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CORNING SUB-BASIN (5-021.51) GROUNDWATER SUSTAINABILITY PLAN ANNUAL REPORT – 2023

SUBMITTED BY

TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT GROUNDWATER SUSTAINABILITY AGENCY

CORNING SUB-BASIN GROUNDWATER SUSTAINABILITY AGENCY

PREPARED BY

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
AEM	Airborne electromagnetic
AF	acre-feet
AFY	acre-feet per year
AMSL	above mean sea level
Tehama County GSA	Tehama County Flood Control and Water Conservation District Groundwater Sustainability Agency
CSGSA	Corning Sub-Basin Groundwater Sustainability Agency
DWR	Department of Water Resources
DMS	Data Management System
eWRIMS	Electronic Water Rights Information Management System
GSP	Groundwater Sustainability Plan
GSA	Groundwater Sustainability Agency
InSAR	Interferometric Synthetic Aperture Radar
MO	Measurable Objective
MT	Minimum Threshold
PMA	projects and management action
RMP	representative monitoring point
RMSE	root-mean-squared error
SI	sustainability indicator
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criteria
Subbasin	Corning Subbasin
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
UR	undesirable result
UWMP	Urban Water Management Plan
WY	Water Year

EXECUTIVE SUMMARY

The Corning Subbasin (Subbasin) (5-021.51) Annual Report was prepared on behalf of the Corning Sub-Basin Groundwater Sustainability Agency (CSGSA) and the Tehama County Flood Control and Water Conservation District GSA (Tehama County GSA) to fulfill the statutory requirements set by the Sustainable Groundwater Management Act (SGMA) legislation (§10728) and the Groundwater Sustainability Plan (GSP) regulations (§354.40 and §356.2) developed by the California Department of Water Resources (DWR). The regulations mandate the submission of an Annual Report to DWR by April 1st after the reporting year, which spans the water year (WY) from October 1st to September 30th. This Annual Report includes information from the recent WY 2023 for the Corning Subbasin, located within part of Tehama and Glenn Counties and shown in **Figure ES-1.**

Measured conditions in the Subbasin are in compliance with Minimum Thresholds (MTs) for all applicable sustainability indicators (SIs), with two exceptions, wells (23N03W13C004M and 23N03W22Q001M); when water levels were below the MTs for Fall 2023. An MT is a quantitative value that represents the groundwater conditions measured at a representative monitoring point (RMP) that, when exceeded individually or in combination with MTs at other monitoring sites, may cause an undesirable result(s) (UR) in the Subbasin per DWR's definition. If groundwater levels are lower than the value of the Measurable Objectives (MO) for that site, they are moving in the direction of the MT. On the contrary, for the groundwater quality Sustainable Management Criteria (SMC), as the value of the Total Dissolved Solids (TDS) concentrations increase from the MO established for that site, they are moving in the direction of the MT. The SIs and SMC, including MTs, are summarized in **Table ES-1.** Note that seawater intrusion is not an applicable SI in this Subbasin. Each SI is measured at an RMP.

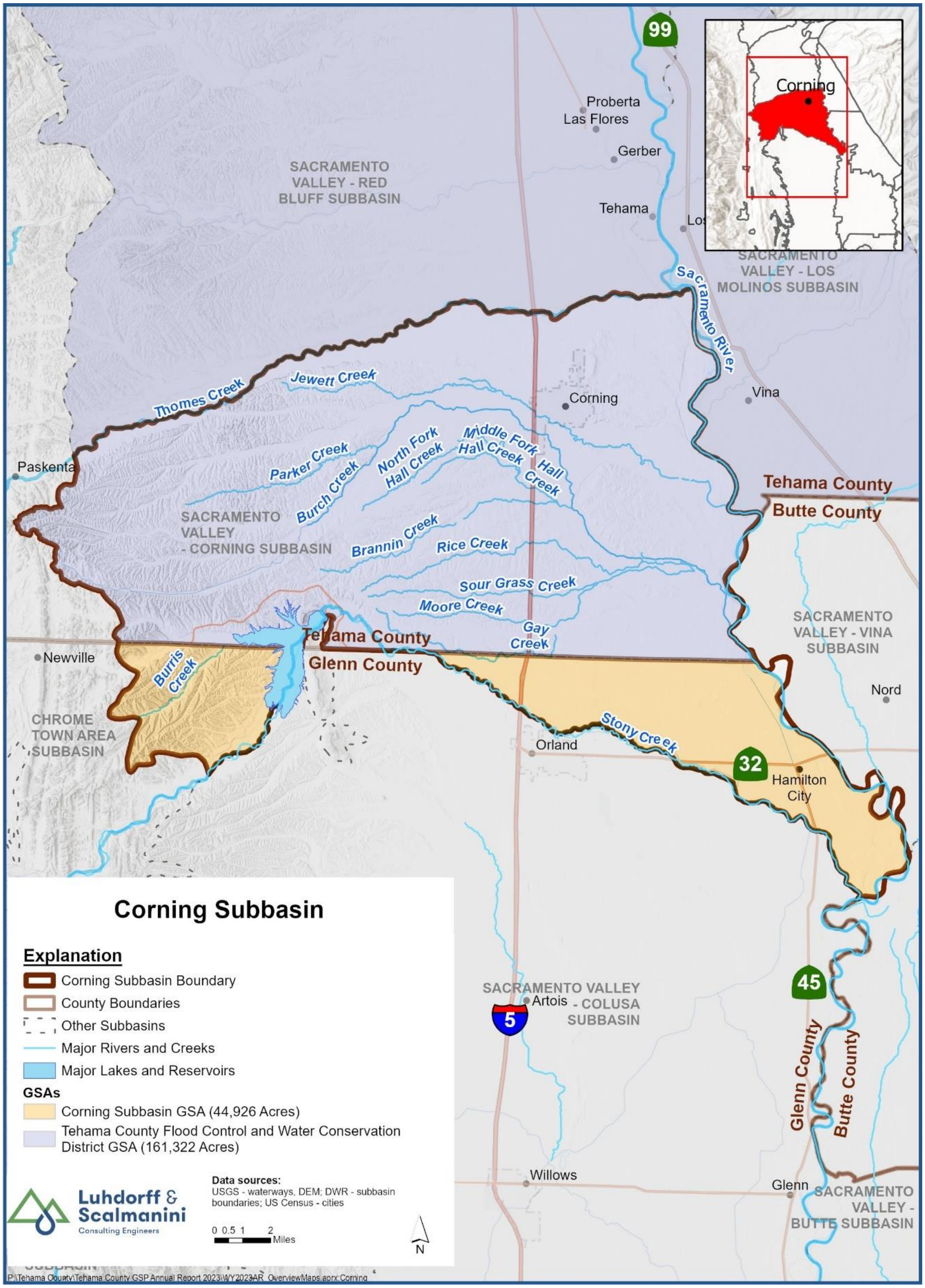

Figure ES-1. Corning Subbasin and Groundwater Sustainability Agency Boundaries

Table ES-1. Sustainability Indicator Summary			
2023 Status	**Undesirable Result Identification**	**MO Definition**	**MT Definition**
Chronic Lowering of Groundwater Levels			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	20% of groundwater elevations measured at RMP wells dropped below the associated MT during two consecutive years. If the water year type is dry or critically dry, then levels below the MT are not undesirable if groundwater management allows for recovery in average or wetter years.	**Stable Wells:** Maximum fall groundwater elevations since 2012 **Declining Wells:** Maximum fall groundwater elevations since 2015	**Stable Wells:** Minimum fall groundwater elevation since 2012 minus 20-foot buffer. **Declining Wells:** Minimum fall groundwater elevation since 2012 minus 20% of minimum groundwater level depth.
Reduction of Groundwater Storage			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	Same as the chronic lowering of groundwater levels	Amount of groundwater in storage when groundwater elevations are at their MO – since groundwater levels are used as a proxy, same as chronic lowering of groundwater level MOs.	Amount of groundwater in storage when groundwater elevations are at their MT– since groundwater levels are used as a proxy, same as chronic lowering of groundwater levels MTs.
Degraded Water Quality			
No indication of undesirable results There were no RMP with TDS levels above their MTs.	At least 25% of RMPs exceed the MT for water quality for two consecutive years at each well, where it can be established that GSP implementation is the cause of the exceedance.	California lower limit SMCL concentration for TDS of 500 mg/L measured at public supply wells.	TDS concentration of 750 mg/L at public supply wells.

Table ES-1. Sustainability Indicator Summary			
2023 Status	**Undesirable Result Identification**	**MO Definition**	**MT Definition**
Land Subsidence			
No indication of undesirable results No InSAR pixel exceeded MT in WY 2023.	Any exceedance of an MT that is irreversible and caused by lowering groundwater elevations.	Zero inelastic subsidence, in addition to any measurement error. If InSAR data are used, the measurement error is 0.1 ft, and any measurement of 0.1 ft or less would not be considered inelastic subsidence.	No more than 0.5 foot of cumulative subsidence over a five-year period (beyond the measurement error), solely due to lowered groundwater elevations
Depletion of Interconnected Surface Water			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	Same as the chronic lowering of groundwater levels.	Same as the chronic lowering of groundwater levels.	Same as the chronic lowering of groundwater levels

Notes:

TDS is the primary water quality constituent of concern.

MO = Measurable Objective; MT = Minimum Threshold; RMP = representative monitoring point; mg/L = milligrams per liter; MCL = Maximum Contaminant Level; SMCL = Secondary Maximum Contaminant Level

Current Groundwater Level and Storage Conditions

The current groundwater conditions in the Subbasin are characterized by groundwater elevations that are near or below the MO. In WY2023, only two wells experienced a decline below the MT in Fall 2023, while all remaining RMP wells remained above the MT. Although one well remained below the MT for 24 consecutive months, if 20% of groundwater levels measured at RMP wells drop below the MT for two consecutive years, this would be considered URs as defined in the GSP. Therefore, URs were avoided in WY 2023.

Generally, groundwater elevations are, on average, 24 feet above the MT throughout the Subbasin and, on average, 5 feet below the MOs in WY 2023. Elevations are mostly near or slightly higher than those observed in recent years. This positive trend is attributed to the ongoing recovery in groundwater conditions, facilitated by increased precipitation which was able to meet evapotranspiration demands.

Fluctuations in groundwater levels and storage within the Subbasin are influenced by the balance between aquifer recharge and extraction. Groundwater levels serve as a proxy for estimating changes in groundwater storage, with observed patterns closely mirroring those in the broader Sacramento Valley. In years characterized by drought and low precipitation, diminished surface water supplies lead to increased extraction and reduced recharge, causing a decline in groundwater storage.

Contrastingly, WY 2023, classified as a Wet WY (DWR, 2023), marked an increase in groundwater storage, totaling approximately 31,000 acre-feet (AF) in the aquifer. For context, in the past 33 years, the largest decrease in groundwater storage is estimated to be -100,000 AF, and the highest increase was estimated to be 120,000 AF. **Figure ES-2** shows groundwater pumping, as well as annual and cumulative changes in groundwater storage from WY 1990 to WY 2023.

