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San Luis Obispo Valley Basin Groundwater Sustainability Committee
and the Groundwater Sustainability Agencies

San Luis Obispo Valley Groundwater Basin Annual Report (Water Year 2022)

March 7, 2023

Prepared by:

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Cleath-Harris Geologists, Inc.

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San Luis Obispo Valley Groundwater Basin
Annual Report (Water Year 2022)

This report was prepared by the staff of GSI Water Solutions, Inc., and Cleath-Harris Geologists, Inc., under the supervision of the professionals whose signatures appear below. The findings or professional opinion were prepared in accordance with generally accepted professional engineering and geologic practice.

Dave O'Rourke, PG, CHg
Principal Hydrogeologist
Project Manager

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Senior Hydrogeologist

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Abbreviations and Acronyms

AF	acre-feet
AFY	acre-feet per year
amsl	above mean sea level
City	City of San Luis Obispo
COC	constituent of concern
County	County of San Luis Obispo
DWR	California State Department of Water Resources
ETo	reference evapotranspiration
ft	foot or feet
GSA	Groundwater Sustainability Agency
GSC	Groundwater Sustainability Commission
GSP	Groundwater Sustainability Plan
InSAR	interferometric synthetic-aperture radar
MOA	memorandum of agreement
PWS	public water system
RMS	representative monitoring site
S	storage coefficient
SGMA	Sustainable Groundwater Management Act
SLOFCWCD	County of San Luis Obispo Flood Control and Water Conservation District

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Annual Report Elements Guide and Checklist

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	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.	Executive Summary (§356.2[a])
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:	Section 2.4 Groundwater Elevation Monitoring (§356.2[b])
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:	Section 3 Groundwater Elevations (§356.2[b][1])
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	Section 3.2 Seasonal High and Low (Spring and Fall) (§356.2[b][1][A])
	(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.	Section 3.3 Hydrographs (§356.2[b][1][B], and Appendix D
	(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.	Section 4 Groundwater Extractions (§356.2[b][2])
	(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.	Section 5 Surface Water Use (§356.2[b][3])

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	(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.	Section 6 Total Water Use (§356.2[b][4])
	(5) Change in groundwater in storage shall include the following:	Section 7 Change in Groundwater in Storage (§356.2[b][5])
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	Section 7.1 Annual Changes in Groundwater Elevation (§356.2[b][5][A])
	(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.	Section 7.2 Annual and Cumulative Change in Groundwater in Storage Calculations (§356.2[b][5][B]) and Appendix D Hydrographs
	(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.	Section 8 Progress toward Basin Sustainability (§356.2[c])

Executive Summary (§ 356.2[a])

Introduction

This 2022 Annual Report for the San Luis Obispo Valley Groundwater Basin (Basin, Figure ES-1) has been prepared in accordance with the Sustainable Groundwater Management Act (SGMA) regulations. Pursuant to the SGMA regulations, a GSP annual report must be submitted to California Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP.

With the submittal of the adopted San Luis Obispo Valley Basin Groundwater Sustainability Plan (GSP) by the January 31, 2022 deadline, the Groundwater Sustainability Agencies (GSAs) submitted the first Annual Report for the preceding two water years before the April 1, 2022 deadline. This is the second Annual Report and documents data for water year 2022 (October 1, 2021 through September 30, 2022). The annual report conveys monitoring and water use data to the DWR and basin stakeholders on an annual basis to gauge performance of the Basin relative to the sustainability goals set forth in the GSP (WSC et al., 2021).

This Annual Report includes the following sections:

- **Section 1. Introduction – San Luis Obispo Valley Basin Second Annual Report (Water Year 2022)**: A brief background of the formation and activities of the San Luis Obispo Basin GSAs and development and submittal of the GSP.
- **Section 2. San Luis Obispo Basin Setting and Monitoring Networks**: A summary of the basin setting, basin monitoring networks, and ways in which data are used for groundwater management.
- **Section 3. Groundwater Elevations (§356.2[b][1])**: A description of recent monitoring data with groundwater elevation contour maps for spring and fall monitoring events and hydrographs of representative monitoring site (RMS) wells.
- **Section 4. Groundwater Extractions (§356.2[b][2])**: A compilation of metered and estimated groundwater extractions by land use sector and location of extractions.
- **Section 5. Surface Water Use (§356.2[b][3])**: A summary of reported surface water use.
- **Section 6. Total Water Use (§356.2[b][4])**: A presentation of total water use by source and sector.
- **Section 7. Change in Groundwater in Storage (§356.2[b][5])**: A description of the methodology and presentation of changes in groundwater in storage based on fall-to-fall groundwater elevation differences.
- **Section 8. Progress toward Basin Sustainability (§356.2[c])**: A summary of management actions taken throughout the Basin by GSAs and individual entities toward sustainability of the Basin.
- **Section 9: References.**

Groundwater Elevations

No Representative Monitoring Site (RMS) had water levels that exceeded the minimum thresholds established in the Groundwater Sustainability Plan (GSP). Water levels in the San Luis Valley subarea, where there is significantly less groundwater production, have remained essentially stable. Water levels in the Edna Valley subarea, which has more intensive agricultural groundwater production, remain comparatively lower than the San Luis Valley. In general, the groundwater elevations observed in the Basin during water year 2022 reflect differing trends in the San Luis Valley subarea and the Edna Valley subarea.

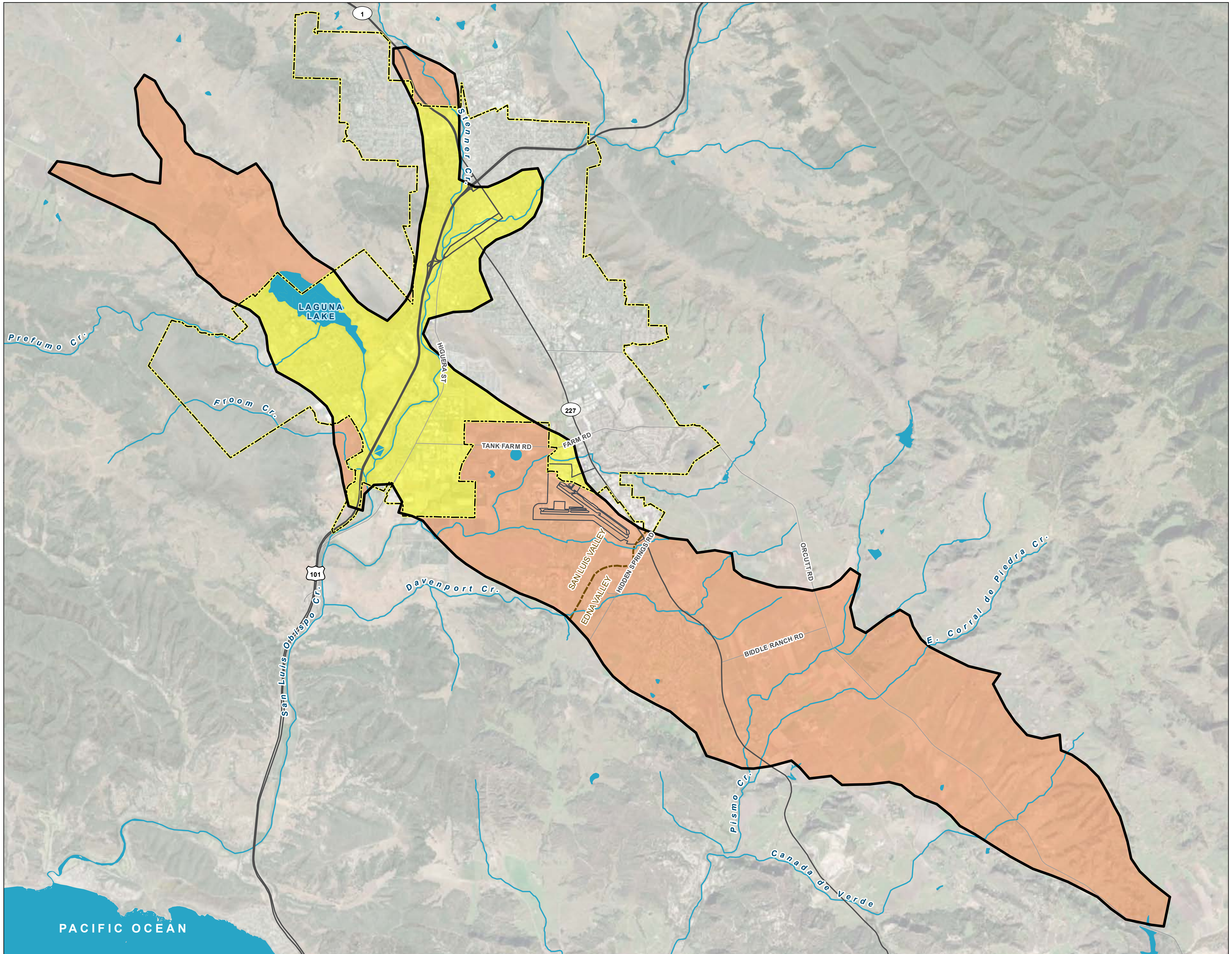

FIGURE ES-1

Extent of the San Luis Obispo Basin and Groundwater Sustainability Agencies

San Luis Obispo, California

DRAFT

LEGEND

Groundwater Sustainability Agencies

- City of San Luis Obispo
- San Luis Obispo County

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

N

0 0.5 1 1.5
Miles

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

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Groundwater Extractions

Total groundwater extractions in the Basin for water year 2022 were 6,700 acre-feet (AF). Table ES-1 summarizes the groundwater extractions by water use sector for water year 2022.

Table ES-1. Groundwater Extractions by Water Use Sector

Water Year	Municipal (AF)	PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
2020	0	1,250	4,960	6,210
2021	0	1,250	5,030	6,280
2022	0	1,290	5,410	6,700
Method of Measure	Metered	PWS-Metered Rural Domestic - Estimated	Soil-Water Balance Model	—
Level of Accuracy	High	High-Medium	Medium	—

Notes

— = not applicable

AF = acre-feet

PWS = public water systems

Only the soil-water balance model results are displayed here.

Surface Water Use

The Basin currently benefits from entitlements for importing surface water from the Nacimiento Water Project, Whale Rock Reservoir, and Salinas Reservoir to supply municipal groundwater demands in the City of San Luis Obispo. There is currently no surface water available for agricultural or recharge project use within the Basin. A summary of total actual surface water use by source is provided in Table ES-2.

Table ES-2. Total Surface Water Use by Source

Water Year	Nacimiento Water Project (AF)	Whale Rock Reservoir (AF)	Salinas Reservoir (AF)	Total Surface Water Use (AF)
2020	1,562	1,459	2,154	5,176
2021	2,691	1,491	1,266	5,448
2022	4,302	613	575	5,489

Note

AF = acre-feet

Total Water Use

For water year 2022, quantification of total water use was completed through reporting of metered water production data from PWS wells, and metered surface water use. In addition, rural water use and small commercial public water system use was estimated. Agricultural use was estimated using the soil-water balance models used to estimate agricultural crop and applicable urban turf (golf course and playground fields) water supply requirements in previous years. (This year, for the first time, a new satellite-based method was used to estimate agricultural production using LandIQ land use data sets and OpenET satellite data. Results were comparable, and are discussed in detail in Section 4. Both methods will be applied again in next year's annual report; after this, the GSAs will determine which method to use in the future.). Table ES-3 summarizes the total annual water use in the Basin by source and water use sector.

Table ES-3. Total Annual Water Use in the Basin by Source and Water Use Sector

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	Groundwater	Surface Water	Groundwater	Groundwater	Groundwater and Surface Water
2020	0	5,176	1,250	4,960	11,390
2021	0	5,448	1,250	5,030	11,728
2022	0	5,489	1,290	5,410	12,148
Method of Measure	Metered	Metered	PWS-Metered Rural Domestic-Estimated	Soil-Water Balance Model	—
Level of Accuracy	High	High	High-Medium	Medium	—

Notes

— = not applicable

AF = acre-feet

PWS = public water systems

Change in Groundwater in Storage

The calculation of change of groundwater in storage in the Basin was derived from a comparison of fall groundwater elevation contour maps from one year to the next, as well as taking the difference between groundwater elevations throughout the Basin as the aquifer becomes saturated (storage gain) or dewatered (storage loss).

The groundwater elevation change map for fall 2021 to fall 2022 (see Figure ES-2), which was a below-average rainfall year, shows that water levels declined in some pumping centers of the Edna Valley area of the Basin, and decreased slightly in the San Luis Valley in the downstream vicinity of San Luis Creek. The decreased water levels in the downstream vicinity of San Luis Creek may be due to dewatering activities related to construction at the San Luis Obispo Water Resource Recovery Facility.

The annual changes of groundwater in storage calculated for water year 2022 are presented in Table ES-4.

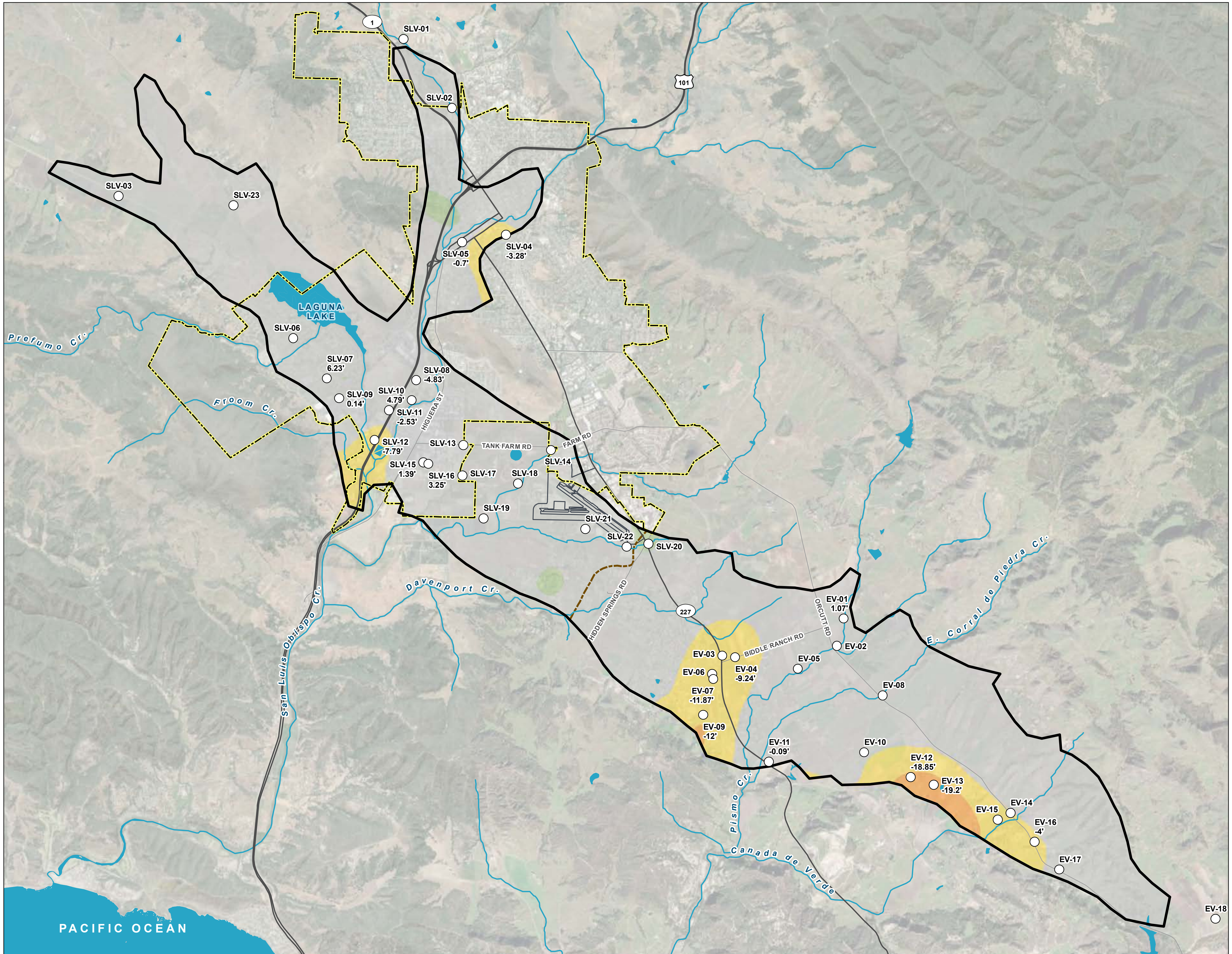

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FIGURE ES-2

Annual Change in Groundwater Elevation, October 2021/2022

San Luis Obispo, California

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LEGEND

- Monitoring Well

Change in Groundwater Elevation (feet NAVD88)

- >25
- >15 to 25
- >5 to 15
- -5 to 5
- -15 to -5
- -25 to -15
- -28 to -25

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO
- Major Road
- Watercourse
- Waterbody

Date: February 20, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Table ES-4. Annual Changes of Groundwater in Storage for Water Year 2022

Water Year	San Luis Valley (AF)	Edna Valley (AF)	Annual Change in Groundwater in Storage (AF)
2020	210	-750	-540
2021	-450	-5,080	-5,530
2022	273	-1,937	-1,663
Total	33	-7,767	-7,734

Note

AF = acre-feet

Progress toward Meeting Basin Sustainability

Pursuit of SGMA Implementation Grant Funding

In December 2022, the County Director of Groundwater Sustainability, in coordination with the City and County Groundwater Sustainability Agencies and the Groundwater Sustainability Commission, applied for grant funding through DWR's SGMA Round 2 SGMA Implementation Grant Program. Under this program, approximately $231 million is available statewide in disbursements ranging from $1 to $20 million. The funding is based on competitive scoring and is intended for basins that received no Round 1 funding, which includes SLO Basin.

The grant application requested funding to facilitate implementation of the following projects and management actions identified in the GSP:

- Recharge for Conjunctive Benefit in Edna Valley
- Basin-wide well verification and registration program
- Pumping fee program
- Irrigated lands best management practices
- Multi-benefit irrigated land repurposing (MILR) program
- Specific well interference mitigation program
- Groundwater extraction measurement program
- Expanded monitoring network
- Varian Ranch Mutual Water Company well 4 feasibility study
- SLO Basin State Water Project (SWP) supplemental water study

Each of these projects is described in concept in the GSP and are detailed in the grant application to DWR. Planning and conceptual design were considered for several of these projects. A grant funding award under this program will help move each of these potential projects through the planning phase and move the most feasible toward ultimate implementation.

Expanded Monitoring Network

During the GSP development a significant number of new private wells were added to the existing network monitored by the County. In addition, some City-owned wells which had not been monitored in over 20 years were added to the network. The new expanded monitoring network of 42 wells was monitored for the first time during the April 2022 monitoring event. This expanded monitoring network will allow for more detailed groundwater elevation maps and more robust calculation of groundwater in storage in future annual reports.

Relative to the basin conditions as reported in the first Annual Report (water years 2020 and 2021), data presented in this report indicate similar groundwater conditions throughout the Basin, with groundwater elevations in the representative monitoring site (RMS) wells ranging from approximately 3 feet higher (SLV-16) to 35 feet lower (EV-12), and some decrease in total groundwater in storage.

However, water year 2022 was another below-average rainfall year. Most of the 10 RMS wells in the basin groundwater monitoring network exhibited declining water levels over this period, due to increased agricultural groundwater extractions related to increased evapotranspiration rates, continued growth of more than 400 acres of citrus plantings (from 2020), and an increase of approximately 80 acres of pasture (see Section 4.3). None of the wells have groundwater elevations at or below the minimum threshold established in the GSP; however, the fall 2022 water level in EV-12 is within 2 feet of the minimum threshold.

Groundwater in storage in the Basin decreased approximately 7,734 AF in total over the past three water years based on calculations of changes in groundwater elevations and estimated specific yield in the Basin. The volume of groundwater extractions in the Basin has remained within the historical range of observed extractions documented in the GSP (WSC et al., 2021). Groundwater in storage has decreased somewhat over the past three water years. Groundwater pumping continues to exceed the estimated sustainable yield, and some of the projects and management actions described in the GSP and in this first Annual Report will be necessary in order to bring the Basin into sustainability.

Recent InSAR land subsidence data available since publication of the GSP indicates that there was no measurable land subsidence in the Basin during water year 2022.

At this time, no additional data describing the interconnectivity of surface water and groundwater, or potential surface water depletion, are available for analysis. The potential for impacts to this sustainability indicator will be assessed in future annual reports as monitoring network improvements and associated data are developed.

It has been about 13 months since the completion and submission of the GSP. Additional time will be necessary to assess the effectiveness and quantitative impacts of the projects and management actions either now underway or in the planning and development stages. The implementation of an improved monitoring network in the Basin will provide the data consistency necessary to provide a more robust evaluation of future conditions. However, all water user groups and stakeholders in the Basin are actively engaged in the water resources planning process, and it is clear that the actions in place and as described in this first Annual Report are a good start toward reaching the sustainability goals laid out in the GSP (WSC et al., 2021). It is too soon to judge the observed changes in basin conditions against the interim goals outlined in the GSP, but the anticipated effects of the projects and management actions now underway are expected to significantly affect the ability of the Basin to reach the necessary sustainability goals.

SECTION 1: Introduction – San Luis Obispo Basin Second Annual Report (Water Year 2022)

This second Annual Report for the San Luis Obispo Valley Basin (Basin) has been prepared for the San Luis Obispo Valley Basin Groundwater Sustainability Committee (GSC) and the Groundwater Sustainability Agencies (GSAs) in accordance with the Sustainable Groundwater Management Act (SGMA) regulations (§ 356.2. Annual Reports) (see Appendix A). Pursuant to the SGMA regulations, a Groundwater Sustainability Plan (GSP) Annual Report must be submitted to California Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP. With adoption and submittal of the San Luis Obispo Valley Basin GSP by January 31, 2022, the GSAs are required to submit an annual report for the preceding water year (October 1 through September 30) to DWR by April 1, 2023.[1]

1.1 Setting and Background

The *San Luis Obispo Valley Basin Groundwater Sustainability Plan* (WSC et al., 2021) was prepared by Water Systems Consulting (WSC), GSI Water Solutions, Inc. (GSI), Cleath-Harris Geologists (CHG), Stillwater Sciences, and GEI Consultants on behalf of and in cooperation with the GSC and the Basin GSAs. The GSP, and this Annual Report, cover the entire San Luis Obispo Basin (Figure 1). The Basin lies in the central portion of San Luis Obispo County. The majority of the Basin comprises gentle alluvial flatlands and hills that drain San Luis Creek and Pismo Creek watersheds, ranging in elevation from approximately 100 feet (ft) above mean sea level (amsl) where San Luis Obispo Creek leaves the Basin to about 450 ft amsl in the higher parts of the Edna Valley. Communities in the Basin are the City of San Luis Obispo (City) and the communities of Edna, Edna Ranch and Varian Ranch. Highway 101 is the most significant north-south highway through the Basin, with State Route 227 running approximately parallel to the axis of the Basin from the City to Edna Valley.

The GSP was jointly developed by two GSAs:

- City of San Luis Obispo GSA
- County of San Luis Obispo GSA

The GSAs overlying the Basin and small water purveyors in the Basin (i.e., Edna Valley Mutual Water Company, Golden State Water Company, and Varian Ranch Mutual Water Company) entered into a Memorandum of Agreement (MOA) effective as of January 25, 2018. The purpose of the MOA was to establish a Basin GSC to act as an advisory body to the GSAs and to develop a single GSP for the entire Basin to be considered for adoption by each GSA and subsequently submitted to DWR for approval. Under the framework of the original MOA, the GSAs and GSC engaged the public and coordinated to jointly develop the San Luis Obispo Valley Basin GSP. At its October 20, 2021 meeting, in accordance with the MOA, the GSC voted unanimously to recommend that the GSAs adopt the GSP and submit it to DWR by the SGMA deadline of January 31, 2022. Subsequent actions by each GSA resulted in unanimous approval of the GSP and a joint submittal of the GSP to DWR.

[1] The required time frame of the annual reports, pursuant to the SGMA regulations, is by water year, which is October 1 through September 30 of any water year. However, because the County of San Luis Obispo Groundwater Level Monitoring Program measures water levels in October, the October 2022 measurements are used to reflect conditions at the end of water year 2022.

