WATER YEAR 2022 ANNUAL REPORT

Cosumnes Groundwater Authority
Cosumnes Subbasin

DRAFT 13 March 2023
EKI C20149.01

EKI ENVIRONMENT & WATER, INC.
www.ekiconsult.com
2001 Junipero Serra Blvd, Suite 300 • Daly City, CA 94014

Water Year 2022 Annual Report

Cosumnes Subbasin

DRAFT 13 March 2023

Prepared for:

Cosumnes Groundwater Authority
8970 Elk Grove Blvd.
Elk Grove, CA 95624

Prepared by:

EKI Environment & Water, Inc.
2001 Junipero Serra Blvd., Suite 300
Daly City, California 94014
(650) 292-9100
www.ekiconsult.com
EKI C20149.01

Anona Dutton, P.G., C.Hg.
Vice President

Kristyn Lindhart
Hydrogeologist

John Fio
Principal Hydrogeologist

Water Year 2022 Annual Report
Cosumnes Subbasin

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS AND ACRONYMS

ACGMA	Amador County Groundwater Management Authority
AF	acre-feet
AFY	acre-feet per year
Ag-Res	Agricultural-Residential
ARSA	Amador Regional Sanitation Authority
AWA	Amador Water Agency
CCR	California Code of Regulations
CGA	Cosumnes Groundwater Authority
CoSANA	Cosumnes, South American, and North American model
DWR	California Department of Water Resources
eWRIMS	Electronic Water Rights Information Management System
Flood-Mar	Flood Managed Aquifer Recharge
FSC	Folsom South Canal
ft	feet
ft NAVD88	feet above the North American Vertical Datum of 1988
GID	Galt Irrigation District
GPS	Global Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWE	Groundwater Elevation
IDC	Irrigation Demand Calculator
IMs	Interim Milestones
IWFM	Integrated Water Flow Model
JPA	Joint Powers Agreement
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MO	Measurable Objective
MT	Minimum Threshold
N	Nitrogen
OHWD	Omochumne-Hartnell Water District
PMA	Projects and Management Actions
PWS	Public Water System
RMW-ISW	Representative Monitoring Well for the Depletions of Interconnected Surface Water
RMW-WL	Representative Monitoring Well for Chronic Lowering of Groundwater Levels
RMW-WQ	Representative Monitoring Well for Degraded Water Quality
SAFCA	Sacramento Area Flood Control Agency
SGM	Sustainable Groundwater Management

SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SMUD	Sacramento Municipal Utility District
SRCD	Sloughhouse Resources Conservation District
TDS	Total Dissolved Solids
TT	Trigger Threshold
µg/L	micrograms per liter
UNAVCO	University NAVSTAR Consortium
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
WWTP	Wastewater Treatment Plant
WY	Water Year

EXECUTIVE SUMMARY

The San Joaquin Valley Groundwater Basin – Cosumnes Subbasin (also referred to herein as "the Basin"), California Department of Water Resources (DWR) Basin No. 5-022.16, is classified as a "medium priority" basin (DWR, 2019). To address the long-term sustainability of groundwater within the Basin, the Basin's seven Groundwater Sustainability Agencies (GSAs) developed a single Groundwater Sustainability Plan (GSP), which was adopted by the GSAs and submitted to DWR on 27 January 2022.

The Basin encompasses 210,300 acres at the northern end of the San Joaquin Valley Groundwater Basin within Sacramento and Amador Counties (see **Figure AR-1**). It is bordered on the north by the South American Subbasin (DWR Basin No. 5-021.65) and on the south by the Eastern San Joaquin Subbasin (DWR Basin No. 5-022.01). The Basin is bounded by surface water features to the north, south, and west and the eastern Basin boundary is formed by low permeability metamorphic rocks in the Sierra Nevada foothills region. The Basin has a single Principal Aquifer which is comprised of six hydraulically connected sedimentary formations that include the Younger Alluvium, Victor, Laguna, Mehrten, Valley Springs, and Ione Formations.

The Basin is cooperatively managed by seven GSAs: Amador County Groundwater Management Authority (ACGMA) GSA, City of Galt GSA, Clay Water District GSA, Galt Irrigation District (GID) GSA, Omochumne-Hartnell Water District (OHWD) GSA, Sacramento County GSA, and Sloughhouse Resource Conservation District (SRCD) GSA. In November 2021, the Cosumnes Groundwater Authority (CGA) was formed upon adoption of a Joint Powers Agreement (JPA) between the seven GSAs. The CGA enables the GSAs to collaboratively comply with the Sustainable Groundwater Management Act (SGMA), implement the GSP, seek and secure grant or other funding to support implementation, and work collaboratively with the GSAs and other entities to sustainably manage the Basin.

This Water Year (WY) 2022 Annual Report for the Basin has been prepared by the CGA in compliance with California Code of Regulations (CCR) 23 § 356.2. WY 2022 includes the period from 1 October 2021 through 30 September 2022.

Figure AR-2 and **Figure AR-3** show groundwater elevation contours for data collected in Fall 2021, and Spring 2022, respectively. Groundwater elevations generally decrease in magnitude from east to west across the Basin, with the greatest elevations measured beneath the higher topographic areas in the east. At lower topography, the western component of groundwater flow shifts towards the middle of the Basin, where extractions have created a groundwater low (i.e., a cone of depression).

Long-term hydrographs for water levels measured in the Representative Monitoring Wells for Chronic Lowering of Groundwater Levels (RMW-WLs) and the Representative Monitoring Wells for Depletions of Interconnected Surface Water (RMW-ISWs) are shown on **Figure AR-4**. Sustainable Management Criteria (SMCs), including Measurable Objectives (MOs), Minimum Thresholds (MTs), Interim Milestones (IMs), were established in the GSP for groundwater levels at the 19 RMW-WLs and the nine RMW-ISWs, as well as Trigger Thresholds (TTs). The measured data is summarized in **Table AR-4** and **Table AR-6**, and plotted on **Figure AR-4**.

During WY 2022, the total volume of extracted groundwater from the Basin was 139,300 acre-feet (AF); almost 90% was for use by "agriculture" areas, which includes domestic (agricultural-residential [Ag-Res]) uses, and 10% was used for "developed" areas including urban water uses (public water systems [PWS]) and industrial water uses (aquaculture and power planting cooling). **Table AR-1** reports WY 2022 groundwater extraction data by water use sectors (e.g., agricultural, urban, and industrial) and **Figure AR-**

5 shows the general location and volume of annual extractions represented by groundwater use within each GSA.

Though groundwater extractions comprise most of the water used in the Basin, surface water is also a source of supply in the Basin. Surface water supply volumes were reported or estimated using the Cosumnes, South American, and North American groundwater flow model (CoSANA) prepared as part of GSP development and used to support implementation. A summary of surface water supply/use by sector is presented in **Table AR-2**.

Table AR-3 summarizes the Basin's WY 2022 total water use by sector (e.g., agricultural, urban and industrial) and water source type (e.g., groundwater, recycled water, imported water, stream diversions). Total pumping in the Basin decreased from 135,400 AF in WY 2021 to 125,200 AF in WY 2022.

Changes in groundwater storage were estimated using CoSANA. **Figure AR-6** is a map showing the distribution of model-calculated changes in groundwater storage during WY 2022. Groundwater storage declined across most of the Basin, as would be expected given that WY 2022 was a critically dry year; however, storage increased along the Cosumnes River and in a portion of Amador County in the area with the least extractions. **Figure AR-7** shows water year type, annual groundwater extractions, annual change in groundwater storage, and the cumulative change in groundwater storage for WY 2015 through WY 2022.

Table AR-4 compares WY 2022 groundwater elevations to the SMCs at the RMW-WLs for the Chronic Lowering of Groundwater Levels Sustainability Indicator. **Table AR-5** compares WY 2022 water quality concentrations for Arsenic, Nitrate, and Total Dissolved Solids (TDS) to their respective SMCs at the Representative Monitoring Wells for Degraded Water Quality (RMW-WQs). **Table AR-6** compares WY 2022 groundwater elevations to SMCs at the RMW-ISWs for the Depletions of Interconnected Surface Water Sustainability Indicator. Based on evaluation of these data, Undesirable Results were not identified within the Basin.

Land subsidence is of low concern in the Basin. **Figure AR-8** shows the vertical displacement trends for WY 2022. Continuous data at the University NAVSTAR Consortium (UNAVCO) Global Positioning System (GPS) station (P275) located within the Basin in the vicinity of the groundwater depression indicates an average displacement of -0.14 ft. The TRE Altamira Interferometric Synthetic Aperture Radar (i.e. InSAR) data indicates the annual vertical displacement rate for the WY 2022 ranges from - 0.1 ft to 0.1 ft throughout the Basin.

The GSP outlined six Projects and Management Actions (PMAs) for the Basin. Initiation of a pilot study at the Laguna Del Sol Resort Project (LDSR Project) site was conducted to support PMA #2 Sacramento Area Flood Control Agency (SAFCA) Flood-MAR. During WY 2022, a dry well was constructed as part of the LDSR Project and an infiltration test initiated at the end of WY 2022. The infiltration test is planned to continue during WY2023. PMA #5 Voluntary Land Repurposing was expanded to include water conservation and plans were developed to increase coordination between landowners and to evaluate conservation methods for regional benefits. A brief description of each PMA and progress made in WY 2022 is included in **Section 7.**

1 GENERAL INFORMATION

☑ *§ 356.2 (a)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

On 16 September 2014, the California legislature enacted the Sustainable Groundwater Management Act (SGMA) - the primary purpose of which is to achieve and/or maintain sustainability within the state's high and medium priority groundwater basins. The San Joaquin Valley Groundwater Basin – Cosumnes Subbasin (also referred to herein as "the Basin"), California Department of Water Resources (DWR) Basin No. 5-022.16, is classified as a "medium priority" basin (DWR, 2019). To address the long-term sustainability of groundwater within the Basin, the Basin's seven Groundwater Sustainability Agencies (GSAs)[1] jointly developed a Groundwater Sustainability Plan (GSP), which was adopted by the GSAs between 14 December 2021 and 12 January 2022 and submitted to DWR on 27 January 2022.

This Water Year (WY) 2022 Annual Report for the Basin has been prepared in compliance with CCR 23 § 356.2. WY 2022 includes the period from 1 October 2021 through 30 September 2022. This Annual Report also contains available and appropriate historical information back to calendar year 2015, as required by CCR 23 §356.2 (b). The GSP Annual Report Elements guide (**Appendix A**) lists the Annual Report requirements and where in this report they are specifically addressed.