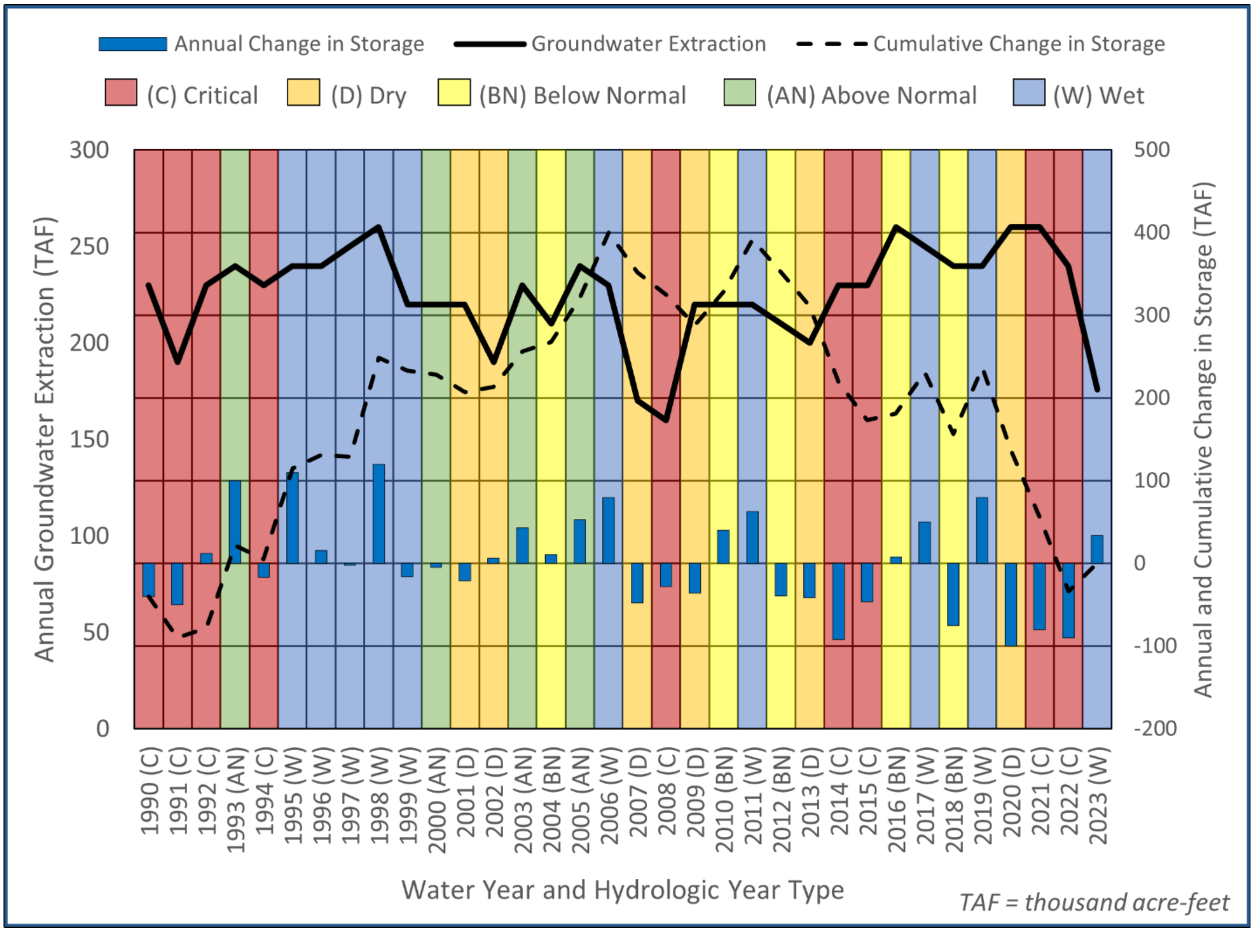

Figure ES-2. Groundwater Pumping, Annual and Cumulative Change in Storage from WY 1990 to WY 2023

Water Use

Groundwater extraction was approximately 175,000 AF in WY 2023, lower than the 242,120 AF extracted in WY 2022. The annual volume of surface water delivered to the Subbasin from surface water features such as Thomes Creek and Stony Creek was about 24,000 AF in WY 2023, lower than the 26,000 AF delivered in WY 2022. The decrease in groundwater extraction in WY 2023 compared to WY 2022 is attributed to increased precipitation in WY 2023, where increased precipitation was able to meet evapotranspiration demands. Despite wet conditions in WY 2023, surface water use decreased slightly from WY 2023 compared to WY 2022.

Groundwater provides the majority (88%) of the water for agriculture in the Subbasin, and surface water is the source for the remainder (12%). Groundwater also met the demand for municipal and rural residential users. The volume of groundwater and surface water used on an annual basis within the Subbasin is summarized directly from measured and reported groundwater pumping and surface water diversions when available; however, a water budget approach has been used to estimate the remaining unmeasured volume of groundwater extraction. **Table ES-2** provides a summary of water use by water sector. Numbers are rounded to the nearest 100 except for totals which are rounded to the nearest 1,000.

Table ES-2. Total Water Use by Water Use Sector				
Sector	WY 2023 (AF)			
	Groundwater	Surface Water	Total	Total Irrigated Area (acres)
Agricultural	171,000	24,000	**195,000**	**72,000**
Municipal	4,000	0	**4,000**	--
Rural Residential	300	0	**300**	--
Total	**175,000**	**24,000**	**199,000**	**72,000**

GSP Implementation Progress

Since the previous Annual Report (Tehama County and CSGSAs, 2023), the Tehama County GSA and CSGSA coordinated with stakeholders to seek funding through DWR's Sustainable Groundwater Management Grant Program for projects and management actions (PMAs) previously identified in the GSP. DWR has been awarded a grant of approximately 8 million dollars for the Corning Subbasin in September 2023. Additionally, several actions by the Tehama County GSA and CSGSA continue to fulfill GSP requirements, such as monitoring groundwater levels and quality, updating the Data Management System (DMS), and annual reporting to DWR.

Also, since the release of the previous Annual Report, DWR issued an "incomplete" determination and provided corrective actions to the Corning Subbasin GSP. The Tehama County GSA and CSGSA acknowledge and are addressing the two deficiencies listed in the DWR's **GSP determination letter.** (https://sgma.water.ca.gov/portal/service/gspdocument/download/9954):

1) The GSAs should revise the GSP to provide a reasonable assessment of overdraft conditions and include a reasonable means to mitigate overdraft.
2) The GSAs must provide a more detailed explanation and justification regarding the selection of the sustainable management criteria for groundwater levels, particularly minimum thresholds and measurable objectives, and quantitatively describe the effects of those criteria on the interests of beneficial uses and users of groundwater.

In 2023, the Tehama County GSA and the CSGSA in the Subbasin prepared to implement future projects to address recommended corrective actions, which will largely be funded by the SGM Implementation Grant Program. The ongoing implementation of PMAs, outlined in **Section 5**, aims to address these corrective actions effectively through the Periodic Evaluation of the GSP, which is due in January 2027.

1 GENERAL INFORMATION §356.2(A)

The Annual Report for the Corning Subbasin (Subbasin) (5-021.51) was prepared on behalf of the Tehama County Flood Control and Water Conservation District (Tehama County GSA) and the Corning Sub-Basin Groundwater Sustainability Agency (CSGSA) to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (§10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) regulations (§354.40 and §356.2). The regulations require the Groundwater Sustainability Agencies (GSAs) to submit an Annual Report to DWR by April 1st following the reporting year, which spans the water year (WY) from October 1st to September 30th. This Annual Report is the third Annual Report submitted on behalf of the Subbasin and includes data for the most recent WY 2023. Public seeking information on Corning Subbasin and GSP Implementation, meeting schedules, and other resources should visit the **Tehama County GSA** (https://tehamacountywater.org/gsa/and the **Corning Sub-Basin GSA** (https://www.countyofglenn.net/CorningSub-basinGSA).

1.1 Report Contents

This report is the third Annual Report prepared for the Corning Subbasin GSP submitted in January 2024. The first Annual Report included data elements for the first reporting year, WY 2021, as well as a "bridge year," WY 2020. The second and third Annual Reports contain data only for the current reporting year, WY and WY 2023, respectively. Data elements presented in this report refer to WY 2023, the 12-month period spanning October 2022 through September 2023, unless otherwise noted. Pursuant to GSP regulations, the Annual Report includes:

- Groundwater Elevation Data
- Water Supply and Use
- Change in Groundwater Storage
- GSP Implementation Progress

1.2 Subbasin Setting

The Subbasin is a 324 square mile (207,342 acres) area on the southern side of Tehama County and the northern side of Glenn County. The Subbasin is managed by the Tehama County GSA and the CSGSA.

The Subbasin is shown in **Figure 1-1** and **Figure 1-2**. The Subbasin lies in the northeastern portion of the Sacramento Groundwater Basin, **Figure 1-1**. The Subbasin's northern boundary is the Red Bluff Subbasin, the western boundary is the Coastal Mountain Range, the southern boundary is the Colusa and Butte Subbasins, and the eastern boundary is the Los Molinos and Vina Subbasins (DWR, 2018), **Figure 1-2**. Several surface water features are located in the Subbasin, including the Sacramento River, Thomes Creek, and Stony Creek. Smaller local streams entering and traversing the Subbasin include Jewett Creek and Hall Creek. Groundwater generally flows from northwest to southeast.

The Corning GSP estimates the sustainable yield of the Subbasin to be 171,800 acre-feet (AF) based on historical groundwater pumping averages of 132,300 acre-feet per year AFY and an annual decrease in storage of 400 AFY (Tehama County and CSGSAs, 2022). Water use in the Subbasin is dominated (98%) by agricultural uses, and municipal and household water use accounts for the remaining 2% of water used. Groundwater constitutes the majority (88%) of the Subbasin’s water supplies, with surface water comprising the remaining portion (12%).

