2 WATER USE AND GROUNDWATER CONDITIONS RELATIVE TO SUSTAINABLE MANAGEMENT CRITERIA

The overarching groundwater sustainability goal of the 180/400 Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits of the Salinas Valley's residents and businesses. The goal of the Salinas Valley GSPs is to balance the needs of all water users and ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of each subbasin.

SGMA requires groundwater to be managed according to 6 sustainability indicators. These indicators are used to show progress toward sustainability while adhering to the overarching sustainability goal of the Subbasin. GSP Amendment 1 updates the sustainable management criteria (SMC) set for each sustainability indicator for the 180/400 Subbasin. SVBGSA monitors groundwater conditions for these sustainability indicators and routinely evaluates progress toward meeting SMC metrics.

2.1 Introduction and Overview of SMC

The SMC outline the desired groundwater conditions and the conditions that are to be avoided. In SGMA terminology, ***significant and unreasonable conditions*** occur due to inadequate groundwater management and qualitatively describe groundwater conditions deemed insufficient by subbasin planning committees. The ***minimum thresholds*** are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. The ***undesirable result*** is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole. ***Measurable objectives*** are the goals that reflect the Subbasin's desired groundwater conditions for each sustainability indicator and provide operational flexibility above the minimum thresholds. GSPs are designed to not only avoid undesirable results, but to achieve or maintain the sustainability goals within 20 years, along with ***interim milestones*** every 5 years that show progress from current conditions to the measurable objectives. Table 2-1 summarizes the SMC for the 6 sustainability indicators, as updated in GSP Amendment 1.

Table 2-1. Summary of SMC

Sustainability Indicator	Significant and Unreasonable Conditions	Minimum Thresholds (groundwater conditions to be avoided)	Measurable Objective (groundwater condition goals)	Undesirable Result (assessment of subbasin-wide unreasonable conditions)
Chronic Lowering of Groundwater Elevations	Groundwater levels at or below the observed groundwater elevations in 2015, or that cause significant financial burden to local agricultural interests	Set to 1 foot above 2015 groundwater elevations	Set to 2003 groundwater elevations	More than 15% of Representative Monitoring Site (RMS) wells exceed groundwater elevation minimum thresholds in any aquifer
Seawater Intrusion	Any further seawater intrusion	2017 extent of 500 milligrams per liter (mg/L) chloride isocontour for the 180- and 400-Foot Aquifers, and the line defined by Highway 1 for the Deep Aquifers	Highway 1 for the 180-Foot, 400-Foot, and Deep Aquifers	Exceedance of the minimum threshold
Reduction of Groundwater Storage	Chronic, long-term reduction in groundwater storage	626,000 acre-feet (AF) below the measurable objective (based on Groundwater Level and Seawater Intrusion minimum thresholds)	0 AF change from Groundwater Level and Seawater Intrusion measurable objectives	Exceedance of the minimum threshold(s)
Degradation of Groundwater Quality	Increases in a COC caused by a direct result of a GSA groundwater management action that either results in groundwater concentrations in a potable water supply well above an established MCL or SMCL, or lead to significantly reduced crop production	No new exceedances past the existing number of wells that are above the regulatory standard for each constituent of concern (COC)		Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction
Land Subsidence	Any inelastic land subsidence that is caused by lowering of groundwater elevations in the Subbasin, or that causes an increase of flood risk	Zero net long-term subsidence		An exceedance of the minimum threshold due to lowered groundwater elevations
Depletion of ISW	Depletion from groundwater extraction that would result in a significant and unreasonable impact on surface water beneficial uses and users, or that is more than observed in 2015	Established by proxy using shallow groundwater elevations 1 foot about those observed in 2015 near locations of ISW	Established by proxy using shallow groundwater elevations observed in 2003 near locations of ISW	An exceedance of the minimum threshold

To operationalize the overarching sustainability goal and comply with SGMA, the Salinas Valley GSPs set SMC for each of the 6 sustainability indicators for the 180/400 Subbasin. SVBGSA and partner agencies will manage the 180/400 Subbasin to its measurable objectives and will avoid undesirable results by 2040, demonstrating progress along the way. Since undesirable results are based on minimum thresholds, managing to measurable objectives helps provide operational flexibility and prevent groundwater conditions from reaching undesirable results. Subbasin-specific SMC were developed based on public input, historically observed hydrologic conditions, and reasonably anticipated climate change. These SMC may be updated in future drafts to reflect changes in anticipated climate conditions or refined data and groundwater modeling results.

The GSP is designed to avoid undesirable results under average hydrologic conditions, as explained in Section 1.1.4. Average hydrologic conditions for the 180/400 Subbasin are represented by the average precipitation during the evaluation period. Table 2-2 shows that the precipitation during the evaluation period was less than the historical average, as well as less than the projected average annual precipitation, accounting for reasonable future climatic change (DWR, 2018). These projections are based on climate datasets developed for modeled future projections for the GSP.

Table 2-2. Historical, Evaluation Period, and Projected Average Annual Precipitation

	Salinas Airport Precipitation (Inches)
Historical Average (WY 1991-2020)	12.6
Average After GSP Implementation (WY 2019-2023)	10.2
2030 Projected Average	12.0
2070 Projected Average	12.5

2.1.1 Conditions that Impact Groundwater Use and Management

2.1.1.1 Precipitation and Water Year Type

Precipitation that falls within the 180/400 Subbasin and its watershed contributes to runoff and percolation components of the water budget. The Salinas Airport gage (National Oceanographic and Atmospheric Administration (NOAA) Station USW00023233) is used to measure precipitation in the 180/400 Subbasin. Figure 2-1 shows the cumulative precipitation from WY 2019 to WY 2023 compared to the cumulative and monthly historical average based over the most recent 30-year period between WY 1991 and WY 2020, as determined by MCWRA. This figure also identifies the water year types for each year in the evaluation period. SVBGSA adopts the methodology used by MCWRA for determining the water year type. MCWRA assigns a water year type of either dry, dry-normal, normal, wet-normal, or wet based on an indexing of annual mean flows at the USGS stream gage on the Arroyo Seco River near Soledad (USGS Gage 11152000) (MCWRA, 2005).

The evaluation period began with a wet year in WY 2019 and was followed by 3 consecutive dry years from WY 2020 to WY 2022. The evaluation period ended with WY 2023, which was a very wet year and had the highest precipitation, followed closely by WY 2019, as shown on Figure 2-1.

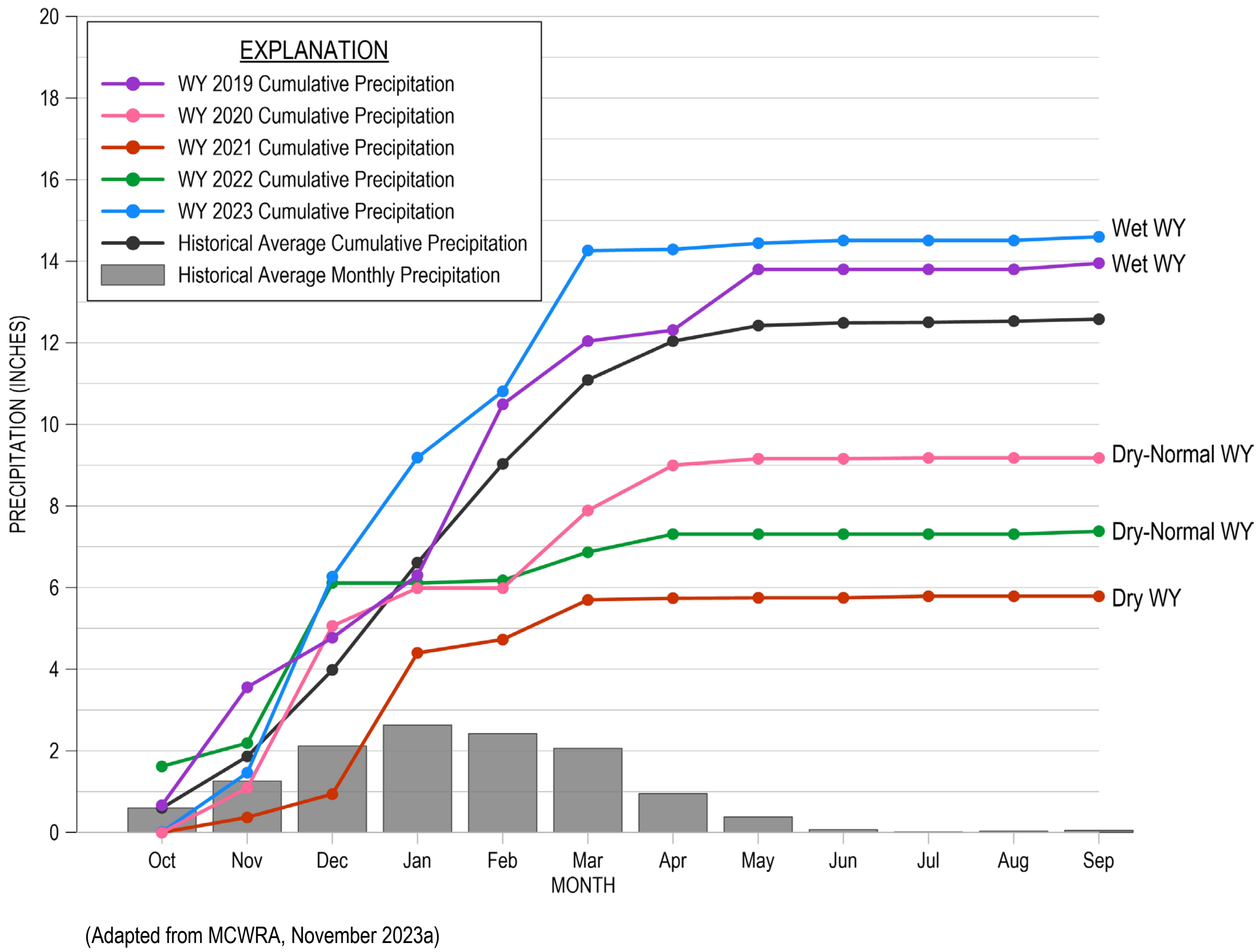

Figure 2-1. WY 2019 to WY 2023 and Historical Average Rainfall at Salinas Airport

2.1.1.2 Water Year Context for Water Use and Groundwater Management

Many factors affect groundwater use and management. In the Salinas Valley, MCWRA operates the Nacimiento and San Antonio Reservoirs for multiple purposes, including groundwater recharge, delivery of surface water to the Castroville Seawater Intrusion Project (CSIP) as an in-lieu irrigation supply in the seawater intruded area, and flood control. Reservoir operation, the amount of surface water diverted to CSIP at the Salinas River Diversion Facility (SRDF), and CSIP deliveries from the SRDF and recycled water provide meaningful context for water use and management in the Salinas Valley.

Flooding

The timing and magnitude of precipitation can lead to unique flooding events and impacts. The high precipitation volumes and timing of rainfall of the winter storms during WY 2023 led to flooding along the Salinas River. In Monterey County, the January and March 2023 storm events cumulatively impacted a total of 20,073 acres and created $600 million of damage to the agricultural industry (Monterey County Agricultural Commissioner, 2023).

Water Use and Management

Water use steadily increased over the evaluation period, with groundwater comprising the majority of the supply. Section 2.1.2 describes the water use and groundwater extraction in greater depth.

Several factors affect water use and management, in particular the following:

- **Precipitation and Temperature**: In general, the drier conditions of WY 2020 to WY 2022 led to increases in pumping. Precipitation in the winter of WY 2023 reduced the need for groundwater extraction during those months. In the neighboring Forebay Subbasin, interested parties noted that spring 2023 was colder than normal, which lowered irrigation water demand by decreasing evapotranspiration losses. Together, the wet year, cooler climate, and flooding contributed to pumping increasing later in the year than normal.
- **Flooding:** as a result of the winter storms in WY 2023, USGS stream gages at Bradley and Spreckels, the Salinas River reached Flood Stage in January and March, and reached Moderate Flood Stage once at Spreckels in March (National Weather Service, 2024a; 2024b). As a result, 20,073 acres could not be farmed until the flooding resided and soils dried out (Monterey County Agricultural Commissioner, 2023). This reduced groundwater extraction typically needed to irrigate those lands. This wet year followed the 3 dry years, which contributed to lower infiltration rates.
- **State urban mandates:** affect water use within drinking water systems subject to the following mandates (SWRCB, 2023):
    - **For urban water suppliers, end of statewide Level 2 demand reduction actions:** The requirement to implement demand-reduction actions that correspond to at least Level 2 of their water shortage contingency plans was in place until June 5, 2023.

- **For commercial, institutional, and HOA common areas, decorative grass watering remains banned:** The Emergency Regulation to Ban Decorative Grass Watering (non-functional turf irrigation) in commercial, industrial, and institutional areas is in effect; it expired in June 2024. In October 2023, the California State Legislature passed Assembly Bill 1572, which phases in a permanent ban on decorative grass watering in commercial, industrial, and institutional areas.
- **Emergency prohibition on wasteful water uses has expired:** The Emergency Regulation to Prohibit Wasteful Water Uses (like refilling fountains without recirculating pumps, overwatering landscapes, etc.) expired on December 21, 2023.

CSIP Operations

CSIP delivers a combination of recycled water, stored reservoir surface water, and groundwater as an irrigation supply to growers in part of the seawater intruded area. MCWRA operates Nacimiento and San Antonio Reservoirs in part to make summer conservation releases and divert surface water at the SRDF to CSIP. Recycled and surface water provided most of the water to CSIP during WY 2023, reducing groundwater pumping when compared to previous years. Figure 2-2 shows monthly CSIP water deliveries by water type January 2019 – September 2023. Since there was no surface water diverted in summer 2022, groundwater extraction made up a large portion of supply. In 2023, surface water and recycled water made up the majority of CSIP supply, with much lower groundwater extraction than in the prior year.