The Basin encompasses 210,300 acres at the northern end of the San Joaquin Valley Groundwater Basin within Sacramento and Amador Counties (see **Figure AR-1**). It is bordered on the north by the South American Subbasin (DWR Basin No. 5-021.65) and on the south by the Eastern San Joaquin Subbasin (DWR Basin No. 5-022.01). The Basin is bounded by surface water features to the north, south, and west and the eastern Basin boundary is formed by low permeability metamorphic rocks in the Sierra Nevada foothills region. The Basin has a single Principal Aquifer which is comprised of six hydraulically connected sedimentary formations that include the Younger Alluvium, Victor, Laguna, Mehrten, Valley Springs, and Ione Formations. Hydraulic conditions in the Principal Aquifer range from unconfined to semi-confined, and its total thickness ranges from 810 to 1,750 feet (ft). Water inflows include rainfall infiltration, leakage from surface water features, percolation of relatively small quantities of imported surface water that originated outside the Basin, and subsurface flows from adjacent basins. Outflows include seepage to surface water features, subsurface flows to adjacent basins, evapotranspiration, and consumption of groundwater extracted by wells.

The Basin is managed by seven GSAs: Amador County Groundwater Management Authority (ACGMA) GSA, City of Galt GSA, Clay Water District GSA, Galt Irrigation District (GID) GSA, Omochumne-Hartnell Water District (OHWD) GSA, Sacramento County GSA, and Sloughhouse Resource Conservation District (SRCD) GSA. In November 2021 the Cosumnes Groundwater Authority (CGA) was formed upon adoption of a Joint Powers Agreement (JPA) between the seven GSAs. The CGA enables the GSAs to collaboratively comply with SGMA, implement the GSP, seek and secure grant or other funding to support implementation, and work collaboratively with the GSAs and other entities to sustainably manage the Basin.

[1] The Cosumnes Subbasin GSAs include Amador County Groundwater Management Authority (ACGMA) GSA, City of Galt GSA, Clay Water District GSA, Galt Irrigation District (GID) GSA, Omochumne-Hartnell Water District (OHWD) GSA, Sacramento County GSA, and Sloughhouse Resource Conservation District (SRCD) GSA.

2 GROUNDWATER ELEVATION DATA

☑ *§ 356.2 (b) (1)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.
(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

2.1 Groundwater Elevation Contour Maps

Fall water levels were measured between 1 October and 29 November 2021, and Spring water levels were measured between 11 March and 15 April 2022. Available Fall 2021 and Spring 2022 groundwater elevation data, including publicly available data from other sources, were contoured (**Figure AR-2** and **Figure AR-3,** respectively). Groundwater elevation contours generally decrease in magnitude from east to west across the Basin, with the greatest elevations measured beneath the higher topographic areas in the east. At lower topography, the western component of groundwater flow shifts towards the middle of the Basin where extractions have created a low in the groundwater levels (a cone of depression). The Fall 2021 and Spring 2022 groundwater contours are generally similar in magnitude and shape because measured water level changes in most wells were only a few feet. WY 2022 was a critically dry year, and the similarity between Fall and Spring water levels is likely explained by the lack of rainfall which is the primary source of groundwater recharge.

2.2 Groundwater Hydrographs

Long-term hydrographs of groundwater levels in Representative Monitoring Wells (RMWs) for Chronic Lowering of Groundwater Levels (RMW-WLs) and Depletions of Interconnected Surface Water (RMW-ISWs) are shown on **Figure AR-4**. Sustainable Management Criteria (SMCs), including Measurable Objectives (MOs), Minimum Thresholds (MTs), and Interim Milestones (IMs), established in the GSP are included in **Figure AR-4**, and the data and SMCs are reported in **Table AR-4** and **Table AR-6**, respectively**.** These data are discussed in **Section 7**.

3 GROUNDWATER EXTRACTIONS

☑ *§ 356.2 (b) (2)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

Groundwater extractions were metered or estimated. Estimated values were provided by the Cosumnes, South American, and North American groundwater flow model (CoSANA), the Numerical Model for the Basin (Appendix M "CoSANA – An Integrated Water Resources Model of the Cosumnes, South American, and North American Groundwater Subbasins, November 2021" in "Groundwater Sustainability Plan for the Cosumnes Subbasin", December 2021). The CoSANA is a three-dimensional (3-D) groundwater flow model that uses DWR's finite-element Integrated Water Flow Model (IWFM) platform. CoSANA was prepared to support GSP development and implementation in the Basin.

Table AR-1 reports WY 2022 groundwater extraction data by water use sector (i.e., agricultural, urban and industrial) and **Figure AR-5** shows the general location and volume of annual extractions represented by groundwater use within each GSA. During WY 2022, the total volume of extracted groundwater was 139,300 acre-feet (AF), of which almost 90% was used by the Agricultural sector; the Agricultural sector includes domestic (agricultural-residential [Ag-Res]) uses. The 10% of remaining extracted groundwater was for the Developed uses which includes urban (e.g., public water systems [PWS]) and industrial (e.g., aquaculture and power plant cooling) water uses. While extractions were reported for most, but not all, municipal and PWS wells, the measurement methods were not always available. When reported extractions were not available, the extractions were estimated by repeating data from the previous year. Total pumping in the Basin decreased from 135,400 AF in WY 2021 to 125,200 AF in WY 2022.

All extractions for agriculture were estimated from reported land use (i.e., crop types), crop water demand, and climate data. In October 2021, meters were installed on three agricultural wells; however, data was not reported for WY 2021. Domestic, non-urban self-supplied water use is also included as part of the Agricultural sector extractions (Ag-Res extractions), and these extractions were calculated based on representative indoor and outdoor water use and the estimated number of residential parcels in the Basin.

Table AR-1 Summary of Groundwater Extraction Data by Sector (AF)

Water Year	Agricultural[(b)]	Developed[(d)]	Total
	Estimated[(c)]	Metered[(e)] and Estimated[(f)]	
2021[(g)]	133,600	16,200	149,800
2022	123,500	15,800	139,300

Abbreviations:
AF = acre-feet

Notes:
(a) Values are rounded to the nearest 100 AF.
(b) Agricultural includes agricultural and domestic water use.
(c) Agricultural extractions were estimated from land use and climate data using the Irrigation Demand Calculator (IDC) within the Cosumnes, South American, and North American model (CoSANA). Domestic (Ag-Res) extractions were estimated based on representative indoor and outdoor water use and the estimated number of residential parcels in the Basin.
(d) Developed extractions include urban (e.g., PWS) and industrial (aquaculture and power plant cooling) water uses.
(e) Data reported by the City of Galt GSA, ACGMA GSA, and some PWSs.
(f) Estimated extractions under the "Developed" Sector include non-reporting PWSs and aquaculture.
(g) WY 2021 data is updated to reflect the Water Year 2022 updated CoSANA model; Some values may differ than data reported in the WY 2021 Annual Report.

4 SURFACE WATER SUPPLY

☑ *§ 356.2 (b) (3)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

Surface water supplies were reported or estimated using CoSANA. In the Basin, the surface water supply includes imported water and stream diversions (**Table AR-2**). In WY 2022, the Amador Water Agency (AWA) provided imported surface water to the City of Ione from Lake Tableaud, and the United States Bureau of Reclamation (USBR) provided imported surface water to the Sacramento Municipal Utility District (SMUD).

Imports:

- AWA delivered water from Lake Tableaud to meet urban demand in the City of Ione. From 1998 onward, these imports have been estimated from the total water treated at the wastewater treatment plant, as provided by AWA. Estimated deliveries in WY 2022 were 1,600 AF.
- Treated wastewater originating outside the Basin is delivered by the Amador Regional Sanitation Authority (ARSA) to the Castle Oaks Water Reclamation Plant, which supplies tertiary treated wastewater for irrigation to the Castle Oaks Golf Course. Estimated deliveries in WY 2022 were 600 AF based on irrigation demand.
- Surface water diversions from the Folsom South Canal (FSC) are delivered to the decommissioned Rancho Seco nuclear power facility, which is owned by SMUD, and is used for cooling the Cosumnes Power Plant and maintaining water levels in the Rancho Seco Lake (i.e., developed uses). SMUD reported 4,211 AF of diversions from the FSC during WY 2022; however, the CoSANA model underestimates these deliveries based on the water demand of agricultural land areas that surround Rancho Seco. **Table AR-2** reports the model-calculated estimated deliveries in WY 2022 as only 100 AF. The CoSANA model needs refinement to accurately represent lake evaporation and plant cooling, which will be addressed as part of the 5-year GSP update.

Stream Diversions:

- In WY 2022, 21,000 AF of water was diverted from surface drainages in the Basin (e.g., the Cosumnes River and Dry Creek). The best available data for most of the diversions are the monthly reported stream diversions uploaded to the Electronic Water Rights Information Management System (eWRIMs). The monthly diversions are reported by the permit holder, but the reports do not include the measurement method. Monthly Cosumnes River diversion by Rancho Murieta were metered and reported directly to the CGA.

Table AR-2 Summary of Surface Water Supply by Sector (AF)

Water Year	AWA Import Surface Water	ARSA Imported Treated Wastewater	SMUD	Stream Diversions	
	Developed	Developed	Developed	Agricultural	Developed
2021[(b)]	1,700	600	100	22,200	600
2022	1,600	600	100	20,400	600

Abbreviations:

AF = Acre-feet
AWA = Amador Water Agency
ARSA = Amador Regional Sanitation Authority
SMUD = Sacramento Municipal Utilities District

Notes:

(a) Values are rounded to the nearest 100 AF.
(b) WY 2021 data is updated to reflect the Water Year 2022 updated CoSANA model; Some values may differ than data reported in the WY 2021 Annual Report.
(c) Developed includes urban (e.g., PWS) water uses.

5 TOTAL WATER USE

☑ *§ 356.2 (b) (4)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

As described above, surface water and groundwater extractions comprise most of the water use in the Basin. Additionally, recycled water is used for a small amount of irrigation within the Basin (1,200 AF). Secondary treated water is imported into the Basin and treated to tertiary standards for use as irrigation water at the Castle Oaks Golf Course. Wastewater produced by the City of Galt is treated at the City of Galt Wastewater Treatment Plant (WWTP) and delivered to nearby fields for use as irrigation water. Therefore, the total water use is equal to the sum of total estimated groundwater extraction and the total surface water and recycled water supplies.

Table AR-3 summarizes the total water use by sector (e.g., agricultural, urban and industrial) and water use type (e.g., extractions, recycled water, imported water, and stream diversions). Groundwater extraction and surface water supply by sector are shown in **Table AR-1** and **Table AR-2**, respectively. Recycled non-potable water used for irrigation by the golf course is estimated based on demand, and recycled water use by agricultural fields near the City of Galt WWTP is recorded using meters that record in gallons.