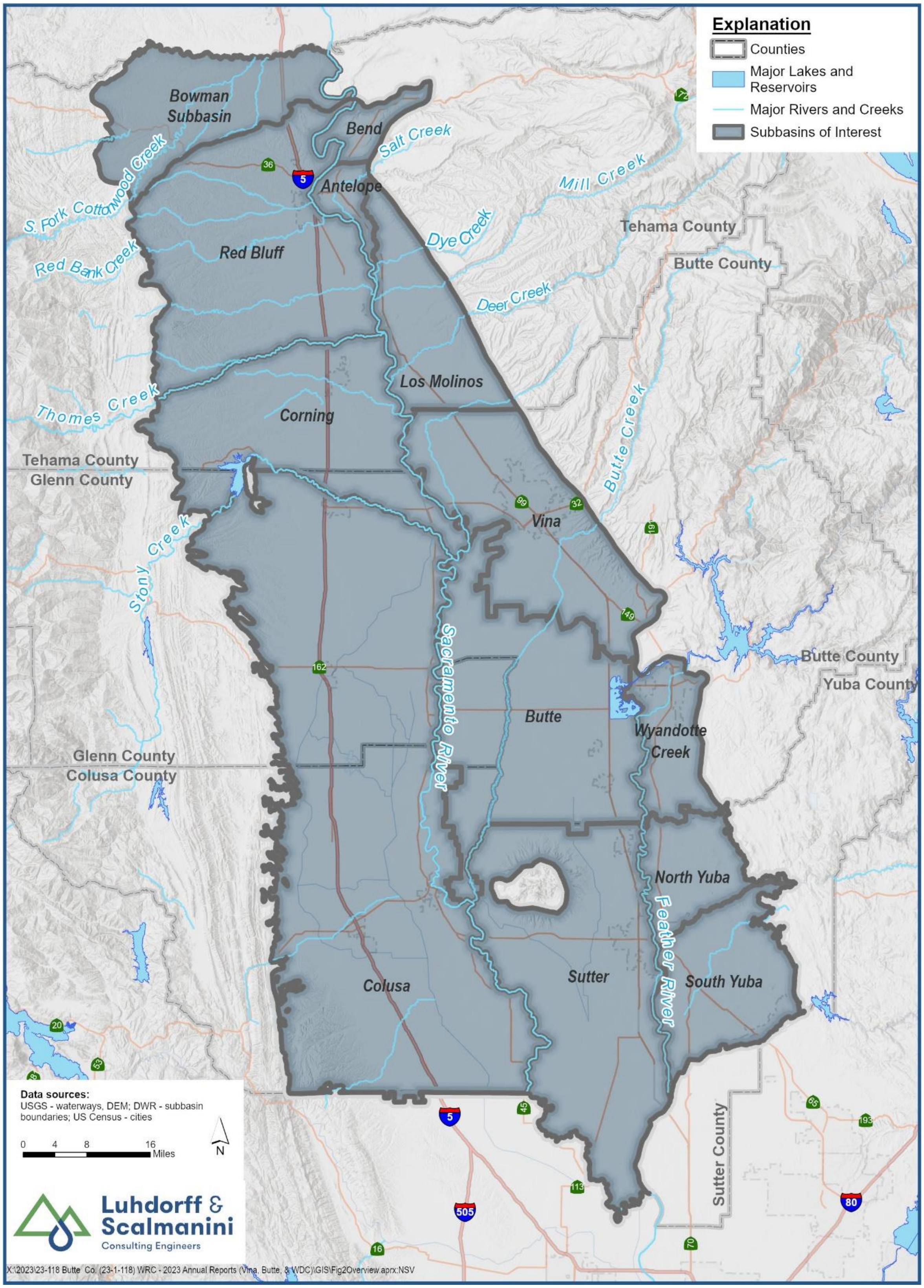

Figure 1-1. Subbasins in the Northern Sacramento Valley

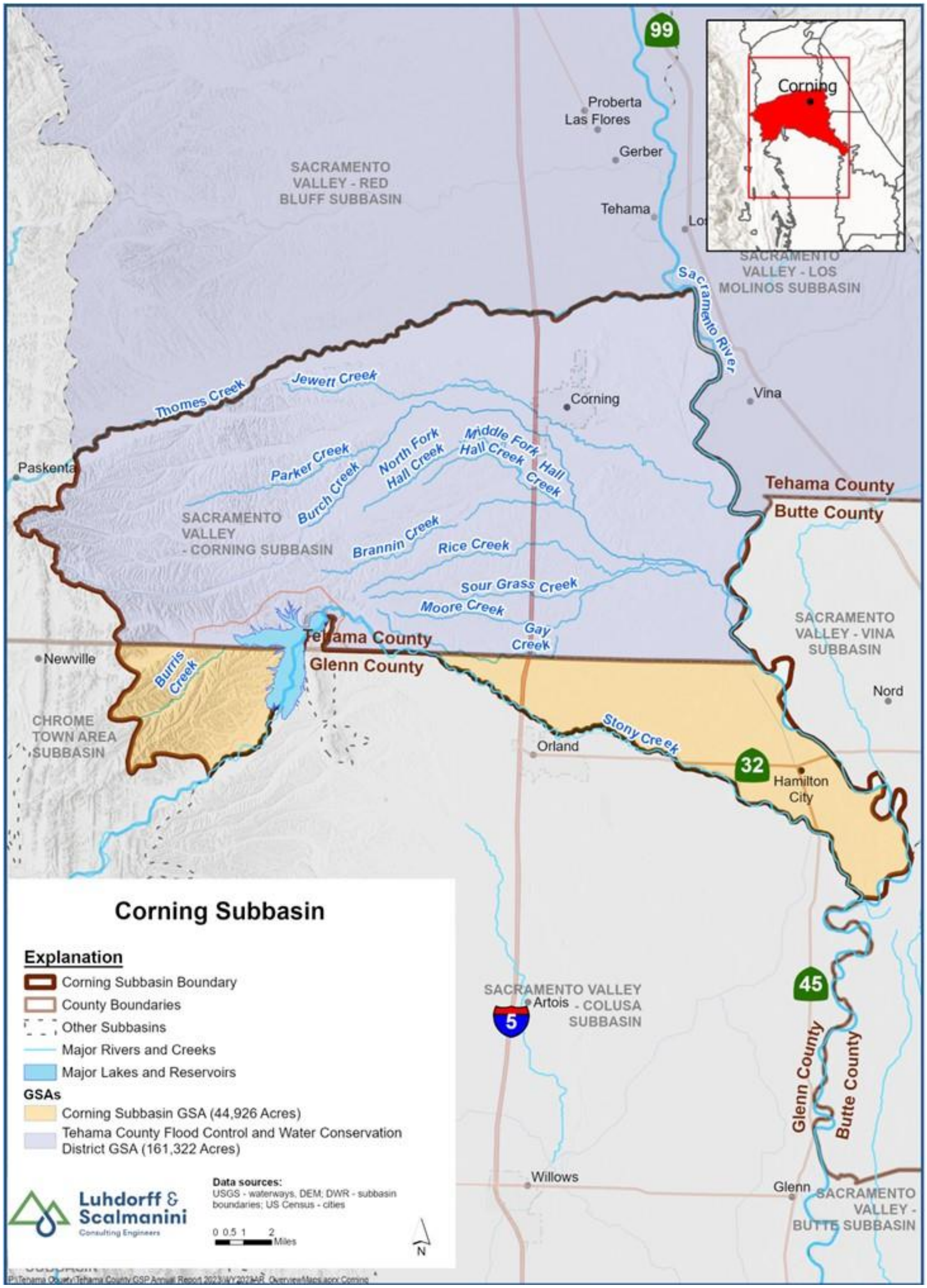

Figure 1-2. Corning Subbasin and Groundwater Sustainability Agency Boundaries

2 GROUNDWATER ELEVATIONS §356.2(B)(1)

Groundwater elevations in the Subbasin typically fluctuate seasonally between and within water years, particularly in groundwater-dependent areas or during drought years when groundwater is used to compensate for diminished surface water supplies. Seasonal fluctuations of groundwater levels occur in response to groundwater pumping and recovery, land and water use activities, recharge, and natural discharge. Sources of recharge into the groundwater system include precipitation, applied irrigation water, and seepage from local creeks and rivers.

Groundwater pumping for irrigation typically occurs from April to September, although depending on the timing of rainfall, it may shift earlier and/or later into the season. Consequently, groundwater levels are usually highest in the spring and lowest during the irrigation season in the summer months. Fall groundwater measurements (typically measured in October) provide an indication of groundwater conditions after the primary irrigation season.

Groundwater levels in the Subbasin are monitored in representative monitoring point (RMP) wells that were selected in the GSP to represent localized groundwater conditions for specified areas of the Subbasin. RMP wells include a mixture of domestic wells, irrigation wells, and dedicated observation wells. In total, 54 RMP wells are used to monitor conditions in the aquifer. Three RMP wells were removed from the monitoring network. This modification will be reflected in forthcoming annual reports, along with any subsequent additions to the monitoring network to replace these wells. **Appendix A** includes hydrographs showing groundwater elevations and the approximate locations of the RMP wells. Sustainable management criteria (SMC), described in **Appendix B**, are assigned for groundwater levels at the RMP wells.

Certain RMP wells measured by DWR and Tehama County are equipped with data loggers and pressure transducers, which continuously monitor and record hourly changes in groundwater levels. These and the remaining wells in the network are measured by hand at least two times each year in March and October. Data from groundwater level monitoring wells is available from DWR's online SGMA Data Viewer tool (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer).

Spring and Fall 2023 groundwater elevation measurements for RMP wells in the Subbasin are summarized in **Table 5-2**. Groundwater elevation data in the Subbasin is collected by DWR and Tehama County and is publicly available from DWR's online SGMA Data Viewer tool (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer). The groundwater level monitoring methods are consistent with the protocols described in the Corning GSP. Depending on the well, groundwater elevations are measured using steel tape, an electric sounder, or a pressure transducer. The accuracy of groundwater level measurements is typically either 0.01 feet or 0.1 feet, depending on the equipment used.

The following sub-sections provide a summary of groundwater elevations and conditions during WY 2023 through the presentation and description of groundwater elevation contours (**Section 2.1**) and hydrographs of groundwater elevations (**Section 2.2; Appendix A**).

2.1 Groundwater Elevation Contour Maps – §356.2(b)(1)(A)

Groundwater elevation contour maps for Spring and Fall 2023 were prepared for the aquifer, as shown in **Figures 2-1** and **2-2**. Spring contours are intended to generally represent seasonal high groundwater elevations (shallower depth to water), while fall contours are intended to generally represent seasonal low groundwater elevations (deeper depth to water). Groundwater elevation contours were developed by creating a continuous groundwater elevation surface based on available monitoring well data using the kriging interpolation method. Questionable groundwater elevation measurements were excluded, and minor adjustments to the contours were made based on professional judgment.

The contour maps of the aquifer (**Figures 2-1 and 2-2**) each show that groundwater elevations are generally higher in the northern and central areas of the Subbasin versus the southern and eastern areas, indicating a general gradient – and thus groundwater flow – from the northwest to the southeast. The contour maps illustrate several general features of the groundwater flow system in the Corning Subbasin, including:

- Overall, northwest to southeast groundwater flow is consistent with recharge from the Northern Coastal Mountain Ranges.
- Movement of water towards the Sacramento River in both the fall and the spring.
- The higher concentration of contours in the central portion of the Subbasin indicates a steeper gradient and could suggest higher groundwater flow. Nonetheless, the contours are consistent with the current understanding of recharge coming from the Northern Coastal Mountain Ranges foothills. New sources of information and data may improve understanding of this area.

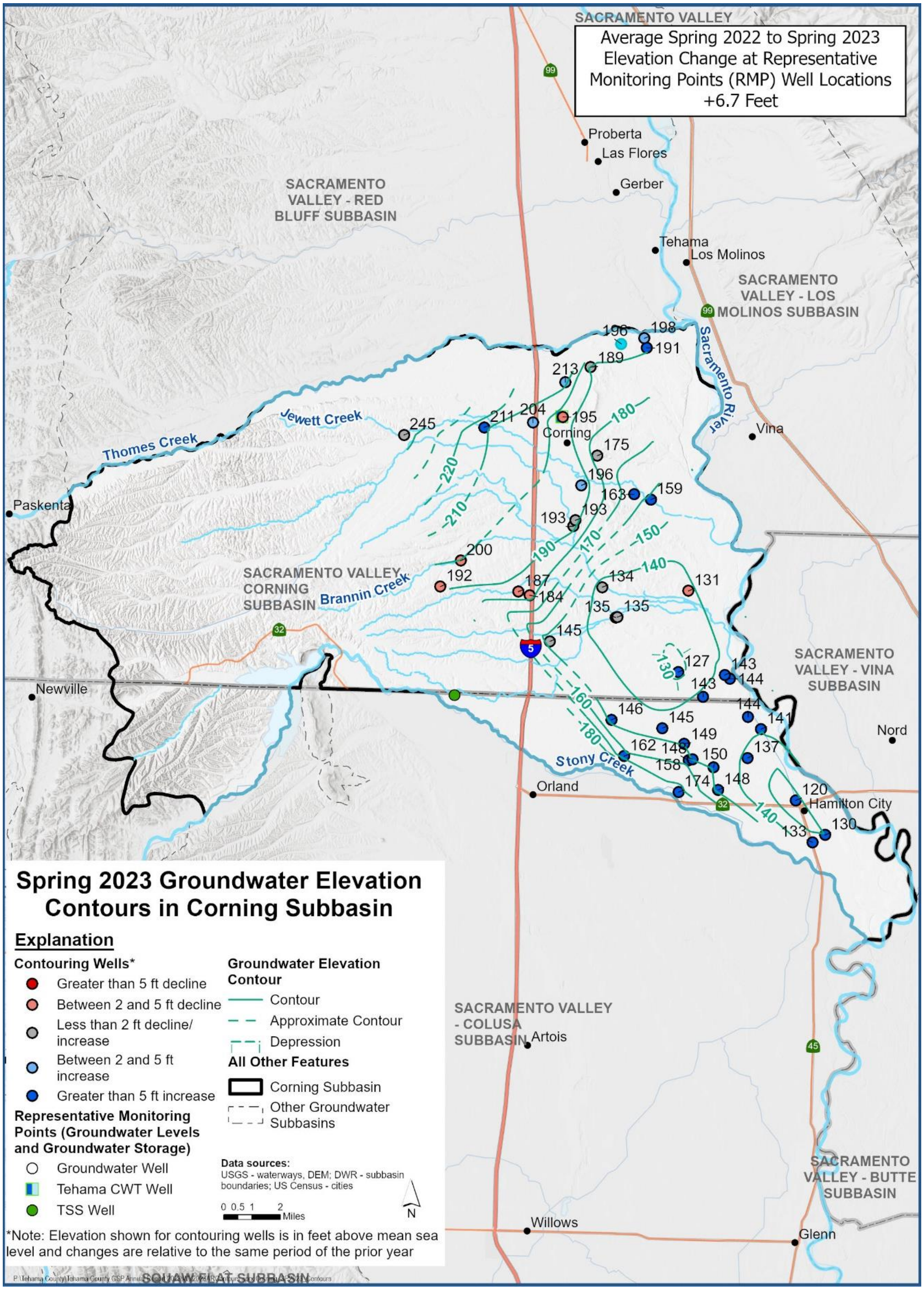

Figure 2-1. Subbasin Contours of Equal Groundwater Elevation, Spring 2023 (Seasonal High)

