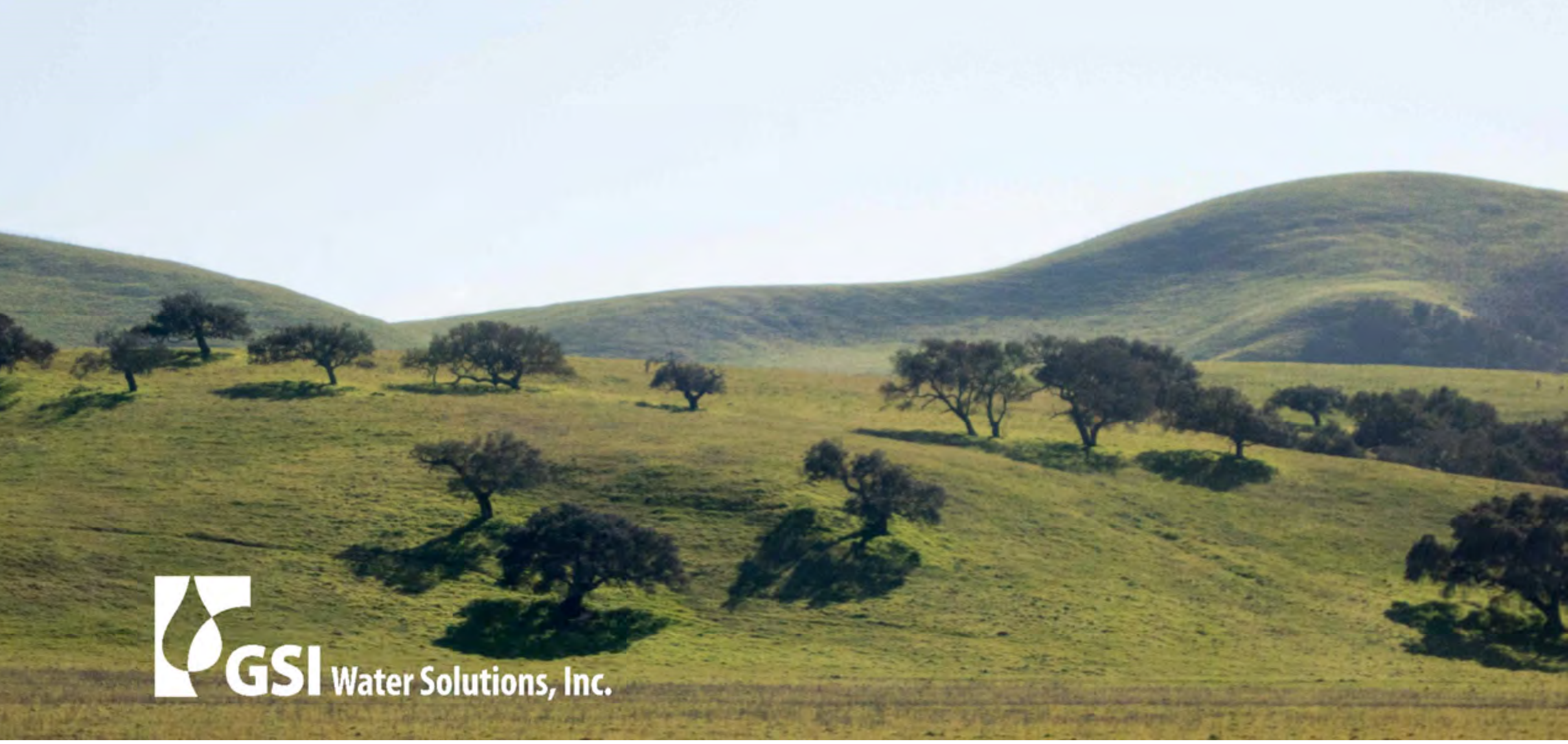

FINAL

Paso Basin Cooperative Committee
and the Groundwater Sustainability Agencies

Paso Robles Subbasin
Water Year 2022 Annual Report

March 24, 2023

Prepared by:
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Paso Robles Subbasin
Water Year 2022 Annual Report

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

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Abbreviations and Acronyms

AEM	airborne electromagnetic
AF	acre-feet
AFY	acre-feet per year
AMSL	above mean sea level
CASGEM	California Statewide Groundwater Elevation Monitoring
CIMIS	California Irrigation Management Information System
COC	constituent of concern
CSA	Community Service Area
CSD	Community Services District
DSOD	Division of Safety of Dams
DWR	California State Department of Water Resources
EPCWD	Estrella-El Pomar-Creston Water District
ETo	reference evapotranspiration
gpd/ft	gallons per day per foot
gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
InSAR	interferometric synthetic-aperture radar
MOA	memorandum of agreement
NPDES	National Pollutant Discharge Elimination System
NWP	Nacimiento Water Project
PBCC	Paso Basin Cooperative Committee
PWS	public water system
RMS	representative monitoring site
S	storage coefficient
SEP	Supplemental Environmental Project
SGMA	Sustainable Groundwater Management Act
SLO	San Luis Obispo
SLOFCWCD	San Luis Obispo County Flood Control and Water Conservation District
SPI	Standardized Precipitation Index
SSJGSA	Shandon-San Juan Groundwater Sustainability Agency
SSJWD	Shandon-San Juan Water District
Subbasin	Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
USACE	United States Army Corps of Engineers
WNND	Water Neutral New Development
WY	water year

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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 Monitoring Networks (§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 E)
	(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])
	(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 towards Basin Sustainability (§356.2[c])

Executive Summary (§ 356.2[a])

Introduction

This Water Year 2022 Annual Report for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin (Paso Robles Subbasin or Subbasin) (see Figure 1) has been prepared in accordance with the Sustainable Groundwater Management Act (SGMA) and Groundwater Sustainability Plan (GSP) Regulations. Pursuant to the California Department of Water Resources (DWR) regulations, a GSP Annual Report must be submitted to DWR by April 1 of each year following the adoption of the GSP.

With the submittal of the adopted Paso Robles Subbasin GSP on January 31, 2020, the Groundwater Sustainability Agencies (GSAs) are required to submit an annual report for the preceding water year (October 1 through September 30) to DWR by April 1 of each subsequent year. These annual reports will convey monitoring and water use data to the DWR and to Subbasin stakeholders on an annual basis to gauge performance of the Subbasin relative to the sustainability goals set forth in the GSP.

Sections of the Water Year 2022 Annual Report include the following:

Section 1. Introduction – Paso Robles Subbasin Water Year 2022 Annual Report: A brief background of the formation and activities of the Paso Robles Subbasin GSAs and development and submittal of the GSP.

Section 2. Paso Robles Subbasin Setting and Monitoring Networks: A summary of the Subbasin setting, Subbasin 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 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 towards Basin Sustainability (§356.2[c]): A summary of management actions taken throughout the Subbasin by GSAs and individual entities towards sustainability of the Subbasin.

Groundwater Elevations

In general, the groundwater elevations observed in the Subbasin during water year (WY) 2022 show a decline across a majority of the Subbasin, likely due predominantly to below-average rainfall conditions in the last three years. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the Subbasin, as has been observed historically, although negative changes predominated in WY 2022. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.

Groundwater Extractions

Total groundwater extractions in the Subbasin for WY 2022 are estimated to be 87,200 acre-feet (AF). These totals include municipal and small public water systems[1] (PWS) pumping, rural domestic pumping, and irrigated agricultural water demand. Note that irrigated agricultural water demand was estimated using two different methods this year; the standard soil-water balance model method and a new satellite-based method (see Section 4.3). 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 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 does not fully capture the actual climatic variability or nuanced crop irrigation practices that may occur each year. 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. Results from the satellite-based method are included below. Table ES-1 summarizes the groundwater extractions by water use sector for each water year. The values for WYs 2017–2021 (grayed out) are included for reference purposes. This convention is carried throughout the report.

Table ES-1. Groundwater Extractions by Water Use Sector

Water Year	Groundwater Extractions by Water Use Sector			Total (AF)
	Municipal PWS[1] (AF)	Small PWS and Rural Domestic (AF)	Agriculture (AF)	
2017	1,626	5,060	64,100	70,800
2018	1,677	5,060	75,500	82,200
2019	1,729	5,060	55,800	62,600
2020	1,509	5,060	59,200	65,800
2021	1,553	5,060	75,500	82,100
2022	1,982	5,060	80,200	87,200
Method of Measure:	Metered	2016 Groundwater Model	Soil-Water Balance Model, OpenET (2022 only)	–
Level of Accuracy:	high	low-medium	medium	–

Notes

[1] These volumes include any water produced as Salinas River underflow within the Paso Robles Subbasin.
AF = acre-feet
PWS = public water systems

[1] A public water system is defined as a system that provides water for human consumption to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year (https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/waterpartnerships/what_is_a_public_water_sys.pdf).

Surface Water Use

The Subbasin currently benefits from surface water entitlements from the Nacimiento Water Project (NWP) and the State Water Project to supplement municipal groundwater demands in the City of Paso Robles and the community of Shandon, respectively. In WY 2022 the City of Paso Robles used 1,913 AF of their NWP entitlement, but 1,012 AF of their NWP deliveries were recharged and extracted in the Atascadero Subbasin, so those volumes do not show up in this accounting. Locations of communities dependent on groundwater and with access to surface water are shown on Figure 8. There is currently no surface water available for agricultural or recharge project use within the Subbasin. 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)	Imported Salinas River Underflow[1] (AF)	State Water Project (AF)	Total Surface Water Use (AF)
2017	1,650	2,609	42	4,301
2018	1,423	3,352	55	4,829
2019	1,142	3,075	43	4,259
2020	737	3,852	0	4,589
2021	1,250	3,612	0	4,861
2022	901	3,349	0	4,250

Notes

[1] The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from its Thunderbird Wells located in the adjacent Atascadero Subbasin.

AF = acre-feet

Total Water Use

For WY 2022, quantification of total water use was completed through reporting of metered water production data from municipal wells (including imported Salinas River underflow[2]) (see Section 5), metered surface water use, and from models used to estimate agricultural crop water supply requirements. In addition, rural water use and small commercial public water system use was estimated. Table ES-3 summarizes the total annual water use in the Subbasin by source and water use sector.