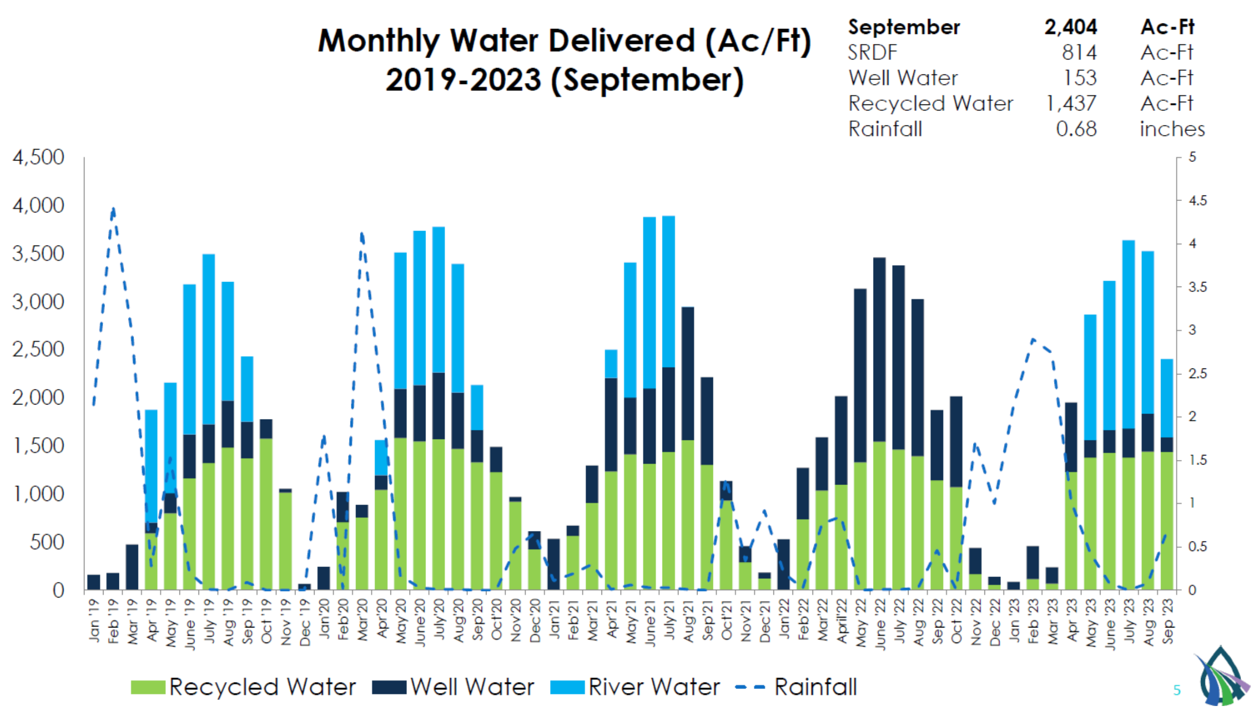

Figure 2-2 Monthly Water Delivered to CSIP 2019-2023 (M1W, 2024)

2.1.2 Reported Water Supply and Use over Evaluation Period

For WY 2019 to WY 2023, total average annual water use in the 180/400 Subbasin was 134,640 AF/yr, as summarized in Table 2-3. For these years, 91% of water use was for agriculture purposes, 9% for urban and industrial use, and a relatively small amount used by rural residential households, wetlands, and native vegetation. On average, 88% of the water supply came from groundwater. Surface water diverted at the SRDF for CSIP contributed 4% of the supply, and recycled water contributed 8% of the supply, most of which was for CSIP. Seasonally, water use is greatest during the summer months, as it is peak growing season, and higher temperatures and lack of precipitation necessitate greater applied irrigation water.

Salinas River watershed diversion data from the SWRCB's Electronic Water Rights Information Management System (eWRIMS) website is also used to account for surface water use in the Subbasin. Many growers and residents have noted that some irrigation is reported both to the SWRCB as Salinas River diversions and to the MCWRA as groundwater pumping. To avoid double counting, the SVBGSA's estimate of total surface water use limited to the SRDF river diversions and appropriative surface water diversions reported to eWRIMS. All other reported surface water uses are excluded from SVBGSA's surface water use estimates. It is possible that not all of the excluded surface water diversions are being reported to both SWRCB and MCWRA, in which case total water use may be 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. SVBGSA will continue to work with interested parties to refine the method used to resolve double counting.

Table 2-3 reports the annual average water use by water use sector and water type since WY 2018, and Figure 2-3 shows the total water use by year, broken down by sector and water type. SVBGSA is not aware of any changes in cropping patterns that affected water use. The lack of surface water diversions for CSIP in 2022 contributed to greater CSIP extraction than previous years to meet demand. Figure 2-4 illustrates the general location and volume of groundwater extractions in the Subbasin. Figure 2-5 includes the annual average water use by sector and aquifer for the WY 2019 to WY 2023 period.

Table 2-3. Average Annual Water Use by Water Use Sector and Source for WY 2018 to WY 2023

Water Use Sector	Groundwater Extraction (AF/yr)	Surface Water (AF/yr)	Recycled Water (AF/yr)	Source/Notes
Rural Domestic	200	0	0	Groundwater estimated by number of domestic dwelling units multiplied by 0.39 AF/yr per unit
Urban (including industrial)	11,940	0	0	Groundwater use reported through MCWRA's Groundwater Extraction Reporting Program, which includes wells with an internal discharge pipe diameter greater than 3 inches within Zones 2, 2A, and 2B. Surface water use is derived from CSIP and Statement of Diversion and Use. To avoid double counting with extraction, Statement of Diversion and Use surface water diversions are subtracted from the total water use. Recycled water use is derived from CSIP and California American Water.
Agricultural	105,820	5,880	10,800	
Managed Wetlands	0	0	0	Water use by managed wetlands is assumed to be *de minimis* and was not estimated
Managed Recharge	0	0	0	Water use by managed recharge is assumed to be *de minimis* and was not estimated
Natural Vegetation	Unknown	Unknown	Unknown	Water use by natural vegetation is assumed to be *de minimis* and not estimated
SUBTOTALS	117,960	5,880	10,800	
TOTAL	**134,640**			

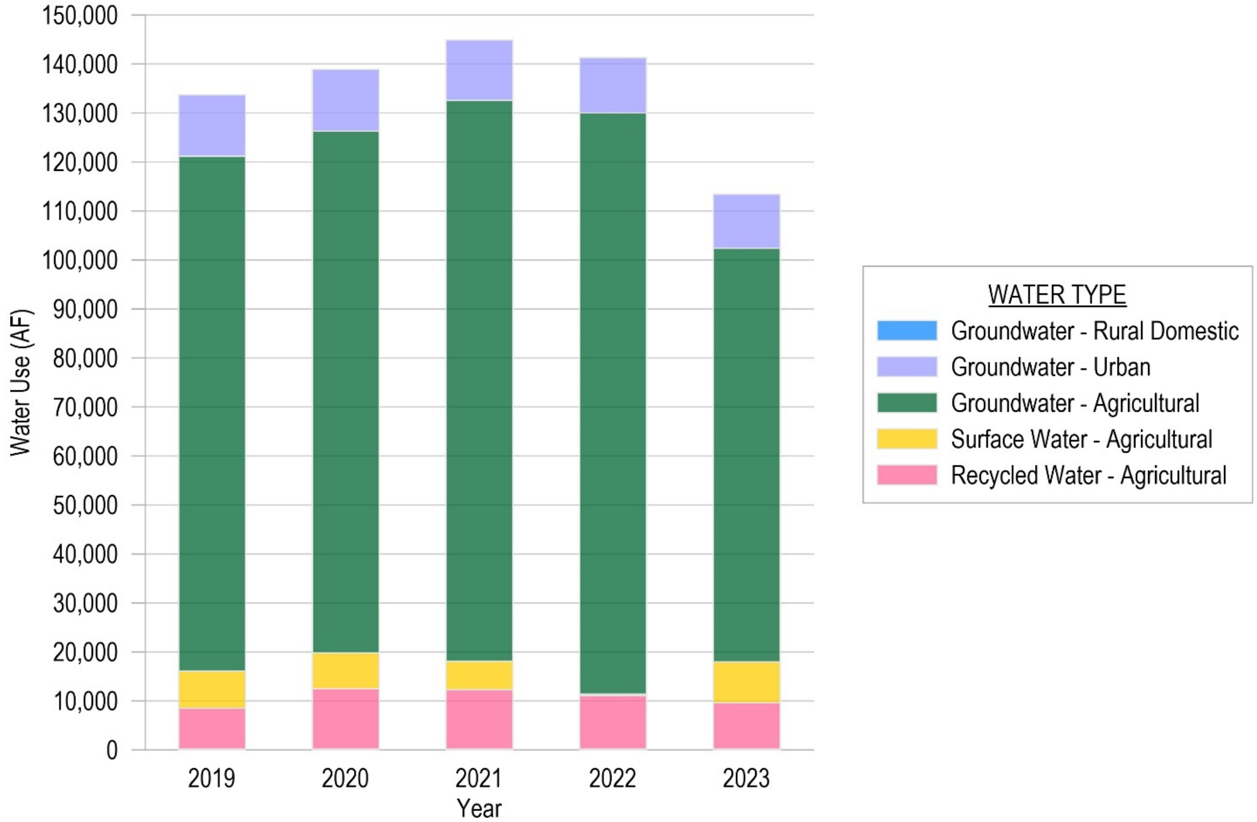

Figure 2-3. Total Water Use by Water Use Sector Since WY 2019

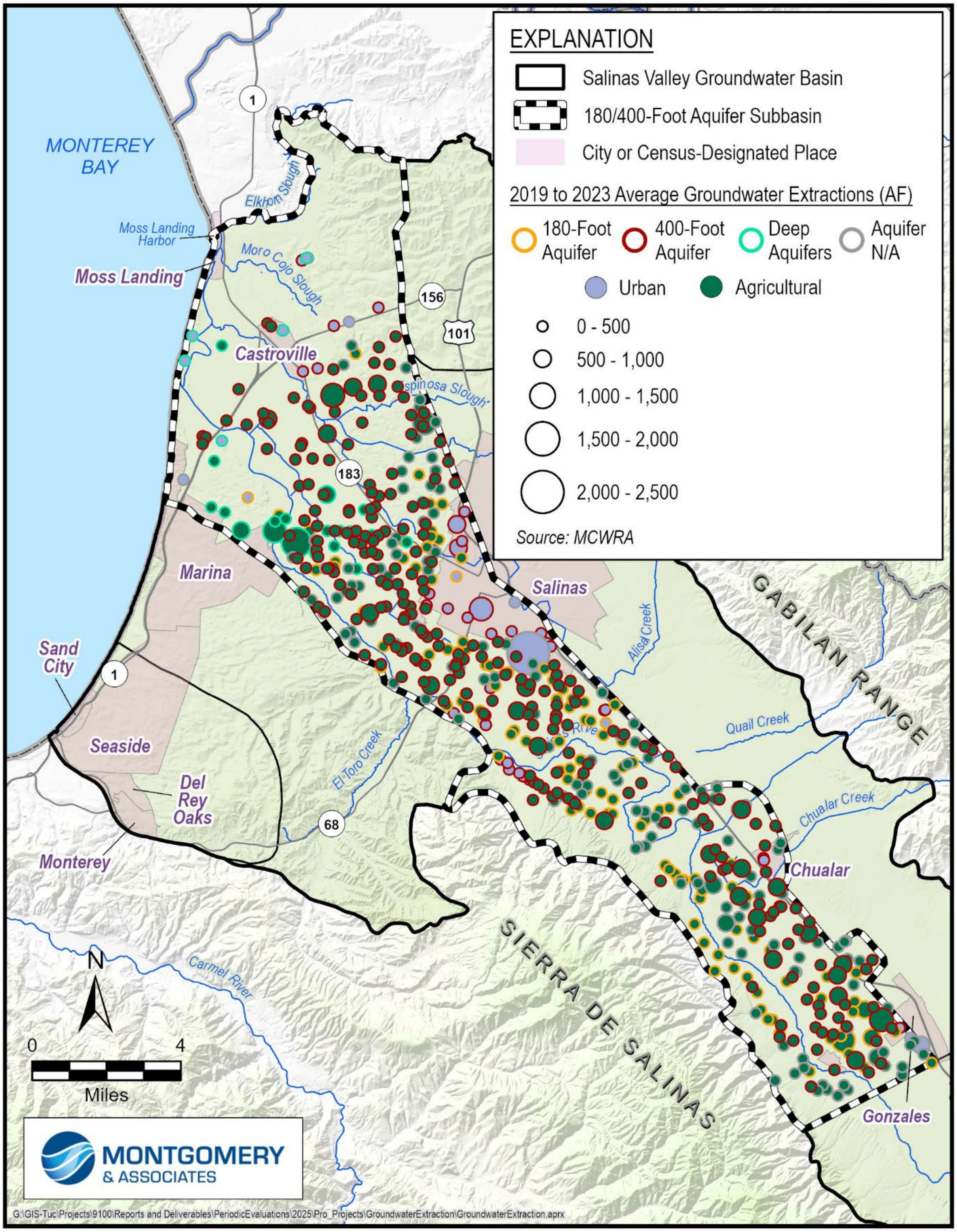

Figure 2-4. General Location and Volume of Groundwater Extractions for WY 2019 to WY 2023

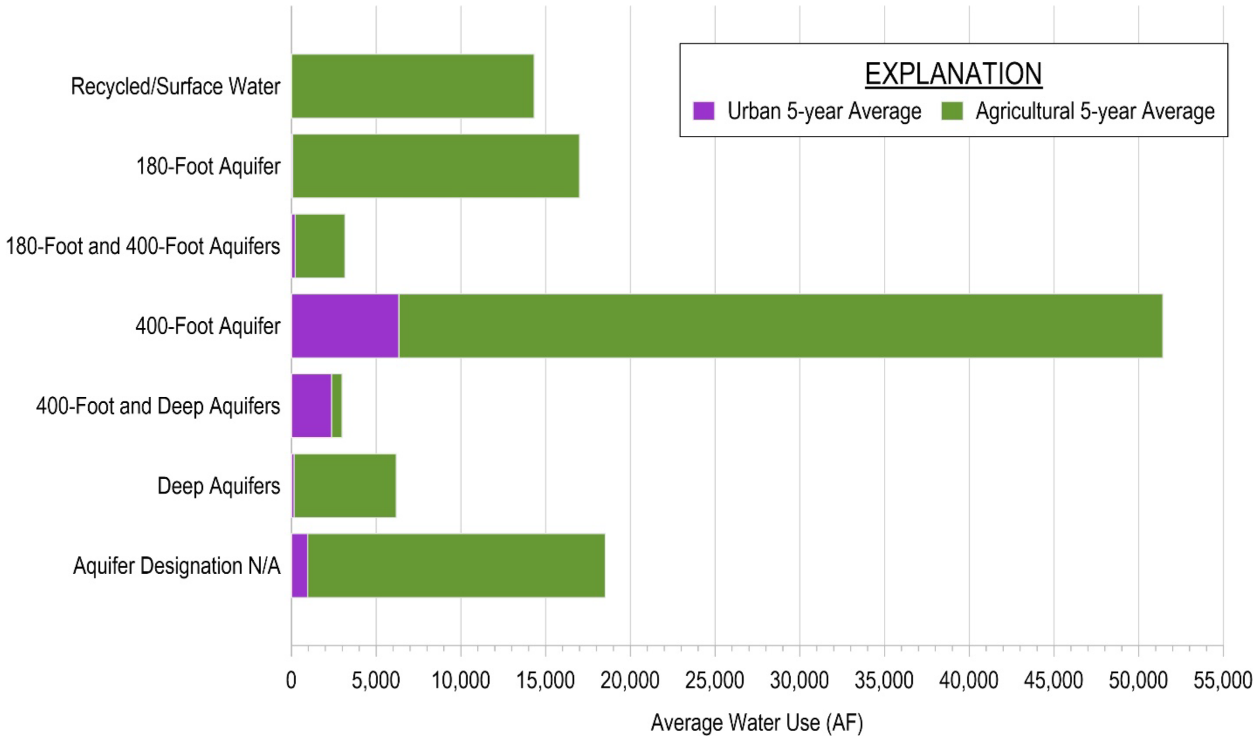

Figure 2-5. WY 2019 to WY 2023 Annual Average Water Use Sector, Type, and Aquifer