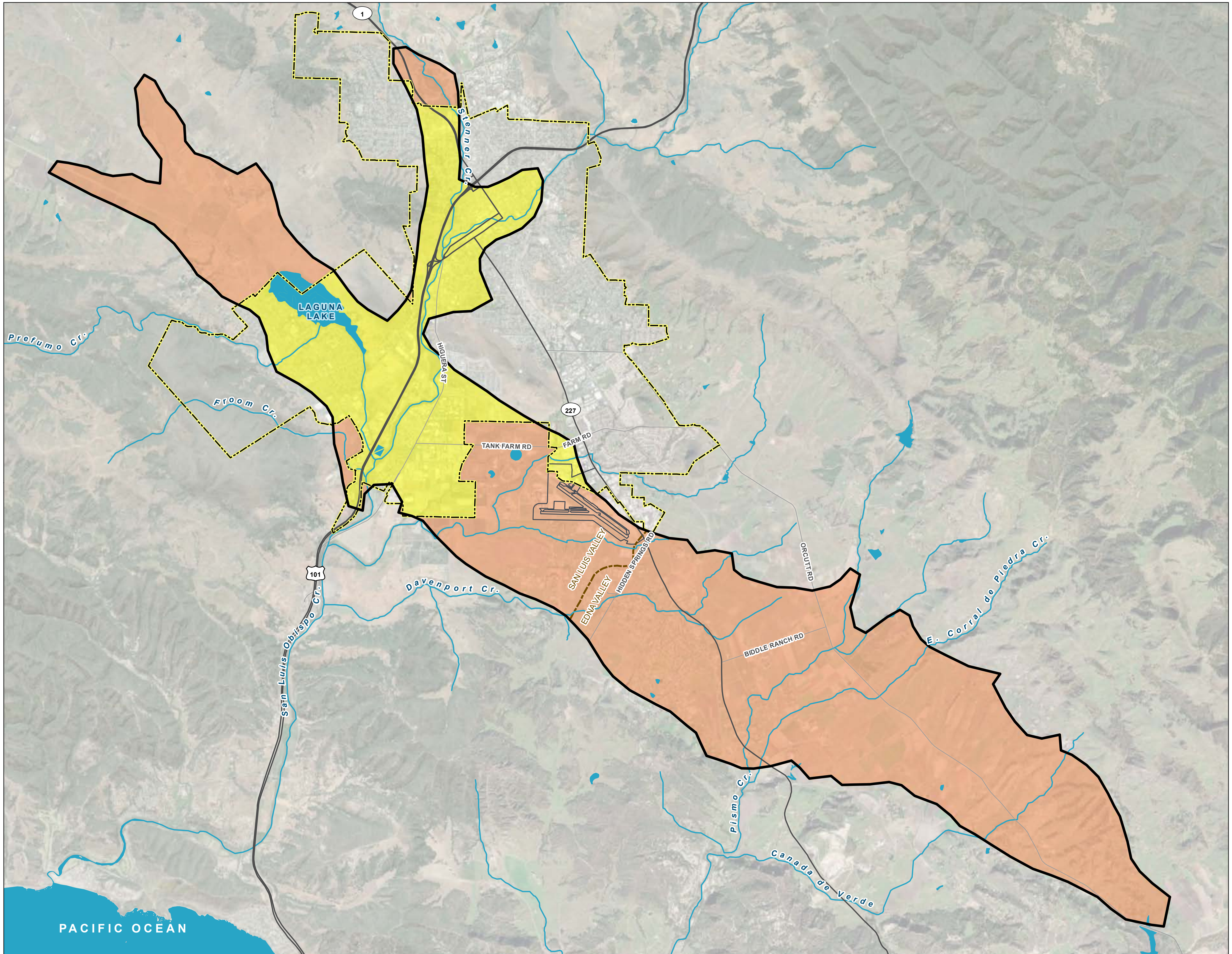

FIGURE 1

Extent of the San Luis Obispo Basin and Groundwater Sustainability Agencies

San Luis Obispo, California

DRAFT

LEGEND

Groundwater Sustainability Agencies

- City of San Luis Obispo
- San Luis Obispo County

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
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N

0 0.5 1 1.5
Miles

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS,
Aerial Photo 2020

GSI Water Solutions, Inc.

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Each of the GSAs and water purveyors appointed a representative to the GSC to coordinate activities among the parties during the development of the GSP, and the development and submittal of this 2022 Annual Report. The GSAs also agreed to designate the County of San Luis Obispo Groundwater Sustainability Director as the Plan Manager with the authority to submit the GSP and the Annual Report and serve as the point of contact with DWR.

1.2 Organization of This Report

The required contents of an Annual Report are provided in the SGMA regulations (§ 356.2), included as Appendix A. Organization of the report is meant to follow the regulations where possible to assist in the review of the document. The sections are briefly described as follows:

- **Section 1. Introduction – San Luis Obispo Valley Basin Second Annual Report (Water Year 2022)**: A brief background of the formation and activities of the San Luis Obispo Valley Basin GSAs and development and submittal of the GSP.
- **Section 2. San Luis Obispo Valley Basin Setting and Monitoring Networks**: A summary of the basin setting, basin monitoring networks, and the ways in which data are used for groundwater management.
- **Section 3. Groundwater Elevations (§356.2[b][1])**: A description of recent monitoring data with groundwater elevation contours for spring and fall monitoring events and representative hydrographs.
- **Section 4. Groundwater Extractions (§356.2[b][2])**: A compilation of metered and estimated groundwater extractions by land use sector and location of extractions.
- **Section 5. Surface Water Use (§356.2[b][3])**: A summary of reported surface water use.
- **Section 6. Total Water Use (§356.2[b][4])**: A presentation of total water use by source and sector.
- **Section 7. Change in Groundwater in Storage (§356.2[b][5])**: A description of the methodology and presentation of changes in groundwater in storage based on fall-to-fall groundwater elevation differences.
- **Section 8. Progress toward Basin Sustainability (§356.2[c])**: A summary of management actions taken throughout the Basin by GSAs and individual entities toward sustainability of the Basin.
- **Section 9: References.**

SECTION 2: San Luis Obispo Valley Basin Setting and Monitoring Networks

2.1 Introduction

This section provides a brief description of the basin setting and the groundwater management monitoring programs described in the GSP (WSC et al., 2021), as well as any notable events affecting monitoring activities or the quality of monitoring results in water year 2022. Much of the information reported on in this 2022 Annual Report was sourced from the GSP prepared by WSC et al. (2021).

2.2 Basin Setting

The Basin is oriented in a northwest-southeast direction and is composed of unconsolidated or loosely consolidated sedimentary materials deposited atop relatively impermeable bedrock (Figure 1). It is approximately 14 miles long and 1.5 miles wide. It covers a surface area of about 12,700 acres (19.9 square miles). The Basin is bounded on the northeast by the bedrock formations of the Santa Lucia Range, and on the southwest by the formations of the San Luis Range and the Edna and Los Osos fault systems. The bottom of the Basin is defined by the contact of permeable sediments with the impermeable bedrock Miocene-aged and Franciscan Assemblage rocks (DWR, 2003). Land surface elevation ranges from less than 100 ft amsl to over 450 ft amsl in the higher parts of the Edna Valley. The Basin is usually identified as having two distinctly different areas: The San Luis Valley subarea and the Edna Valley subarea. The unofficial boundary between these two subareas is a subsurface bedrock divide located just southwest of the airport, approximately coincident with Hidden Springs Road (Figure 1).

The San Luis Valley subarea comprises approximately the northwestern half of the Basin. It is the area of the Basin drained by San Luis Obispo Creek and its tributaries (Prefumo Creek and Stenner Creek west of Highway 101, Davenport Creek and smaller tributaries east of Highway 101). Surface drainage in the San Luis Valley subarea drains out of the Basin via San Luis Obispo Creek, flowing to the south along approximately along the alignment of Highway 101 toward the coast in the Avila Beach area. The San Luis Valley subarea includes the parts of the City and California Polytechnic University (Cal Poly) jurisdictional boundaries, which intersect with the Basin boundary, while the remainder of the Basin is unincorporated land. Land use in the City is primarily municipal, residential, and commercial. The area in the northwest part of the Basin, along Los Osos Valley Road, has significant areas of groundwater-dependent irrigated agriculture, primarily row crops.

The Edna Valley subarea comprises approximately the southeastern half of the Basin. The primary creeks that drain this subarea are the east and west branches of Corral de Piedras Creek, which join to form Pismo Creek just south of the basin boundary, draining south out of the Edna Valley into Price Canyon. Smaller tributaries, including Canada de Verde, drain south from the Edna Valley subarea in the extreme southeastern part of Edna Valley, ultimately joining Pismo Creek (Figure 1). The Edna Valley subarea includes unincorporated lands, including lands associated with various private water purveyors' service areas. The primary land use in the Edna Valley subarea is agriculture. Over the past two decades, wine grapes have become the most significant crop type in the Edna Valley.

There are three recognized water-bearing geologic formations that serve as aquifers: the Recent Alluvium, the Paso Robles Formation, and the Squire member of the Pismo Formation. These three formations are comprised of unconsolidated sediments whose productive strata are laterally discontinuous; no extensive confining layer separates one formation from the others throughout the Basin. In the San Luis Valley subarea, the Alluvium is not confined to active stream corridors, but is present at the surface throughout that entire part of the Basin. In the Edna Valley subarea, Alluvium is only present at the surface along active stream channels; the Paso Robles Formation is exposed at the surface in most of the Edna Valley subarea, and the Squire member is present at depth below the Paso Robles Formation. Groundwater production in the Basin has historically been seen as utilization of a single resource. Wells are typically screened across all productive strata regardless of the source geologic formation. In the San Luis Valley subarea, most wells are screened in both the Alluvium and the Paso Robles Formation. In the Edna Valley subarea, wells are typically screened across both the Paso Robles Formation and the Squire member of the Pismo Formation.

2.3 Precipitation and Climatic Periods

Annual precipitation recorded at the Cal Poly weather station is presented by water year in Figure 2. The long-term average annual precipitation for the period from 1870 through 2021 is 21.7 inches per water year, as recorded at the Cal Poly weather station. Climatic periods in the Basin have been determined based on published DWR analysis of historical precipitation data and are displayed for years since 1960 on Figure 2. These climatic periods are categorized according to the following designations: wet, dry, above normal, below normal, and critical. Historical precipitation records are provided in Appendix B.

2.4 Groundwater Elevation Monitoring (§ 356.2[b])

This section provides a brief description of the groundwater management monitoring programs currently in place and any notable events affecting monitoring activities or the quality of monitoring results.

2.4.1 Groundwater Elevation Monitoring Locations

The GSP (WSC et al., 2021) provided a summary of existing groundwater monitoring efforts currently promulgated under various existing local, state, and federal programs. SGMA requires that monitoring networks be developed to provide sufficient data quality, frequency, and spatial distribution to characterize groundwater and surface water in the Basin, and to evaluate changing aquifer conditions in response to GSP implementation. The monitoring network developed in the GSP is intended to support efforts to accomplish the following:

- Monitor changes in groundwater conditions and demonstrate progress toward achieving measurable objectives and minimum thresholds documented in the GSP.
- Quantify annual changes in water use.
- Monitor impacts to the beneficial uses and users of groundwater.

Monitoring networks are developed for each of the five sustainability indicators relevant to the San Luis Obispo Basin:

- Chronic lowering of groundwater levels
- Reduction of groundwater in storage
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

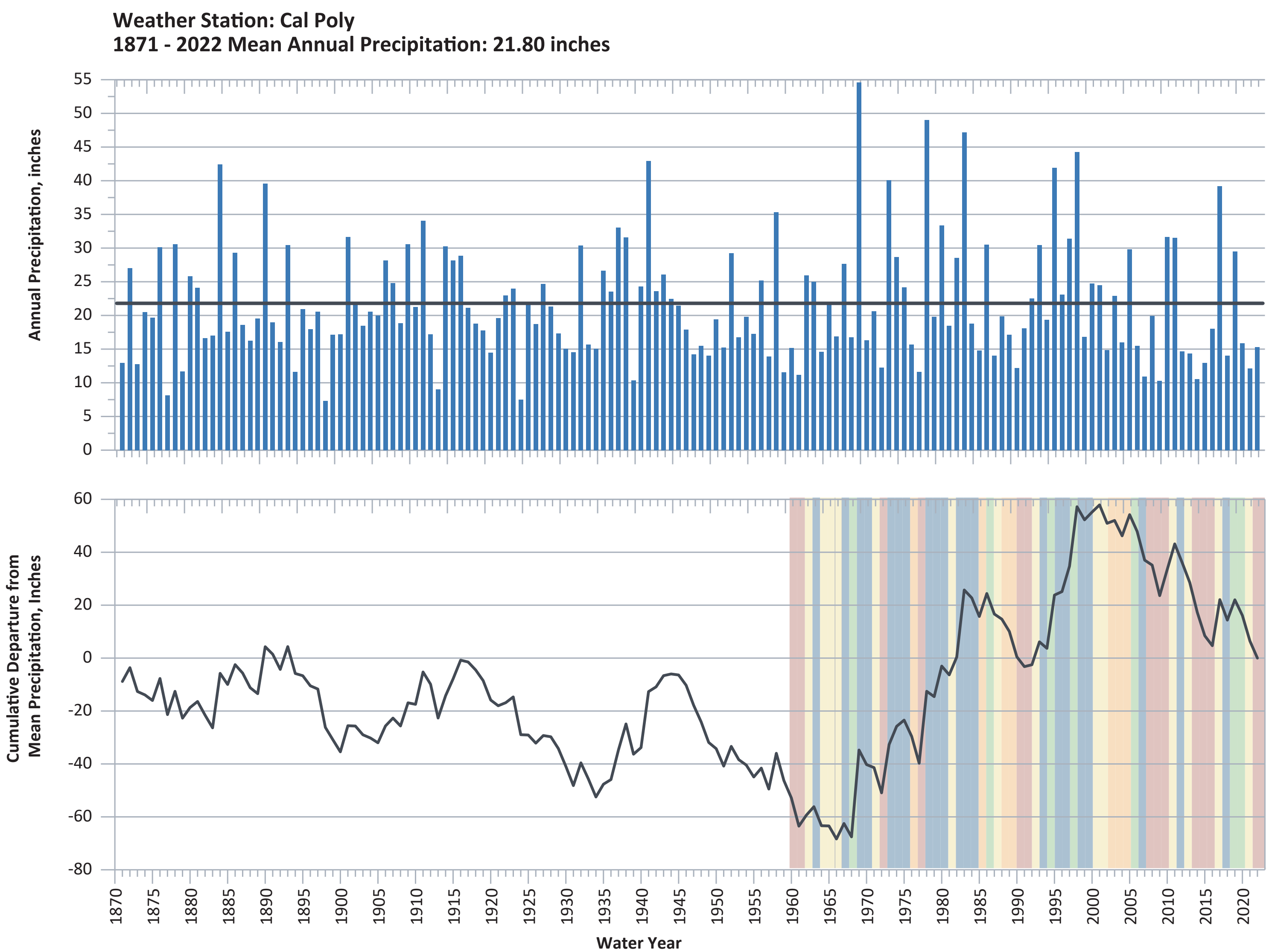

FIGURE 2

Cal Poly Annual Precipitation and Cumulative Departure from Mean Annual Precipitation

San Luis Obispo, California

LEGEND

Cumulative Departure

Water Year Type

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

GSI Water Solutions, Inc.

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Monitoring for the first two sustainability indicators (i.e., chronic lowering of water levels and reduction of groundwater in storage) is implemented using the same representative monitoring sites (RMS) identified in the GSP. The GSP identifies an existing network of 10 RMS wells for monitoring of water levels and storage change (WSC et al., 2021). Of these 10 wells, 6 are located in the Edna Valley subarea and 4 are located in the San Luis Valley subarea (Figure 3). These RMS have been monitored biannually, in April and October, for various periods of record. The RMSs are displayed as squares in Figure 3, and a summary of information for each of the wells is included in Appendix C.

The County Flood Control District has historically monitored 12 wells within the Basin, displayed as brown circles on Figure 3. The City has 9 wells (displayed as yellow circles on Figure 3) that were monitored prior to the year 2000, but monitoring stopped at that time, and has been re-started recently. The GSP team made a significant effort to reach out to private well owners in the Basin and identified additional wells to include in the Basin monitoring network. As of spring 2022, the current updated monitoring well network is comprised of 42 wells. These wells were used in the preparation of the WY 2022 GSP Annual Report and will be included in future monitoring efforts during the GSP implementation period.

2.4.2 Monitoring Data Gaps

The GSP originally noted numerous data gaps in the basin monitoring network. Public outreach during the GSP development helped address many of these data gaps. However, ongoing efforts will continue during the implementation phase of the GSP to identify existing wells that can be added to the network, or to construct new wells for the network. These wells are displayed in Figure 3, and a summary of available well information is included in Appendix C.

2.5 Additional Monitoring

Evaluation of the water quality sustainability indicator is achieved through monitoring of an existing network of public water supply (PWS) wells in the Basin. Constituents of concern (COCs) identified in the GSP (WSC et al., 2021) that have the potential to impact suitability of water for public supply or agricultural use include total dissolved solids, nitrate, and arsenic.

COCs for drinking water are monitored at PWS wells. There are currently 45 PWS wells in the Basin. A subset of PWS wells constitute part of the monitoring network for water quality in the Basin. In addition, Agricultural Order 4.0 of the Irrigated Lands Regulatory Program is currently in draft form and under review. Selection of specific wells regulated under that program would be recommended when the program is implemented and monitoring data is available for review.

Subsidence was documented in the 1990s along the Los Osos Valley Road corridor. Land subsidence in the Basin is now monitored using interferometric synthetic-aperture radar (InSAR) data collected using microwave satellite imagery provided by DWR. Available data to date indicate no significant subsidence in the Basin that impacts infrastructure. The GSAs will annually assess subsidence using the InSAR data provided by DWR.

Three RMS wells were identified to monitor conditions associated with groundwater/surface water interaction. Additional monitoring network sites to assess the sustainability indicator of groundwater/surface water interconnection is a current data gap that will be addressed during GSP implementation.

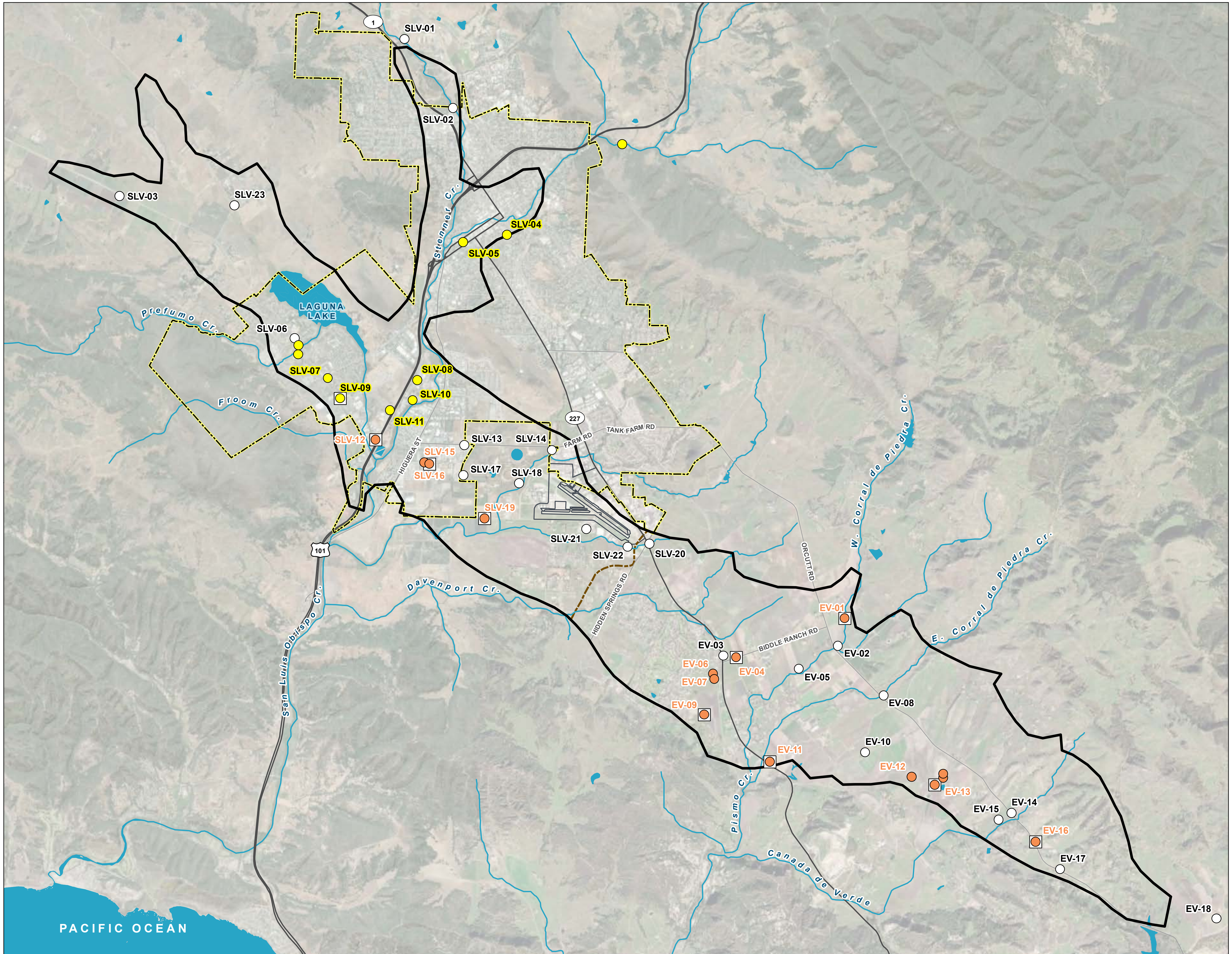

FIGURE 3

Groundwater Level Monitoring Network

San Luis Obispo, California

DRAFT

LEGEND

Monitoring Well

- GSP Approved
- City
- County
- Representative Monitoring Well

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

N

0 0.5 1 1.5

Miles

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

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SECTION 3: **Groundwater Elevations (§ 356.2[b][1])**

3.1 Introduction

This section provides a detailed report on groundwater elevations in the Basin for water year 2022. Data presented in this section represent the most up-to-date seasonal conditions in the Basin. The data presented characterize conditions for the highest encountered water in the Basin Aquifer, regardless of screened interval. As discussed in Section 2.2, the aquifer in the Basin is characterized and developed as a single hydrogeologic unit.

Monitoring data is reviewed for quality and an appropriate time frame is chosen to provide the highest consistency in the wells used for each reporting period. Data quality is often difficult to ascertain when measurements are taken by other agencies or private well owners. Well construction information, including surveyed reference elevations, may be incomplete or unavailable at this time. This means that a careful review of the data is required prior to uploading to DWR's new Monitoring Network Module (replacing the current California State Groundwater Elevation Monitoring Program) to verify whether measurements are trending consistent with trends of previous years and with the current year's hydrology and level of extractions.

3.1.1 Principal Aquifers

As discussed in Section 2, the three geologic formations in the Basin effectively function as a single basin aquifer. Recent Alluvium thickness ranges from a few feet to over 50 ft. The Paso Robles Formation Aquifer is up to 200 feet thick, and the Squire member of the Pismo formation is observed to be up to 400 ft thick in some boring logs.

3.2 Seasonal High and Low (Spring and Fall) (§ 356.2[b][1][A])

The assessment of groundwater elevation conditions in the Basin as described in the GSP (WSC et al., 2021) is largely based on data from the County of San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD) groundwater monitoring program. Groundwater levels are measured by the SLOFCWCD through a network of public and private wells in the Basin. The County has a legacy confidentiality agreement with these well owners that precludes the presentation of well locations or well data in public documents. Most well owners in the County network signed an updated confidentiality agreement that allows presentation of these data without revealing owner information. A few well owners did not sign this updated agreement. Data from these wells was used in development of groundwater elevation contours, but not displayed in the figures in this report. Many wells that were monitored by the City prior to 2000 have only begun to be monitored again recently.