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

Water Year	Municipal PWS[1] (AF)		Small PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	**Groundwater**	**Surface Water[1]**	**Groundwater**	**Groundwater**	**—**
2017	1,626	4,301	5,060	64,100	75,100
2018	1,677	4,829	5,060	75,500	87,100
2019	1,729	4,259	5,060	55,800	66,800
2020	1,509	4,589	5,060	59,200	70,400
2021	1,553	4,861	5,060	75,500	87,000
2022	1,832	4,250	5,060	80,200	91,300
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model, OpenET (2022 only)	—
Level of Accuracy:	high	high	low-medium	medium	—

Notes

[1] Includes imported Salinas River underflow, which is regulated as surface water by the State Water Resources Control Board

AF = acre-feet

PWS = public water systems

[2] Salinas River underflow is regulated as surface water by the State Water Resources Control Board.

Change in Groundwater in Storage

The calculation of change in groundwater in storage in the Subbasin was derived from comparison of fall groundwater elevation contour maps from one year to the next as well as taking the difference between groundwater elevations throughout the Subbasin as the aquifer becomes saturated (storage gain) or dewatered (storage loss). For this analysis, fall 2021 groundwater elevations were subtracted from the fall 2022 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during WY 2022. A noteworthy update for WY 2022 is the inclusion of water level data from 24 monitoring wells in the Shandon-San Juan GSA (SSJGSA) and Estrella-El Pomar-Creston Water District (EPCWD) expanded monitoring networks (see Section 8.3.5). The addition of these data points has filled previous data gaps and significantly reduced the uncertainty of the change in groundwater in storage calculation for WY 2022 compared to previous years.

The groundwater elevation change map for WY 2022 (see Figure 10) shows that compared to the previous fall, water levels were generally lower over a majority of the basin, particularly on the vegetable ground west of Shandon (see Figure 8). Note that this change in groundwater in storage analysis does not include any potential aquifer recharge related to the above average precipitation received so far in WY 2023 (including December 2022 and January 2023).

The annual change of groundwater in storage calculated for WY 2022 is presented in Table ES-4. Increases of groundwater in storage are presented as positive numbers and decreases of groundwater in storage are presented as negative numbers.

Table ES-4. Annual Change of Groundwater in Storage

Water Year	Annual Change (AF)
2017	60,100
2018	6,400
2019	59,700
2020	-80,800
2021	-41,500
2022	-117,100

Note

AF = acre-feet

Submittal of Revised GSP

On June 3, 2021, the Paso Robles Subbasin GSP manager received a consultation letter from DWR. The letter was intended to initiate consultation between DWR and the Paso Robles Subbasin GSAs in advance of issuance of a plan adequacy determination. The letter indicates that DWR had identified deficiencies which may result in an incomplete determination. The letter also presents two potential corrective actions that, if addressed sufficiently, may result in GSP approval. On January 21, 2022, DWR released an official 'incomplete' determination for the Paso Robles Subbasin GSP. The Paso Robles Subbasin GSAs retained a consultant to address the deficiencies identified in the GSP and resubmitted the revised GSP to DWR before the July 20, 2022 deadline.

Progress towards Meeting Basin Sustainability

Several projects and management actions are in process or have been recently implemented in the Subbasin to attain sustainability. These projects and actions include capital projects as well as non-structural basin-wide initiatives intended to reduce or optimize local groundwater use. Some of these projects were described in concept in the GSP; some of the actions described herein are new initiatives designed to make new water supplies available to the Subbasin that may be implemented by project participants to reduce pumping and partially mitigate the degree to which the management actions would be needed. Some of the ongoing efforts include:

- Airborne Electromagnetic (AEM) Geophysical Survey
- Three-Dimensional Geologic Model of Basin using SkyTEM Survey Data
- Expansion of Monitoring Well Network
- Multi-Benefit Irrigated Land Repurposing Program
- City of Paso Robles Recycled Water Program
- San Miguel Community Services District Recycled Water Project
- Blended Water Project
- Expansion of Salinas Dam and Ownership Transfer

Relative to the basin conditions at the end of the study period as reported in the GSP, the First Annual Report (WYs 2017–2019) (GSI, 2020) and the Water Year 2020 Annual Report (GSI, 2021) indicated an improvement in groundwater conditions throughout the Subbasin and a modest increase of total groundwater in storage. However, the groundwater conditions documented in the Water Year 2021 Annual Report (GSI, 2022) and this Water Year 2022 Annual Report indicate a return to worsening conditions following three consecutive years of extreme drought. It is clear that historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. Of particular concern are communities and rural residential areas that rely solely on groundwater for their water supply[3] (see Figure 10). During WY 2022, several Subbasin wells were reported to have gone dry or experienced a reduction in water pressure. The distribution of these dry well reports lodged with San Luis Obispo County Environmental Health Services and DWR during WY 2022 is shown on Figure 10.

Actions are underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and entities throughout the Subbasin to develop and implement solutions that address the shared mutual interest in the Subbasin's overall sustainability goal.

The above-average rainfall water years of 2017 and 2019 improved groundwater conditions in the Subbasin. However, three consecutive below average rainfall years since 2019 have resulted in a reversal of this trend. Two of the 22 Paso Robles Formation Aquifer representative monitoring site (RMS) wells in the Subbasin groundwater monitoring network exhibit groundwater elevations below the minimum threshold established in the GSP for the first time in WY 2022, and one of the Paso Robles Formation Aquifer RMS wells exhibited groundwater elevations below the minimum threshold for the third consecutive year (see Section 3.3). Although the groundwater elevations in one of the Paso Robles Formation Aquifer RMS wells is recovering in

[3] Affected communities may include Disadvantaged Communities (DACs), which are defined as: "the areas throughout California which most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes as well as high incidence of asthma and heart disease" (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/disadvantaged-communities). DACs occurring within the Subbasin as identified by San Luis Obispo Council of Governments (SLOCOG) are included on Figure 10.

the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. One of the 22 Paso Robles Formation Aquifer RMS wells have current groundwater elevations greater than the measurable objective for that RMS well.

Updated Interferometric Synthetic Aperture Radar (InSAR) data has been provided by DWR through October 2022, allowing for analysis of potential land subsidence for both WY 2021 and WY 2022. As discussed in the GSP, there is a potential error of 0.1 feet (or 1.2 inches) associated with the InSAR measurement and reporting methods. A land surface change of less than 0.1 feet is therefore within the noise of the data and is equivalent to no evidence of subsidence. Considering this range of potential error, examination of the October 2020 through October 2021 InSAR and also the October 2021 through October 2022 InSAR data show that zero land subsidence has occurred since October 2020. These data indicate that there is no indication of an undesirable result. The GSAs will continue to monitor and report annual subsidence as more data become available.

At this time, there are insufficient data available to adequately assess the interconnectivity of surface water and groundwater and the potential depletion of interconnected surface water. There is at present only a single Alluvial Aquifer RMS well in the Subbasin. Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed. The revised GSP submitted to DWR in July 2022 includes an improved groundwater/surface water interaction discussion and identifies key data gaps that need to be filled before a sufficiently robust annual assessment of interconnected surface water can occur.

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 Water Year 2022 Annual Report are consistent with reaching the sustainability goals laid out in the revised GSP. 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 positively affect the ability of the Subbasin to reach the necessary sustainability goals.

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SECTION 1: **Introduction – Paso Robles Subbasin Water Year 2022 Annual Report**

The Water Year 2022 Annual Report for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin (Paso Robles Subbasin or Subbasin) has been prepared for the Paso Basin Cooperative Committee (PBCC) and the Groundwater Sustainability Agencies (GSAs) in accordance with the Sustainable Groundwater Management Act (SGMA) and Groundwater Sustainability Plan (GSP) Regulations (§ 356.2. Annual Reports) (see Appendix A, GSP Regulations for Annual Reports). Pursuant to the California Department of Water Resources (DWR) regulations, a GSP Annual Report must be submitted to DWR by April 1 of each year following the adoption of the GSP. Submittal of the adopted Paso Robles Subbasin GSP occurred on January 31, 2020. The GSAs are required to submit an annual report for the preceding water year (WY) (October 1 through September 30) to DWR by April 1 of each subsequent year. This Water Year 2022 Annual Report for the Paso Robles Subbasin documents groundwater production, water use data and water level data from October 1, 2021 through October 31, 2022.[4]

1.1 Setting and Background

The Paso Robles Subbasin GSP was prepared by Montgomery & Associates, Inc. (M&A, 2020), on behalf of and in cooperation with the Paso Basin Cooperative Committee and the Subbasin GSAs. The GSP, and subsequent annual reports including this Water Year 2022 Annual Report, covers the entire Paso Robles Subbasin (see Figure 1). The Subbasin lies in the northern portion of San Luis Obispo County. The majority of the Subbasin comprises gentle rolling topography and flatlands near the Salinas River Valley, ranging in elevation from approximately 450 to 2,400 feet above mean sea level (AMSL). The Subbasin is drained by the Salinas River and its tributaries, including the Estrella River, Huer Huero Creek, and San Juan Creek. Communities in the Subbasin are the City of Paso Robles and the communities of San Miguel, Creston, and Shandon. Highway 101 is the most significant north-south highway in the Subbasin, with Highways 41 and 46 running east-west across the Subbasin.

The GSP was jointly developed by four GSAs:

- City of Paso Robles GSA
- Paso Basin – County of San Luis Obispo GSA
- San Miguel Community Services District (CSD) GSA
- Shandon-San Juan GSA

The Paso Basin GSAs overlying the Subbasin entered into a Memorandum of Agreement (MOA) in September 2017. The purpose of the MOA was to establish a Paso Basin Cooperative Committee (PBCC) to develop a single GSP for the entire Subbasin to be considered for adoption by each GSA and subsequently submitted to DWR for approval. Under the framework of the original MOA, the GSAs engaged the public and coordinated to jointly develop the Paso Robles Subbasin GSP. At its November 20, 2019 meeting, in accordance with the MOA, the PBCC voted unanimously to recommend that the GSAs adopt the GSP and submit it to DWR by the SGMA deadline. Subsequent actions by each GSA resulted in unanimous approval of the GSP and a joint submittal of the GSP to DWR.

