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WYANDOTTE CREEK SUBBASIN (5-021.69) GROUNDWATER SUSTAINABILITY PLAN ANNUAL REPORT – 2023

SUBMITTED BY

Wyandotte Creek
GROUNDWATER SUSTAINABILITY AGENCY

WYANDOTTE CREEK
GROUNDWATER SUSTAINABILITY AGENCY

PREPARED UNDER CONTRACT WITH

BUTTE COUNTY DEPARTMENT OF
WATER AND RESOURCE CONSERVATION

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
µS/cm	micro siemens per centimeter
AEM	airborne electromagnetic
AF	acre-feet
AFY	acre-feet per year
AMSL	above mean sea level
BBGM	Butte Basin Groundwater Model
Cal Water	California Water Service
DMS	Data Management System
DWR	Department of Water Resources
EC	electrical conductivity
GSP	Groundwater Sustainability Plan
GSA	Groundwater Sustainability Agency
IM	Interim Milestone
MA	management area
MO	Measurable Objective
MT	Minimum / Maximum Threshold
PMAs	projects and management actions
RMS	representative monitoring site
SFWPA	South Feather Water and Power Agency
SI	sustainability indicator
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criteria
Subbasin	Wyandotte Creek Subbasin
TWSD	Thermalito Water and Sewer District
WY	Water Year (October 1-September 30)

EXECUTIVE SUMMARY

The Wyandotte Creek Subbasin (Subbasin) (5-021.69) Annual Report was prepared on behalf of the Wyandotte Creek Groundwater Sustainability Agency (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 GSA is formed through a Joint Powers Agreement (Agreement) of three member agencies, including Butte County, the City of Oroville, and Thermalito Water and Sewer District. 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 (October 1, 2022, to September 30, 2023) for the Wyandotte Creek Subbasin, located within Butte County, and shown in **Figure ES-1.**

Measured conditions in the Subbasin were in compliance with Minimum/Maximum Thresholds (MTs) for all applicable sustainability indicators (SIs), with two exceptions, wells 18N04E19D001M and 18N04E19D002M, which had electrical conductivity (EC) levels at 6,640 micro siemens per centimeter (µS/cm) and 5,474 µS/cm, respectively. Upon completion in 2021, both new wells had high baseline measurements of 3,910 µS/cm and 2,480 µS/cm, respectively. An MT is a quantitative value that represents the groundwater conditions at a representative monitoring site that, when exceeded individually or in combination with minimum thresholds at other monitoring sites, may cause an undesirable result(s) in the basin per DWR's definition. If groundwater levels are lower than the value of the Measurable Objective (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 EC concentrations increase from the MO established for that site, they are moving in the direction of the MT. The SIs and sustainable management criteria (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 representative monitoring sites (RMS).

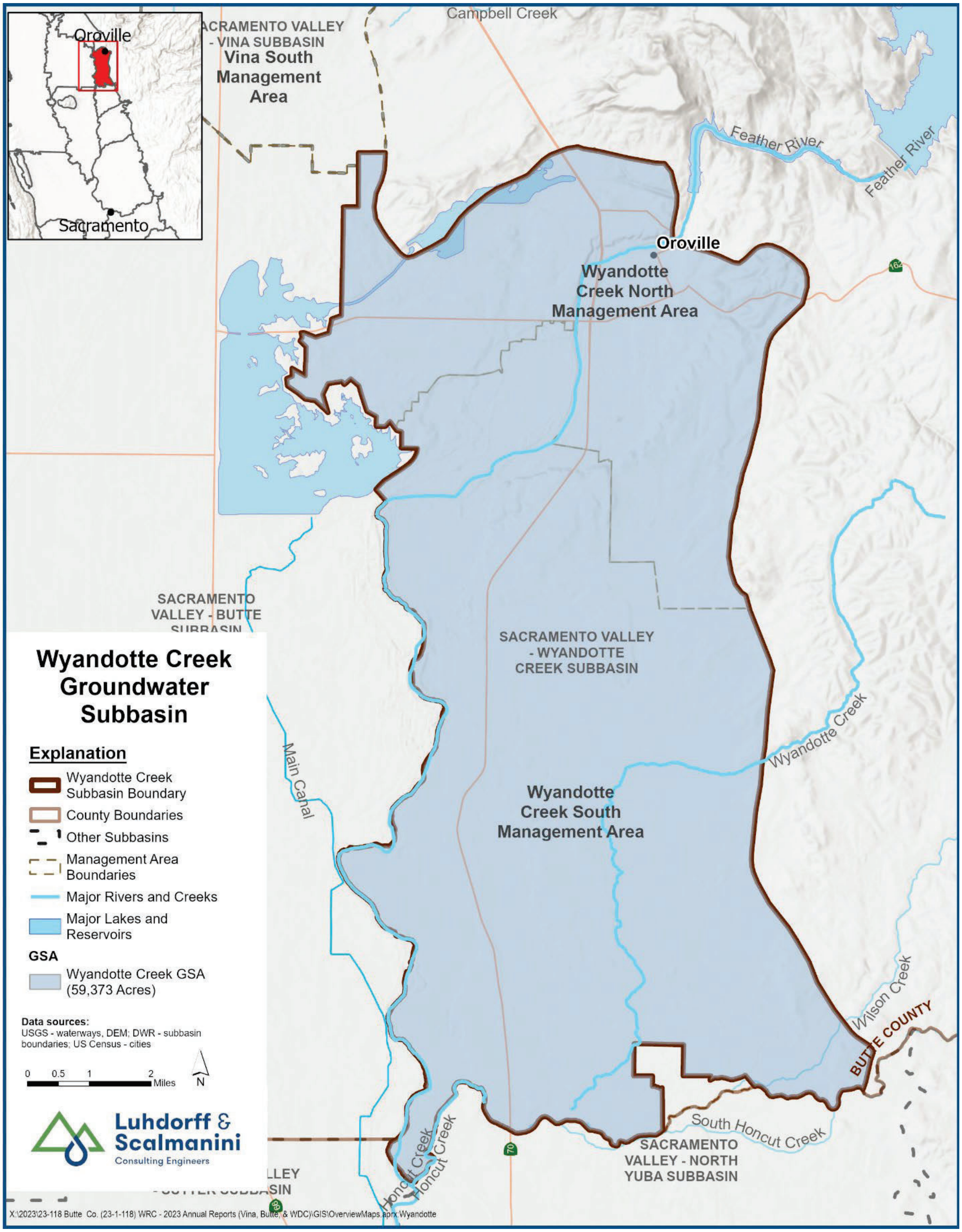

Figure ES-1. Subbasin and Groundwater Sustainability Agency Boundaries

Table ES-1. Sustainability Indicator Summary

2023 Status	Undesirable Result Identification	Measurable Objective (MO) Definition	Minimum Threshold (MT) Definition
Chronic Lowering of Groundwater Levels			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	When 2 RMS wells within a management area reach their MT for two consecutive non-dry year types	The groundwater level based on the groundwater trend line for the dry periods (over the period of record) of observed short-term climatic cycles extended to 2030	Elevation based on the 15th percentile of shallowest domestic wells using refined DWR database (includes wells installed since 1980) based on the elevation of the bottom of the wells within a 3-mile radius of the RMS well
Reduction of Groundwater Storage			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.
Degraded Water Quality			
No indication of undesirable results In August of 2023, a non-dry year, 2 of 7 RMS wells had EC levels above their MTs. Multi-completion wells 18N04E19D001M and 18N04E19D002M had EC levels at 6,640 µS/cm and 5,474 µS/cm, respectively. Upon completion in 2021, both new wells had high baseline measurements of 3,910 µS/cm and 2,480 µS/cm, respectively. The first year of monitoring, 2022, was a dry year.	When 2 RMS wells exceed their MT for two consecutive non-dry years	Measured electrical conductivity less than or equal to the recommended Secondary Maximum Contaminant Level (900 µS/cm) based on State Secondary Drinking Water Standards at each well	The upper limit of the Secondary Maximum Contaminant Level for electrical conductivity (1,600 µS/cm) is based on the State Secondary Drinking Water Standards.

Table ES-1. Sustainability Indicator Summary

2023 Status	Undesirable Result Identification	Measurable Objective (MO) Definition	Minimum Threshold (MT) Definition
Land Subsidence			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.
Depletion of Interconnected Surface Water			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Uses groundwater levels as a proxy. GSP identifies the data gap and describes the "Interconnected Surface Water Sustainable Management Criteria Framework."	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.

Notes:

Salinity is the primary water quality constituent of concern, which is evaluated by measuring electrical conductivity (EC).

MO = Measurable Objective, MT = Minimum Threshold, RMS = representative monitoring site, µS/cm = micro siemens per centimeter

Current Groundwater Level and Storage Conditions

The current groundwater conditions in the Subbasin are characterized by groundwater elevations that have remained consistently near or above the MO, staying well above the corresponding MT and remaining within the Subbasin's established margin of operational flexibility for each RMS well. Importantly, none of the RMS wells experienced a decline below the MT for two non-dry WYs, hence avoiding undesirable results as defined in the GSP.

Groundwater elevations are, on average, 39 feet above the MT throughout the Subbasin and on average, 14 feet above the MOs in WY 2023. Elevations are mostly near or slightly higher than those observed in recent years. This positive trend is influenced by the wet conditions experienced in WY 2023, which resulted in increased surface water supplies and reduced groundwater extractions.

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.

In contrast, WY 2023, classified as a Wet WY (CDEC, 2023), marked an increase in groundwater storage of approximately 22,300 acre-feet (AF) in the Primary Aquifer (a 269% change from the previous WY). For context, in the past 23 years, the largest decrease in groundwater storage is estimated to be -28,800 AF, and the greatest increase was estimated to be 36,500 AF. **Figure ES-2** shows groundwater pumping, as well as annual and cumulative change in groundwater storage from WY 2000 to WY 2023.