To represent conditions as extensively as possible, this 2022 Annual Report uses as many wells as have data for each groundwater elevation map. This leads to differing data sets for each water level map. Since this is the first water year that the expanded monitoring network has been available, there is a large discrepancy between the data sets used for October 2021 and April/October 2022. In October 2021, 19 wells were used to generate groundwater elevation contours. In 2022, a network of 42 wells was available to generate water level maps. In future years, when the new monitoring network is consistently used from year to year, changes in water levels will be more robustly characterized. As implementation of the GSP progresses, it is anticipated that additional wells will be added to the data set.

In accordance with the SGMA regulations, the following information is presented based on available data:

- Groundwater elevation contour maps for fall 2021, spring 2021, and fall 2022.
- A map depicting the change in groundwater elevation for water year 2022.
- Hydrographs for RMS wells (Appendix D).

3.2.1 Basin Aquifer Groundwater Elevation Contours

As discussed previously, sediments that comprise all three geologic formations in the Basin are interfingered, and no laterally extensive confining layer is observed between any of the formations. There is no significant hydraulic separation between productive sediments of the different formations. The basin aquifer is used as a single resource; most wells screen at least two of the formations throughout the Basin. Therefore, groundwater elevation data for the first encountered groundwater in the basin aquifer are contoured as a single hydrogeologic unit.

Groundwater elevation data for fall 2021 through fall 2022 for the Basin were contoured to assess spatial variations, yearly fluctuations, trends in groundwater conditions, groundwater flow directions, and horizontal groundwater gradients. Contour maps were prepared for the seasonal spring and fall groundwater levels, which are intended to represent approximations of seasonal high and low water levels at the beginning and end of the local irrigation seasons. In general, the spring groundwater data are for April and the fall groundwater data are for October.

Figures 4 through 6 present groundwater elevation contours for fall 2021 (Figure 4), spring 2022 (Figure 5), and fall 2022 (Figure 6). Groundwater elevations range from approximately 290 to 300 ft amsl in the Edna Valley subarea where West Corral de Piedras Creek enters the Basin to less than 110 ft amsl near the area where San Luis Obispo Creek leaves the Basin. Groundwater flow directions remain consistent between the maps, although relative water levels change. In the San Luis Valley subarea regional flow directions generally follow topography, including southward flow roughly parallel to the course of San Luis Obispo Creek, southeastward along Los Osos Valley Road toward San Luis Obispo Creek, and west to southwest toward San Luis Obispo Creek in the vicinity of Tank Farm Road. In Edna Valley, regional flow is northwestward toward San Luis Valley, and local flow regimes are southward toward the locations where Corral de Piedras Creeks and Canada de Verde Creek exit the Basin, and toward apparent pumping centers in the southern edge of the Valley.

Figure 4 presents groundwater elevation contours for fall 2021. This map was originally generated during the development of the GSP. In the version of this map presented in the first annual report, the sparser data set of available monitoring wells provided no control points to estimate groundwater elevations near the northwest extent of the Basin at the border with Los Osos Basin, nor at the northern edge of the Basin near Cal Poly, nor at the southeast border of the Basin at the boundary with the Arroyo Grande Subbasin. As a result, groundwater elevation contours in these areas were extrapolated using land surface and other inputs as a guide. However, new monitor wells in these area (SLV-03 and SLV-23 near Los Osos Basin boundary, SLV-01 and SLV-02 near Cal Poly, and EV-18 near the Arroyo Grande Subbasin boundary) have provided new data on groundwater elevations in these areas, so the groundwater elevation map for October 2021 was revised accordingly, for use in updated change in storage calculations. This map now serves as the starting condition for calculations of change in ground water levels in water year 2022.

FIGURE 4

October 2021 Groundwater Contours

San Luis Obispo, California

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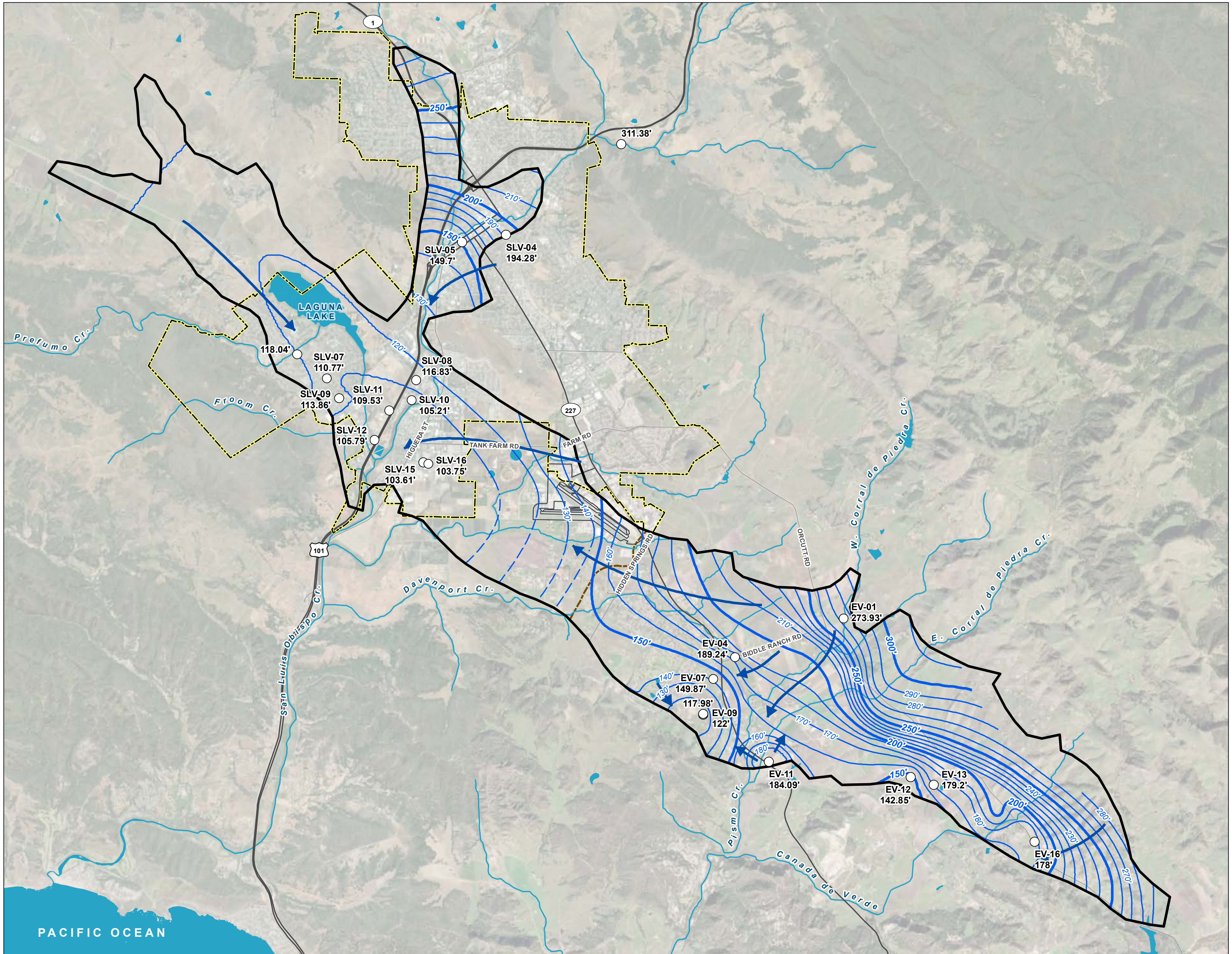

LEGEND

- Well
- Groundwater Contour, Fall 2021 (dashed where inferred)
- Groundwater Flow Direction

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

N

0 0.5 1 1.5
Miles

Date: February 28, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

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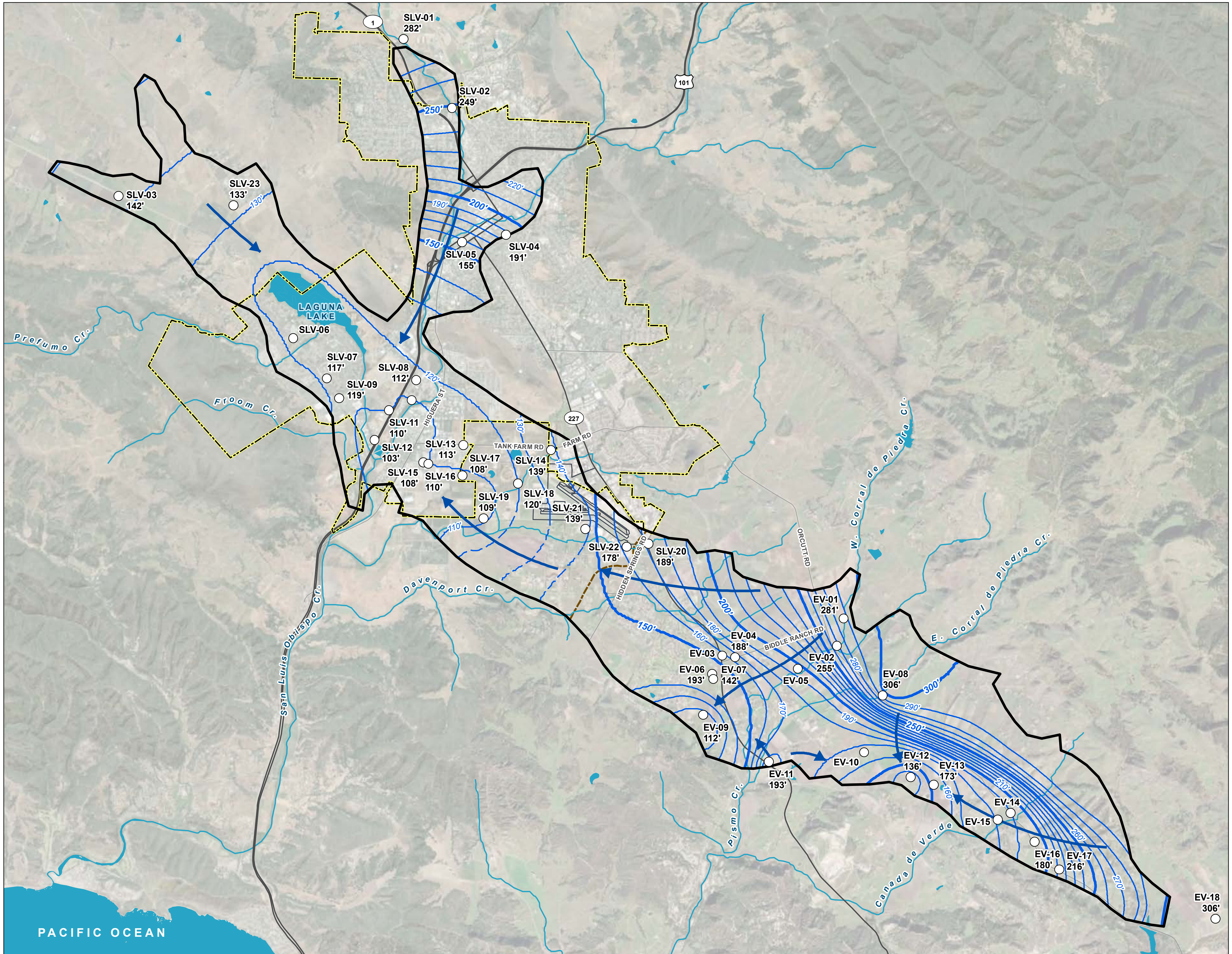

FIGURE 5

April 2022 Groundwater Contours

San Luis Obispo, California

DRAFT

LEGEND

- Well
- Groundwater Contour, Spring 2022 (dashed where inferred)
- Groundwater Flow Direction

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

Date: February 28, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

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Figure 5 presents groundwater elevation contours for spring 2022. Groundwater elevations are approximately 281 ft amsl in Edna Valley in the vicinity of EV-01, where East and West Corral de Piedras Creeks enter the Basin, and the groundwater flow direction in this vicinity is both west/northwest toward San Luis Valley and southward toward pumping centers and the location where Corral de Piedras Creeks exit the Basin. A regional flow direction is apparent from the southeast to northwest, from the Edna Valley toward the San Luis Valley portion of the Basin. The lowest groundwater elevations are observed where San Luis Obispo Creek leaves the Basin, with observed elevations as low as 103 ft amsl.

Figure 6 presents groundwater elevation contours for fall 2022. Groundwater elevations are approximately 275 to 289 ft amsl in the Edna Valley where East and West Corral de Piedras Creeks enter the Basin, and the groundwater flow directions in this vicinity are unchanged from the spring conditions. Most wells in the Edna Valley are about 5 to 15 ft lower than the spring levels, which is consistent with previously observed seasonal fluctuations. Seasonal groundwater elevation fluctuations in the San Luis Valley are not as pronounced as in the Edna Valley. Groundwater flow direction patterns in the San Luis Valley part of the Basin are unchanged. The lowest groundwater elevations are observed where San Luis Obispo Creek leaves the Basin, with One observed elevation of 98 ft amsl.

Figure 7 presents the calculated change in water level between fall 2021 and fall 2022 based on the groundwater elevations presented in Figures 4 and 6. In San Luis Valley, the majority of the area shows changes ranging from -5 ft to +5 ft. This indicates that the San Luis Valley subarea of the Basin is in relative equilibrium, with no significant changes in groundwater elevations evident during this time period. In the Edna Valley subarea, areas of groundwater decline over this time period are evident near EV-07 and EV-09, and near EV-12 and EV-13.

It is important to note, as described previously, that there was not a uniform data set of wells monitored for water levels during the monitoring events. Several of the new monitoring wells were not accessed in the April 2022 monitoring event. To some extent, this can lead to patterns of water level changes that are artifacts of the data variability and may not reflect true changes in water levels. These occurrences will be minimized once a uniform set of wells is used for calculation in future annual reports and GSP revisions.

In general, the groundwater elevations observed in the Basin during water year 2022 reflect largely static conditions in the San Luis Valley subarea, and water level declines in the Edna Valley subarea. Water years 2021 and 2022 were both below-average precipitation years. Positive and negative changes in groundwater elevations from year to year are observed in different parts of the Basin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels continued in each of the water years.

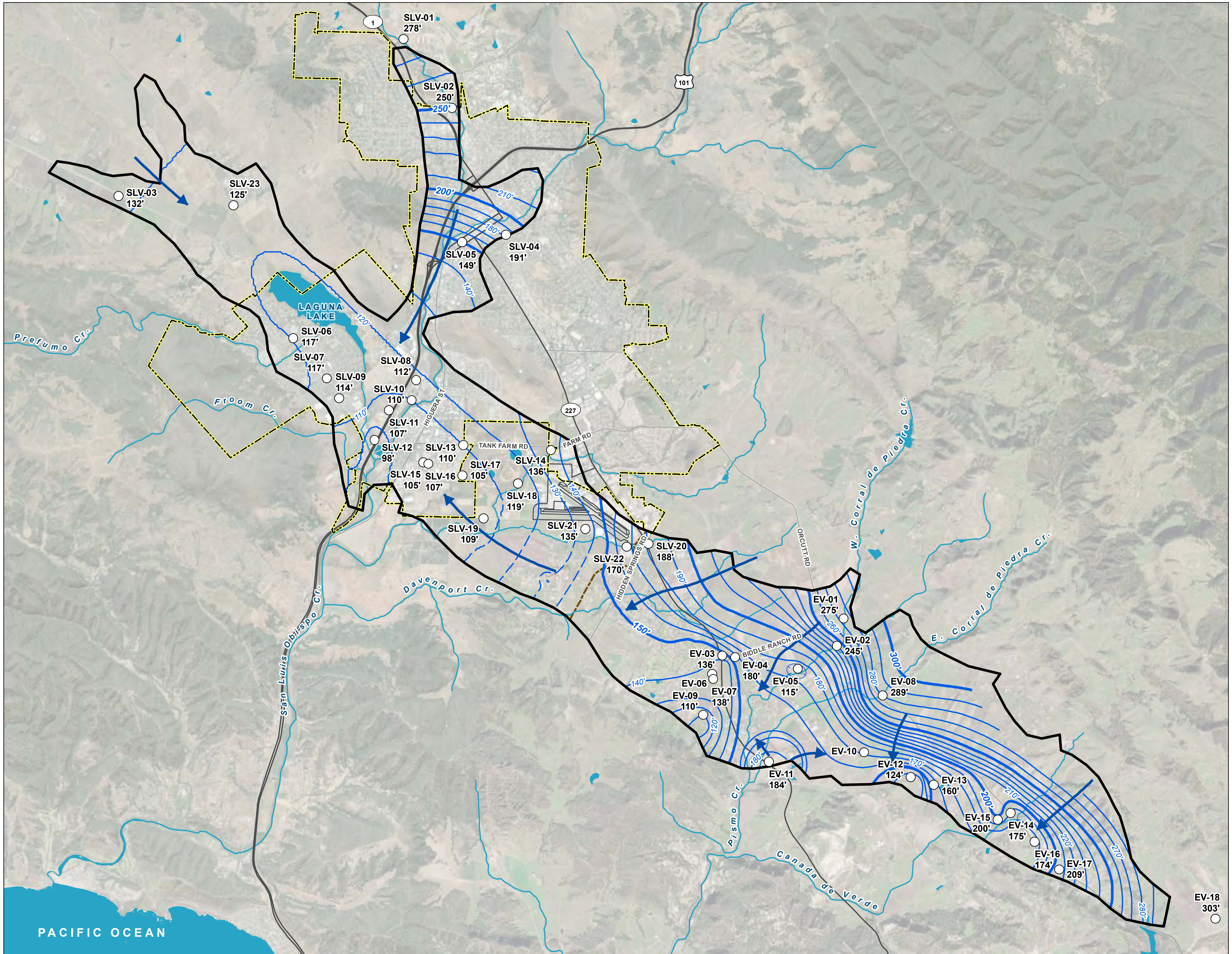

FIGURE 6

October 2022 Groundwater Contours

San Luis Obispo, California

DRAFT

LEGEND

- Well
- Groundwater Contour, Fall 2022 (dashed where inferred)
- Groundwater Flow Direction

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

N

0 0.5 1 1.5

Miles

Date: February 28, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

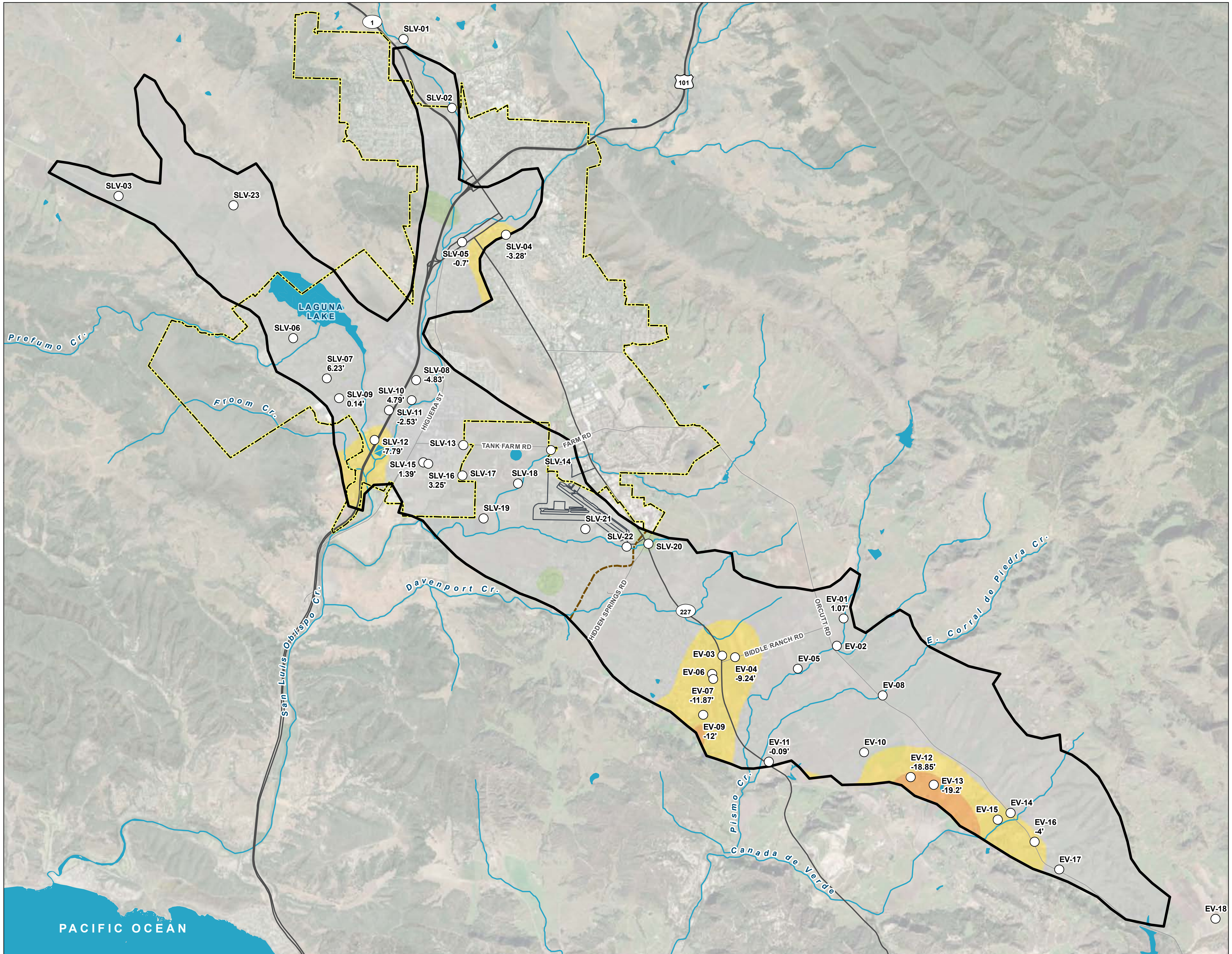

FIGURE 7

Annual Change in Groundwater Elevation, October 2021/2022

San Luis Obispo, California

DRAFT

LEGEND

- Monitoring Well

Change in Groundwater Elevation (feet NAVD88)

- >25
- >15 to 25
- >5 to 15
- -5 to 5
- -15 to -5
- -25 to -15
- -28 to -25

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO
- Major Road
- Watercourse
- Waterbody

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Miles

Date: February 20, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

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3.3 Hydrographs (§ 356.2[b][1][B])

Groundwater elevation hydrographs are used to evaluate changes in groundwater elevations over time. Changes in groundwater elevation at a given point in the Basin can result from many factors, with all or some occurring at any given time. Some of these factors include changing hydrologic trends, seasonal variations in precipitation, varying basin extractions, changing inflows and outflows along boundaries, availability of recharge from surface water sources, and influence from localized pumping conditions. Climatic variation can be one of the most significant factors affecting groundwater elevations over time. For this reason, the hydrographs also display periods of climatic variation with designation of historical water year types as defined by DWR.

Groundwater elevation hydrographs and associated location maps for the 10 RMS wells in the basin monitoring network are presented in Appendix D. These hydrographs also include graphical display of well construction details (if known), reference point elevation, measurable objectives and minimum thresholds for each well that were developed during the preparation of the GSP. Many of the hydrographs illustrate a condition of declining water levels since the late 1990s, although some indicate relative water level stability over the same period. Most wells display water levels that decline with the lower-than-average precipitation measured over the past three water years.

As described in the GSP (WSC et al., 2021), various criteria were used to define the measurable objectives and minimum thresholds for the RMS wells. Going forward from 2021, the average of the spring and fall measurements in 2 consecutive water years will be the benchmark against which trends will be assessed.

Of the 10 RMS hydrographs presented in Appendix D, none exhibit groundwater elevations at or below the minimum threshold. Although the groundwater elevations in some of the RMS wells continue to trend downward, some of the RMS wells exhibit stable groundwater elevations, despite three consecutive years of below average rainfall. Future annual reports will document transient groundwater elevations with time at each of the RMS wells, and progress toward sustainability will be evaluated based on these criteria.

SECTION 4: **Groundwater Extractions (§ 356.2[b][2])**

4.1 Introduction

This section presents the metered and estimated groundwater extractions from the Basin for water year 2022. The types of groundwater extraction described in this section include municipal, agricultural (Tables 1 and 2), rural domestic (Table 3), and small public water systems (Table 4). Each following subsection includes a description of the method of measurement and a qualitative level of accuracy for each estimate. The level of accuracy is rated on a qualitative scale of low, medium, and high. The annual groundwater extraction volumes for all water use sectors are shown in Table 5.

