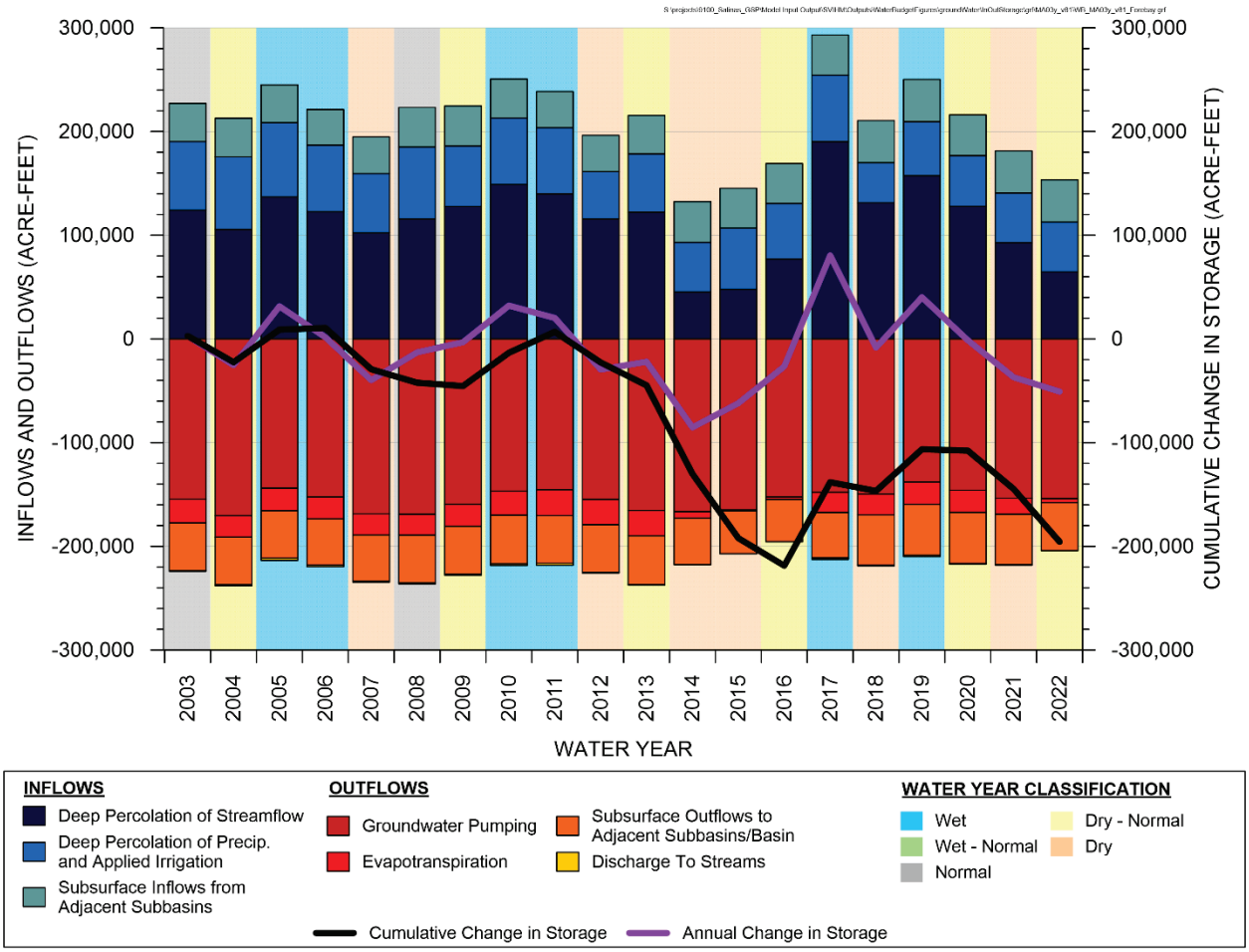


Figure 6-10. SVIHM-Simulated Historical and Current Groundwater Budget

Table 6-8. Summary of Groundwater Budget

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-155,400	-153,800
Net Stream Exchange (gain from streams)	117,700	78,200
Deep Percolation of Precipitation and Applied Irrigation	58,400	48,000
Net flow to Adjacent Subbasins/Basin	-8,100	-6,700
ET from Groundwater	-18,700	-9,700
Net Storage Gain (+) or Loss (-) (Change in Storage)	-500[1]	-43,900

Note: Due to rounding, net storage values may differ by 100-200 AF/yr from sum of inflows and outflows.
[1] Adjusted based on observed groundwater levels compared to simulated groundwater levels; adjusted to be change in storage calculated based on observed groundwater levels using raster method identified in Chapter 5. Value is different than in Chapter 5 because it was calculated here for the same years as the water budget period.

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:

Sustainable yield = pumping + change in storage

This estimate does not account for the dynamic interaction between pumping, groundwater levels, and recharge. For example, differing pumping near the Salinas River would likely have altered recharge (stream exchange). While groundwater level trends extending to WY 2025 are relatively stable, both observed and simulated groundwater levels declined over the historical period. As a subbasin-wide calculation, the sustainable yield obscures geographic differences within the Subbasin. To avoid undesirable results, pumping reductions may need to occur in some parts of the Subbasin but not in other parts. Observed and simulated groundwater levels declined during both the historical and current periods, so the simulated loss of storage is removed from the pumping as an approximation of the sustainable yield during these years.

For this sustainable yield discussion and associated calculations, 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 estimated historical and current sustainable yields for the Subbasin. 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 for the Forebay Subbasin

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Total Subbasin Pumping	155,400	153,800
Change in Storage	-500[1]	-43,900
Estimated Sustainable Yield	154,900	109,900

Note: Pumping is shown as positive value for this computation.
[1] Based on calculated change in storage based on observed groundwater levels for WY 2003-2020 using the raster method identified in Chapter 5.

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.

Model information and assumptions are summarized in a model update summary report by Montgomery & Associates (2026b).

6.4.1 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. SRDF diversions 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 diversions occur at up to a rate of 36 cubic feet per second.
- Recycled Water Deliveries: Recycled water has been delivered to the CSIP area since 1998 as irrigation supply. The SVOM continued these recycled water deliveries throughout the duration of the model, similar to the last years of the historical model.

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 updated 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.

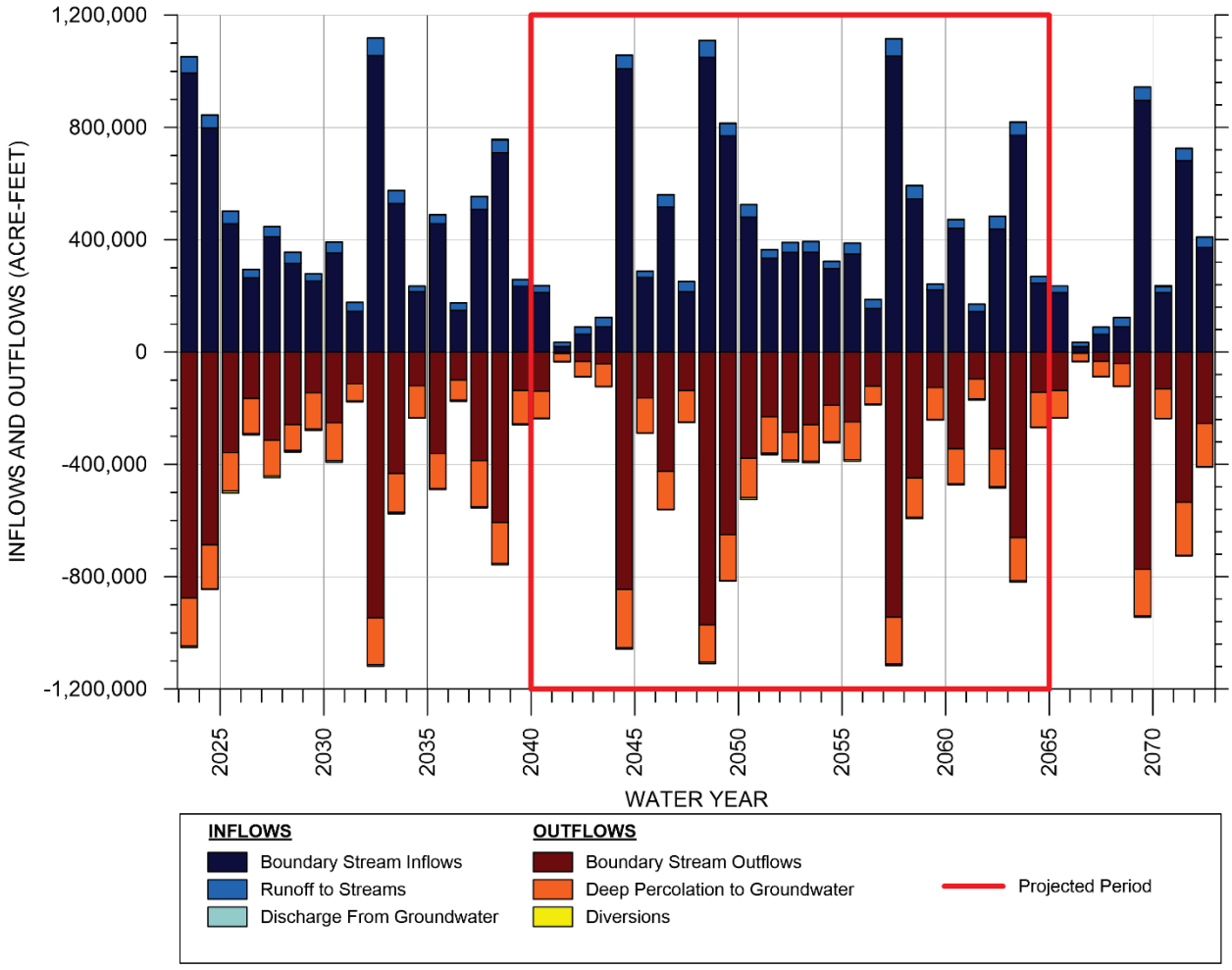


Figure 6-11. SVOM-Simulated Projected Surface Water Budget

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

Surface Water Budget Components	Average Flow WY 2040-2064 (AF/yr)
Boundary Inflows	416,100
Boundary Outflows	-329,300
Net Flow Between Surface Water and Groundwater	-118,600
Overland Runoff to Streams	35,600
Diversions from Streams	-3,700

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 is deep percolation of streamflow. The largest outflow is groundwater pumping. Projected groundwater pumping is less than the historical average, reflecting the projected change in agricultural pumping. The model assumes 2022 crop distribution for the future simulation, and the annual crop water demand in 2022 is less than the historical average crop water demand, which requires less pumping. Projected deep percolation of precipitation and applied water is less than the historical average because less agricultural water is being applied to the land resulting in less deep percolation. Overall, average change in groundwater storage is -400 AF/yr.

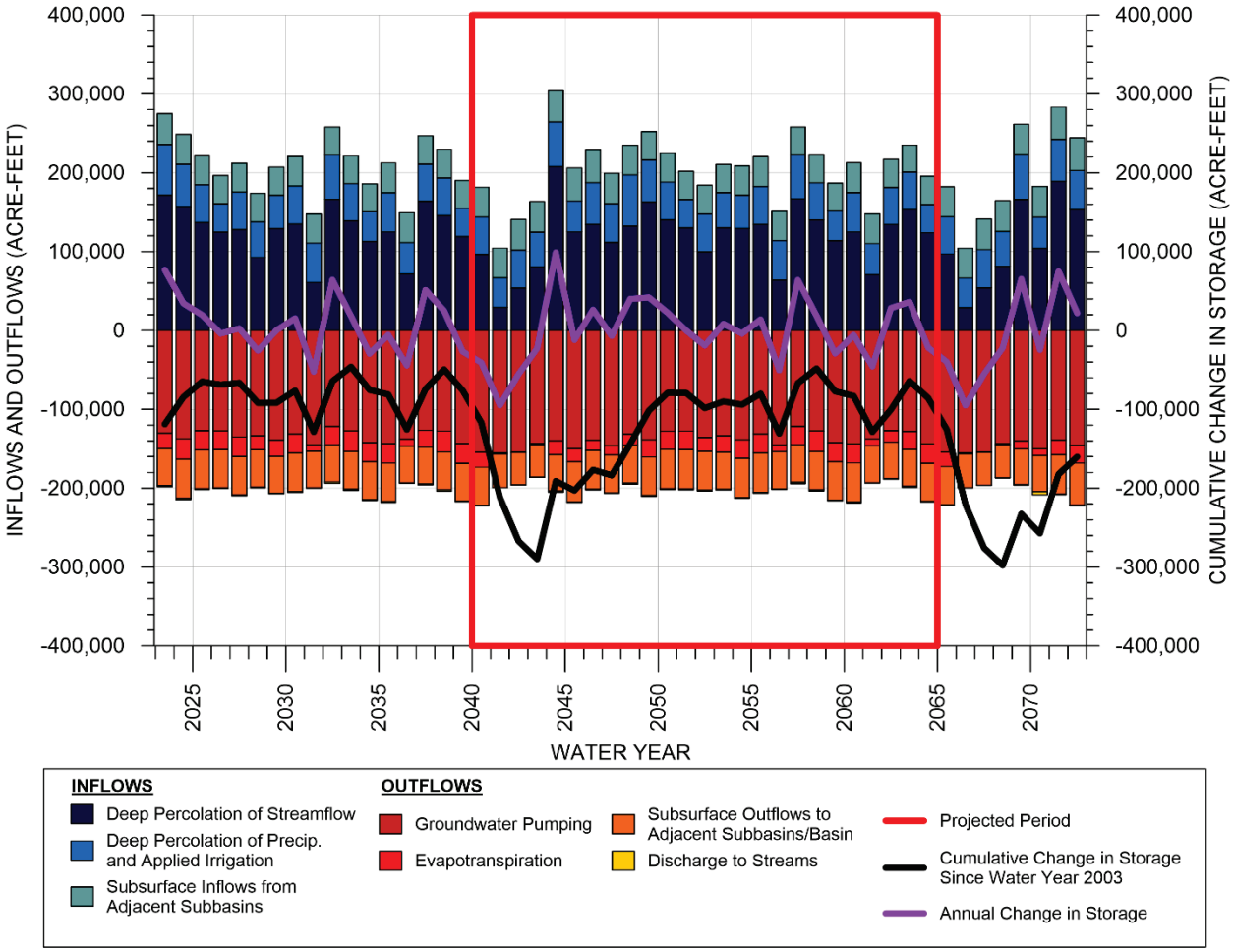


Figure 6-12. SVOM-Simulated Projected Groundwater Budget

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

Groundwater Budget Components	Average Flow WY2040-2064 (AF/yr)
Groundwater Pumping	-138,600
Net Stream Exchange	118,600
Deep Percolation of Precipitation and Irrigation	46,800
ET from Groundwater	-17,100
Net Flow to 180/400-Foot Aquifer Subbasin	-29,900
Net Flow from Upper Valley Subbasin	25,600
Net Flow to Eastside Subbasin	-6,400
Net Flow from Outside Areas	500
Net Storage Gain (+) or Loss (-)	**-400**

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 95% of pumping. Future municipal pumping is lower than current municipal pumping because of urban population decline. The only cities in the Forebay Subbasin are Soledad and Greenfield. AMBAG projects Soledad's population to decline, while Greenfield's population is expected to increase. The overall change in the Subbasin's municipal and industrial pumping is negative.

Table 6-12. SVOM-Simulated Projected Groundwater Pumping

Water Use Sector	Average Pumping WY2040-2064 (AF/yr)
Agricultural	-131,800
Municipal & Industrial	-6,800
Total Pumping	**-138,600**

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 a net negative change in storage. Forebay 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 maintain 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.

Although the sustainable yield values provide guidance for achieving sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability. Table 6-13 provides an estimate of the future sustainable yield using estimated future pumping and storage values. 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. The projected sustainable yield is less than the historical average. This is due to the simple mathematic equation used to estimate the value. The amount of projected pumping is smaller than the historical average, thus resulting in a smaller estimate for sustainable yield. However, 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 WY2040-2064 (AF/yr)
Groundwater Pumping	138,600
Change in Storage	-400
Projected Sustainable Yield	138,200

6.5 Historical and Current Water Budgets for Arroyo Seco Cone Management Area

The ASCMA was established to account for the unique hydrogeologic, water quality, and water supply characteristics of the Arroyo Seco Cone region that are discussed in Chapter 4. The water budgets for the ASCMA are a subset of the greater Forebay Subbasin water budgets. The water budgets for both the ASCMA and the greater Forebay Subbasin are developed using the identical SVIHM and SVOM models, and identical techniques for refining model results with measured data. Although the water budgets are presented separately, management of the ASCMA and the greater Forebay Subbasin will be coordinated to meet the sustainability goal of the entire Subbasin.

Water budgets for the historical and current periods for the ASCMA are presented below. The surface water budgets are presented first, followed by the groundwater budgets.

6.5.1 Historical and Current Surface Water Budget for Arroyo Seco Cone Management Area

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

Figure 6-4 shows the surface water network simulated in the SVIHM. The network includes the Salinas River, Arroyo Seco, Clark Colony canal, and other streams within the ASCMA. For this water budget, boundary inflows and outflows are the sum of all locations that cross the ASCMA boundary.