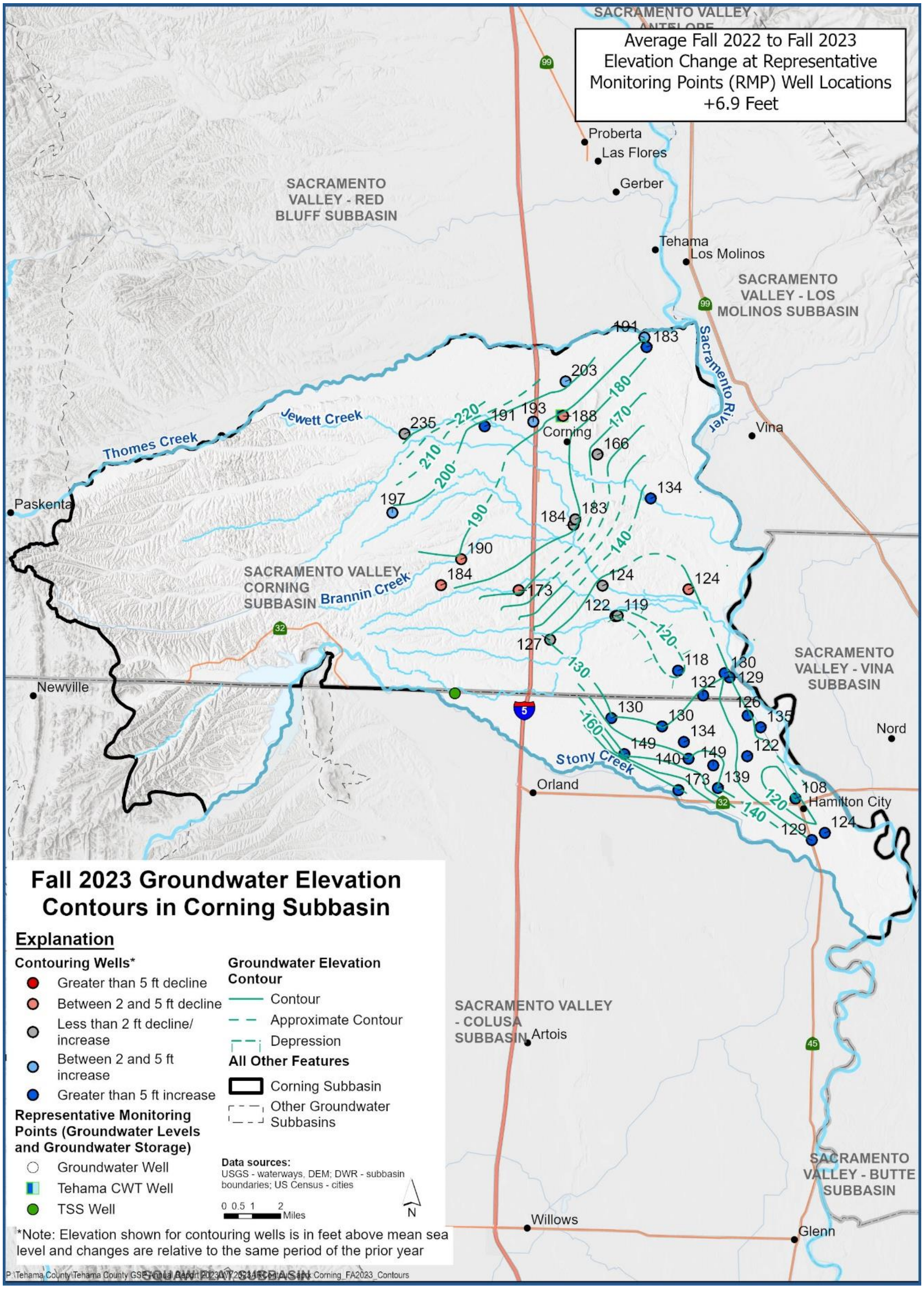

Figure 2-2. Subbasin Contours of Equal Groundwater Elevation, Fall 2023 (Seasonal Low)

2.2 Hydrographs of Groundwater Elevations – §356.2(b)(1)(B)

Groundwater elevation hydrographs for each RMP well are presented in **Appendix A**. **Appendix B** provides an explanation of the SMC terminology defined in Section 6 of the Corning Subbasin GSP (e.g., Minimum Threshold [MT], Measurable Objective [MO], and Interim Milestone [IM]). **Table 5-1** summarizes the MOs, MTs, and identification of Undesirable Results (URs) for WY 2023**,** and **Table 5-2** contains a summary of the Spring 2023 (Seasonal High) and Fall 2023 (Seasonal Low) groundwater elevations measured at each well. **Table 5-2** also summarizes the established MO and MT for groundwater elevations, the changes in groundwater elevations from WY 2022 to WY 2023, and the differences between WY 2023 groundwater elevations and the MO.

Historically, groundwater levels have typically remained at or above their respective MOs in the Subbasin. The GSP also established IMs to provide numerical metrics for GSAs to track the Subbasin's conditions relative to the overall sustainability goal, ensuring that the groundwater management of the Subbasin remains sustainable.

Spring and Fall 2023 groundwater elevations were generally near or slightly higher than seasonal groundwater elevations in WY 2022. In WY 2023, the average seasonal high was 172 feet above mean sea level (AMSL), and the average seasonal low was 158 feet AMSL. In WY 2022, the average seasonal high was 159 feet AMSL, and the average seasonal low was 140 feet AMSL. Increases in groundwater levels are generally expected to result from decreased groundwater extraction in WY 2023, as well as increased recharge due to wet climate conditions.

All wells fell below the MO in Fall 2023. All but two measured groundwater elevations also remained above the corresponding MT of that RMS well. However, this does not trigger URs as outlined in the GSP (summarized in **Table 5-1**), since less than 20% of wells fell below their MTs for two consecutive years, . On average, groundwater levels measured in RMP wells were approximately 32 feet higher than MT elevations in Spring 2023 and 15 feet higher than MT elevations in Fall 2023. All measured groundwater levels, with the exception of the two wells mentioned above, remained within the Subbasin's margin of operational flexibility.

3 WATER SUPPLY AND USE

As required by §356.2, this section summarizes water supply and use in the Subbasin, categorized by groundwater extraction volumes, surface water supply, and total supply. The total water available for use in the Subbasin was tabulated from groundwater extraction volumes reported in **Table 3-1** and the surface water supply reported in **Table 3-2**. The total water available is summarized in **Table 3-3** for WY 2023. Groundwater extraction volumes are either based on measured data or are estimates from a water use analysis based on 2023 land use data and climate conditions. The water use analysis methodology is discussed in **Appendix E**. Surface water use was estimated from historic deliveries when records were not available.

3.1 Groundwater Extraction – §356.2(b)(2)

Groundwater extraction in the Subbasin is summarized in **Table 3-1**. Groundwater extraction is reported from pumping records where available, while the remaining groundwater extraction is estimated through the water use analysis approach described in the previous section and in **Appendix E**.

The majority of the Subbasin relies on groundwater supplies for agricultural irrigation, although portions of the Subbasin rely on surface water supplies. In years characterized by drought and low precipitation, diminished surface water supplies lead to increased groundwater extraction and reduced recharge, causing a decline in groundwater storage. Contrastingly, in wet years, such as WY 2023, wet climate conditions help to increase recharge and bolster groundwater storage.

Municipal water users extracted approximately 4,000 AF in the Subbasin in WY 2023. Municipal water supplies are measured and provided by the City of Corning and Hamilton City. The record of municipal supplies does not distinguish between urban and industrial water uses.

Rural residential water users rely on private domestic wells to meet their household water needs. Rural residential groundwater extraction was quantified based on average per capita water use and estimated population. The average per capita water use reported in the California Water Service Chico-Hamilton City District 2020 Urban Water Management Plan 2020 (Cal Water Chico, 2020) is considered to be representative of the area. Water use in 2020 was 181 gallons per capita per day. Parcels were chosen within the Subbasin, except for those in municipal service areas. Residential parcels were selected based on Tehama and Glenn County general plan zoning codes. Population estimates were derived from these zoning codes and average household sizes from the US census. The resulting population estimate was used to estimate residential groundwater pumping.

The total estimated groundwater extraction was approximately 175,000 AF in WY 2023, the majority of which was used to meet agricultural water demands (approximately 171,000 AF). The total groundwater extraction is about 52,000 AF less than the historical groundwater pumping average (227,000 AFY; **Table 4-1**) and 60,000 AF less than the average annual extraction of the last four wet WYs on record, 235,000 AF (2006, 2011, 2017, and 2019). The decrease in groundwater extraction in WY 2023 is attributed to increased precipitation in WY 2023, where increased precipitation was able to meet evapotranspiration demands. **Figure 3-1** shows the general areas where groundwater is applied in the Subbasin. About 98% of the total groundwater extraction was used by the agricultural sector, while the remaining 2% was used for municipal and rural residential water needs.

Table 3-1. Groundwater Use by Water Use Sector

Sector	WY 2023 (AF)
Agricultural	171,000
Municipal	4,000
Rural Residential	300
Total	**175,000**

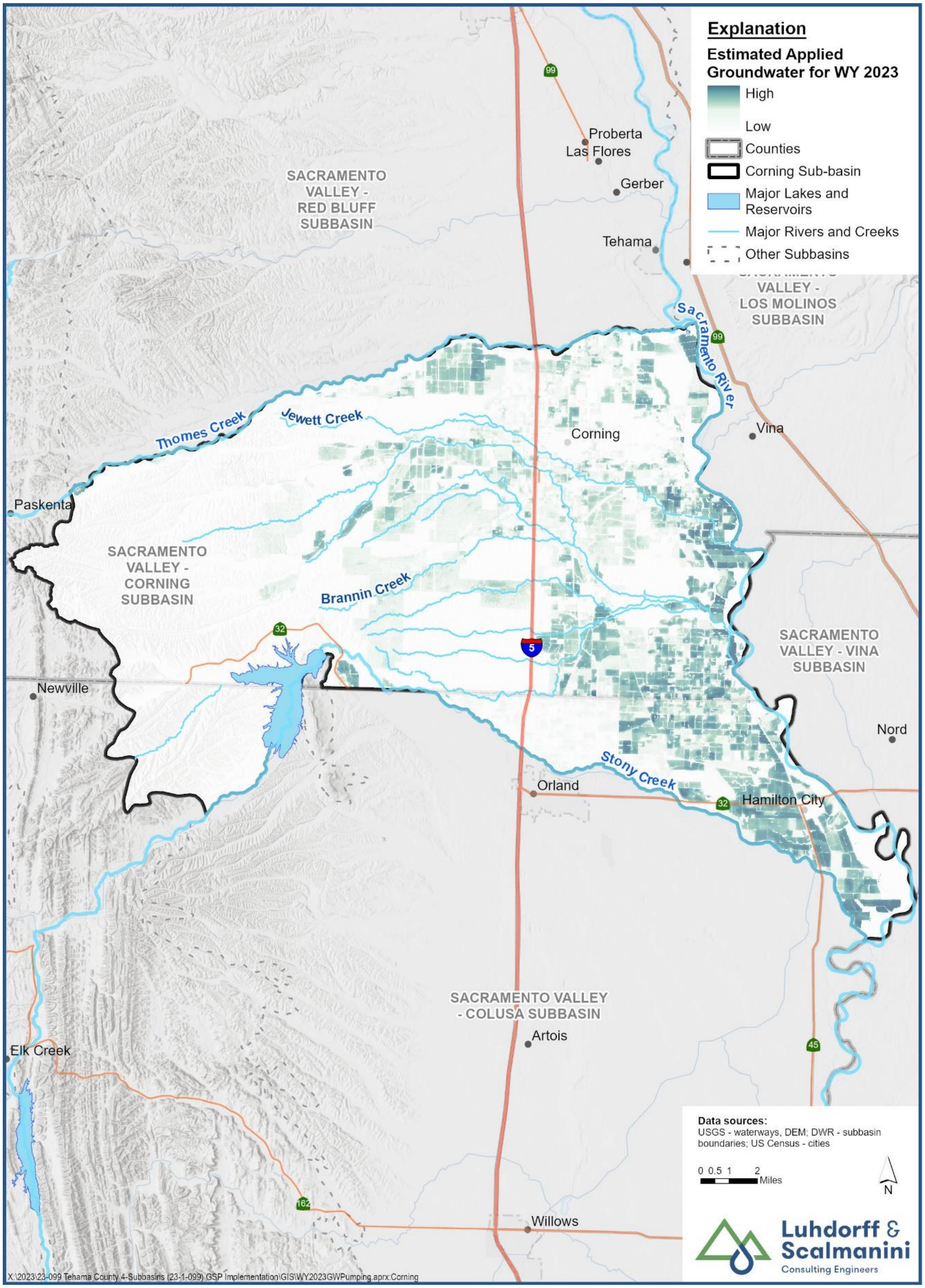

Figure 3-1. Estimated Applied Groundwater – WY 2023

3.2 Surface Water Supply – §356.2(b)(3)

Surface water supplies used or available for use in the Subbasin are summarized in **Table 3-2.** Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available. Missing surface water supply data was estimated based on available historical diversions data in similar water years.

Surface water provided about 12% of the agricultural water demand in the Subbasin for WY 2023. Diversions from surface water features such as Thomes Creek and Stony Creek were accessed from the State Water Resource Control Board's (SWRCB) Electronic Water Rights Information Management System (eWRIMS; SWRCB, 2023a). Data from eWRIMS on surface water delivery indicated which water rights holders in the Subbasin had made diversions during WY 2023. There are currently no surface water supplies for municipal use in the Corning Subbasin. Total surface water diversions and deliveries for the Corning Subbasin are estimated to be about 27,900 AF and 24,000 AF, respectively.

In contrast with curtailments and reduced surface water supplies experienced in WY 2022, WY 2023 was a Wet WY. Despite wet conditions in WY 2023, surface water use decreased slightly from WY 2023 compared to WY 2022.