4.2 Municipal Metered Well Production Data

Municipal groundwater extractions are mandated by regulation to be metered data. The City of San Luis Obispo currently uses no groundwater as part of their water supply. The City used groundwater during the 1980s and 1990s, and still owns several wells that could be activated in the future. The City retains the right to re-start production of groundwater as part of their water supply portfolio as part of carefully planned operations of their water resources planning activities.

4.3 Estimate of Agricultural Extraction

During the GSP development, and for the first annual report, agricultural pumping was estimated using the soil water budget method. This method is used again in this analysis. However, an additional method of estimating agricultural pumping via direct satellite measurement of evapotranspiration was performed for this annual report, and the results are compared. Both methods will be used again in next year's annual report, at which time the GSAs will decide on which method to use moving forward.

4.3.1 Soil Water Budget Method

Agricultural water use constituted 81 percent of the total anthropogenic groundwater use in the Basin in water year 2022. To estimate agricultural water demand, land use data along with climate and soil data were analyzed and processed using the soil-water balance model that was developed for the GSP water budget (GSP Section 6). Annual land use spatial data sets from Land IQ were used to determine the appropriate crop categories, distribution, and acreages, which were then reviewed using aerial imagery and field reconnaissance. Land use types were grouped within five crop categories, including citrus, deciduous, pasture, vegetable, and vineyard, each with a respective set of crop water demand coefficients and water system efficiencies, as described in the GSP water budget. A summary of acreage by crop group is presented in Table 1.

Figure 8 shows the distribution of agricultural acreage irrigated by wells extracting water from the Basin for water year 2022. Agricultural fields are shown on parcels overlying the basin, or on which the water extracted for irrigation is interpreted to come from wells in the Basin.

Climate data inputs include precipitation and evapotranspiration (ETo) data from the Cal Poly Weather Station (CIMIS station 52). Crop coefficients were developed using the DWR Consumptive Use Program Plus (CUP+; DWR, 2015), which uses climate data and soil moisture parameters to develop estimated applied water demand for each crop type.

The soil-water balance model was utilized to estimate agricultural water demands through water year 2021 during completion of the GSP and first Annual Report. Agricultural water demand for this 2022 Annual Report was estimated for water year 2022 using the soil-water balance model, and also by the OpenET method as will be discussed below. The resulting estimated groundwater extractions for agricultural demands are summarized in Table 2. The accuracy level rating of these estimated volumes is low-medium.

Table 1. Irrigated Acreage by Crop Type

Crop Group	Irrigated Acreage by Water Year		
	2020	2021	2022
San Luis Valley			
Citrus	44	44	42
Deciduous	7	7	3
Pasture	28	28	26
Vegetable	370	268	214
Vineyard	81	81	86
San Luis Valley Totals	**530**	**430**	**370**
Edna Valley			
Citrus	649	652	688
Deciduous	3	3	4
Pasture	13	13	92
Vegetable	530	614	608
Vineyard	1,894	1820	1757
Edna Valley Totals	**3,090**	**3,100**	**3,150**
Basin			
Citrus	693	696	730
Deciduous	9	9	7
Pasture	40	40	118
Vegetable	900	882	822
Vineyard	1,974	1,900	1,843
Basin Totals	**3,620**	**3,530**	**3,520**

Table 2. Estimated Agricultural Irrigation Groundwater Extractions

Water Year	San Luis Valley (AF)		Edna Valley (AF)		Agricultural Total (AF)	
	Soil Water Budget	Open ET	Soil Water Budget	Open ET	Soil Water Budget	Open ET
2017	1,550	-	3,640	-	5,190	-
2018	1,190	-	3,550	-	4,740	-
2019	1,030	-	3,350	-	4,380	-
2020	1,200	-	3,760	-	4,960	-
2021	960	-	4,070	-	5,030	-
2022	830	920	4,580	5,030	5,410	5,950

Note

AF = acre-feet

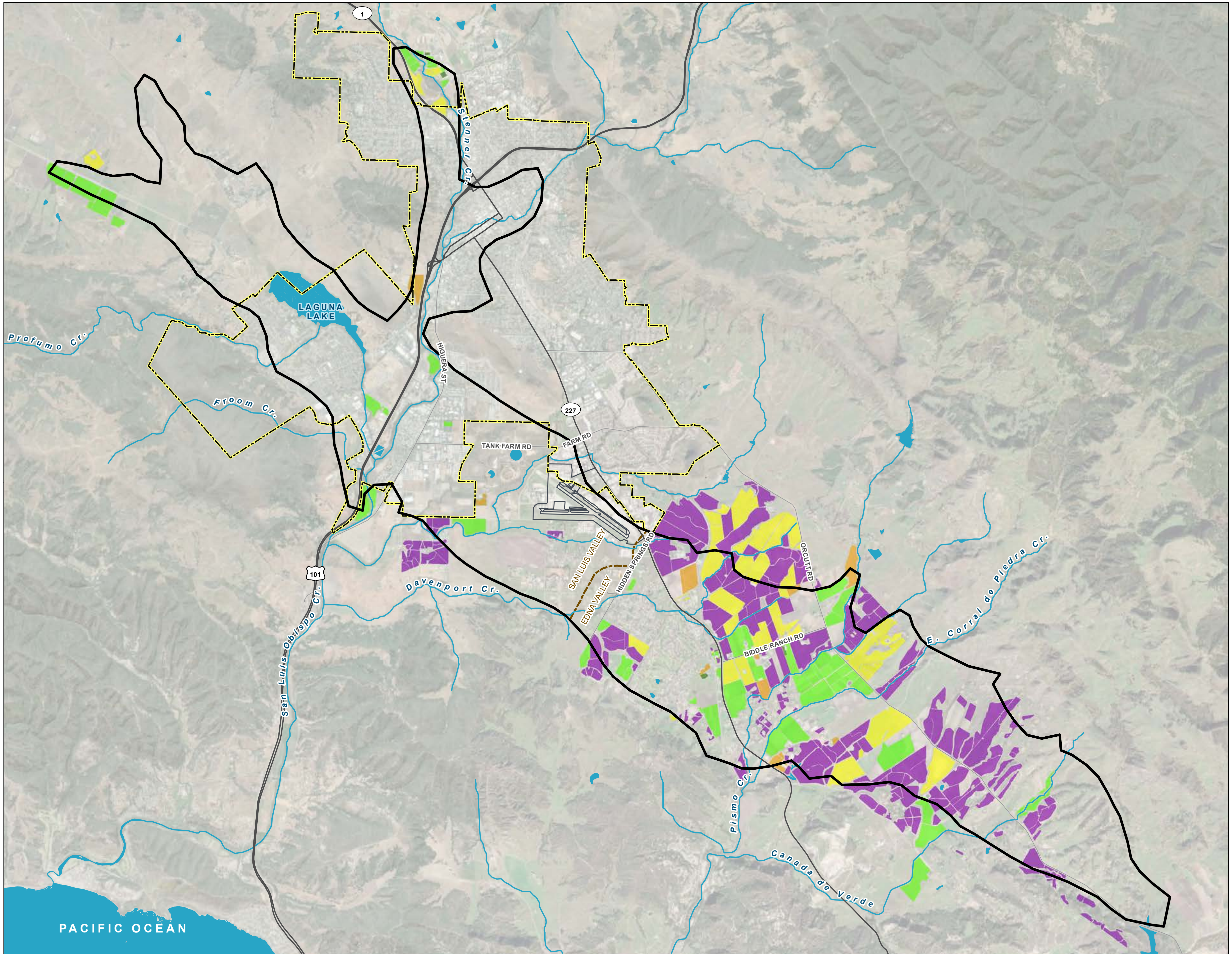

FIGURE 8

Irrigated Agriculture 2022

San Luis Obispo, California

DRAFT

LEGEND

2022 Irrigated Agriculture by Crop Type

- Citrus
- Deciduous
- Pasture
- Vegetable
- Vineyard

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

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Miles

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

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4.3.2 Satellite-Based OpenET Method

To estimate agricultural groundwater extraction, water year 2022 specific land use data from Land IQ was used in conjunction with the OpenET ensemble model.[2] OpenET provides satellite-based estimates of the total amount of water that is transferred from the land surface to the atmosphere through the process of evapotranspiration (ET). The OpenET ensemble model uses Landsat satellite data to produce ET data at a spatial resolution of 30 meters by 30 meters (0.22 acres per pixel). Additional inputs include gridded weather variables such as solar radiation, air temperature, humidity, wind speed, and precipitation (OpenET, 2023). OpenET provides estimates of ET for the entire land surface, or in other words, "wall to wall". To produce an estimate of ET specific to the irrigated crop acreage in the Subbasin the OpenET ensemble model results are screened by the Land IQ land use data set, thereby removing the estimated ET volumes associated with bare ground, non-irrigated crops or native vegetation. A total of 13 irrigated crop types were identified in the water year 2022 Land IQ spatial dataset. These 13 crop types have been grouped into five basic crop groups: citrus, deciduous, pasture, vegetable, and vineyard, which are shown on Figure 8. A summary of acreage by crop group is presented in Table 1. Irrigated agricultural crop types were identified by inspection of monthly ET for each mapped crop type versus monthly ET for fallow ground. Essentially, crop types were considered irrigated if monthly ET remained high throughout the latter part of the growing season as opposed to the diminishing monthly ET following the rainy season on fallow ground. ET associated with precipitation events were removed from the analysis by subtracting the volume of rain received (irrigated acreage times decimal feet of spatially variable precipitation received based on gridMET[3]) on a monthly time-step. In addition, vineyard and citrus crop areas were evaluated only for their crop specific irrigation seasons; April through October and March through November, respectively. Applied irrigation volumes are estimated by scaling up the estimated irrigated crop ET volumes using assumed crop specific irrigation efficiency factors.[4] The resulting volumes are summed by water year, which then represent estimated annual agricultural groundwater extraction. Deficit irrigation is captured in the satellite-based method through the measurement of actual ET. Groundwater extractions for frost protection are captured to the extent that the produced water results in increased ET. It is assumed that the remainder of the water produced for frost protection remains within the Subbasin and percolates back to groundwater. The results of this method are summarized in Table 2.

4.3.3 Results and Discussion

As shown in Table 2, the estimates of groundwater extraction for agricultural irrigation in water year 2022 from the soil-water balance model are 5,410 AF)(830 AF in San Luis Valley and 4,580 AF in Edna Valley. The agricultural pumping estimates from the satellite-based method are 5,950 AF (920 AF in San Luis Valley, 5,030 AF in Edna Valley). The similarity in results between the methods demonstrates the utility of the satellite-based method. The satellite-based method is considered more accurate as it directly measures actual ET as it varies spatially and temporally throughout the Subbasin and throughout the year, thereby

[2] OpenET uses reference ET data calculated using the American Society of Civil Engineers (ASCE) Standardized Penman-Monteith equation for a grass reference surface, and usually notated as 'ETo'. For California, OpenET uses Spatial CIMIS meteorological datasets generated by the California DWR to compute ASCE grass reference ET. OpenET provides ET data from multiple satellite-driven models, and also calculates a single "ensemble value" from those models. The models currently included are ALEXI/DisALEXI, eeMETRIC, geeSEBAL, PT-JPL, SIMS, and SSEBop. More information about these models can be found at: https://openetdata.org/methodologies/. All of the models included in the OpenET ensemble have been used by government agencies with responsibility for water use reporting and management in the western U.S., and some models are widely used internationally (OpenET, 2023).

[3] gridMET is a public domain dataset of daily high-spatial resolution (~4-km, 1/24th degree) surface meteorological data covering the contiguous United States from 1979-yesterday (https://www.climatologylab.org/gridmet.html). The methodology behind gridMET is described in Abatzoglou (2013).

[4] Irrigation efficiencies were assigned based on Carollo et al. (2012). Vineyard, the dominant crop in the Subbasin was assigned an irrigation efficiency of 80 percent.

capturing nuances in crop irrigation practices, such as deficit irrigation. The soil-water balance method uses a more rigid approach to capturing ET variability in the basin that may not fully capture the actual climatic variability or nuanced crop irrigation practices that may occur each year. It is intended to estimate the agricultural extraction using both methods again in next year's annual report. After that, if the GSAs are in agreement, the intention going forward is to retire the soil-water balance model method and use the satellite-based method exclusively for estimating groundwater extractions for irrigated agriculture.

The soil-water balance model was utilized to estimate agricultural water demands through water year 2019 during completion of the GSP (WSC et al., 2021) and for WYs 2020 and 2021 in the first Annual Report (GSI and Cleath, 2021). Agricultural water demand for this Water Year 2022 Annual Report was estimated for water year 2022 using both the soil-water balance model and the satellite-based method. The resulting estimated groundwater extractions for agricultural demands are summarized in Table 2. For the present time, results from the soil-water balance method are carried forward into the total water use calculations (Section 6). It is intended to perform the agricultural extraction estimates using both methods again in next year's annual report. At that time, the GSAs may consult with the technical team to determine the preferred method moving forward. The accuracy level rating of this satellite-based method estimated volume is medium-high.

Water extractions for agriculture in the Edna Valley increased between WY 2021 and WY 2022 due to a combination of increased evapotranspiration rates, continued growth of more than 400 acres of citrus plantings (from 2020), and an increase of approximately 80 acres of pasture. Rainfall at the Gas Company rain station (#3102) was almost 2 inches greater in WY 2022 compared to WY 2021, however, the rain distribution in WY2022 was concentrated earlier in the year (only 1.45 inches of rain fell after December 2021), leading to greater seasonal evapotranspiration rates. Agricultural water extractions in the San Luis Valley subarea decreased in WY 2022, compared to WY 2021, due primarily to a 40-acre reduction in irrigated vegetable acreage.

4.4 Rural Domestic and Small Public Water System Extraction

Rural domestic and small PWS groundwater extractions in the Basin were estimated using the methods described below.

4.4.1 Rural Domestic Demand

As documented in the GSP water budget (GSP Section 6), rural residential groundwater use through 2019 was estimated based on the number of residences identified on aerial images outside of water company service areas. Each rural residence was assigned a water use of 0.8 AFY, consistent with the San Luis Obispo County Master Water Plan (Carollo, 2012). As a comparison, a City study reported residential use for large parcels (>0.26 acres) at 0.6 AFY (City of San Luis Obispo, 2000), which was similar to the average estimated use per service connection in the Golden State Water Company service area over the historical base period. Water use per connection at Varian Ranch MWC and Edna Valley East MWC had ranged from 0.6 to 1.5 AFY, averaging approximately 1 acre-foot per year.

For this 2022 Annual Report, the same methodology was applied, using an aerial image from 2022 to update the estimated number of rural residences. The resulting groundwater extractions for rural domestic demands in water year 2022 is summarized in Table 3. There was no estimated increase in water year 2022 from 2021 for rural domestic totals shown in Table 3, based on a comparison between the 2021 and 2022 areal imagery. The accuracy level rating of these estimated volumes is low-medium.

Table 3. Estimated Rural Domestic Groundwater Extractions

Water Year	San Luis Valley (AF)	Edna Valley (AF)	Rural Domestic Total (AF)
2017	160	120	280
2018	160	130	290
2019	160	130	290
2020	170	130	300
2021	170	140	310
2022	170	140	310

Notes

The totals are rounded to the closest 10 AF.

AF = acre-feet

4.4.2 Small Public Water System Extractions

The category of small PWSs in the Basin includes a wide variety of establishments and facilities that operate mutual water companies and other types of public water systems under the purview of the County Environmental Health. Groundwater extractions for golf courses and playfields (turf) are classified as urban extractions, and have been included with the small PWS extractions estimates.

During GSP preparation in 2019, there were 45 small PWSs, using groundwater from wells. Three of these small PWSs, Golden State Water Company, Varian Ranch Mutual Water Company, and Edna Ranch Mutual Water Company, provided metered production records. The remaining 42 small PWSs, mostly in the San Luis Valley subarea, were assigned water use categories (such as commercial-service, mixed-use office, manufacturing, etc.) and corresponding water use factors, such as floor space square footage, to estimate water demand.

For the 2022 Annual Report, small PWSs extractions were updated with the latest available information. The same three small PWSs that previously report production have provided records for water year 2022. The database for the remaining water systems was reviewed, with a few changes made for systems where service is now provided by the City. Urban turf irrigation was estimated based on turf acreage, applied water demand, and irrigation system efficiency using the same soil-water budget methodology described for the agricultural extractions.

The total amount of water extracted by small PWSs from the Basin, including turf irrigation extractions, is estimated at 980 AFY in water year 2022, with the majority of use (760 AFY) in the Edna Valley subarea. Water use in the Edna valley subarea increased due to an increase in the estimated evapotranspiration rate of golf course turfgrass in water year 2022, compared to water year 2021.

Estimated groundwater extractions for small PWS demands are summarized in Table 4. The accuracy level rating of these estimated volumes is medium-high.

Table 4. Estimated Small Public Water System Groundwater Extractions

Water Year	San Luis Valley (AF)	Edna Valley (AF)	Small PWS Total (AF)
2017	270	720	990
2018	260	750	1,010
2019	260	650	910
2020	260	690	950
2021	240	700	940
2022	220	760	980

Notes

These amounts include urban extractions for golf and playfields (turf).

The totals are rounded to the closest 10 AF.

AF = acre-feet

4.5 Total Groundwater Extraction Summary

Total groundwater extractions in the Basin for water year 2022 are estimated to be 7,270 AF. Table 5 summarizes the total water use by sector and indicates the method of measure and associated level of accuracy. Approximate points of extraction were spatially distributed and colored according to a grid system to represent the relative pumping across the basin in terms of AF per acre (Figure 9).

Table 5. Total Groundwater Extractions

Water Year	Municipal (AF)	PWS and Rural Domestic (AF)		Agriculture (AF)		Total (AF)
		San Luis Valley (AF)	Edna Valley (AF)	San Luis Valley (AF)	Edna Valley (AF)	
2020	0	430	820	1,200	3,760	6,210
2021	0	410	840	960	4,070	6,280
2022	0	390	900	830	4,580	6,700
Method of Measure	—	PWS Metered Rural Domestic Estimated		Soil-Water Balance Model		—
Level of Accuracy	—	Medium		Medium		—

Notes

— = not applicable

AF = acre-feet

PWS = public water systems

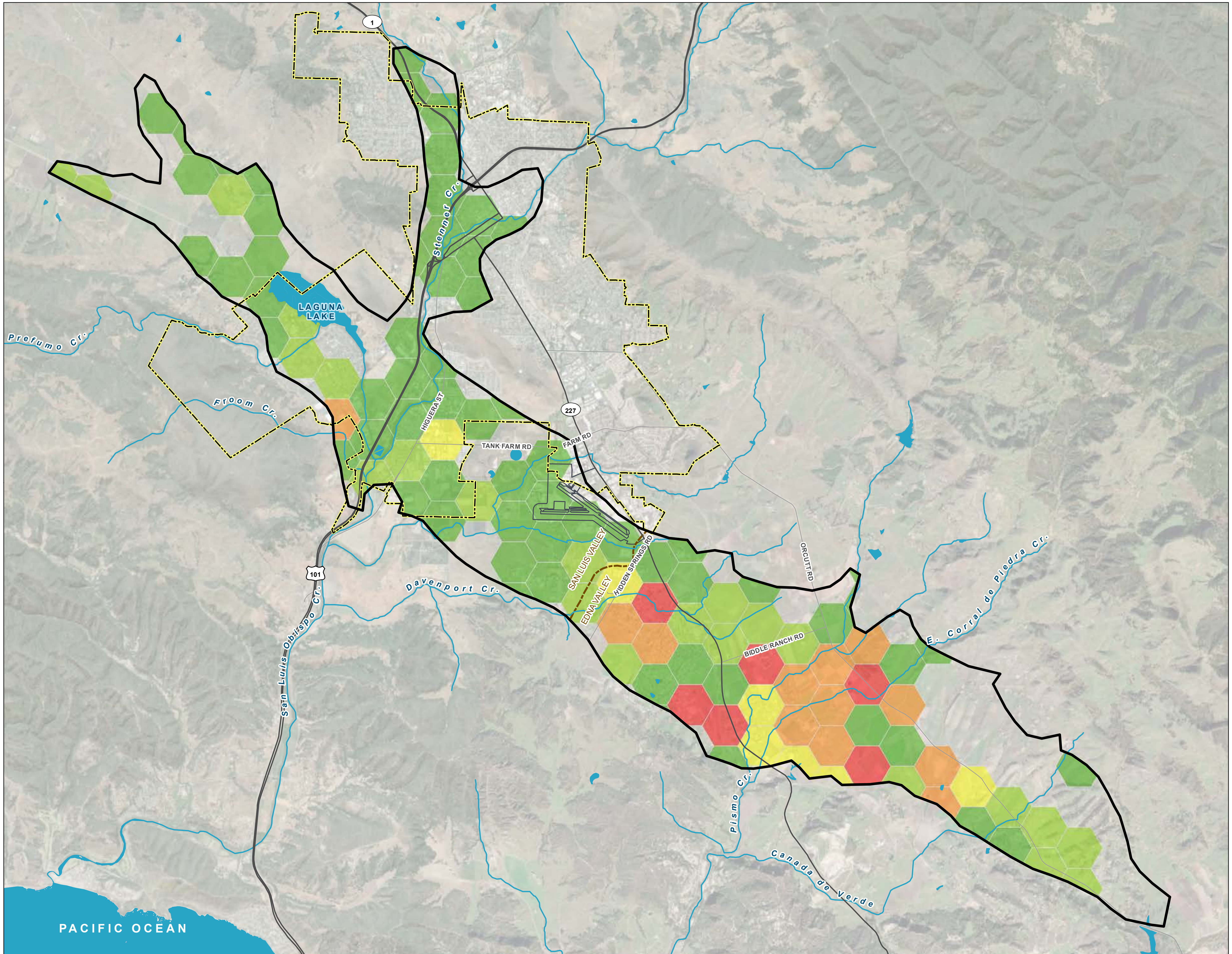

FIGURE 9

Pumping Distribution

San Luis Obispo, California

DRAFT

LEGEND

Average Q AFY

- >0 - 25
- >25 - 50
- >50 - 100
- >100 - 200
- >200

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

N

0 0.5 1 1.5

Miles

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

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SECTION 5: **Surface Water Use (§ 356.2[b][3])**

5.1 Introduction

This section addresses the reporting requirement of providing surface water supplies used, or available for use, and describes the annual volume and sources for water year 2022. The method of measurement and level of accuracy is rated on a qualitative scale. The Basin currently benefits from surface water entitlements from the Nacimiento Water Project, Salinas Reservoir (also known as Santa Margarita Lake), and Whale Rock Reservoir to provide municipal supply for the City of San Luis Obispo. Cal Poly receives surface water from Whale Rock and is in the Basin but outside of the City.

Table 6 provides a breakdown of reported surface water municipal use in the Basin, which is used exclusively by the City of San Luis Obispo. There is currently no surface water available for agricultural or recharge project use within the Basin.

5.2 Total Surface Water Use

A summary of total actual surface water use by source is provided in Table 6. The accuracy level rating of these metered data is high.

Environmental uses of surface water are also recognized but not estimated due to insufficient data to make an estimate of surface water use. It is expected that environmental uses may be quantified in future annual reports as more data becomes available.

Table 6. Annual Surface Water Use

Water Year	Nacimiento Water Project (AF)	Whale Rock Reservoir (AF)	Salinas Reservoir (AF)	Total Surface Water Use (AF)
2020	1,562	1,459	2,154	5,176
2021	2,691	1,491	1,266	5,448
2022	4,302	613	575	5,489

Note

AF = acre-feet

SECTION 6: **Total Water Use (§ 356.2[b][4])**

This section summarizes the total annual groundwater and surface water used to meet municipal, agricultural, and rural demands within the Basin. For water year 2022, the quantification of total water use was completed from reported metered groundwater production, metered surface water delivery, and from models used to estimate agricultural and rural water demand. Table 7 summarizes the total annual water use in the Basin by source and water use sector for water years 2020 through 2022. The method of measurement and a qualitative level of accuracy for each estimate is rated on a qualitative scale of low, medium, and high.