Table AR-3 Summary of Total Water Use by Sector and Source (AF)

Water Year	Agricultural			Developed			
	Estimated Extractions	Recycled Water	Stream Diversions	Metered/ Estimated Extractions	Imported Water	Recycled Water	Stream Diversions
2021[(b)]	133,600	700	22,200	16,200	1,800	600	600
2022	123,500	600	20,400	15,800	1,700	600	600

Abbreviations:
AF = acre-feet

Notes:
(a) Values are rounded to the nearest 100 AF.
(b) WY 2021 data is updated to reflect the Water Year 2022 updated CoSANA model; Some values may differ slightly from the data reported in the WY 2021 Annual Report.
(c) Developed includes urban (e.g., PWS) and industrial (aquaculture and power plant cooling) water uses.

6 CHANGE IN GROUNDWATER STORAGE

☑ *§ 356.2 (b) (4)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(4) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

Changes in groundwater storage were estimated using CoSANA. **Figure AR-6** is a map showing the distribution of model-calculated changes in groundwater storage between October 1, 2021, through September 30, 2022 (WY 2022). CoSANA calculates the volume of storage change within each model element, and the element-by-element change was normalized by dividing the volumetric change in storage by the area of each respective element and the results mapped in units of feet. Groundwater storage declined across most of the Basin with the greatest decline near the areas characterized by the greatest extractions (**Figure AR-5**). Groundwater storage increased along the Cosumnes River and in a portion of Amador County in the area with the least extractions and greatest opportunities for water to recharge the aquifer (**Figure AR-5**).

Figure AR-7 shows water year type, annual groundwater extractions, annual change in groundwater storage, and the cumulative change in groundwater storage for WY 2015 through WY 2022. Annual extraction rates of 135,200 acre-feet per year (AFY) or greater resulted in storage declines, whereas annual extraction rates of 121,800 AFY or less resulted in storage accretion. The estimated sustainable yield for the Basin reported in the GSP ranges from 119,000 AFY to 125,700 AFY.

7 PLAN IMPLEMENTATION

☑ *§ 356.2 (b) (4)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

7.1 Semi-Annual Monitoring

The WY 2022 semi-annual monitoring occurred in Fall 2021 and Spring 2022. During the Fall 2021 event, water levels were not measured in six (6) monitoring wells (RMW-WL4, RMW-WL16, RMW-WL17, RMW-WL18, RMW-ISW2, and RMW-ISW3), and during the Spring 2022 monitoring event water levels were not measured in six (6) monitoring wells (RMW-WL3, RMW-WL16, RMW-ISW2, RMW-ISW3, RMW-ISW4 and RMW-ISW7). Complete water quality data (i.e., Arsenic, Nitrate and TDS) were not collected for seven (7) monitoring wells (RMW-WQ1, RMW-WQ3, RMW-WQ8, RMW-WQ9, RMW-WQ10, RMW-WQ11, and RMW-WQ12). Additionally, readings from the few known agricultural wells that have meters were not obtained as part of the Fall and Spring events. The missing water level and well production data is attributed primarily to the lack of well access. Some wells became inaccessible because the original access agreement was with the former Cosumnes Working Group and not the CGA. The agreements therefore need to be updated to gain access. Similarly, CGA relied on telemetry systems to retrieve data from some wells and therefore did not require physical access, but removal of the 3G network in 2022 unexpectedly caused the telemetry systems to go offline. Without access agreements in place for these wells, the wells could not be visited to collect manual measurements.

Missing data is also attributed to insufficient communication between CGA, GSA staff, and field technicians collecting the data. For example, wells were not measured if the technician could not physically access the well and a contact could not be reached to resolve the issue. The agreements therefore need to be updated to include multiple points of contact to resolve access issues when encountered in the field. Moreover, protocols need to be put in place to ensure frequent check-in calls between CGA and field technicians to monitor progress and identify potential conflicts in the field.

To mitigate access issues and develop a more robust monitoring implementation plan, CGA plans to do the following.

1) Conduct site visits to each Representative Monitoring Well to document site conditions, access procedures, and identify key issues of concern, if any.
2) Secure updated access agreements that include multiple points of contact to address unforeseen conditions that prevent well access or collecting the necessary data.
3) Develop a checklist of procedures and steps based on Section 17.2 “Protocols for Data Collection and Monitoring” to guide each monitoring event. The checklist will include a kick-off meeting between participating parties to review the checklist, moreover check-in calls will occur during monitoring to review progress and resolve issues that can potentially prevent meeting the monitoring objectives.

7.2 Progress Towards Interim Milestones for Chronic Lowering of Groundwater Levels

Fall 2021 water levels were measured in fifteen (15) wells and Spring 2022 water levels were measured in seventeen (17) wells. **Table AR-4** compares these WY 2022 groundwater elevations to SMCs (MOs and MTs) at the RMW-WLs for the Chronic Lowering of Groundwater Levels Sustainability Indicator. The GSP defines Undesirable Results when MTs are exceeded in 25% or more of the RMW-WLs (5 out of 19) for two (2) consecutive years. MT exceedances in WY 2022 are discussed below and do not indicate Undesirable Results in The Basin. There are no Interim Milestones for WY 2022.

- In WY 2022 groundwater elevations in RMW-WL5 were below the MT. However, data were not available for RMW-WL5 in WY 2021. There is uncertainty in the SMCs for RMW-WL5 because historical data are not available to assess seasonal and long-term water level trends relative to land use and climatic variations.
- In WY 2022 groundwater elevations in RMW-WL12 were more than 60 feet lower than measured in WY 2021, and field notes indicate the well was actively pumping at the time of the Spring 2022 measurement. Hence, the low elevation represents pumped (dynamic) water levels and were not compared to the SMCs.
- In WY 2021, one well (RMW-WL16) had a groundwater elevation below the MT but the water level was not measured during WY 2022. Based on the hydrograph for this well (**Figure AR-4b**), it is plausible the water level in RMW-WL16 was also below the MT in 2022, but this cannot be confirmed.
- In Fall 2021 (WY 2022) the groundwater elevation in RMW-WL19 was below the MT, however the elevation was more than 10 feet lower than the previous measurement in Spring 2021 (WY 2021), and lower than the measurement in the following Spring 2022 (WY 2022). Hence, the low elevation may represent pumped conditions, but this needs to be confirmed.

Consistent with the GSP (Section 15.8 *Action Plan Related to Minimum Threshold Exceedances*), the CGA and affected GSAs (Amador County Groundwater Management Authority [RMW-WL16 and -WL19], Galt Irrigation District [RMW-WL5], and Sloughhouse Resource Conservation District [RMW-WL12]) will investigate conditions at the noted wells to further evaluate factors that could contribute to lowered water levels and assess the need for increased or expanded monitoring.

Table AR-4 Groundwater Elevations and Relevant Sustainable Management Criteria

Well Name	Fall 2021 GWE (ft msl)	Spring 2022 GWE (ft msl)	MO (ft msl)	MT (ft msl)
RMW-WL1	-46	-47	-55	-65
RMW-WL2	-68	-57	-59	-69
RMW-WL3	-41	--	-46	-56
RMW-WL4	--	-20	-24	-39
RMW-WL5	-92	-90	-70	-84
RMW-WL6	-69	-65	-51	-78
RMW-WL7	-27	-26	-28	-38
RMW-WL8	-42	-35	-36	-48
RMW-WL9	-87	-84	-75	-89
RMW-WL10	-32	-28	-22	-32
RMW-WL11	-33	-31	-28	-38
RMW-WL12	(48)	(53)	106	85
RMW-WL13	-32	-29	-36	-46
RMW-WL14	252	254	250	232
RMW-WL15	127	127	141	119
RMW-WL16	--	---	269	259
RMW-WL17	---	209	116	89
RMW-WL18	---	198	195	185
RMW-WL19	160	172	171	161

Abbreviations:
ft msl = feet above mean sea level
GWE = groundwater elevation
MO = measurable objective
MT = minimum threshold
RMW-WL = Representative Monitoring Well for Chronic Lowering of Groundwater Levels
"--" = not collected

Notes:
(a) Measured water levels in parenthesis "()" represent pumping (dynamic) conditions well and therefore are not compared to SMCs.

7.3 Progress Towards Interim Milestones for Groundwater Storage

There are no groundwater storage IMs for WY 2022. As explained in the GSP, groundwater levels are a reasonable proxy for groundwater storage. Progress made during the reporting period is therefore represented by the discussion of water levels in **Section 7.1.**

7.4 Progress Towards Interim Milestones for Seawater Intrusion

Because significant and unreasonable effects from seawater intrusion are not present in the Basin and are not likely to occur, SMCs were not set for Seawater Intrusion. The Seawater Intrusion Sustainability Indicator is therefore not discussed herein.

7.5 Progress Towards Interim Milestones for Degraded Water Quality

Table AR-5 compares available WY 2022 water quality concentrations for arsenic, nitrate, and TDS (i.e., Constituents of Concern [COCs]) to their respective SMCs at the RMW-WQs for the Degraded Water Quality Sustainability Indicator. At the time of GSP development, current concentrations were below the MOs and setting IMs would promote water quality degradation. Therefore, TTs were established for Degraded Water Quality whereby if the concentration of a COC in a RMW-WQ reaches 50% of its Maximum Contaminant Level (MCL), the GSAs will consider whether additional action is necessary. There are no TTs specified for WY 2022.

The GSP defines the criteria for Undesirable Results when MTs for a constituent of concern are exceeded in samples from 25% or more of the RMW-WQs (for example, the MTs are exceeded in samples from 4 of the 14 RMW-WQ wells) for two (2) consecutive years. In WY 2022, except for arsenic, all available data were below the MT. The arsenic concentration in the sample from RMW-WQ2 was 11 micrograms per liter (µg/L) and exceeded the MT; no data was available for this well in WY 2021. This exceedance of the MT is not indicating Undesirable Results in the Basin.

Table AR-5 Groundwater Quality and Sustainable Management Criteria

Well Name	**Arsenic** (µg/L)		**Nitrate as N** (mg/L)		**TDS** (mg/L)	
	MO = 8	MT = 10	MO = 8	MT = 10	MO= 500	MT=1,000
RMW-WQ1	--		--		--	
RMW-WQ2	11		ND		170	
RMW-WQ3	--		--		--	
RMW-WQ4	2		2.2		150	
RMW-WQ5	4.6		0.4		140	
RMW-WQ6	1.4		1.2		190	
RMW-WQ7	2		1.6		110	
RMW-WQ8	--		--		--	
RMW-WQ9	--		--		--	
RMW-WQ10	--		--		--	
RMW-WQ11	--		ND		--	
RMW-WQ12	--		3.7		--	
RMW-WQ13	3.5		1.4		150	
RMW-WQ14	9.8		ND		150	

Abbreviations:

mg/L = milligrams per liter
MO = Measurable Objective
MT = Minimum Threshold
N = Nitrogen
ND= Not Detected
RMW-WQ = Representative Monitoring Well for Degraded Water Quality
TDS = Total Dissolved Solids
µg/L = micrograms per liter
"--"= not collected

Notes:

(a) For all RMW-WQs, SMCs were set at the same level based on state and federal standards.