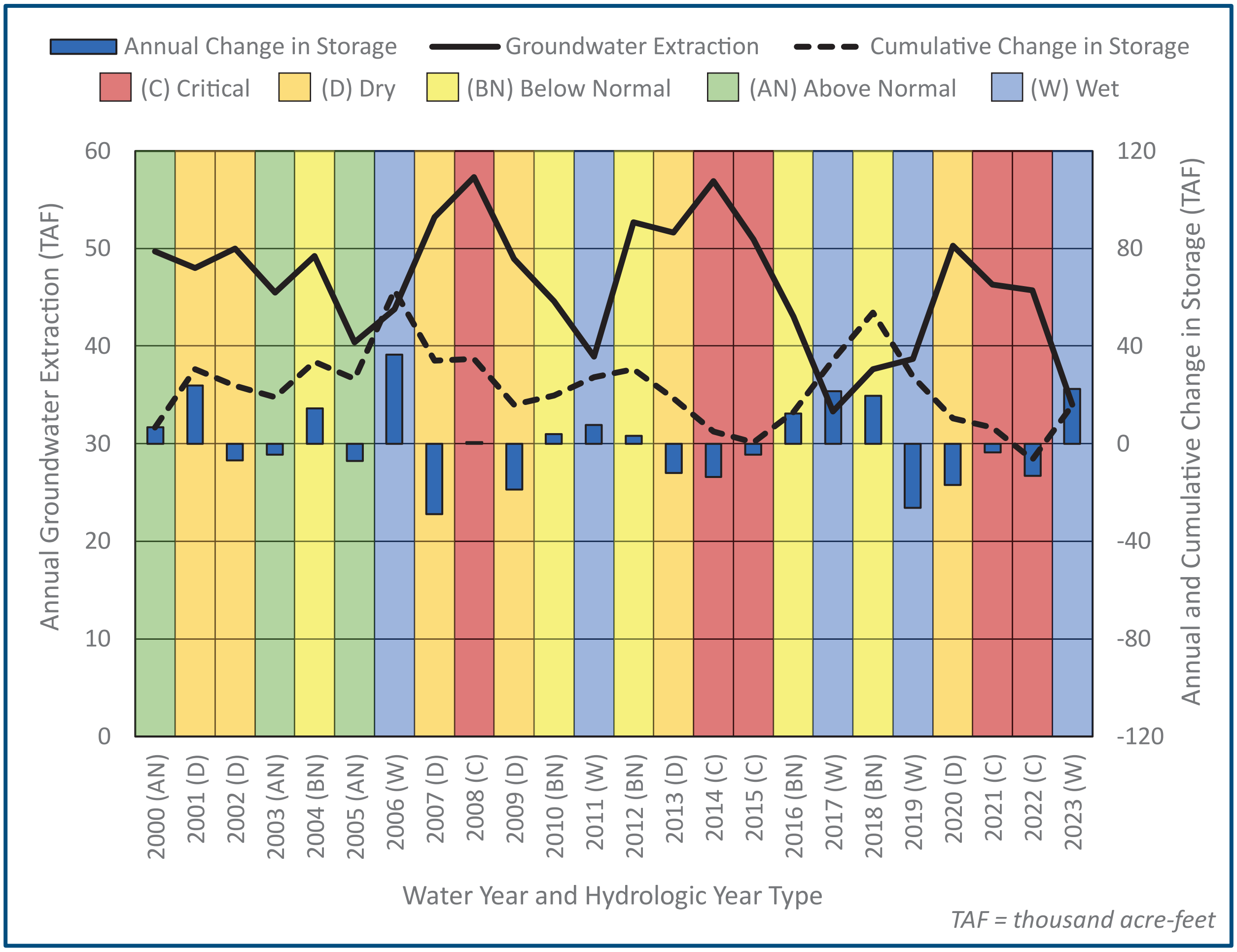

Figure ES-2. Groundwater Pumping, Annual and Cumulative Change in Storage from WY 2000 to WY 2023

Water Use

Groundwater extraction was approximately 34,500 AF in WY 2023, lower than the 45,700 AF extracted in WY 2022. The annual volume of surface water delivered to the Subbasin from surface water features such as the Feather River was about 22,400 AF in WY 2023, higher than the 16,200 AF delivered in WY 2022.

Groundwater provided the majority (61%) of the water for agriculture in the Subbasin, and surface water was the source for the remainder. Groundwater also met the demand for municipal and rural residential users in WY 2023. 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.

Table ES-2. Total Water Use by Water Use Sector				
Sector	WY 2023			
	Groundwater (AF)	Surface Water (AF)	Total (AF)	Total Irrigated Area (ac)
Agricultural	32,900	17,400	**50,300**	**13,700**
Municipal	600	5,000	**5,600**	--
Rural Residential	1,000	0	**1,000**	--
Total	**34,500**	**22,400**	**56,900**	**13,700**

GSP Implementation Progress

Since the previous Annual Report (Butte County, 2023), the Wyandotte Creek GSA has 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. An awards list for the grant application was released by DWR in September 2023. Additionally, several actions by the GSA 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 previous Annual Report, DWR has formally approved the Wyandotte Creek Subbasin GSP. The Wyandotte Creek Subbasin GSA acknowledges and will address the five key recommended corrective actions listed in the DWR's **GSP determination letter** (https://sgma.water.ca.gov/portal/service/gspdocument/download/9924), including:

1. Providing additional information on historical and current groundwater quality conditions in the Subbasin and refining the definition of sustainable management criteria through a number of actions further described in the letter.

2. Providing more information regarding criteria used to identify significant and unreasonable conditions, undesirable results, and the potential impacts to various beneficial uses and users of groundwater related to the chronic lowering of groundwater level minimum thresholds through a number of actions further described in the letter.

3. Revising the definition of undesirable results to remove the non-dry year condition or discuss how degradation during dry periods will be managed as necessary to ensure that adverse water quality conditions are offset during other periods.

4. Providing more information about the criteria used to identify undesirable results and sustainable management criteria for land subsidence through a number of actions further described in the letter.

5. Using future DWR guidance regarding estimations of the location, quantity, and timing of depletions of interconnected surface water and establishing specific sustainable management criteria to sustainably manage depletions of interconnected surface water through a number of actions further described in the letter.

In 2023, the GSAs in the Subbasin prepared to implement future projects to address recommended corrective actions, which will be largely funded by the SGM Implementation Grant Program. The ongoing implementation of PMAs, described 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 Wyandotte Creek Subbasin (Subbasin) (5-021.69) was prepared on behalf of the Wyandotte Creek Groundwater Sustainability Agency (GSA) 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 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 (October 1, 2022 to September 30, 2023). The public seeking information on Wyandotte Creek Subbasin and GSP Implementation, Wyandotte Creek Advisory Board meeting schedules and recordings, and other resources should visit the **Wyandotte Creek Groundwater Sustainability Agency website** (https://www.wyandottecreekgsa.com/).

1.1 Report Contents

This report is the third Annual Report prepared for the adopted Wyandotte Creek Subbasin GSP submitted in January 2022. 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 2022, 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 93 square mile (59,382 acres) area on the southeastern side of Butte County. The Subbasin is managed by the Wyandotte Creek GSA, formed through a Joint Powers Agreement (Agreement) by three member agencies, including Butte County, the City of Oroville, and Thermalito Water and Sewer District. The GSA worked to develop and submit a GSP for the Subbasin and to submit Annual Reports every year.

The Agreement defines two Management Areas (MAs) within the Wyandotte Creek Subbasin: Wyandotte Creek Oroville and Wyandotte Creek South. An MA refers to an area within a subbasin for which a GSP may identify different minimum thresholds (MTs), measurable objectives (MOs), monitoring, and projects and management actions (PMAs) based on unique local conditions or other circumstances as described in the GSP regulations. The interests and vulnerability of stakeholders and groundwater uses in these MAs vary based on the nature of the water demand (agricultural, domestic, municipal), numbers and characteristics of wells supplying groundwater, and to some degree, the hydrogeology and mix of recharge sources. Although all stakeholders have a shared interest in the sustainable management of groundwater in this predominantly groundwater-dependent Subbasin, the landscape of beneficial users varies between Mas.

The Wyandotte Creek North MA is predominantly an urban area with three water providers, including California Water Service, Oroville (Cal Water-Oroville) and Thermalito Water and Sewer District (TWSD), providing ground and surface water supplies for residential and municipal/industrial use and South Feather Water and Power Agency (SFWPA) providing surface water supplies for agricultural, residential and municipal/industrial use. The Wyandotte Creek South MA is dominated by irrigated agriculture dependent on groundwater and, to a lesser extent, surface water diversions primarily from Feather River. To a limited extent, private domestic wells provide the primary source of water to households or, in some cases, provide a secondary supply for outdoor water use.

The Subbasin Is shown in **Figure 1-1** and **Figure 1-2**. The Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin, **Figure 1-1**. The Subbasin's northern and eastern boundary is the alluvial basin, the western boundary is the Feather River and the Thermalito Afterbay, and the southern boundary is the Butte-Yuba County line (except for Ramirez Water District, which is fully within the North Yuba Subbasin) (DWR, 2018) **Figure 1-2**. The major surface water feature located in the Subbasin is the Feather River, which flows along the Subbasin's western border. Smaller local streams entering and traversing the Subbasin include North Honcut Creek, Wyandotte Creek, and Wyman Ravine. Groundwater generally flows from north to southwest.

The Wyandotte Creek Subbasin GSP estimates the sustainable yield of the Subbasin to be 46,100 acre-feet per year (AFY) based on historical groundwater pumping averages of 47,100 AFY and an average annual decrease in storage of 1,000 AFY (Geosyntec, 2021). In WY 2023, water use in the Subbasin is dominated (88%) by agricultural uses, including irrigation of nut and fruit trees, vineyards, row crops, grazing, and rice fields. Municipal and household water use accounts for about 12% of total water used. Groundwater constitutes the majority (61%) of the Subbasin's water supplies, while surface water constitutes about 39%.