Figure 6-13 shows the surface water budget for the historical period and current period. Table 6-14 shows the average surface water budget for the historical and current periods. Positive values are inflows into the stream system and negative values are outflows from the stream system. The net flow between surface water and groundwater is negative for both the historical and current periods, indicating more stream leakage to groundwater than groundwater discharge to streams.

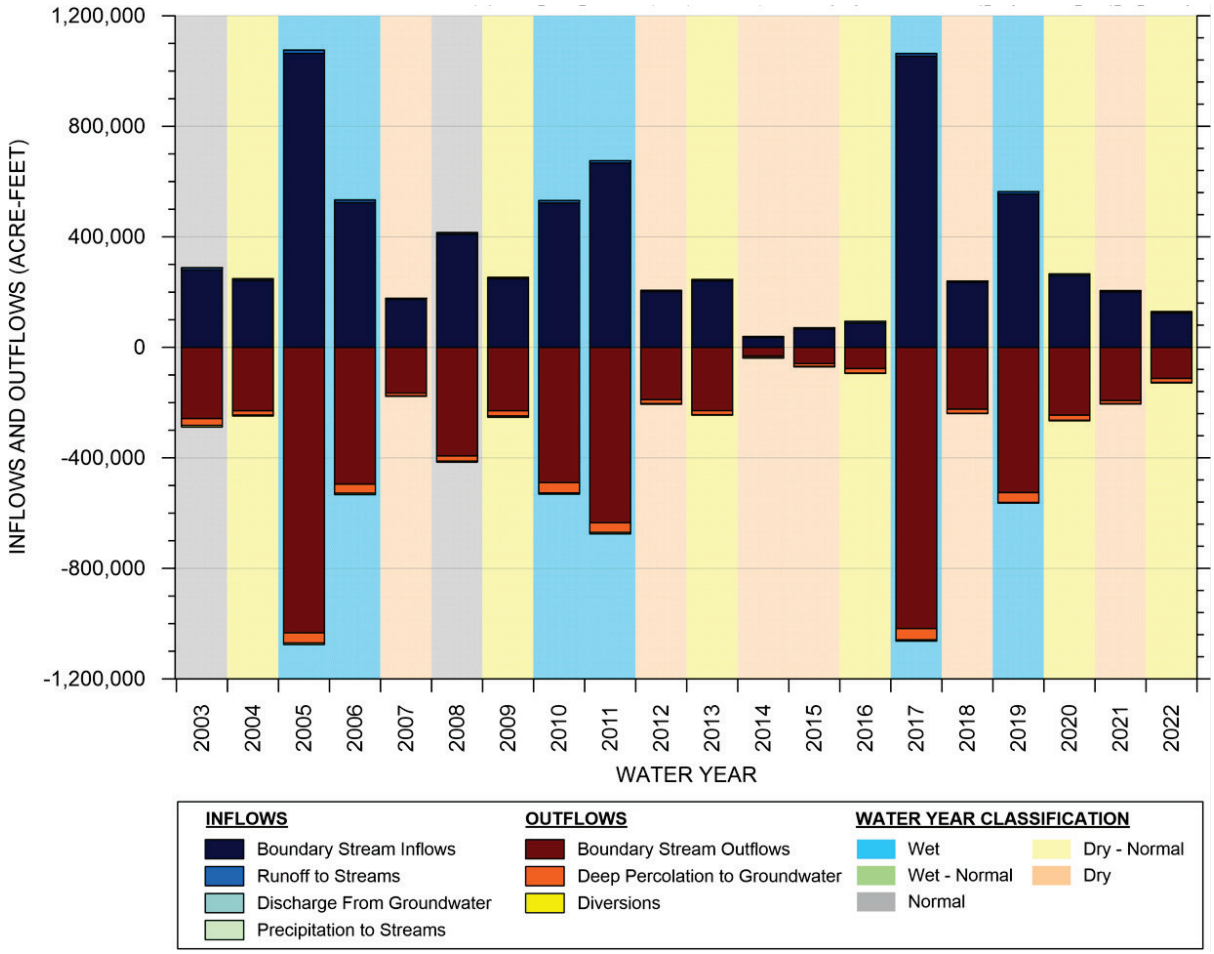


Figure 6-13. SVIHM-Simulated Historical and Current Surface Water Budget for ASCMA

Table 6-14. SVIHM-Simulated Surface Water Budget Summary for ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Boundary Stream Inflows	381,400	162,300
Precipitation to Streams	0	0
Net Flow between Surface Water and Groundwater	-22,100	-12,300
Overland Runoff to Streams	6,800	4,800
Diversions from Streams	-3,400	-2,000
Boundary Stream Outflows	-362,700	-152,900

Note: Precipitation to streams is less than 50 AF/yr

6.5.2 Historical and Current Groundwater Budget for Arroyo Seco Cone Management Area

The groundwater budget accounts for the inflows and outflows to and from the Management Area, based on results from the updated SVIHM, similar to the Subbasin groundwater budget.

6.5.2.1 Groundwater Inflow and Outflow Components

The groundwater budget includes inflows and outflows of groundwater at the ASCMA's boundaries, recharge, pumping, ET, and net flow between surface water and groundwater. Annual inflows to the groundwater system for the historical and current time periods estimated by the SVIHM are shown on Figure 6-14. Table 6-15 provides average groundwater inflows for the historical and current period. The largest and most consistent inflows are from the greater Forebay Subbasin, making up about half the total inflows into the ASCMA.

Figure 6-15 shows the SVIHM-simulated outflows from the groundwater system for the historical and current time periods. Groundwater pumping, including municipal, industrial, and agricultural water, is consistently the largest outflow from the ASCMA, but is closely followed by subsurface outflows to greater Forebay Subbasin. Table 6-16 provides annual averages for groundwater outflows of the historical and current period.

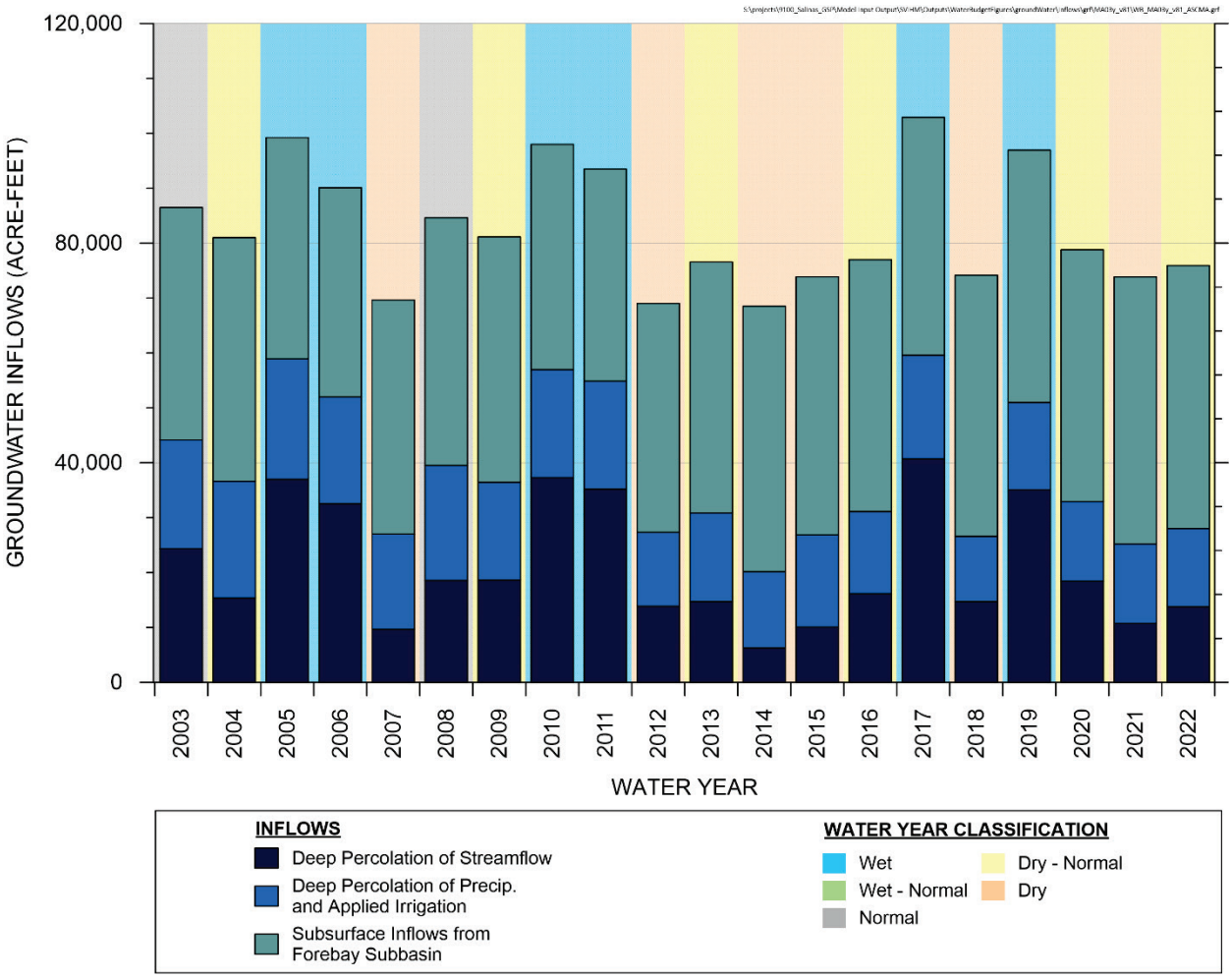


Figure 6-14. SVIHM-Simulated Groundwater Inflows to ASCMA

Table 6-15. SVIHM-Simulated Groundwater Inflows Budget Summary in ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Deep Percolation of Streamflow	22,100	12,300
Deep Percolation of Precipitation and Applied Water	17,500	14,400
Subsurface Inflow from Forebay Subbasin	43,800	48,300

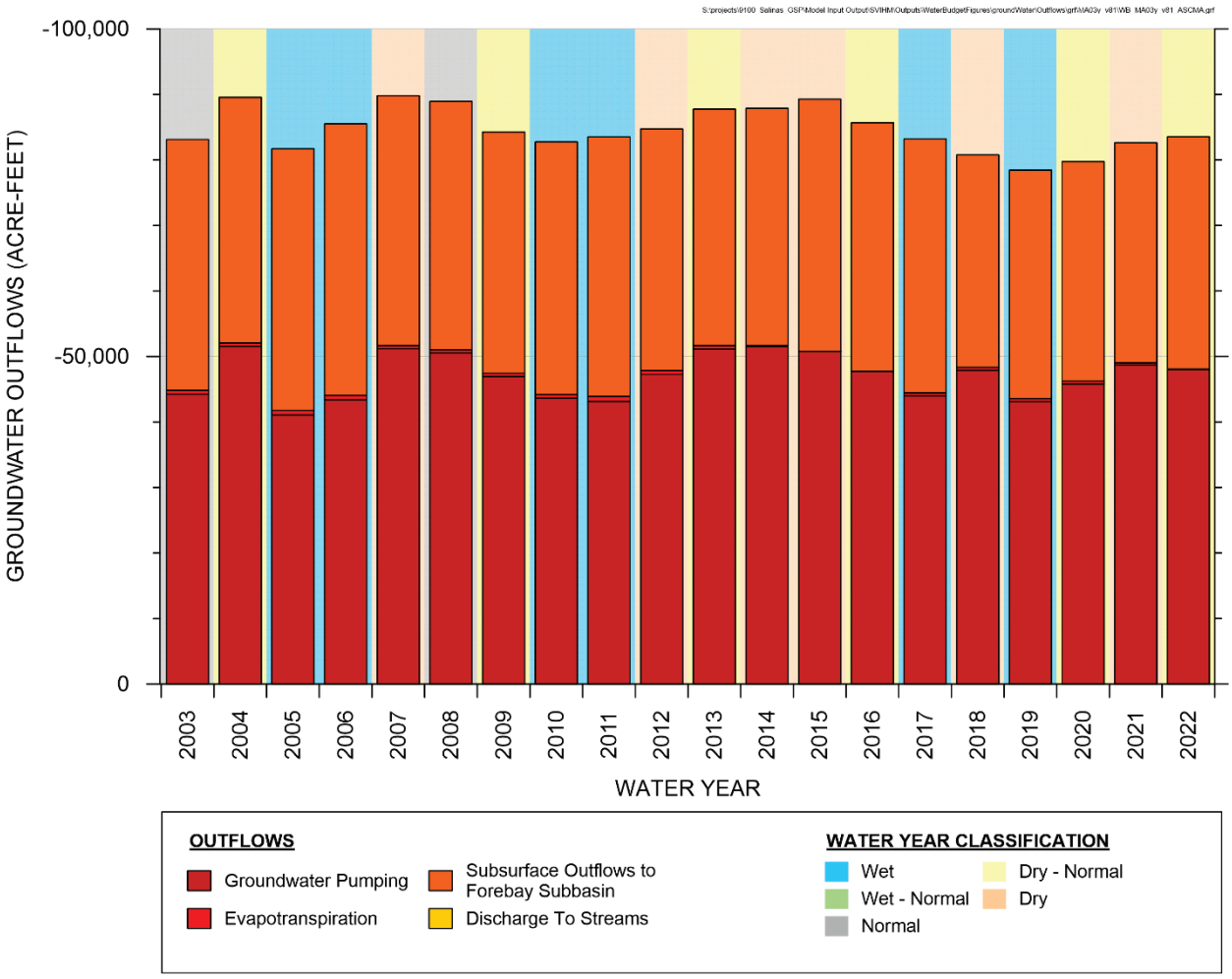


Figure 6-15. SVIHM-Simulated Groundwater Outflows from ASCMA

Table 6-16. SVIHM-Simulated Groundwater Outflows Budget Summary in ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-46,900	-48,400
ET from Groundwater	-500	-200
Subsurface Outflow to Forebay Subbasin	-37,400	-34,500
Discharge to Streams	0	0

SVIHM-simulated groundwater pumping by water use sector is summarized on Figure 6-16 and in Table 6-17. Groundwater pumping remained relatively stable over the historical period and similar to the historical average for the current period. These show that more than 95% of pumped groundwater goes toward agricultural use. Industrial pumping is included with

municipal. Rural domestic pumping, including *de minimis* pumping, is assumed to be negligible and is not included in the model for the ASCMA or in this water budget.

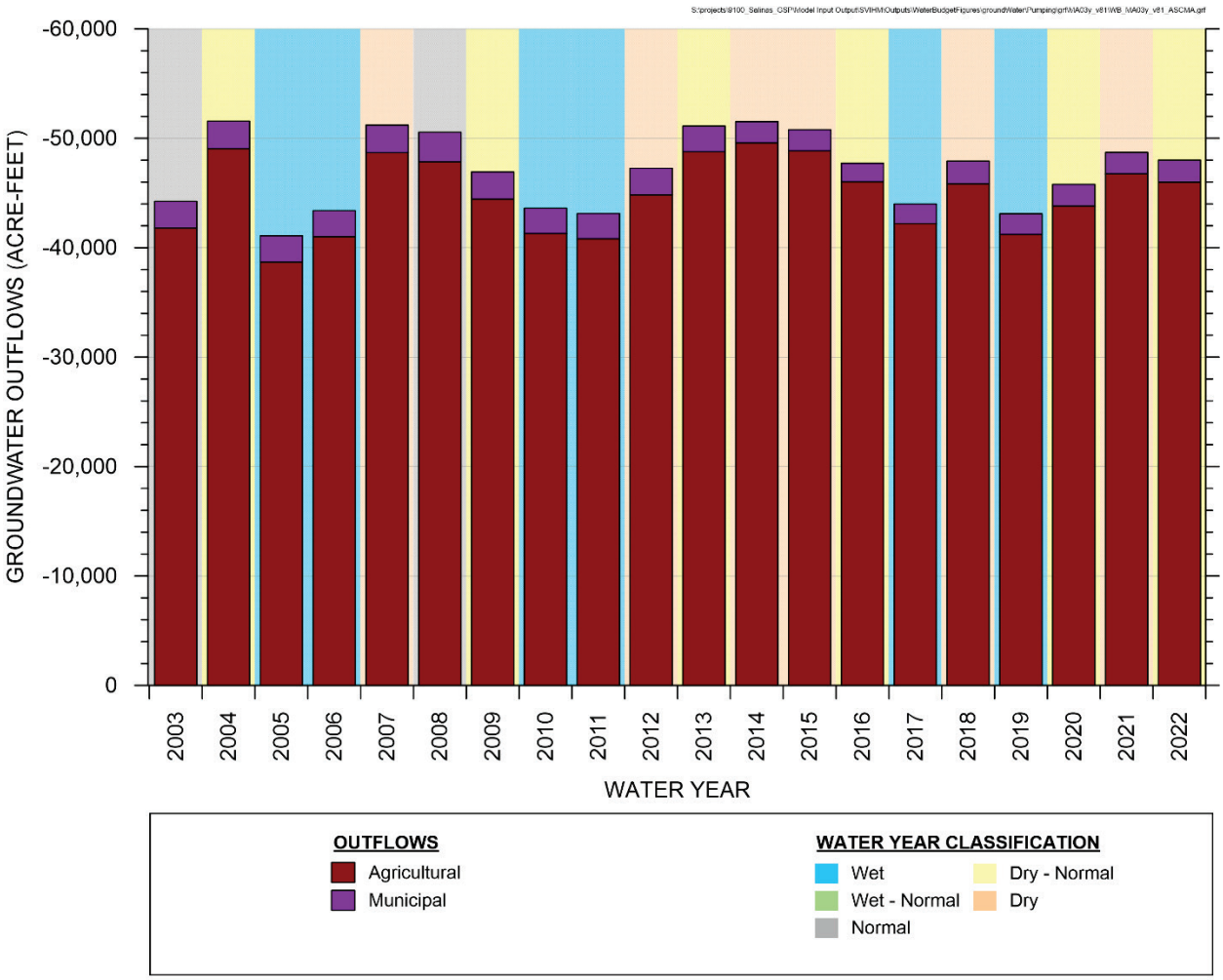


Figure 6-16. SVIHM-Simulated Groundwater Pumping by Water Use Sector in ASCMA

Table 6-17. SVIHM-Simulated Groundwater Pumping by Water Use Sector in ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Municipal	-2,200	-2,000
Agricultural	-44,700	-46,400
Total Pumping	-46,900	-48,400

Figure 6-17 shows the SVIHM-simulated net subsurface flows entering and exiting the ASCMA from the greater Forebay Subbasin. On average during the historical period, the ASCMA received about 6,400 AF more in subsurface inflows per year than it loses to subsurface outflows. In the current period, the net flow from the greater Forebay Subbasin was about the same as the historical period.