2.2 Chronic Lowering of Groundwater Levels

Although groundwater levels in the 180/400 Subbasin have been declining on average over the past few decades. Between 2019 and 2023, groundwater levels have been generally static or slightly risen due to 2023 being a very wet year; however, that is not necessarily indicative of long-term trends. Changes vary geographically throughout the Subbasin, by aquifer, and temporally. The greatest declines have been in the coastal area west of Salinas, along the Eastside Aquifer Subbasin boundary, and in the Deep Aquifers. The confined conditions in this area lead to less or slower recharge, and no evidence of surficial recharge of modern (post-1953) water has been found in the Deep Aquifers. Unconfined parts of the Subbasin have a greater ability to recharge, which exist mainly in the southern part of the Subbasin and northern part near the Elkhorn Slough. However, some wells in these areas still show groundwater level decline. In general, groundwater levels increase or decrease less during wet years; however, increases are not enough to offset groundwater level declines, leading to chronic lowering of groundwater levels. CSIP has significantly helped to offset extraction from private wells, but is still heavily dependent on groundwater, especially during years such as 2022 when there were no surface water diversions. These declines contribute to seawater intrusion and potentially dry wells and add risk of land subsidence due to declines in the clay-rich Deep Aquifers.

Per the GSP, locally defined significant and unreasonable groundwater elevations in the Subbasin are those that:

- *Are at or below the observed groundwater elevations in 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.*

The measurable objective for chronic lowering of groundwater levels is for groundwater levels to be at or above 2003 levels. The minimum threshold for chronic lowering of groundwater levels is for groundwater levels to remain above 2015 conditions to avoid significant and unreasonable conditions. The SMC are also designed to avoid impacts related to other sustainability indicators, such as seawater intrusion, depletion of interconnected surface water, and reduction of groundwater in storage. SMC for chronic lowering of groundwater levels are summarized in Table 2-4.

Table 2-4. Summary of Sustainable Management Critera for Chronic Lowering of Groundwater Levels

Sustainable Management Criteria	Description
Metric	Groundwater elevations measured at RMS wells
Minimum Threshold	Set to 1 foot above 2015 groundwater elevations
2025 Interim Milestone	Set to ¼ of the way between 2020 groundwater elevations and the Measurable Objective
Measurable Objective	Set to 2003 groundwater elevations
Undesirable Results	More than 15% of RMS wells exceed groundwater elevation minimum thresholds in any aquifer

Figure 2-6 shows the average annual and cumulative change in groundwater levels, with a box to highlight 2018 to 2023. This figure is based on Subbasin-wide average groundwater elevation changes. This figure includes groundwater extraction from 1995 to 2023, and the 1995 to 2016 average historical extraction. The orange line represents cumulative groundwater level change since 1944, and it is the equivalent of an average hydrograph for the Subbasin (i.e., zero is the amount of groundwater in storage in 1944, and each year the annual change in storage is added to produce the cumulative change in storage). The green line represents the annual average change in groundwater level from the previous year (i.e. the 1995 annual change in storage value is based on change in storage from 1994). The cumulative change is driven by the groundwater elevations changes that occur in the 180-Foot and 400-Foot Aquifers since most wells are in those aquifers but limited data for the Deep Aquifers is included. As more data becomes available for the Deep Aquifers, the plot will be refined accordingly.

By WY 2019, groundwater levels had rebounded partially from the 2015 drought. Groundwater elevations declined again during the 3 consecutive dry years from WY 2020 to WY 2022. Several winter storms in early 2023 led to above-normal recharge and reduced pumping, contributing to the highest rise in groundwater elevations during the evaluation period. However, the rise from the 2023 wet water year is not indicative that there has been a change in the long-term downward trend.

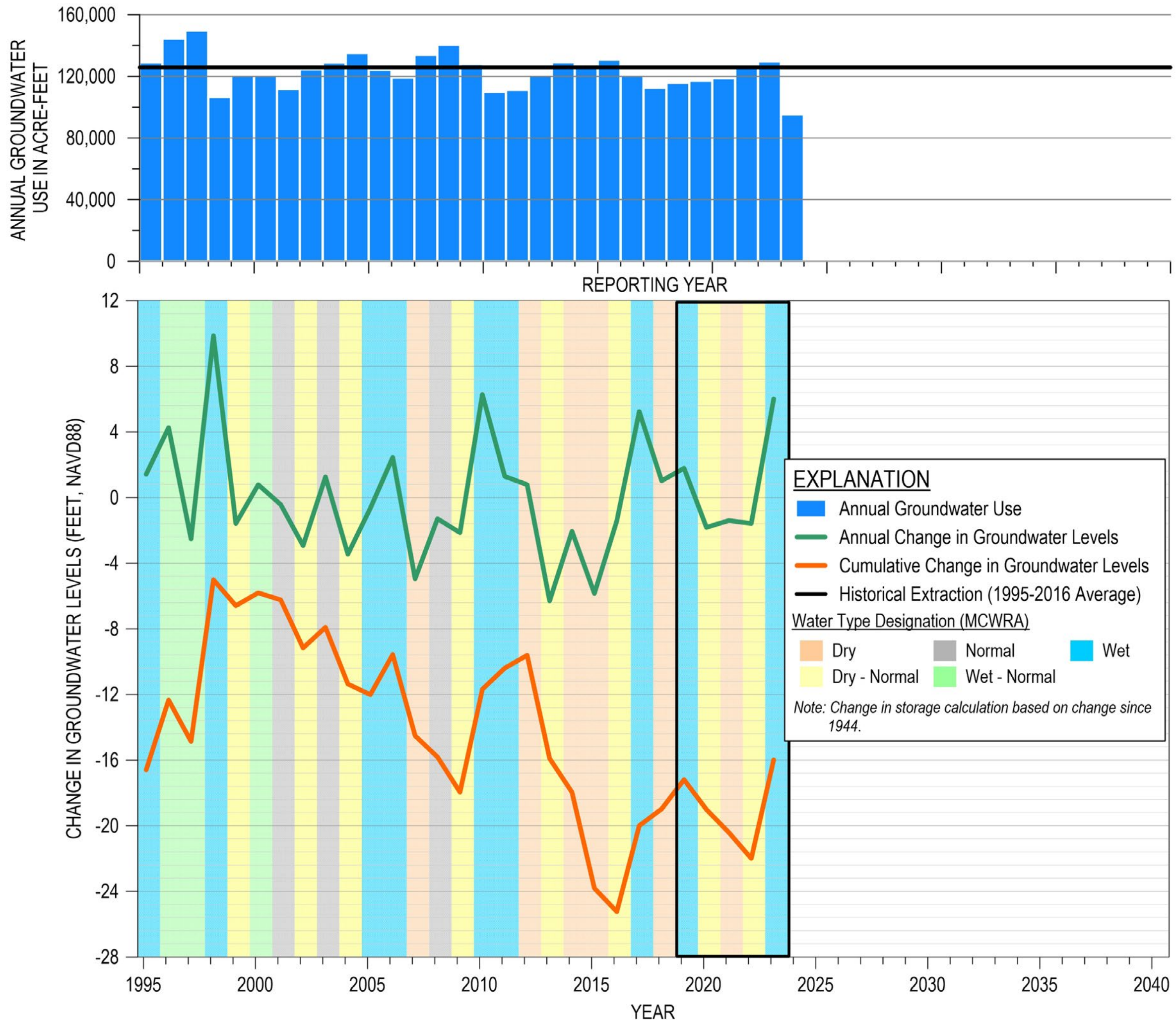

Figure 2-6. Cumulative Change in Groundwater Levels Since 1944

2.2.1 Groundwater Conditions Relative to SMC

Groundwater elevations respond to climate and extraction differently in each of the Subbasin's principal aquifers depending on depth, confinement, and distance from the coast. While precipitation readily recharges groundwater in unconfined portions of the 180-Foot Aquifer, coastal groundwater elevations confined by the Salinas Valley Aquitard and other shallow clays show a less clear response to annual changes in recharge from precipitation. In coastal confined aquifers, groundwater levels respond more directly to changes in groundwater extraction than precipitation. This is particularly true of the Deep Aquifers.

MCWRA measures fall groundwater elevations primarily in November and December. Groundwater elevations during this period represent stable aquifer conditions when annual groundwater demand is at its lowest and before groundwater elevations are influenced by winter recharge events. These fall measurements represent the seasonal high for SGMA reporting.

For this GSP 2025 Evaluation, the 2025 interim milestones are compared to: (1) the fall 2023 groundwater elevations, which represent the most recent data, and (2) where the 5-year 2019-2023 groundwater elevation trend line is plotted at 2023. Groundwater elevation trends, using both 20-years and the most recent 5-years of data, were analyzed for this GSP 2025 Evaluation. Hydrographs showing the minimum threshold, 2025 interim milestone, measurable objective, and linear regression trendline were developed for each Representative Monitoring Site (RMS) well; these hydrographs are included in Appendix 3A and an example is shown on Figure 2-7.

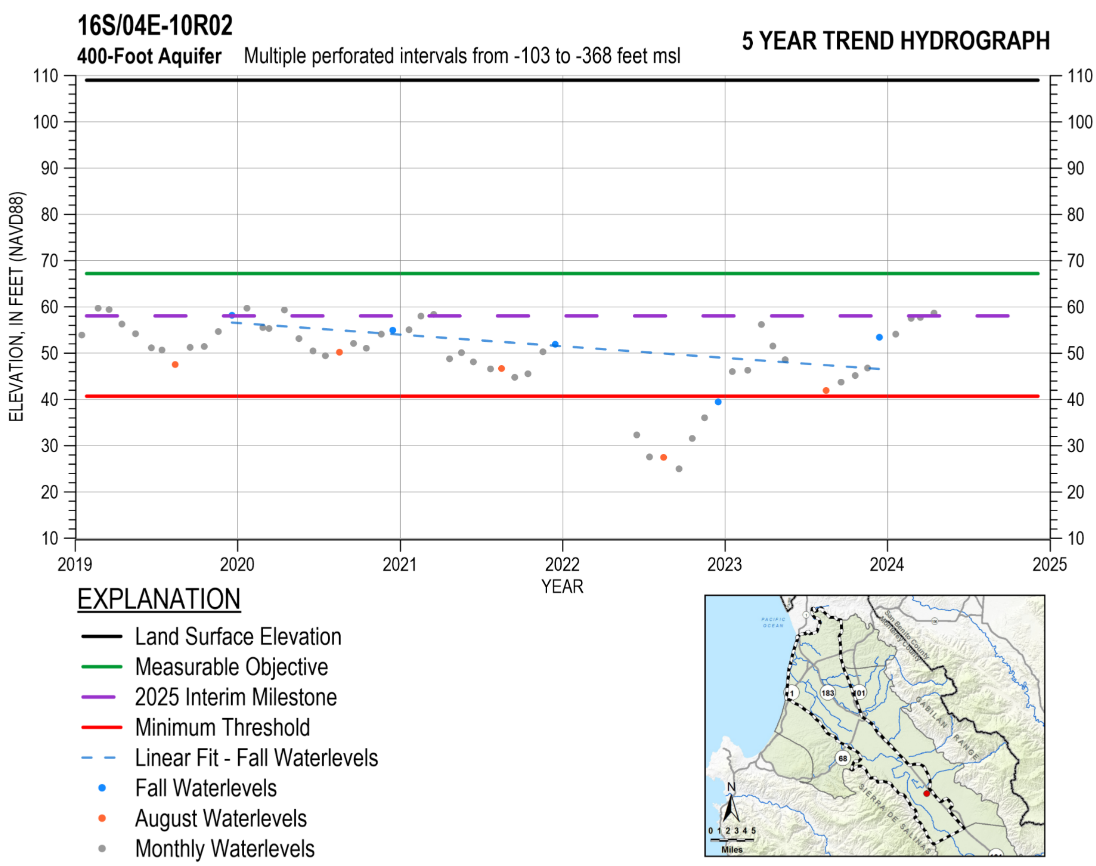

Figure 2-7. Example Groundwater Elevation Hydrograph and 5-year Trend Line

Rates of change in the 180-Foot and 400-Foot Aquifer wells were on average negative for the 20-year period and slightly positive for the 5-year period. The increasing 5-year trends in these aquifers are primarily due to high groundwater elevations in WY 2023, compared to the 4 prior years. The wet water year was not enough to result in an increasing 5-year trend in the Deep Aquifers. Similar to the other aquifers, the average 20-year trend in the Deep Aquifers is decreasing at a greater rate than the 5-year trend. During both periods, the Deep Aquifers had the greatest decline in groundwater elevations compared to the other principal aquifers.

Table 2-5 summarizes the number of RMS wells that are above the minimum threshold, 2025 interim milestone, and measurable objective as of fall 2023. This table also includes the groundwater elevation evaluated to the 5-year trendline compared to the SMC. About half as few RMS wells reached the 2025 interim milestone based on the 5-year trendline indicating that assessing groundwater elevations solely on the wet conditions observed in WY 2023 is not representative of groundwater elevations during the entire evaluation period. Furthermore, a third of RMS wells showed a very slight rising trend over the 5-year period but had a declining trend over the 20-year period, demonstrating the effect of the unusually wet conditions experienced in WY 2023. This suggests that the 5-year trends may not reflect average groundwater conditions in the Subbasin.