Table 7. Total Annual Water Use by Source and Water Use Sector

Water Year	Municipal (AF)		PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	Groundwater	Surface Water	Groundwater	Groundwater	Groundwater and Surface Water
2020	0	5,176	1,250	4,960	11,390
2021	0	5,448	1,250	5,030	11,728
2022	0	5,489	1,290	5,410	12,148
Method of Measure	Metered	Metered	Estimated	Soil-Water Balance Model	—
Level of Accuracy	High	High	Medium	Medium	—

Notes

— = not applicable

AF = acre-feet

PWS = public water systems

SECTION 7: **Change in Groundwater in Storage (§ 356.2[b][5])**

7.1 Annual Changes in Groundwater Elevation (§ 356.2[b][5][A])

Annual changes in groundwater elevation in the San Luis Obispo Basin Aquifer for water year 2022 are derived from comparison of fall groundwater elevation contour maps from one year to the next. For example, the fall 2022 groundwater elevations are subtracted from the fall 2021 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Basin Aquifer that occurred during that time period (Figure 7). These groundwater elevation change maps are based on a reasonable and thorough analysis of the currently available data. As discussed previously, a non-uniform set of wells was monitored during water years 2021 and 2022. It is anticipated that the current expanded monitoring network (Figure 3) will be consistently utilized going forward to more consistently and robustly assess basin conditions.

Figure 7 presents the calculated change in water level between fall 2021 and fall 2022 based on the groundwater elevations presented in Figures 4 and 6. In San Luis Valley subarea, the majority of the area shows changes ranging from -5 ft to +5 ft. This indicates that the San Luis Valley subarea of the Basin is in relative equilibrium, with no significant changes in groundwater elevations evident during this time period. Declines in groundwater elevations in the Edna Valley are observed in localized pumping centers.

In general, the groundwater elevations observed in the Basin during water years 2020 and 2021 reflect largely static conditions in the San Luis Valley subarea, and water level declines in the Edna Valley subarea. Water years 2020 and 2021 were both below-average precipitation years. Positive and negative changes in groundwater elevations from year to year are observed in different parts of the Basin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels continued in each of the water years.

7.2 Annual and Cumulative Change in Groundwater in Storage Calculations (§ 356.2[b][5][B])

The groundwater elevation change map presented above represents a volume change within the Basin Aquifer for the water year. The volume change depicted on the map represents a total volume, including the volume occupied by the aquifer sediments and the volume of groundwater stored within the void space of the aquifer sediments. The portion of void space in the aquifer that can be used for groundwater storage is represented by the aquifer storage coefficient (S), (or specific yield [Sy] for an unconfined aquifer). S is a unitless factor, which is multiplied by the total volume change to derive the change in groundwater in storage. Based on work completed for the GSP (WSC et al., 2021), S is estimated to be 8 percent for the San Luis Valley subarea and 11.7 percent for the Edna Valley subarea.[5] The annual changes of groundwater in storage calculated for water year 2022 are presented in Table 8.

[5] Appendix E includes derivation of the storage coefficient and a sensitivity analysis.

Table 8. Annual Changes in Groundwater in Storage – San Luis Obispo Valley Basin Aquifer

Water Year	San Luis Valley (AF)	Edna Valley (AF)	Annual Change in Groundwater in Storage (AF)
2020	210	-750	-540
2021	-450	-5,080	-5,530
2022	273	-1,937	-1,663
Total	33	-7,767	-7,734

Notes
Historical values are taken from the GSP water budget (see Section 6 of the GSP [WSC et al., 2021]).
Water year types are presented graphically in Appendix D.
AF = acre-feet

SECTION 8: Progress toward Basin Sustainability (§ 356.2[c])

8.1 Introduction

This section describes several projects and management actions that are in progress or have been recently implemented in the Basin to attain sustainability and avoid undesirable results. These projects and actions include capital projects and policies intended to improve data sets and to reduce or optimize local groundwater use. Some of the projects were described in concept in the GSP (WSC et al., 2021). Some of the actions described herein are new initiatives. All are intended to be implemented by project participants to reduce pumping and partially mitigate the degree to which the management actions would be needed.

As described in the GSP (WSC et al., 2021), the need for projects and management actions is based on observed basin conditions, including the following:

- Groundwater levels are declining in the Edna Valley portion of the Basin, indicating that the amount of groundwater pumping exceeds the natural recharge.
- Water budgets indicate that the amount of groundwater in storage has been in decline and will continue to decline in the future if there is no net decrease in pumping demand in Edna Valley.

To mitigate declines in groundwater levels in some parts of the Basin, achieve the sustainability goal before 2042, and avoid undesirable results as required by SMGA regulations, an overall reduction of groundwater pumping will be needed. A reduction in groundwater pumping can occur as a result of both management actions and projects that develop new water supplies used in lieu of pumping. The projects and management actions described in this section will help achieve groundwater sustainability by avoiding undesirable results.

This section also provides a brief discussion of land subsidence, potential depletion of interconnected surface waters, and groundwater quality trends that have occurred during water year 2022.

8.2 Implementation Approach

As described in the GSP (WSC et al., 2021), because the amount of groundwater pumping in the Basin is more than the estimated sustainable yield and groundwater levels are declining in some parts of the Basin, the GSAs have already initiated planning for several projects and management actions. It is anticipated that additional new projects and management actions will be implemented in the future to continue progress toward avoiding or mitigating undesirable results.

Some of the projects and management actions described in this section are basin-wide initiatives and some are area-specific. Generally, the basin-wide management actions apply to all areas of the Basin and reflect relatively basic GSP implementation requirements. Area-specific projects have been designed to aid in mitigating water level declines in certain parts of the Basin.

8.3 Basin-Wide Management Actions and Projects

8.3.1 Director of Groundwater Sustainability Grant Funding Coordination

In December 2022, the County Director of Groundwater Sustainability, in coordination with the City and County Groundwater Sustainability Agencies and the Groundwater Sustainability Commission, applied for grant funding through DWR's SGMA Round 2 SGMA Implementation Grant Program. Under this program, approximately $231 million is available statewide in disbursements ranging from $1 to $20 million. The funding is based on competitive scoring and is intended for basins that received no Round 1 funding, which includes SLO Basin.

The grant application requested funding to facilitate implementation of the following projects and management actions identified in the GSP:

- Recharge for Conjunctive Benefit in Edna Valley
- Basin-wide well verification and registration program
- Pumping fee program
- Irrigated lands best management practices
- Multi-benefit irrigated land repurposing (MILR) program
- Specific well interference mitigation program
- Groundwater extraction measurement program
- Expanded monitoring network
- Varian Ranch Mutual Water Company well 4 feasibility study
- SLO Basin State Water Project (SWP) supplemental water study

Each of these projects is described in concept in the GSP and are detailed in the grant application to DWR. A grant funding award under this program will help move each of these potential projects through the planning phase, and move the most feasible toward ultimate implementation.

8.3.2 Expand Basin Well Monitoring Network

As discussed in Section 2.4.1, during the GSP development a significant number of new private wells were added to the existing network monitored by the County. In addition, some City-owned wells which had not been monitored in over 20 years were added to the network. The new expanded monitoring network of 42 wells was monitored for the first time during the April 2022 monitoring event. This expanded monitoring network will allow for more detailed groundwater elevation maps and calculation of groundwater in storage in future annual reports.

Most of these wells have not been surveyed for location, land surface elevation, or most importantly, water level measuring point elevation. As a result, publicly available Digital Elevation Model data, or other public sources of elevation data, have been used to calculate groundwater elevation. This introduces potential error to the groundwater elevation contour maps and hydrographs. The GSP and Annual Report consultants have initiated discussions with the County Groundwater Sustainability Director to prioritize completing a physical land survey of all 42 wells in the monitoring network. This will result in a more accurate and consistent data set from which to calculate water level maps, change of storage calculations, and groundwater elevation hydrographs in future annual reports and GSP updates.

On January 10, 2022, the County installed a new dedicated monitoring well at the Corner of West Foothill Boulevard and O'Connor Way, designated SLV-23 in the basin monitoring network (Figure 3). The well is a 2-inch diameter polyvinyl chloride well set to a total depth of 48 ft and screened from 28 to 48 ft with a screen slot size of 0.020 inches. This well fills in a significant data gap in the northwestern extent of the Basin along Los Osos Valley Road and will provide important data to generate water level maps, hydrographs, and storage change calculations in future annual reports and GSP updates. The well is intended to be outfitted with a continuous water level transducer initially set to record water levels every hour.

8.3.3 GSA Boundary Modifications

On December 3, 2021, the County of San Luis Obispo GSA and City of San Luis Obispo GSAs coordinated with the DWR to effectuate boundary modifications in response to changes to the City of San Luis Obispo's city limits. The San Luis Ranch area located in the north-west part of the Basin, and the Fiero East-West area near the center of the Basin were switched from the County GSA to the City GSA. During the modification it was determined that the posted notice did not constitute a material change.

8.4 Area-Specific Projects

8.4.1 City of San Luis Obispo Recycled Water Program

The City of San Luis Obispo has been using recycled water from their Water Resource Recovery Facility (WRRF) as a component of its multi-source water supply since 2006. The City's goal is to use this water source to the highest and most beneficial use, and to use it to help the City achieve and maintain groundwater sustainability throughout the SGMA implementation period. The City's priority is to use the recycled water to benefit their service area and rate payers. The City currently has over 50 recycled water accounts, with plans to use this water in the future to help supply future development in their service area.

An upgrade of the WRRFs is currently underway. The upgrade will incorporate the use of membrane bioreactor treatment which will produce higher quality recycled water. Design capacity of the WRRF is increasing from 5.1 to 5.4 MGD as part of the project as well. The City anticipates bringing online new recycled water customers in the East Airport Annexation area, San Luis Ranch area, Righetti Ranch area, and Avila Ranch area over the next 1 to 3 years.

The City instituted studies to evaluate an update on recycled water availability, analysis of existing City policies, recycled water cost and pricing, legal analysis, and a pathway to potable reuse.

8.4.2 Sentinel Peak Creek Restoration and Fish Habitat Project

The Sentinel Peak Creek Restoration and Fish Habitat Project is described in the GSP (identified as Discharge Relocation Project). Sentinel Peak Resources operates an oil field in Price Canyon 1 to 2 miles south of Edna Valley, and currently discharges highly treated recycled water from their operations to Pismo Creek approximately 1 mile downstream from the edge of the Basin south of Edna Valley. Representatives for Edna Growers and the Edna Mutual Water Company have engaged in communication with representatives for Sentinel Peak and the Resource Conservation District to discuss a project in which this creek discharge point would be moved upstream to the north edge of the Basin where West Corral de Piedras Creek enters.

This project has been proposed in the past in conjunction with the previous operator of the oil field, Freeport-McMoRan. A consortium of Edna Valley Growers cooperated with state fisheries stakeholders to identify a pipeline route and to obtain political support for the project from local government. Progress on the past efforts to implement this project was postponed when Freeport-McMoRan was sold to Sentinel Peak Resources. Negotiations have re-started, and the two parties are working toward an agreement.

8.4.3 San Luis Obispo Recycled Water to Edna Valley Project

During preparation of the GSP, a conceptual project was identified in which the City would sell excess recycled water to growers in Edna Valley to augment their water for irrigation. Representatives of Edna Valley growers have engaged in discussions with the County Director of Groundwater Sustainability and City staff to continue negotiations with the intention to move the project forward. The project would require construction of a pipeline from the end of the City's service area near the airport to growers in Edna Valley. Supply would be limited by seasonal availability constraints and infrastructure limitations described in the GSP (WSC et al., 2021). Negotiations continue with regard to price and feasibility between Edna Valley representatives, City staff, and County stakeholders.

Numerous challenges exist to develop the project, but considerable time and effort has been expended by several private entities as well as County and City staff to develop this conceptual project. The primary benefit from the project would be higher groundwater elevations in the Edna Valley due to reductions in groundwater pumping for irrigation from the use of the recycled water. Ancillary benefits could also include improved groundwater quality from the use and recharge of high-quality recycled water. As previously discussed in the text on the City's Recycled Water Project, the City has instituted studies to evaluate an update on recycled water availability, analysis of existing City policies, recycled water cost and pricing, legal analysis, and a pathway to potable reuse, as due diligence to inform their ultimate decision on providing recycled water to Edna Valley Agriculture.

8.5 Summary of Progress toward Meeting Basin Sustainability

Water year 2022 was a below average precipitation years. Relative to the basin conditions at the end of the study period as reported in the GSP, this 2022 Annual Report indicates relative equilibrium in groundwater conditions in the San Luis Valley part of the Basin, and some additional declines in the Edna Valley part of the Basin. No RMS well had water levels below the Minimum Threshold defined in the GSP (WSC et al., 2021). It is evident that historical groundwater pumping in the Basin has created challenging conditions for sustainable management. However, actions are already underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and entities throughout the Basin to develop projects and solutions that address the mutual interest in the Basin's overall sustainability goal.

8.5.1 Subsidence

Subsidence is not currently a major concern for the Basin. Land subsidence is the lowering of the land surface and may be associated the lowering of water levels through pumping. Subsidence was documented in the Los Osas Valley in the early 1990s. More recent subsidence can be estimated using Interferometric Synthetic Aperture Radar (InSAR) data provided by DWR. InSAR measures ground elevation using microwave satellite imagery data. The GSP (WSC et al., 2021) documents that no recent subsidence was detected in the Basin between 2015 and 2020. Recent land subsidence datasets made available since publication of the GSP indicate that no subsidence greater than the established minimum threshold of 0.1 feet per year has been measured in the Basin during water year 2022 (Figure 10). The GSAs will continue to monitor and report annual subsidence as more data become available.

8.5.2 Interconnected Surface Water

Transient ephemeral surface water flows and groundwater conditions in the Basin make it difficult to assess the interconnected surface water and groundwater and to quantify the degree to which surface water depletion has occurred. Three RMS wells are designated to monitor conditions of potential interconnected surface water. Potential locations for future stream gage locations and wells were included in the GSP (WSC et al., 2021). It has been a relatively brief time since the submittal of the GSP. No more recent data available since publication of the GSP to assess the interconnectivity of surface water and groundwater or to quantify potential surface water depletion is available. It is anticipated that long-term improvements to the monitoring network will include more comprehensive data collection to address this data gap. Grant funding from DWR Round 2 SGMA Implementation grants may help to achieve this.

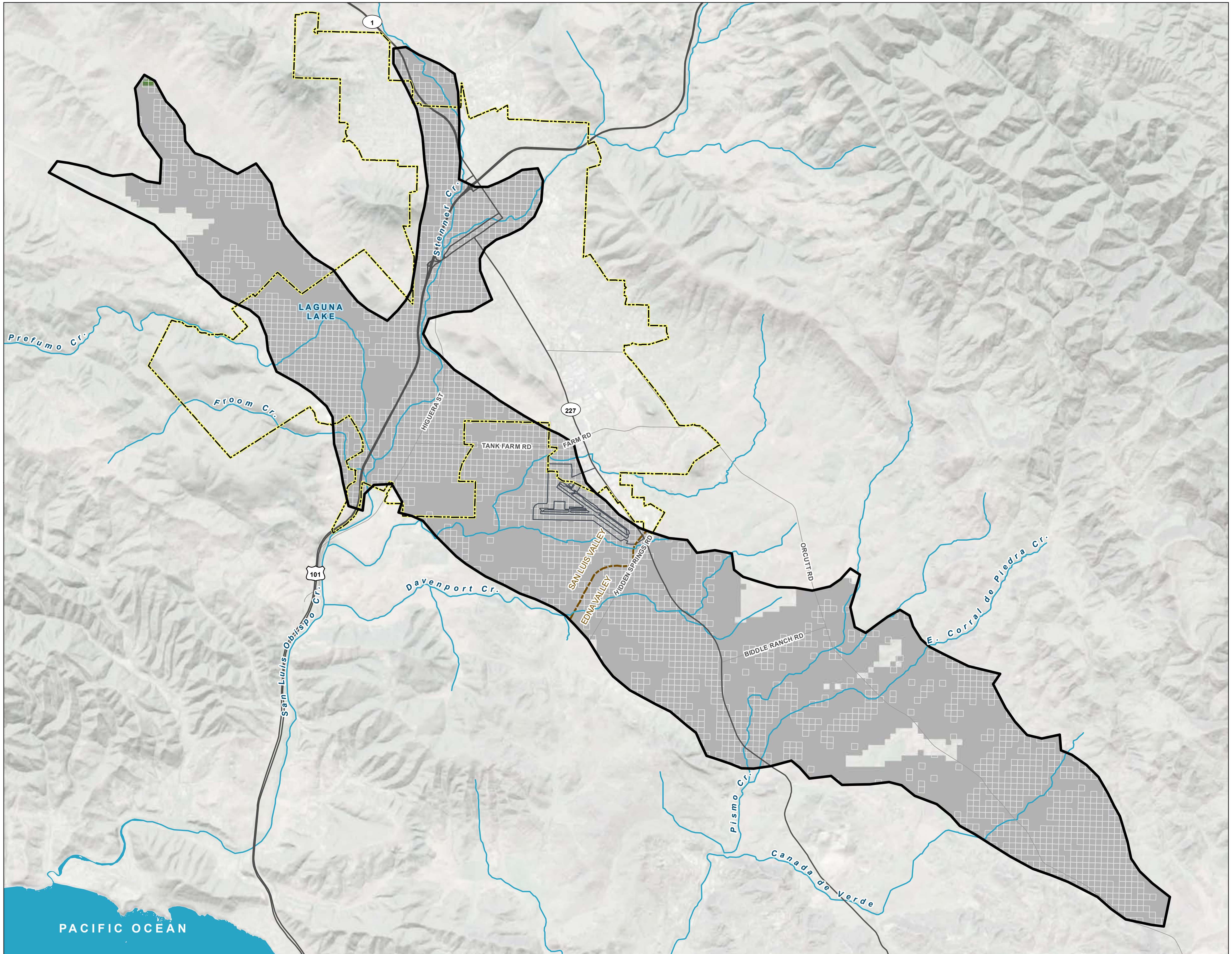

FIGURE 10

Land Subsidence Measured by InSAR (October 2021 - October 2022)

San Luis Obispo, California

DRAFT

LEGEND

Vertical Displacement Point Data Location

Estimated Subsidence (decimal ft) October 2021 - October 2022

- -0.2 to -0.1
- -0.1 to 0.1

All Other Features

- Bulletin 118 Boundary
- Bedrock Divide
- City Boundary
- SLO Airport
- Major Road
- Watercourse
- Waterbody

Date: February 17, 2023
Data Sources: BLM, ESRI, USGS, Aerial Photo 2020, TRE Altamira InSAR dataset

GSI Water Solutions, Inc.

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8.5.3 Groundwater Quality

Although groundwater quality is not a primary focus of SGMA, actions or projects undertaken by GSAs to achieve sustainability cannot degrade water quality to the extent that they would cause undesirable results. As stated in the GSP (WSC et al., 2021), groundwater quality in the Basin is generally suitable for both drinking water and agricultural purposes. Three COCs were identified and discussed in the GSP that have the potential to be impacted by groundwater management activities. These COCs identified in the GSP are total dissolved solids, nitrate, and arsenic. A review of groundwater quality data available in public datasets since the submittal of the first annual report for the wells included in the Water Quality Monitoring Network established in the GSP indicate no increasing trends in TDS, nitrates, or arsenic in any of the Basin water quality monitoring wells. One well operated by Edna Ranch MWC East that is not included in the established Monitoring Network had detections of arsenic above the maximum contaminant level. However, the purveyor is abiding by all terms of its permit for water delivered to its customers. The GSAs will continue to review groundwater quality data as it becomes available to update the characterization of groundwater quality.

Implementation of sustainability projects and/or management actions, as presented in the GSP (WSC et al., 2021), in this 2022 Annual Report, or in future reports or GSP updates, are not anticipated to result in degraded groundwater quality in the Basin. Any potential changes in groundwater quality will be documented in future annual reports and GSP updates.

8.5.4 Summary of Changes in Basin Conditions

The below-average rainfall water years of 2021 and 2022 impacted groundwater conditions in the Basin. Groundwater in storage in the Basin decreased about 7,700 AF over the past 3 water years. These estimates will be more robust in the future as the new monitoring network is implemented, and all the monitoring wells in the network are surveyed to a common datum. The volume of groundwater extractions in the Basin has remained relatively consistent for the past several years. The known irrigated acreage in the Basin has not changed dramatically since publication of the GSP, but known changes in crop type have been documented (i.e., conversion of vineyard to citrus). Groundwater in storage has decreased over the past three water years; groundwater pumping continues to exceed the estimated future sustainable yield, and at least some of the projects and management actions described in the GSP and in this first Annual Report will be necessary in order to bring the Basin into sustainability.

8.5.5 Summary of Impacts of Projects and Management Actions

Groundwater systems respond to stresses slowly and gradually. Additional time will be necessary to judge the effectiveness and quantitative impacts of the projects and management actions either now underway or in the planning and implementation stage. However, it is clear that the actions in place and as described in this first Annual Report are a good start toward reaching the sustainability goals laid out in the GSP. It is too soon to correlate observed changes in basin conditions with causes based on water resources management operations. The interim milestones outlined in the GSP will not be assessed for 5 years. But the anticipated effects of the projects and management actions now underway are expected to significantly improve the ability of the basin stakeholders to reach the necessary sustainability goals.

SECTION 9: **References**

DWR. 2003. California's Groundwater: Bulletin 118 – Update 2003, Groundwater Basin Descriptions.

DWR. 2015. Consumptive Use Program Plus (CUP+) Model, in California Water Plan Update 2013, Volume 4. Reference Guide, Developed by DWR and UC Davis.

UC Davis Cooperative Extension. 2020. *2020 Sample Costs to Establish an Orchard and Produce Eureka Lemons*. University of California Agriculture and Natural Resources Cooperative Extension Agricultural Issues Center, University of California Davis (UC Davis) Department of Agricultural and Resource Economics.

WSC, et al. 2021. San Luis Obispo Valley Basin Groundwater Sustainability Plan. Prepared by Water Systems Consulting (WSC), GSI Water Solutions, Inc., Cleath-Harris Geologist, Stillwater Sciences, and GEI. October 2021.

APPENDIX A

Sustainable Groundwater Management Act Groundwater Sustainability Plan Regulations for Annual Reports

§ 356.2. Annual Reports

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.

(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) 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.

(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.

(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.

(5) 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.

(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.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10727.2, 10728, and 10733.2, Water Code.