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

The original MOA included provision for automatic termination upon approval of the GSP by DWR. Resolutions adopted by each GSA during the GSP approval process included an amendment to the MOA that removed automatic termination language because the GSAs will continue cooperating on the GSP and its implementation until such time as the long-term governance structure for implementation of the GSP is developed.

Each of the GSAs appointed a representative Member and Alternate to the PBCC to coordinate activities among the GSAs during the development of the GSP and the development and submittal of this Water Year 2022 Annual Report. The GSAs also agreed to designate the County of San Luis Obispo Director of Public Works as the Plan Manager with the authority to submit the GSP and annual reports and serve as the point of contact with DWR. However, on November 2, 2021, the County of San Luis Obispo filled a newly created position of Groundwater Sustainability Director, which reports directly to the County Administrative Officer, and operates independently of the Public Works Department. The new Groundwater Sustainability Director position has supplanted the Director of Public Works as the designated GSP Plan Manager.

1.2 Organization of This Report

The required contents of an annual report are provided in the GSP 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 – Paso Robles Subbasin Water Year 2022 Annual Report: A brief background of the formation and activities of the Paso Robles Subbasin GSAs and development and submittal of the GSP.

Section 2. Paso Robles Subbasin Setting and Monitoring Networks: A summary of the Subbasin setting, Subbasin 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 towards Basin Sustainability (§356.2[c]): A summary of management actions taken throughout the Subbasin by the GSAs and individual entities towards sustainability of the Subbasin.

SECTION 2: **Paso Robles Subbasin 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, as well as any notable events affecting monitoring activities or the quality of monitoring results in the reported WY 2022. Much of the background information reported on in this Water Year 2022 Annual Report was taken from the GSP prepared by Montgomery & Associates, Inc. (M&A, 2020).

2.2 Subbasin Setting

The Subbasin is a structural trough trending to the northwest filled with terrestrially derived sediments sourced from the surrounding mountains. The Subbasin is surrounded by relatively impermeable geologic formations, sediments with poor water quality, and structural faults. Land surface elevation ranges from approximately 2,000 feet AMSL in the southeast extent of the Subbasin to about 600 feet AMSL in the northwest extent, where the Salinas River exits the Subbasin. Agriculture is the dominant land use. The Subbasin includes the incorporated City of Paso Robles and unincorporated communities of San Miguel, Creston, and Shandon.

The Subbasin is the southernmost portion of the Salinas Valley Groundwater Basin. As originally defined by DWR (2003), the Subbasin was in both San Luis Obispo and Monterey counties. The 2019 DWR basin boundary modification process resulted in a revision of the northern boundary of the Paso Robles Subbasin to be coincident with the San Luis Obispo/Monterey county line, thereby placing the Subbasin entirely within San Luis Obispo County.

The top of the Subbasin is defined by land surface. The bottom of the Subbasin is defined by the base of the Paso Robles Formation. Sediments below the base of the Paso Robles Formation are typically much less permeable than the overlying sediments. Although the bedrock sediments often produce usable quantities of groundwater, the water is generally of poor quality, so they are not considered part of the Subbasin. As described in the GSP, the lateral boundaries of the Subbasin include the following:

- The western boundary is defined by the contact between the sediments in the Subbasin and the sediments of the Santa Lucia Range. A portion of the western boundary is defined by the Rinconada fault system which separates the Paso Robles Subbasin from the Atascadero Subbasin.
- The eastern boundary of the Subbasin is defined by the contact between the sediments in the Subbasin and the sediments of the Temblor Range. The San Andreas Fault generally forms the eastern Subbasin boundary.
- The southern boundary of the Subbasin is defined by the contact between the sediments in the Subbasin and the sediments of the La Panza Range. To the southeast, a watershed and groundwater divide separates the Subbasin from the adjacent Carrizo Plain Basin; sedimentary layers are likely continuous across this divide.
- The northern boundary of the Subbasin is defined by the San Luis Obispo/Monterey county line.

Two principal aquifers exist in the Subbasin, including the Alluvial Aquifer and the Paso Robles Formation Aquifer. The Alluvial Aquifer is the youngest aquifer. It is unconfined and consists of predominantly coarse-grained sediments (sand and gravel) deposited along the Salinas River, Estrella River, Huer Huero Creek, and San Juan Creek. The Alluvial Aquifer varies in thickness but may be up to 100 feet thick along the channels. Much of the Alluvial Aquifer is characterized by relatively high transmissivity that may exceed

100,000 gallons per day per foot (gpd/ft). Wells screened in the Alluvial Aquifer can be very productive and may yield over 1,000 gallons per minute (gpm).

The Paso Robles Formation Aquifer underlies the Alluvial Aquifer and outcrops in the Subbasin everywhere outside of the Holocene stream channels. The Paso Robles Formation represents the largest volume of sediments in the Subbasin, with a total thickness up to 3,000 feet in the northern Estrella area and up to 2,000 feet in the Shandon area. The Paso Robles Formation has a thickness of 700 to 1,200 feet throughout most of the Subbasin. It is generally characterized by interbedded, discontinuous lenses of sand and gravel that comprise the most productive strata within the aquifer, separated vertically by comparatively thick zones of fine-grained sediments (silts and clays). Well depths generally range from approximately 200 to 1,000 feet or more. As described in the GSP, reported aquifer transmissivity estimates in the Paso Robles Formation range from approximately 1,000 to 9,000 gpd/ft, and well yields range from approximately 150 to 850 gpm.

The primary components of recharge to the Subbasin aquifers are percolation of precipitation and infiltration of surface water from rivers and streams. Natural discharge from the Subbasin aquifers occurs through springs and seeps, evapotranspiration, and discharge to surface water bodies. The most significant component of discharge is pumping of groundwater from wells. The regional direction of groundwater flow is from the southeast to the northwest. As there is no hydrogeologic barrier to flow along the northern boundary of the Subbasin, groundwater exits the Subbasin along that boundary to the adjacent Salinas Valley Basin to the north.

2.3 Precipitation and Climatic Periods

Annual precipitation recorded at the Paso Robles weather station (National Oceanic and Atmospheric Administration [NOAA] station 46730) is presented by water year in Figure 2. The total annual precipitation recorded at the Paso Robles weather station for WY 2022 is 11.95 inches. The long-term average annual precipitation for the period 1925 through 2022 is 14.5 inches per water year, as recorded at the Paso Robles weather station. Climatic periods in the Subbasin have been determined based on analysis of data from the Paso Robles weather station using the Standardized Precipitation Index (SPI), which quantifies deviations from normal precipitation patterns. The WY 2022 SPI analysis uses a 24-month period instead of the 60-month period used in the GSP.[5] Climatic periods are categorized according to the following designations: wet, dry, and average/alternating wet and dry (see Figure 2). It is generally recognized that the eastern portion of the Subbasin receives less annual rainfall than the rest of the Subbasin. Recently, the University of California Cooperative Extension (UCCE) installed a series of sophisticated weather stations across San Luis Obispo County and nine of these are now located in the Subbasin. Two new California Irrigation Management Information System (CIMIS) stations were installed in the Subbasin during WY 2022. These new CIMIS stations include Paso Robles #265 located near the intersection of Wellsona and Airport Road at an elevation of 764 feet and Shandon #266 located near the intersection of Starkey Road and HWY 41 at an elevation of 1,105 feet. CIMIS stations #265 and #266 began collecting data on March 1 and August 1, 2022, respectively. Station locations and rainfall totals for WY 2022 are presented in Figure 3, along with the spatial distribution of long-term average annual precipitation in the Paso Robles Subbasin.[6] Historical precipitation records for the Paso Robles weather station and monthly UCCE station records for WY 2022 are provided in Appendix B.

[5] The 24-month period SPI analysis is considered an improvement over the 60-month period analysis due to its enhanced sensitivity to short-term climatic variations. The 24-month period SPI analysis provides insight into the relationship between water year type and groundwater elevation response (WMO, 2012).
[6] Average distribution of annual precipitation based on 30-year normal PRISM data calibrated to the Paso Robles Station (NOAA 46730).

2.4 Monitoring Networks

This section provides a brief description of the monitoring programs currently in place and any notable events affecting monitoring activities or the quality of monitoring results. Monitoring networks are developed for each of the five sustainability indicators relevant to the Paso Robles Subbasin:

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

Monitoring for the first two sustainability indicators (chronic lowering of water levels and reduction of groundwater in storage) is implemented using the representative monitoring sites (RMS), discussed in Section 2.4.1. Monitoring for the remaining three sustainability indicators (degraded water quality, land subsidence, and depletion of interconnected surface water) is discussed in Section 2.4.2.

2.4.1 Groundwater Elevation Monitoring Network (§ 356.2[b])

The GSP 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 in the Subbasin to provide sufficient data quality, frequency, and spatial distribution to evaluate changing aquifer conditions in response to GSP implementation.

The GSP identifies an existing network of 23 RMS wells for water level monitoring. Of these 23 wells, 22 are wells that screen the Paso Robles Formation[7], and one is an Alluvial Aquifer well. These RMS wells have been monitored biannually, in April and October, for various periods of record. The RMS groundwater monitoring network developed in the GSP is intended to support efforts to do the following:

- Monitor changes in groundwater conditions and demonstrate progress towards 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.

The RMS wells are displayed in Figure 4, and a summary of information for each of the wells is included in Appendix C.

2.4.1.1 Monitoring Data Gaps

The GSP noted numerous data gaps in the current RMS network. It should be noted that efforts are continuing 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. As a start to this effort, the GSP identified nine additional wells that may be incorporated into the RMS network once the depth and screened aquifer are established. These wells are displayed in Figure 4, and a summary of available well information is included in Appendix D.

[7] Since initial establishment of the monitoring well network, two of the 22 Paso Robles Formation Aquifer RMS wells (27S/13E-30N01 and 26S/12E-2607) have become either inactive or inaccessible.

2.4.2 Additional Monitoring Networks

Evaluation of the water quality sustainability indicator is achieved through monitoring of an existing network of supply wells in the Subbasin. Constituents of concern (COCs) identified in the GSP that have the potential to impact suitability of water for public supply or agricultural use include salinity (as indicated by electrical conductivity), total dissolved solids (TDS), sodium, chloride, nitrate, sulfate, boron, and gross alpha.