7.6 Progress Towards Interim Milestones for Land Subsidence

Land subsidence is of low concern in the Basin. The following describe measured vertical displacement (subsidence) trends for WY 2022 (see **Figure AR-8**):

- Continuous vertical displacement data has been collected since July 2006 at a University NAVSTAR Consortium (UNAVCO) Global Positioning System (GPS) station (P275). The site is located in the cone of depression, and measured -0.14 ft of average vertical displacement during WY 2022.
- The TRE Altamira Interferometric Synthetic Aperture Radar (InSAR) data indicates the annual vertical displacement rate for the period 1 October 2021 through 1 October 2022 ranged from - 0.1 ft to 0.1 ft throughout the Basin.

As explained in the GSP, groundwater levels are a reasonable proxy for land subsidence, and progress made during the reporting period is therefore represented by the discussion of water levels in **Section 7.1**.

7.7 Progress Towards Interim Milestones for Depletions of Interconnected Surface Water

Fall 2021 water levels were measured in seven (7) wells and Spring 2022 water levels were measured in five (5) wells. **Table AR-6** compares these WY 2022 groundwater elevations to SMCs (MOs and MTs) at the RMW-ISWs for the Depletion of Interconnected Surface Water Sustainability Indicator. The GSP defines Undesirable Results when MTs are exceeded in one or more of the RMW-ISWs (1 out of 9) for two (2) consecutive years. In WY 2021, the water levels reported for all RMW-ISWs were above their respective MTs and therefore the MT exceedances in WY 2022, discussed below, do not indicate Undesirable Results in the Basin.

WY 2022 groundwater elevations in RMW-ISW5 were below the MT in both the Fall and Spring monitoring events. However, data were not available for RMW-ISW5 in WY 2021, and the SMCs for this well are uncertain because historical data are not available to assess seasonal and long-term trends under variable land use and climatic conditions. In Fall 2021, the groundwater elevation in RMW-ISW6 was below its MT. The hydrograph for this well is shown in **Figure AR-4c** and shows the water levels have been trending downward through two critically dry years (the only years with data).

Table AR-6 Groundwater Levels in Interconnected Surface Water Representative Monitoring Wells and Sustainable Management Criteria

Well Name	Fall 2021 GWE (ft msl)	Spring 2022 GWE (ft msl)	MO (ft msl)	MT (ft msl)
RMW-ISW1	-18	-13	-18	-23
RMW-ISW2	--	--	-3	-6
RMW-ISW3	--	--	-4	-10
RMW-ISW4	-27	--	-14	-19
RMW-ISW5	72	58	83	78
RMW-ISW6	-31	-28	-26	-31
RMW-ISW7	252	--	257	247
RMW-ISW8	176	178	179	172
RMW-ISW9	171	172	171	164

Abbreviations:

ft msl = feet above mean sea level
GWE = groundwater elevation
MO = Measurable Objective
MT = Minimum Threshold
RMW-ISW = Representative Monitoring Well for the Depletions of Interconnected Surface Water
"--" = not collected

7.8 Implementation of Projects and Management Actions (PMAs)

The GSP outlined six PMAs. PMA implementation progress described below represents activities taken place during WY 2022. The CGA will continue to pursue available funding opportunities to support PMA implementation (e.g., DWR's Sustainable Groundwater Management (SGM) Implementation Round 2 funding, California Department of Conservation's Multi-benefit Land Repurposing Program, and State Water Resources Control Board's Water Recycling Funding Program).

- PMA #1 - OHWD Agricultural Flood Managed Aquifer Recharge (Flood-MAR). In WY 2022, no diversions occurred. Progress was made to gain a 5-year diversion permit (granted in WY 2023).
- PMA #2 - Sacramento Area Flood Control Agency (SAFCA) Flood-MAR. Initiated a pilot study at the Laguna Del Sol Resort Project site (LDSR Project). During WY 2022, a dry well was installed (August 2022), and the first infiltration test began at the end of WY2022. Test results will be evaluated and reported as part of the WY 2023 Annual Report.
- PMA #3 - OHWD Cosumnes River Flow Augmentation. PMA #3 has not been initiated.
- PMA #4 – City of Galt Recycled Water Project. PMA #4 has not been initiated.
- PMA #5 – Voluntary Land Repurposing. In WY 2022, a survey was conducted to gather input from growers and evaluate parameters for the project. As a result, the project was modified to include conservation activities aimed to reduce groundwater use by agriculture. The CGA initiated an evaluation of conservation methods for their regional effectiveness and coordination activities with landowners.
- PMA #6 - Groundwater Banking and Sale. PMA #6 has not yet been initiated.

7.9 Stakeholder Outreach

During WY 2022 the CGA continued to conduct stakeholder outreach on a variety of platforms:

- Monthly CGA Board of Directors meetings open to the public provided updates of GSP implementation activities.
- The PMA Committee was formed in March 2022 to develop the Cosumnes Subbasin Priority Projects List. This list guides PMA implementation and prioritizes CGA efforts to apply for future funding opportunities.
- The Citizen Advisory Committee (CAC) was formed in March 2022 to provide input from and information-sharing among the Basin's diverse communities and interests. The CAC serves an advisory role to the CGA Board of Directors and consists of a range of applicants with interest and experience in sustainable groundwater management.
- Stakeholder/Technical Workshops, website maintenance, updates and expansion of the list of interested parties, fact sheet development and distribution, farmer surveys, and public presentations made by GSA members to their local governing bodies as part of regular Public City Council or Board meetings. Dates of the various stakeholder outreach activities during WY 2022 are included in **Appendix B**.

8 REFERENCES

DWR, 2019. *Sustainable Groundwater Management Act 2018 Basin Prioritization Process and Results*. California Department of Water Resources, April 2019.

Robertson-Bryan, Inc. and WRIME, 2011, South Basin Groundwater Management Plan, Prepared for South Area Water Council, dated October 2011.

San Joaquin Valley
Cosumnes
(5-022.16)

Sacramento Valley
South American
(5-021.65)

San Joaquin Valley
Eastern San Joaquin
(5-022.01)

Wilton
Herald
Galt
Lodi
Acampo
Woodbridge
Victor
Thornton
Clements
Wallace
Burson
Jackson Valley
Lone Valley
Camanche Reservoir
Rancho Seco Park
Castle Oaks Golf Club
Deer Creek
Dry Creek
Badger Creek
North Fork Badger Creek
Browns Creek
Hadselville Creek
Twin Cities Rd
Griffith Creek
Skunk Creek
Goose Creek
Coyote Creek
Bear Creek
Crevis Creek
Willow Creek
Sacramento
Amador
Calaveras
Carlton E Forbes Fwy
E Highway 12
Lockeford Springs
Paddy Creek
Middle Paddy Creek
Duck Creek

Legend

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)
- South American Subbasin (5-021.65)
- Eastern San Joaquin Subbasin (5-022.01)

Abbreviations

DWR = California Department of Water Resources

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 8 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.

N

0 3 6

(Scale in Miles)

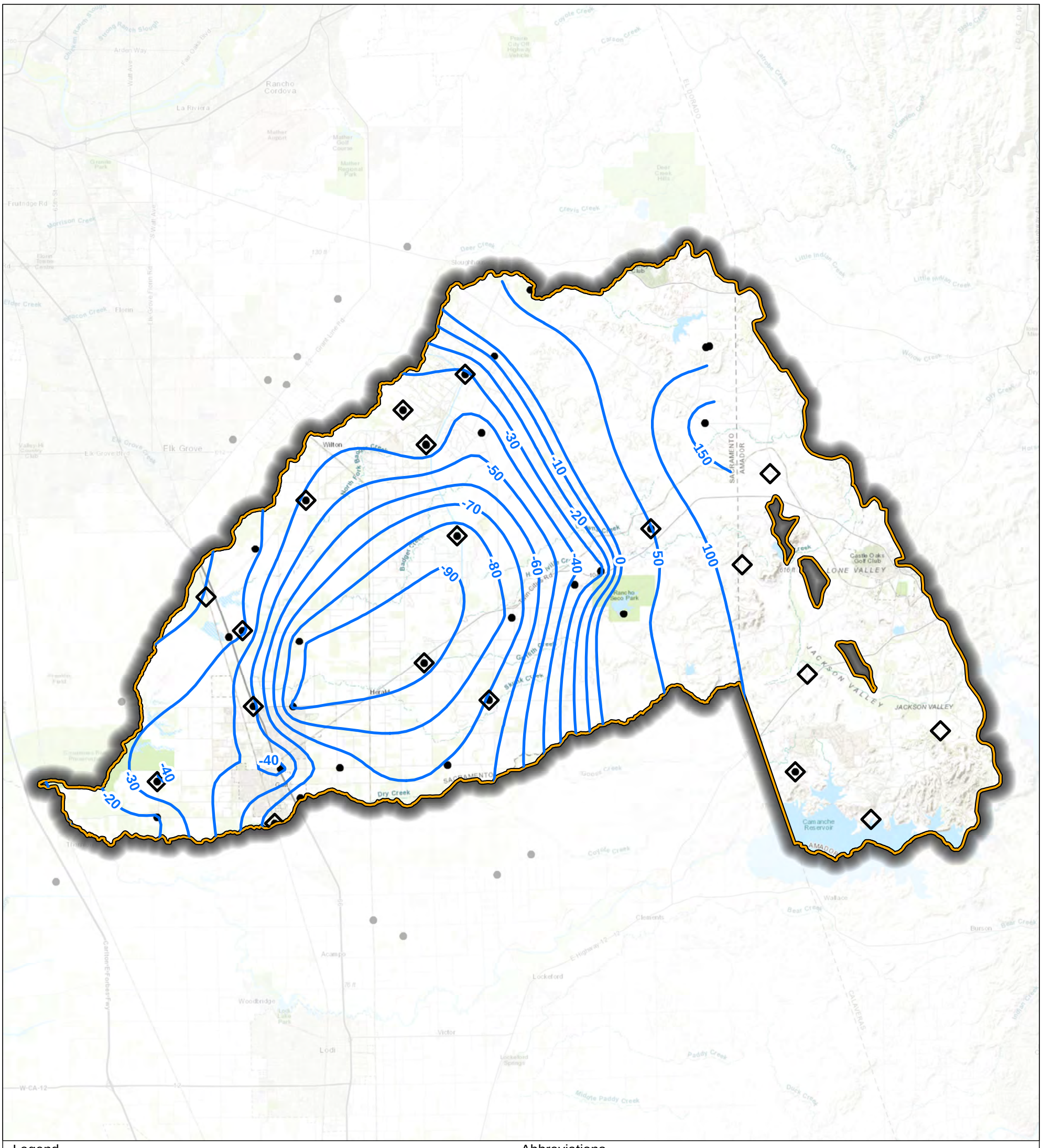
Cosumnes Groundwater Subbasin

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-1

eki environment & water

Path: X:\C20149.01\Map\01\Figure AR-1. Cosumnes Groundwater Basin.mxd



Legend

- Well with Fall 2021 GWE
- RMW-WL
- Fall 2021 GWE (ft NAVD 88)

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)

Abbreviations

DWR = California Department of Water Resources
ft NAVD 88 = feet above the North American Vertical Datum of 1988
GWE = Groundwater Elevation
RMW-WL = Representative Monitoring Well for Chronic Lowering of Groundwater Levels

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.