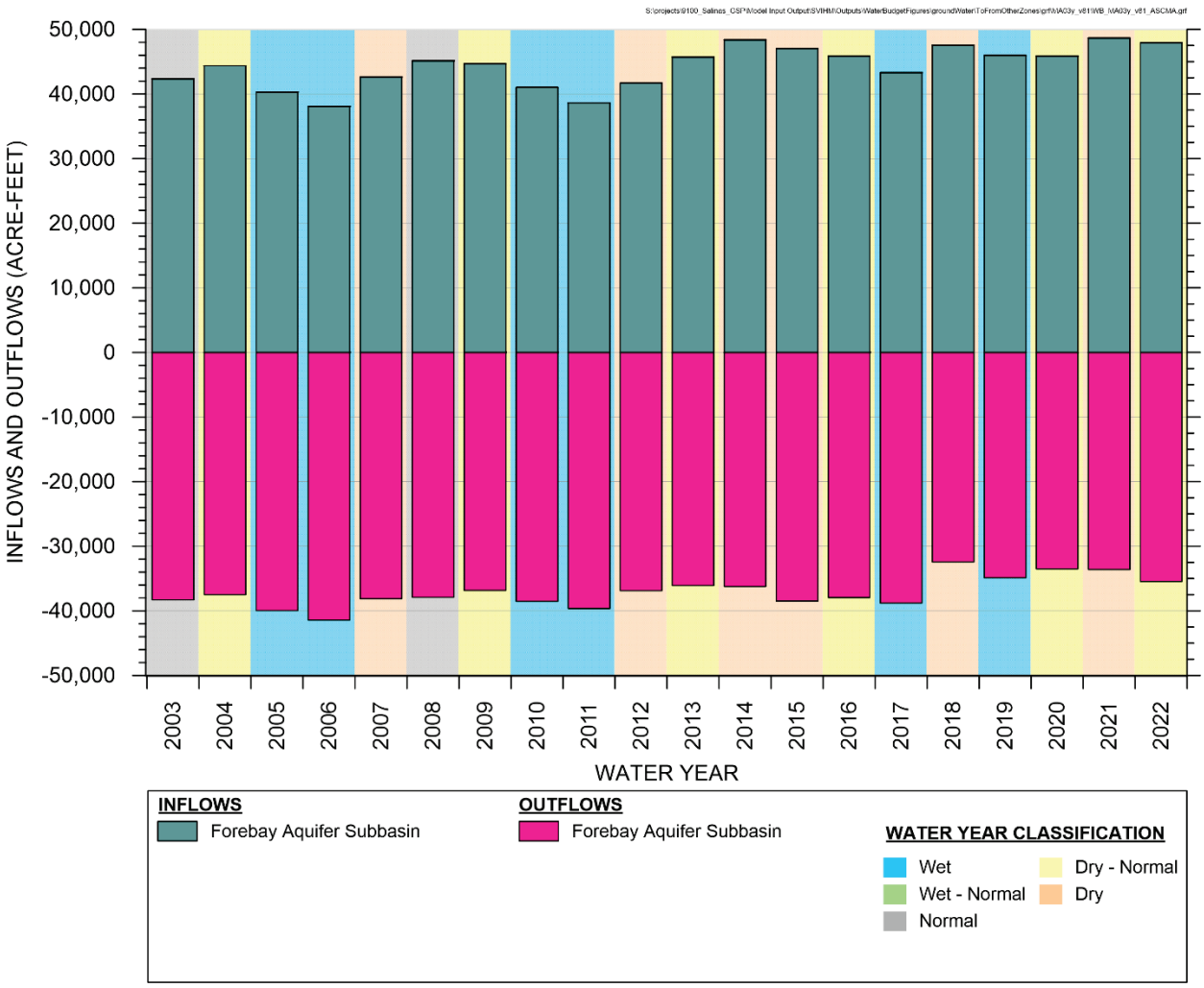


Figure 6-17. SVIHM-Simulated Subsurface Inflows and Outflows for ASCMA

6.5.2.2 Change in Groundwater in Storage

Change in groundwater storage is equal to total groundwater inflow minus total groundwater outflows. Figure 6-18 shows the cumulative and annual change in storage along with the entire groundwater water budget from the SVIHM. Combining Table 6-15 and Table 6-16 yields the net groundwater inflows and outflows for the historical and current periods, which are shown in Table 6-18. Negative values indicate outflows or depletions. Particularly, negative change in groundwater storage value indicates groundwater storage depletion associated with lower groundwater levels; while a positive value indicates groundwater storage accretion associated

with higher groundwater levels. Averaged over the historical period, the SVIHM estimates that the ASCMA loses about 1,400 AF/yr. However, as described above in the Subbasin water budget, the SVIHM underestimates groundwater level rebound in WY 2019 and 2020, and thus the historical water budget overestimates the decrease in groundwater in storage.

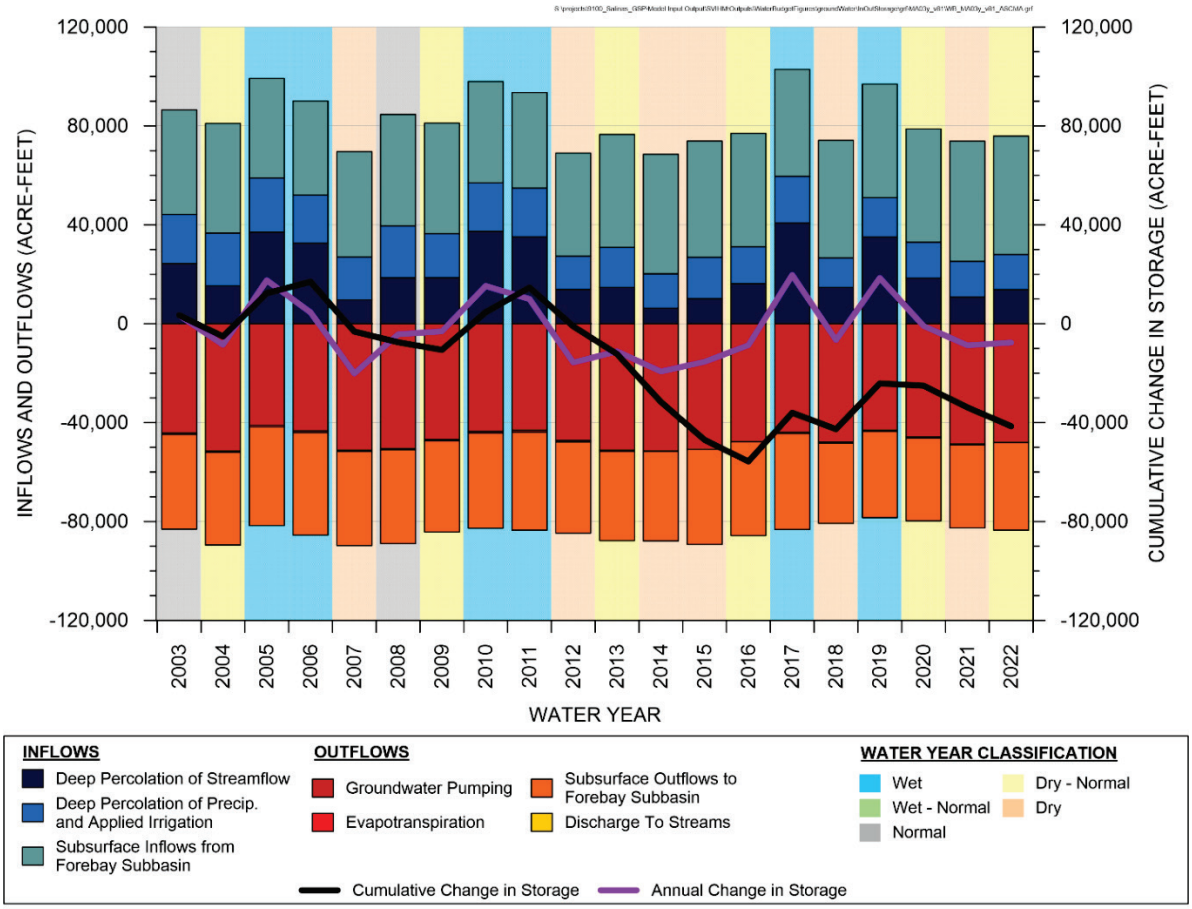


Figure 6-18. SVIHM-Simulated Groundwater Budget for ASCMA

Table 6-18. Summary of Groundwater Budget for ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Groundwater Pumping	-46,900	-48,400
Net Stream Exchange	22,100	12,300
Deep Percolation	17,500	14,400
Net flow from Adjacent Subbasins/Basin	6,400	13,800
ET from Groundwater	-500	-200
Net Storage Gain (+) or Loss (-)	-200[1]	-8,200

Note: Due to rounding, net storage values may differ by 100 AF/yr from sum of inflows and outflows.
[1] Adjusted based on observed groundwater levels compared to simulated groundwater levels; adjusted to be change in storage calculated based on observed groundwater levels using raster method identified in Chapter 5.

6.5.3 Historical and Current Sustainable Yield for Arroyo Seco Cone Management Area

Similar to the calculation for the whole Forebay Subbasin, an approximation of the subbasin-wide historical and current sustainable yields can be calculated based on water budget components. There is no true estimate of the historical and current sustainable yield because elimination of pumping would have caused other flows to change. Similar to the Subbasin-wide analysis, when analyzed through WY 2025, groundwater levels in recent decades have been relatively stable and do not show a declining trend. However, during both the historical and current water budget periods both observed and simulated groundwater levels declined, so the simulated change in storage is subtracted from the pumping as an approximation of the sustainable yield during these years.

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 6-19 shows the historical and current sustainable yields for the Subbasin.

Table 6-19. Historical and Current Sustainable Yield for the ASCMA

	Historical Average WY 2003-2020 (AF/yr)	Current WY 2021-2022 (AF/yr)
Total Subbasin Pumping	46,900	48,400
Change in Storage	-200	-8,200
Estimated Sustainable Yield	46,700	40,200

6.6 Projected Water Budgets for Arroyo Seco Cone Management Area

Projected water budgets are extracted from the SVOM. This is the same model used for projected water budgets in Forebay Subbasin.

6.6.1 Assumptions and Overview of Projected Water Budget in Arroyo Seco Cone Management Area

The projected water budget in ASCMA makes the same assumptions and has the same organizational structure as the projected water budget in the greater Forebay Subbasin.

6.6.2 Projected Surface Water Budget for Arroyo Seco Cone Management Area

Average SVOM surface water budget inflows and outflows for the projected period are shown on Figure 6-19 and quantified in Table 6-20. As with ASCMA's historical surface water budget,

boundary inflows and boundary outflows are far greater than any other component and they vary widely from year to year.

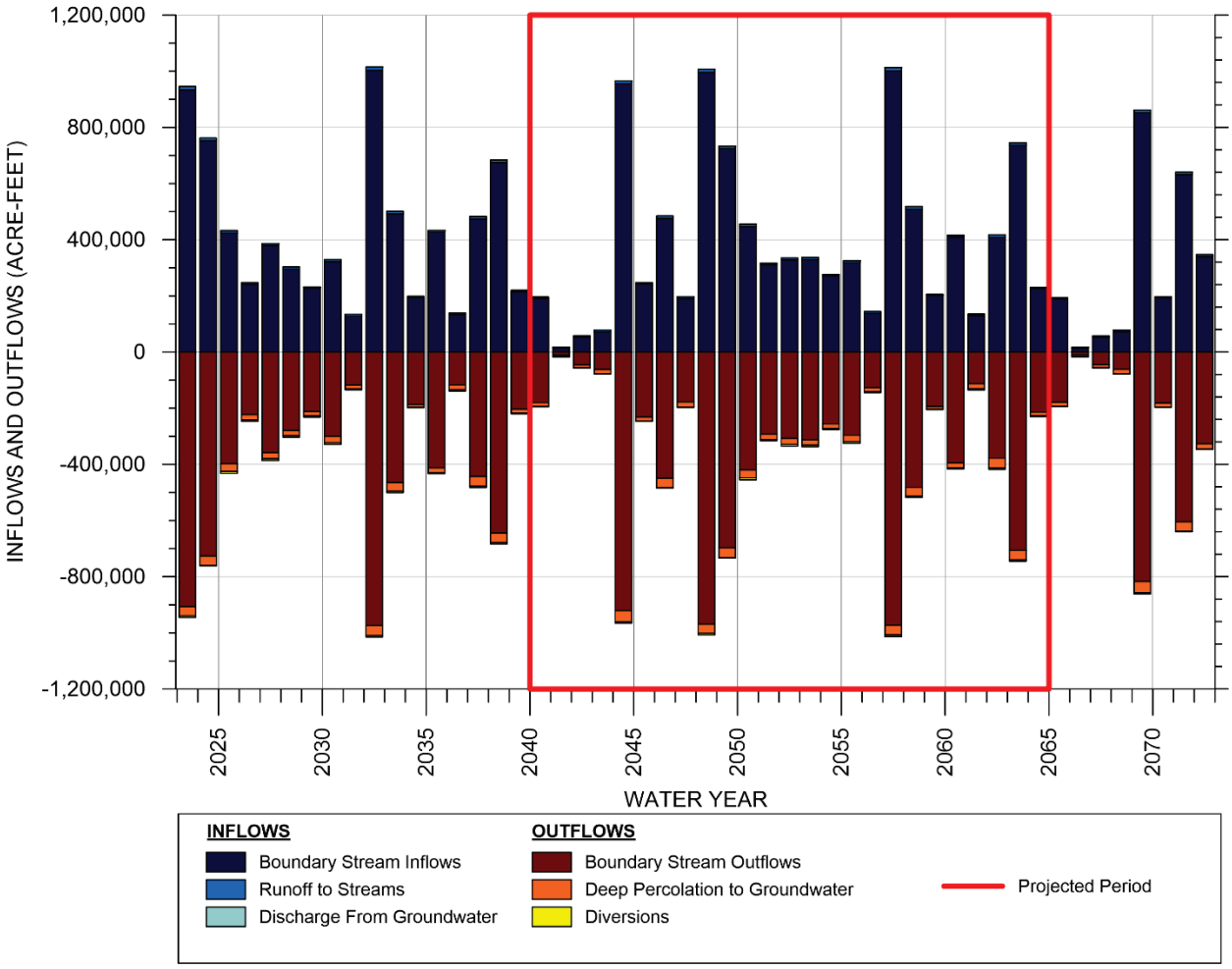


Figure 6-19. SVOM-Simulated Projected Surface Water Budget for ASCMA

Table 6-20. SVOM-Simulated Projected Surface Water Budget Summary for ASCMA

Surface Water Budget Components	Average Flow WY 2040-2064 (AF/yr)
Boundary Inflows	387,200
Boundary Outflows	-368,500
Net Flow Between Surface Water and Groundwater	-22,000
Overland Runoff to Streams	7,000
Diversions from Streams	-3,700

6.6.3 Projected Groundwater Budget for Arroyo Seco Cone Management Area

Average annual SVOM groundwater budget inflows for the projected period are shown on Figure 6-20 and net projected average annual flows are quantified in Table 6-21. The largest inflow is subsurface inflow from the surrounding Forebay Subbasin. The 2 largest outflows are groundwater pumping and subsurface outflow. Deep percolation from streamflow is the most variable water budget component, and it generally correlates with the annual change in storage that is depicted with the purple line. As described for the Forebay Subbasin projected water budget, projected groundwater pumping is less than the historical average, reflecting the projected change in agricultural pumping. The model assumes 2022 crop distribution for the future simulation, and the annual crop water demand in 2022 is less than the historical average crop water demand, which requires less pumping. Projected deep percolation of precipitation and applied water is less than the historical average because less agricultural water is being applied to the land resulting in less deep percolation.