APPENDIX B

Precipitation Data

Data Source: SLO County | Reservoir #1 | ITRC Manual Data | CIMIS Manual Data

Monthly Precipitation Data (inches):

Water Year	Oct.	Nov.	Dec.	Jan	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	TOTAL
1871	0.68	0.38	2.90	1.51	4.43	0.00	2.79	0.28	0.00	0.00	0.00	0.00	12.97
1872	0.00	2.40	13.93	5.16	3.45	0.71	1.37	0.00	0.00	0.00	0.00	0.00	27.02
1873	0.00	0.00	6.00	5.00	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.79
1874	0.00	0.00	7.96	4.29	4.04	3.23	1.00	0.00	0.00	0.00	0.00	0.00	20.52
1875	4.28	2.05	0.48	12.10	0.28	0.50	0.00	0.00	0.00	0.00	0.00	0.00	19.69
1876	0.00	6.20	2.20	9.87	5.29	5.30	1.26	0.00	0.00	0.00	0.00	0.00	30.12
1877	1.16	0.00	0.00	4.83	0.42	1.74	0.00	0.00	0.00	0.00	0.00	0.00	8.15
1878	0.00	1.42	3.90	7.88	11.91	2.74	2.75	0.00	0.00	0.00	0.00	0.00	30.6
1879	0.00	1.50	2.58	1.78	2.15	1.60	1.80	0.25	0.00	0.00	0.00	0.00	11.66
1880	0.75	1.40	3.03	1.75	7.23	2.36	8.78	0.52	0.00	0.00	0.00	0.00	25.82
1881	0.00	0.48	13.35	4.71	1.90	1.40	1.85	0.00	0.00	0.00	0.00	0.40	24.09
1882	1.65	0.25	2.00	0.85	3.40	6.75	1.73	0.00	0.00	0.00	0.00	0.00	16.63
1883	0.69	2.95	0.44	1.50	1.60	4.88	1.10	3.85	0.00	0.00	0.00	0.00	17.01
1884	0.00	0.00	3.56	10.57	10.21	12.41	3.39	0.00	2.26	0.00	0.00	0.00	42.4
1885	2.17	0.13	8.85	2.25	0.00	0.94	3.15	0.10	0.00	0.00	0.00	0.00	17.59
1886	0.04	12.90	3.67	5.78	0.79	2.37	3.75	0.00	0.00	0.00	0.00	0.00	29.3
1887	0.25	1.25	1.06	1.10	9.60	1.29	1.56	0.36	0.07	0.02	0.00	2.05	18.61
1888	0.25	1.40	3.15	7.02	0.28	3.84	0.14	0.16	0.04	0.00	0.00	0.00	16.28
1889	0.00	4.48	3.36	1.50	2.08	7.51	0.61	0.00	0.00	0.00	0.00	0.00	19.54
1890	9.19	2.46	11.37	7.27	4.67	3.07	0.29	0.41	0.00	0.00	0.00	0.82	39.55
1891	0.00	0.42	6.04	0.88	7.14	1.97	1.96	0.13	0.15	0.00	0.00	0.27	18.96
1892	0.00	0.20	5.15	0.70	2.88	4.25	0.60	2.23	0.05	0.00	0.00	0.00	16.06
1893	0.15	2.76	6.57	4.02	6.35	9.33	1.14	0.08	0.00	0.00	0.00	0.03	30.43
1894	0.82	0.45	1.64	1.83	2.31	0.79	0.41	1.32	0.21	0.05	0.00	1.81	11.64
1895	1.71	0.35	5.45	8.05	1.82	2.44	0.67	0.47	0.00	0.00	0.00	0.00	20.96
1896	1.80	1.56	0.68	8.23	0.00	3.16	2.22	0.10	0.00	0.04	0.20	0.00	17.99
1897	1.44	3.02	3.04	5.22	4.40	3.17	0.18	0.04	0.00	0.00	0.00	0.07	20.58
1898	0.79	0.07	0.65	1.37	2.20	0.91	0.06	1.04	0.04	0.00	0.00	0.20	7.33
1899	0.39	0.08	0.64	5.56	0.28	7.62	1.54	0.10	0.92	0.00	0.00	0.00	17.13
1900	3.92	1.94	4.51	2.13	0.16	2.18	0.98	1.38	0.01	0.00	0.00	0.00	17.21
1901	1.93	8.01	0.26	11.21	5.89	0.58	2.83	0.69	0.00	0.00	0.18	0.10	31.68
1902	2.58	1.58	0.12	1.46	8.79	4.68	2.44	0.03	0.00	0.00	0.00	0.00	21.68
1903	2.00	1.52	1.48	3.67	3.18	4.98	1.66	0.00	0.00	0.00	0.00	0.00	18.49
1904	0.02	0.48	0.32	1.08	6.79	5.13	2.97	0.20	0.00	0.00	0.06	3.54	20.59
1905	1.00	0.13	1.72	2.35	7.51	4.19	0.77	2.26	0.03	0.03	0.00	0.00	19.99
1906	0.00	1.97	0.32	6.37	3.48	10.86	0.71	4.22	0.16	0.00	0.03	0.04	28.16
1907	0.00	1.08	5.14	8.78	2.45	6.79	0.34	0.11	0.02	0.00	0.00	0.07	24.78
1908	3.23	0.01	3.33	6.69	3.59	0.79	0.14	0.21	0.00	0.00	0.00	0.84	18.83
1909	0.59	0.73	1.70	17.00	6.44	4.04	0.03	0.00	0.00	0.00	0.00	0.02	30.55
1910	0.54	2.24	10.09	3.48	0.43	3.81	0.23	0.00	0.00	0.00	0.00	0.41	21.23
1911	0.30	0.27	0.95	14.31	4.86	11.92	1.32	0.08	0.00	0.00	0.00	0.02	34.03
1912	0.12	0.46	3.72	2.80	0.02	5.65	2.27	2.09	0.00	0.00	0.00	0.04	17.17
1913	0.00	0.79	0.24	3.48	1.66	0.96	0.52	0.30	0.09	0.00	0.91	0.07	9.02
1914	0.00	3.97	5.73	15.03	3.31	1.24	0.68	0.06	0.22	0.00	0.00	0.00	30.24
1915	0.08	0.12	6.01	7.11	9.51	0.95	2.47	1.91	0.01	0.01	0.00	0.00	28.18
1916	0.00	0.34	3.58	18.25	2.38	2.12	0.21	0.04	0.00	0.00	0.00	1.94	28.86
1917	1.82	0.38	9.26	1.59	7.01	0.44	0.11	0.49	0.00	0.01	0.00	0.00	21.11
1918	0.09	0.47	0.14	0.55	9.63	7.12	0.04	0.01	0.00	0.00	0.01	0.73	18.79
1919	0.81	4.00	1.92	1.51	5.48	3.35	0.09	0.19	0.00	0.00	0.00	0.42	17.77
1920	0.12	0.14	4.52	0.82	2.36	4.78	1.65	0.00	0.05	0.00	0.03	0.00	14.47
1921	1.23	1.64	3.85	6.18	2.16	2.29	0.57	1.32	0.00	0.00	0.00	0.40	19.64
1922	0.16	0.16	7.22	4.48	6.49	3.46	0.27	0.72	0.00	0.00	0.00	0.00	22.96
1923	0.47	5.30	6.64	4.51	1.36	0.38	4.57	0.01	0.04	0.00	0.00	0.70	23.98
1924	0.16	0.32	0.73	1.46	0.44	4.05	0.33	0.00	0.00	0.00	0.04	0.00	7.53
1925	0.94	0.89	2.04	2.78	4.32	4.21	2.68	3.58	0.15	0.00	0.03	0.06	21.68
1926	0.37	0.05	3.00	3.32	7.29	0.33	4.31	0.06	0.00	0.00	0.00	0.00	18.73
1927	0.66	8.24	1.41	2.78	7.78	2.10	1.54	0.05	0.12	0.00	0.00	0.00	24.68
1928	2.54	3.04	4.93	0.34	3.89	5.65	0.51	0.43	0.00	0.00	0.00	0.00	21.33
1929	0.00	3.51	5.42	1.96	2.90	1.78	1.39	0.00	0.34	0.00	0.00	0.05	17.35
1930	0.00	0.00	0.33	6.07	3.32	3.15	0.67	1.21	0.17	0.00	0.00	0.14	15.06
1931	0.04	1.98	0.63	6.22	1.92	0.54	0.48	2.52	0.16	0.00	0.06	0.00	14.55
1932	0.09	2.88	14.99	4.95	5.92	0.88	0.40	0.18	0.00	0.04	0.02	0.05	30.4
1933	0.33	0.31	1.81	8.87	0.33	1.03	0.17	0.93	1.88	0.00	0.00	0.00	15.66
1934	0.95	0.00	7.11	0.05	4.80	0.07	0.00	0.38	1.61	0.00	0.00	0.07	15.04

1935	2.28	3.91	2.84	6.01	0.93	4.59	5.35	0.01	0.00	0.00	0.71	0.00	26.63
1936	0.74	1.94	2.72	2.53	12.00	1.49	1.55	0.14	0.20	0.14	0.00	0.11	23.56
1937	1.69	0.00	8.29	7.98	9.25	5.56	0.22	0.00	0.05	0.00	0.00	0.00	33.04
1938	0.09	0.78	7.51	2.70	11.96	6.79	1.12	0.09	0.00	0.00	0.00	0.54	31.58
1939	0.53	0.48	1.08	3.39	1.97	1.92	0.26	0.13	0.00	0.02	0.00	0.59	10.37
1940	1.34	1.07	1.92	9.29	6.41	1.89	2.37	0.01	0.00	0.00	0.00	0.00	24.3
1941	0.78	0.25	9.68	7.80	9.85	8.60	5.23	0.73	0.00	0.02	0.02	0.00	42.96
1942	1.14	0.95	10.18	2.80	1.93	2.33	3.94	0.30	0.00	0.00	0.01	0.00	23.58
1943	0.54	1.34	3.35	10.83	2.01	6.94	1.04	0.00	0.00	0.00	0.00	0.00	26.05
1944	1.15	0.42	4.57	1.77	9.45	2.61	2.22	0.24	0.01	0.00	0.00	0.00	22.44
1945	0.14	6.10	2.18	0.16	6.48	5.91	0.12	0.10	0.09	0.00	0.03	0.11	21.42
1946	1.14	0.83	7.36	0.63	2.26	4.20	1.24	0.19	0.00	0.04	0.02	0.00	17.91
1947	0.55	6.64	2.68	0.44	1.15	2.04	0.20	0.27	0.24	0.00	0.04	0.00	14.25
1948	1.40	0.12	1.47	0.06	2.17	5.25	4.14	0.89	0.00	0.00	0.00	0.00	15.5
1949	0.39	0.02	3.50	1.94	2.41	5.68	0.11	0.00	0.00	0.00	0.00	0.00	14.05
1950	0.00	2.23	3.85	4.89	3.88	1.41	2.53	0.17	0.00	0.46	0.00	0.03	19.45
1951	2.12	2.38	3.25	3.42	1.31	1.03	1.48	0.13	0.00	0.00	0.04	0.05	15.21
1952	0.93	1.96	8.39	9.53	0.63	6.65	1.05	0.04	0.03	0.05	0.00	0.00	29.26
1953	0.00	3.55	7.28	2.37	0.00	1.40	1.99	0.15	0.04	0.00	0.00	0.00	16.78
1954	0.00	3.45	0.42	6.10	3.50	4.90	1.28	0.09	0.03	0.00	0.00	0.00	19.77
1955	0.00	2.77	3.10	5.60	1.96	0.18	2.67	1.00	0.00	0.00	0.01	0.00	17.29
1956	0.00	1.93	10.88	6.51	1.46	0.01	3.47	0.90	0.00	0.00	0.00	0.00	25.16
1957	0.65	0.00	0.49	3.01	3.88	1.17	3.11	1.57	0.00	0.00	0.00	0.00	13.88
1958	1.68	0.55	4.23	3.78	8.99	8.40	6.51	0.23	0.00	0.00	0.00	0.95	35.32
1959	0.00	0.32	0.18	2.69	6.60	0.00	0.95	0.07	0.00	0.00	0.00	0.73	11.54
1960	0.00	0.00	0.60	4.23	6.85	1.52	1.94	0.04	0.00	0.00	0.00	0.00	15.18
1961	0.22	3.76	1.67	1.97	0.91	1.74	0.49	0.33	0.04	0.01	0.00	0.01	11.15
1962	0.00	4.60	2.14	2.88	13.96	2.16	0.13	0.04	0.06	0.00	0.00	0.00	25.97
1963	1.52	0.04	2.73	3.56	8.08	4.61	3.84	0.33	0.09	0.00	0.00	0.19	24.99
1964	1.94	4.08	0.15	3.01	0.12	2.10	1.69	1.03	0.37	0.02	0.00	0.10	14.61
1965	1.43	3.79	5.78	4.10	0.42	2.29	3.91	0.00	0.00	0.00	0.00	0.00	21.72
1966	0.00	7.80	4.12	2.13	1.15	0.29	0.12	0.00	0.01	0.15	0.00	1.11	16.88
1967	0.00	4.40	7.70	0.00	0.58	6.38	6.90	0.36	0.13	0.00	0.00	1.20	27.65
1968	0.00	3.83	3.05	2.43	2.07	3.70	1.31	0.35	0.00	0.00	0.00	0.01	16.75
1969	3.08	2.10	3.92	24.63	15.16	1.88	3.72	0.00	0.03	0.00	0.00	0.10	54.62
1970	0.62	0.89	1.73	7.28	1.42	4.11	0.18	0.00	0.07	0.00	0.00	0.00	16.3
1971	0.11	6.02	8.51	1.89	0.42	0.73	1.56	1.22	0.00	0.00	0.00	0.19	20.65
1972	0.36	2.00	7.03	1.03	0.86	0.00	0.89	0.06	0.00	0.04	0.00	0.00	12.27
1973	2.72	6.79	2.00	13.84	9.67	4.94	0.00	0.02	0.00	0.00	0.00	0.07	40.05
1974	2.18	4.18	4.90	5.17	0.43	8.97	2.81	0.00	0.02	0.02	0.00	0.00	28.68
1975	1.96	0.74	4.93	0.26	8.35	5.90	2.00	0.00	0.00	0.00	0.00	0.02	24.16
1976	2.23	0.36	0.18	0.01	4.17	2.54	0.88	0.00	0.03	0.00	1.41	3.87	15.68
1977	0.50	1.03	2.49	2.01	0.08	2.13	0.06	3.29	0.00	0.00	0.00	0.03	11.62
1978	0.05	0.28	8.49	15.76	10.71	8.09	4.37	0.00	0.07	0.00	0.00	1.18	49
1979	0.00	2.46	2.24	4.62	5.99	4.03	0.24	0.00	0.00	0.00	0.00	0.20	19.78
1980	1.28	1.21	4.84	9.22	11.91	3.47	0.70	0.43	0.00	0.29	0.00	0.00	33.35
1981	0.00	0.01	2.10	6.40	2.15	7.48	0.34	0.00	0.00	0.00	0.00	0.00	18.48
1982	1.59	2.97	1.97	5.87	1.65	8.89	4.12	0.01	0.17	0.00	0.11	1.19	28.54
1983	1.74	6.28	4.97	10.05	10.53	8.61	3.30	0.61	0.00	0.00	0.91	0.15	47.15
1984	2.47	6.54	6.72	0.18	0.97	1.02	0.82	0.00	0.00	0.00	0.08	0.00	18.8
1985	1.27	3.61	3.76	0.72	1.94	3.07	0.30	0.02	0.00	0.04	0.02	0.04	14.79
1986	1.05	4.39	2.03	2.65	11.79	7.26	0.16	0.00	0.00	0.01	0.00	1.14	30.48
1987	0.00	0.28	1.51	2.48	2.90	6.62	0.19	0.06	0.00	0.00	0.00	0.00	14.04
1988	2.76	1.49	4.95	2.87	2.67	1.29	3.44	0.20	0.18	0.02	0.00	0.00	19.87
1989	0.00	1.85	8.08	0.98	1.66	1.99	0.76	0.12	0.00	0.00	0.00	1.70	17.14
1990	1.62	0.55	0.00	3.91	2.98	0.70	0.48	1.42	0.00	0.00	0.00	0.56	12.22
1991	0.00	0.36	0.43	0.81	2.39	12.82	0.43	0.00	0.80	0.00	0.07	0.00	18.11
1992	0.44	0.58	4.49	3.43	9.84	3.15	0.10	0.00	0.04	0.44	0.00	0.00	22.51
1993	1.29	0.00	5.45	10.51	8.61	4.03	0.25	0.23	0.09	0.00	0.00	0.00	30.46
1994	0.22	1.89	2.20	2.93	5.97	1.43	1.46	0.86	0.00	0.00	0.00	2.38	19.34
1995	0.89	2.51	1.15	16.03	2.25	16.48	1.12	0.74	0.76	0.00	0.00	0.00	41.93
1996	0.02	0.40	3.55	4.68	9.73	1.78	1.90	1.05	0.00	0.00	0.00	0.00	23.11
1997	2.23	4.43	10.88	13.31	0.46	0.00	0.05	0.00	0.00	0.05	0.01	0.00	31.42
1998	0.00	5.84	5.32	6.86	15.07	3.79	3.58	3.41	0.05	0.00	0.00	0.35	44.27
1999	0.37	1.88	1.22	3.62	2.37	5.19	2.07	0.00	0.00	0.00	0.00	0.13	16.85
2000	0.00	1.69	0.08	4.33	13.17	1.92	2.97	0.21	0.34	0.00	0.00	0.02	24.73
2001	2.22	0.03	0.19	8.10	7.17	4.94	1.87	0.00	0.00	0.00	0.00	0.00	24.52
2002	0.49	5.47	3.03	1.31	0.84	2.14	1.33	0.18	0.00	0.00	0.00	0.05	14.84
2003	0.00	4.42	8.07	0.38	3.16	3.51	1.92	1.39	0.00	0.03	0.00	0.00	22.88
2004	0.00	2.71	3.25	1.13	8.29	0.61	0.00	0.00	0.00	0.00	0.00	0.00	15.99
2005	0.83	3.96	6.21	6.78	5.54	4.29	0.68	1.46	0.01	0.00	0.00	0.05	29.81

2006	0.01	1.17	0.83	4.32	1.34	3.38	2.88	1.33	0.00	0.20	0.00	0.00	15.46
2007	0.08	0.63	3.03	1.61	4.14	0.51	0.75	0.08	0.00	0.00	0.08	0.04	10.95
2008	0.98	0.08	4.45	9.84	3.58	0.12	0.71	0.00	0.00	0.00	0.16	0.00	19.92
2009	0.19	1.58	1.89	0.87	3.11	1.49	0.51	0.20	0.35	0.00	0.00	0.08	10.27
2010	7.36	0.08	4.80	8.94	5.75	1.81	2.40	0.51	0.00	0.00	0.00	0.01	31.66
2011	2.20	2.24	12.09	0.47	4.33	7.20	0.16	1.42	1.38	0.01	0.00	0.00	31.5
2012	0.51	3.20	0.26	3.27	0.73	2.95	3.69	0.00	0.00	0.00	0.03	0.00	14.64
2013	1.35	3.07	6.42	1.35	0.89	0.90	0.00	0.31	0.01	0.03	0.00	0.02	14.35
2014	0.44	0.34	0.27	0.03	5.83	2.57	1.08	0.00	0.00	0.00	0.00	0.00	10.56
2015	0.00	1.51	5.89	0.12	2.31	0.02	1.49	0.18	0.00	1.37	0.00	0.05	12.94
2016	0.13	1.78	2.50	6.85	0.70	5.84	0.25	0.00	0.00	0.00	0.00	0.00	18.05
2017	2.85	2.10	4.17	13.36	11.00	2.71	2.29	0.45	0.00	0.00	0.04	0.24	39.21
2018	0.01	0.49	0.17	3.55	0.15	9.12	0.56	0.01	0.00	0.00	0.00	0.00	14.06
2019	0.70	5.03	1.20	7.02	7.41	6.01	0.22	1.89	0.00	0.00	0.00	0.00	29.48
2020	0.00	2.28	4.22	0.44	0.02	5.81	2.87	0.19	0.05	0.00	0.00	0.00	15.88
2021	0.00	0.93	1.86	7.92	0.00	1.38	0.00	0.00	0.00	0.05	0.02	0.00	12.16
2022	2.15	0.35	10.13	0.10	0.01	0.73	0.55	0.00	0.01	0.00	0.00	1.30	15.33

APPENDIX C

Groundwater Level and Groundwater Storage Monitoring Well Network

Appendix C
Groundwater Level Monitoring Network

Local ID[1]	TRS / **State ID**[2]	**X**	**Y**	Well Depth (feet)	Screen Interval (feet)	RP Elev.[3] (feet AMSL)	First Data Year	Last Data Year	Data period (years)	Data Count	Aquifer[4]	Well Criteria[5]	Well Use[6]	GSA
SLV-01	30S/12E-23E	5763498.0	2307722.0	(pending)	(pending)	304			(pending)		Qa	GDE, T	MW	County
SLV-02	30S/12E-22G	5765468.9	2305193.3	(pending)	(pending)	276			(pending)		Qa		MW	City
SLV-03	30S/12E-30P	5747129.7	2300343.2			153					Qa		IRR-I	County
SLV-04	**30S/12E-35B1**	5768429.3	2298214.4	48	28-48	215.6	1991	2020	29	38	Qa		IRR-A	City
SLV-05	30S/12E-35D	5766014.2	2297818.7	52	32-52	187	1990	2018	28	7	Qa	GDE, T	IRR-A	City
SLV-06	31S/12E-04D	5756745.6	2292537.7	85	45-85	150	1989		1	1	Qa	T	MW	City
SLV-07	31S/12E-04K	5758677.8	2290384.3	125	55-125	139.5	1992	2000	8	46	Qpr		PS-I	City
SLV-08	31S/12E-03K	5763487.4	2290226.9	70	50-70	128	1988	2020	32	2	Qpr		IRR-A	City
SLV-09	**31S/12E-4R1**	5759261.7	2289227.3	130	40-130	129.5	1988	2020	32	48	Qa/Qpr	SUB	PS-I	City
SLV-10	31S/12E-3Q	5763256.2	2289115.1	48		131	2017	2020	3	82	Qa		MW	City
SLV-11	**31S/12E-3P1**	5762001.1	2288573.6	61		119	1990	2006	16	31	Qa		MW	City
SLV-12	**31S/12E-10D3**	5761213.3	2286945.5	175	0-90; 150-17	109.2	1992	2020	28	72	Qa/Qpr/Tps	ISW, SUB, T	IRR-A	City
SLV-13	31S/12E-11D	5766075.3	2286659.3	40	May-40	121.75	1996	2020	24	49	Qa	T, GDE	MW	City
SLV-14	31S/12E-12E	5770901.8	2286371.5	20	20-May	144.68	1990	2020	30	60	Qa		MW	County
SLV-15	**31S/12E-10G2**	5763888.4	2285703.3	190		122	1965	2020	55	90	Qpr		IRR-A	City
SLV-16	**31S/12E-10H3**	5764170.7	2285620.9	165	65-165	122	1984	2020	36	68	Qpr	WL	DOM-A	City
SLV-17	31S/12E-11M	5766025.2	2284993.8	100	60-100	119.78	1996	2020	24	73	Qpr		MW	County
SLV-18	31S/12E-11K	5769088.4	2284549.3	30	21-Jun	133.28	1990	2020	30	59	Qa		MW	County
SLV-19	**31S/12E-14C1**	5767192.3	2282627.0			128	1958	2020	62	98	Qpr	WL, GDE, T	IRR-A	County
SLV-20	31S/13E-18D	5776258.9	2282139.0			202					Qa		MW	County
SLV-21	31S/12E-13A	5772783.0	2282039.5	60	50-60	178.68	2018	2018	1		Qpr		MW	County
SLV-22	31S/12E-13C	5775063.4	2281053.1	100	11-100	178	2004	2020	16	2	Qpr/Kjf	T	IRR-I	County
SLV-23		5753426.0	2299828.0	48	28-48	138.25	2022	2022	0	0	Qa		MW	County
EV-01	**31S/13E-16N1**	5786983.4	2277122.1	72		324	1958	2020	62	99	Qa	ISW, T	DOM-A	County
EV-02	31S/13E-20A	5786620.8	2275622.5	75		305					Qa	GDE	IRR-I	County
EV-03	**31S/13E-19H4**	5780328.7	2275069.4	250	178-250	254					Qpr/Tps		IRR-A	County
EV-04	**31S/13E-19H1**	5781018.4	2274987.6			262	1958	2020	62	100	Tps	WL, GWS, T	IRR-A	County
EV-05	31S/13E-20G	5784473.2	2274357.8	400	120-400	280					Tps		IRR-I	County
EV-06	**31S/13E-19J1**	5779762.2	2274076.8			251	1998	2020	22	44	Qpr		DOM-I	County
EV-07	**31S/13E-19J2**	5779828.3	2273795.1			250	1998	2020	22	45	Tps		DOM-A	County
EV-08	31S/13E-21L	5789142.5	2272893.7			350					Qa	GDE, T	IRR-A	County
EV-09	**31S/13E-19R3**	5779269.9	2271824.3	440	0-190; 290-4	239	1974	2020	46	45	Tps/Tm	WL, GWS	PS-A	County
EV-10	31S/13E-28F	5788113.2	2269755.9	340	200-330	344					Qpr/Tps		IRR-A	County
EV-11	**31S/13E-20F6**	5782878.1	2269254.1	150	55-150	230	2011	2020	9		Qpr/Tm	ISW, GDE, T	MW	County
EV-12	**31S/13E-28J3**	5790677.2	2268409.9	600		303	1993	2020	27	39	Qpr/Tps		IRR-A	County
EV-13	**31S/13E-27M3**	5791941.4	2267983.1	400	130-380	289	1993	2020	27	34	Qpr/Tps	WL, GWS	IRR-A	County
EV-14	31S/13E-27R	5796154.5	2266436.8	300	90-290	319	2017	2020	3	6	Qpr/Tps	T	MW	County
EV-15	31S/13E-27Q	5795453.0	2266061.0			307	1989	2020	31	9	Qpr/Tps		DOM-I	County
EV-16	31S/13E-35D	5797475.5	2264847.4	260	200-260	323	1988	2020	32	188	Tps	WL, GWS	PS-A	County
EV-17	31S/13E-35F	5798828.5	2263327.5	260	200-260	333	2014	2020	6	66	Tps/Kjf		PS-I	County
EV-18	**31S/13E-36R1**	5807420.6	2260616.0			327	1968	2020	52	99	(out of Basin)		IRR-A	County

Notes:

1- Representative Monitoring Sites are in **bold**. Wells with known State Well Completion Reports are underlined.