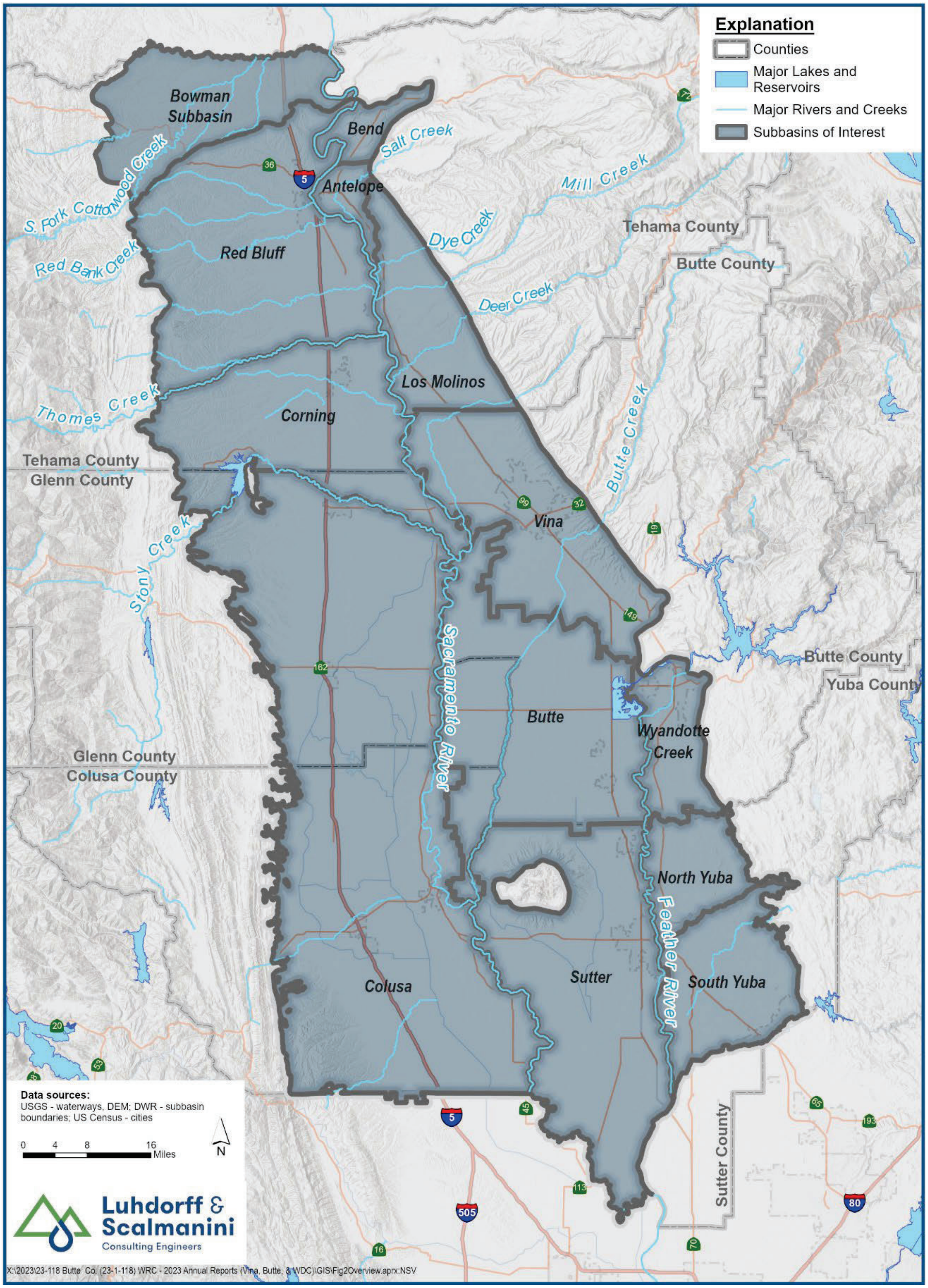

Figure 1-1. Subbasins in the Northern Sacramento Valley

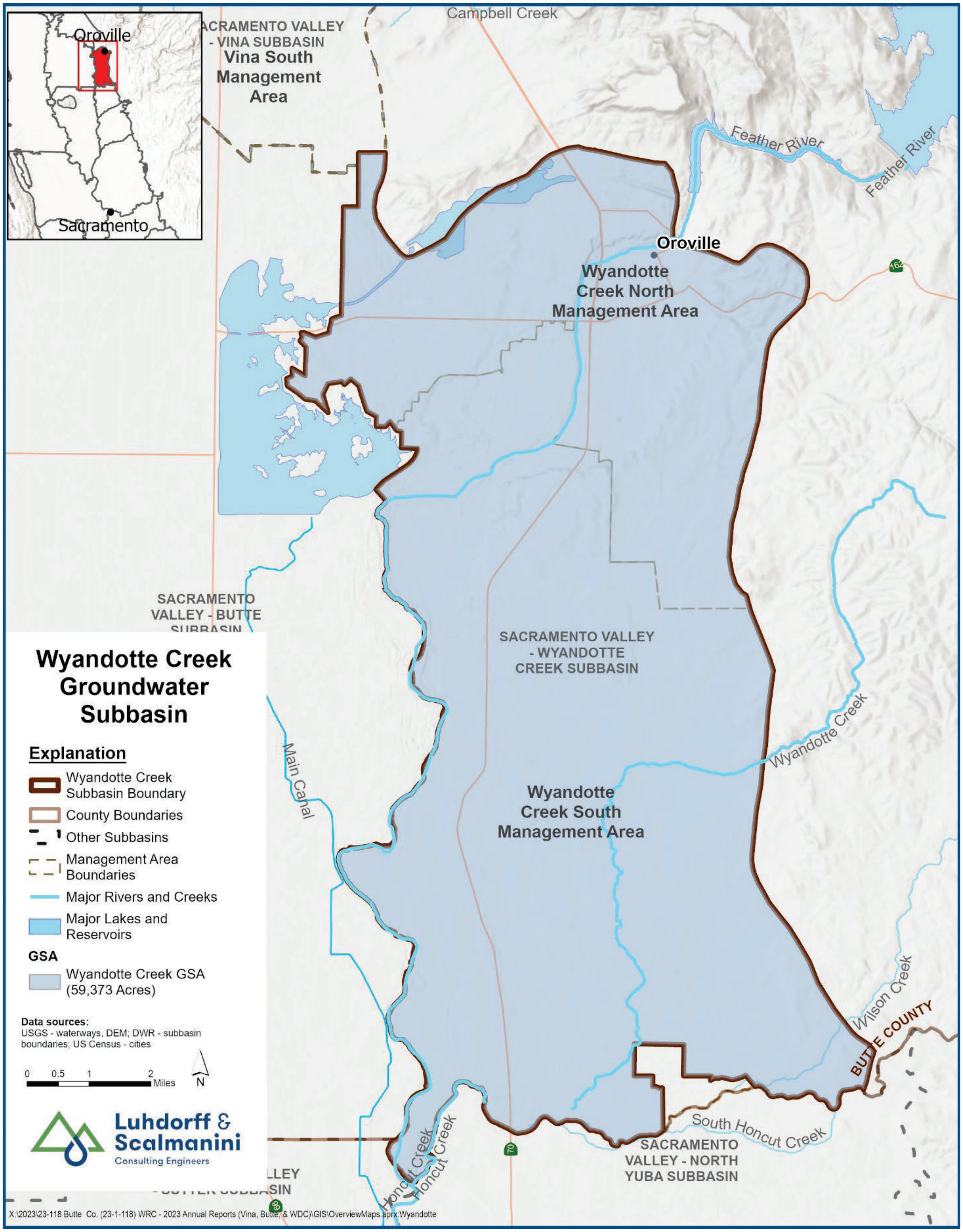

Figure 1-2. Groundwater Sustainability Agency Boundaries

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 (such as rice flood-up), 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 follow a variety of patterns in different areas of the Subbasin; however, groundwater generally ranges from about 40 to 80 feet below ground surface and is relatively stable in most of the Subbasin.

Groundwater levels in the Subbasin are monitored in representative monitoring site (RMS) wells that were selected in the GSP to represent localized groundwater conditions for specified areas of the Subbasin. RMS wells include a mixture of domestic wells, irrigation wells, and dedicated observation wells. In total, nine RMS wells are used to monitor conditions in the Primary Aquifer. **Appendix A** includes a map of the approximate locations of the RMS wells and hydrographs depicting groundwater elevations in the RMS wells. Sustainable management criteria (SMC), described in **Appendix B**, are assigned for groundwater levels at the RMS wells.

Certain RMS wells measured by DWR and Butte 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 twice in Spring and Fall but up to four times each year in March, July, August, 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 from RMS wells in the Primary Aquifer systems are summarized in **Table 5-2**. Groundwater elevation data in the Subbasin is collected by DWR and Butte 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 Wyandotte Creek Subbasin GSP. Depending on the well, groundwater elevations are measured using steel tape, electric sounder, or pressure transducers. The accuracy of groundwater level measurements is typically either 0.01 feet or 0.1 feet, depending on the equipment used.

The following 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**).

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

Groundwater elevation contour maps for Spring and Fall 2023 were prepared for the Primary Aquifer, as shown in **Figures 2-1** through **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 Primary Aquifer (**Figures 2-1 and 2-2**) each show that groundwater elevations are generally higher in the northern and eastern areas of the Subbasin versus the southern and western areas, indicating a general gradient – and thus groundwater flow from north to south and northeast to southwest. In general, elevations in Fall 2023 tend to be roughly eight feet lower than elevations in Spring 2023 throughout the Subbasin; groundwater levels are typically lower in the fall in valley floor locations due to irrigation season pumping. However, groundwater levels have increased relative to the same season in the prior year (e.g., Spring 2022 to Spring 2023) for both Spring and Fall measurements due to increased precipitation in 2023. Maps showing the regional context of groundwater contours, including groundwater contours in the Wyandotte Creek, Vina and Butte Subbasins, are included in **Appendix A**.