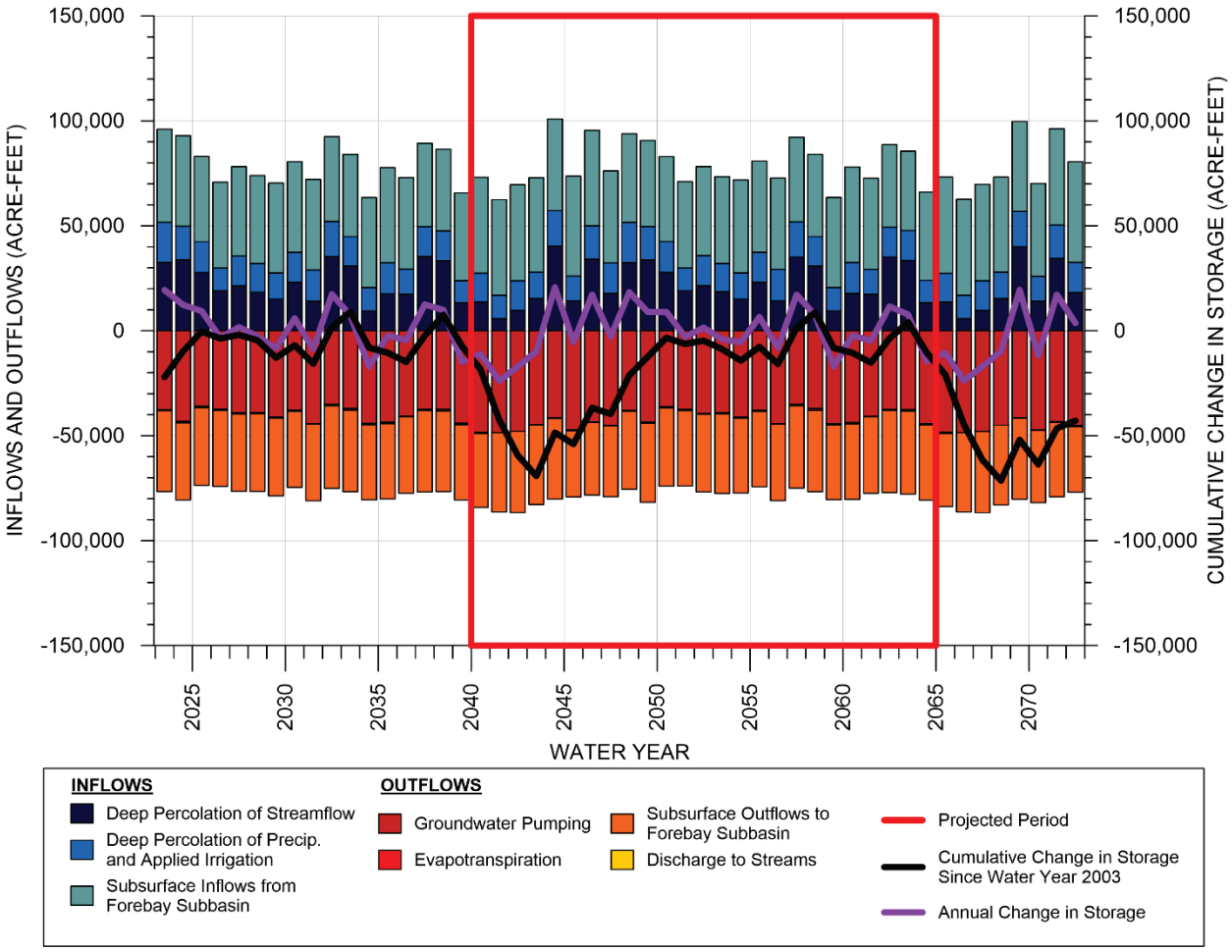


Figure 6-20. SVOM-Simulated Projected Groundwater Budget for ASCMA

Table 6-21. SVOM-Simulated Projected Groundwater Budget Summary for ASCMA

Groundwater Budget Components	Average Flow WY 2040-2064 (AF/yr)
Groundwater Pumping	-41,800
Net Stream Exchange	22,000
Deep Percolation of Precipitation and Irrigation	13,900
Net Flow from Forebay Subbasin	6,200
ET from Groundwater	-400
Net Storage Gain (+) or Loss (-)	**-100**

SVOM projected groundwater pumping by water use sector is summarized in Table 6-22. As it did in the historical period, agricultural pumping in is expected to account for 95% of total pumping in the ASCMA.

Table 6-22. SVOM-Simulated Projected Groundwater Pumping for ASCMA

Water Use Sector	Average Pumping WY 2040-2064 (AF/yr)
Agricultural	-39,600
Municipal & Industrial	-2,200
Total Pumping	**-41,800**

6.6.4 Projected Sustainable Yield for Arroyo Seco Cone Management Area

Projected sustainable yield is the long-term pumping that can be sustained once all undesirable results have been addressed, without allowing change in storage to decrease. To retain consistency with the historical sustainable yield, projected sustainable yield is estimated by summing all the average groundwater extractions and adding 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 estimation, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables.

Table 6-23 provides an estimate of the projected period sustainable yield using the pumping and storage values in Table 6-21. 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. The projected sustainable yield is less than the historical average. This is due to the simple mathematic equation used to estimate the value. The amount of projected pumping is smaller than the historical average, thus resulting in a smaller estimate for sustainable yield. Although the sustainable yield values provide guidance for maintaining sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability, which must be demonstrated through the SMC.

Table 6-23. Projected Period Sustainable Yield in ASCMA

	Average Flow WY 2040-2064 (AF/yr)
Groundwater Pumping	41,800
Change in Storage	-100[1]
Projected Sustainable Yield	41,700

[1]Based on calculated change in storage based on observed groundwater levels for WY 2003-2020 using the raster method identified in Chapter 5.

6.7 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.

6.7.1 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 (ETo), 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 ETo) 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, ETo, 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 WYwas 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.

6.7.2 Results of Climate Change Scenarios

Table 6-24 shows the average annual water budget for the Forebay 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, stream recharge, and groundwater extraction than the baseline scenario. Of the 4 scenarios, including the baseline scenario, the Dry-Extreme Warming scenario represents the worst-case scenario for sustainability. Increased pumping results in a 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 scenario and the Central Tendency scenario show a similar magnitude 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 6-24. Average Water Budget Comparison for Climate Change Scenarios for WY2040-2064 in Forebay Subbasin

Water Budget Component	WY 2040-2064 Average (AF/yr)			
	Projected Baseline	Central Tendency	Dry-Extreme Warming	Wet-Moderate Warming
Deep Percolation	46,800	49,100	50,000	53,500
Net Stream Exchange	118,600	125,100	125,300	119,600
Net Subsurface Inflows	-10,200	-10,400	-9,900	-11,400
ET from Groundwater	-17,100	-18,900	-16,400	-21,500
Groundwater Extraction	-138,600	-145,200	-151,600	-140,100
Net Storage Change	-400	-300	-2,500	200

6.8 Overdraft Assessment

Groundwater level observations indicate that the Forebay Subbasin is not experiencing overdraft. For GSP Amendment 1, trends over the most recent 15 and 20 years were evaluated using several annual metrics. This window is long enough to give a dependable view of long-term trends rather than short-term climate variability, yet short enough to reflect current conditions, including the effects of reduced pumping and changed reservoir operations on the system. Across this period, water levels in the Forebay generally followed a consistent pattern: a relatively steady early period, sharp declines during the drought of the 2010s, a sharp recovery afterward, and levels in the last few years comparable to those at the start — though somewhat below their 1990s levels in places.

Of the 72 wells with sufficient data to support a trend analysis, the large majority were stable, showing little to no long-term trend. Only 2 wells showed clear declining water level trends; both are at the margins of the basin and are likely influenced by localized hydrogeologic conditions rather than conditions representative of the wider subbasin, as nearby wells with adequate data

did not show similar declines. Another 5 wells showed clear increasing trends, and 5 locations—4 of them in the northern third of the Forebay Subbasin—showed water levels that may not have fully recovered following the drought. In addition, estimates of change in groundwater in storage based on observed groundwater levels as well as simulated groundwater levels both show a long-term decrease. Taken together, the weight of the evidence showing a long-term decline in groundwater levels and storage indicate the Subbasin is in overdraft. See Appendix 6A for more details on the trend analysis.

6.9 Subbasin Water Supply Availability and Reliability

Water is not imported into the Forebay 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 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, and therefore projected water budgets incorporate reasonable fluctuations in water supply availability. MCWRA is preparing a Salinas River Operations HCP f, which may change the current reservoir release schedule and could influence the reliability of groundwater recharge.

6.10 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) and 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 by the 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 explained further 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 to 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 Forebay 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. Representative Monitoring Sites (RMS) are a subset of the monitoring network to provide the most representative information about groundwater conditions in the Subbasin.

The SVBGSA evaluated the density of monitoring sites and the frequency of measurements required to demonstrate short-term, seasonal, and long-term trends. The results indicate that all monitoring networks have sufficient site density and measurement frequency. The SVBGSA will review the monitoring network during each 5-year evaluation, including identifying any new data gaps that could affect the Plan's ability to achieve the Subbasin's sustainability goal.

7.1.3 Management Areas

The Forebay Subbasin includes the ASCMA that is designated to be managed by the ASGSA. The remaining area of the Subbasin will be managed by the SVBGSA in accordance with the Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement (Forebay Implementation Agreement, 2021). Both implementation areas will be managed consistent to a single GSP for the entire Subbasin and will consist of the same monitoring network for each sustainability indicator. The quantity and density of monitoring sites in both implementation areas shall be sufficient to evaluate conditions of the Subbasin setting and to establish SMC to reach the sustainability goal of the Subbasin in accordance with GSP Regulation § 354.34 (d).

7.2 Groundwater Level Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by assessing groundwater elevations in a designated well network. The 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 5-1 shows 71 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. 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. Of these wells, 43 are selected as groundwater level monitoring network RMS wells. Generally, the criteria for selecting RMS wells include:

- 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 Forebay 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 wells in the monitoring network.

The RMS wells in the water level monitoring network are shown in Table 7-1 and Figure 7-1. Only RMS wells are labeled on Figure 7-1. Both the table and map include the 6 new wells (4 new installations and 2 existing) SVBGSA has added to the monitoring network since the 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 yet have SMC. Appendix 5A provides well construction information and historical hydrographs for each RMS well.

As established in the Salinas Valley Deep Aquifers Study, the Deep Aquifers extend into the Forebay Subbasin (Montgomery & Associates, 2024). Furthermore, there are many deep wells in the Subbasin's principal aquifer that are screened in the sediments adjacent to the Deep Aquifers. Since the 400/Deep Aquitard that delineates the Deep Aquifers does not exist in most of the Subbasin and Deep Aquifers extraction within the Subbasin is limited, the Deep Aquifers are not considered a separate principal aquifer for SGMA purposes. The need for any additional wells is discussed in Section 7.2.2.

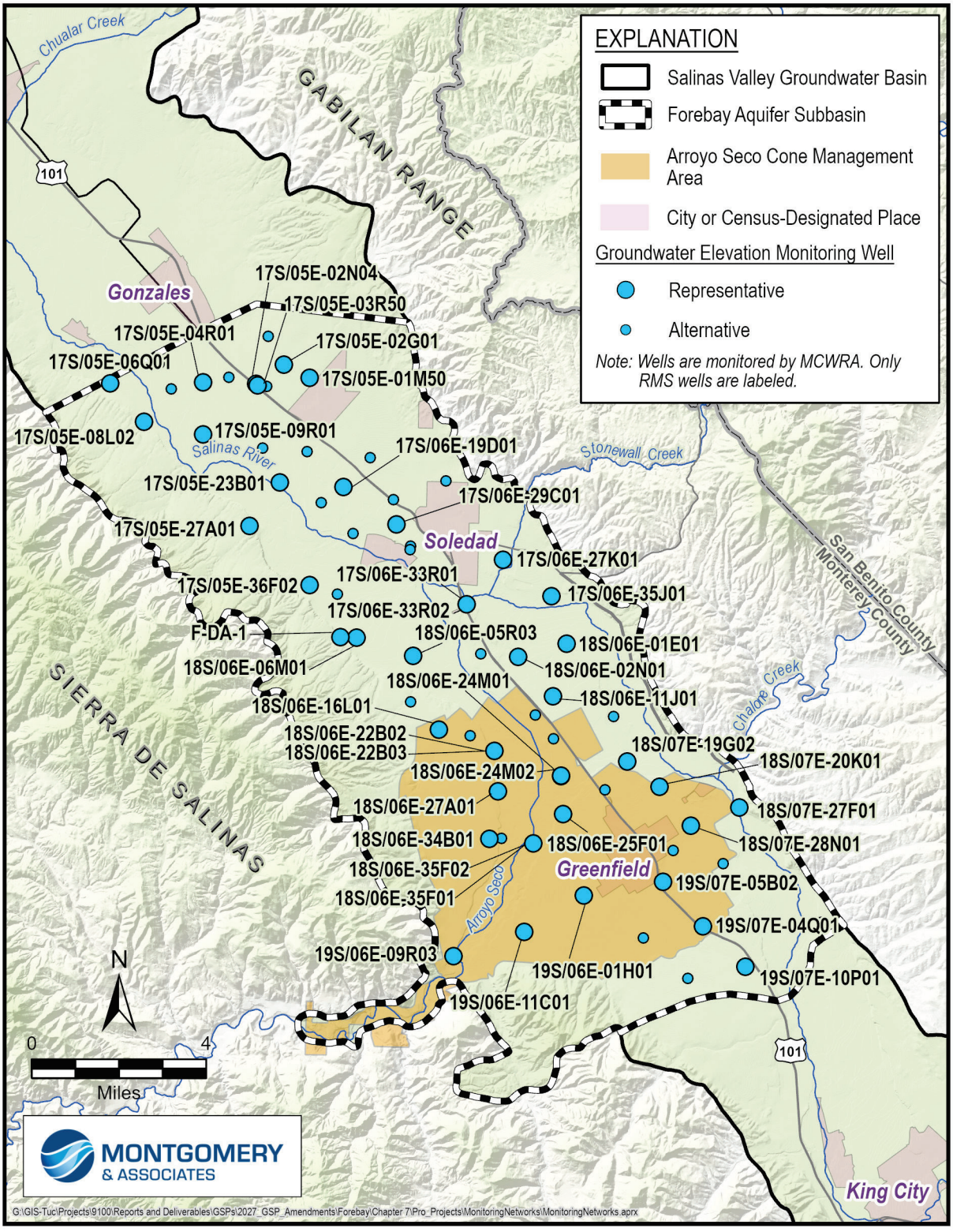


Figure 7-1. Groundwater Level Monitoring Network

Table 7-1. Forebay Aquifer 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)
17S/05E-02N04	364761N1214050W001	2489	Irrigation	630	170.7	36.47610	-121.40500
17S/05E-03R50	364755N1214043W001	2420	Irrigation	810	171.1	36.47559	-121.40434
17S/05E-04R01	364762N1214267W001	534	Irrigation	442	141.6	36.47621	-121.42677
17S/05E-02G01*	N/A	Casa Grande North	Irrigation	1,004	257.0	36.48284	-121.39364
17S/05E-06Q01	364751N1214649W001	719	Irrigation	170	117.7	36.47510	-121.46499
17S/05E-08L02	364625N1214507W001	22926	Irrigation	830	133.5	36.46259	-121.45070
17S/05E-09R01	364590N1214261W001	513	Irrigation	210	137.9	36.45902	-121.42618
17S/05E-01M50*	N/A	Garcia Main	Irrigation	900	269.2	36.47856	-121.38292
17S/05E-27A01	364289N1214061W001	1201	Domestic/Irrigation	265	263.3	36.42894	-121.40611
17S/05E-36F02	364098N1213808W001	914	Irrigation	234	167.5	36.40985	-121.38080
17S/06E-16N01	364454N1213291W001	2310	Irrigation	626	173.2	36.44544	-121.32919
17S/06E-19D01	364424N1213682W001	1485	Irrigation	252	244.2	36.44240	-121.36820
17S/06E-27K01	364198N1213016W001	1248	Irrigation	250	180.3	36.41980	-121.30167
17S/06E-29C01	364306N1213457W001	1441	Irrigation	303	198.9	36.43063	-121.34578
17S/06E-33R01	364048N1213162W001	VidaDeep21209	Observation	260	196.8	36.40480	-121.31620
17S/06E-33R02	364047N1213162W001	VidaShallow21210	Observation	120	263.3	36.40470	-121.31620
18S/06E-01E01	363923N1212746W001	1001	Irrigation	218	215.1	36.39234	-121.27469
18S/06E-02N01	363876N1212944W001	1000	Irrigation	274	211.2	36.38769	-121.29443
18S/06E-05R03	363871N1213375W001	1335	Irrigation	279	199.1	36.38715	-121.33755
18S/06E-06M01	363928N1213610W001	1771	Irrigation	350	187.4	36.39280	-121.36102
18S/06E-11J01	363748N1212798W001	788	Irrigation	235	217.4	36.37481	-121.27980
18S/06E-16L01	363627N1213263W001	24	Irrigation	444	306.4	36.36278	-121.32634
18S/06E-22B02	363562N1213033W003	LosCochesC18449	Observation	590	225.8	36.35620	-121.30330
18S/06E-22B03	363562N1213033W002	LosCochesB21066	Observation	280	223.6	36.35620	-121.30330
18S/06E-24M01	363485N1212755W001	HUDB18467	Observation	253	234.1	36.34850	-121.27560
18S/06E-24M02	363485N1212756W001	HUDA21067	Observation	130	234.1	36.34850	-121.27560
18S/06E-25F01	363359N1212745W001	1495	Irrigation	120	256.9	36.33590	-121.27450
18S/06E-27A01	363428N1213014W001	1488	Irrigation	343	243.2	36.34285	-121.30140

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)
18S/06E-34B01	363269N1213045W001	2308	Irrigation	300	343.7	36.32699	-121.30453
18S/06E-35F01	363259N1212863W001	THNB18502	Observation	258	263.1	36.32590	-121.28630
18S/06E-35F02	363258N1212864W001	THNA21068	Observation	N/A	265.8	36.32580	-121.28640
18S/07E-19G02	363537N1212485W001	403	Irrigation	265	230.6	36.35373	-121.24851
18S/07E-20K01	363456N1212349W001	1886	Irrigation	200	238.0	36.34565	-121.23498
18S/07E-28K01	363361N1212158W001	1415	Irrigation	120	258.8	36.33610	-121.21584
19S/06E-01H01	363090N1212650W001	333	Irrigation	300	321.6	36.30902	-121.26509
19S/06E-11C01	362963N1212892W001	10004	Irrigation	320	376.3	36.29639	-121.28924
19S/07E-04Q01	362996N1212157W001	1813	Irrigation	342	257.7	36.29969	-121.21579
19S/07E-05B02	363141N1212327W001	10010	Irrigation	420	262.5	36.31416	-121.23271
19S/07E-10P01	362865N1211980W001	10011	Domestic	245	317.0	36.28651	-121.19807
19S/06E-09R03*	N/A	F-GWL-1	Observation	195	228.6	36.33938	-121.20205
18S/07E-27F01*	N/A	F-ISW-1	Observation	70	481.2	36.28772	-121.31804
17S/05E-23B01*	N/A	F-ISW-2	Observation	70	143.4	36.44356	-121.39407
18S/06E-06M02*	N/A	F-DA-1	Observation	1,255	245.0	36.39274	-121.36770

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, 2015). 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 Forebay Subbasin encompasses 147 square miles. Applying the BMP guidance recommendations to the Subbasin, the well network should include between 1 and 15 wells. The RMS network includes 43 wells—surpassing 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 MCWRA to fill this data gap 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 to calculate change in storage. 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's supply wells monitored under the SWRCB DDW, and all wells monitored under the CCRWQCB ILP for Ag Order 4.0 compliance. The Subbasin's groundwater quality network is shown on Figure 7-2 and the wells in the network are listed in Appendix 7B.