Table 2-5. Summary of Groundwater Level SMC as of WY 2023

Aquifer	Number of RMS Wells	Number of RMS Wells Sampled Fall 2023[1]	Number of RMS Meeting SMC					
			Based on Observed Measurements			Based on 5-year Trendline		
			Minimum Threshold (* indicates Undesirable Result)	Interim Milestone 2025	Measurable Objective	Minimum Threshold	Interim Milestone 2025	Measurable Objective
180-Foot Aquifer	35	34	32	21	9	30	13	3
400-Foot Aquifer	43	40	37	24	5	36	12	4
Deep Aquifers	21	17	5*	5	2	2	2	1
Total	**99**	**91**	**74**	**50**	**16**	**68**	**27**	**8**

[1] 1 180-Foot Aquifer well, 3 400-Foot Aquifer wells, and 4 Deep Aquifers wells did not have fall 2023 samples.

As shown in Table 2-6, in 2019, 2020, 2021, and 2023, there was an undesirable result only in the Deep Aquifers. In 2022, there were undesirable results in all 3 aquifers. Since an undesirable result in any aquifer constitutes an undesirable result for the Subbasin, there has been a Groundwater Levels SMC undesirable result for all 5 years.

Many of the RMS wells in the Deep Aquifers were completed during this evaluation period. Therefore, these wells do not have the 2003 or 2015 groundwater elevation measurements that were used to define the groundwater level SMC. Appendix 3B describes how SMC were developed for the new Deep Aquifers RMS wells.

Table 2-6. Annual Summary of Groundwater Level Undesirable Results

Aquifer	Less Than 15% of RMS Wells are Exceeding their Minimum Threshold			More Than 15% of RMS Wells are Exceeding their Minimum Threshold	
	Percent of RMS Wells Below MT				
	2019	2020	2021	2022	2023
180-Foot Aquifer	0	9%	9%	37%	6%
400-Foot Aquifer	11%	0	13%	34%	7%
Deep Aquifers	45%	100%	82%	78%	55%
Subbasin Groundwater Level Undesirable Result	**2019 Undesirable Result**	**2020 Undesirable Result**	**2021 Undesirable Result**	**2022 Undesirable Result**	**2023 Undesirable Result**

Figure 2-8 to Figure 2-10 show the WY 2019 to WY 2023 average annual change in fall groundwater elevations and fall 2023 groundwater elevations compared to SMC for each of the principal aquifers. In the 180-Foot Aquifer, 18 out of 35 RMS wells have an increasing trend, 21 wells met the interim milestone, and 2 wells exceeded their minimum thresholds. Wells that met the interim milestone are primarily in the southern part of the Subbasin that receives recharge more quickly due to the absence of the Salinas Valley Aquitard or other shallow clays. In the 400-Foot Aquifer, 23 out of 43 RMS wells had increasing 5-year trends, 24 wells met their interim milestones, and 3 wells had groundwater elevations lower than their minimum threshold in fall 2023. The greatest increasing trends occur in some of the wells along the boundary with the Eastside Subbasin, which could be due to the decrease in pumping in WY 2023. In the Deep Aquifers, 3 out of 17 RMS wells have an increasing 5-year trend, 5 wells had fall 2023 groundwater elevations higher than the interim milestone, and 12 wells exceed the minimum threshold. Out of the 17 Deep Aquifers RMS, 3 wells are not included in the 5-year trend analysis because they only have 2 fall groundwater elevation records. Data for this period in the Deep Aquifers are concentrated west of Salinas, in contrast to the overlying aquifers where RMS wells exist throughout the extent of the Subbasin. However, as described in Section 1.2.2, groundwater elevations are higher in the new Deep Aquifers monitoring well (180/400-DA-2) near Gonzales than in the coastal areas.

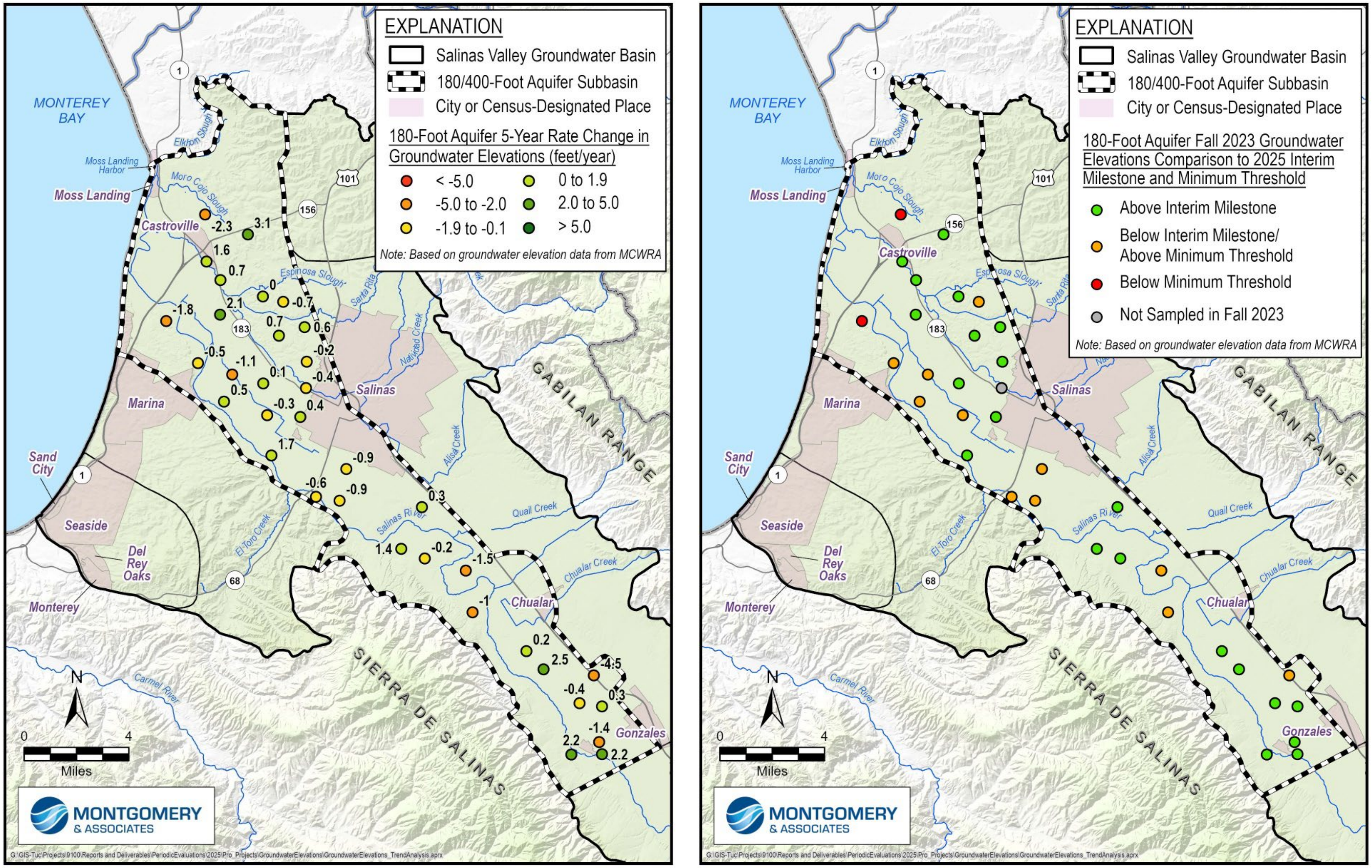

Figure 2-8. 180-Foot Aquifer Fall 2019 to 2023 Average Annual Change in Groundwater Elevations and Fall 2023 Groundwater Elevations Compared to SMC

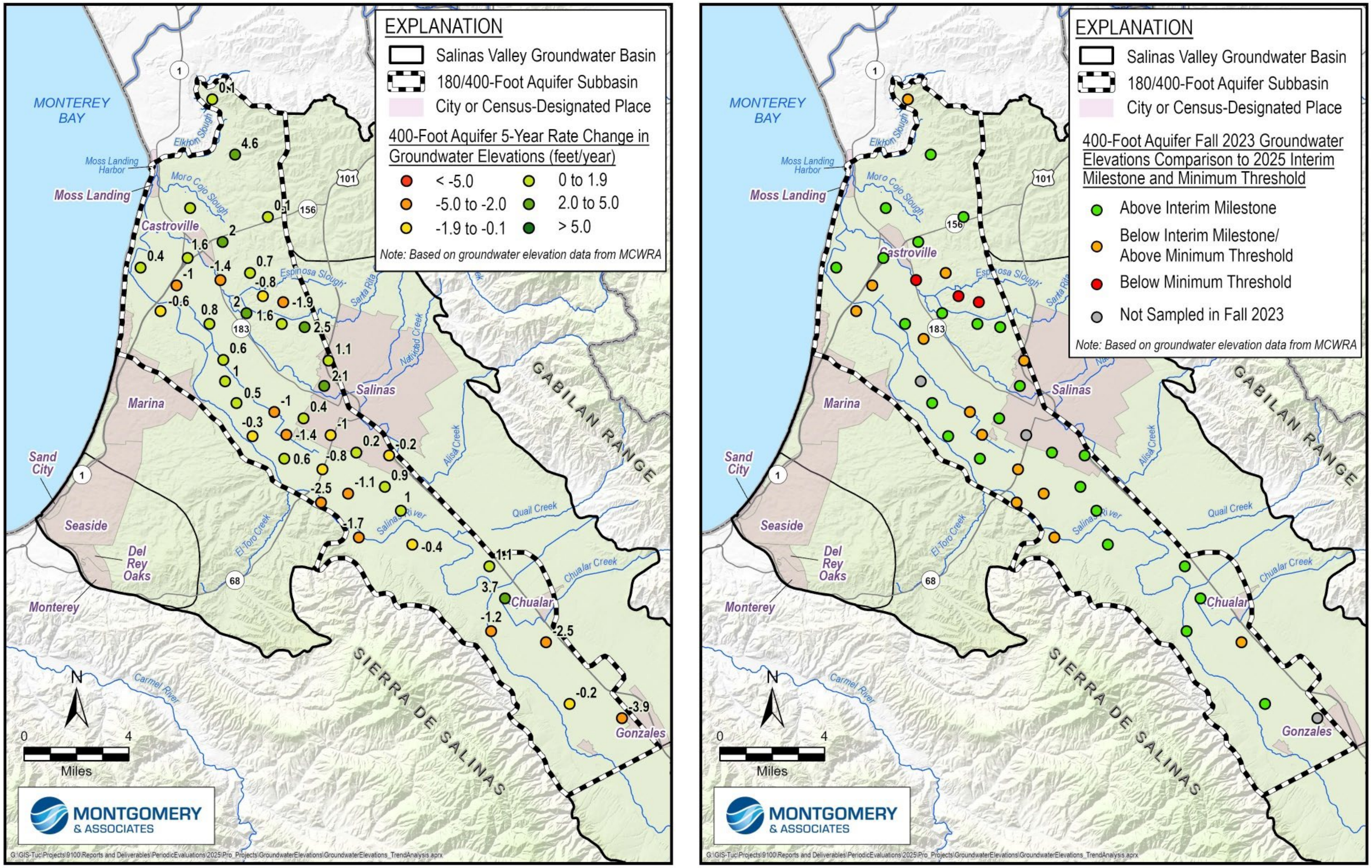

Figure 2-9. 400-Foot Aquifer Fall 2019 to 2023 Average Annual Change in Groundwater Elevations and Fall 2023 Groundwater Elevations Compared to SMC

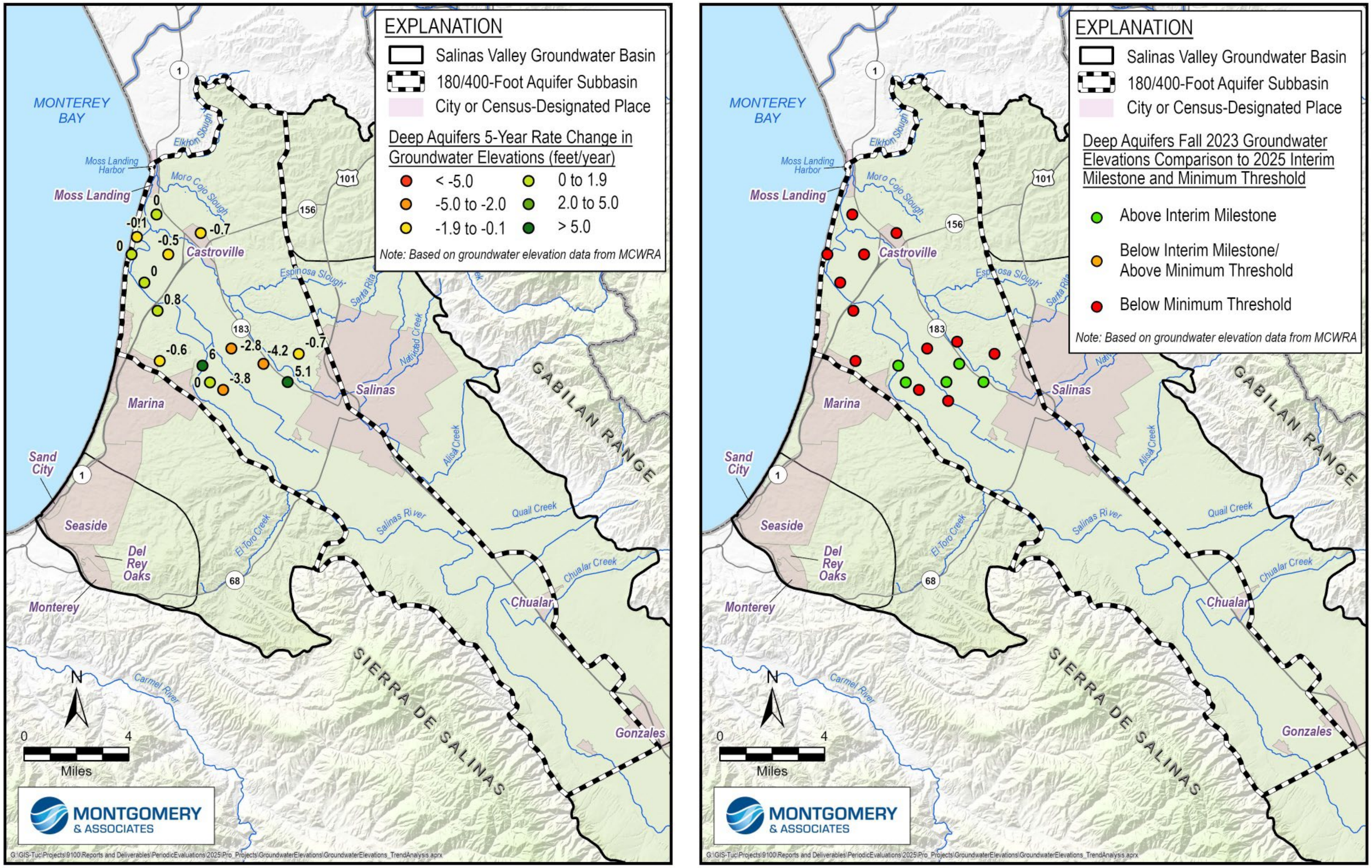

Figure 2-10. Deep Aquifers Fall 2019 to 2023 Average Annual Change in Groundwater Elevations and Fall 2023 Groundwater Elevations Compared to SMC

2.2.2 Deep Aquifers

As discussed in Section 1.2.2, three new groundwater elevation monitoring wells have recently been installed in the Deep Aquifers, filling most of the groundwater elevation data gaps. The new wells, along with other monitoring wells identified by SVBGSA, expanded the number of RMS wells in the Deep Aquifers from 11 to 17. Appendix 3B specifies the minimum thresholds, interim milestones, and measurable objectives for each of the new wells. In addition, since most wells have been installed in recent years and therefore do not have historical 2015 or 2003 groundwater elevation measurements, the attachment describes the process to estimate groundwater elevations in those years, which form the basis of the SMC.