Table 3-2. Surface Water Use by Water Use Sector for WY 2023

Sector	Diverted (AF)	Applied (AF)
Agricultural	27,900	24,000
Total	**27,900**	**24,000**

3.3 Total Water Use by Sector – §356.2(b)(4)

Groundwater supplied approximately 88% of the agricultural water demand in the Subbasin in WY 2023. Surface water supplied approximately 12% of the agricultural water demand in the Subbasin in WY 2023. The total water available for use in the Subbasin was tabulated from groundwater extraction volumes reported in **Table 3-1** and the surface water supply reported in **Table 3-2**. The total water available is summarized in **Table 3-3** for WY 2023. The results are either based on measured data or estimates, as described in the previous two sections.

Table 3-3. Total Water Use by Water Use Sector

Sector	WY 2023 (AF)			
	Groundwater	Surface Water	Total	Total Irrigated Area (acres)
Agricultural	171,000	24,000	**195,000**	**72,000**
Municipal	4,000	0	**4,000**	--
Rural Residential	300	0	**300**	--
Total	**175,000**	**24,000**	**199,000**	**72,000**

3.4 Uncertainties in Water Use Estimates

Estimated uncertainties in the water budget components are presented in **Table 3-4**. The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

Table 3-4. Estimated Uncertainty in Water Use Estimates

Water Budget Component	Data Source	Estimated Uncertainty (%)	Source
Groundwater Water			
Agricultural	Measurement	20%	Typical uncertainty from water balance calculation.
Municipal/Industrial	Measurement /Estimate	5%	Typical accuracy of municipal water system reporting.
Rural Residential	Calculation	15%	Estimated from per capita water use and Census information.
Surface Water			
Agricultural	Calculation	10%[1]	Estimated from Senate Bill 88 measurement accuracy standards.

[1] *Higher uncertainty of 10-20% is typical for estimated surface water inflows, including un-gaged inflows from small watersheds into creeks that enter the Basin.*

4 GROUNDWATER STORAGE

Long-term fluctuations in groundwater levels and groundwater in storage occur when there is an imbalance between the volume of water recharged into the aquifer and the volume of water removed from the aquifer, either by extraction or natural discharge to surface water bodies. If, over a period of years, the amount of water recharged to the aquifer exceeds the amount of water removed from the aquifer, then groundwater levels will increase and groundwater storage increases (i.e., positive change in storage). Conversely, if, over time, the amount of water removed from the aquifer exceeds the amount of water recharged, then groundwater levels decline, and groundwater storage decreases. These long-term changes can be linked to various factors, including increased or decreased groundwater extraction or variations in recharge associated with wet or dry hydrologic cycles.

A review of the RMP well hydrographs (**Appendix A**) indicates that groundwater elevations are either relatively stable or showing a declining trend over time. Declines may be influenced by the significant percentage of water years since 2006 that have been dry (i.e., characterized as Below Normal, Dry, or Critical). Since groundwater storage is closely related to groundwater levels, measured changes in groundwater levels can serve as a proxy for and be utilized to estimate changes in groundwater storage. Changes in groundwater storage in the Subbasin follow a pattern typically seen in the majority of the Sacramento Valley. During normal to wet years, groundwater is withdrawn during the summer for irrigation and replenished during the winter through recharge of precipitation and surface water inflows, allowing groundwater storage to potentially rebound by the following spring. During dry years and drought conditions, this pattern is disrupted when more groundwater may be pumped to meet irrigation demand and less recharge may occur due to reduced precipitation, diminished or curtailed surface water supplies, and lower stream levels.

In WY 2023, (a Wet WY), groundwater storage increased by approximately 31,000 AF. Decreased groundwater extraction in WY 2023 relative to WY 2022 contributed to the increase in groundwater storage, as well as increased recharge due to wet climate conditions. These and related factors, such as flood irrigation with surface water and increased stream flows, resulted in higher groundwater levels in Spring 2023 compared to Spring 2022.

The following sections present a summary of groundwater use and change in storage over time, along with a description of the uncertainty in storage change estimates.

4.1 Change in Groundwater Storage – §356.2(b)(5)(B)

Annual groundwater pumping, groundwater storage changes, and the cumulative change in storage over time are presented for WY 1990 through WY 2023 in **Table 4-1** and **Figure 4-1**. In contrast to WY 2022, WY 2023 was a Wet WY and saw a marked increase in groundwater storage, totaling approximately 31,000 AF. For context, in the past 33 years, the largest decrease in groundwater storage is estimated to be 100,000 AF, and the highest increase was estimated to be 120,000 AF.

Changes in storage values for WY 1990-2020 and groundwater pumping for WYs 1990-2021 come from the Corning Subbasin GSP (Tehama County and CSGSAs, 2022). It should be noted that the groundwater model was not used to estimate storage changes for WY 2021 through WY 2023. Therefore, future updates to the model may result in different estimates for WY 2021 through WY 2023 groundwater storage changes. The approach of using measured groundwater elevation changes to estimate storage changes is considered reasonable and cost-effective for the purposes of the Annual Report. **Table 4-1** includes estimates of annual groundwater pumping, annual storage change, and cumulative storage change for WYs 1990-2023. Estimates of annual groundwater pumping for WYs 2022-2023 are described in **Section 3** and **Appendix E.** The change in annual storage and cumulative change in storage for WYs 2021-2023 was estimated based on the method described in **Section 4.2**. Groundwater extractions for the entire period include pumping for agricultural, municipal, and rural residential purposes.

The annual and cumulative changes in groundwater storage for the period from WY 2021 through WY 2023 were based on the methodology described in **Section 4.2**. This methodology differs from the methodology reported in the GSP; however, it is anticipated that the methodology described in **Section 4.2** will be utilized for future Annual Reports. Expanding the boundaries of the Tehama Integrated Hydrogeological Model (TIHM; Tehama County and Corning GSAs, 2022) to incorporate the entire Corning Subbasin is being considered (if completed, results would be included as part of the periodic evaluation of the GSP due in January 2027 if not sooner).

Table 4-1. Annual Groundwater Extraction and Change in Storage			
Water Year (Hydrologic Year Type)	**Groundwater Extraction[1] (AF)**	**Annual Change in Storage (AF)**	**Cumulative Change in Storage (AF)**
1990 (C)	230,000	-40,000	-40,000
1991 (C)	190,000	-50,000	-90,000
1992 (C)	230,000	12,000	-78,000
1993 (AN)	240,000	100,000	22,000
1994 (C)	230,000	-17,000	5,000
1995 (W)	240,000	110,000	115,000
1996 (W)	240,000	16,000	131,000
1997 (W)	250,000	-2,000	129,000
1998 (W)	260,000	120,000	249,000
1999 (W)	220,000	-16,000	233,000
2000 (AN)	220,000	-5,000	228,000
2001 (D)	220,000	-21,000	207,000
2002 (D)	190,000	6,500	213,500
2003 (AN)	230,000	43,000	256,500
2004 (BN)	210,000	11,000	267,500
2005 (AN)	240,000	53,000	320,500
2006 (W)	230,000	80,000	400,500
2007 (D)	170,000	-48,000	352,500
2008 (C)	160,000	-28,000	324,500
2009 (D)	220,000	-36,000	288,500
2010 (BN)	220,000	40,000	328,500
2011 (W)	220,000	63,000	391,500
2012 (BN)	210,000	-39,000	352,500
2013 (D)	200,000	-41,000	311,500
2014 (C)	230,000	-92,000	219,500
2015 (C)[2]	230,000	-46,000	173,500
2016 (BN)	260,000	8,000	181,500
2017 (W)	250,000	50,000	231,500
2018 (BN)	240,000	-75,000	156,500
2019 (W)	240,000	80,000	236,500
2020 (D)	260,000	-100,000	136,500

Table 4-1. Annual Groundwater Extraction and Change in Storage			
Water Year (Hydrologic Year Type)	**Groundwater Extraction[1] (AF)**	**Annual Change in Storage (AF)**	**Cumulative Change in Storage (AF)**
2021 (C) [2]	260,000	-80,000	56,500
2022 (C) [2]	240,000	-90,000	-33,500
2023 (W)	175,000	31,000	-500
Historic Averages (2000-2022) [3]			
2000-2022 (22 years)	227,000	-1,000	190,000
W (9 years)	239,000	56,000	235,000
AN (4 years)	232,000	48,000	207,000
BN (5 years)	228,000	-11,000	257,000
D (6 years)	210,000	-40,000	252,000
C (9 years)	222,000	-48,000	60,000

Notes:

Positive values indicate inflows to the groundwater system, and negative values indicate outflows from the groundwater system.

GW = Groundwater

Water Year Types Classified According to the Sacramento Valley Water Year Index: AN = Above Normal, BN = Below Normal, C = Critical; D = Dry, W = Wet

[1] Groundwater extraction for WY 1990 through WY 2021 are from the Corning GSP Appendix 4D (Historical water budget tables; estimated using a numerical model); values for WY 2022 through WY 2023 were estimated using a water use analysis (presented in ***Section 3; Appendix E****). Annual Change in Storage for WY 1990 through WY 2015 are from the Corning Subbasin GSP Appendix 4D (Historical water budget tables; estimated using a numerical model); values for WY 2016 through WY 2020 are from the Corning Subbasin Annual Report – 2021; values for WY 2021 though WY 2023 were estimated using measured groundwater elevation changes and average aquifer storage coefficient. Pumping and uptake data are reported in previous Annual Reports for WY 1990 through WY 2022; while only pumping data is reported for WY 2023.*

[2] Indicated cutback year with reduced surface water supply availability.

[3] The historical average calculation covers the period from 2000 to 2022, excluding the current water year.

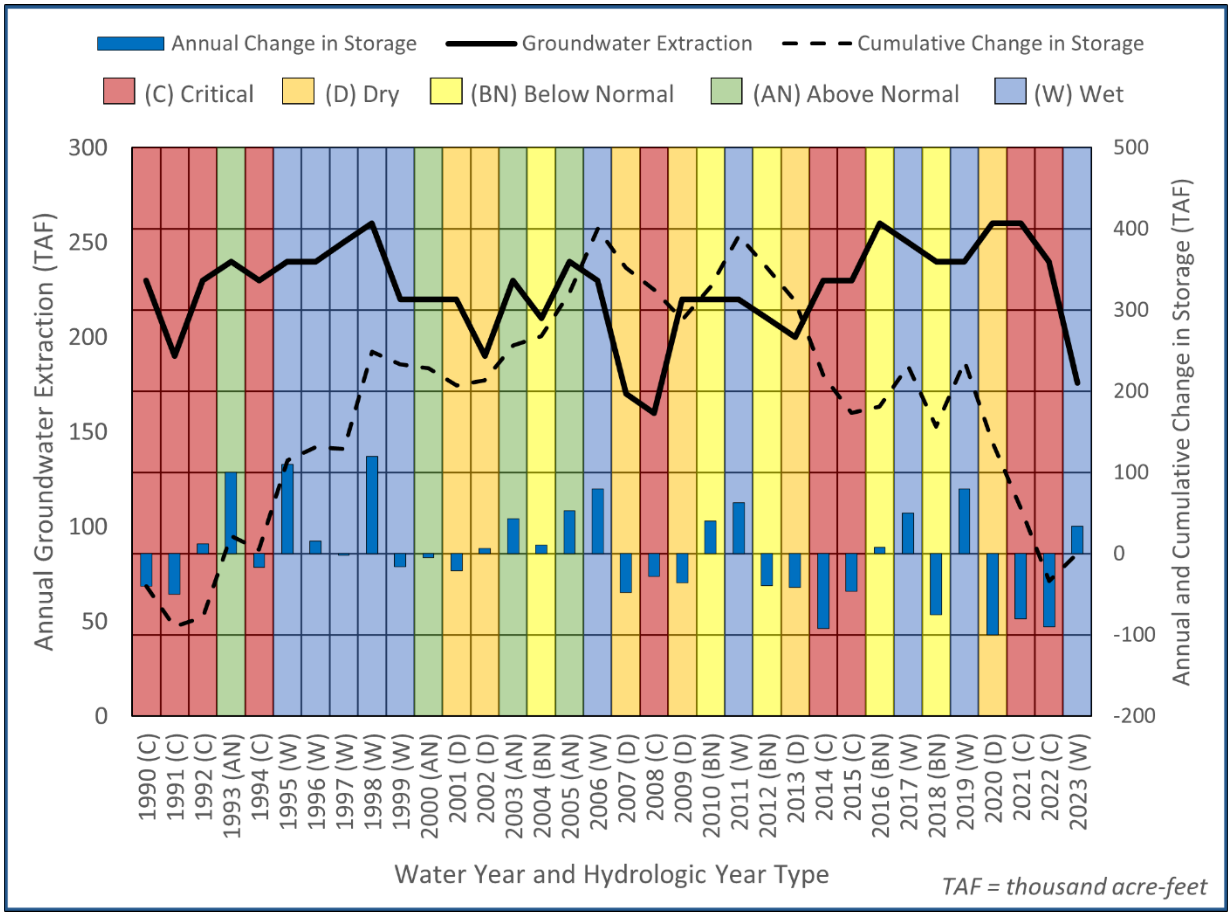

Figure 4-1. Groundwater Extraction and Change in Groundwater Storage from WY 1990 to WY 2023

4.2 Groundwater Storage Maps – §356.2(b)(5)(A)

The spatial distribution of estimated changes in groundwater storage for the period from Spring 2022 to Spring 2023 are shown in **Figure 4-2.** Since groundwater storage is closely related to groundwater levels, measured changes in groundwater levels can serve as a proxy for and be utilized to estimate changes in groundwater storage. Change in groundwater storage was estimated based on change in measured spring-to-spring groundwater levels at each RMP well. Change in groundwater levels from Spring 2022 to Spring 2023 was measured in RMP wells, and the larger well network was interpolated to estimate the groundwater elevation change in areas where sufficient data was available. The estimated elevation change was multiplied by a spatially variable aquifer storage coefficient (0.0061 - 0.0557) available from the TIHM to estimate the groundwater storage change volume in the aquifer. The spatial extent of this estimate was limited to areas where measured groundwater levels were available (**Figure 4-1**). Therefore, an area-weighted adjustment was applied to the estimated storage to estimate the Subbasin-wide change in storage.