COCs for drinking water are monitored at public water systems[7] (PWS), including municipal and small PWSs. There are 41 PWSs in the Subbasin which serve potable water to small communities, schools, and rural businesses such as restaurants and wineries. PWSs constitute part of the monitoring network for water quality in the Subbasin. In addition, the GSP identified 28 agricultural supply wells that are monitored for COCs under the Irrigated Lands Regulatory Program (see GSP Figure 7-4 [M&A, 2020]).

Land subsidence in the Subbasin is 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 Subbasin that impacts infrastructure. The GSAs will annually assess subsidence using the InSAR data provided by DWR.

A monitoring network to assess the sustainability indicator of groundwater/surface water interconnection is a current data gap that will be addressed during GSP implementation. There is at present only a single Alluvial Aquifer RMS well in the Subbasin. However, the City of Paso Robles installed two new Alluvial Aquifer wells using Supplemental Environmental Project (SEP) funding during WY 2021.[8] The GSAs should incorporate these two new Alluvial Aquifer wells into the RMS network during WY 2023. Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed. The revised GSP submitted to DWR in July 2022 includes an improved groundwater/surface water interaction discussion and identifies key data gaps that need to be filled before a sufficiently robust annual assessment of interconnected surface water can occur.

[8] The City of Paso Robles GSA and the SWRCB agreed to the use of SEP funds that are available as a result of a settlement agreement between the SWRCB and the City of Paso Robles for violations of the City's National Pollutant Discharge Elimination System (NPDES) permit related to wastewater treatment releases.

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

3.1 Introduction

This section provides a detailed report on groundwater elevations in the Subbasin measured during spring and fall of 2022. These maps present the most up-to-date seasonal conditions in the Basin. Most of the data presented characterizes conditions in the Paso Robles Formation Aquifer. Data for the Alluvial Aquifer are too sparse for regional analysis. 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, and well construction information may be incomplete or unavailable. This means that a careful review of the data is required prior to uploading to DWR's Monitoring Network Module[9] 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, there are two principal aquifers in the Subbasin. The Paso Robles Formation Aquifer is several hundreds of feet thick, represents the greatest volume of saturated sediments in the Subbasin, and is the aquifer that is most utilized for supply. The Alluvial Aquifer is limited in extent to the active channels of the streams in the Subbasin and is generally less than 100 feet thick.

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

The assessment of groundwater elevation conditions in the Subbasin as described in the GSP is largely based on data from the San Luis Obispo County 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 Subbasin. Data from many of the wells in the monitoring program are collected subject to confidentiality agreements between the SLOFCWCD and well owners. Consistent with the terms of such agreements, the well owner information and specific locations for these wells are not published in the GSP and that convention is continued in this Water Year 2022 Annual Report. Beginning in 2021, monitoring network expansion efforts by Shandon-San Juan GSA (SSJGSA) and Estrella-El Pomar-Creston Water District (EPCWD) have resulted in water level data being available from several additional wells, located strategically in previous data gap areas. Groundwater level data from 55 wells (vs 42 wells in WY 2021) were used to create the spring 2022 groundwater elevation contour map and data from 59 wells (vs 44 wells in WY 2021) were used for the fall 2022 contour map. The well locations and data points are not shown on the maps to preserve confidentiality of the data between the well owner and the SLOFCWD. Of these wells, owners of 23 of the wells have agreed to allow public use of the well data and are therefore used as RMS wells for the purpose of monitoring sustainability indicators. As implementation of the GSP progresses, it is anticipated that additional wells will be added to the data set and that many of the wells with current confidentiality agreements will be modified to allow for public use of the data.

[9] The Paso Robles Subbasin is no longer in the CASGEM program since implementation of the GSP. The GSAs are now responsible for monitoring and reporting of groundwater elevation data.

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

- Groundwater elevation contour maps for the seasonal high and seasonal low groundwater conditions for the previous water year. Groundwater elevation contour maps are presented for spring 2022 and fall 2022.
- A map depicting the change in groundwater elevation for the preceding water year. A change in groundwater elevation map is shown here for the period fall 2021 to fall 2022 (see Section 7.1).
- Hydrographs for wells with publicly available data (Appendix E).

3.2.1 Alluvial Aquifer Groundwater Elevation Contours

Groundwater elevation data for the Alluvial Aquifer are too limited to prepare representative contour maps of the seasonal high and seasonal low groundwater elevations. Figure 5 shows the current (as of 2017) groundwater elevation contours for the Alluvial Aquifer, as shown in the GSP. This map, however, was developed using 2017 data (when available) as well as the most recent data prior to 2017. A reasonable data set of Alluvial Aquifer groundwater elevations specific to 2022 is not available, so the map as presented in the GSP is the most recent map available. This same map was also presented in previous annual reports (GSI, 2020, 2021, and 2022). Work is currently underway to identify existing alluvial wells that along with the two newly constructed SEP funded wells (see Section 2.4.2) can be added to the RMS network.

Groundwater elevations range from approximately 1,400 feet AMSL in the southeastern portion of the Subbasin to approximately 600 feet AMSL near San Miguel. Groundwater flow direction in the Alluvial Aquifer generally follows the alignment of the creeks and rivers. Overall, groundwater in the Alluvial Aquifer flows from southeast to northwest across the Subbasin. On a basin-wide scale, the average horizontal hydraulic gradient in the alluvium is about 0.004 feet per foot (ft/ft) from the southeastern portion of the Subbasin to San Miguel.

3.2.2 Paso Robles Formation Aquifer Groundwater Elevation Contours

Spring and fall 2022 (high and low) groundwater elevation data for the Paso Robles Formation Aquifer in the Subbasin 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 high groundwater levels, which typically occur in the spring, and the seasonal low groundwater levels, which typically occur in the fall. In general, the spring groundwater data are for April and the fall groundwater data are for October. Information identifying the owner or detailed location of private wells is not shown on the maps to preserve confidentiality.

Figures 6 and 7 show contours of groundwater elevations in the Paso Robles Formation Aquifer for spring 2022 and fall 2022, respectively. Overall, groundwater conditions in the Subbasin in the spring and fall of 2022 were similar, with groundwater elevations in the fall generally lower than in the spring, a typical seasonal trend for the Subbasin. Groundwater flow direction is generally to the northwest and west over most of the Subbasin. In general, groundwater flow in the western portion of the Subbasin tends to converge toward areas of low groundwater elevations. These areas of low groundwater elevation are in the area between the City of Paso Robles and the communities of San Miguel and Whitley Gardens. Horizontal groundwater gradients range from approximately 0.002 ft/ft in the southeast portion of the Subbasin to approximately 0.02 ft/ft in the area southeast of Paso Robles.

In general, the groundwater elevations observed in the Subbasin during WY 2022 show a decline across a majority of the Subbasin, likely due predominantly to below-average rainfall conditions in the last three years. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the Subbasin, as has been observed historically, although the negative changes predominated in WY 2022. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.

3.3 Hydrographs (§ 356.2[b][1][B])

Groundwater elevation hydrographs are used to evaluate aquifer behavior over time. Changes in groundwater elevation at a given point in the Subbasin can result from many influencing factors, with all or some occurring at any given time. Factors can include changing climatic trends, seasonal variations in precipitation, varying Subbasin 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 categorized as wet, dry, or average/alternating wet and dry (see Figure 2).

3.3.1 Hydrographs

Groundwater elevation hydrographs and associated location maps for the 22 RMS wells that are constructed in and extract groundwater from the Paso Robles Formation Aquifer and the single Alluvial Aquifer RMS well are presented in Appendix E. These hydrographs also include information on well screen interval (if available), reference point elevation, as well as 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.

As described in the GSP for the Paso Robles Formation Aquifer RMS wells[10], an average of the 2017 non-pumping groundwater levels was selected as the measurable objectives and minimum thresholds are set below those levels. Going forward from 2017, the average of the spring and fall measurements in any one water year will be the benchmark against which trends will be assessed.

One of the 22 Paso Robles Formation Aquifer RMS wells has average WY 2022 groundwater elevations greater than the measurable objective for that RMS well. Although groundwater elevations in a few of the Paso Robles Formation Aquifer RMS wells are stable over the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. Two of the 22 Paso Robles Formation Aquifer RMS wells in the Subbasin groundwater monitoring network exhibit groundwater elevations below the minimum threshold established in the GSP for the first time in WY 2022, and one of the Paso Robles Formation Aquifer RMS wells exhibited groundwater elevations below the minimum threshold for the third consecutive year (27S/13E-28F01). This condition constitutes a chronic lowering of groundwater elevation undesirable result as defined in the GSP. Based on initial observation this appears to be an isolated local issue. However, according to Section 8.4.5.1 of the GSP[11], the GSAs must initiate an investigation to determine if local or Subbasin-wide actions are required to address this undesirable result. Work was initiated on this investigation as part of a monitoring network expansion study during 2022 (see Section 8.3.5) and will continue into 2023.

[10] A measurable objective and minimum threshold were not set for the single Alluvial Aquifer monitoring network well due to lack of available historical groundwater elevation data at the time of GSP submittal (M&A, 2020).

[11] Section 8.4.5.1 of the GSP – Criteria for Defining Undesirable Results includes the text: "*A single monitoring well in exceedance for two consecutive years also represents an undesirable result for the area of the Basin represented by the monitoring well. Geographically isolated exceedances will require investigation to determine if local or Basin wide actions are required in response*."

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

4.1 Introduction

This section presents the metered and estimated groundwater extractions from the Subbasin for WY 2022. The types of groundwater extraction described in this section include municipal (Table 1), agricultural (Table 3), rural domestic (Table 4), and small PWSs[12] (Table 5). 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 6.

4.2 Municipal Metered Well Production Data

The municipal groundwater extractions documented in this report are metered data. Metered groundwater pumping extraction data are from the City of Paso Robles, San Miguel CSD, and the County of San Luis Obispo for Community Service Area (CSA) 16, providing service to the community of Shandon. The data shown in Table 1 reflect metered data reported by the respective agencies. The accuracy level rating of these metered data is high.