Initial groundwater elevations were taken at the 3 new monitoring sites after installation. While 2 measurements are typically taken before reporting groundwater elevations so that the first can be a baseline, initial groundwater elevations are included in Section 1.2.2. SVBGSA will include them in the WY 2024 Annual Report.

With the expansion of the groundwater level monitoring network and installation of new wells, there are now sufficient wells to develop groundwater elevation contours in a greater area of the Deep Aquifers. While not a requirement of periodic evaluations, the fall 2023 contours are included in Appendix 3B. The contours will enable SVBGSA to estimate change in storage in the Deep Aquifers in the WY 2024 annual report.

2.2.3 Impact on Beneficial Users

Domestic well users are an important beneficial user that needs to be considered in order to address the human right to water. The DWR's Online System for Well Completion Reports (OSWCR) database is used to estimate the number of domestic wells in the 180/400 Subbasin. The OSWCR database includes tabulated well completion information for individual wells and well completion statistics (e.g., average well depth) summarized by Public Land Survey System (PLSS) sections. The average computed depth of domestic wells in the Subbasin is 320 feet using the PLSS data in the OSWCR database.

The 2020 GSP did not include an analysis of groundwater elevation's impact on domestic wells. GSP Amendment 1 includes a limited analysis that only used wells that were accurately located. Most wells in the OSWCR database are located in the centroid of the PLSS section meaning that less than 5% of domestic wells were used in the analysis included in GSP Amendment 1.

For this GSP 2025 Evaluation, the analysis was improved and includes more domestic wells. The OSWCR database contains 562 domestic well completion records within the Subbasin. Out of the 562 wells, 450 wells were determined to be installed in the principal aquifers and are used for this updated analysis. Groundwater elevations from contour maps are compared to the wells' completion information based on the domestic well locations. The average groundwater elevation of the PLSS section was used to compare to most domestic wells. The analysis included 97 domestic wells that were accurately located, and these wells were compared to more precise groundwater elevation estimates.

Fall groundwater elevations from 2019 to 2023 are compared to the range of domestic well depths in the Subbasin. Table 2-7 shows the percentage of wells where groundwater levels are at least 25 feet above the bottom of the well in fall 2019 to 2023 for the 3 principal aquifers. Well saturation of 25 feet was chosen to allow for some reasonable pumping drawdown. Results of this comparison indicated that groundwater levels at most domestic wells in each principal aquifer are at least 25 feet above the bottom of the wells from 2019 to 2023. With respect to the wells in the 400-Foot and Deep Aquifers, the domestic wells in the 180-Foot Aquifer were the most impacted by groundwater elevation changes during the evaluation period. On average, 76% of domestic wells in the 180-Foot Aquifer had at least 25 feet of water from 2019 to 2023. In the 400-Foot and Deep Aquifers, 91% and 100% of domestic wells had at least 25 feet of water, respectively. These are reasonable values, considering that many of the domestic wells in the OSWCR database may no longer exist, having been replaced by newer wells.

Table 2-7. Percent of Domestic Wells with at Least 25 Feet of Water from 2019 to 2023

Aquifer	Well Count	% Wells with at least 25 feet of water					
		2019	2020	2021	2022	2023	Average
180-Foot Aquifer	216	75%	75%	73%	75%	80%	76%
400-Foot Aquifer	231	91%	91%	91%	91%	91%	91%
Deep Aquifers	3	100%	100%	100%	100%	100%	100%

GDEs may also be affected by groundwater elevations. Baseline GDE data was collected in 2024. Any changes in conditions will be reported in future periodic evaluations.

2.2.4 Impact on Other Sustainability Indicators

Groundwater elevation minimum thresholds can influence other sustainability indicators. SVBGSA set groundwater level minimum thresholds to avoid undesirable results for the other sustainability indicators. However, it will take time to plan and implement projects and management actions that show groundwater elevation improvements. Therefore, even if groundwater levels during this evaluation period have affected other sustainability indicators, the Subbasin may still avoid undesirable results by 2040.

- **Reduction in groundwater storage.** The chronic lowering of groundwater levels minimum thresholds are used to calculate the groundwater storage minimum thresholds. Therefore, the significant rises in groundwater levels in 2023 have contributed to a slight increase in groundwater storage since 2019.

- **Seawater intrusion.** While the groundwater elevation minimum thresholds were set to not exacerbate seawater intrusion, and potentially help control it, groundwater elevations during the evaluation period declined during some years and seawater intrusion has continued to advance in both the 180- and 400-Foot Aquifers. Meeting groundwater level and seawater intrusion goals are anticipated to take several years; however, as noted in Chapter 4, SVBGSA and partner agencies have made progress toward determining how to reach sustainability.
- **Degraded water quality.** The chronic lowering of groundwater levels minimum thresholds were set to not exacerbate groundwater quality; however, the relationship between groundwater pumping, levels, and quality is complex. While SVBGSA has not implemented any actions that would have impacted groundwater conditions during the evaluation period, pumping that causes groundwater level declines could contribute to water quality degradation. SVBGSA plans to conduct a more thorough analysis of the relationship between groundwater pumping, levels, and quality in order to better understand this relationship, and ensure pumping and groundwater level declines do not cause groundwater quality degradation.
- **Land subsidence.** Inelastic land subsidence has not been observed to date. However, the Deep Aquifers Study identified a risk of land subsidence if groundwater elevations in the Deep Aquifers continue to drop below historical lows due to high prevalence of clays in the Deep Aquifers.
- **Depletion of ISW.** The chronic lowering of groundwater levels minimum thresholds are identical to the ISW minimum thresholds. Depletion of ISW was considered significant and unreasonable in WY 2022 when groundwater levels in the ISW well was below the minimum threshold.

2.2.5 Evaluation of SMC

SVBGSA set groundwater level minimum thresholds and measurable objectives to avoid significant and unreasonable conditions that occurred during the 2015 drought, namely dry wells, advancement of seawater intrusion, and negative impacts to GDEs. At this point, no new data on well depths or GDEs justify changing the minimum thresholds.

In the Deep Aquifers, groundwater levels during the evaluation period remained far below the 2003 groundwater elevations that define the measurable objectives. 2003 may be unrealistically high for the SGMA management horizon since there is no evidence of surficial recharge. The Deep Aquifers Study found that even when most agricultural Deep Aquifers pumping temporarily stopped after CSIP came online in 1998 and groundwater elevations rebounded, storage was significantly depleted based on early groundwater elevation measurements. This does not warrant a change in the measurable objective goal at this point; however, future analysis could consider the conditions that would be protective of the Deep Aquifers with respect to seawater intrusion and subsidence risk.

Projects and management actions would affect groundwater levels in different ways. For example, while aquifer storage and recovery (ASR) may raise groundwater levels inland to halt and push back seawater intrusion, the Brackish Groundwater Replenishment Project would include a seawater extraction barrier that would lower groundwater levels along the coast to form a hydraulic barrier against seawater intrusion in combination with pumping offsets from delivery of an in-lieu supply to both urban and agricultural end users. Given the differing approaches and difficulty in addressing seawater intrusion, SVBGSA and partner agencies may face trade-offs between meeting the sustainability goals of 1 sustainability indicator versus another, which may necessitate adjusting SMC once an approach is selected in order to best meet the needs of beneficial uses and users.

Currently, no new information indicates the SMC should be changed. SVBGSA will continue to monitor groundwater levels and will adjust the groundwater level SMC in future amendments if needed to manage the Subbasin according to all sustainability indicators.

2.3 Seawater Intrusion

Seawater intrusion has been documented in the Salinas Valley since 1944. To date, it has been observed in the 180-Foot and 400-Foot Aquifers. It has not been observed in the Deep Aquifers. Seawater intrusion is the primary reason why the Subbasin is classified as critically overdrafted. Therefore, addressing seawater intrusion is the main focus of the SVBGSA's sustainability planning for this Subbasin.

After surface water diversions at the SRDF began to supplement CSIP supplies in 2010, the area of land overlying the seawater intrusion front slowed, as measured by the 500 milligrams per liter (mg/L) chloride isocontour. During the 2015 drought, when there were no surface water diversions for 3 consecutive years so groundwater extraction as a source of supply for CSIP increased, there was a jump in seawater intrusion in the 400-Foot Aquifer. During this period, seawater vertically migrated from the 180-Foot to 400-Foot Aquifer in an inland area due to a combination of leaky wells and a thin or absent aquitard. MCWRA has since implemented a well destruction program and destroyed wells that are a conduit of vertical migration or could be.

Per GSP Amendment 1, locally defined significant and unreasonable seawater intrusion in the Subbasin is defined as follows:

- *Any additional seawater intrusion in the Subbasin since 2017 is significant and unreasonable.*

The SMC for seawater intrusion aims to push seawater intrusion back toward the coast, providing operational flexibility and prevent seawater intrusion from extending past its 2017 extent. The SMC are also designed to avoid impacts related to other sustainability indicators, such as reduction of groundwater in storage. SMC for seawater intrusion are summarized in Table 2-8.

Table 2-8. Summary of Sustainable Management Critera for Seawater Intrusion

Sustainable Management Criteria	Description
Metric	500 mg/L chloride isocontour maps developed by MCWRA
Minimum Threshold	2017 extent of 500 mg/L chloride isocontour for the 180- and 400-Foot Aquifers, and the line defined by Highway 1 for the Deep Aquifers
2025 Interim Milestone	Identical to 2017
Measurable Objective	Highway 1 for the 180-Foot, 400-Foot, and Deep Aquifers
Undesirable Results	Exceedance of the minimum threshold

2.3.1 Groundwater Conditions Relative to SMC

As defined by the 500 mg/L chloride isocontour, seawater advanced in both the 180-Foot and 400-Foot Aquifers from WY 2019 to WY 2023. In the 180-Foot Aquifer, advancement slowed and only occurred in some years. In the 400-Foot Aquifer, advancement continued in several areas along the front and connected several isolated "islands." No seawater intrusion has been detected in the Deep Aquifers.

In the 180-Foot Aquifer, seawater intrusion advanced in 2018, 2019, 2020, and 2023, as shown on Figure 2-11. Advancement was slow, and it was mainly concentrated on the southern plume intruding along the boundary of the 180/400 and Monterey Subbasins. Additionally, Figure 2-11 shows how the area overlying the seawater intruded area of the 180-Foot Aquifer has slowed since the SRDF began diverting surface water for CSIP. This figure also includes the 2023 250 mg/L chloride isocontour, which provides an early warning of intrusion, particularly for the City of Salinas where the 250 mg/L chloride isocontour is only 830 feet away.

In the 400-Foot Aquifer, seawater has spread at a faster rate in terms of land area than the 180-Foot Aquifer, connecting some of the "islands" that resulted from vertical migration, as shown on Figure 2-11. Figure 2-11 also includes a graph of the acreage impacted by seawater intrusion in the 400-Foot Aquifer and the 2023 250 mg/L chloride isocontour. Like the overlying 180-Foot Aquifer, the 250 mg/L chloride isocontour in the 400-Foot Aquifer is only 990 feet away from the City of Salinas. With the development of CSIP to deliver recycled and river water for irrigation, the advancement of the 500 mg/L chloride isocontour slowed in the 180-Foot Aquifer, but not the 400-Foot Aquifer.

The minimum threshold is a single isocontour that connects the inland leading edges of the 500 mg/L chloride isocontours, so that infill of seawater intrusion does not impact the minimum threshold; however, it does affect groundwater use in the area and actions to address seawater intrusion. An assessment focusing on the effect of increased groundwater extraction from 2021 to 2022 on seawater intrusion is included in Appendix 3C. The advancement of seawater intrusion is not solely dependent on groundwater use—there must be a pathway in the subsurface that enables its advancement. However, pumping in most wells along the main areas of additional intrusion increased from 2021 to 2022. Groundwater elevation data in these areas is limited compared to pumping data, but many wells experienced a decrease in August groundwater elevations since 2021.

In the Deep Aquifers, seawater intrusion has not been detected to date. The Deep Aquifers Study identifies seawater intrusion in the Deep Aquifers as a potential risk given that in most of the coastal area groundwater elevations in the Deep Aquifers are lower than the overlying 400-Foot Aquifer. However, MCWRA monitors 30 Deep Aquifers wells in the Subbasin for chloride and has not found evidence of seawater intrusion.

Table 2-9 summarizes the undesirable results by aquifer for WY 2019 to 2023. Since an undesirable result in any aquifer constitutes an undesirable result for the Subbasin, there has been a Seawater Intrusion SMC undesirable result for all 5 years.