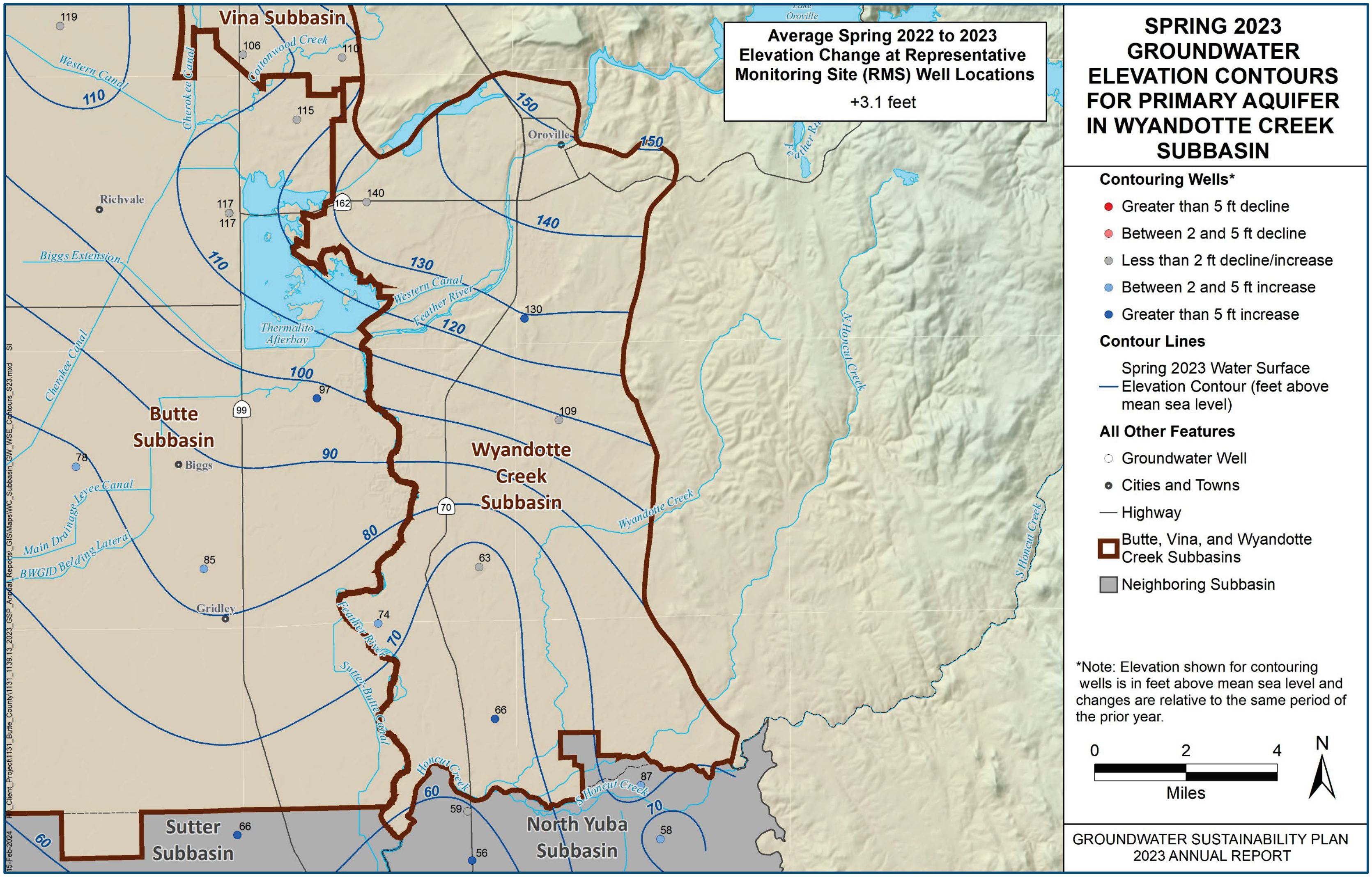

Figure 2-1. Contours of Equal Groundwater Elevation for the Primary Aquifer, Spring 2023 (Seasonal High)

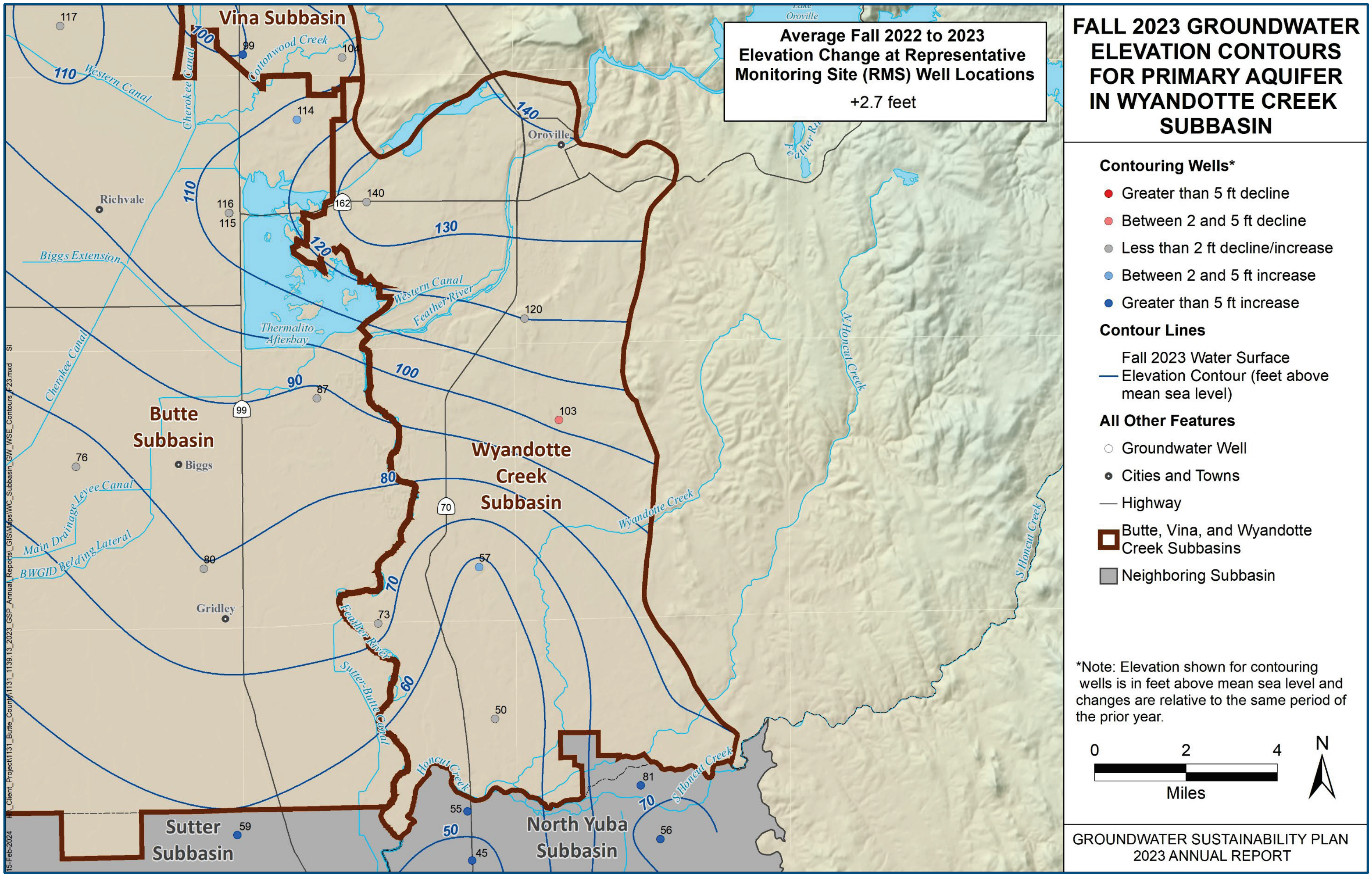

Figure 2-2. Contours of Equal Groundwater Elevation for the Primary Aquifer, Fall 2023 (Seasonal Low)

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

Groundwater elevation hydrographs for each RMS well are presented in **Appendix A**. **Appendix B** provides an explanation of the SMC terminology defined in Section 3 of the GSP (e.g., MT, MO, Interim Milestone [IM]). **Table 5-1** summarizes the MOs, MTs, and identification of undesirable results 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 RMS well. **Table 5-2** also summarizes where each RMS well is located, the established MO and MT for groundwater elevations, the Interim Milestone for 2027, the changes in groundwater elevations from WY 2022 to WY 2023, and the differences between the 2023 groundwater elevations and the MO.

Groundwater levels have historically remained at or near the MOs in the Subbasin. The GSP established IMs equal to the MOs to provide numerical metrics for the GSA to track the Subbasin's conditions relative to the overall sustainability goal, ensuring that the groundwater management in the Subbasin remains sustainable.

Spring and Fall 2023 groundwater elevations were generally near or slightly higher than seasonal groundwater elevations in previous years, particularly WY 2022. In WY 2023, the average seasonal high was 106 feet above mean sea level (AMSL), and the average seasonal low was 99 feet AMSL. The WY 2022 average seasonal high was 103 feet AMSL, and the average seasonal low was 96 feet AMSL. Increases in groundwater levels generally were expected to result from the decreased groundwater extraction in WY 2023 relative to WY 2022, as well as increased recharge due to wet climate conditions.

In total, all RMS wells remained above the MO as of Spring 2023, and all groundwater levels in the Fall of 2023 were at or above the MO. All measured groundwater elevations remained above the corresponding MT of that RMS well, avoiding undesirable results related to groundwater levels as defined in the GSP. On average, groundwater levels in RMS wells were roughly 35 feet higher than MT elevations in Fall 2023. All measured groundwater levels remained within the Subbasin's margin of operational flexibility and above the MTs.

3. WATER SUPPLY AND USE

As required by §356.2, this section summarizes water supply and use in the Subbasin, categorized by groundwater supply, 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 uses groundwater supplies for agricultural irrigation, although portions of the Subbasin may rely on surface water for irrigation. In years characterized by drought and low precipitation, diminished surface water supplies lead to increased extraction and reduced recharge and can cause a decline in groundwater storage. Contrastingly, in wet years, such as WY 2023, substantial surface water supplies help to increase recharge and offset extraction and can increase groundwater storage.