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 supple 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 agricultural production wells and on-farm domestic wells. All ILP wells sampled by Preservation Inc. as of GSP Amendment 1are provisionally included in the Subbasin's monitoring network until the GQTM Workplan is approved by the CCRWQCB. Once its 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.

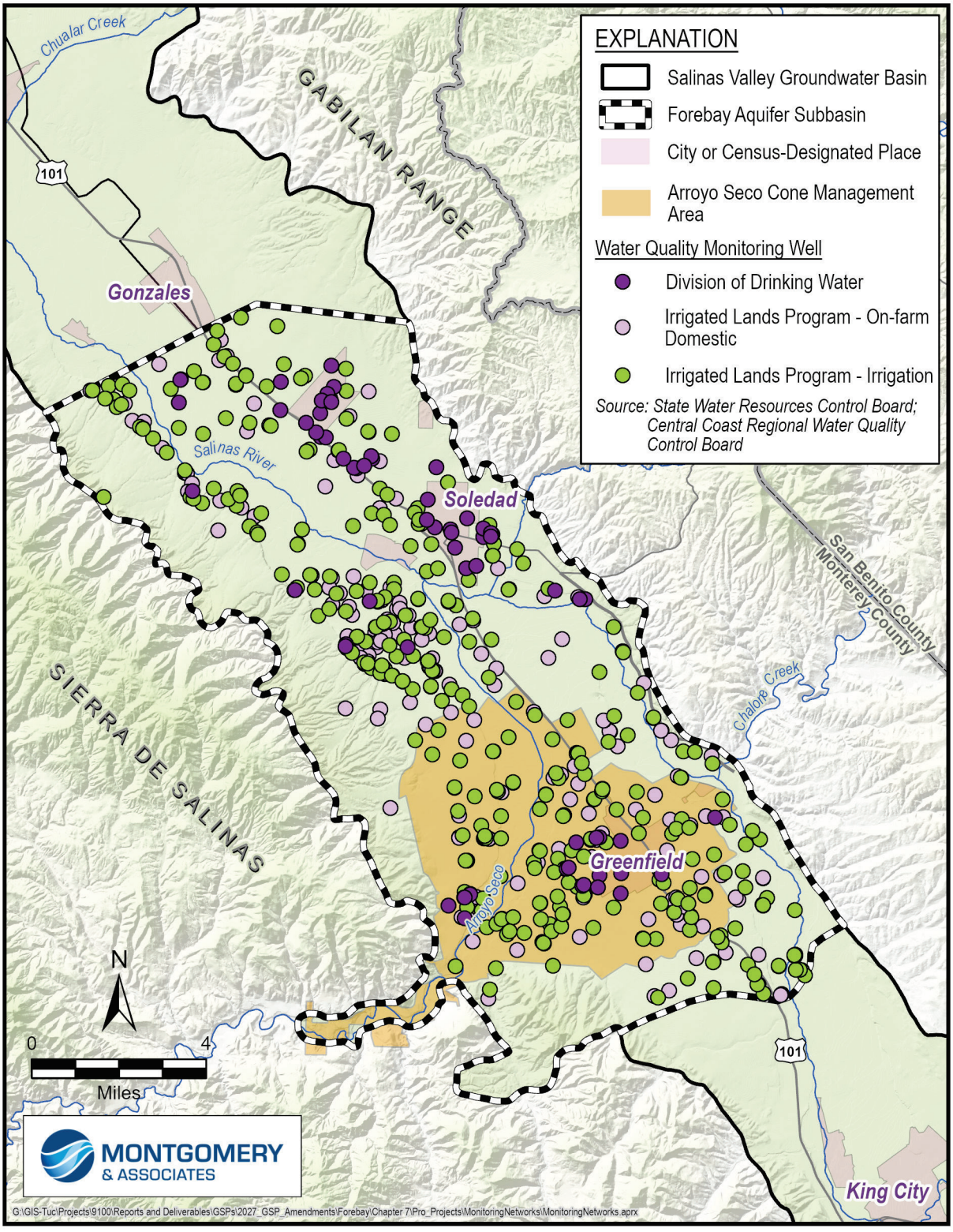


Figure 7-2. Groundwater Quality Monitoring Network

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 GQTM Workplan. 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. Not all wells are sampled every year; the sampling frequency is further outlined in Ag Order 4.0. A copy of 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 ILP 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 the GSAs. This subsidence dataset represents the best available science for the Forebay 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 Arroyo Seco, and other streams in the Subbasin. 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 and Arroyo Seco. 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 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 classified as RMS and 4 of these wells are also RMS for the groundwater level sustainability indicator.

Following the 2022 GSP, SVBGSA installed 3 new ISW wells which are 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. Because it is closer to the Salinas River and once it has a longer record of groundwater elevation measurements, F-ISW-2 will replace 18S/07E-32G02.

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)
17S/06E-33R02	364047N1213162W001	VidaShallow21210	Observation	150	36.40473	-121.31618
18S/06E-03P01	363884N1213097W001	708	Irrigation	195	36.38841	-121.30974
18S/07E-32G02	363245N1212289W001	10494	Public Supply	150	36.32459	-121.22892
19S/06E-09R03*	N/A	F-ISW-1	Observation	195	36.33938	-121.20205
18S/07E-27F01*	N/A	F-ISW-2	Observation	70	36.28772	-121.31804
17S/05E-23B01*	N/A	F-ISW-3	Observation	70	36.44356	-121.39407

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

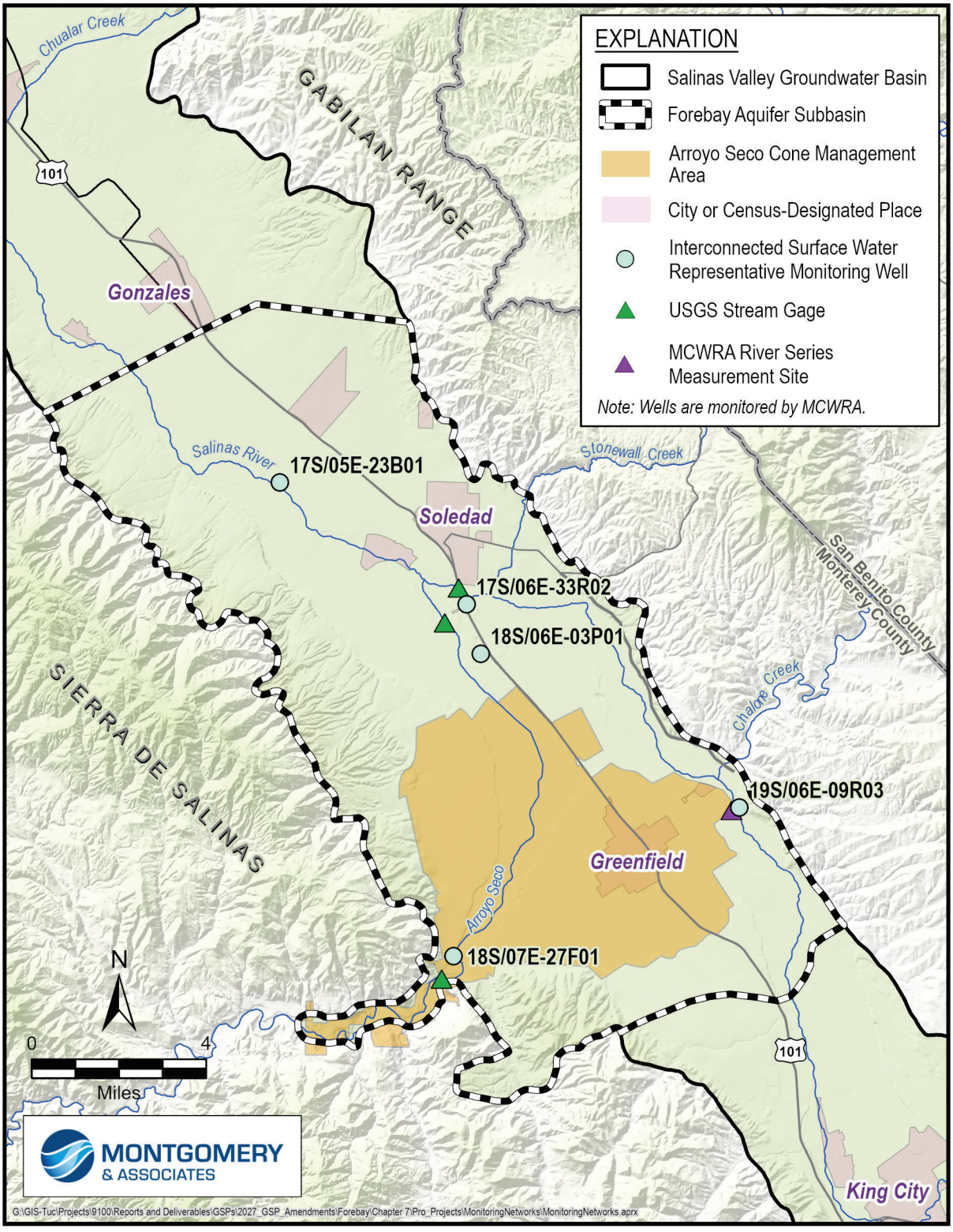


Figure 7-3. ISW Monitoring Network

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 installed 2 ISW monitoring wells in 2025 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 Forebay Subbasin.

7.7 Other Monitoring Networks

The following monitoring networks are needed in addition to the monitoring networks outlined above for sustainability indicators. 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

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 Forebay Subbasin.

7.7.2 Groundwater Extraction

MCWRA's GEMS is the 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 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 mainly overlaps with 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 wells 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 number of connections was 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. 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 a complete count of the number of municipal, agricultural, and domestic wells in the GSP area. As discussed in Chapter 9, 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, such as CCWC's diversion from the Arroyo Seco.

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 established by the SWRCB 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 in the Forebay 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 EnviroSQL database, which is linked to the HydroSQL database for data management purposes. Fields in the EnviroSQL database include:

- 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. Table 7-3 mainly summarizes data that are used to produce annual reports. Groundwater extraction is confidential, and cannot be made publicly accessible by SVBGSA unless aggregated.

Table 7-3. Datasets Available for Use in Populating the 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 (ILP)						X
USGS Gage Stations					X	

[1] Pumping data not publicly accessible

Data are compiled and reviewed to comply with quality objectives. The review includes 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.

Well log information is entered for selected wells and other information will be added as needed to satisfy the requirements of the GSP Regulations.

The DMS includes a publicly accessible web map that is available on the SVBGSA website; 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 withaccess to 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, as well as various local administrative boundaries. In addition, the web map has functionalities to be able to graph time series 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.

Chapter 8 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 §354.22 et seq.; DWR, 2017).

The Forebay Subbasin includes the ASCMA, which is managed by the ASGSA. The remaining area of the Subbasin is managed by the SVBGSA in accordance with the Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement (Forebay Implementation Agreement, 2021). The Management Area was established to account for the unique hydrogeologic, water quality, and water supply characteristics of the Arroyo Seco Cone region as described in Chapter 4. Although the ASCMA and the greater Forebay Subbasin are managed by different GSAs, both areas will be managed cooperatively to meet the sustainability goal of the entire Subbasin. The undesirable results for all sustainability indicators are defined consistently throughout the Subbasin.

8.1 Definitions

Key terms relevant to the SMC are repeated from the SGMA legislation and GSP Regulations below. Where 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 a 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 sustainability.
- **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 Forebay 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 that will allow the SVBGSA to maintain sustainability are included in this GSP and detailed in Chapter 9. It is not necessary to implement all projects and actions listed in this GSP to maintain 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 Forebay Subbasin throughout GSP implementation.

The PMAs are designed to maintain sustainability for the next 20 years by 1 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. Year-by-year micro-management is not the intent of this GSP; this GSP is developed to avoid undesirable results with long-term, deliberate groundwater 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 include feedback gathered during public meetings, hydrogeologic analysis, and coordination with other agencies. The general process included:

- Presenting to Forebay Subbasin Committee and ASGSA Advisory Committee on the general SMC requirements and implications. These presentations outlined the approach to developing SMC and discussed initial SMC ideas.
- Gathering feedback from discussions with subbasin committee and the ASGSA Advisory Committee on challenges and goals.
- Providing supplemental data to the subbasin committees to guide the approach to setting SMC.
- Polling and receiving feedback from the subbasin committees to establish preferences for establishing SMC.
- Selecting approach and criteria for setting SMC in the subbasin committee.
- Developing joint ASGSA and SVBGSA recommendations for SMC.
- Soliciting feedback on joint approach from the Forebay Subbasin Committee and the ASGSA Advisory Committee.
- 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, if needed.

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 the 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 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 maintain those conditions for 30 years for all 5 sustainability indicators. Chapter 9 also includes contingency projects 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. The SMC are identical for the ASCMA and the Greater Forebay Subbasin. 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 to 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 level representative monitoring well network	Minimum thresholds are set to December 2015 groundwater elevations. See Table 8-2 .	Measurable objectives are set to 2015 groundwater elevations plus 75% of the difference between 2015 and 1998 groundwater elevations.	More than 15% of groundwater elevation minimum thresholds are exceeded.
Reduction in groundwater storage	Measured from groundwater elevation contour maps.	Minimum threshold is set to 119,500 AF below the measurable objective. This reduction is based on the groundwater level minimum thresholds. This number will be refined as additional data are collected and other projects are implemented.	Measurable objective is set to zero when the groundwater elevations are held at the groundwater level measurable objectives. Since the goal is to manage to the measurable objective, additional water in storage is needed until groundwater elevations are at their measurable objectives.	There is an exceedance of the minimum threshold.
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 standard or Basin Plan objective beyond those observed on December 31, 2019 for groundwater quality constituents of concern. Exceedances are only measured in public water system supply wells and ILP 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.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Land subsidence	Measured using DWR provided InSAR data.	Minimum threshold is 0.133 feet per year. This is the rate that results in less than 1 foot of cumulative subsidence over a 30-year implementation horizon, plus 0.1 feet per year of estimated land movement to account for InSAR measurement errors.	Measurable objective is 0.1 feet per year. This is a long-term rate of zero feet per year plus 0.1 feet per year of estimated land movement to account for InSAR measurement errors.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations that surpass historical lows.
Depletion of ISW	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 December 2015 near locations of ISW.	Measurable objectives are established by proxy using shallow groundwater elevations near locations of ISW and are set to 75% of the distance between 2015 and 1998 shallow groundwater elevations.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well 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 in December 2015. 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.

8.6.2 Minimum Thresholds

> *The minimum thresholds for chronic lowering of groundwater levels are set to 2015 groundwater elevations.*

The minimum threshold values for each well within the groundwater level monitoring network are provided in Table 8-2. The minimum threshold contour map, along with the RMS well locations for the single principal aquifer in the Forebay Subbasin, are shown on Figure 8-1. Both Table 8-2 and Figure 8-1 do not include the 4 new monitoring wells SVBGSA added to the monitoring network, after the original GSP was drafted. Once these wells have approximately 5 years of groundwater elevation measurements, SMC will be established for each and will be documented through annual reports.