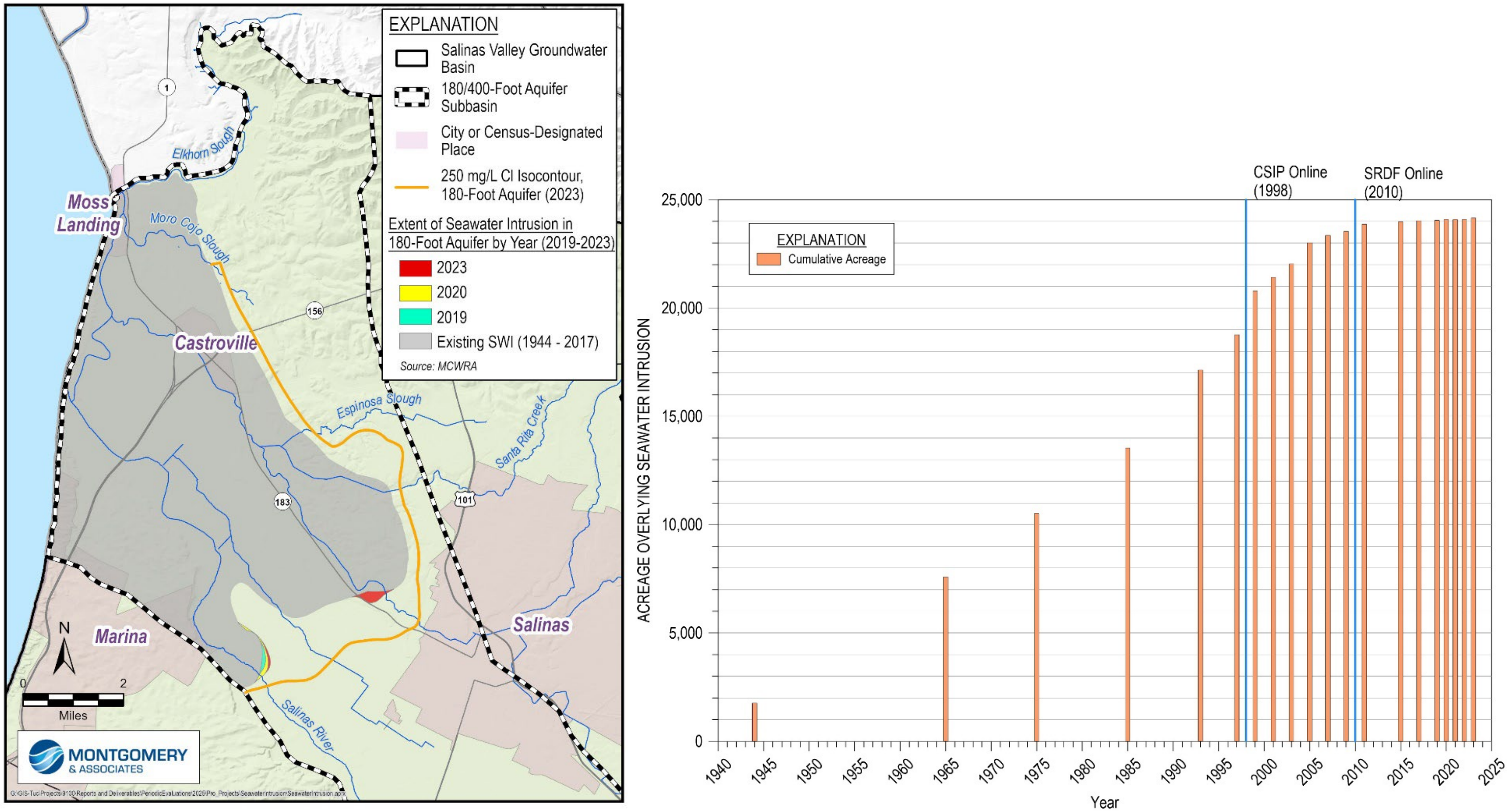

Figure 2-11. Seawater Intrusion Extent and Acres Overlying Seawater Intrusion in the 180-Foot Aquifer

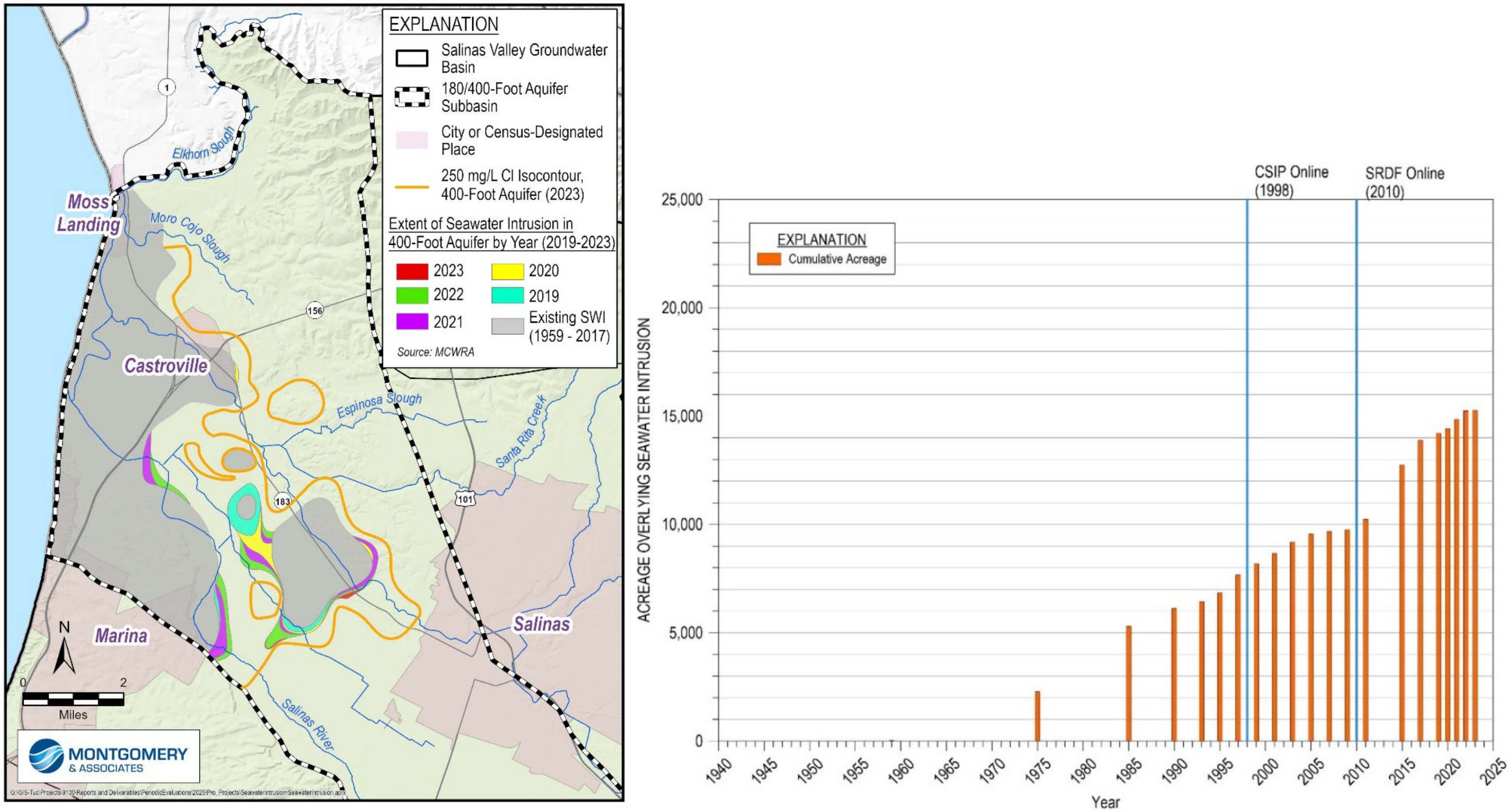

Figure 2-12. Seawater Intrusion Extent and Acres Overlying Seawater Intrusion in the 400-Foot Aquifer

Table 2-9. Annual Summary of Seawater Intrusion Undesirable Results

	2019	2020	2021	2022	2023
180-Foot Aquifer	Intrusion	Intrusion	No new intrusion but beyond 2017	No new intrusion but beyond 2017	Intrusion
400-Foot Aquifer	Intrusion	Intrusion	Intrusion	Intrusion	Intrusion
Deep Aquifers	No intrusion	No intrusion	No intrusion	No intrusion	No intrusion
Subbasin Groundwater Level Undesirable Result	2019 Undesirable Result	2020 Undesirable Result	2021 Undesirable Result	2022 Undesirable Result	2023 Undesirable Result

2.3.2 Impact on Beneficial Users

The seawater intruded area in the 180-Foot Aquifer increased in 2019, 2020, and 2023, as delineated by the 500 mg/L chloride isocontour. In the 400-Foot Aquifer, the seawater intruded area increased annually from 2019 to 2023. In 2021, a Castroville Community Services District well in the 400-Foot Aquifer was taken offline due to high chloride levels.

For wells without regular chloride sampling, the chloride isocontours are used as a best estimate of where chloride concentration in groundwater is above 500 mg/L, which is based on the MCWRA seawater intrusion monitoring network. During the evaluation period, seawater intrusion in the 180-Foot Aquifer expanded beneath 1 domestic well. The expansion of seawater intrusion in the 400-Foot Aquifer affected an area where 9 agricultural 400-Foot Aquifer wells and 2 agricultural wells in both the 180-Foot and 400-Foot Aquifers are located. Among the wells located within the newly intruded areas, 2 400-Foot Aquifer wells have been destroyed.

2.3.3 Impact on Other Sustainability Indicators

Seawater intrusion minimum thresholds can influence other sustainability indicators such as groundwater in storage. SVBGSA set seawater intrusion minimum thresholds so that seawater intrusion minimum thresholds will not cause undesirable results for the other sustainability indicators. However, it will take time to plan and implement projects and management actions that control and reduce seawater intrusion. Therefore, even if groundwater levels during this evaluation period have affected other sustainability indicators, the Subbasin may still avoid undesirable results by 2040.

- **Chronic lowering of groundwater levels.** Seawater intrusion is a result of low groundwater levels, not a cause. Therefore, the increases in seawater intrusion during the evaluation period did not have an effect on groundwater levels.
  - **Reduction in groundwater storage.** The seawater intrusion minimum thresholds are used to calculate the groundwater storage minimum thresholds. Therefore, as

compared to 2017, increases in seawater intrusion have contributed to a slight decrease in groundwater storage since 2019.

- **Degraded water quality.** Chloride is 1 of the groundwater quality constituents monitored for the groundwater quality SMC. No additional wells exceeded regulatory limits for groundwater quality in the areas of intrusion during the evaluation period. As actions are implemented to meet the seawater intrusion minimum threshold, it may have a beneficial impact on groundwater quality by preventing increases in chloride concentrations in supply wells.
- **Land subsidence.** Seawater intrusion has not impacted land subsidence because no inelastic land subsidence has been detected to date.
- **Depletion of ISW.** Seawater intrusion does not promote additional pumping, and therefore does not contribute to a significant or unreasonable depletion of ISW.

2.3.4 Evaluation of SMC

SVBGSA set seawater intrusion minimum thresholds to avoid additional seawater intrusion beyond 2017, which was the current extent when drafting the GSP. However, seawater intruded further even before GSP submittal. Based on interested parties feedback during the GSP development process, the measurable objective was set at Highway 1 to improve the Subbasin's groundwater quality and provide access to usable groundwater to additional beneficial users. The GSP stated this may need to be revised as the projects and actions to address seawater intrusion are refined.

Projects and management actions will address seawater intrusion to different extents. Differing approaches to addressing seawater intrusion may have different impacts on other sustainability indicators, namely groundwater levels and storage. As such, SVBGSA and partner agencies may face trade-offs between meeting the sustainability goals of 1 sustainability indicator versus another, which may necessitate adjusting SMC once an approach is selected in order to best meet the needs of beneficial uses and users.

At this point, no new information indicates the SMC should be changed. SVBGSA will continue to monitor seawater intrusion and will adjust the seawater intrusion SMC in future amendments if needed to manage the Subbasin according to all sustainability indicators.

2.4 Reduction of Groundwater in Storage

The Subbasin GSP adopted the concept of change in usable groundwater storage, defined as the annual average increase or decrease in groundwater that can be safely used for municipal, industrial, or agricultural purposes. On average over the past few decades, the 180/400 Subbasin has experienced declines in groundwater elevations, advancement of seawater intrusion, and loss of groundwater in storage. Average groundwater elevations rise after wet years like WY 2023, leading to an increase in groundwater in storage. This is expected during wet years but does not indicate a change in the overall downward trend.

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

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

2.4.1 GSP Amendment 1 Change to Reduction of Groundwater in Storage SMC

While the understanding of what constitutes significant and unreasonable conditions for the reduction of groundwater in storage remains similar to the 2020 GSP, the metric and SMC are updated in GSP Amendment 1. The 2020 GSP was an amount of pumping based on a modeled long-term sustainable yield. However, groundwater models are estimates and will be refined with new information, which makes it a difficult benchmark for the SMC. Furthermore, the sustainable yield as the groundwater elevations within the Subbasin and adjacent subbasins change. GSP Amendment 1 generally aligns the SMC with the approach in the 2022 Salinas Valley GSPs, which benchmark the reduction of groundwater in storage to observed groundwater levels. Since seawater intrusion is also present in the Subbasin, rather than as a direct proxy from the groundwater level SMC, the groundwater level and seawater intrusion minimum thresholds and measurable objectives are used to calculate changes in storage. Total change in groundwater storage between minimum threshold conditions and measurable objective conditions is the sum of the storage change due to groundwater elevations and the storage change due to seawater intrusion.

As defined in GSP Amendment 1, change in usable groundwater storage is the sum of change in storage due to groundwater elevation changes and the change in storage due to seawater intrusion. The measurable objective for reduction of groundwater in storage is the amount of groundwater in storage when groundwater levels are at 2003 levels and seawater intrusion is at Highway 1, providing operational flexibility above the minimum threshold to avoid significant and unreasonable conditions. The SMC for reduction of groundwater in storage are summarized in Table 2-10.

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.

Table 2-10. Summary of Sustainable Management Critera for Reduction of Groundwater in Storage

Sustainable Management Criteria	Description
Metric	Calculated change of groundwater in storage based on proxy measurements of groundwater levels and seawater intrusion
Minimum Threshold	626,000 AF below the measurable objective
2025 Interim Milestone	454,200 AF below the measurable objective
Measurable Objective	0 AF change from Groundwater Level and Seawater Intrusion measurable objectives
Undesirable Results	Exceedance of the minimum threshold

Groundwater in storage decreased from WY 2019 to WY 2022. Several winter storms in early 2023 led to higher-than-normal recharge and reduced pumping, contributing to an increase of groundwater in storage from WY 2022 to WY 2023. Ending with a wet water year resulted in an overall increase of groundwater in storage over the evaluation period; however, it does not change the long-term trend of declining groundwater in storage.