Municipal water users extracted approximately 600 acre-feet (AF) of groundwater in the Subbasin in WY 2023. Municipal water supplies are measured and provided by Cal Water-Oroville, TWSD. The record of municipal supplies does not distinguish between urban and industrial water uses.

Table 3-1. Groundwater Use by Water Use Sector

Sector	WY 2023 (AF)
Agricultural	32,900
Municipal	600
Rural Residential	1,000
Total	34,500

Rural residential water users rely on private domestic wells to meet their household water needs and extracted approximately 1,000 AF in WY 2023. 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) was 181 gallons per capita per day. This is considered representative of rural residential per capita water use in the region. Parcels were chosen within the Subbasin, except for those in municipal service areas. Residential parcels were selected based on Butte County's general plan zoning codes from the general plan. 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 34,500 AF in WY 2023, the majority of which was used to meet agricultural water demands (approximately 32,900 AF). The total groundwater extraction is about 12,300 AF less than the historical (2000 – 2022) groundwater pumping average (46,800 AFY; **Table 4-1**) and also lower than 38,700 AF, which was the average annual extraction of the last four wet WYs on record (2006, 2011, 2017, and 2019). **Figure 3-1** shows the general areas and pumping rates where extraction occurs by sector. About 95% of the total groundwater extraction was used by the agricultural sector, while the remaining 5% was used for municipal and rural residential needs.

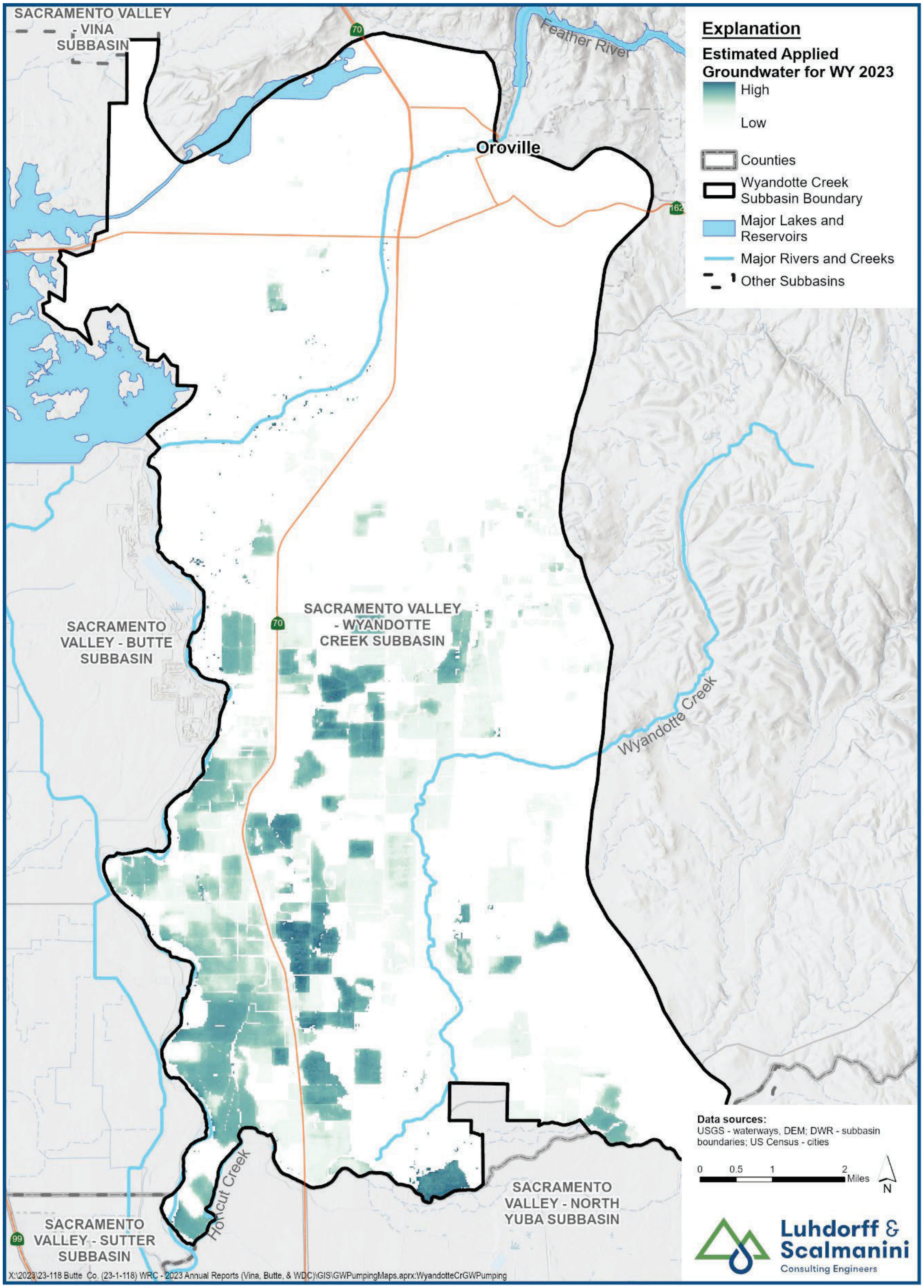

Figure 3-1. Estimated Applied Groundwater – WY 2023

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.

Diversions from the Feather River and Honcut Creek outside of district areas are estimated based on the historic State Water Resources Control Board's (SWRCB) Electronic Water Rights Information Management System (eWRIMS; SWRCB, 2023) data for total diversions. For the appropriative water rights outside of surface water suppliers, the face value of the water right was taken and multiplied by a local factor of 59%. The local factor is based on an overview of measured deliveries in the area.
Surface water is a significant source of water supply for municipal and/or industrial use (municipal and industrial use are not differentiated). In total, approximately 22,400 AF of surface water was applied for beneficial uses in the Subbasin in WY 2023, supplying approximately 35% of the water used by agriculture and 89% of the water used by the municipal sector. This includes surface water sourced from the Feather River and Honcut Creek. Although both diverted and applied water volumes are shown in **Table 3-2**, the volumes shown are equivalent for each. Surface water use volumes were assembled from multiple sources, and not enough information is currently known to estimate the differences between diverted and applied volumes that are influenced by data source and supplier-specific characteristics such as conveyance losses and water reuse.

In contrast with the curtailments and reduced surface water supplies experienced in WY 2022, WY 2023 was a Wet WY with substantial surface water supplies. These, combined with wet climate conditions and increased stream flows, supported groundwater recharge and offset groundwater extraction volumes compared to WY 2022.

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

Sector	Diverted (AF)	Applied (AF)
Agricultural	17,400	17,400
Municipal	5,00	5,000
Total	**22,400**	**22,400**

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

Groundwater supplied approximately 65% of the agricultural water demand in the Subbasin in WY 2023, while surface water supplied the remaining approximately 35% of the agricultural water demand. 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** also shows the total irrigated area in WY 2023 within the Subbasin.

Table 3-3. Total Water Use by Water Use Sector				
Sector	WY 2023			
	Groundwater (AF)	Surface Water (AF)	Total (AF)	Total Irrigated Area (ac)
Agricultural	32,900	17,400	**50,300**	**13,700**
Municipal	600	5,000	**5,600**	--
Rural Residential	1,000	0	**1,000**	--
Total	**34,500**	**22,400**	**56,900**	**13,700**

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			
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 Subbasin.*

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 RMS well hydrographs (**Appendix A**) indicates that groundwater elevations are relatively stable over time. 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 is 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 23,300 AF. Decreased groundwater extraction in WY 2023 relative to WY 2022 contributed to the increase, 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 2000 through WY 2023 in **Table 4-1** and **Figure 4-1**. In contrast to the Critically Dry conditions of WY 2022, WY 2023 was a Wet WY and correspondingly saw an increase in groundwater storage of approximately 22,300 AF in the Primary Aquifer.

The historical record since 2000 includes multiple data sources. Groundwater extractions for WY 2000 through WY 2018 were obtained from the Butte Basin Groundwater Model (BBGM, BCDWRC, 2021), and the water budgets were prepared as part of the Wyandotte Creek Subbasin GSP (Geosyntec, 2021). The WY 2019 and WY 2020 groundwater extraction values were calculated as the average based on the hydrologic year type from WY 2000 to WY 2018. The WY 2021 and WY 2022 groundwater extraction values were obtained from prior Annual Reports and were developed using the same methods as WY 2023, as described in **Section 3** and **Appendix E**. Groundwater extractions for the entire period include pumping for agricultural, municipal, and rural residential purposes.