Table 1. Municipal PWS Groundwater Extractions

Water Year	Metered Groundwater Extractions			Total (AF)
	City of Paso Robles[1] (AF)	San Miguel CSD (AF)	CSA 16 (AF)	
2017	1,261	295	70	**1,626**
2018	1,302	325	50	**1,677**
2019	1,392	289	48	**1,729**
2020	1,121	297	91	**1,509**
2021	1,157	300	96	**1,553**
2022	1,617	279	86	**1,982**

Notes:

1 – The City of Paso Robles produces water from wells located in both the Paso Robles Subbasin and the Atascadero Subbasin. Only the portion produced from within the Paso Robles Subbasin is included here. These volumes include any water produced as Salinas River underflow within the Paso Robles Subbasin.

AF = acre-feet

CSA = Community Service Area

CSD = Community Services District

4.3 Estimate of Agricultural Extraction

Agricultural water use constituted 92 percent of the total anthropogenic groundwater use in the Subbasin in WY 2022. Groundwater extraction for agricultural irrigation was estimated in two ways for WY 2022:

1) using the standard **soil-water balance model** that was developed for the Paso Robles Groundwater Basin Model Update (GSSI, 2014), and

2) using a **satellite-based method** that measures actual evapotranspiration (ET) at the field level.

[12] Small PWSs in the Subbasin generally serve water produced from their own private wells.

Both methods of estimation utilize a WY 2022-specific land use dataset purchased from Land IQ. The Land IQ dataset is a significant upgrade from the previously used datasets available from San Luis Obispo County, primarily because the Land IQ dataset encompasses actual planted acreage rather than parcel acreage and because crop types and acreages are verified on the ground. Although not a significant factor in the Subbasin, the Land IQ dataset documents multi-cropping that occurs throughout the growing season.

The two agricultural water demand estimation methodologies are described below, followed by a discussion of the results from each.

Soil-Water Balance Model

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 Paso Robles Groundwater Basin Model Update (GSSI, 2014). WY 2022 specific land use data from Land IQ was used to appropriate crop categories, distribution, and acreages. Land use types were grouped within seven crop categories, including alfalfa, citrus, deciduous, nursery, pasture, vegetable, and vineyard, each with a respective set of crop water demand coefficients from the San Luis Obispo County Master Water Report[13] (Carollo et al., 2012). Climate data inputs include precipitation from the Paso Robles Station (NOAA station 46730) and reference evapotranspiration (ETo) data from the Atascadero California Irrigation Management Information System (CIMIS)[14] station and several private stations in the Subbasin operated by Western Weather Group. Soil water holding capacity data from National Resources Conservation Service soil surveys of San Luis Obispo County were used. The soil-water balance model includes consideration for regulated deficit irrigation, cover crop, and frost protection water demands for vineyards as well as irrigation system efficiencies (GSSI, 2014). The results of this method are summarized in Table 3.

Satellite-Based Method

To estimate agricultural groundwater extraction, WY 2022 specific land use data from Land IQ was used in conjunction with the OpenET ensemble model.[15] 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 20 irrigated crop types were identified in the WY 2022 Land IQ spatial dataset. These 20 crop types have been grouped into five basic crop groups: orchard, pasture, alfalfa, vegetable, and vineyard which are shown on Figure 8. A summary of acreage by crop type is presented in Table 2. 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

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[13] Vineyard crop coefficients were modified based on discussions with Mark Battany, University of California Extension (GSSI, 2014).

[14] California Irrigation Management Information System: https://cimis.water.ca.gov.

[15] 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).

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[16]) on a monthly time-step. Applied irrigation volumes are estimated by scaling up the estimated irrigated crop ET volumes using assumed crop specific irrigation efficiency factors.[17] 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 3.

Results and Discussion

As shown in Table 3, the estimates of groundwater extraction for agricultural irrigation in WY 2022 from the soil-water balance model and the satellite-based method are 78,700 acre-feet (AF) and 80,200 AF, respectively. 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 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 does not fully capture the actual climatic variability or nuanced crop irrigation practices that may occur each year. Based on the similarity in results and the stated benefits of the satellite-based method, 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 WY 2016 during completion of the GSP (M&A, 2020) and for WYs 2017, 2018, and 2019 in the First Annual Report (GSI, 2020), WY 2020 in the Water Year 2020 Annual Report (GSI, 2021), and for WY 2021 in the Water Year 2021 Annual Report (GSI, 2022). Agricultural water demand for this Water Year 2022 Annual Report was estimated for WY 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 3. Results from the satellite-based method are carried forward into the total water use calculations (see Section 6). The accuracy level rating of this satellite-based method estimated volume is medium-high.

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[16] 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).

[17] Irrigation efficiencies were assigned based on FAO (1989) and Martin (2011). Vineyard, the dominant crop in the Subbasin was assigned an irrigation efficiency of 90 percent.

Table 2. Irrigated Acreage by Basic Crop Group

Basic Crop Group	WY 2022 Irrigated Acreage
Orchard	1,410
Pasture	1,000
Alfalfa	1,387
Vegetable	1,123
Vineyard	32,683
Total	37,604

Table 3. Estimated Agricultural Irrigation Groundwater Extractions

Water Year	Agricultural Demand (AF)	
	Soil-Water Balance Model	Satellite-Based Method
2017	64,100	--
2018	75,500	--
2019	55,800	--
2020	59,200	--
2021	75,500	--
2022	~~78,700~~	80,200

Notes
AF = acre-feet
~~Strikethrough~~ text indicates value not used in the Total Water Use calculations (see Section 6)

4.4 Rural Domestic and Small Public Water System Extraction

Rural domestic and small PWS groundwater extractions in the Subbasin were estimated using the methods described here.

4.4.1 Rural Domestic Demand

As documented in the Paso Robles Groundwater Basin Model Update (GSSI, 2014), the rural domestic water demand was originally estimated as the product of County estimates of rural domestic units (DUs) and a water demand factor of 1.7 acre-feet per year (AFY) per DU, which included small PWS water demand (Fugro, 2002). This factor was subsequently modified to 1.0 AFY/DU in the San Luis Obispo County Master Water Report, not including small PWS demand (Carollo et al., 2012). Based on further investigation completed for the 2014 groundwater model update, the rural domestic water use factor was refined to 0.75 AFY/DU (GSSI, 2014). To simulate rural water demand over time in the groundwater model, an annual growth rate of 2.25 percent for the rural population was assumed, based on recommendation from the San Luis Obispo County Planning Department (GSSI, 2014). The groundwater model update completed for the GSP (M&A, 2020) used a linear regression projection based on the 2014 model update to estimate rural domestic demand through WY 2016. The projected future water budget presented in the GSP (M&A, 2020) assumes water neutral growth in rural domestic water demand from WY 2016 going forward. Therefore, the rural domestic demand has been held constant at the estimated WY 2016 volume for this Water Year 2022 Annual Report.

The resulting groundwater extractions for rural domestic demands are summarized in Table 4. The accuracy level rating of these estimated volumes is low-medium.

Table 4. Estimated Rural Domestic Groundwater Extractions

Water Year	Rural Domestic (AF)
2017	3,530
2018	3,530
2019	3,530
2020	3,530
2021	3,530
2022	3,530

Note

AF = acre-feet

4.4.2 Small Public Water System Extractions

The category of small PWSs includes a wide variety of establishments and facilities including small mutual water companies, golf courses, wineries, rural schools, and rural businesses. Various studies over the years used a mix of pumping data and estimates for type-specific water demand rates to estimate small PWS groundwater demand (Fugro, 2002; Todd Engineers, 2009). The 2012 San Luis Obispo County Master Water Report used the County of San Luis Obispo geographic information services mapping to define the distribution and number of commercial systems at the time and applied a single annual factor of 1.5 AFY per system (Carollo et al., 2012).

For the 2014 model update, actual pumping data were used as available to provide a monthly record over the study period (GSSI, 2014). Groundwater demand for four major golf courses (at the time) in the Subbasin (The Links, Hunter Ranch, Paso Robles, and River Oaks) was estimated using the following factors: ETo data measured in Paso Robles, the crop coefficient for turf grass, monthly rainfall data, and golf course acreage (GSSI, 2014). Water use for wineries was estimated by identifying each winery and its permitted capacity and applying a water use rate of 5 gallons of water per gallon of wine produced. Minor landscaping, wine tasting/restaurant functions, and return flows were also accounted for (GSSI, 2014). Water use for several small commercial/institutional water systems was estimated using water duty factors specific to the water system type (i.e., camp, school, restaurant, and other uses) (GSSI, 2014).

The groundwater model update completed for the GSP (M&A, 2020) used a linear regression projection for the 2014 model update to estimate small PWS demand through WY 2016. The projected future water budget presented in the GSP (M&A, 2020) assumes water neutral growth in small PWS water demand from WY 2016 going forward. Therefore, the small PWS demand has been held constant at the estimated WY 2016 volume for this Water Year 2022 Annual Report. The resulting groundwater extractions for small PWS demands are summarized in Table 5. The accuracy level rating of these estimated volumes is low-medium.

Table 5. Estimated Small Public Water System Groundwater Extractions

Water Year	Small PWS (AF)
2017	1,530
2018	1,530
2019	1,530
2020	1,530
2021	1,530
2022	1,530

Note

AF = acre-feet

4.5 Total Groundwater Extraction Summary

Total groundwater extractions in the Subbasin for WY 2022 are estimated to be 87,200 AF. Table 6 summarizes the total groundwater 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 (see Figure 8).

Table 6. Total Groundwater Extractions

Water Year	Groundwater Extractions by Water Use Sector			Total (AF)
	Municipal PWS[1] (AF)	Small PWS and Rural Domestic (AF)	Agriculture (AF)	
2017	1,626	5,060	64,100	70,800
2018	1,677	5,060	75,500	82,200
2019	1,729	5,060	55,800	62,600
2020	1,509	5,060	59,200	65,800
2021	1,553	5,060	75,500	82,100
2022	1,982	5,060	80,200	87,200
Method of Measure:	Metered	2016 Groundwater Model	Soil-Water Balance Model, OpenET (2022 only)	—
Level of Accuracy:	high	low-medium	medium	—

Notes

AF = acre-feet

PWS = public water systems

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 WY 2022. This section also reports quantities of Salinas River underflow, regulated as surface water by the State Water Resources Control Board (SWRCB), produced and imported into the Subbasin by the City of Paso Robles from the adjacent Atascadero Subbasin. The method of measurement and level of accuracy is rated on a qualitative scale. The Subbasin currently benefits from surface water entitlements from the Nacimiento Water Project (NWP) and the State Water Project (SWP) to supplement municipal groundwater demands in the City of Paso Robles and the community of Shandon, respectively. Locations of communities dependent on groundwater and with access to surface water are shown on Figure 9.