Negative changes in storage values indicate lowering groundwater levels and depletion of groundwater storage, whereas positive changes in storage values represent rising groundwater levels and accretion of groundwater storage. As shown in **Figure 4-2**, the change in storage within the aquifer from Spring 2022 to Spring 2023 was between -0.04 and 0.67 AF per acre. The central portion of the Subbasin had the smallest positive change in storage, while the surrounding portions, especially the southeastern and northeastern portions of the Subbasin, experienced the largest positive change in storage. Total groundwater storage change was estimated to be approximately 31,000 AF between Spring 2022 and Spring 2023.

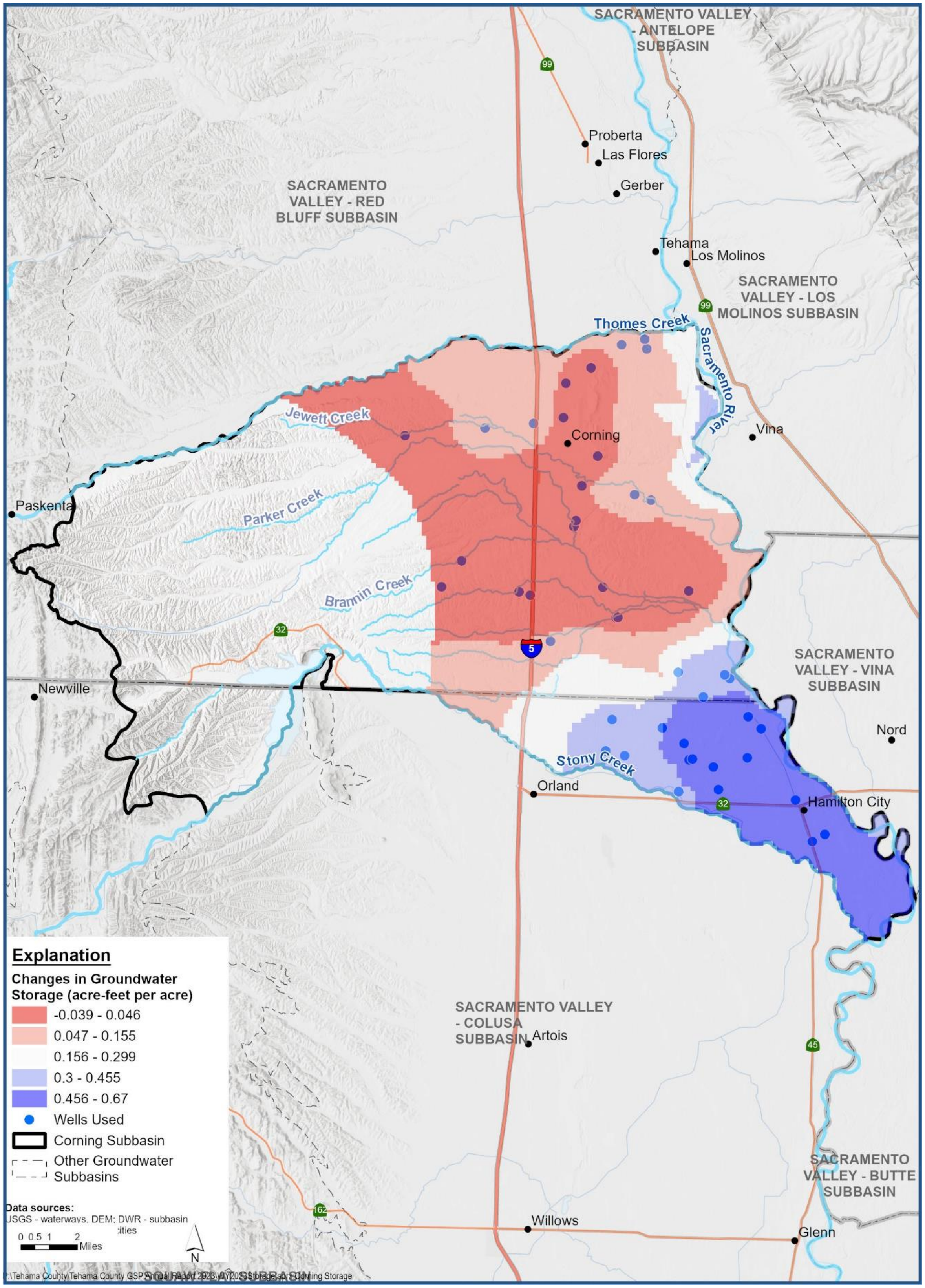

Figure 4-2. Change in Groundwater Storage from Spring 2022 to Spring 2023

4.3 Uncertainty in Groundwater Storage Estimates

The uncertainty associated with the change in groundwater storage estimates depends in part on the underlying uncertainty of the groundwater level data, the representative area, and the calibrated storage coefficient parameter used to calculate the change in groundwater storage. As described in **Section 4.2**, the calibrated storage coefficient (0.0061 - 0.0557) from the TIHM was used to calculate the change in storage for this WY. Based on a comparison of storage change estimates from the C2VSim model for similar water year types, the calculated storage change is reasonable. Further, the uncertainty of the estimated change in groundwater storage is typically 20-30% for integrated hydrologic models; therefore, the approach described in **Section 4.2** is considered to have similar uncertainty.

5 GSP IMPLEMENTATION PROGRESS – §356.2(B)(5)(C)

5.1 Main Activities of Water Year 2023

The main activities and updates since the previous Annual Report are as follows:

- The GSAs completed the WY 2022 Annual Report and other critical tasks.
- The CSGSA developed a property-related service fee to fund GSA operations and implementation costs to comply with SGMA.
- The GSAs coordinated a proposal seeking funding through DWR's SGM Grant Program. Coordination efforts included planning and refinement PMAs, evaluating and ranking PMAs, and preparing and submitting the grant application. The grant application was submitted in December 2022, and a final award list was released by DWR in September 2023; results are summarized in **Table 5-4**.
- An airborne electromagnetic (AEM) survey by DWR took place in the summer of 2022. The data collected provides a better understanding of aquifer characteristics and will help support future efforts to refine the current hydrogeologic conceptual model. Data is available at: **https://data.cnra.ca.gov/dataset/aem**.
- All sustainability indicators (SIs) are in compliance with their MTs, except for the chronic lowering of groundwater levels SI (see summary **Table 5-1**).
- Progress has been made on 5 PMAs since the last Annual Report. See **Table 5-4**; **and 5-5**.

Several other actions continue in the Subbasin to fulfill the requirements of the GSP. These include:

- Monitoring and recording groundwater levels and groundwater quality.
- Maintaining and updating the Data Management System (DMS) with newly collected data.
- Annual reporting of Subbasin conditions and submission to DWR as required by SGMA.
- Ongoing intra- and inter-basin coordination.

DWR proposed two recommended corrective actions that will enhance the GSP (below), and the GSAs are in the process of revising the GSP to address them.

1) The GSAs should revise the GSP to provide a reasonable assessment of overdraft conditions and include a reasonable means to mitigate overdraft.
2) The GSAs must provide more detailed explanation and justification regarding the selection of the sustainable management criteria for groundwater levels, particularly minimum thresholds, and measurable objectives, and quantitatively describe the effects of those criteria on the interests of beneficial uses and users of groundwater.

5.2 Progress Toward Achieving Interim Milestones

All SIs are in compliance with their MTs with the exception of the chronic lowering of groundwater levels SI (see summary **Table 5-1**). An MT is the quantitative value that represents the groundwater conditions at an RMP site that, when exceeded individually or in combination with MTs at other monitoring sites, may cause a UR in the subbasin per DWR's definition. If groundwater levels are lower than the value of the MO for that site, they are moving in the direction of the MT. On the contrary, for the groundwater quality SMC, as the value of the Total Dissolved Solids (TDS) concentrations increase from the MO established for that site, they are moving in the direction of the MT. Seawater Intrusion is not an applicable SI.

Groundwater elevations all fell below the MO in Fall 2023 but remained near the MOs in Spring 2023. Two wells fell below their MTs in Fall 2023 and avoided URs since less than 20% of wells fell below their MTs for two consecutive years, hence avoiding URs as defined in the GSP.

Overall, groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 Interim Milestones for groundwater levels at each of the RMP wells. Groundwater elevations are all above the MTs throughout the Subbasin, except for two wells, with elevations mostly near those observed in recent years (**Appendix A**). This positive trend is attributed to the ongoing recovery in groundwater conditions, facilitated by increased precipitation to meet evapotranspiration demands in WY 2023. Spring 2023 groundwater elevations were generally above the MOs and Fall 2023 groundwater elevations were generally above the MOs (**Table 5-2**), Spring 2024 groundwater conditions are expected to rebound.

Table 5-1. Sustainability Indicator Summary

2023 Status	Undesirable Result Identification	MO Definition	MT Definition
Chronic Lowering of Groundwater Levels			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	20% of groundwater elevations measured at RMP wells dropped below the associated MT during two consecutive years. If the water year type is dry or critically dry, then levels below the MT are not undesirable if groundwater management allows for recovery in average or wetter years.	**Stable Wells:** Maximum fall groundwater elevations since 2012 **Declining Wells:** Maximum fall groundwater elevations since 2015	**Stable Wells:** Minimum fall groundwater elevation since 2012 minus 20-foot buffer. **Declining Wells:** Minimum fall groundwater elevation since 2012 minus 20% of minimum groundwater level depth.
Reduction of Groundwater Storage			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	Same as the chronic lowering of groundwater levels	Amount of groundwater in storage when groundwater elevations are at their MO – since groundwater levels are used as a proxy, same as chronic lowering of groundwater level MOs.	Amount of groundwater in storage when groundwater elevations are at their MT– since groundwater levels are used as a proxy, same as chronic lowering of groundwater levels MTs.
Degraded Water Quality			
No indication of undesirable results There were no RMP with TDS levels above their MTs.	At least 25% of RMPs exceed the MT for water quality for two consecutive years at each well, where it can be established that GSP implementation is the cause of the exceedance.	California lower limit SMCL concentration for TDS of 500 mg/L measured at public supply wells.	TDS concentration of 750 mg/L at public supply wells.

Table 5-1. Sustainability Indicator Summary			
2023 Status	**Undesirable Result Identification**	**MO Definition**	**MT Definition**
Land Subsidence			
No indication of undesirable results No InSAR pixel exceeded MT in WY 2023.	Any exceedance of an MT is irreversible and caused by lowering groundwater elevations.	Zero inelastic subsidence, in addition to any measurement error. If InSAR data are used, the measurement error is 0.1 ft, and any measurement of 0.1 ft or less would not be considered inelastic subsidence.	No more than 0.5 foot of cumulative subsidence over a five-year period (beyond the measurement error), solely due to lowered groundwater elevations
Depletion of Interconnected Surface Water			
No indication of undesirable results There were two RMP with spring or fall 2023 groundwater level measurements below the MT.	Same as the chronic lowering of groundwater levels.	Same as the chronic lowering of groundwater levels.	Same as the chronic lowering of groundwater levels

Notes:

TDS is the primary water quality constituent of concern.