2- TRS = Township Range Section and ¼-¼ section listed, State Well ID bolded where applicable.

3- Reference Point elevations from various sources with variable accuracy.

4- Principal Aquifers are Quaternary Alluvium (Qa), Quaternary Paso Robles Formation (Qpr), and Tertiary Pismo Formation (Tps). Other bedrock aquifers (non-Basin sediments) are Tertiary Monterey Formation (Tm) and Cretaceous-Jurassic Franciscan Assemblage (KJf). Aquifers are inferred where construction information is not available.

5- Representative well criteria include Subsidence (SUB), Interconnected Surface Water Depletion (ISW), Chronic Water Level Decline (WL), and Groundwater Storage Decline (GSW). Other criteria are Transducer site (T), and Groundwater Dependent Ecosystem indicator evaluation site (GDE), which may be paired with nearby existing or proposed stream gage. Transducer installations are pending well owner authorization. Measurement frequency is semi-annual for all wells except Transducer sites (T), which are measured daily.

6- Well Use includes Monitoring Well (MW), Irrigation Well (IRR), Public Supply Well (PS), and Domestic Well (DOM). Modifiers are Active (A) or Inactive (I).

Information for some wells inferred pending confirmation.

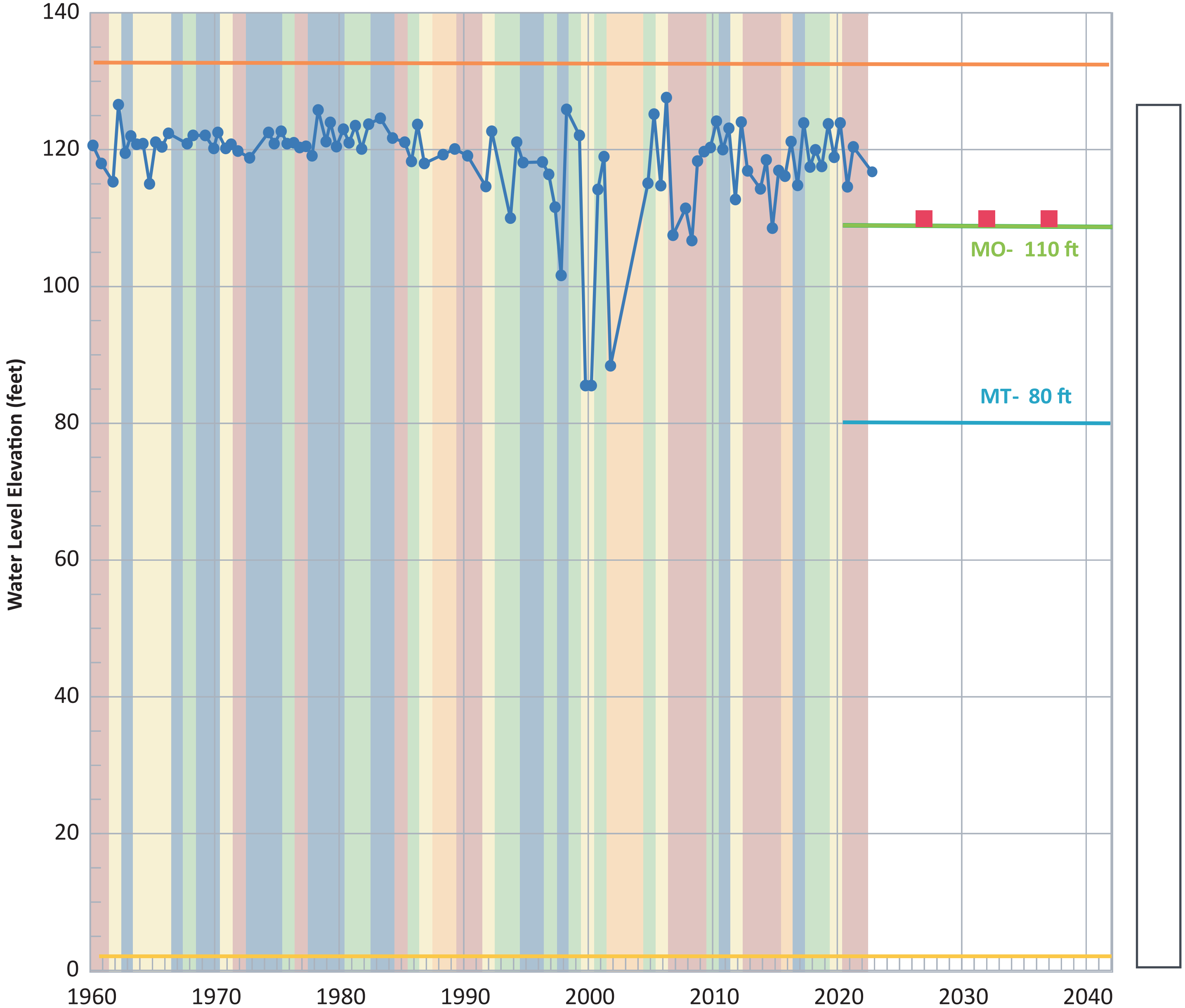
APPENDIX D

Hydrographs

APPENDIX D

RMS SLV-19
(31S/12E-14C01)

San Luis Obispo, California

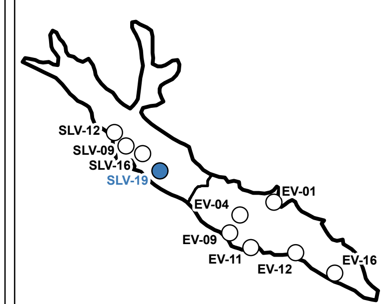


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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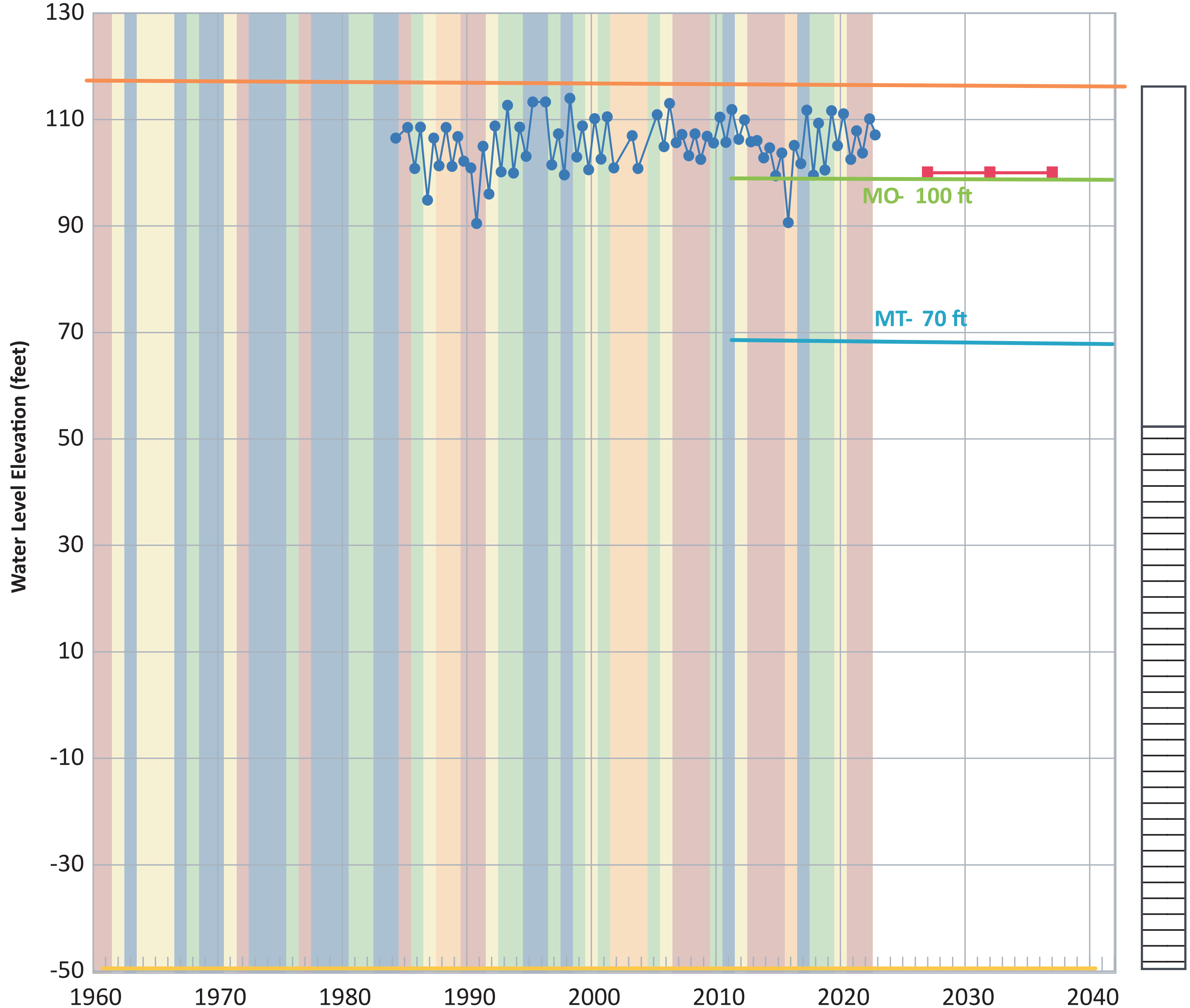
APPENDIX D

RMS SLV-16
(31S/12E-10H03)

San Luis Obispo, California

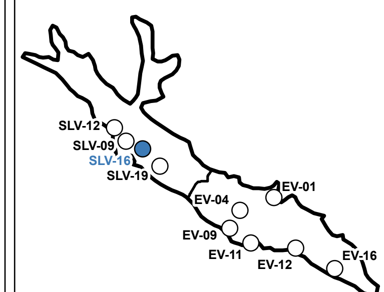


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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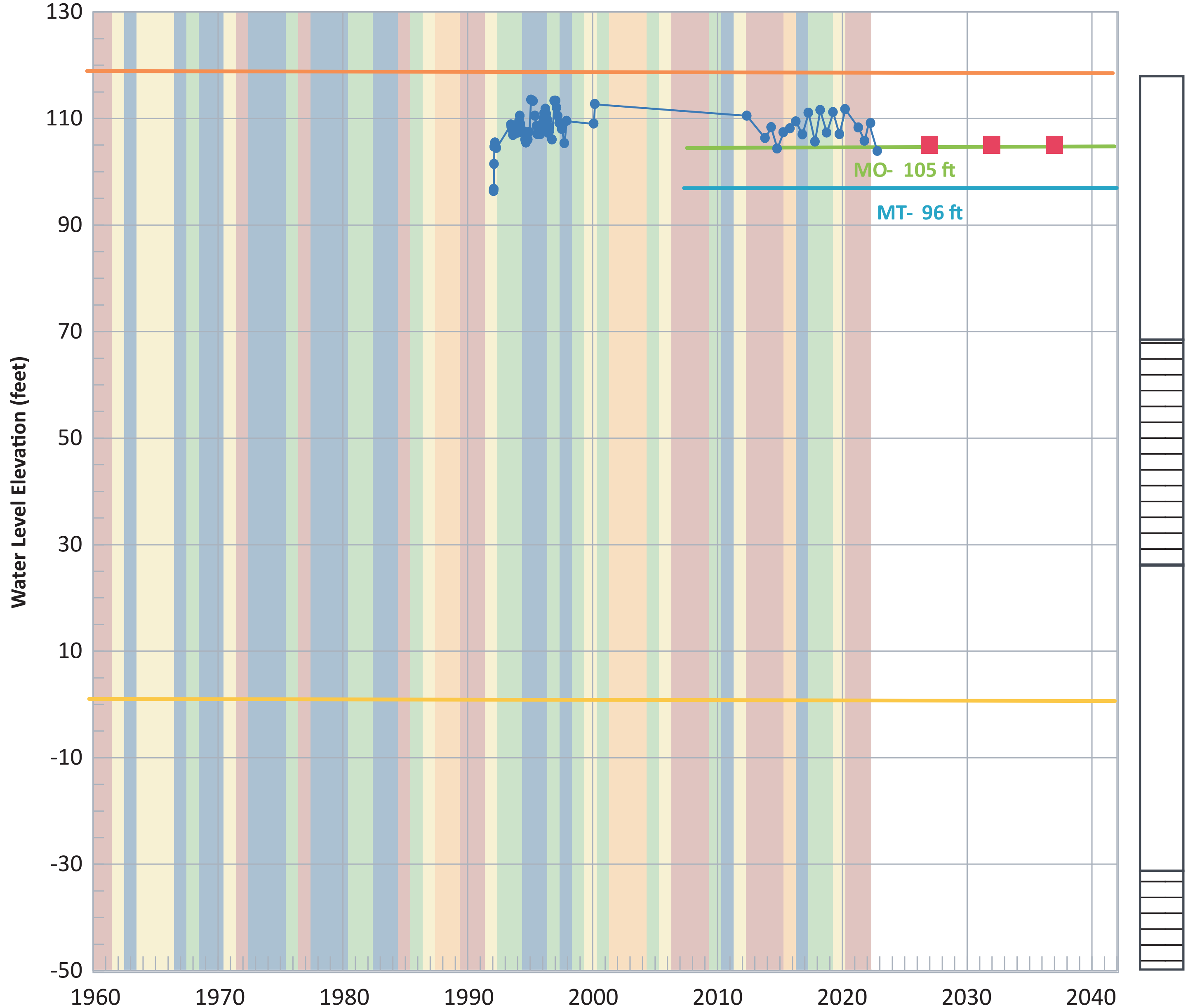
APPENDIX D

SLV-12
(31S/12E-10D03)
San Luis Obispo, California

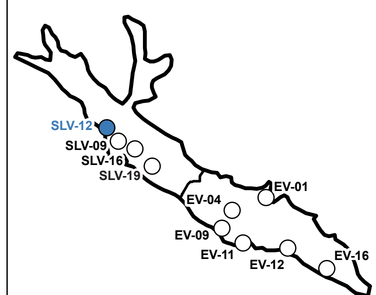


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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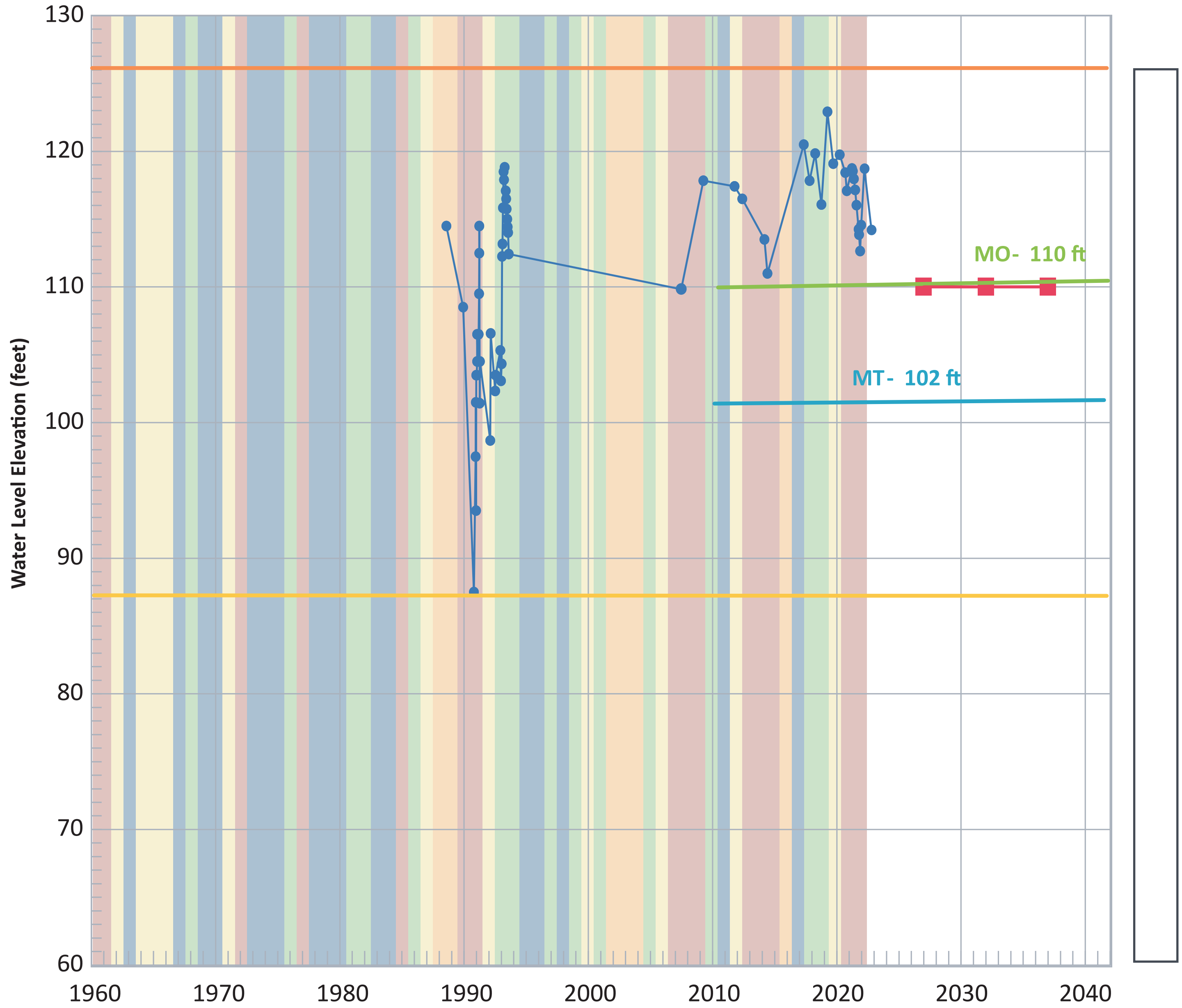
APPENDIX D

SLV-09
(Pacific Beach Well #1)

San Luis Obispo, California

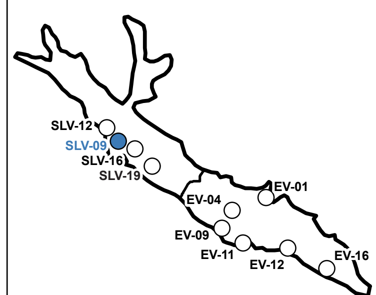


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



Water Solutions, Inc.

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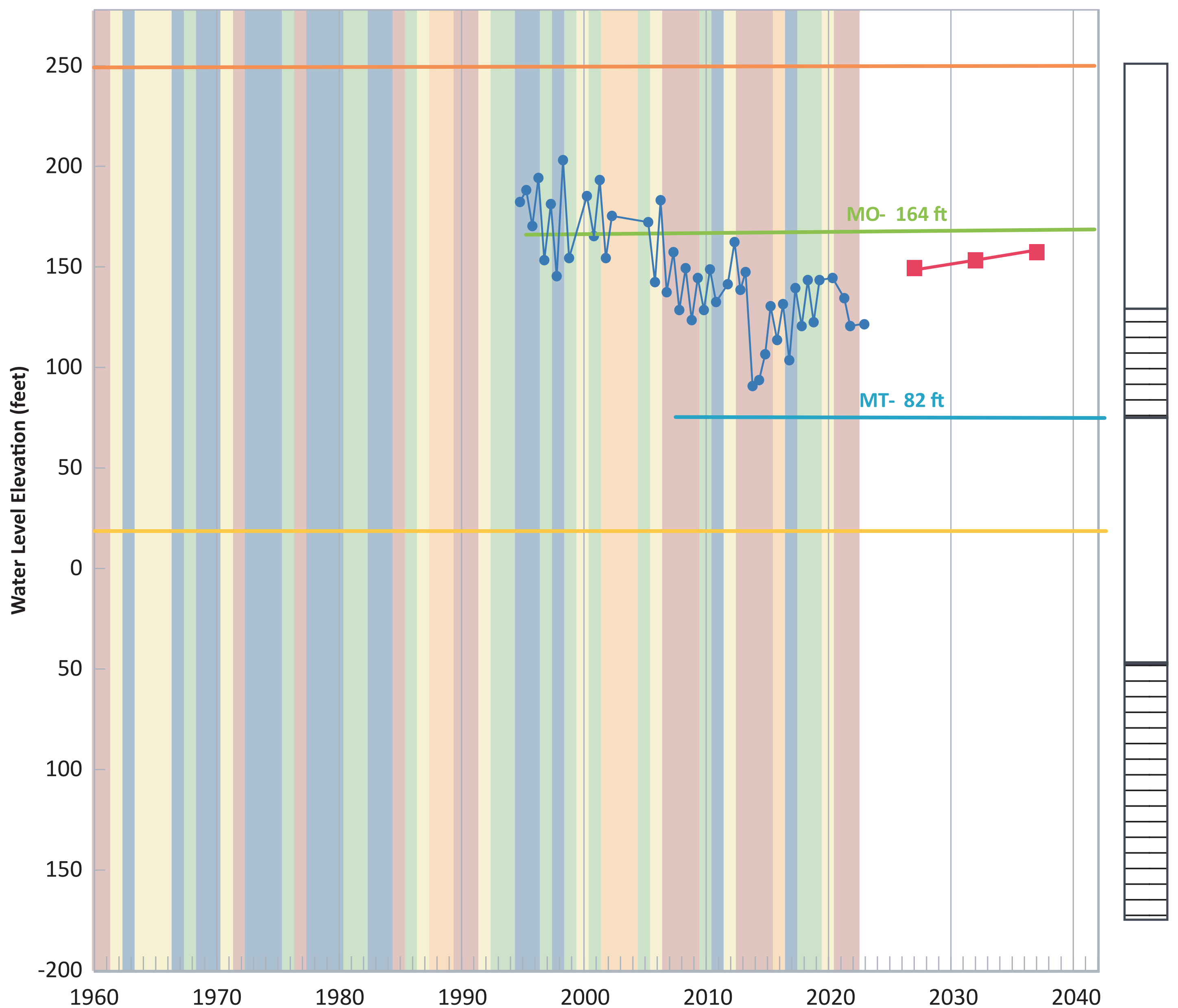
APPENDIX D

RMS EV-09
(31S/13E-19R03)