N

0 3 6

(Scale in Miles)

DRAFT

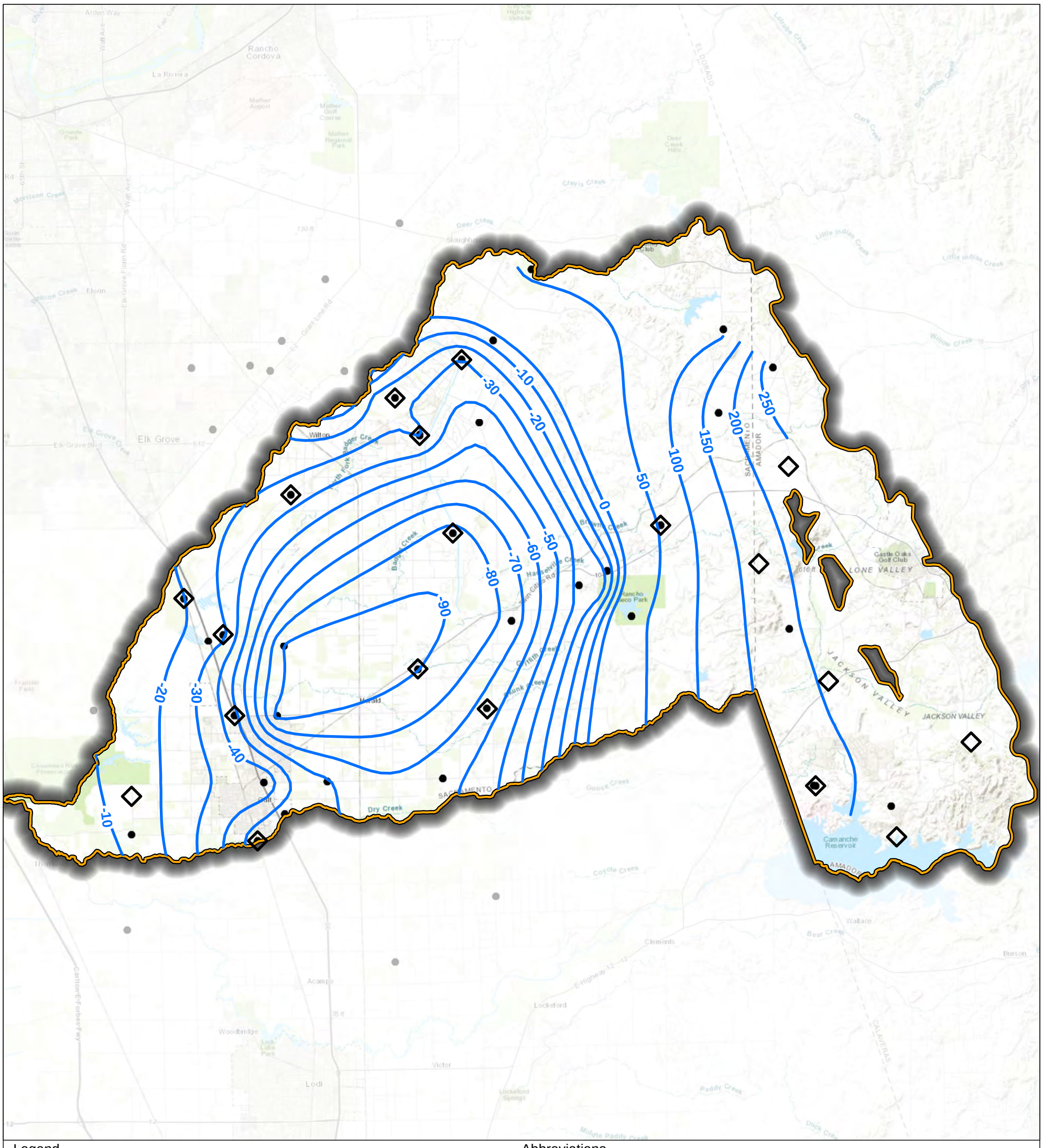
Groundwater Elevation - Fall 2021

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-2

eki environment & water

Path: X:\C20149.01\Map\03\Figure AR-2. Groundwater Elevations - Fall 2021.mxd



Legend

- Well with Spring 2022 GWE
- RMW-WL
- Spring 2022 GWE Contour (ft NAVD88)

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)

Abbreviations

DWR = California Department of Water Resources
ft msl = ft above the North American Vertical Datum of 1988
GWE = Groundwater Elevation
RMW-WL = Representative Monitoring Well for Chronic Lowering of Groundwater Levels

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.

N

0 3 6

(Scale in Miles)

DRAFT

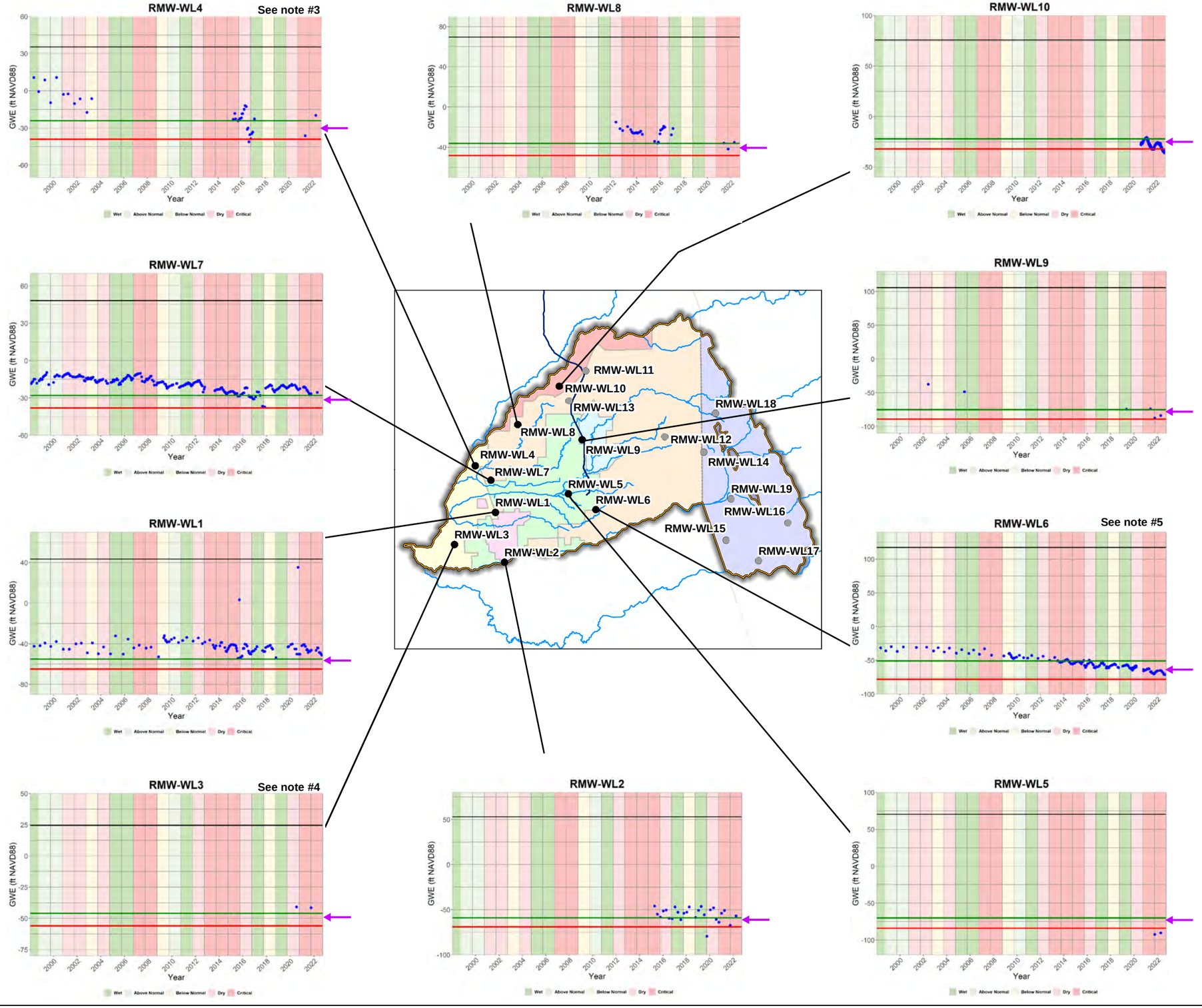
Groundwater Elevation - Spring 2022

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-3

eki environment & water

Path: X:\C20149.01\Map\03\Figure AR-3. Groundwater Elevations - Spring 2022.mxd



Legend

- Cosumnes Subbasin (5-022.16)

Groundwater Sustainability Agency

- Amador County Groundwater Management Authority
- City of Galt
- Clay Water District
- Galt Irrigation District
- Omochumne-Hartnell Water District
- Sacramento County
- Sloughhouse Resource Conservation District
- County Line
- Major Stream
- Folsom South Canal
- RMW-WL
- Groundwater Elevation
- Ground Surface Elevation
- MT
- MO
- 2027 Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Abbreviations

ft NAVD88	= feet above the Vertical Datum of 1988l
GWE	= groundwater elevation
MO	= Measurable Objective
MT	= Minimum Threshold
RMW-WL	= Represenatitve Monitoring Well for Chronic Lowering of Water Levels

Notes

1. All locations are approximate.
2. See Figure AR-4b for RMW-WL11 through RMW-WL19.
3. Fall 2021 water levels were not measured in RMW-WL4.
4. Spring 2022 water levels were not measured in RMW-WL3.
5. Since about 2015, the trend seems to have increased relative to the longer-term historical trend.