2.4.2 Groundwater Conditions Relative to SMC

Since the groundwater storage SMC is dependent on both groundwater elevations and seawater intrusion, a wet year will not necessarily lead to an increase in groundwater storage. For example, although WY 2019 was a wet year, there was an exceedance of the groundwater storage minimum threshold. This was mainly caused by the decrease in storage due to seawater intrusion. WY 2020 through WY 2022 were all dry years that experienced decreases in usable groundwater storage due to both decreasing groundwater elevations and advancement of seawater intrusion. In WY 2023, the groundwater in storage increased because of a large increase in groundwater elevations in the 180-Foot Aquifer during the wet year. Table 2-11 summarizes the undesirable results from WY 2019 to WY 2023. Out of the 5-year evaluation period, all years but WY 2023 had a Groundwater Storge SMC undesirable result. Groundwater in storage was 5,000 acre-feet (AF) above the minimum threshold in WY 2023.

Table 2-11. Annual Summary of Groundwater Storage Undesirable Results

	2019	2020	2021	2022	2023
Groundwater in storage needed to reach the Measurable Objective (acre-feet)	642,000	648,000	666,000	678,000	621,000
Subbasin Groundwater Level Undesirable Result	Undesirable Result	Undesirable Result	Undesirable Result	Undesirable Result	No Undesirable Result

2.4.3 Impact on Beneficial Users

The reduction in groundwater storage over the evaluation period has not had a direct impact on beneficial uses and users within the evaluation period.

2.4.4 Impact on Other Sustainability Indicators

Since the reduction of groundwater in storage SMC is calculated by proxy based on the groundwater level and seawater intrusion SMC, it has no further impact on other sustainability indicators beyond those SMC.

2.4.5 Evaluation of SMC

The reduction of groundwater in storage SMC were changed in GSP Amendment 1 to a subbasin-wide calculation based on the groundwater levels and seawater intrusion SMC. The GSP Amendment 1 also includes revisions to the aquifer-specific change in storage calculation required for Annual Reports. Because of variations in groundwater elevations, the subbasin-wide and aquifer specific storage change calculations use difference storage coefficients that may lead to discrepancies in the storage change totals that are included in Annual Reports. Additionally, the calculated storage change is inconsistent with the storage change from the SVIHM. In future GSP amendments, the storage coefficients used to calculate change in storage will be reviewed and revised as needed for consistency among all storage change estimates.

2.5 Degraded Groundwater Quality

Per the GSP, locally defined significant and unreasonable changes in groundwater quality in the Subbasin are increases in a constituent of concern (COC) caused by a direct result of a GSA groundwater management action that either:

- *Results in groundwater concentrations in a potable water supply well above an established MCL or SMCL, or*
- *Leads to significantly reduced crop production.*

Table 2-12. Summary of Sustainable Management Critera for Degradation of Water Quality

Sustainable Management Criteria	Description
Metric	Groundwater quality data from the groundwater ambient monitoring & assessment program (GAMA) groundwater information system supplemented with additional data from CCRWQCB
Minimum Threshold	No new exceedances past the existing number of wells that are above the regulatory standard for each COC
2025 Interim Milestone	Same as the minimum threshold
Measurable Objective	Same as the minimum threshold
Undesirable Results	Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction

2.5.1 GSP Amendment 1 Change to Degraded Groundwater Quality SMC

As noted in Section 1.1.5, to address DWR's review comment that GSAs are not just responsible for managing impacts of projects and management actions on groundwater quality, but also required to manage groundwater quality impacts from extraction, in GSP Amendment 1 SVBGSA revised the undesirable result to be:

> *Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.*

In addition, SVBGSA added text in the Amendment to further describe the regulatory context, coordination with other agencies, and the approach underlying the development of the SMC. Since the chronic lowering of groundwater levels SMC sets minimum thresholds above historical lows, additional constituents should not be mobilized. An analysis of the groundwater quality exceedances compared to groundwater levels or extraction is currently not possible given that the aquifer or screen interval is not designated in most irrigation supply wells, as noted in Section 2.5. However, there have been a notable number of water quality minimum threshold exceedances and SVBGSA is working with partner agencies to resolve these data challenges.

This revised undesirable result statement was included in SVBGSA 2022 GSPs. In its review of those GSPs, DWR included an RCA to revise the definition of undesirable results so that exceedances of minimum thresholds caused by groundwater extraction, whether the GSA has implemented pumping regulations or not, are considered in the assessment of undesirable results.

While DWR did not note this RCAs for the 180/400 Subbasin, SVBGSA plans to take a Valley-wide approach and make this adjustment to all GSPs in future GSP amendments.

2.5.2 Groundwater Conditions Relative to SMC

Groundwater quality is assessed in both drinking water and irrigation supply wells. Drinking water quality data is available for public water supply wells through the SWRCB's Division of Drinking Water (DDW) and on-farm domestic wells through the CCRWQCB's Irrigated Lands Regulatory Program (ILRP), all of which are considered RMS wells for groundwater quality. The ILRP dataset is also used to obtain water quality data for irrigation supply wells. The COCs for each well type are those outlined in GSP Amendment 1 (Table 2-13). The MCLs and SMCLs established by the State's Title 22 drinking water regulatory standards are used to evaluate water quality in public water system supply wells and on-farm domestic wells. Water quality in irrigation supply wells is compared to the COC levels that may lead to reduced crop production specified in the CCRWQCB (2019) Water Quality Control Plan for the Central Coast Basin.

Water quality data is mainly sourced from the State's Groundwater Ambient Monitoring and Assessment (GAMA) groundwater information system. However, through collaboration with the CCRWQCB and Central Coast Water Quality Preservation, Inc., after the submittal of the WY 2023 Annual Report it was determined that the GAMA groundwater information system is missing ILRP data. Therefore, in this GSP 2025 Evaluation and future reports produced by the SVBGSA, data downloaded from the GAMA groundwater information system will be supplemented with ILRP data directly from the CCRWQCB. In addition, the 2017 baseline that forms the basis for the minimum thresholds and measurable objectives were adjusted for ILRP wells based on the more complete dataset provided by the CCRWCB.

Table 2-13 lists the COC for each well type and summarizes the number of wells that exceed the regulatory standard for any given COC from the GSP baseline year, 2017, through the most recent year of data, 2023. The exceedance values for each year are based on the last sample collected for each RMS well. Table 2-13 does not include all Title 22 constituents for drinking water wells, and not all listed COCs were sampled during the 7-year period. For a given year, if a COC had no exceedance or was not sampled, the recorded value in the table is zero. The ILRP on-farm domestic wells exhibited the most variability in exceedances between 2017 and 2023, which is likely due to the recently available ILRP data from CCRWQCB. A comparison of the annual exceedances of each COC are included in Appendix 3D.

In 2023, 15 COCs exceeded their groundwater quality minimum thresholds. The last column in Table 2-13 includes the number of wells above the 2017 baseline that had higher concentrations than the regulatory standard. If a COC has more wells with concentrations above the regulatory standard than the minimum threshold, the row is highlighted in orange to indicate an exceedance. The negative numbers in the last column indicate a drop in the total number of wells with concentrations above the regulatory limit, and a zero indicates no change in exceedances compared to 2017 when the minimum threshold was established. The COCs with the highest minimum threshold exceedances were Nitrate + Nitrite (sum as nitrogen) and Specific Conductance in ILRP on-farm domestic wells.

Table 2-13. Water Quality Constituent of Concern Exceedances for 2017 and 2023

Constituent of Concern (COC)	Existing Exceedances of Regulatory Standard in 2017 (Minimum Threshold/Measurable Objective)	Exceedances of Regulatory Standard in 2023	Number of Wells in 2023 with Exceedances above 2017 (negative if fewer than 2017 exceedances)
DDW Wells			
1,2,3-Trichloropropane	0	2	2
Aluminum	1	0	-1
Arsenic	2	1	-1
Chloride	3	5	2
Chromium	1	0	-1
Chromium, Hexavalent (Cr6)	16	0	-16
Di(2-ethylhexyl) phthalate	2	2	0
Foaming Agents (MBAS)	7	8	1
Gross Alpha radioactivity	4	2	-2
Iron	8	11	3
Manganese	3	10	7
Methyl-tert-butyl ether (MTBE)	0	3	3
Nitrate (as nitrogen)	9	11	2
Selenium	1	0	-1
Specific Conductance	6	7	1
Sulfate	1	0	-1
Total Dissolved Solids	6	9	3
ILRP On-Farm Domestic Wells			
Chloride	17	14	-3
Iron	9	10	1
Manganese	3	3	0
Nitrate (as nitrogen)	64	68	4
Nitrate + Nitrite (sum as nitrogen)	12	50	38
Nitrite	2	2	0
Specific Conductance	59	92	33
Sulfate	4	4	0
Total Dissolved Solids	64	72	8
ILRP Irrigation Wells			
Chloride	26	28	2
Iron	2	2	0
Manganese	2	2	0

Table 2-14 summarizes the undesirable results from WY 2019 to WY 2023. There were minimum threshold exceedances of some COC in each year of the 5-year evaluation period. Since SVBGSA has yet to implement any projects or management actions in the Subbasin, these exceedances are not determined to be due to GSA action; however, an analysis should be done after the initial analyses to address the RCAs for the 2022 GSPs, as noted above. Therefore, at this time, the groundwater quality exceedances are not considered an undesirable result.

Groundwater quality minimum threshold exceedances, compared with the undesirable results, are included in Table 2-14 for each year of the evaluation period. If exceedances of the minimum threshold are determined to be due to a GSA groundwater management action or inaction, it would constitute an undesirable result.

SVBGSA is working to develop the baselines and a process through which exceedances will be reviewed. In the meantime, SVBGSA shares and discusses minimum threshold exceedances with the Water Quality Coordination Group.

Table 2-14. Annual Summary of Groundwater Quality Undesirable Results

	2019	2020	2021	2022	2023
Groundwater Quality Minimum Thresholds Exceeded	Exceeded for 12 Constituents	Exceeded for 14 Constituents	Exceeded for 14 Constituents	Exceeded for 15 Constituents	Exceeded for 15 Constituents
Subbasin Groundwater Quality Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result

2.5.3 Impact on Beneficial Users

The SMC were set to avoid financial costs to drinking water and agricultural water users. SVBGSA is not aware of any costs that have been incurred by beneficial uses and users from further water quality exceedances; however, Castroville Community Services District will have costs associated with replacing the well that has been taken offline due to seawater intrusion.

2.5.4 Impact on Other Sustainability Indicators

Degradation of groundwater quality does not affect other sustainability indicators.

2.5.5 Evaluation of SMC

In DWR's review of the 2022 Salinas Valley GSPs that had similar water quality SMC to GSP Amendment 1, DWR gave additional guidance through RCAs. These included the need to explain why the baseline year was not 2015 and recommendation to conduct necessary investigation or studies to understand the degree to which groundwater extraction affects groundwater quality. While these RCAs were not specified for the 180/400 Subbasin, SVBGSA plans to take a consistent approach across its subbasins. As described in Section 8, SVBGSA is working with partner agencies to resolve data challenges, which is needed to undertake this analysis in the 180/400 Subbasin. It plans to complete the analysis in 2025 for inclusion in the

GSP 2027 Evaluations. If any adjustments to the SMC are needed based on this analysis or changes to the water quality monitoring network, those will be included in a future amendment.

2.6 Land Subsidence

Land subsidence due to lowering of groundwater levels is not known to occur in the Subbasin. However, the presence of clay aquitards and interspersed clay lenses creates the conditions under which subsidence may occur.

Per GSP Amendment 1, locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

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

The minimum threshold and measurable objective for land subsidence is to continue to have no inelastic land subsidence in the Subbasin caused by lowering of groundwater elevations. The SMC are also designed to avoid impacts related to other sustainability indicators, such as seawater intrusion and reduction of groundwater in storage. SMC for land subsidence are summarized in Table 2-15.

Table 2-15. Summary of Sustainable Management Critera for Land Subsidence

Sustainable Management Criteria	Description
Metric	Measured using DWR provided Interferometric Synthetic-Aperture Radar (InSAR) data
Minimum Threshold	Zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors
2025 Interim Milestone	Same as the minimum threshold
Measurable Objective	Same as the minimum threshold
Undesirable Results	An exceedance of the minimum threshold due to lowered groundwater elevations

2.6.1 Groundwater Conditions Relative to SMC

Land subsidence is monitored annually through Interferometric Synthetic-Aperture Radar (InSAR) data. To avoid potentially aggregating measurement error, rather than summing the annual change over each of the evaluation period 5 years, the change from 2015 to 2024 was used to review cumulative land subsidence. Figure 2-13 shows land subsidence within versus outside of the minimum threshold of 0.1 foot per year change.

There are 3 points in the subbasin with maximum cumulative subsidence from June 2015 to October 2023 greater than 0.1 foot. Subsidence change over time and groundwater elevation change in all 3 aquifers are evaluated to assess the extent to which subsidence was inelastic, and therefore pertains to the SMC. Each of the 3 locations displays elastic response to groundwater level changes, as shown in Appendix 3E. Maximum cumulative subsidence was between 0.15 and 0.2 foot and was observed in fall 2022 when groundwater levels were at their lowest regionally following the 2020-2022 drought. Since fall 2022 the land surface has rebounded partially, as groundwater levels recovered following the wet winter and spring in 2023, indicating subsidence is predominantly elastic in all 3 locations. The March 2024 land surface at the 3 points is about 0.5 foot below the land surface in June 2015. Lowering land surface during droughts and rising land surface during wetter periods suggests that subsidence in the subbasin is primarily elastic, or recoverable, subsidence. The inelastic portion of subsidence is 0.05 foot or less.