San Luis Obispo, California

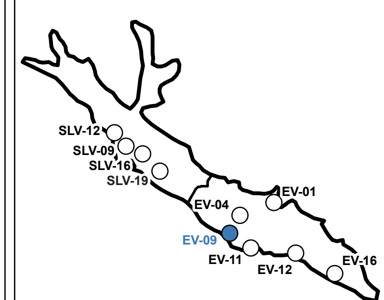


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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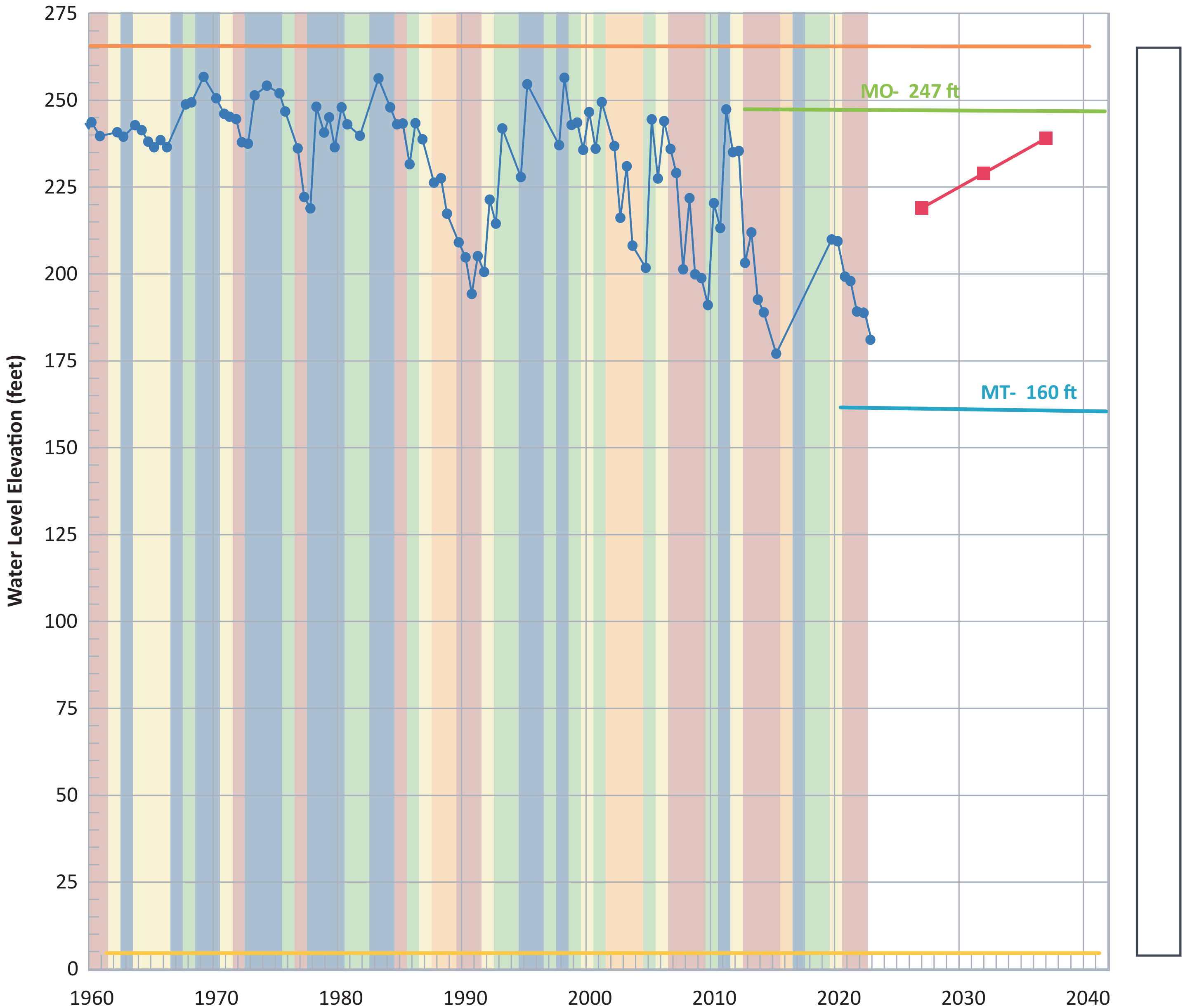
APPENDIX D

RMS EV-04
(31S/13E-19H01)

San Luis Obispo, California

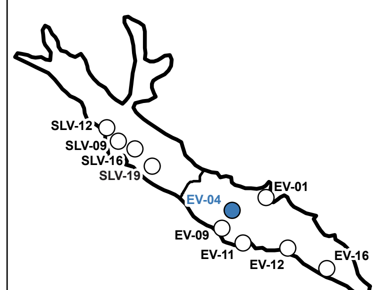


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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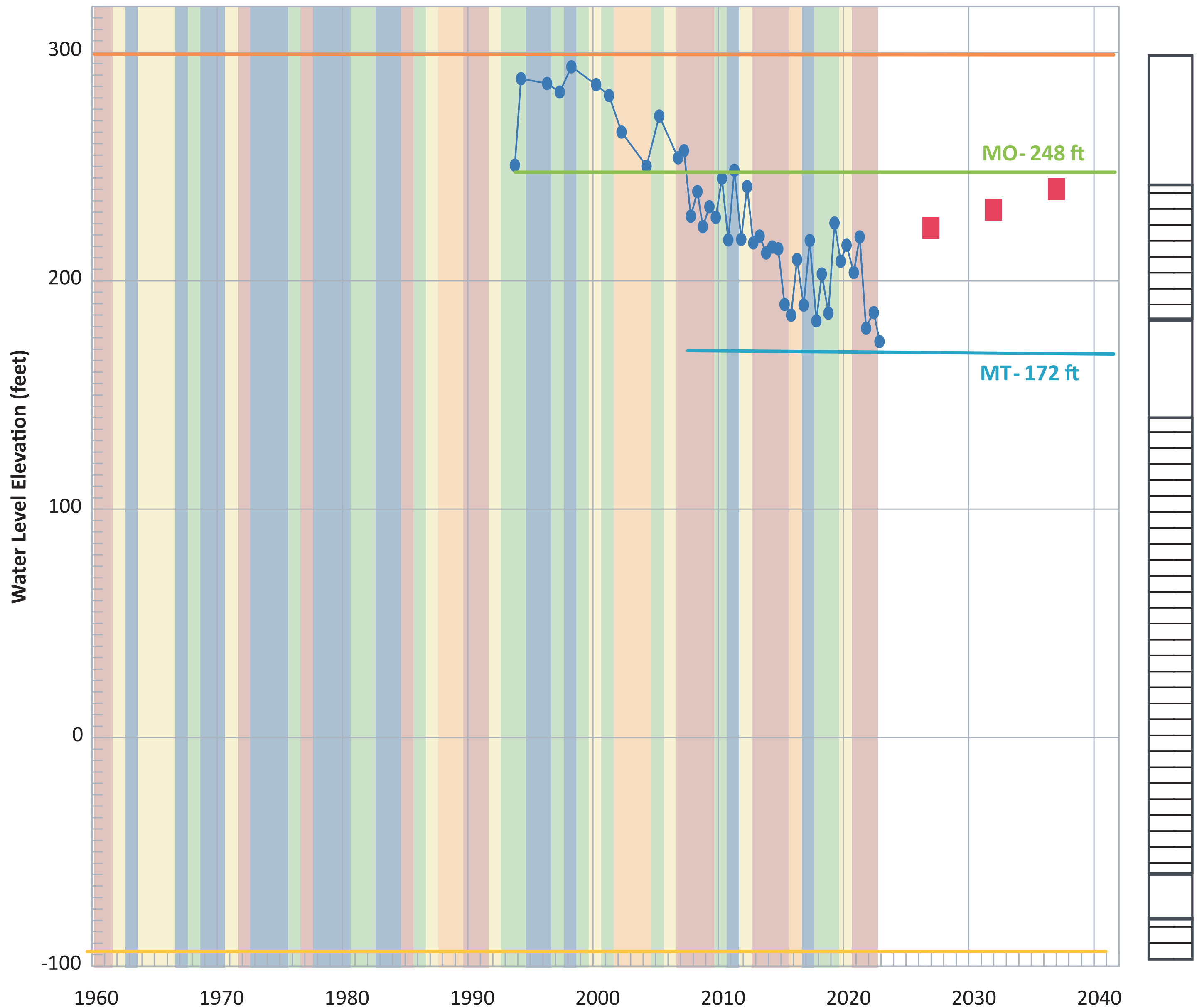
APPENDIX D

RMS EV-12
(31S/13E-27M03)

San Luis Obispo, California

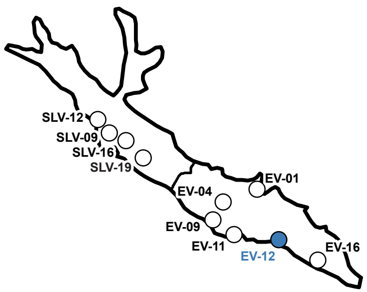


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

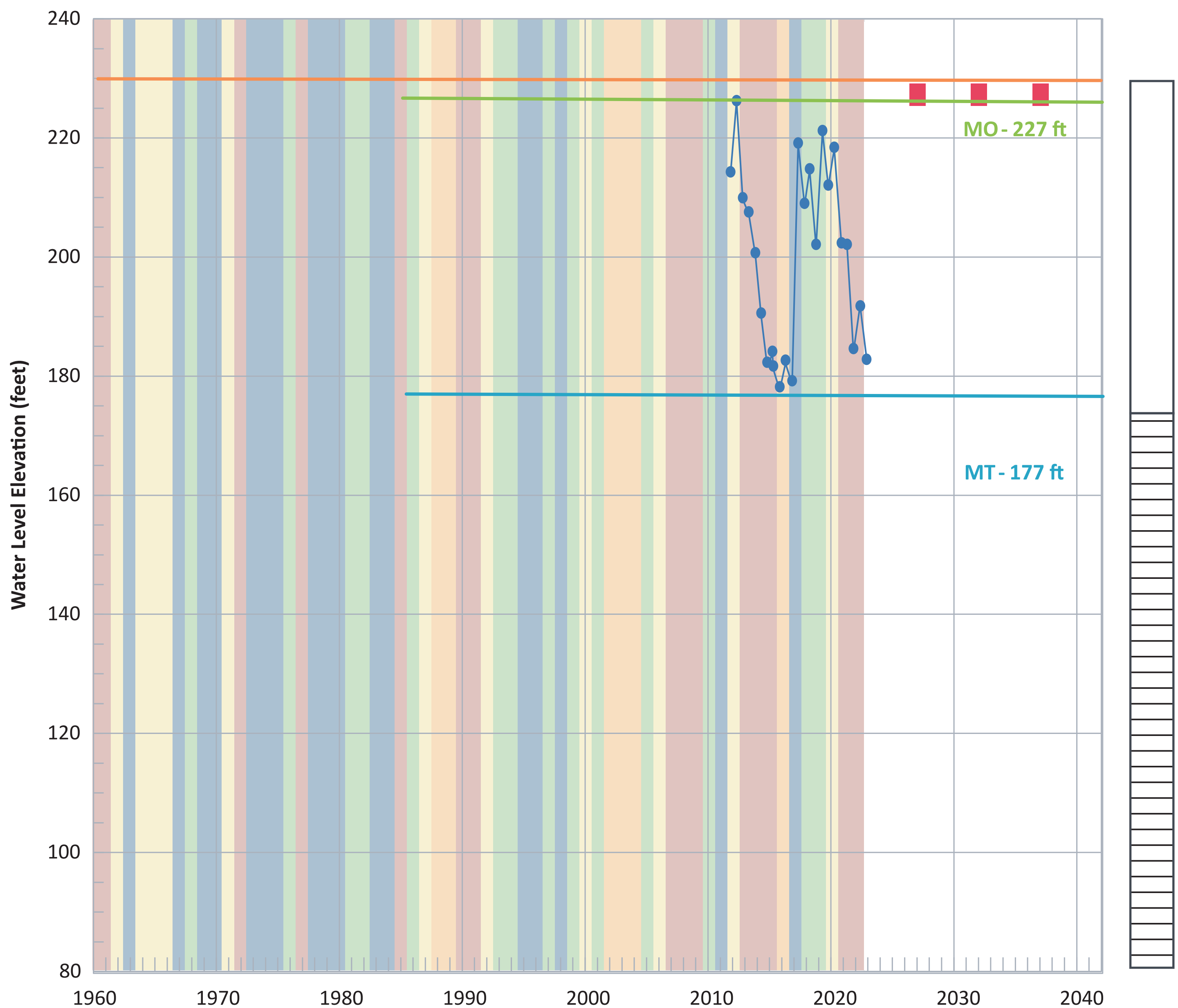
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



APPENDIX D

RMS EV-11
(31S/13E-29F06)

San Luis Obispo, California

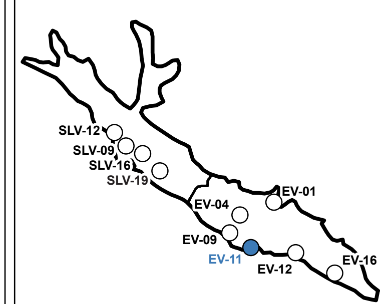


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



Water Solutions, Inc.

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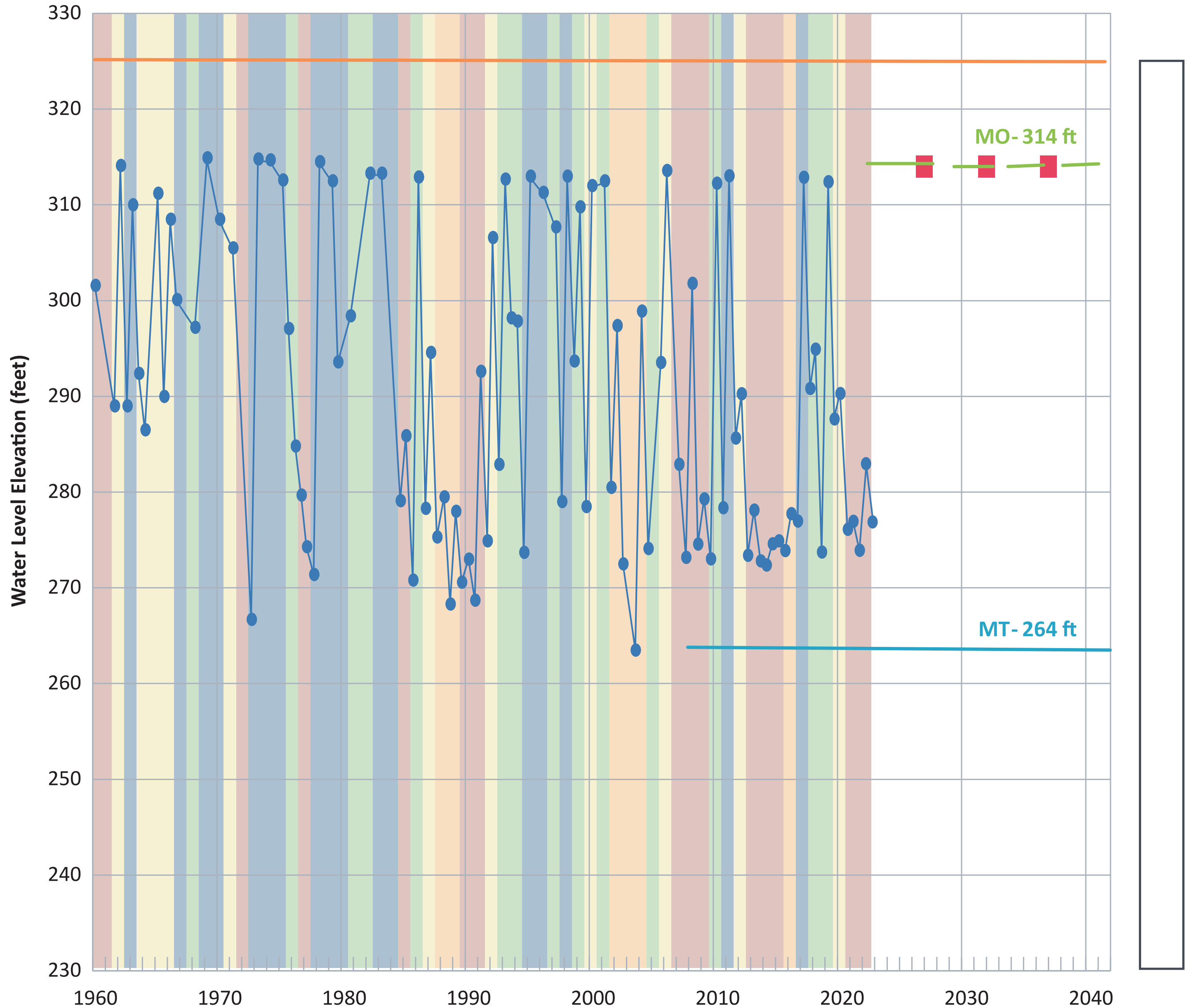
APPENDIX D

RMS EV-01
(31S/13E-16N01)

San Luis Obispo, California

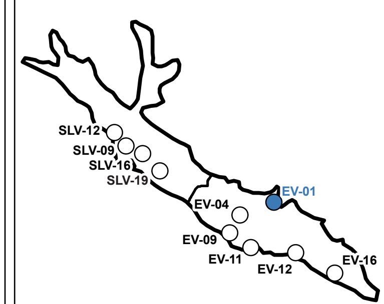


LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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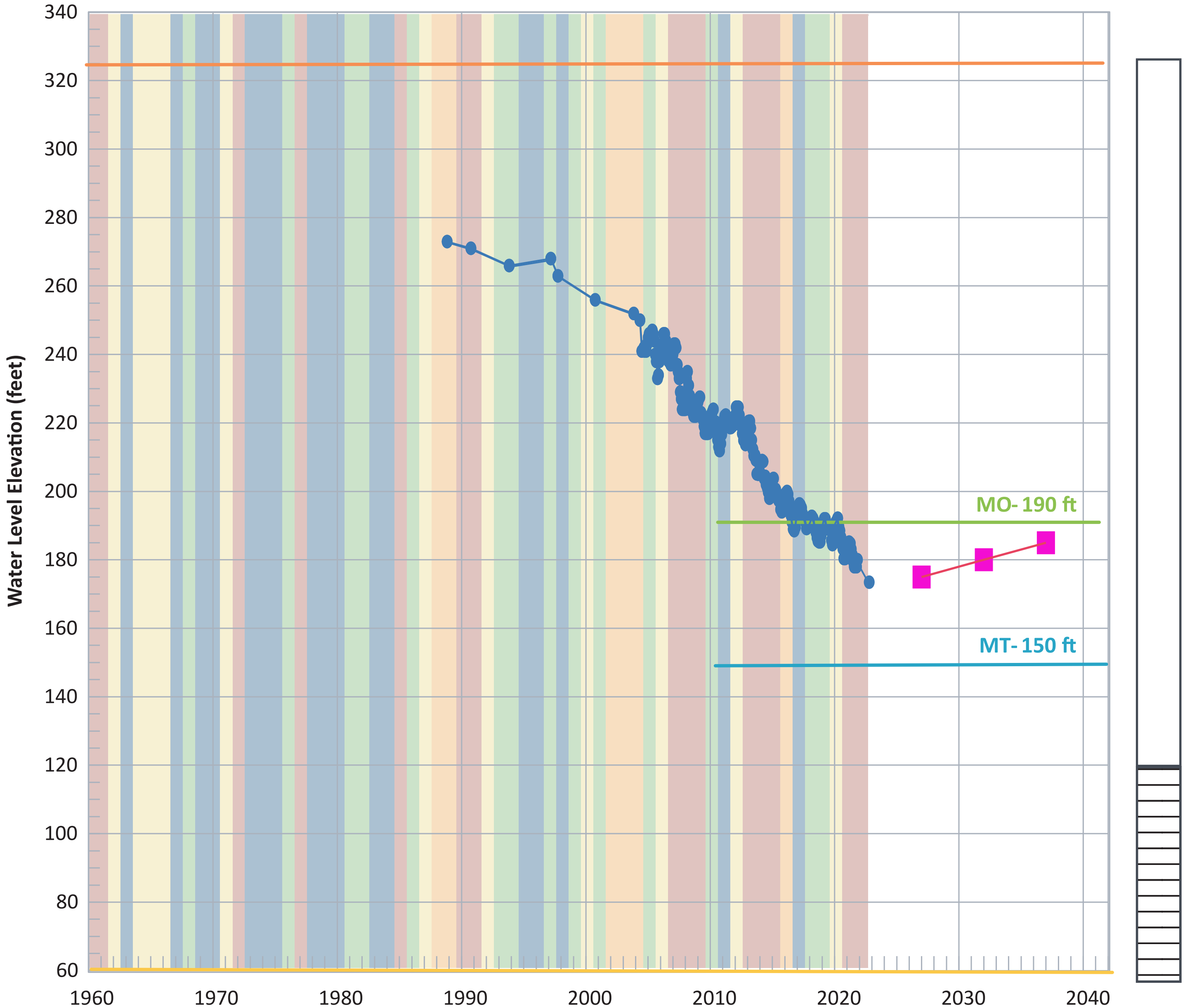


APPENDIX D

RMS EV-16 (VRMWC #1)

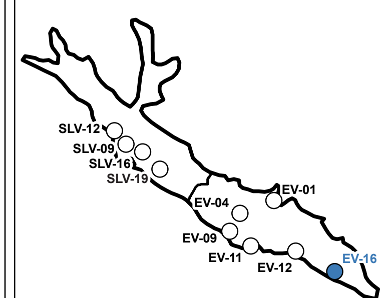
San Luis Obispo, California

LEGEND

- Observed
- Interim Milestone(s)
- Measurable Objective (MO)
- Minimum Threshold (MT)
- Land Surface Elevation
- Bedrock Elevation (approx)

Water Year Type

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



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APPENDIX E

Aquifer Storage Coefficient Derivation

6.4.6. Total Groundwater in Storage

Groundwater is stored within the pore space of Basin sediments. The Specific yield is a ratio of the volume of pore water that will drain under the influence of gravity to the total volume of saturated sediments. The specific yield method for estimating groundwater in storage is the product of total saturated Basin volume and average specific yield. Calculation of total groundwater in storage for selected years was performed based on the specific yield method.

Estimates of specific yield for Basin sediments were obtained based on a review of 21 representative well logs. The lithology for each well log was correlated with specific yield values reported for sediment types in San Luis Obispo County (Johnson, 1967). A summary of the correlations is shown in Table 6-13. Locations of well logs used for the specific yield correlations are shown in the referenced cross-sections from the SLO Basin Characterization Report (GSI Water Solutions, 2018).

Groundwater in storage calculations were performed for the Spring conditions of 1986, 1990, 1995, 1998, 2011, 2014, and 2019 using the specific yield method. Water level contours for each year were prepared based on available water level data from various sources, including the SLCFCWCD water level monitoring program, Geotracker Groundwater Information System data, groundwater monitoring reports, Stakeholder provided information, and Environmental Impact Reports. Water level contour maps for the Spring 1986 and Spring 2019 are shown in Figure 6-18 and Figure 6-19.

The water level contours for storage calculations extend to the Basin boundaries. Groundwater levels in the San Luis Valley subarea may contour at, or slightly above, ground surface in areas where wetlands are present, and there are no major differences between Spring 1986 and Spring 2019 water levels. In the Edna Valley subarea, water level contours show some notable areas of decline between 1986 and 2019 near the intersection of Edna Road (Highway 227) and Biddle Ranch Road and at the southeast end of the Basin. Declines in these areas are also shown for other time intervals in Figure 5-8 and Figure 5-9 of Chapter 5 (Groundwater Conditions). Of note, however, is that Spring 2019 water levels shown in Figure 6-18 are lower near the intersection of Edna and Biddle Ranch Road than for the same period shown in Figure 5-6. This is because Figure 5-6 contours pressure in a shallow alluvial aquifer in this area while Figure 6-19 contours pressure in the deeper Pismo Formation aquifer that is the main supply aquifer for irrigation, and more appropriate for water budget storage calculations.

Table 6-13. Specific Yield Averages

WELL ID	BASIN CROSS-SECTION	AQUIFER SPECIFIC YIELD (PERCENT) QAL	QTP	PISMO
139405	B-B'	3.0	4.7	
158599	G-G'	6.8	6.9	18.0
279128	C2-C2'	11.0		
279130	A1-A2	8.2	6.5	3.0
287786	C1-C1'	7.2		
319126	C1-C1'	5.5	11.7	
438979	A1-A2	4.4	8.1	
469906	A3-A4		12.0	10.7
529099	E-E'		8.1	11.2
68734	A2-A3		5.9	8.0
710817	G-G'	3.0	5.0	10.8
73143	A1-A2	12.7	5.8	
782309	A2-A3	7.1	10.5	15.8
782656	D-D'	5.0	16.0	
e026022	H-H'		7.4	18.6
e0047435	G-G'	6.6	4.5	17.6
e0115806	offset I-I'		9.1	16.2
e0161526	F-F'		5.4	15.6
e0183287	H-H'	3.0	7.0	
e0225875	A2-A3	3.6	17.3	10.1
TH1	C1-C1'	5.9	8.9	18.0
AVERAGE SPECIFIC YIELD		**6.2**	**8.5**	**13.4**
BASIN AVERAGE (WEIGHTED)		**10.5**		
SAN LUIS VALLEY SUBAREA (WEIGHTED)		**8.0**		
EDNA VALLEY SUBAREA (WEIGHTED)		**11.7**		

Notes: Cross-sections shown in SLO Basin Characterization Report (GSI Water Solutions, 2018)

Qal = alluvium; QTp = Paso Robles Formation; Pismo = Pismo Formation

Weighted averages based on penetrated thicknesses of aquifer type.

APPENDIX F

Public Comments on San Luis Obispo Valley Groundwater Basin Annual Report, Water Year 2022