5.2 Surface Water Available for Use

Table 7 provides a breakdown of surface water available for municipal use in the Subbasin. There is currently no surface water available for agricultural or recharge project use within the Subbasin.

Table 7. Surface Water Available for Use

Water Year	Nacimiento Water Project[1] (AF)	State Water Project[2] (AF)	Total Available Surface Water (AF)
2017	6,488	100	6,588
2018	6,488	100	6,588
2019	6,488	100	6,588
2020	6,488	100	6,588
2021	6,488	100	6,588
2022	6,488	100	6,588

Notes

[1] Contract annual entitlement to the City of Paso Robles

[2] Contract annual entitlement to CSA 16

AF = acre-feet

CSA = Community Service Area

5.3 Imported Salinas River Underflow

Salinas River underflow, which is regulated as surface water by the SWRCB, is produced by the City of Paso Robles from the adjacent Atascadero Subbasin and imported into the Subbasin. These imported underflow volumes are integrated into the City of Paso Robles water distribution system and served to municipal customers located predominantly within the Subbasin.[18] The annual volumes of imported Salinas River underflow production are presented in Table 8. The accuracy level rating of these metered data is high.

Table 8. Imported Salinas River Underflow

Water Year	Imported Salinas River Underflow[1] (AF)
2017	2,609
2018	3,352
2019	3,075
2020	3,852
2021	3,612
2022	3,349

Notes

[1] The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from wells located in both the Paso Robles Subbasin and the Atascadero Subbasin. Only the portion produced from within the Atascadero Subbasin is included here.

AF = acre-feet

[18] A minor portion of the City of Paso Robles municipal water supply is used by customers located outside of the Subbasin.

5.4 Total Surface Water Use

A summary of total actual surface water use by source is provided in Table 9. 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 will be quantified in future annual reports as more data become available.

Table 9. Surface Water Use

Water Year	Nacimiento Water Project (AF)	Imported Salinas River Underflow[1] (AF)	State Water Project (AF)	Total Surface Water Use (AF)
2017	1,650	2,609	42	4,301
2018	1,423	3,352	55	4,829
2019	1,142	3,075	43	4,259
2020	737	3,852	0	4,589
2021	1,250	3,612	0	4,861
2022	901	3,349	0	4,250

Notes

[1] The City of Paso Robles produces Salinas River underflow, regulated as surface water by the State Water Resources Control Board, from its Thunderbird Wells located in the adjacent Atascadero Subbasin

AF = acre-feet

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

This section summarizes the total annual groundwater and imported surface water used to meet municipal, agricultural, and rural demands within the Subbasin. For WY 2022, the quantification of total water use was completed from reported metered municipal water production and metered surface water delivery, and from models used to estimate agricultural and rural water demand. Table 10 summarizes the total water use in the Subbasin by source and water use sector for WY 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 10. Total Water Use by Source and Water Use Sector, Water Year 2022

Water Year	Municipal PWS[1] (AF)		Small PWS and Rural Domestic (AF)	Agriculture (AF)	Total (AF)
Source:	**Groundwater**	**Surface Water[1]**	**Groundwater**	**Groundwater**	**—**
2017	1,626	4,301	5,060	64,100	75,100
2018	1,677	4,829	5,060	75,500	87,100
2019	1,729	4,259	5,060	55,800	66,800
2020	1,509	4,589	5,060	59,200	70,400
2021	1,553	4,861	5,060	75,500	87,000
2022	1,982	4,250	5,060	80,200	91,500
Method of Measure:	Metered	Metered	2016 Groundwater Model	Soil-Water Balance Model, OpenET (2022 only)	—
Level of Accuracy:	high	high	low-medium	medium	—

Notes

[1] Includes imported Salinas River underflow, which is regulated as surface water by the State Water Resources Control Board

AF = acre-feet

PWS = public water systems

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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 Paso Robles Formation Aquifer for WY 2022 are derived from a comparison of fall groundwater elevation contour maps from one year to the next. For this analysis, fall 2021 groundwater elevations were subtracted from the fall 2022 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during WY 2022 (see Figure 10). Beginning in 2021, monitoring network expansion efforts by SSJGSA and EPCWD have resulted in water level data being available from several additional wells, located strategically in previous data gap areas. Because of the monitoring network expansion efforts begun in 2021 the WY 2022 groundwater elevation change map is more highly constrained than similar maps produced in previous years. The WY 2022 map is based on data from 58 wells (vs only 40 wells in WY 2021). As stated in Section 3, groundwater elevation data for the Alluvial Aquifer are too limited to prepare annual groundwater elevation contour maps. Therefore, the change in groundwater in storage analysis is limited to the Paso Robles Formation Aquifer for this Water Year 2022 Annual Report.

The groundwater elevation change map for WY 2022 (see Figure 10) shows that compared to the previous fall, water levels were generally lower over a majority of the basin, particularly on the vegetable ground west of Shandon. The groundwater elevation change map represents the difference in groundwater elevations between two snapshots in time, made approximately one year apart. Considering that groundwater elevations may fluctuate dynamically throughout each year in response to changing climatic conditions and groundwater pumping patterns, the specific patterns of 'higher' versus 'lower' water level areas shown on Figure 10 may not necessarily be representative of conditions occurring throughout the entire water year.

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

The groundwater elevation change map presented above represents a volume change within the Paso Robles Formation Aquifer for WY 2022. The volume change inferred from the groundwater elevation change map (see Figure 10) represents a total volume, including the volume displaced by the aquifer material and the volume of groundwater stored within the void space of the aquifer. The portion of void space in the aquifer that can be utilized for groundwater storage is represented by the aquifer storage coefficient (S), 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, S is estimated to be 7 percent.[19] The annual change of groundwater in storage calculated for WY 2022 is presented in Table 11 and the annual and cumulative change in groundwater in storage since 1981 are presented on Figure 11.

[19] Appendix F includes derivation of the storage coefficient from the GSP groundwater model files and a sensitivity analysis.

Table 11. Annual Change in Groundwater in Storage - Paso Robles Formation Aquifer

Water Year	Annual Change (AF)
2017	60,100
2018	6,400
2019	59,700
2020	-80,800
2021	-41,500
2022	-117,100

Note
AF = acre-feet

The 117,100 AF decrease of groundwater in storage in WY 2022 shown in Table 11 is coincident with below average precipitation in 2022 (11.95 inches) and the sustained drought conditions prevailing since the last above average precipitation water year in 2019. Historical comparison of annually tabulated precipitation, total groundwater extractions, and annual change in groundwater in storage reveals a close correlation between annual total precipitation and change in groundwater in storage (see Figure 12). Specifically, years with well above average precipitation (i.e., 1983, 1993, 1995, 1998, 2005, and 2017) are all associated with years of large increases in groundwater in storage. Conversely, nearly all[20] below average precipitation years are associated with years of decline in groundwater in storage. The influence of total annual groundwater extractions on annual change in groundwater in storage is also apparent, although to a lesser degree. The influence of groundwater extractions on annual changes in groundwater in storage is most apparent during the drought of the mid-1980s through the early 1990s, when below average precipitation prevailed, but a trend of decreasing groundwater extractions resulted in a slight upward trend in annual changes of groundwater in storage.

Annual Change in Groundwater in Storage was calculated using the groundwater model for WYs 1981 through 2016 and by groundwater elevation change maps for WYs 2017 through present. The groundwater elevation method has been calibrated to groundwater model results (see Appendix F), however, some noteworthy differences between the methods remain. While the estimated value of S, used in the groundwater elevation change method, is based on sound science and using the best readily available information, it is necessary to acknowledge that the true value of S in the Paso Robles Formation Aquifer is spatially variable (as indicated in the GSP groundwater model) and ranges in value both above and below the estimated value of 7 percent. This, coupled with the necessity to rely on interpolated groundwater elevations through data gap areas in the groundwater level monitoring network (see Section 2.4.1), contributes to a moderate amount of method uncertainty. In addition, the groundwater elevation change method is susceptible to potential over or under-estimation due to the method's inability to account for groundwater in transit.[21] Regardless, the groundwater elevation change method is considered the best available tool for estimating annual change in groundwater in storage until the GSP groundwater model can be updated. Additionally, inclusion of newly available water level data from monitoring network expansion efforts begun in 2021 has significantly improved the accuracy of the groundwater elevation change method for WY 2022.

[20] The exception to this is WY 2018, which was a below average precipitation year associated with a minor increase in groundwater in storage. It should be noted that this change in groundwater in storage was calculated independently from the groundwater model using the groundwater elevation change map method described above.
[21] Groundwater in transit refers to recharged groundwater that is in the process of percolating downward through the unsaturated zone and is not yet contributing to a measurable change in groundwater elevation. The amount of groundwater in transit is assumed to be highly spatially and temporally variable in the Subbasin.

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

8.1 Introduction

This section describes several projects and management actions that are in process, have been initiated, or have been recently implemented in the Subbasin as a means to improve groundwater conditions, avoid potential undesirable results, attain subbasin sustainability, and improve understanding of the Subbasin groundwater dynamics as well as implications of GSP implementation. These projects and actions include capital projects and non-structural policies intended to reduce or optimize local groundwater use. Some of these projects were described in concept in the GSP; some of the actions described herein are new initiatives designed to make new water supplies available to the Subbasin that may be implemented by the GSAs to reduce pumping and partially mitigate the degree to which the management actions would be needed.

As described in the GSP, the need for projects and management actions is based on emerging Subbasin conditions, including the following:

- Groundwater levels are declining in some parts of the Subbasin, indicating that the amount of groundwater pumping is more than the natural recharge.
- The calculated water budget of the Paso Robles Formation aquifer indicates that the amount of groundwater in storage is in decline and will continue to decline if there is no net decrease in groundwater extractions.