MO = Measurable Objective; MT = Minimum Threshold; RMP = representative monitoring point; mg/L = milligrams per liter; MCL = Maximum Contaminant Level; SMCL = Secondary Maximum Contaminant Level

5.2.1 Chronic Lowering of Groundwater Levels and Reduction in Groundwater Storage SMC

The reduction in groundwater storage SMC utilizes the chronic lowering of groundwater levels SMC as a proxy (**Table 5-1**). Thus, groundwater conditions related to storage and chronic lowering of groundwater levels are discussed together. Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 Interim Milestones for groundwater levels at each of the RMP wells. In Spring 2023, all groundwater elevations were above the established MTs. In Fall 2023, groundwater elevations at two wells were below the established MT (23N03W22Q001M, 23N03W13C004M, as indicated in **Table 5-2**). Fall groundwater elevations at 23N03W22Q001M were above the MT in Fall 2021, and below the MT in Fall 2022 and Fall 2023; and groundwater elevations at 23N03W13C004M remained below the MT in Fall 2021, Fall 2022, and Fall 2023 or 24 consecutive months. **Table 5-2** shows measurements from WY 2023 for spring seasonal highs and fall seasonal lows, along with MOs and MTs. It also compares the WY 2023 measurements to those from WY 2022 and to the MOs. Higher water levels were observed in Fall 2023 compared to Fall 2022 due to wet conditions, which has helped to increase recharge and offset extraction, bolstering groundwater storage in the Subbasin.

Table 5-2 Measurable Objectives, Minimum Thresholds, and Seasonal Groundwater Elevations of Representative Monitoring Point Wells

State Well Number /Representative Monitoring Point (RMP) ID	Groundwater Elevation (feet above mean sea level)				Spring 2023 vs. MO	Fall 2023 vs. MO	Spring 2023 vs. Spring 2022 (seasonal high)	Fall 2023 vs. Fall 2022 (seasonal low)
	2023 Measurements		MO	MT				
	Spring (seasonal high)	Fall (seasonal low)						
21N01W04N001M	121.68	116.08	116.10	89.30	5.58	-0.02	--	--
22N01W19E003M	135.29	--	128.10	97.70	7.19	--	--	--
22N01W29N002M	117.69	109.82	121.90	77.20	-4.21	-12.08	3.78	10.44
22N01W29N003M	126.02	123.00	123.40	91.70	2.62	-0.41	6.37	8.82
22N02W01N002M	127.83	109.75	134.70	74.50	-6.87	-24.95	9.90	8.52
22N02W01N003M	133.70	128.16	136.50	99.30	-2.80	-8.34	5.57	5.67
22N02W15C002M	115.18	98.27	121.60	57.70	-6.42	-23.33	4.78	15.81
22N02W15C004M	131.98	129.45	144.10	84.00	-12.12	-14.65	7.64	20.41
22N02W18C001M	94.03	79.40	90.40	63.50	3.63	-11.01	7.69	24.36
22N02W18C003M	151.35	144.11	148.40	131.60	2.95	-4.29	11.09	14.88
22N03W01R001M	141.61	130.17	135.20	116.60	6.41	-5.03	9.09	15.80
22N03W01R002M	146.41	134.23	143.90	123.60	2.51	-9.67	4.66	8.80
22N03W05F002M	--	182.29	204.50	177.90	--	-22.21	--	--
22N03W06B001M	250.60	239.90	264.10	238.00	-13.50	-24.20	7.80	3.00
22N03W12Q003M	180.94	170.94	174.80	163.20	6.14	-3.86	35.00	17.90
23N02W16B001M	130.63	123.63	135.30	98.40	-4.67	-11.67	-3.20	6.10
23N02W28N002M	127.22	--	133.90	100.00	-6.68	--	--	--
23N02W28N004M	139.95	--	142.70	104.30	-2.75	--	--	--
23N02W34A003M	143.11	129.81	135.50	109.20	7.61	-5.69	11.10	14.90
23N02W34N001M	139.12	132.12	145.90	111.80	-6.78	-13.78	3.60	7.80
23N03W04H001M[1]	--	--	194.00	180.40	--	--	--	--
23N03W07F001M	199.90	189.80	209.90	188.40	-10.00	-20.10	-3.20	1.80
23N03W13C004M[2]	131.08	106.30	131.10	107.20	-0.02	-24.80	--	--
23N03W13C006M	133.69	123.89	145.60	123.10	-11.91	-21.71	--	--
23N03W16H001M	184.08	--	193.40	174.30	-9.32	--	-2.80	--
23N03W17R001M	199.00	189.60	207.70	187.30	-8.70	-18.10	-2.60	-2.60
23N03W22Q001M[2]	142.65	127.28	152.70	129.90	-10.05	-25.42	-3.21	1.76
23N03W24A003M	135.44	118.94	137.40	118.60	-1.96	-18.46	-1.10	7.20
23N03W25M002M	139.06	122.13	151.50	111.60	-12.44	-29.37	3.63	--

Table 5-2 Measurable Objectives, Minimum Thresholds, and Seasonal Groundwater Elevations of Representative Monitoring Point Wells

State Well Number /Representative Monitoring Point (RMP) ID	Groundwater Elevation (feet above mean sea level)				Spring 2023 vs. MO	Fall 2023 vs. MO	Spring 2023 vs. Spring 2022 (seasonal high)	Fall 2023 vs. Fall 2022 (seasonal low)
	2023 Measurements		MO	MT				
	Spring (seasonal high)	Fall (seasonal low)						
23N03W25M004M	145.49	127.09	150.30	122.70	-4.81	-23.21	6.67	--
23N04W13G001M	192.40	184.40	198.60	159.70	-6.20	-14.20	-2.60	1.40
24N02W17A001M	178.35	169.70	170.90	150.90	7.45	-1.20	12.55	--
24N02W20B001M[1]	--	--	173.40	150.30	--	--	--	--
24N02W29N003M	158.84	141.27	158.10	123.20	0.74	-16.83	--	--
24N02W29N004M	158.85	134.17	155.50	124.90	3.35	-21.33	--	--
24N03W02R001M	--	--	188.60	172.60	--	--	--	--
24N03W03R002M	209.66	203.06	207.30	192.80	2.36	-4.24	0.37	13.00
24N03W14B001M[1]	--	--	195.30	175.50	--	--	--	--
24N03W16A001M	202.47	192.77	200.70	182.60	1.77	-7.93	1.70	12.40
24N03W17M001M	--	--	216.30	190.50	--	--	--	--
24N03W17M002M	210.80	190.90	196.80	172.80	14.00	-5.90	7.50	12.10
24N03W24E001M	173.35	165.55	169.20	136.70	4.15	-3.65	-0.90	16.80
24N03W26K001M	196.46	--	191.10	172.60	5.36	--	2.90	--
24N03W29Q001M	200.94	192.22	211.60	179.30	-10.66	-19.38	-1.20	--
24N03W29Q002M	203.48	181.76	212.60	174.90	-9.12	-30.84	3.12	--
24N03W35P005M	190.83	183.86	192.00	180.10	-1.17	-8.14	-1.91	7.90
24N04W14N002M	245.02	234.72	247.40	221.80	-2.38	-12.68	-1.12	5.50
24N04W33P001M	419.56	--	240.00	183.50	179.56	--	--	--
24N04W34K001M	--	196.60	223.90	184.40	--	-27.30	--	2.80
24N04W34P001M	--	--	214.30	183.50	--	--	--	--
24N04W36G001M	--	190.40	214.40	183.20	--	-24.00	--	5.20
24N05W23L001M	358.20	343.70	345.80	312.00	12.40	-2.10	--	-2.70
25N02W31G002M	198.00	191.00	191.40	169.30	6.60	-0.40	5.00	--
25N03W36H001M	195.50	--	183.30	160.90	12.20	--	8.20	--

MO = Measurable Objective, MT = Minimum Threshold, -- = Indicates missing or questionable measurements

[1] No longer monitored by DWR. Wells have been removed by the GSA's from the groundwater monitoring network.

[2] *Well fell below MT in WY 2023*

5.2.2 Degraded Water Quality SMC

The degraded water quality MT and MO are summarized in **Table 5-1**. TDS is the main constituent of concern in the Subbasin. TDS is measured at public supply wells throughout the Subbasin, and data was collected and reported by public agencies in WY 2023 and retrieved through the Groundwater Ambient Monitoring and Assessment (GAMA) (SWRCB, 2023b; available at: https://www.waterboards.ca.gov/gama/). A summary of groundwater quality monitoring data is available in **Appendix F**. Groundwater conditions are on track to avoid URs related to water quality.

5.2.3 Land Subsidence SMC

The land subsidence MT and MO are summarized in **Table 5-1**. Interferometric Synthetic Aperture Radar (InSAR) data provided by DWR (DWR, 2024) was analyzed from October 2022 to October 2023 to track annual changes and from October 2015 to October 2023 to track net changes. Subsidence estimates based on InSAR methodology were reviewed and compared to continuous GPS measurements (Towill, 2023). The accuracy report found that a one-year measurement error, reported as a root-mean-squared error (RMSE), was approximately 0.025 feet. **Figure 5-1** shows that a maximum vertical displacement between 0.02 feet and -0.06 feet occurred within the Subbasin from October 2022 to October 2023. Land surface changes are used to interpret vertical displacement; for example, a positive change corresponds to a higher land surface elevation, and a negative change corresponds to a lower land surface elevation relative to a reference elevation. Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 IMs and avoid URs for land subsidence. Conditions indicate that there has not been any inelastic land subsidence during the reporting period.

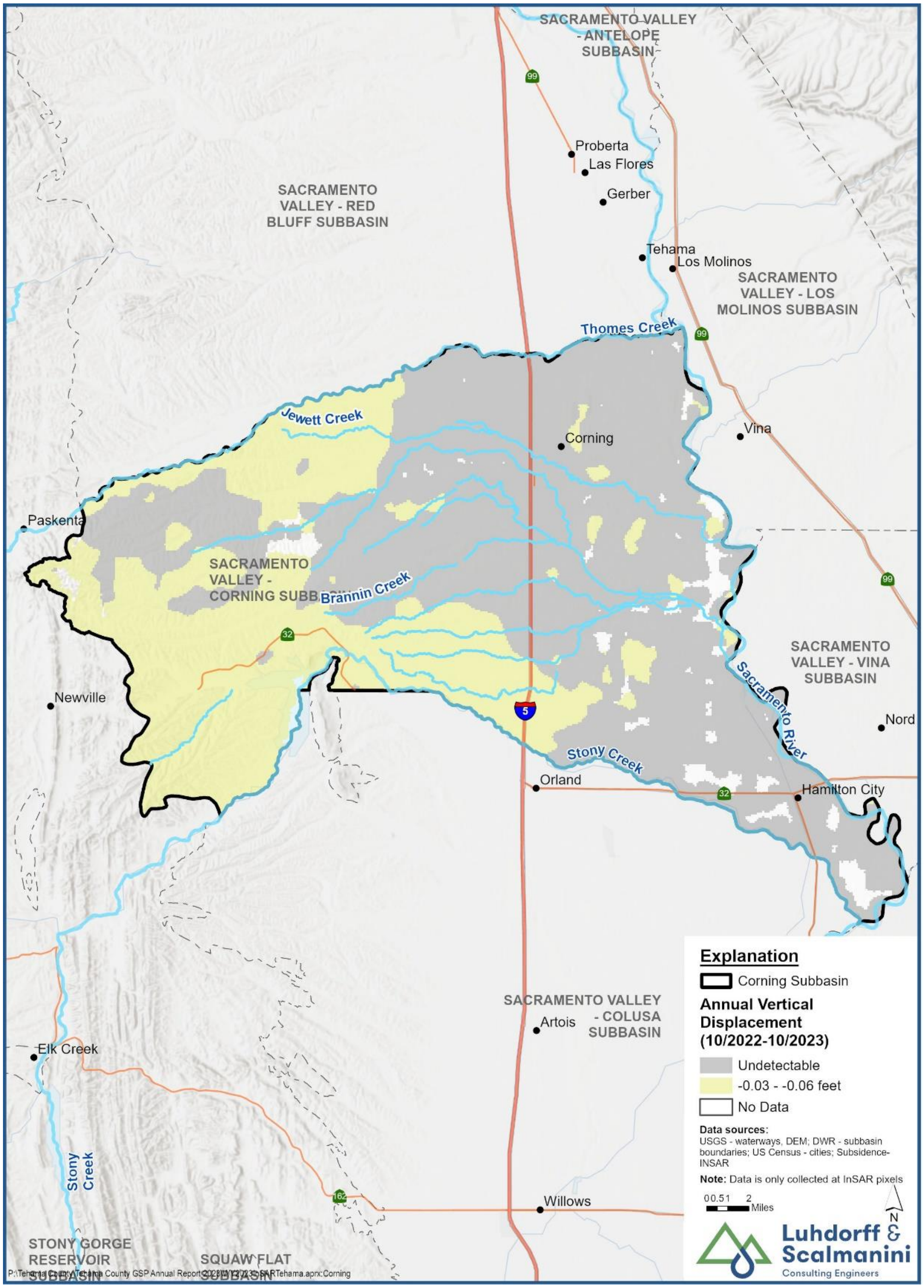

Figure 5-1. Change in Subsidence from 10/2022 to 10/2023

5.2.4 Depletion of Interconnected Surface Water SMC

The groundwater level measurements at the Interconnected Surface Water RMP during WY 2023 were all higher than their corresponding MTs, as summarized in **Table 5-3**. Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 IMs and to avoid URs for groundwater levels at each RMP.