The annual and cumulative changes in groundwater storage are both calculated for the period from WY 2000 through WY 2023 based on the methodology described below in **Section 4.2**. This methodology differs from the change in groundwater storage estimates available through the BBGM. An evaluation of a total of 20 pairs of concurrent annual storage changes over the period from WY 1999 through WY 2018 was assembled from the BBGM, and the methodology described in **Section 4.2** was completed to evaluate the consistency of the new methodology with the BBGM results. Although groundwater storage changes differ in some cases, the general trends are similar, and there is agreement between the methodologies. It is anticipated that the methodology described in **Section 4.2** will be utilized for Annual Report updates until the BBGM model is updated from 2018 through the present (anticipated to be completed 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)
Storage Change and Cumulative Change in Storage			
2000 (AN)	49,700	6,600	6,600
2001 (D)	48,000	23,800	30,400
2002 (D)	50,000	-6,800	23,600
2003 (AN)	45,500	-4,600	19,000
2004 (BN)	49,200	14,500	33,500
2005 (AN)	40,400	-7,100	26,400
2006 (W)	43,800	36,500	62,900
2007 (D)	53,200	-28,800	34,100
2008(C)	57,300	600	34,700
2009 (D)	48,900	-18,800	15,900
2010 (BN)	44,600	3,800	19,700
2011 (W)	38,900	7,600	27,300
2012 (BN)	52,700	3,300	30,600
2013 (D)	51,600	-12,000	18,600
2014 (C)	56,900	-13,600	5,000
2015 (C)[2]	50,900	-4,600	400
2016 (BN)	43,000	12,400	12,800
2017 (W)	33,300	21,400	34,200
2018 (BN)	37,600	19,500	53,700
2019 (W)	38,700	-26,300	27,400
2020 (D)	50,300	-17,000	10,400
2021 (C)[2]	46,300	-3,700	6,700
2022 (C)[2]	45,700	-13,200	-6,500
2023 (W)	34,500	22,300	15,800

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)
Historic Averages (2000-2022) [3]			
2000-2022 (22 years)	46,800	-300	N/A
Wet (4 years)	38,700	9,800	N/A
Above Normal (3 years)	45,200	-1,700	N/A
Below Normal (5 years)	45,400	10,700	N/A
Dry (6 years)	50,300	-9,900	N/A
Critical (5 years)	51,400	-6,900	N/A

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 values from 2000 to 2018 were determined using BBGM (Geosyntec, 2021). Values for 2019-2020 are averages from that period. Estimates for 2021 were based on a drought impact analysis (**Appendix E**), while estimates for 2022-2023 are based on a GEEEO process, described in the same appendix.*

[2] *Indicates curtailment year with reduced surface water supply allocations to Feather River water districts.*

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

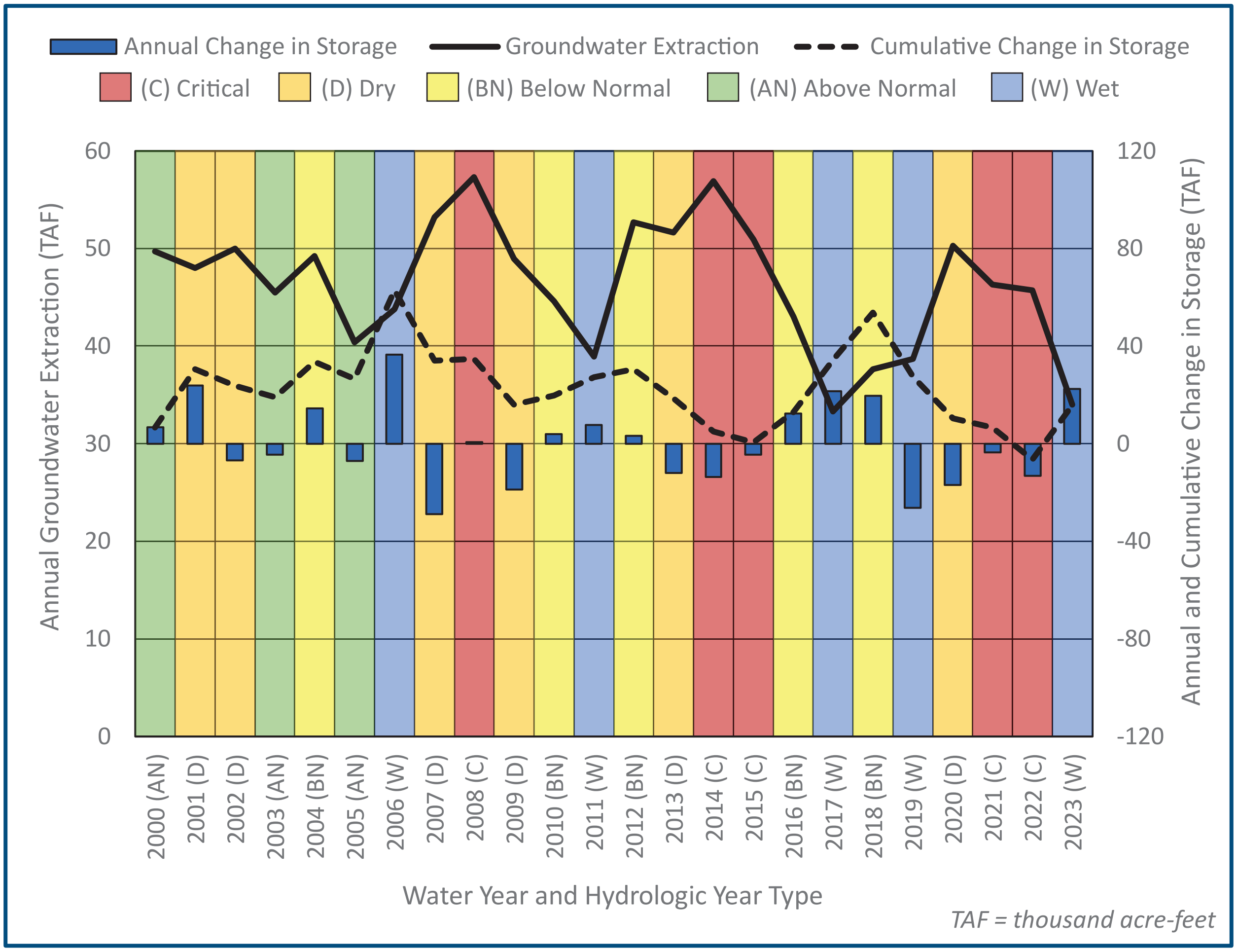

Figure 4-1. Groundwater Pumping and Annual and Cumulative Change in Storage from WY 2000 to WY 2023

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

The spatial distributions of estimated changes in groundwater storage for the Primary Aquifer 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 the change in measured spring-to-spring groundwater levels at each RMS well, multiplied by the area of a Thiessen polygon surrounding that RMS well (defining a representative area for each RMS well) and a representative storage coefficient of 0.1 for the Primary Aquifer.

Spring measurements used to calculate the change in groundwater storage were computed as the average of all available groundwater level measurements from March and April of the respective year. The representative storage coefficient was established by roughly calibrating the estimated change in storage based on changes in observed groundwater levels (i.e., calculated using groundwater level data, representative area, and a storage coefficient parameter) with estimated change in storage outputs from the BBGM, as reported in the GSP to aggregate characteristics across all zones of the Primary Aquifer system. A total of 20 pairs of concurrent annual storage changes assembled from both methods over the period from WY 1999 through WY 2018 were used for calibration. Determination of a representative storage coefficient allows for estimating the change in volume of groundwater storage based on the measured change in groundwater levels and known representative area (i.e., Thiessen polygon) associated with each groundwater level measurement.

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 in storage. As shown in **Figure 4-2**, the change in storage for each representative area (i.e., Thiessen polygon) in the Primary Aquifer over the previous year ranged from roughly zero to 4,000 AF. The representative areas in the northern central and southern portions of the Subbasin had a larger positive change in storage than other parts of the Subbasin. Total groundwater storage change in the Primary Aquifer was estimated to be approximately 22,300 AF between Spring 2022 and Spring 2023.

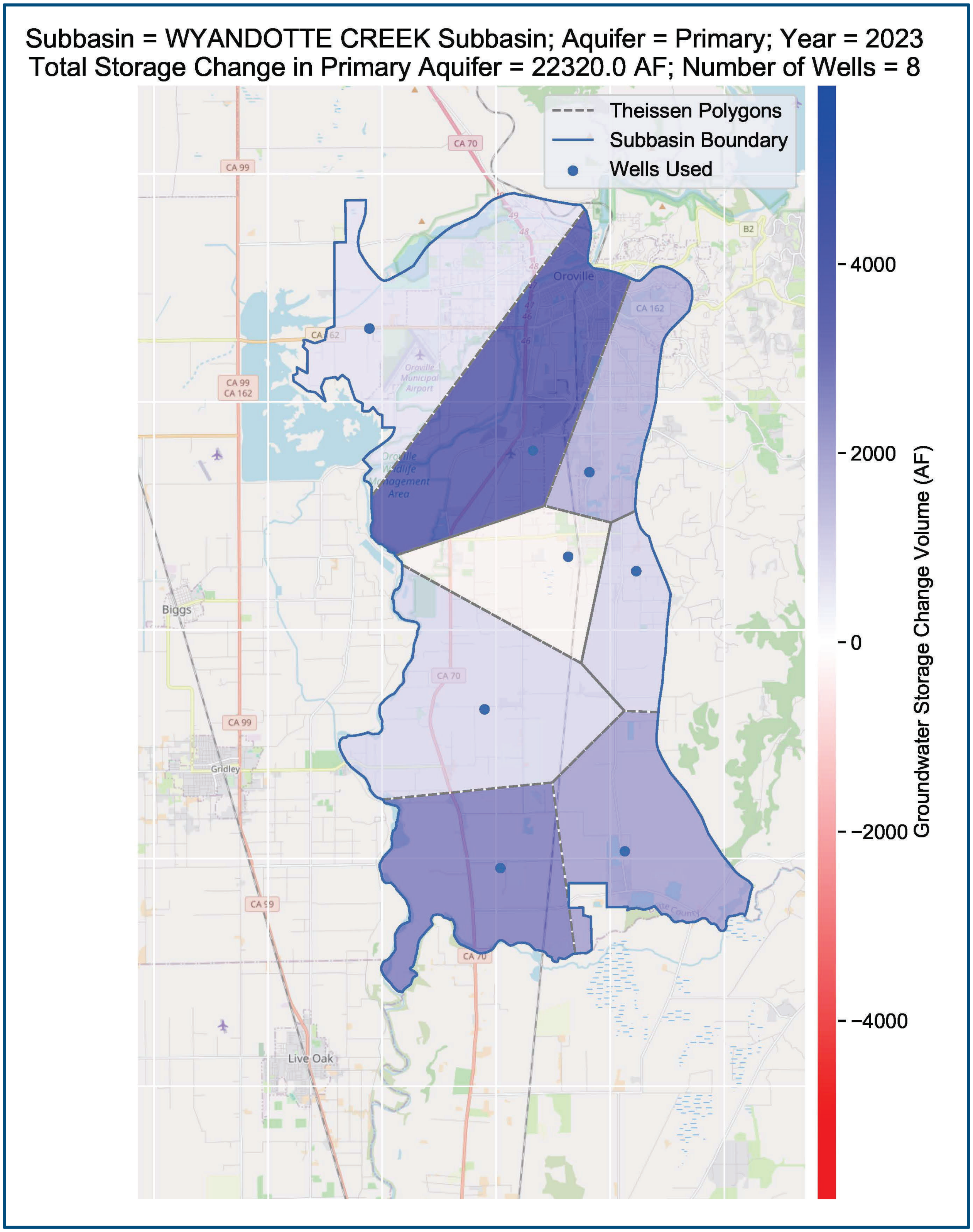

Figure 4-2. Change in Groundwater Storage from Spring 2022 to Spring 2023 in the Primary Aquifer

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 (i.e., Thiessen polygon), and the calibrated storage coefficient parameter used to calculate the change in groundwater storage. As described in **Section 4.2**, a calibration process was conducted to roughly align the estimated change in groundwater storage based on observed groundwater levels to the estimated change in groundwater storage outputs from the BBGM. Thus, the uncertainty of the estimated change in groundwater storage reported in **Table 4-1** and **Figure 4-2** is estimated to be approximately equal to the uncertainty of the estimated change in groundwater storage outputs from the BBGM (typically 20-30% for integrated hydrologic models).