To mitigate declines in groundwater levels in some parts of the Subbasin, achieve the Subbasin sustainability goal by 2040, and avoid undesirable results as required by SMGA regulations, new water supplies must be imported into the Subbasin [i.e., project(s)] and groundwater pumping must be reduced through management action(s).

In addition to project and management actions that address chronic declines in groundwater levels and depletion of groundwater in storage, this section also provides a brief discussion of land subsidence, potential depletion of interconnected surface waters, and groundwater quality trends that occurred during WY 2022.

The projects and management actions described in this section are all intended to help achieve groundwater sustainability in the Subbasin and avoid undesirable results.

8.2 Implementation Approach

As described in the GSP, the volume of groundwater pumping in the Subbasin is more than the estimated sustainable yield and, as a result, groundwater levels are persistently declining in some parts of the Subbasin. In response, the GSAs have initiated several projects and management actions designed to address the impacts of the decline in groundwater levels and reductions of groundwater in storage. It is anticipated that additional new projects and management actions, some of which are described herein, will be implemented in the future to continue progress towards avoiding or mitigating undesirable results.

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

8.3 Basin-Wide Management Actions and Projects

8.3.1 Sustainable Groundwater Management Grant Program – Sustainable Groundwater Management Implementation Round 1

In February 2022, the County of San Luis Obispo Groundwater Sustainability Director submitted an application for DWR Sustainable Groundwater Management (SGM) Grant Program – Implementation Round 1 grant funding on behalf of the PBCC. The application was for $10 million, of which $7.6 million was awarded by DWR in July 2022. The grant package includes funding for the following list of GSP implementation items:

- **Grant administration** $250,000
- **City of Paso Robles Recycled Water Project** $3,500,000
- **San Miguel Recycled Water Project** $1,000,000
- **Address GSP Data Gaps – High Priority** $1,400,000

  a. Expand/Improve Existing Basin Monitoring Network
  b. Supplemental Hydrogeologic Investigations
  c. Install New Monitoring Wells, Stream Gauges, Climatologic Stations
- **High Priority Management Actions** $800,000

  a. Well Verification and Registration Program
  b. Groundwater Extraction Measurement Program
  c. Well Interference Mitigation Program to address equitable access to groundwater by rural residential communities of concern
  d. Multi-Benefit Land Repurposing Program
- **Supplemental Water Supply Feasibility / Engineering Studies** $650,000

  a. Nacimiento Lake
  b. State Water Project
  c. Santa Margarita Lake
  d. Well Impact Mitigation and Alternative Water Supply Projects

8.3.2 Paso Basin Land Use Ordinance

On August 24, 2021, the board adopted Ordinance No. 3456, amending Title 22 of the San Luis Obispo County code by amending section 22.30.204 agricultural offset requirements to extend the termination date to August 31, 2022, and to add a table grapes specific water duty factor. This action effectively extends the existing Water Neutral New Development amendments to Title 22.[22] A copy of Ordinance No. 3456 is included in Appendix G.

8.3.3 Airborne Electromagnetic Geophysical Survey

The DWR has been conducting airborne electromagnetic (AEM) surveys in California's high- and medium-priority groundwater basins, where data collection is feasible, to assist local water managers as they implement SGMA to manage groundwater for long term sustainability. The surveys are funded by voter-approved Proposition 68, Senate Bill 5, and from the State general fund.

In August 2021 DWR, together with Ramboll and SkyTEM, conducted additional AEM geophysical surveying in San Luis Obispo County, including portions of the Paso Robles Subbasin that had not been previously surveyed during the initial AEM survey of the Subbasin in November 2019 (see WY 2021 Annual Report [GSI, 2022]). Results from this 2021 survey were made publicly available in May 2022. The results have improved the understanding of the geologic framework that controls groundwater flow in the Subbasin specifically within previous data gap areas of the initial AEM survey dataset. The dataset generated from this 2021 survey has been input into the 3D geologic model, which is described in greater detail below.

8.3.4 Three-Dimensional Geologic Model of Basin using SkyTEM Survey Data

SSJWD retained the services of a consultant to conduct a basin-wide groundwater recharge desktop study utilizing all available science, including the results of the Paso Basin Aerial Groundwater Mapping Study (Ramboll, 2020). This ongoing study has resulted in the creation of a digital 3D geologic model of the Paso Robles Subbasin incorporating the SkyTEM geophysical survey results (Ramboll, 2020) developed in Leapfrog Works®. The 3D model has been used to enhance data visualization and communication with stakeholders and to help identify favorable groundwater recharge areas in the Subbasin. The initial concept of the ongoing desktop study is to focus on the physical characteristics of the basin materials, including aquifers and aquitards, and to identify areas with favorable conditions to recharge the major aquifers of the basin (primarily the Paso Robles Formation Aquifer) regardless of location within the basin or proximity to potential recharge water sources. The 2021 AEM geophysical survey (see above) were incorporated into the 3D geologic model during WY 2022. As more datasets continue to be developed, they can be incorporated into the model to produce an ever-improving understanding of the geologic framework and groundwater flow within the Subbasin. It is anticipated that this 3D geologic model will ultimately be used to select key target areas where high resolution, site specific subsurface investigations may be performed for the purpose of developing groundwater recharge project(s) that would benefit areas of the Subbasin that are experiencing the greatest groundwater elevation declines.

[22] In October 2015, the County Board of Supervisors adopted the Water Neutral New Development (WNND) amendments to the County Land Use Ordinance (Title 22) and Building and Construction Ordinance (Title 19). The amendments require a 1:1 water offset for new non-agricultural development and new or expanded irrigated commercial crop production while providing a 5 AFY exemption for irrigated properties outside of an "area of severe decline" defined based on changes in groundwater elevation measurements from spring 1997 to spring 2013. The action to amend the ordinances was taken in response to declining groundwater levels to minimize further depletion of the groundwater resource. The 1:1 water offset requirement was originally intended to be a stopgap measure to avoid further depletion of the groundwater basin until SGMA implementation and included a termination clause to expire upon the effective date of a final and adopted GSP. On November 5, 2019, the County Board of Supervisors extended the termination date of the WNND ordinances to January 1, 2022 and removed "off-site" agricultural water offsets.

8.3.5 Expansion of Monitoring Well Network

As described in the GSP, SGMA regulations require a sufficient density of monitoring wells to characterize the groundwater elevation in each principal aquifer. The GSP concluded that a significant data gap existed in the number of monitoring wells in both the Alluvial Aquifer and Paso Robles Formation Aquifer within the Subbasin. The City of Paso Robles GSA project (using SEP funds) has partially addressed this data gap by drilling new monitoring wells, as described in the WY 2021 Annual Report (GSI, 2022).

The 22 wells in the Paso Robles Formation Aquifer monitoring network are insufficient to develop representative and sufficiently detailed groundwater contour maps. The lack of publicly available data for the aquifer is identified as a data gap that must be addressed in GSP implementation. This section describes ongoing and new projects and initiatives undertaken by SSJGSA, EPCWD, and the Groundwater Sustainability Director to expand the collection of water level data in the Subbasin.

8.3.5.1 SSJGSA Program to Expand the Monitoring Well Network

The SSJGSA initiated a program in WY 2020 to enlist many well owners that are members of the SSJWD to join a pilot study to measure water levels in wells throughout the District. Beginning in March 2021 water levels have been measured approximately monthly in nearly 70 wells. This initial effort is being undertaken to gain a better understanding of the time of year of the seasonal high and low water levels and to identify key representative wells in each area throughout the District. Data collection is continuing into WY 2023.

As this groundwater elevation dataset grows the data are being analyzed with the intent to reduce the number of measuring points as key wells are identified. The eventual goal of the program is to develop a network of 20 to 30 new wells to incorporate into the GSP RMS monitoring network. The water level data from this expanded monitoring network has been incorporated into the groundwater elevation and change in groundwater in storage analyses for WY 2022. These data points infilled several prior data gaps and have had the effect of substantially reducing the uncertainty in the WY 2022 analyses.

8.3.5.2 EPCWD Program to Expand the Monitoring Well Network

The EPCWD initiated a program in WY 2020 similar to the SSJGSA program. Beginning in April 2021 water levels have been measured quarterly in approximately 30 wells throughout the EPCWD membership area. Data collection is continuing into WY 2023. Like the SSJGSA program, the eventual goal of the EPCWD initiative is to develop a network of 20 to 30 new wells to incorporate into the GSP RMS monitoring network. The water level data from this expanded monitoring network has been incorporated into the groundwater elevation and change in groundwater in storage analyses for WY 2022. These data points infilled several prior data gaps and have had the effect of substantially reducing the uncertainty in the WY 2022 analyses.

8.3.5.3 Paso Robles Basin Groundwater Level Monitoring Network Expansion and Refinement and Investigation of the El Pomar Junction Area

The Groundwater Sustainability Director retained the services of a consultant to prepare a draft work plan for expansion and refinement of the Subbasin groundwater level monitoring network and to investigate the hydrogeology in the El Pomar Junction area in response to the chronic lowering of groundwater elevation undesirable result recorded in RMS well 27S/13E-28F01 (see Section 3.3.1). The purpose of the groundwater monitoring network expansion portion of the work plan is two-fold: (1) to refine the set of monitoring wells throughout the Basin that are measured manually in April and October; and (2) establish a subset of wells equipped with continuous water level monitoring devices to better understand the hydrogeology of the Basin and to capture the annual high and low groundwater elevations in each well, which are often at some date other than April and October.

The chronic lowering of groundwater elevation undesirable result identified in RMS well 27S/13E-28F01 in the WY 2021 and this year's Annual Reports requires an investigation to determine if this undesirable result is a localized or basin-wide issue. The draft work plan details a hydrogeologic investigation of the El Pomar Junction area to satisfy this requirement and to generally improve upon the hydrogeologic understanding of the area. Details from this investigation shall be incorporated into the expansion and refinement of the groundwater monitoring network.

Based on preliminary review of well completion reports (WCRs) provided by San Luis Obispo County Environmental Health Services, lithologic evidence was discovered indicating that several wells located in the El Pomar Junction area, including active irrigation wells, are completed either partially or completely within the Santa Margarita Formation, a non-Basin aquifer. Among these wells are three of the existing RMS wells (27S/12E-13N01, 27S/13E-30J01, and 27S/13E-30N01), which each appear to be completed entirely within the Santa Margarita Formation. It is anticipated that further review of El Pomar Junction area WCRs and any other discoverable hydrogeologic information shall be undertaken during WY 2023.