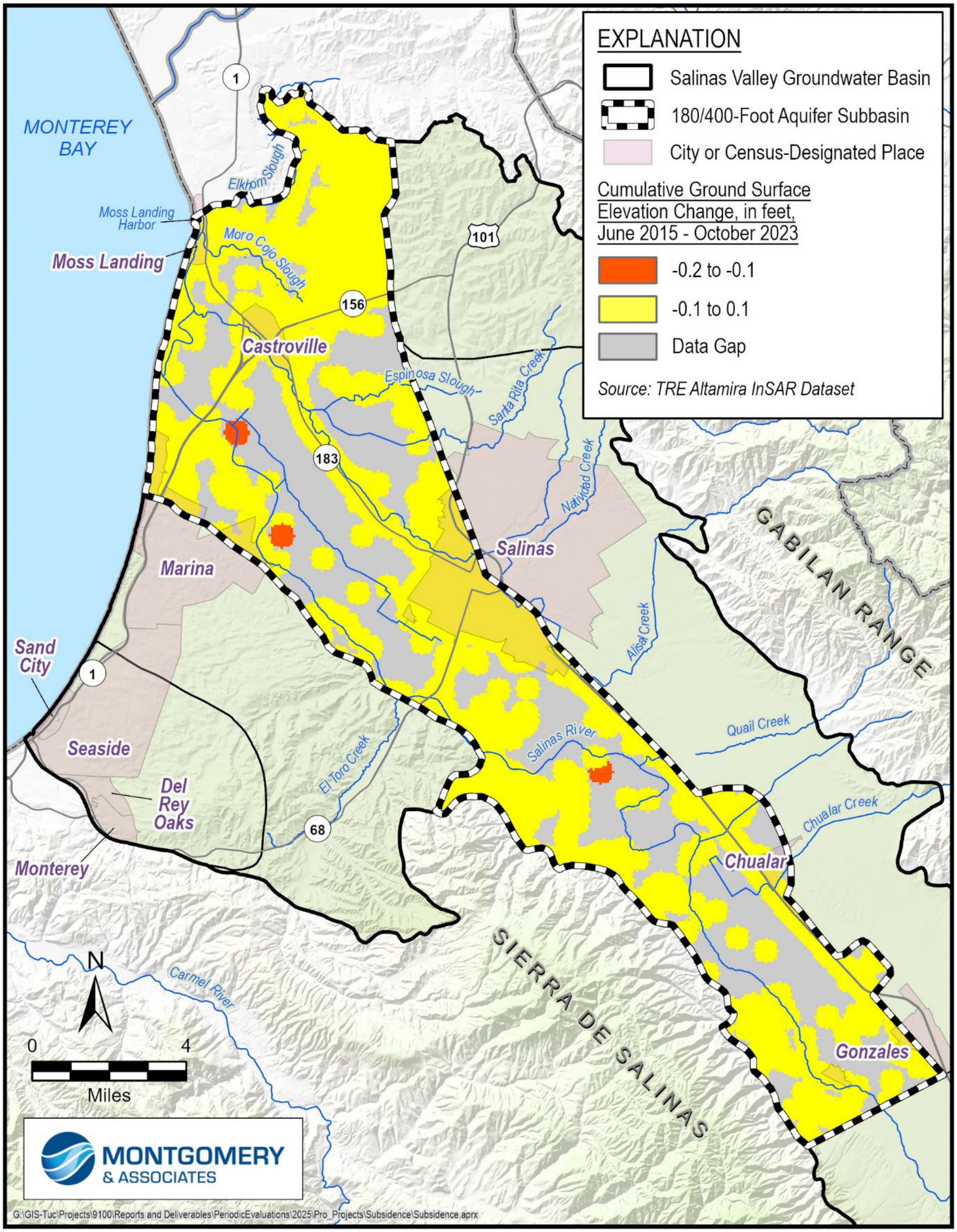

Figure 2-13. Land Subsidence from June 2015 to October 2023

Table 2-15 summarizes the undesirable results from WY 2019 to WY 2023. There were no minimum threshold exceedances in any year of the 5-year evaluation period; therefore, there were no Land Subsidence SMC undesirable results.

Table 2-16. Annual Summary of Land Subsidence Undesirable Results

	2019	2020	2021	2022	2023
Land Subsidence Outside of the Minimum Threshold	No	No	No	No	No
Subbasin Land Subsidence Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result

2.6.2 Impact on Beneficial Users

No impact on beneficial users or land use because no inelastic subsidence has occurred due to lowered groundwater elevations.

2.6.3 Relationship Other Sustainability Indicators

No inelastic land subsidence has been observed, and therefore there has been no impact of land subsidence on other sustainability indicators.

2.6.4 Evaluation of SMC

SVBGSA set land subsidence minimum thresholds and measurable objectives to avoid significant and unreasonable conditions associated with inelastic subsidence. At this point, no new information indicates the SMC should be changed. SVBGSA will continue to monitor subsidence and groundwater levels and will adjust the groundwater level SMC in future amendments if needed to manage the Subbasin according to all sustainability indicators.

2.7 Depletion of Interconnected Surface Water

SVBGSA's current understanding of surface water and groundwater interactions are informed by streamflow monitoring, groundwater level monitoring, and simulated surface water/ groundwater interactions using the SVIHM, an integrated surface water groundwater model. SVBGSA used the SVIHM to map locations of surface water and groundwater interconnection. It identified areas along the Salinas River where the Salinas Valley Aquitard is not present, and some smaller areas of potential interconnection in the northern part of the Subbasin, such as the Moro Cojo Slough.

Per GSP Amendment 1, locally defined significant and unreasonable depletion of ISW in the Subbasin is defined as:

- *Depletion 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.*
- *Depletion from groundwater extraction more than observed in 2015, as measured by shallow groundwater elevations near locations of ISW. While a documented determination of whether past depletions was significant is not available, staying above 2016 depletions was determined to be a reasonable balance for all the beneficial uses and users.*

2.7.1 GSP Amendment 1 Change to Depletion of ISW SMC

While the understanding of what constitutes significant and unreasonable conditions for depletion of ISW remains similar to the 2020 GSP, the metric and SMC for depletion of ISW are updated in GSP Amendment 1. The 2020 GSP based depletion on a modeled quantity; however, it is unrealistic that the SVIHM will be updated annually to make this determination. GSP Amendment 1 aligns with the approach of the 2022 Salinas Valley GSPs that monitors depletion of ISW by proxy through shallow groundwater levels near locations of interconnection.

The SMC for depletion of ISW aims for shallow groundwater levels at or above 2003 levels, providing operational flexibility to keep groundwater levels above 2015 conditions to avoid significant and unreasonable conditions. The SMC are also designed to avoid impacts related to other sustainability indicators. The updated SMC is summarized in Table 2-17.

Table 2-17. Summary of Sustainable Management Critera for Depletion of ISW

Sustainable Management Criteria	Description
Metric	Groundwater elevations measured at ISW RMS wells
Minimum Threshold	Established by proxy using shallow groundwater elevations 1 foot above those observed in 2015 near locations of ISW
2025 Interim Milestone	Set to ¼ of the way between 2020 groundwater elevations and the measurable objective
Measurable Objective	Established by proxy using shallow groundwater elevations observed in 2003 near locations of ISW
Undesirable Results	An exceedance of the minimum threshold

2.7.2 Groundwater Conditions Relative to SMC

During the evaluation period, the ISW monitoring network consisted of 1 well. A second well in the monitoring network was determined to be screened beneath the Salinas Valley Aquitard, which prevented accurate analysis of interconnection between surface water and groundwater in that location. This well was removed from the monitoring network. In 2023, SVBGSA installed an additional shallow monitoring well that will start reporting data in the WY 2024 Annual Report. In addition, new shallow monitoring wells recommended for GDE monitoring will be part of a GDE Program the SVBGSA Board will be considering in the future.

Figure 2-14 shows how the groundwater elevations in the existing ISW monitoring well declined from January 2019 to November 2022, falling below the minimum threshold in fall 2022. Groundwater elevations rebounded with the winter storms of late 2022 and early 2023. By the fall 2023 measurement, the groundwater level was between the 2025 interim milestone and measurable objective. The blue dashed trendline on Figure 2-14 shows a slight decline in the groundwater elevation over the evaluation period, with the trendline falling below the 2025 interim milestone and above the minimum threshold by fall 2023.

The figure also notes the monthly average streamflow at the nearest USGS gage #11152300 (Salinas River Near Chualar). It shows a correlation between the shallow groundwater elevation and streamflow. It shows that groundwater levels, and therefore depletion of surface water by proxy, was only less than in 2015 during 2022. In 2022, there were no summer conservation releases from the reservoirs, which led to little to no streamflow throughout the year. After the winter storms and high streamflow in early 2023, groundwater levels rebounded and ended the year above the 5-year interim milestone. Similar to the groundwater levels SMC, measurement in a wet year is not necessarily indicative of long-term trends. Similar to the analysis of groundwater elevations, Figure 2-14 shows the 5-year trend based on fall groundwater level measurements by the blue dashed line. The trendline crosses fall 2023 above the minimum threshold and below the interim milestone.

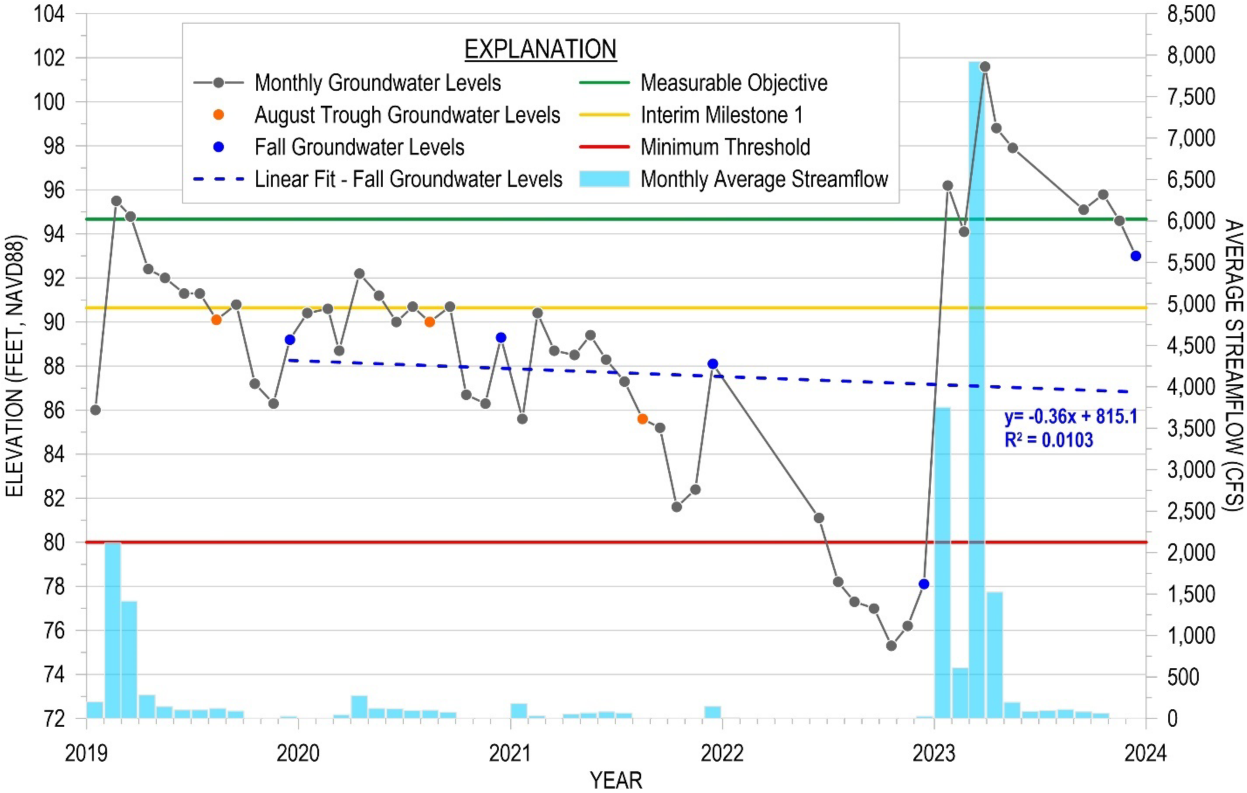

Figure 2-14. Shallow Groundwater Elevations Compared to SMC in Interconnected Surface Water RMS

Table 2-17 summarizes the undesirable results from WY 2019 to WY 2023. Even though the SMC approach was not revised until 2022, a summary of the undesirable results based on the revised SMC is included in the table. As also shown on Figure 2-14, there was only a minimum threshold exceedance and undesirable result in WY 2022.

Table 2-18. Annual Summary of ISW SMC Undesirable Results

	2019	2020	2021	2022	2023
Minimum Threshold Exceedances	0	0	0	1	0
Subbasin ISW Undesirable Result	No Undesirable Result	No Undesirable Result	No Undesirable Result	Undesirable Result	No Undesirable Result

For the 2022 GSPs, DWR issued an RCA related to ISW. While not received for the 180/400 Subbasin 2020 GSP, SVBGSA plans to include the 180/400 Subbasin in addressing the RCA to have consistency across the Subbasin. To address the RCA, SVBGSA will review the forthcoming DWR ISW Guidance and apply as appropriate.

2.7.3 Impact on Beneficial Users

There are currently no data that determine what level of depletion from groundwater extraction has a significant adverse effect on steelhead trout or other beneficial use or user. 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. Monitoring is needed to evaluate the impact of depletion of ISW on GDEs. SVBGSA is in the process of developing GDE monitoring protocols.

The SVBGSA is not aware of any current water rights litigation or water rights enforcement complaints by any riparian water rights holders in the Subbasin. Therefore, SVBGSA assumes that the current level of depletion has not injured any riparian water rights holders in the Subbasin.

MCWRA rediverts water stored in the reservoirs at the SRDF; however, reservoir releases are intended for both groundwater recharge and diversion at the SRDF, so recharge of surface water to the aquifers is not considered surface water depletion.

2.7.4 Impact on Other Sustainability Indicators

Depletion of ISW can be affected by reservoir releases, groundwater levels, pumping, and other factors. MCWRA manages reservoir releases to increase groundwater recharge, among other objectives. The 2022 undesirable result for depletion of ISW may have had an impact on beneficial users; however, depletion of ISW does not have impact on other sustainability indicators. Depletion of ISW is measured by proxy using groundwater elevations, and the SMC are set at the same levels as the groundwater level SMC. Therefore, depletion of ISW has not impacted groundwater levels. Similarly, since reduction of groundwater in storage is based in part on observed groundwater levels, depletion of ISW has not impacted groundwater storage. Depletion of ISW does not directly affect seawater intrusion, degraded groundwater quality, or land subsidence.

2.7.5 Evaluation of SMC

SVBGSA set ISW minimum thresholds and measurable objectives to avoid significant and unreasonable conditions that occurred during the 2015 drought. At this point, no new information indicates the SMC should be changed. SVBGSA will continue to monitor shallow groundwater levels and will adjust the groundwater level SMC in future amendments if needed to manage the Subbasin according to all sustainability indicators. In addition, SVBGSA will review the ISW guidance when released by DWR and apply as appropriate in the Subbasin.