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

Monitoring Site	Minimum Threshold (feet)	Measurable Objective (feet)
17S/05E-02N04	91.5	110.3
17S/05E-03R50	91.1	112.9
17S/05E-04R01	82.7	101.8
17S/05E-06Q01	73.9	95.1
17S/05E-08L02	86.0	102.9
17S/05E-09R01	97.1	116.8
17S/05E-27A01	121.6	139.3
17S/05E-36F02	120.9	136.6
17S/06E-19D01	121.8	138.7
17S/06E-27K01	137.9	156.2
17S/06E-29C01	133.4	148.3
17S/06E-33R01	146.0	164.8
17S/06E-33R02	143.8	161.5
17S/06E-35J01	142.0	161.7
18S/06E-01E01	150.7	175.5
18S/06E-02N01	147.0	168.8
18S/06E-05R03	136.1	154.0
18S/06E-06M01	146.0	163.8
18S/06E-11J01	158.1	180.8
18S/07E-19G02	151.8	176.3
19S/07E-10P01	201.4	224.7
ASCMA		
18S/06E-16L01	140.4	168.4
18S/06E-22B02	151.1	178.7
18S/06E-22B03	151.8	178.4
18S/06E-27A01	159.6	190.7
18S/06E-24M01	163.0	188.5
18S/06E-24M02	163.1	188.5
18S/06E-25F01	169.3	200.4
18S/06E-34B01	165.9	198.2
18S/06E-35F01	166.4	195.9
18S/06E-35F02	169.6	203.3
18S/07E-20K01	150.1	173.2
18S/07E-28N01	186.0	208.8
19S/06E-01H01	181.3	207.0
19S/06E-11C01	175.6	206.3
19S/07E-04Q01	201.6	218.4
19S/07E-05B02	189.2	210.0

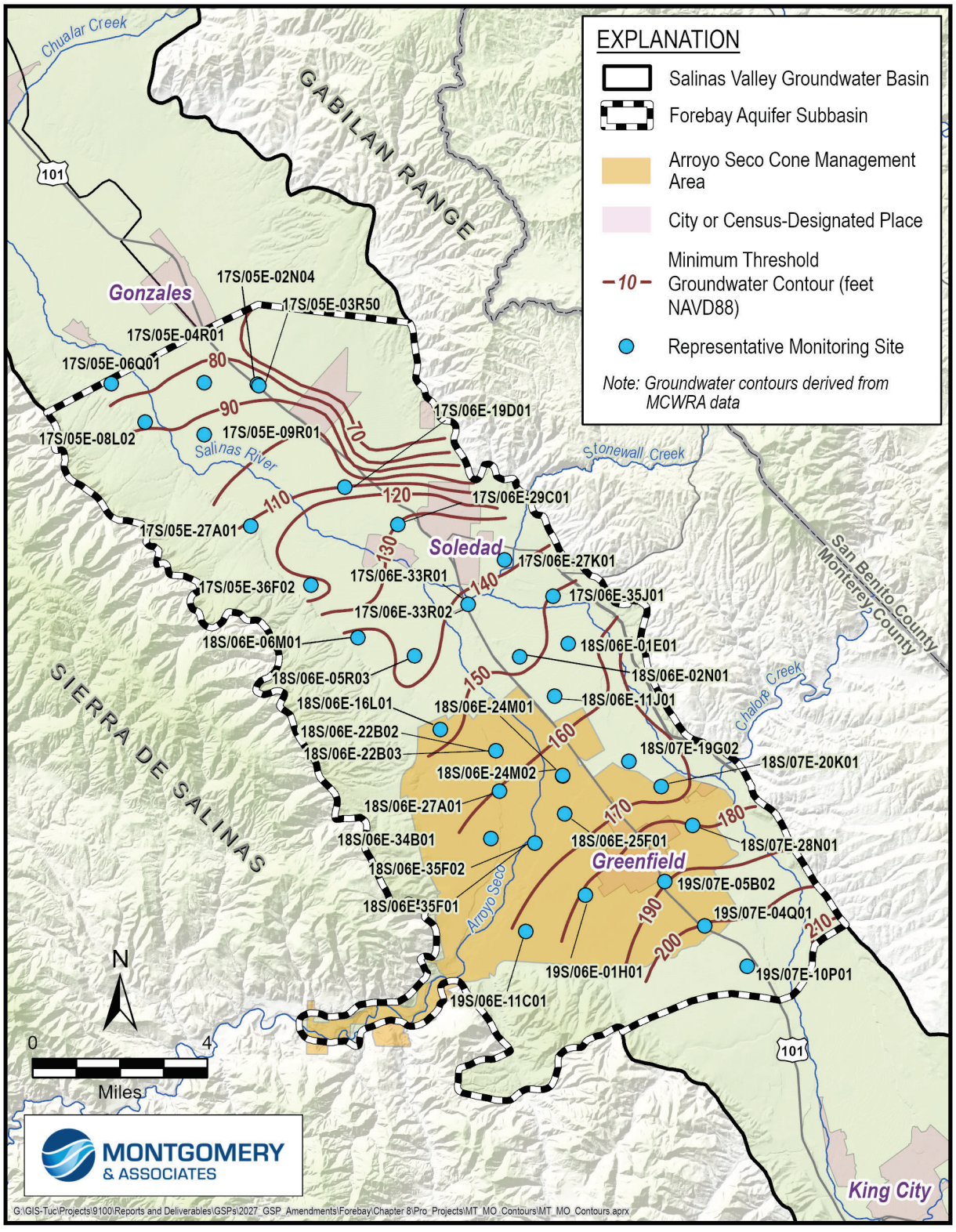


Figure 8-1. Groundwater Level Minimum Threshold Contour Map

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

The development of minimum thresholds and measurable objectives followed similar processes and are described concurrently in this section. The information used includes:

- Feedback from discussions with the Subbasin Committee and the ASGSA Advisory 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:

The ASGSA Advisory Committee and the Subbasin Committee selected approaches and criteria for setting the groundwater level minimum thresholds and measurable objectives.

1. The ASGSA and SVBGSA consultants reviewed and compared information from the various committee recommendations, tentatively agreeing on December 2015 as the minimum threshold.
2. The ASGSA reviewed hydrographs and estimated that groundwater elevations have historically been held approximately 75% of the way up from December 1995 elevations to the relatively high elevations recorded in 1998. This was tentatively chosen as the measurable objective.
3. SVBGSA reviewed the cumulative change in groundwater levels from all years, shown on Figure 8-2, to verify if the minimum threshold and measurable objective were realistic criteria for the Subbasin. The measurable objective chosen falls within the representative climatic cycle shown on Figure 8-2, meaning that it is an achievable goal under reasonably expected climatic conditions.
4. SVBGSA verified the minimum threshold and measurable objective with the Subbasin Committee Stakeholders.
5. SVBGSA and ASGSA plotted 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

minimum thresholds and measurable objectives. The interpolated minimum thresholds and measurable objectives are indicated by an asterisk in Table 8-2. Additionally, November measurements were used if December measurements were unavailable.

Hydrographs with well completion information showing minimum thresholds for each RMS are included in Appendix 8A.

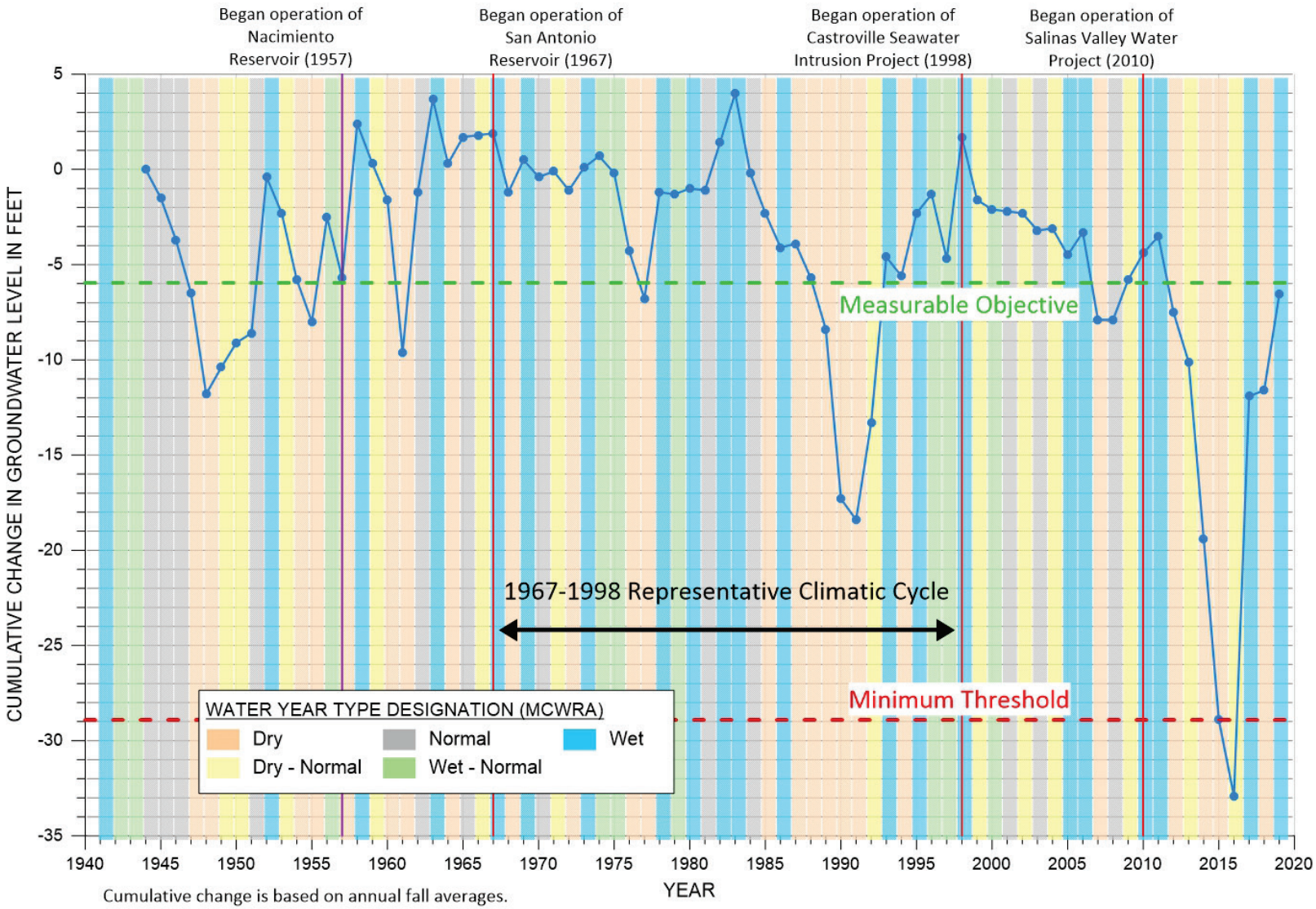


Figure 8-2. Cumulative Groundwater Elevation Change Hydrograph with Selected Minimum Threshold and Measurable Objective for the Forebay Subbasin

8.6.2.2 Minimum Thresholds Impact on Domestic Wells

To address the human right to water, minimum thresholds for groundwater levels are compared to the range of domestic well depths in the Subbasin using DWR's OSWCR database. This check was done to assure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater levels do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. However, domestic wells are an important beneficial user. Well completion reports that were reported as domestic were included; however, some may support multiple households.

The average computed depth of domestic wells in the Subbasin is 281 feet using the Public Land Survey System sections data in the OSWCR database. The average computed depth of domestic wells in the Subbasin is 361 feet using the Public Land Survey System sections data in the OSWCR database.

While this approach is reasonable, there are some adjustments that had to be made to improve the accuracy of the analysis. Considerations included:

- Only wells that had accurate locations were included, since some wells in the OSWCR database are not accurately located, it could lead to inaccurate estimations of depth to water in the wells.
- The depth to water is derived from a smoothly interpolated groundwater elevation contour map. Errors in the map may result in errors in groundwater elevation at the selected domestic wells.

Given the limitations listed above, the analysis of minimum threshold impacts on domestic wells only included 8 domestic wells out of the total 154 domestic wells in the OSWCR database. In the Forebay Subbasin, 100% of all domestic wells have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds; and 100% of all domestic wells will have at least 25 feet of water in them when measurable objectives are achieved. These percentages were considered reasonable despite the limitations of this analysis. Since data for the analysis is limited, further assessment may be done when more data becomes available.

An additional analysis was completed using MCWRA well database, which includes 53 active domestic wells. Of these, only 23 wells had construction information and were used to compare to the minimum thresholds. All 23 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.

For both sets of domestic wells used for the analysis, 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.

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 is 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 or above 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 COC are mobilized and are therefore protective of beneficial uses and users.

- **Land subsidence.** The chronic lowering of groundwater levels' minimum thresholds is 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 is identical to the ISW minimum thresholds. Therefore, the groundwater level minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.6.2.4 Effect of Minimum Threshold on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400 Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is 1 of the coordinating GSAs for all adjacent Subbasins. Because SVBGSA's jurisdiction covers all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. SVBCSA submitted the180/400 GSP in 2020, which was approved by DWR in 2022, and GSP Amendment 1 in 2025. The Forebay, Eastside, and Upper Valley Subbasins GSPs (January2022) were also 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 or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

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 public drinking 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, including small local system 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 monitoring network in the Subbasin includes 43 wells as of GSP Amendment 1. This includes 6 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. 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 2015 groundwater elevations plus 75% of the difference between 2015 and 1998 groundwater elevations.*

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

8.6.3.1 Methodology for Setting Measurable Objectives

Groundwater levels minimum thresholds are set to 2015 elevations, and 1998 groundwater elevations were considered the highest reasonable groundwater elevation. To provide adequate operational flexibility during droughts and to mimic historical hydrograph patterns, the measurable objective was set 75% of the way up from 2015 groundwater elevations rather than halfway between 2015 and 1998 groundwater elevations. The measurable objective contour maps along with the representative monitoring network wells are shown on Figure 8-3 for the Forebay Subbasin.

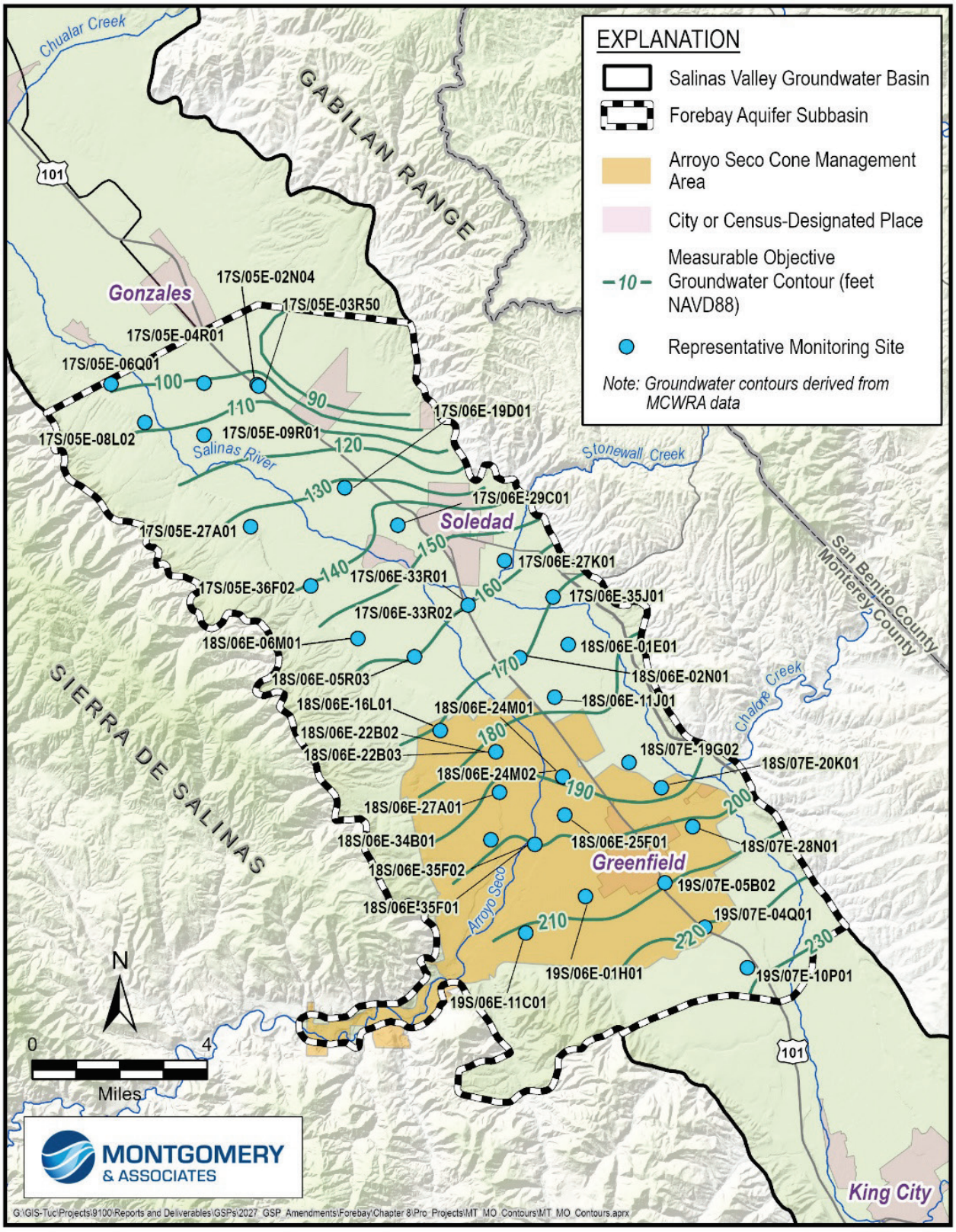


Figure 8-3. Groundwater Level Measurable Objective Contour Map

8.6.3.2 Interim Milestones

Interim milestones for groundwater levels are shown in Table 8-3.