N

0 8 16

(Scale in Miles)

Representative Monitoring Well - Hydrographs

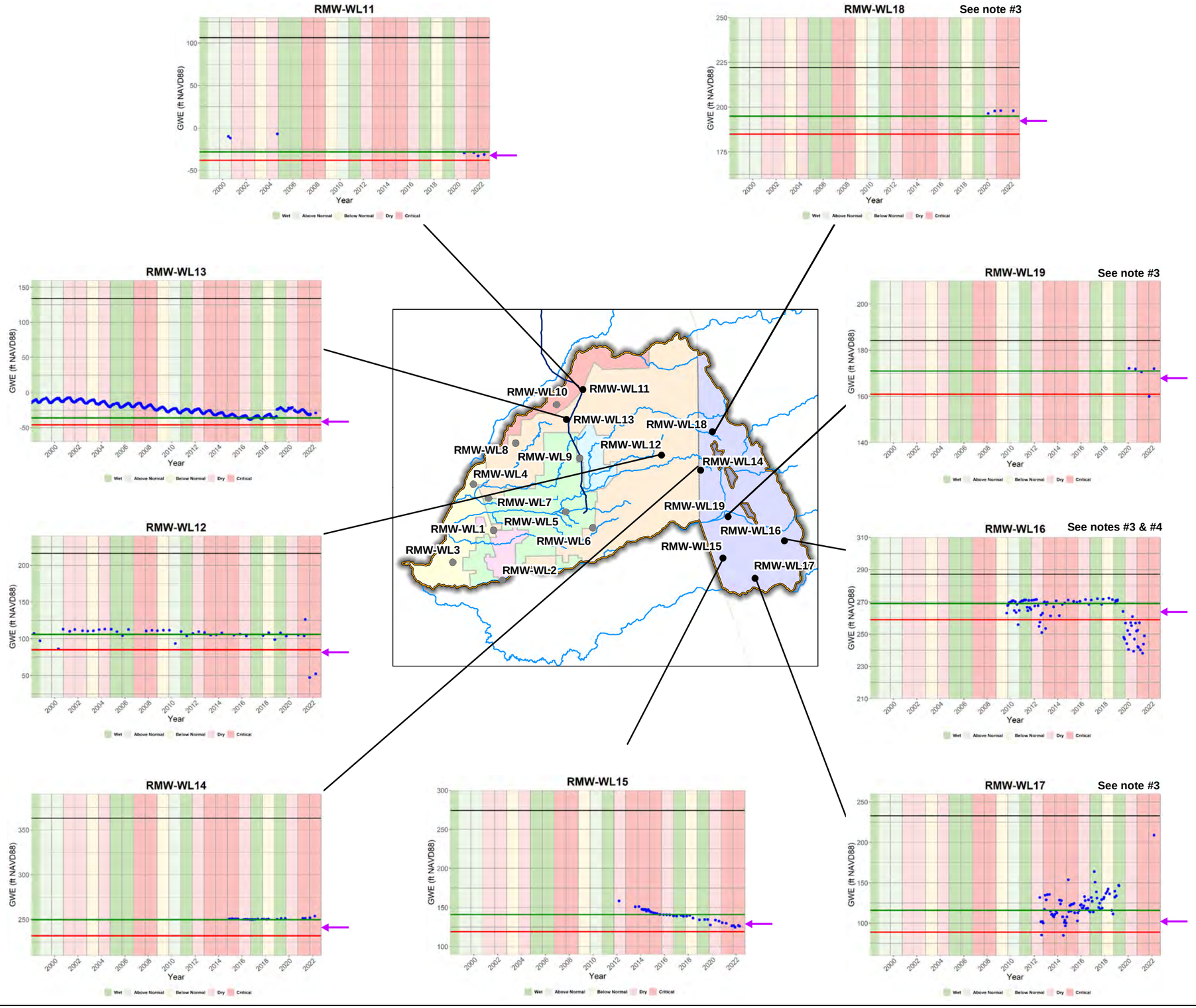
DRAFT

eki environment & water

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-4a

Path: X:\C20149.01\Map\03\Figure AR-4. Hydrographs (a).mxd



Legend

- Cosumnes Subbasin (5-022.16)

Groundwater Sustainability Agency

- Amador County Groundwater Management Authority
- City of Galt
- Clay Water District
- Galt Irrigation District
- Omochumne-Hartnell Water District
- Sacramento County
- Sloughhouse Resource Conservation District
- County Line
- Major Stream
- Folsom South Canal
- RMW-WL
- Groundwater Elevation
- Ground Surface Elevation
- MT
- MO
- 2027 Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Abbreviations

ft NAVD 88 = feet above the North American Vertical Datum of 1988
GWE = groundwater elevation
MO = Measurable Objective
MT = Minimum Threshold
RMW-WL = Represenatitve Monitoring Well for Chronic Lowering of Water Levels

Notes

1. All locations are approximate.
2. See Figure AR-4a for RMW-WL1 through RMW-WL10.
3. Water levels were not measured in RMW-WL14, RMW-WL16, RMW-WL17, RMW-WL18, and RMW-WL19 during Water Year 2022.
4. Change in water level trends starting in WY 2020.

N

0 8 16

(Scale in Miles)

Representative Monitoring Well - Hydrographs

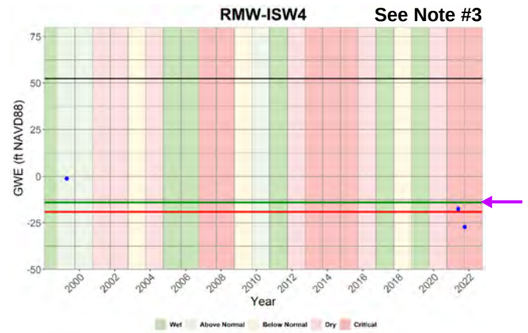
DRAFT

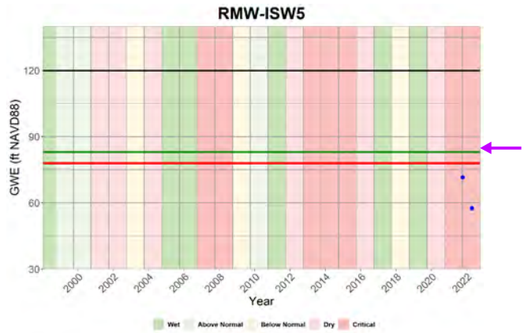
Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

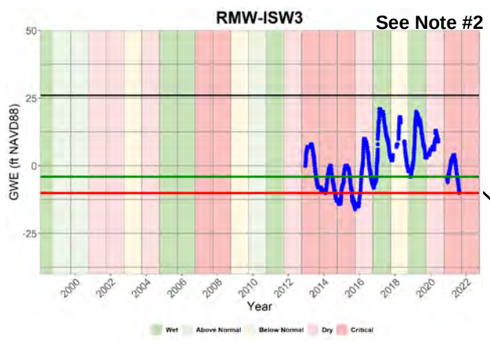
Figure AR-4b

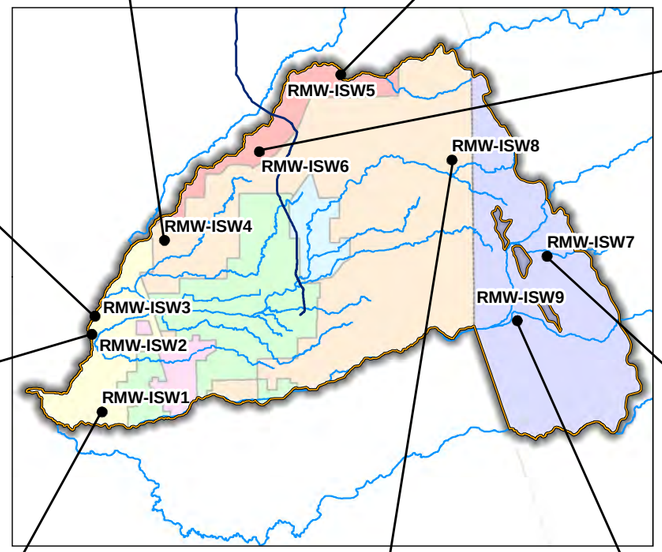
eki environment & water

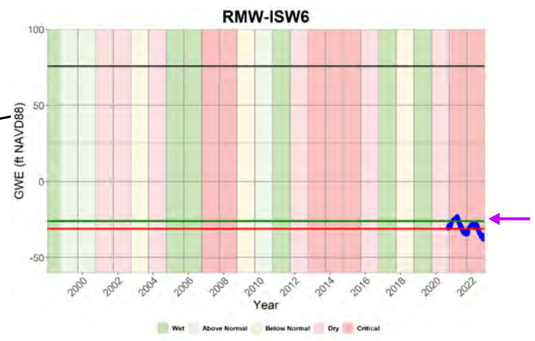
Path: X:\C20149.01\Mapl\02\Figure AR-4. Hydrographs (b).mxd

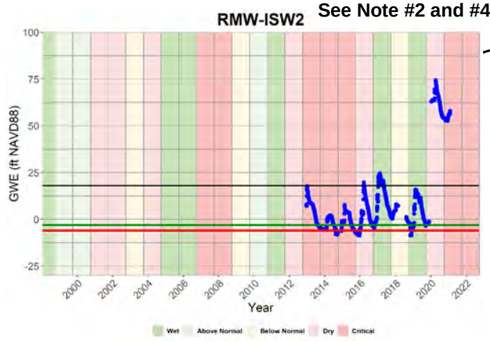


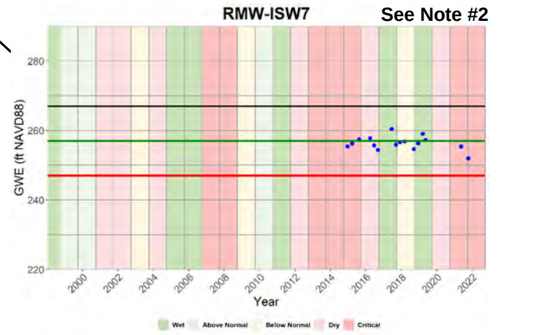


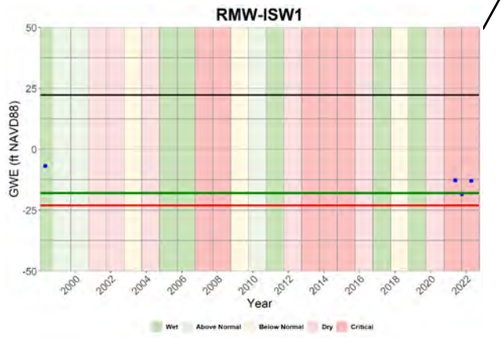


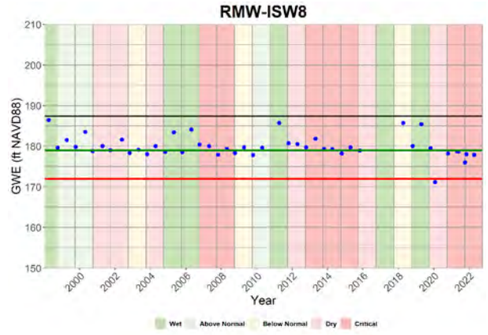


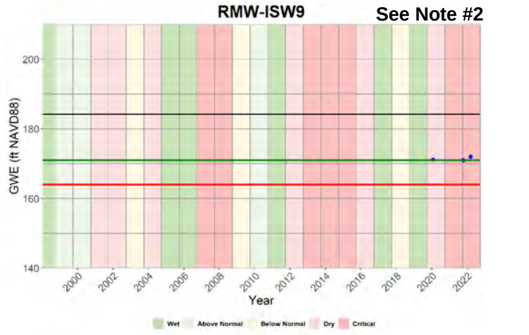












Legend

- Cosumnes Subbasin (5-022.16)