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 GSA completed the WY 2023 Annual Report and other critical tasks.
- The GSA adopted a property-related service fee to fund its operations and implementation costs to comply with SGMA.
- The GSA coordinated a proposal seeking funding through DWR's SGM Grant Program. Coordination efforts included planning and refinement of project and management actions (PMAs), evaluating and ranking PMAs, and preparing and submitting the grant application. The grant application was submitted in December 2022, and DWR released a final awards list in September 2023; results are summarized below in **Table 5-3**.
- 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 be used in future efforts to help 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 water quality SI (see **Appendix F**).
- Progress has been made on nine PMAs since the last annual report (**Tables 5-3 and 5-4**).

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

The GSP was approved in July of 2023, and DWR proposed five recommended corrective actions that will enhance the GSP:

1. Providing additional information on historical and current groundwater quality conditions in the Subbasin, and refining the definition of sustainable management criteria through a number of actions further described in the letter.

2. Providing more information regarding criteria used to identify significant and unreasonable conditions, undesirable results, and the potential impacts to various beneficial uses and users of groundwater related to the chronic lowering of groundwater level minimum thresholds through a number of actions further described in the letter.

3. Revising the definition of undesirable results to remove the non-dry year condition or discuss how degradation during dry periods will be managed as necessary to ensure that adverse water quality conditions are offset during other periods.

4. Providing more information about the criteria used to identify undesirable results and sustainable management criteria for land subsidence through a number of actions further described in the letter.

5. Using future DWR guidance regarding estimations of the location, quantity, and timing of depletions of interconnected surface water and establishing specific sustainable management criteria to sustainably manage depletions of interconnected surface water through a number of actions further described in the letter.

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

5.2 Progress Toward Achieving Interim Milestones

All SIs are in compliance with their MTs, with the exception of Water Quality SI (see summary **Table 5-1**). An MT is a quantitative value that represents the groundwater conditions at an RMS that, when exceeded individually or in combination with MTs at other monitoring sites, may cause a UR in the basin 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 electrical conductivity (EC) 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 have remained near or above their MOs and above their corresponding MTs and, therefore, remained within the Subbasin's margin of operational flexibility established for each RMS well. None of the RMS wells fell below the MT for two non-dry years, hence avoiding undesirable results 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 RMS wells. Generally, groundwater elevations are above the MTs throughout the Subbasin, with elevations mostly near or slightly higher than those observed in recent years (**Appendix A**). This positive trend is attributed to the ongoing recovery in groundwater conditions, facilitated by increased surface water supplies following recent years of cutbacks and curtailments. Spring and Fall 2023 groundwater elevations were all at or above the established MOs (**Table 5-2**).

Table 5-1. Sustainability Indicator Summary

2023 Status	Undesirable Result Identification	Measurable Objective (MO) Definition	Minimum Threshold (MT) Definition
Chronic Lowering of Groundwater Levels			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	When 2 RMS wells within a management area reach their MT for two consecutive non-dry year types	The groundwater level based on the groundwater trend line for the dry periods (over the period of record) of observed short-term climatic cycles extended to 2030	Elevation based on the 15th percentile of shallowest domestic wells using refined DWR database (includes wells installed since 1980) based on the elevation of the bottom of the wells within a 3-mile radius of the RMS well
Reduction of Groundwater Storage			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.
Degraded Water Quality			
No indication of undesirable results In August of 2023, a non-dry year, 2 of 7 RMS wells had EC levels above their MTs. Multi-completion wells 18N04E19D001M and 18N04E19D002M had EC levels at 6,640 µS/cm and 5,474 µS/cm, respectively. Upon completion in 2021, both new wells had high baseline measurements of 3,910 µS/cm and 2,480 µS/cm, respectively. The first year of monitoring, 2022, was a dry year.	When 2 RMS wells exceed their MT for two consecutive non-dry years	Measured electrical conductivity less than or equal to the recommended Secondary Maximum Contaminant Level (900 µS/cm) based on State Secondary Drinking Water Standards at each well	The upper limit of the Secondary Maximum Contaminant Level for electrical conductivity (1,600 µS/cm) is based on the State Secondary Drinking Water Standards.

Table 5-1. Sustainability Indicator Summary

2023 Status	Undesirable Result Identification	Measurable Objective (MO) Definition	Minimum Threshold (MT) Definition
Land Subsidence			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.
Depletion of Interconnected Surface Water			
No indication of undesirable results There were no RMS wells with spring or fall 2023 groundwater level measurements below the MT.	Uses groundwater levels as a proxy. GSP identifies the data gap and describes the "Interconnected Surface Water Sustainable Management Criteria Framework."	Groundwater levels are a proxy, per SGMA regulations.	Groundwater levels are a proxy, per SGMA regulations.

Notes:

Salinity is the primary water quality constituent of concern, which is evaluated by measuring electrical conductivity (EC).

MO = Measurable Objective, MT = Minimum Threshold, RMS = representative monitoring site, µS/cm = micro siemens per centimeter

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 and avoid undesirable results for groundwater levels at each of the RMS wells. In Spring 2023, all groundwater elevations were above the established MOs and MTs (as indicated in **Table 5-2**). **Table 5-2** shows measurements from 2023 for spring seasonal highs and fall seasonal lows, along with measurable objectives and minimum thresholds. It also compares the 2023 measurements to those from 2022 and to the measurable objectives. Higher water levels were observed in Spring 2023 compared to Spring 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 Site Wells

State Well Number[1]	Groundwater Elevation (feet above mean sea level)				Spring 2023 vs. MO (ft)	Fall 2023 vs. MO (ft)	Spring 2023 vs. Spring 2022 (ft) (seasonal high)	Fall 2023 vs. Fall 2022 (ft) (seasonal low)
	2023 Measurements		MO	MT				
	Spring (seasonal high)	Fall (seasonal low)						
Wyandotte North Management Area								
19N03E**16Q001M**	140.1	139.5	133	85	7.1	6.5	0.8	1.3
19N04E**32P001M**	133.4	127.8	107	78	26.4	20.8	5.2	5.3
CWS-03	136	133	133	102	3	0	-1	-1
Wyandotte South Management Area								
17N03E**13B002M**	66.4	49.7	47	35	19.4	2.7	5.8	-1.9
17N04E**09N002M**	69.8	56.3	49	35	20.8	7.3	4.4	9.4
18N03E**25N001M**	63.3	56.9	52	37	11.3	4.9	1.1	4.1
18N04E**08M001M**	109.1	102.8	86	59	23.1	16.8	-0.5	-2.7
18N04E**16C001M**	110.5	104.5	95	71	15.5	9.5	3.5	8.6
19N04E**31F001M**	130	120.5	99	76	31	21.5	8.5	1.6

[1] *The portion of the State Well Number shown in bold underlined text is the RMS ID.*

MO = measurable objective, MT = minimum threshold

5.2.2 Degraded Water Quality SMC

The degraded water quality MT and MO are summarized in **Table 5-1**. Salinity is the main constituent of concern in the Subbasin and is evaluated by EC. Salinity (i.e., EC) is measured at RMS wells throughout the

Subbasin, and data was collected by the GSA in WY 2023. In August of 2023, a non-dry year, two of the seven RMS wells had EC levels above their MTs. Multi-completion wells 19D001M and 19D002M had EC levels at 6,640 micro siemens per centimeter (µS/cm) and 5,474 µS/cm, respectively. These are newly constructed wells as part of the DWR Technical Support Services program. Upon completion in 2021, both of these new wells had high baseline measurements of 3,910 µS/cm and 2,480 µS/cm, respectively. DWR waited another four months after construction to resample, and again, both wells had relatively high measurements. A summary of groundwater quality monitoring results is provided in **Appendix F**. Groundwater conditions are on track to avoid undesirable water quality results.

5.2.3 Land Subsidence SMC

Conditions indicate that there has not been any inelastic land subsidence during the reporting period. The land subsidence SMC utilizes the chronic lowering of groundwater levels SMC as a proxy (**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. 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 a maximum vertical displacement between 0 feet and -0.04 feet occurred within the subbasin from October 2022 to October 2023. Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 Interim Milestones and avoid undesirable results for land subsidence.