Table 8-3. Chronic Lowering of Groundwater Levels 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)
17S/05E-02N04	112	111.6	111.2	111.0	110.3
17S/05E-03R50	113.5	113.4	113.3	113.2	112.9
17S/05E-04R01	105.5	101.9	101.8	101.8	101.8
17S/05E-06Q01	98.8	97.9	97.2	96.7	95.1
17S/05E-08L02	105.5	104.7	103.9	103.1	102.9
17S/05E-09R01	114.4	115.0	115.5	115.8	116.8
17S/05E-27A01	135.6	135.4	135.3	135.1	139.3
17S/05E-36F02	143.4	137.6	137.2	136.9	136.6
17S/06E-19D01	139.5	139.3	139.1	138.9	138.7
17S/06E-27K01	163.2	158.3	157.6	156.9	156.2
17S/06E-29C01	150.1	149.3	148.6	147.8	148.3
17S/06E-33R01	167.7	167.1	166.4	165.8	164.8
17S/06E-33R02	165.5	160.7	161.0	161.2	161.5
17S/06E-35J01	172.2	169.0	166.6	164.1	161.7
18S/06E-01E01	176.8	177.1	177.5	177.8	175.5
18S/06E-02N01	175.8	174.0	172.7	171.7	168.8
18S/06E-05R03	162.8	156.0	155.3	154.6	154.0
18S/06E-06M01	155.8	157.8	159.3	160.4	163.8
18S/06E-11J01	183.8	182.5	181.2	179.8	180.8
18S/07E-19G02	195.8	190.9	187.3	184.5	176.3
19S/07E-10P01	231.1	229.5	228.3	227.4	224.7

Monitoring Site	GSP Baseline 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)
ASCMA					
18S/06E-16L01	169.7	167.9	168.0	168.2	168.4
18S/06E-22B02	178.3	178.4	178.5	178.5	178.7
18S/06E-22B03	185.3	184.5	183.6	182.8	178.4
18S/06E-27A01	184.8	186.2	187.7	189.1	190.7
18S/06E-24M01	197.8	196.3	194.9	193.4	188.5
18S/06E-24M02	198	196.5	194.9	193.4	188.5
18S/06E-25F01	198.2	198.7	199.1	199.4	200.4
18S/06E-34B01	189.1	190.8	192.6	194.3	198.2
18S/06E-35F01	210.64	191.3	192.4	193.3	195.9
18S/06E-35F02	206.3	205.5	205.0	204.5	203.3
18S/07E-20K01	205	197.1	191.1	186.6	173.2
18S/07E-28N01	208.9	208.9	208.9	208.9	208.8
19S/06E-01H01	205	204.3	205.2	206.1	207.0
19S/06E-11C01	205	204.6	205.1	205.7	206.3
19S/07E-04Q01	223.3	223.1	223.0	222.8	218.4
19S/07E-05B02	211.7	210.1	210.1	210.0	210.0

*Groundwater elevations were 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 5 exceedances in the 37 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. Additionally, when the SMC for the 6 new monitoring wells are established, 1 additional exceedance will be allowed. 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 or heavily utilized 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 rediversion at the SRDF, along with recycled water availability, affect CSIP groundwater demand.
- **Subsurface flows with adjacent subbasins.** The Forebay Subbasin is hydraulically connected with the 180/400, Eastside, and Upper Valley Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Forebay 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. GDEs have the potential to be impacted if the depth to groundwater falls below their rooting depths.

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 collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff.

8.7.2 Minimum Thresholds

> *The minimum threshold for reduction in groundwater storage is 119,500 acre-feet below the measurable objective. This reduction is based on the groundwater level minimum thresholds. This number will be refined as additional data are collected and other projects are implemented.*

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

The groundwater storage minimum threshold relies on the groundwater elevation minimum thresholds, for which the methodology used to establish minimum thresholds is detailed in Section 8.6.2.1. The GSP Regulations § 354.36 (b) states that "Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following: (1) Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy." 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.

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 is derived from the groundwater elevation network; cumulative change in groundwater storage is derived from the SVIHM. Although the data come from 2 sources, the data generally show similar patterns between 1980 and 2022. Figure 8-5 shows a scatter plot of simulated cumulative change in storage and average change in observed groundwater elevations. The comparison between 1980 and 2022 yields a strong positive correlation (R^2=0.725). The correlation for the 1980 to 2022 period is sufficient to show that groundwater elevations are an adequate proxy for groundwater storage. Additionally, the relationships shown on Figure 8-4 and Figure 8-5 also demonstrate that, when paired with SVIHM storage parameters, groundwater elevations can be used to estimate storage change.

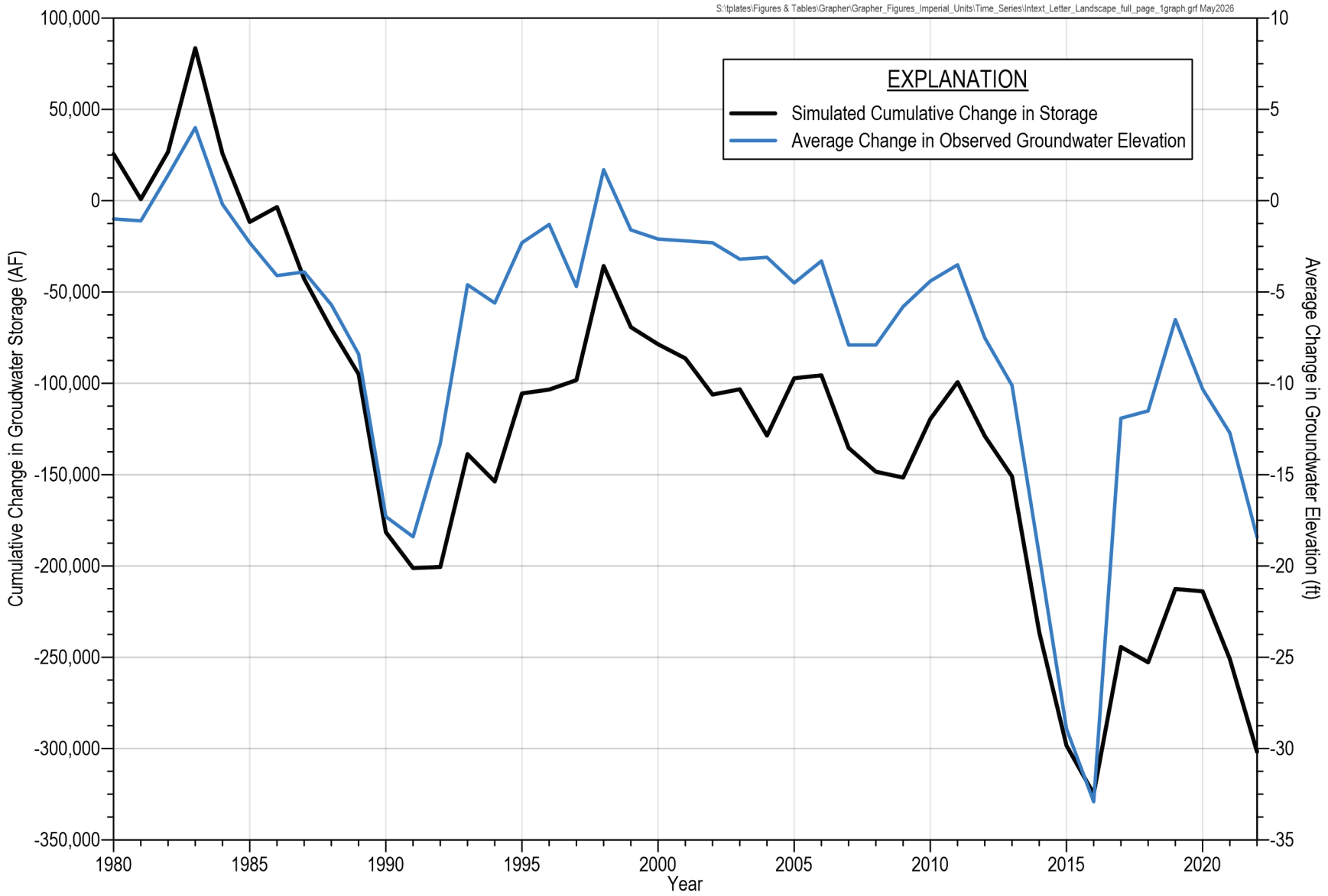


Figure 8-4. Cumulative Change in Storage and Average Change in Groundwater Elevation in the Forebay Subbasin

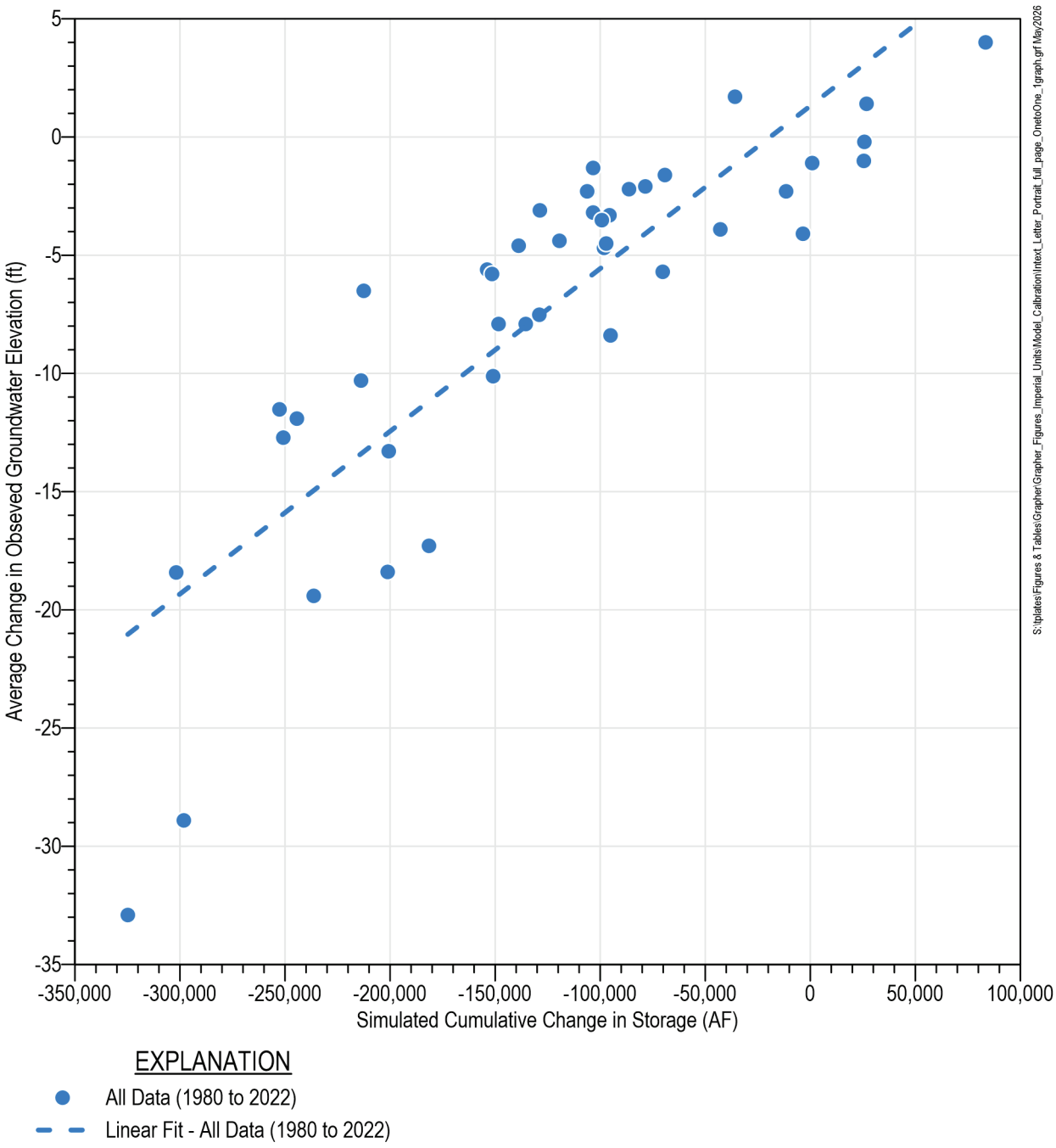


Figure 8-5. Correlation Between Cumulative Change in Storage and Average Change in Groundwater Elevation

With groundwater elevations established as a proxy for storage, the calculation of storage change follows the methodology outlined in Section 5.2, the groundwater storage change resulting from changes in groundwater elevations is computed on a cell-by-cell basis from the SVIHM. Minimum threshold and measurable objective groundwater elevations at RMS wells were each interpolated to create raster layers. The measurable objective surface was subtracted from the minimum threshold surface, and the resulting elevation difference was multiplied by SVIHM grid cell area to estimate an aquifer volume between the 2 elevation surfaces. This aquifer volume was multiplied by the average storativity of layer 1 of the SVIHM (0.0585 ft^3/ft^3) to estimate the total amount of water in storage between the minimum thresholds and measurable objectives that defines the SMC for reduction of groundwater storage (119,500 AF). As previously mentioned, more than 1 layer comprises the Forebay Subbasin in the SVIHM but only the storage properties of layer 1 are used because most of the storage change occurs in this layer.

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

The minimum threshold for reduction in groundwater storage is a single value for the entire Subbasin. Therefore, the concept of potential conflict between minimum thresholds at different locations is not applicable.

The reduction in groundwater storage minimum threshold could influence other sustainability indicators. The reduction in groundwater storage minimum threshold is selected to avoid undesirable results for other sustainability indicators, as outlined below.

- **Chronic lowering of groundwater levels.** The reduction in storage minimum threshold is calculated from the groundwater level minimum thresholds. Therefore, the minimum threshold for reduction in groundwater storage is consistent with, and will not result in, a significant or unreasonable impact on groundwater elevations.
- **Degraded water quality.** The reduction in storage minimum threshold is established to maintain groundwater in storage with groundwater elevations above historical lows. The change in storage minimum threshold will not directly lead to any additional degradation of groundwater quality.
- **Land subsidence.** The reduction in storage minimum threshold is established to maintain groundwater in storage with groundwater elevations above historical lows. Therefore, the change in storage minimum threshold will not induce any additional dewatering of clay-rich sediments; and will not induce additional subsidence.
- **Depletion of ISW.** The reduction in storage minimum threshold is established to maintain groundwater in storage with groundwater elevations above historical lows. Therefore, the change in storage minimum threshold will not induce additional depletion of ISW beyond those lows, which are set to December 2015 levels in this Subbasin.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400 Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is 1 of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. The Forebay, Eastside, and Upper Valley Subbasins GSPs (January2022) were also 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 or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

8.7.2.4 Effect on Beneficial Uses and User

The reduction in groundwater storage minimum is based on the groundwater level minimum threshold and might limit the amount of groundwater pumping in the Subbasin or increase the cost of projects to raise groundwater levels. Limiting pumping may impact the beneficial uses and users of the Subbasin.

Agricultural land uses and users. Limiting the amount of groundwater pumping or raising the cost of water may limit agricultural production or restrict options for crops that can be grown in the Subbasin by reducing the amount of available water.

Urban land uses and users. Limiting the amount of groundwater pumping or increase the cost for projects, either of which increase the cost of water for municipal users in the Subbasin because municipalities may need to find other, more expensive water sources.

Domestic land uses and users. The change in storage minimum thresholds are based on groundwater level minimum thresholds that 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.

Ecological land uses and users. Limiting the amount of pumping may generally benefit the environmental groundwater uses. Maintaining historical amounts of groundwater in the Subbasin maintains groundwater supplies for environmental purposes at levels similar to historical levels.

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 amount of groundwater in storage will be calculated by calculating the change in storage based on groundwater elevations, through the method described in Chapter 5. These storage change estimates will also be reviewed and, if necessary, updated when the SVIHM model is revised.

8.7.3 Measurable Objectives

> *The measurable objective for reduction in groundwater storage measurable objective is 0 when the groundwater elevations are held at the groundwater level measurable objectives.*

Since the goal is to manage to the measurable objective, additional water in storage is needed until groundwater elevations are at their measurable objectives.

8.7.3.1 Methodology for Setting Measurable Objectives

As mentioned in Section 8.7.2.1, the measurable objective groundwater elevations were used to estimate the amount of groundwater in storage when groundwater elevations are held at the measurable objective levels.