Groundwater Sustainability Agency

- Amador County Groundwater Management Authority
- City of Galt
- Clay Water District
- Galt Irrigation District
- Omochumne-Hartnell Water District
- Sacramento County
- Sloughhouse Resource Conservation District
- County Line
- Major Stream
- Folsom South Canal
- RMW- ISW
- Groundwater Elevation
- Ground Surface Elevation
- MT
- MO
- 2027 Interim Milestone (see note #5)

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Abbreviations

ft NAVD88	= feet above mean sea level
GWE	= groundwater elevation
MO	= Measurable Objective
MT	= Minimum Threshold
RMW-ISW	= Represenatitve Monitoring Well for Interconnected Surface Water

Notes

1. All locations are approximate.
2. Water levels were not measured in RMW-ISW2, RMW-ISW3, RMW-ISW7 or RMW-ISW9 during Water Year 2022.
3. Water levels were not measured in RMW-ISW4 during Spring Water Year 2022.
4. Measurements recorded for RMW-ISW2 after 10 January 2020 are considered questionable as all values are increased by up to 60 feet compared to recent data.
5. Interim Milestones only set for RMW-ISWs in disconnected reaches lacking Groundwater Dependant Ecosystems.

N

0 8 16

(Scale in Miles)

DRAFT

Representative Monitoring Well - Hydrographs

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-4c

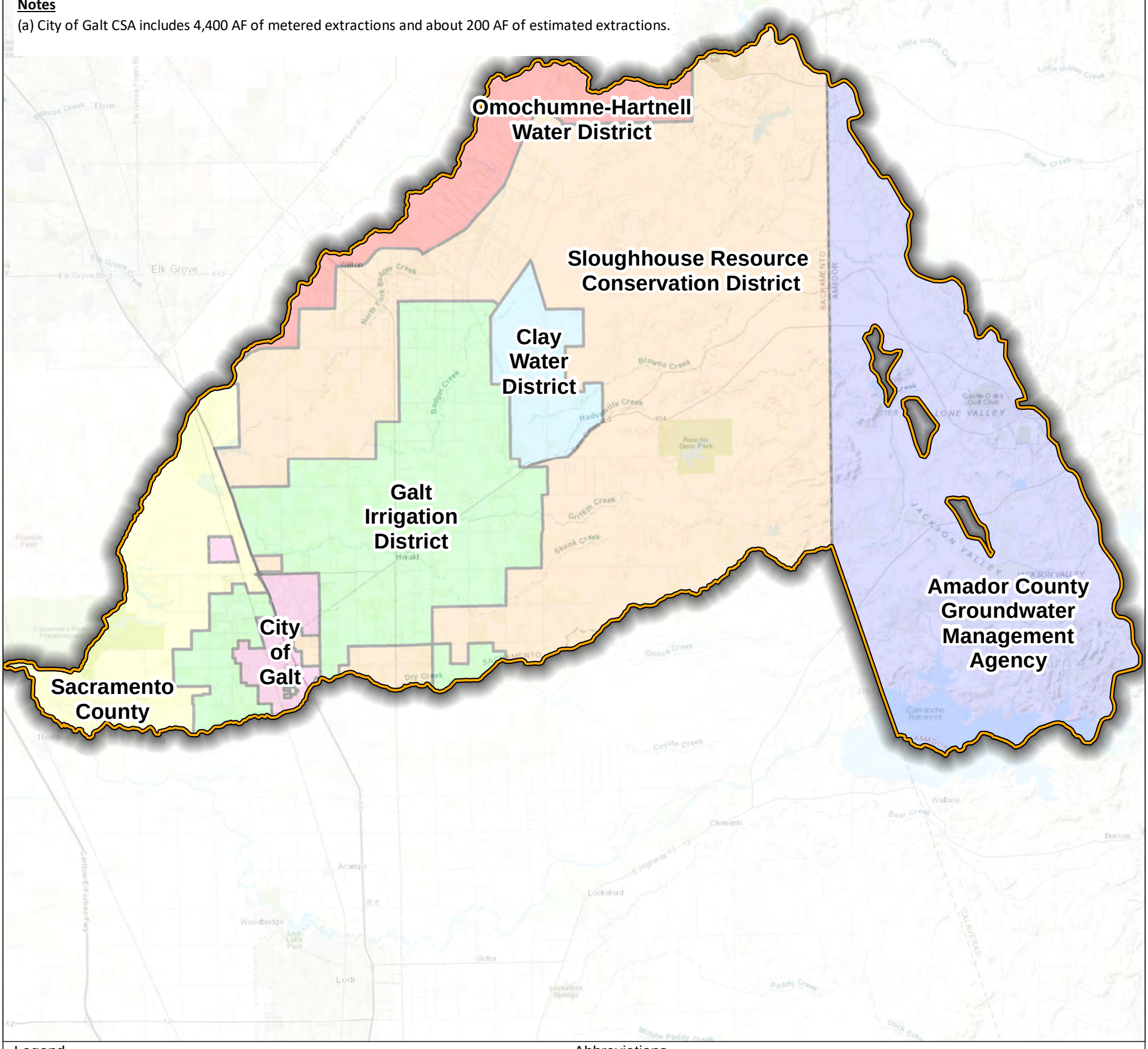
eki environment & water

Path: X:\C20149.01\Map\03\Figure AR-4, Hydrographs (c).mxd

Groundwater Sustainability Agency	Total Estimated Extractions (AF)
Amador County Groundwater Management Authority	1,700
City of Galt[(a)]	4,600
Clay Water District	8,200
Galt Irrigation District	57,700
Omochumne-Hartnell Water District	6,900
Sacramento County	15,400
Sloughhouse Resource Conservation District	44,800
Total	139,300

Notes

(a) City of Galt CSA includes 4,400 AF of metered extractions and about 200 AF of estimated extractions.



Legend

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)

Groundwater Sustainability Agency

- Amador County GMA
- City of Galt
- Clay WD
- Galt ID
- Omochumne-Hartnell WD
- Sacramento County
- Sloughhouse RCD

Abbreviations

DWR = California Department of Water Resources
GMA = Groundwater Management Authority
ID = Irrigation District
RCD = Resource Conservation District
WD = Water District

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018.

N

0 3 6

(Scale in Miles)

DRAFT

General Locations and Volumes of Annual Extractions Water Year 2022

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-5

eki environment & water

Path: X:\C20149.01\Map\03\Figure AR-5. Location and Groundwater Production Supply Wells, WY 2022.mxd

RMW-WL11
RMW-WL10
RMW-WL13
RMW-WL8
RMW-WL9
RMW-WL12
RMW-WL18
RMW-WL4
RMW-WL7
RMW-WL14
RMW-WL5
RMW-WL6
RMW-WL1
RMW-WL19
RMW-WL16
RMW-WL3
RMW-WL15
RMW-WL2
RMW-WL17
Arkansas Creek
Laguna Creek
Willow Creek
Cosumnes River
North Fork Badger Creek
Badger Creek
Hadselville Creek
Carabas Paleo-Ridge
Willow Creek
Rancho Seco Lake
Jackson Creek
Deadman Gulch
Dry Creek
Camanche Reservoir

Legend

- RMW-WL
- Major Stream
- Folsom South Canal
- Lake and Reservoir

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)

Storage Change (ft/yr)

- ≤ - 1
- - 0.999 to - 0.750
- - 0.749 to - 0.500
- - 0.499 to - 0.250
- - 0.249 to 0.000
- >0.001

Abbreviations

CoSANA = Cosumnes, South American, and North American model
ft/yr = feet per year
DWR = California Department of Water Resources
RMW-WL = Represenatitve Monitoring Well for Chronic Lowering of Water Levels

Notes

1. All locations are approximate.
2. CoSANA calculates the volume of storage change within model element, and the element-by-element change was normalized by dividing the volumetric change in storage by the area of each respective model element and the results mapped in units of feet

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.
3. Storage change calculated by the updated numerical model (Appendix M "CoSANA - An Integrated Water Resources Model of the Cosumnes, South American, and North American Groundwater Subbasins, November 2021" in "Groundwater Sustainability Plan for the Cosumnes Subbasin, December 2021").

N

0 3 6

(Scale in Miles)