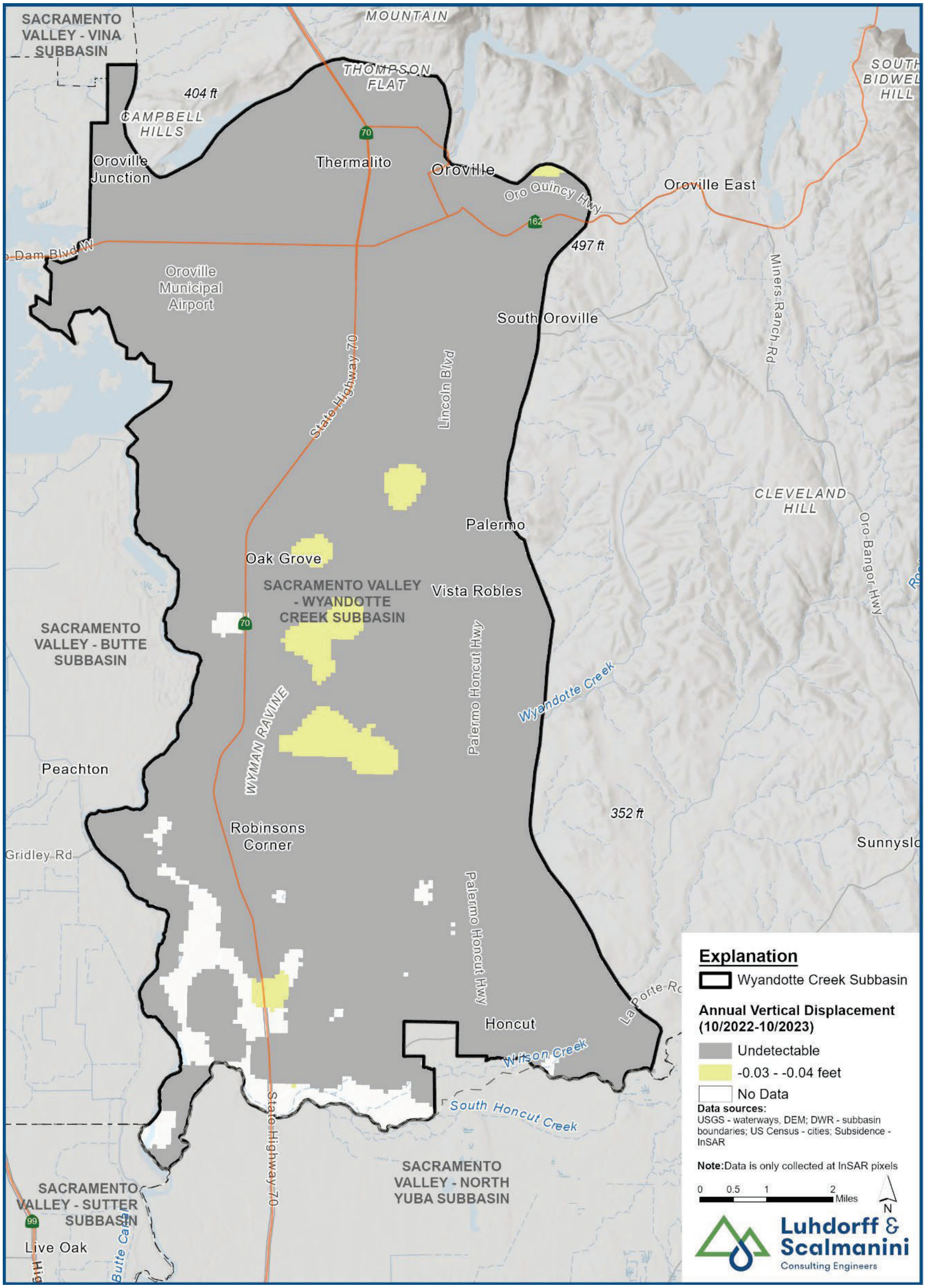

Figure 5-1. Vertical Displacement of Ground Surface from 10/2022 to 10/2023

5.2.4 Depletion of Interconnected Surface Water SMC

The depletion of interconnected surface utilizes the chronic lowering of groundwater levels SMC as a proxy (**Table 5-1**). Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 Interim Milestones and to avoid undesirable results for groundwater levels at each of the RMS wells.

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 5-3**. Updates on the status of management actions are described below and summarized in **Table 5-4**.

Groundwater users in the Subbasin benefit from generally stable and shallow groundwater levels supported by naturally occurring recharge and recharge resulting from surface water use in the Subbasin. Surface water supplies available to diverters in the Subbasin are used, when available, for irrigation, agronomic practices, and for other projects described in the GSP. Ongoing access to surface water supplies is crucial to preserving the sustainability of the Subbasin.

Table 5-3. Subbasin Summary of Project Implementation Status

GSP Section Reference	Project (Proponent)	Current Status	Notable Progress Since Last Annual Report
5.2.4.1	Residential Water Conservation Project	Ongoing	Conservation programs saved ~100 AFY of water
5.2.4.4	Oroville Wildlife Area Robinson's Riffle Project	Ongoing	Sutter Butte Flood Control Agency (SBFCA) was awarded grant funding; grant-funded work was initiated in March 2023 and is expected to be completed in spring 2026
5.2.4.6	Thermalito Water and Sewer District Water Treatment Plant Capacity Upgrade Project	Funded	The SGM Grant Program application submitted in December 2022 was awarded. The project is complete.
5.2.4.8	Palermo Clean Water Consolidation Project	Underway, seeking funding	The application for funding to the Drinking Water State Revolving Fund was submitted, and the annexation process for the project was completed.
5.2.5.1	Intra-basin Water Transfer	Funded	The SGM Grant Program application submitted in December 2022 was awarded for the planning phase of this project.
5.2.5.2	Agricultural Surface Water Supplies	Funded	The SGM Grant Program application submitted in December 2022 was awarded for the planning phase of this project.

Table 5-4. Subbasin Summary of Management Actions			
GSP Section Reference	Management Action	Current Status	Notable Progress Since Last Annual Report
5.3.1	General Plan Updates	In Progress	The 2040 general plan update was adopted in March 2023.
5.3.2	Domestic Well Mitigation	Funded	Not in effect; however, funds secured for domestic well survey to address data gap identified in the GSP.
5.3.5	Expansion of Water Purveyors' Service Area	In Progress	Ongoing development of the Palermo Clean Water Consolidation Project. Funding secured through SGM Grant Program to assess other opportunities.

5.4 GSP Project Implementation Progress

5.4.1 Residential Water Conservation Project (GSP Section 5.2.4.1)

Notable progress on this project since 2022 includes continued implementation of water conservation practices by residential water providers, including the Cal-Oroville, TWSD, and the SFWPA, in accordance with their 2020 Urban Water Management Plans. In WY 2023, urban pumping, primarily in the City of Oroville, served by two different water service providers (Cal Water-Oroville and TWSD) declined by about 100 AF compared to WY 2022, resulting in a benefit to the Subbasin.

5.4.2 Oroville Wildlife Area Robinson's Riffle Project (GSP Section 5.2.4.4)

Notable progress on this project since 2022 includes securing funding from both DWR and the California Department of Fish and Wildlife for the planning, design, and permitting of the project. The grant-funded work was initiated in March 2023 and is expected to be completed in spring 2026.

5.4.3 Thermalito Water and Sewer District Water Treatment Plant Capacity Upgrade Project (GSP Section 5.2.4.6)

Notable progress on this project since 2022 includes the Wyandotte Creek GSA's December 2022 submittal of a grant application to pursue funds through DWR's SGM Grant Program to increase the capacity of the water treatment plant serving the City of Oroville and the surrounding area, resulting in a reduced need for supplemental groundwater pumping. This project was fully funded and completed. Two additional membrane filter racks were added, which increased the treatment plant capacity from 4 million gallons per day to 8 million gallons per day.

5.4.4 Palermo Clean Water Consolidation Project (GSP Section 5.2.4.8)

Notable progress on this project since 2022 includes the completion of the funding application to the Drinking Water State Revolving Fund and the annexation process for the project area has been completed and approved by LAFCO, laying the groundwork to extend the SFWPA water supply system to serve the parcels included in the Palermo project description. Funding for a portion of the project through the American Rescue Plan Act, Integrated Regional Water Management funds, and DWR Small Community Relief funds has also been secured (DWRSRF). The project is expected to receive final DWRSRF funding approval in the first half of the calendar year 2024, with project construction beginning in the second half of the 2024 calendar year.

5.4.5 Intra-basin Water Transfer (GSP Section 5.2.5.1)

Notable progress on this project since 2022 includes the Wyandotte Creek GSA's December 2022 submittal of a grant application to pursue funds through DWR's SGM Grant Program to supply surface water to agricultural groundwater users in the Subbasin to offset groundwater pumping with available surface water, providing in-lieu recharge benefits to the Subbasin. This project was awarded funding.

5.4.6 Agricultural Surface Water Supplies (GSP Section 5.2.5.2)

Notable progress on this project since 2022 includes the Wyandotte Creek GSA's December 2022 submittal of a grant application to pursue funds through DWR's SGM Grant Program to supply agricultural users surface water to be used in place of groundwater by using dual water source irrigation systems to reduce groundwater demand. This project was awarded funding.

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 General Plan Updates (GSP Section 5.3.1)

Notable progress on this project since 2022 includes updates from Butte County (Wyandotte Creek GSA Management Committee members) on the 2040 General Plan Update in cooperation with the Butte County Water Commission and Department of Development Services to the Water Resources Element and applicable General Plan Goals, Policies, and Actions. These updates ensured that important components of the GSP are supported by the 2040 General Plan, available at: https://www.buttecounty.net/DocumentCenter/View/7749/Butte_County_General_Plan_2040_Compiled_Appendix_Optimized---Updated?bidId=.

5.5.2 Domestic Well Mitigation (GSP Section 5.3.2)

Notable progress on this project since 2022 includes the Wyandotte Creek GSA's December 2022 submittal of a grant application to pursue funds through DWR's SGM Grant Program for a Community Monitoring and Domestic Well Survey project that would support the goals of this management action by creating a registry of domestic wells in the region. This project was awarded funding.

5.5.3 Expansion of Water Purveyor's Service Area (GSP Section 5.3.5)

Notable progress on this project since 2022 includes the development of the project and securing funds for the Palermo Clean Water Consolidation Project (described above) to expand SFWPA's service areas and provide drinking water to residential areas that are currently using private domestic groundwater wells. In addition, Butte County has applied for drought-related funding to identify other areas in the county that could benefit from expanding service areas to private well owners.

6. Conclusions

The GSA adopted and submitted the GSP to DWR in January 2022 and continues to actively work on sustainable groundwater management in the Subbasin. As presented in **Section 5** of this report, recent progress made on activities applicable to the GSP demonstrates the commitment of the GSA to implement the GSP by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the Wyandotte Creek Subbasin.

7. References

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