Table 5-3 Measurable Objectives, Minimum Thresholds, Undesirable Results for Depletion of Interconnected Surface Water

State Well Number /Representative Monitoring Point (RMP) ID	Groundwater Elevation (feet above mean sea level)				Spring 2023 vs. MO	Fall 2023 vs. MO
	2023 Measurements		MO	MT		
	Spring (seasonal high)	Fall (seasonal low)				
22N01W29N003M	126.02	123	123.4	91.7	2.62	-0.41
22N02W01N003M	133.7	128.16	136.5	99.3	-2.8	-8.34
22N02W15C004M	131.98	129.45	144.1	84	-12.12	-14.65
22N02W18C003M	151.35	144.11	148.4	131.6	2.95	-4.29
22N03W01R002M	146.41	134.23	143.9	123.6	2.51	-9.67
23N02W28N004M	139.95	--	142.7	104.3	-2.75	--
24N02W29N003M	158.84	141.27	158.1	123.2	0.74	-16.83

MO = Measurable Objective, MT = Minimum Threshold, -- = Indicates missing or questionable measurements

5.3 Progress Toward PMA Implementation

The following sections summarize the GSAs' progress towards implementing PMAs that were developed to manage groundwater conditions in the Subbasin and achieve the groundwater sustainability objectives described in the GSP. Projects as outlined in the GSP are provided below and summarized in **Table 5-4**. Updates on the status of management actions are described below in **Table 5-5**.

Groundwater users in the Subbasin benefit from generally stable groundwater levels in the Subbasin. Surface water supplies available to diverters in the Subbasin are used, when available, for irrigation and for the benefit of other recharge efforts and projects described in the GSP. Ongoing access to surface water supplies is crucial to preserving the sustainability of the Subbasin.

Table 5-4. Summary of Project Implementation Status			
GSP Section Reference	**Project (Proponent)**	**Current Status**	**Notable Progress Since Last Annual Report**
3.2.8	Ongoing Monitoring, Data Gaps, and Enhancements	Funded	DWR SGM Grant Program application submitted in December 2022 was funded to address data gaps identified in the GSP.
7.2	GSP Implementation, Outreach, and Compliance Activities	Funded	The DWR SGM Grant Program application submitted in December 2022 was funded during the planning phase.
7.4.1	Recharge and Conjunctive Use Focused Projects	Funded	DWR SGM Grant Program application submitted in December 2022 was funded to plan and roll out recharge projects identified in the GSP.
7.4.4.4	California Olive Ranch	In Planning	Project is in planning phase, water to be used to recharge areas of used in-lieu.

Table 5-5. Summary of Management Actions			
GSP Section Reference	**Management Action**	**Current Status**	**Notable Progress Since Last Annual Report**
7.3.1.1	Well Management Program: Well Inventory	In Progress	Program is in its second year, well inventory is in progress (Tehama GSA).
7.3.1.1	Well Management Program: Well Incident Reporting System	In Progress	System is in place, collecting dry well and related incidents (Glenn County).
7.3.1.3	Policy and Ordinances that Control Pumping Growth	In Progress	Program is in effect; well permitting process has been re-evaluated; permits are issued on a 3 tier basis (Glenn County).

5.4 GSP Project Implementation Progress

5.4.1 Ongoing Monitoring, Data Gaps, and Enhancements (GSP Section 3.2.8)

Advancements have been made on this project since 2022, including identifying sites for multi-completion wells and surface water groundwater monitoring sites within the Subbasin, developing a synoptic stream gaging monitoring plan, conducting a biological investigation to determine the locations of groundwater-dependent ecosystems, and initiating a community domestic monitoring program.

5.4.2 GSP Implementation, Outreach, and Compliance Activities (GSP Section 7.2)

Advancements since the last Annual Report include securing funding from the DWR SGM Grant Program application submitted in December 2022. This project is currently active and includes the development of WY 2023 Annual Reports, outreach to the community, and revising the GSP.

5.4.3 Recharge and Conjunctive Use Focused Projects (GSP Section 7.4.1.1 & GSP Section 7.4.1.2)

Advancements made on these projects since 2022, includes securing funding from the DWR SGM Grant Program application submitted in December 2022; Tehama County. These projects are currently in the planning phase, with 12 projects at different stages of implementation. Due to these projects being in the planning phase, both recharge and conjunctive use focused projects are discussed together for this annual report.

USBR Pond South of Corning: The USBR Pond project involves utilizing an existing 10-acre stormwater pond connected to the Corning Canal for recharge. Water would be diverted from the Corning Canal into the stormwater pond for recharge. Additional water could be recharged by adding flows to Brannin creek. Conveyance infrastructure for this site is already in place and planning for funding of water has commenced. There is potential to recharge a maximum of 1000 AFY at this site.

Stony Creek Diversion to Gay Creek: This project would involve recharging water through Gay Creek by diverting water into the creek from Stoney Creek. Gay Creek is unlined and dry during the irrigation season when recharge would occur. Conveyance infrastructure between the two creeks is already in place. The main challenge at this site involves the availability of water. There is no water right in place at the site of the water diversion and funding for water purchases would be required to conduct recharge. Potential recharge amounts are estimated to be a maximum of 400 AFY.

Burch Creek: This project would involve pumping water from Burch Creek directly into the Subbasin. Potential recharge amounts are estimated to be a maximum of 164 AFY.

Thomes Creek- Multi Benefit: This project would involve pumping water from Thomes Creek directly onto habitat area within the Subbasin. Potential recharge amounts are estimated to be a maximum of 50 AFY.

Simpson Rd: This project would involve conveying water from an outlet in the Corning Water District to farmland within the Subbasin. Potential recharge amounts are estimated to be a maximum of 38 AFY.

Fishman Recharge Pond: This project would involve conveying water to a recharge pond within the Subbasin. Potential recharge amounts are estimated to be a maximum of 34 AFY.

Rice Creek: This project would involve conveying water from an outlet on the Tehama Colusa Canal to an on-farm pipe and then to Rice Creek. Potential recharge amounts have not been quantified.

Middle Fork Hall Creek: This project would involve conveying water from an outlet in the Corning Water District to an on-farm unlined ditch to the Middle Fork Hall Creek. Potential recharge amounts have not been quantified.

Duck Ponds: This project would involve conveying water from an outlet on the Corning Water District to farmland within the Subbasin. Potential recharge amounts have not been quantified.

Rolling Hills Casino: This project would involve conveying water to Brannin Creek from the Corning Canal. Potential recharge amounts have not been quantified.

Corning WD -NW Corning: This project would involve conveying water from the Corning Water District outlet to farmland. Potential recharge amounts are estimated to be a maximum of 23 AFY.

North Thomas Creek: This project would involve conveying water pumped from Thomas Creek directly into recharge area + 3-mile ditch. Potential recharge amounts are estimated to be a maximum of 40 AFY + 3 miles.

5.4.4 California Olive Ranch (GSP Section 7.4.4.4)

This project involves diverting water from the Tehama-Colusa Canal through existing irrigation canals into existing unlined basins where it can percolate to groundwater and be used for direct recharge. Progress since 2022 includes investigating potential water sources, one of which could be Section 215 flood flows, identifying the frequency of the recharge, and developing the infrastructure needed for this project.

5.5 GSP Management Action Implementation Progress

Below are Management Action Updates and their progress in implementation since the last Annual Report.

5.5.1 Well Management Program: Well Inventory (GSP Section 7.3.1.1)

Tehama County GSA is in its second year of administering a well registration program that provides information about the location, number, and construction of wells. It will also eventually provide a source of funding for GSP implementation and a future well mitigation program.

5.5.2 Well Management Program: Well Incident Reporting System (GSP Section 7.3.1.1)

Glenn County developed a robust well incident reporting system which includes the Glenn County portion of the Subbasin. This system records reported water supply issues due to wells running dry or other related well maintenance issues. Data from this system would allow for analysis of areas with declining groundwater elevations, communication could then be targeted to owners/ drillers of wells in impacted areas.

5.5.3 Policy and Ordinances that Control Pumping Growth (GSP Section 7.3.1.3)

Glenn County Environmental Health (Glenn County), in coordination with CSGSA, , has revised the well permitting process which impacts the Glenn County portion of the Subbasin. The revised well permitting process evaluates proposed non-exempt wells (ex: non-domestic wells: agricultural, municipal, etc) based on predicted impacts to various sustainability criteria. Wells are evaluated based on a 3-Tiered analysis. Wells with lower predicted impacts are approved at Tier 1, while those with greater predicted impacts are subject to a Tier 2 or Tier 3 Well Impact Analysis to ensure they do not adversely impact neighboring domestic wells. All non-exempt wells permitted since the approval of the revised permitting process in June of 2023 have been subject to this analysis prior to a permit being issued.

6 CONCLUSIONS

The Tehama County GSA and CSGSAs adopted and submitted the GSP to DWR in January 2022 and continue to actively work on sustainable groundwater management in the Subbasin directly with their partners. As presented in **Section 5** of this report, recent progress made on activities applicable to the GSAs demonstrates the commitment of the GSAs to implement the GSP by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the Corning Subbasin.

7 REFERENCES

California Department of Water Resources (DWR). 2018. 5-021.74 Sacramento Valley-Corning Basin Boundaries Description. Retrieved at: https://data.cnra.ca.gov/dataset/ca-gw-basin-boundary-descriptions/resource/2385b4bd-4858-4902-b98d-19936ee3f21e.

California Department of Water Resources (DWR). 2023. Periodic Groundwater Level Measurements - Datasets - California Natural Resources Agency Open Data. Downloaded February 2023. Available at: https://data.cnra.ca.gov/dataset/periodic-groundwater-level-measurements.

California Department of Water Resources (DWR). 2024. TRE ALTAMIRA InSAR Subsidence Data. Available At: https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence.

California State Water Resources Control Board. 2023a. Electronic Water Rights Information Management System (eWRIMS). Accessed March 13, 2023. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/ewrims/.

California State Water Resources Control Board (SWRCB). 2023b. Groundwater Ambient Monitoring and Assessment Program. Available at: https://www.waterboards.ca.gov/gama/.

California Water Service (Cal Water Chico). 2020. 2020 Urban Water Management Plan's (UWMP) 2020 Chico-Hamilton City District. Available at: https://www.calwater.com/docs/uwmp2020/CH_2020_UWMP_FINAL.pdf.

Tehama County Flood Control and Water Conservation District Groundwater Sustainability Agency (Tehama County GSA) and Corning Sub-Basin GSA for the Corning Subbasin (CSGSA)(Tehama County and CSGSAs). 2022. Corning Sub-basin Groundwater Sustainability Plan. Prepared by Montgomery and Associates. Available at: https://sgma.water.ca.gov/portal/gsp/preview/94.

Tehama County Flood Control and Water Conservation District Groundwater Sustainability Agency (Tehama County GSA) and Corning Sub-Basin GSA for the Corning Subbasin (CSGSA) (Tehama County and CSGSAs). 2023. WY 2022 Corning Sub-basin Groundwater Sustainability Plan Annual Report. Prepared by Luhdorff and Scalmanini Consulting Engineers. Available at: https://sgma.water.ca.gov/portal/gspar/preview/209.

Towill. 2023. InSAR Data Accuracy for California Groundwater Basins CGPS Data Comparative Analysis January 2015 to October 2022. Available At: https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence/resource/b9f6f30b-e998-4cf1-b4e1-5d530356f172.