8.7.3.2 Interim Milestones

The reduction in storage interim milestones are set for each of the 5-year intervals, consistent with the minimum threshold and the measurable objective. At GSP baseline 2019 groundwater elevations, the groundwater in storage is about 20,700 AF above the measurable objective. Therefore, all interim milestones are set to the measurable objective.

8.7.4 Undesirable Result

8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Result

The reduction in groundwater storage undesirable result is:

> *There is an exceedance of the minimum threshold.*

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, or additional sweater intrusion 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 and groundwater elevations. 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. In addition, surface water rediversion at the SRDF, along with recycled water availability, affect CSIP groundwater demand.
- **Subsurface flows with adjacent subbasins.** The Forebay Subbasin is hydraulically connected with the adjacent 180/400, Eastside, and Upper Valley Subbasins. Groundwater levels in those subbasins may affect the potential for undesirable results in the Forebay 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 that exists as of the development of the GSP, 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 resulting from 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 collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, 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 on December 31, 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 Basin Plan for the Central Coastal Basin (CCRWQCB, 2019). The minimum threshold values for the COC 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 Forebay 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, as discussed in Section 8.8.2. 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 2020 to WY 2025 period, and therefore need to be included in the constituent watchlist. This 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 averaged over this period, and occur in at least 5 wells averaged over this period (Section 8.8.2.1). The constituents selected to the COC are highlighted in orange in Table 8-4.

Since WY 2019, there has been 1 new additional COC (1,2,3-trichloropropane) in the Subbasin which is flagged with an asterisk in Table 8-4. Because there were no exceedances of the level of concern for these COC in WY 2019, the minimum threshold is set to 0%. Only constituents that meet the COC criteria outlined below in Section 8.8.2.1 are included in Table 8-4, as described in Chapter 5; however, all monitored constituents included in the watchlist (Section 5.3.3.2) 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 8-4Water 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)	Number of Years with Level of Concern Exceedances (COC >3)	Number of Years with Level of Concern Exceedances (COC >3)	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								
1,2,3-Trichloropropane (1,2,3-TCP)	0.005	µg/l	4	7%	1	4	7%	1
Chloride	106	mg/l	5	25%	2	5	25%	2
Gross Alpha radioactivity	15	pci/l	1	3%	0	1	3%	0
Iron	300	µg/l	5	17%	2	5	17%	2
Manganese	50	µg/l	5	22%	2	5	22%	2
Nitrate (as nitrogen)	10	mg/l	5	14%	5	5	14%	5
Selenium	0.5	mg/L	2	4%	0	2	4%	0
Sodium	69	mg/L	3	41%	3	3	41%	3
Specific Conductance	1600	µmhos/cm	3	6%	1	3	6%	1
Total Dissolved Solids	1000	mg/l	4	10%	1	4	10%	1
ILP On-Farm Domestic Wells								
1,2,3-Trichloropropane (1,2,3-TCP)*	0.005	µg/L	4	17%	9	4	17%	9
Nitrate + Nitrite (sum as nitrogen)	10	mg/l	5	55%	78	5	55%	78
Specific Conductance	1600	µmhos/cm	4	21%	34	4	21%	34
ILP Irrigation Supply Wells								
Chloride	106	mg/L	0	0%	0	0	0%	0
Nitrate + Nitrite (sum as nitrogen)	10	mg/l	5	44%	81	5	44%	81
Sodium	69	mg/L	2	16%	1	2	16%	1
Specific Conductance	1600	µmhos/cm	4	16%	34	4	16%	34
Total Dissolved Solids	1000	mg/l	4	19%	40	4	19%	40

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 CCR §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 WY 2025 were reviewed and 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 from WY 2021 to 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 all 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 degradation of groundwater quality may affect other sustainability indicators or may limit activities needed to achieve minimum thresholds for other sustainability indicators as described below:

- 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 Threshold on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400 Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is 1 of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. The Forebay, Eastside, and Upper Valley Subbasins GSPs (January 2022) were also 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.

8.8.2.4 Effect on Beneficial Uses and Users

In general, holding groundwater quality at the minimum thresholds will not further impact beneficial users and land uses in the Subbasin. The selected minimum thresholds generally benefit beneficial users and land uses in the Basin:

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 on-farm 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 previously. Every 5 years, in line with Periodic Evaluations, water quality data will be reassessed to determine if any additional constituents meet the COC criteria listed above. If so, these additional constituents will be added to the list of COC 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 Table 8-4.

> *The measurable objectives for degraded water quality are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or Basin Plan objectives (irrigation supply wells) beyond those observed on December 31, 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 projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to GSP baseline conditions.

8.8.4 Undesirable Result

8.8.4.1 Criteria for Defining Undesirable Result

Water quality degradation that results in a minimum threshold exceedance becomes an undesirable result 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 either 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 GSAs 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 does not require nor obligate SVBGSA nor ASGSA to take any affirmative actions to manage or control existing groundwater quality. However, SVBGSA and ASGSA are 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 and ASGSA 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, the GSAs will review groundwater quality and groundwater gradients in and around the project areas to assess if the exceedance resulted from GSA actions to address sustainability indicators 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.

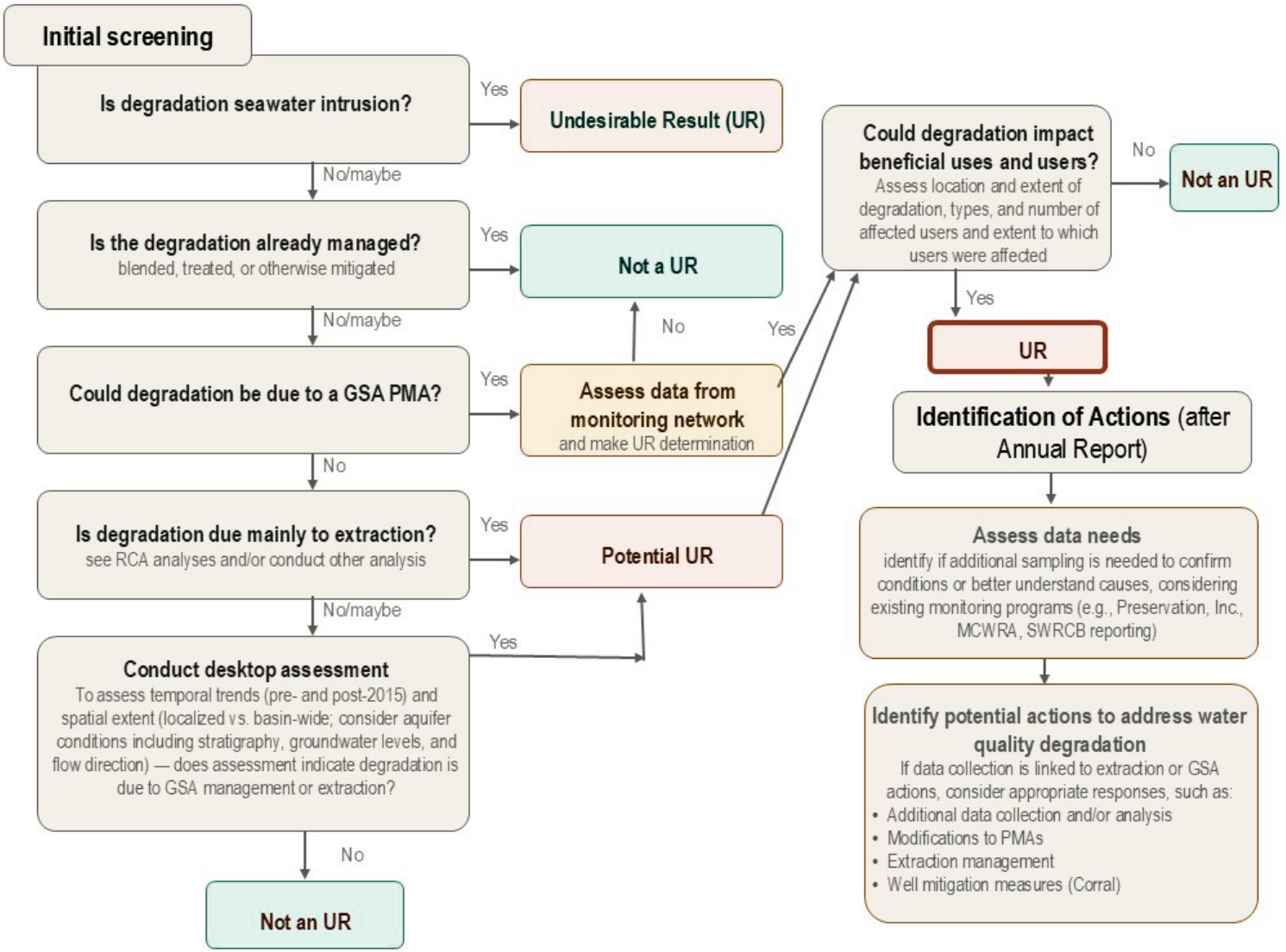


Figure 8-6. Flow Chart of Process to Determine if Minimum Threshold Exceedances Constitute an Undesirable Result

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 p; 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 1 of the COC 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 1 of the COC 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 impacts infrastructure and is caused by lowering of groundwater elevations occurring in the Subbasin or
- Any inelastic subsidence that causes an increase of flood risk

These significant and unreasonable conditions were determined based on input collected during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, 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 0.133 feet per year. This is the rate that results in less than 1 foot of cumulative subsidence over a 30-year implementation horizon, plus 0.1 feet per year of estimated land movement 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

Significant and unreasonable impacts from subsidence include loss of canal and drainage ditch capacity due to overflowing, increased flooding extent and duration near stream channels, reduced gradients in sewers, storm drains and other gravity flow pipelines, degradation of leveling in laser-leveled fields, and damage to well casings due to compaction of clay layers adjacent to the casing. Example standards for flooding and drainage include:

- Ground floor elevations are recommended or required to be at least 1 foot above the Base Flood Elevation in some jurisdictions (see for example Federal Emergency Management Agency [no date]; City of Temecula [no date]).
- The minimum freeboard along roadside ditches is often required to be 1 foot above the maximum anticipated water level (see for example City of Morgan Hill [no date]).

Therefore, any more than 1 foot of cumulative subsidence over the implementation horizon was considered significant and unreasonable because of the potential impact on infrastructure.

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 1 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 or surface water flow 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 Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400 Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is 1 of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdication includes all these subbasins, the SVBGSA coordinates development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. The Forebay, Eastside, and Upper Valley Subbasins GSPs (January2022) were also 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 or maintaining sustainability. SVBGSA GSPs have been developed with consistent methods and SMC.

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.

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 0.1 foot per year. This is a long-term rate of zero feet per year plus 0.1 foot per year of estimated land movement 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.

8.9.4 Undesirable Results

8.9.4.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. No rate of subsidence that results in greater than 1 foot of cumulative subsidence, and that is directly caused by lowered groundwater elevations, 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 that surpass historical lows.*

Should potential subsidence be observed, the SVBGSA and ASGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the GSAs 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 GSAs shall assume that any observed subsidence was not caused by lowered groundwater levels. If groundwater levels have dropped below historical lows, the GSAs 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.

8.9.4.2 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.

8.9.4.3 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, diversion structures, 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 4-9.

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 GSP baseline 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 and seasonality of stream depletions in interconnected reaches is 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 December 2015. While a documented determination of whether past depletions was significant is not available, staying above December 2015 groundwater elevations near locations of ISW 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 during ASGSA Advisory Committee meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff. There is no data as of GSP Amendment 1 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 due to extraction are shallow groundwater elevations observed in December 2015 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 Forebay Subbasin. This table does not include the 3 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)
17S/06E-33R02*	143.8	161.5
18S/06E-03P01	147.4	170.7
18S/07E-32G02	182.8	203.4

*Well is an RMS for groundwater levels and ISW.

No minimum thresholds are established for April to October when flow in the Salinas River is due to conservation releases from reservoir releases. One purpose for these conservation releases is to recharge the Salinas Valley. Therefore, depletion of conservation release water 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. The SVIHM provides the only estimate of the quantity and timing of depletions of ISW due to pumping.

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 and Pre-1914 water rights holders. Table 8-6 provides a summary of water diversions reported to the SWRCB by riparian water rights holders and pre-1914 water rights holders on the Salinas River and its tributaries within the Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system and represent water diversions self-reported by water-rights holders with points of diversion located within the Subbasin boundaries. Riparian rights holders are not differentiated from pre-1914 rights holders in the eWRIMS query results, and therefore diversions by riparian rights holders are summarized together with the pre-1914 right diversions by Clark Colony. The reported surface water diversions are not a determination of water rights and may not include all pre 1914 water rights. 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 water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Furthermore, to the extent that groundwater pumping depletes surface water flows, these depletions, and the potential surface water limitations, would be injurious only if the surface water right holders held rights senior to the groundwater pumpers. Lack of enforcement complaints suggest that historical depletions have not resulted in substantial and unreasonable impact.

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

Diversions (Acre-Feet)	2011	2012	2013	2014	2015	2016	2017	2018	2019
Appropriation per Permit	84,270	33,708	0	0	0	0	0	0	0
Statement of Diversion and Use including Clark Colony and Reported Riparian Diversions	17,692	30,782	9,914	9,929	16,624	12,358	16,440	13,032	12,327
Total	101,962	64,490	9,914	9,929	16,624	12,358	16,440	13,032	12,327

Appropriative water rights holders. The 1 permitted appropriative water right holder in the Forebay Subbasin, shown in Table 8-6, is MCWRA. The reported surface water diversion is not a determination of water rights. In addition to this 1 diversion, MCWRA releases water from upstream appropriative diversions, the Nacimiento Reservoir and San Antonio Reservoir, which flow through the Subbasin. MCWRA has not filed any action noting illegal use of these appropriated waters. Therefore, minimum threshold levels of depletion are assumed to not infringe on their appropriative water right from the reservoir releases.

The SVBGSA and ASGSA are not aware of any current water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Therefore, the GSAs assume 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 reservoirs in a manner that meets downstream demands, considers ecological surface water users, and provides for groundwater recharge. MCWRA is in the process of developing a Salinas River Operations HCP, a comprehensive strategy to balance water management and flood control with the protection of endangered species in the Salinas River watershed. 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 if needed.

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 set based on 2015 groundwater elevations.

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 December 2015 groundwater elevations in the shallow monitoring wells within the Subbasin. The minimum thresholds all reference the same historical year. 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 is identical to 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 threshold is identical to the groundwater elevation minimum thresholds. The change in groundwater storage minimum threshold require groundwater elevations be held at the minimum thresholds set for the chronic lowering of groundwater indicator. Thus, the ISW minimum threshold is therefore consistent with the change in groundwater storage minimum threshold.
- **Degraded water quality.** The depletion of ISW minimum thresholds does 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 does 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 Forebay Subbasin has 3 neighboring subbasins within the Salinas Valley:

- The Eastside Subbasin to the northeast
- The Upper Valley Subbasin to the south
- The 180/400 Subbasin to the northwest

The SVBGSA is either the exclusive GSA or is 1 of the coordinating GSAs for the adjacent Subbasins. Because SVBGSA's jurisdiction includes all these subbasins, the SVBGSA coordinates the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400 Subbasin GSP was submitted in 2020, was approved in 2022, and GSP Amendment 1 was submitted in 2025. The Forebay, Eastside, and Upper Valley Subbasins GSPs (January2022) were also 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.

8.10.2.4 Effect on Beneficial Uses and Users

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

- 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 prevents lowering of groundwater elevations adjacent to certain parts of streams and riversbelow recent historical lows. While the measurable objectives are higherthan the minimum thresholds, providing flexibility for needed groundwater extraction 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 needed groundwater extraction during droughts or periods of low reservoir releases. Minimum thresholdshigher than historical levels help protect downstream users, but theymay 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 recent 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 address 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 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. As of the development of GSP Amendment 1, a habitat conservation plan for reservoir operations was under development.

8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

The SVIHM is used to identify locations of ISW and help determine the extent to which depletions of the Salinas River occur during the April to October conservation release period, when managed releases from Nacimiento and San Antonio Reservoirs are intended to recharge the groundwater basin. Groundwater elevations measured in shallow wells adjacent to these areas of ISW will serve as the primary approach for monitoring depletion of ISW.

New shallow monitoring wells installed pursuant to the GSP do not have data from 2015. 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 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 measurable objectives for depletion of ISW shallow groundwater elevations near locations of ISW and are set to 75% of the distance between 2015 and 1998 shallow groundwater elevations.*

8.10.3.1 Methodology for Setting Measurable Objectives

The 2015 groundwater elevations are the minimum thresholds, and 1998 groundwater levels were considered the highest reasonable groundwater elevation. To provide adequate operational flexibility during droughts and to mimic historical hydrograph patterns, the measurable objective was set 75% of the way up from 2015 groundwater elevations.

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)
17S/06E-33R02*	165.5	164.5	163.5	162.5	161.5
18S/06E-03P01	170.6	170.6	170.7	170.7	170.7
18S/07E-32G02	206.7	205.9	205.1	204.2	203.4

*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 December 2015, represent depletions that are significant and unreasonable. Any additional lowering of shallow groundwater levels below where they were in December 2015 would likely be an undesirable result that must be addressed under SGMA. As of GSP Amendment 1, there is no biological opinion or HCP that indicates additional protection is needed for species protected under the Endangered Species Act; however, MCWRA is developing a habitat conservation plan for its reservoir operations. In the future, 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 ISW 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.