DRAFT

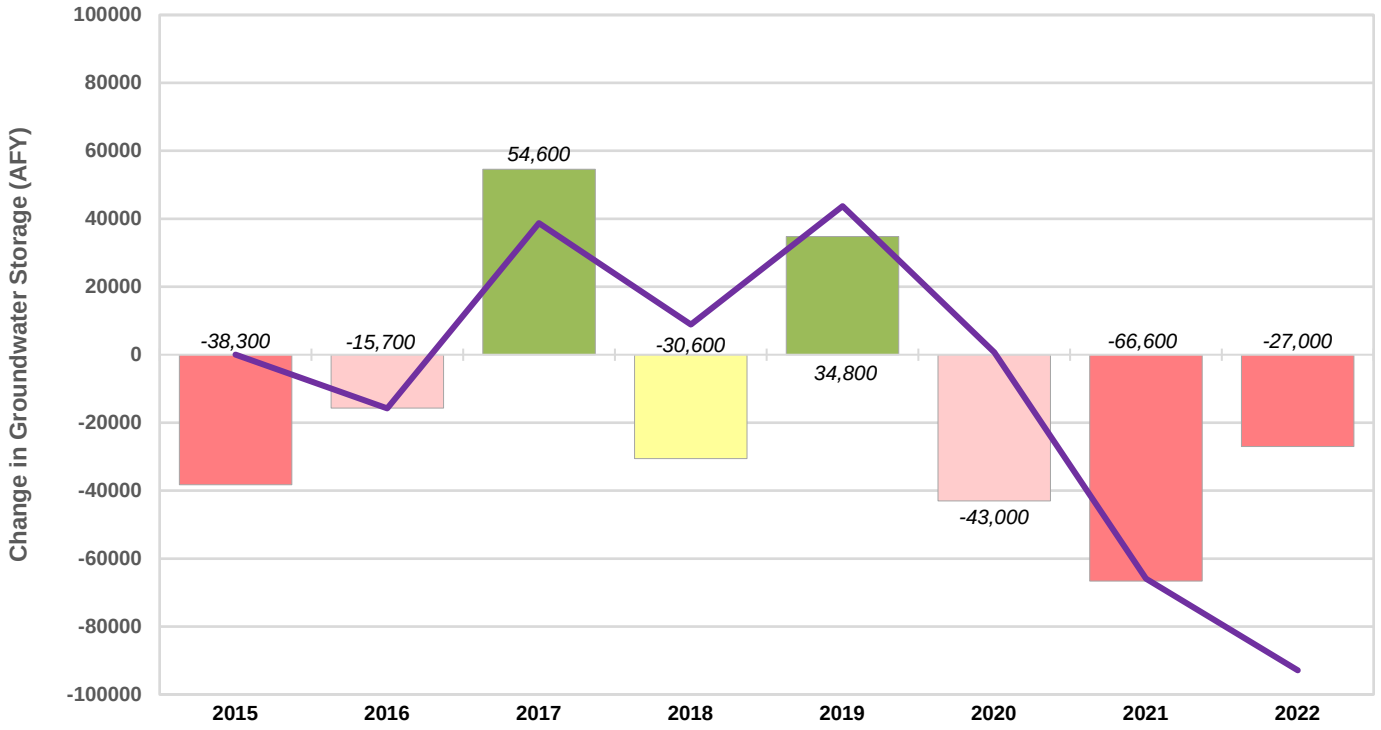
Map Showing the Distribution of Model-Calculated Changes in Groundwater Storage between October 1, 2021 through September 30, 2022 (Water Year 2022), Normalized by Model Element Area and Reported in feet

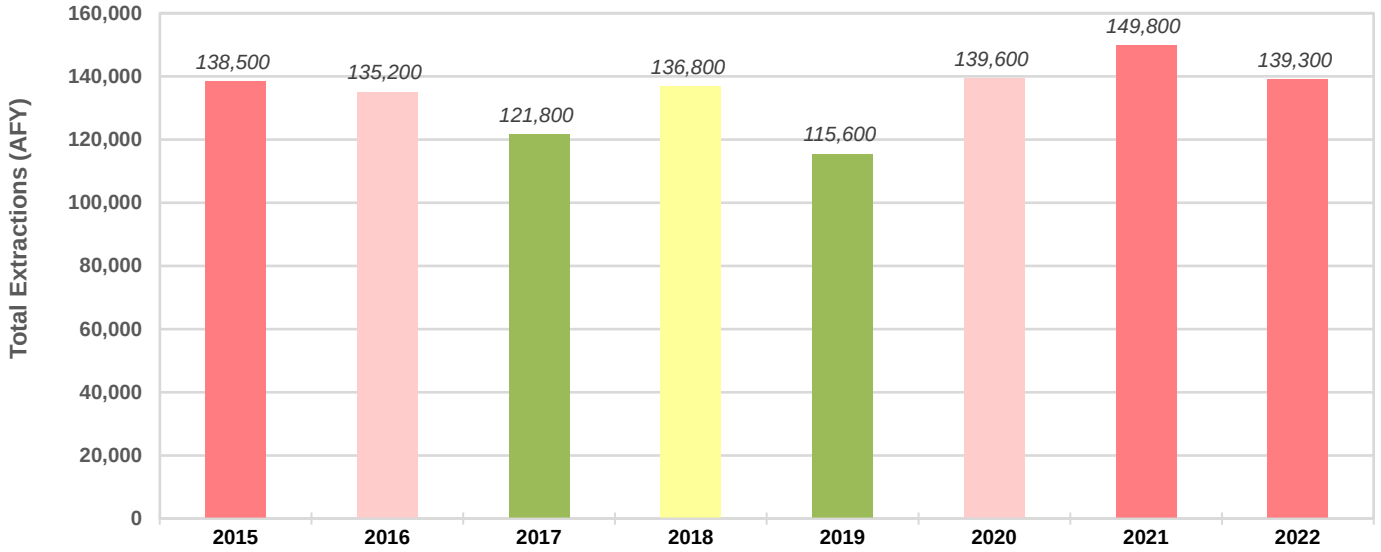
Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-6

eki environment & water

Path: X:\C20149.01\Map\03\Figure AR-6. Change in Storage Numerical Model.mxd





Legend

DWR Water Year Type and Annual Groundwater Storage Change (AFY)

- Wet
- Above Normal
- Below Normal
- Dry
- Critical
- Cumulative Storage Change Since 2015 (AFY)
- Estimated Extractions (AFY)

Abbreviations

AFY = acre-feet per year
DWR = California Department of Water Resources
WY = Water Year

Notes

1. Water Year is defined as the October of the previous year through September of the current year.
2. All values are rounded to the nearest 100 AF.

Sources

1. DWR Water Year type for 2015 - 2021 is from DWR's Water Year Hydrologic Classification Indices for the San Joaquin Valley (http://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST).
2. WY 2022 assigned the water year type based on previous years having similar annual precipitation and evapotranspiration.

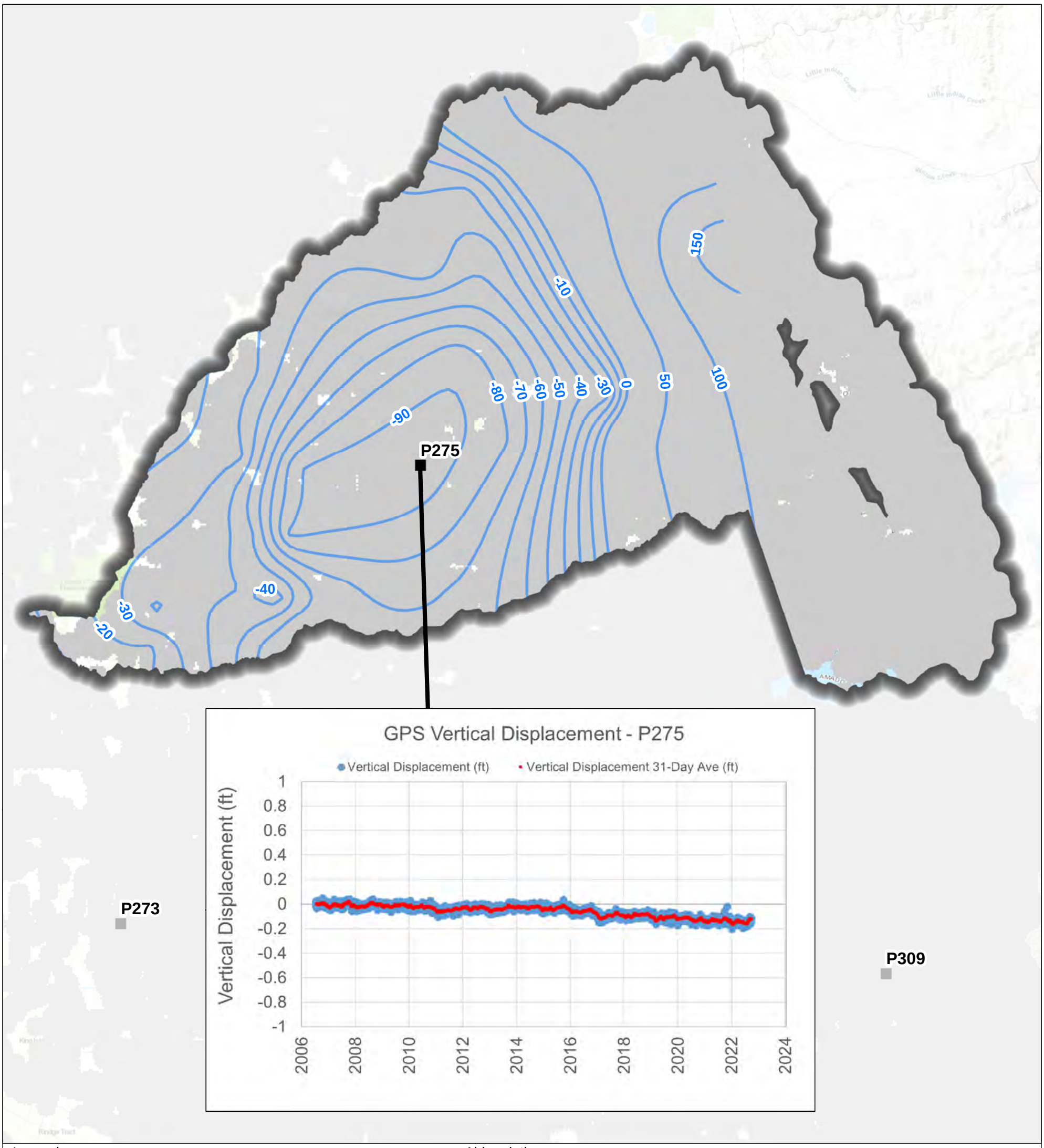
Annual Change in Groundwater Storage, Groundwater Use, and DWR Water Year Type

DRAFT

eki environment & water

Cosumnes Groundwater Autority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-7



Legend

- Subsidence Monitoring Station
- Fall 2021 GWE (ft NAVD 88)

Groundwater Subbasin

- Cosumnes Subbasin (5-022.16)

TRE Altamira InSAR Vertical Displacement WY 2022

- < - 1 ft
- - 1.0 to - 0.8 ft
- - 0.8 to - 0.6 ft
- - 0.6 to - 0.4 ft
- - 0.4 to - 0.2 ft
- - 0.2 to - 0.1 ft
- - 0.1 to 0.1 ft
- > 0.1 ft

Abbreviations

DWR = California Department of Water Resources
ft = feet
ft NAVD 88 = feet above the North American Vertical Datum of 1988
GWE = Groundwater Elevation
SGMA = Sustainable Groundwater Management Act

Notes

1. All locations are approximate.
2. TRE Altamira InSAR data displayed shows October 2021 through October 2022.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 3 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.
3. GPS subsidence monitoring data and Vertical Displacement data are from the SGMA Data Viewer: https://sgma.water.ca.gov/webgis/appid=SGMADataViewer#currentconditions
4. GWE contours from Figure AR-2.

N

0 3 6

(Scale in Miles)

DRAFT

Subsidence Monitoring WY 2022

Cosumnes Groundwater Authority
Cosumnes Subbasin
March 2023
C20149.01

Figure AR-8

eki environment & water

Path: X:\C20149.01\Mapl\02\Figure AR-8. Susidence Monitoring.mxd