The ultimate goal of the draft work plan is to identify a refined set of RMS wells equipped with continuous water level monitoring devices that are ideally suited to annually evaluate the Subbasin condition in regard to the six undesirable results. The refined RMS well network shall be spatially distributed to minimize data gap areas. The draft work plan is attached as Appendix H.

8.3.6 Multi-Benefit Irrigated Land Repurposing Program

The Groundwater Sustainability Director presented the concept of a multi-benefit irrigated land repurposing (MILR) program to the PBCC in October 2022. The combined impacts to groundwater resources from the multi-year drought and lack of available and reliable supplemental surface water supplies may increase the likelihood of requiring some irrigated agriculture in the Subbasin to temporarily come out of production. Statewide, the ongoing drought conditions have created momentum for new voluntary incentivized programs for growers facing the difficult decision of taking land out of production and to support some amount of continued farming even if in a smaller irrigated footprint. Typically called repurposing, these programs can provide a strategically designed way to approach fallowing decisions and potentially find new uses for areas taken out of production. It is anticipated that the next steps for the MILR program in WY 2023 will be to convene an ad hoc committee to develop recommendations to bring back to the PBCC for further consideration, develop a request for proposal to develop program details and assist in program implementation, and ultimately retain a consultant team to perform the work. As one of the high priority management actions funded by the SGM Grant Program – Implementation Round 1 (see Section 8.3.1) the MILR program is expected to be a critical component in achieving long-term groundwater sustainability in the Subbasin.

8.4 Area-Specific Projects

8.4.1 City of Paso Robles Recycled Water Program

In 2016, the City of Paso Robles completed a major upgrade of its Wastewater Treatment Plant to remove all harmful pollutants efficiently and effectively from the wastewater. The City's master plan is to produce tertiary-quality recycled water and distribute it to various locations within the City as well as east Paso Robles, where it may be used for irrigation of city parks, golf courses, and vineyards. This will reduce the need to pump groundwater from the Subbasin and will further improve the sustainability of the City's water supply. In 2019, the City completed an upgrade to full tertiary treatment and began producing high-quality recycled water. Design and environmental permitting of the recycled water distribution system are complete.

The City is currently awaiting low-interest financing from the State of California in order to construct the distribution system. The City has been taking opportunities to construct some segments of the system where appropriate. For example, in 2022, a segment of the recycled water pipeline was completed in conjunction with a new housing subdivision. In 2022, the City received $3.5 million in SGM Grant Program – Implementation Round 1 grant funding, via the County of San Luis Obispo (see Section 8.3.1), for construction of a difficult 1,900 lineal foot segment of the distribution system under the Salinas River. That segment will be under construction in 2023. In 2022, the City applied for SGM Grant Program – Implementation Round 2 grant funding for an additional $5.7 million. These grant funds will help reduce the ultimate price of the recycled water, thus help maximize its use. Also in 2022, Caltrans completed a major retrofit of their irrigation system in order to use recycled water for irrigation of the US 101 corridor. Caltrans became the City's first official recycled water customer in January 2023. In 2022, the City also established interim recycled water user rates. The City also established a new Recycled Water Manager position as part of the formation of a new Utilities Department, which will create much more capacity for advancement and further development of the recycled water program.

The program will have the capacity to use up to 2,200 AFY of tertiary quality recycled water for in-lieu recharge inside the City of Paso Robles and in the central portion of the Subbasin (see Section 8.4.3). Water that is not used for recycled water purposes may be discharged to surface infiltration facilities, such as Huer Huero Creek, with the possibility for additional recharge benefits.

The primary benefit from the City's Recycled Water Program is higher groundwater elevations in the central portion of the Subbasin due to in-lieu recharge from the direct use of the recycled water and potential surface recharge opportunities.

8.4.2 San Miguel Community Services District Recycled Water Project

The San Miguel CSD Recycled Water project is currently in the final design phase. This planned project will upgrade the CSD wastewater treatment plant to meet California Code of Regulations Title 22 criteria for disinfected tertiary recycled water for irrigation use by vineyards. Potential customers include a group of agricultural irrigators on the east side of the Salinas River, and a group of agricultural customers northwest of the wastewater treatment plant. The project could provide between 200 AFY and 450 AFY of additional water supplies. The primary benefit from the CSD's Recycled Water project is higher groundwater elevations in the vicinity of the community of San Miguel due to in-lieu recharge from the direct use of the recycled water.

8.4.3 Blended Water Project

Private entities and individuals are working actively with the City of Paso Robles and numerous agricultural irrigators to develop a project that can bring recycled water to the central portion of the Subbasin. As described above, the City estimates that as much as 2,200 AFY of recycled water will be available, and the volume will likely increase in the future as the City grows. The wastewater treatment plant is designed to process and deliver up to 4,000 AFY.

The goal of the Blended Water Project is to design and construct a pipeline system to connect to the City's Recycled Water Program and convey recycled water into the agricultural areas east of the City. Although there are many ways to utilize the Recycled Water Program water directly, certain challenges exist to make the water quality of the recycled water attractive to some agricultural users. Blending the recycled water with surplus Nacimiento Water Project water, when available, may mitigate these challenges. Additional challenges with the use of NWP water include acreage limitations on the place of use for irrigated agricultural lands within SLO County – a constraint in the existing water right held by the Monterey County Water Resources Agency.

Numerous challenges exist to develop the project, but considerable time and effort has been expended by several private entities as well as City and County staff to develop this conceptual project. Key developments in 2022 include progress on the City of Paso Robles Recycled Water Program (see Section 8.4.1) and ongoing negotiations with Monterey County regarding modification to the point of use requirements for Nacimiento Water Project water. The primary benefit from the Blended Water Project is higher groundwater elevations in the central portion of the Subbasin east of the City of Paso Robles due to reductions in groundwater pumping for irrigation and in-lieu recharge from the direct use of the blended water. Associated benefits may include improved groundwater quality from the use and recharge of high-quality irrigation water.

8.4.4 Expansion of Salinas Dam and Ownership Transfer

One of the conceptual projects discussed in the GSP (Section 9.5.2.7 of the GSP) is expansion of the Salinas Dam. The dam is owned by the United States Army Corps of Engineers (USACE), which jointly holds Santa Margarita Reservoir water rights permits with the City of San Luis Obispo (City of SLO). The USACE leases the dam to the SLOFCWCD, who oversees its operation and maintenance, including water delivery to the City of SLO.

The original dam design included the installation of spillway gates that would raise the reservoir elevation, however they were not installed due to seismic safety concerns. The storage capacity of Santa Margarita Reservoir could be expanded by installing the spillway gates, potentially increasing the maximum volume in the reservoir from 23,843 AF to 41,792 AF.

As described in the GSP, expanded reservoir storage might benefit the Subbasin by scheduling summer releases from reservoir storage to the Salinas River, which would benefit the Subbasin by increasing streamflow recharge through augmented flows in the Salinas River. Another way the project might indirectly benefit the Subbasin is if the City of SLO could increase their Santa Margarita Reservoir deliveries, thereby freeing up a portion of their NWP water allocation for purchase by the GSAs.

In 2018, the USACE initiated a Disposition Study to evaluate options to dispose of the Salinas Dam, including transferring ownership to a local agency. An option under investigation is to transfer the dam to a local agency such as the SLOFCWCD, thus the USACE has requested that the County Board of Supervisors, acting in their role as the SLOFCWCD, submit a letter expressing interest in potentially moving forward with the ownership transfer process. Such an ownership transfer would help facilitate the dam expansion, should it prove to be a cost-effective and worthwhile project.

Some of the known issues with transferring ownership of the dam include:

- The USACE has indicated that the Salinas Dam has some deficiencies but is considered low risk. As such, the USACE has indicated that the dam would need to be transferred “as-is”, with the USACE only willing to consider providing minimal funding to support retrofit.
- The State, as the California DWR Division of Safety of Dams (DSOD), has indicated that seismic rehabilitation of Salinas Dam would be required. Any retrofit or structural improvements, including expanding the dam’s capacity, will require coordination with and approval by the DSOD following acquisition of the dam by the SLOFCWCD.
- Since the USACE has indicated they are unlikely to install the gates, ownership of the dam would need to be transferred from the federal government to a local agency to pursue the opportunity. This transfer would result in the Salinas Dam oversight responsibilities transferring from federal to state jurisdiction and require the dam retrofit and expansion to meet any additional requirements from the State.

On September 22, 2020, the County Board of Supervisors approved sending a letter to the USACE expressing interest in moving forward with the ownership transfer process. Coordination between agencies and advocacy for the ownership transfer by United States Congressman Salud Carbajal continued through WY 2022. It will require considerable time and expense to eventually bring this potential project to fruition and increase the local water supply resiliency, including potential benefits to the Subbasin and other public or private entities downstream of the dam along or near the Salinas River.

8.5 Summary of Progress towards Meeting Subbasin Sustainability

Relative to the basin conditions at the end of the study period as reported in the GSP, the First Annual Report (WYs 2017–2019) (GSI, 2020) and the Water Year 2020 Annual Report (GSI, 2021) indicated an improvement in groundwater conditions throughout the Subbasin and a modest increase of total groundwater in storage. However, the groundwater conditions documented in the Water Year 2021 Annual Report (GSI, 2022) and this Water Year 2022 Annual Report indicate a return to worsening conditions following three consecutive years of extreme drought. Historical groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management. Of particular concern are communities and rural residential areas that rely solely on groundwater for their water supply[3] (see Figure 10). During WY 2022, several Subbasin wells were reported to have gone dry or experienced a reduction in water pressure. The distribution of these dry well reports lodged with San Luis Obispo County Environmental Health Services and DWR during WY 2022 is shown on Figure 10.

Actions are underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and entities throughout the Subbasin to develop solutions that address the shared mutual interest in the Subbasin's overall sustainability goal.

8.5.1 Submittal of Revised GSP

On June 3, 2021, the Paso Robles Subbasin GSP manager received a consultation letter from DWR. The letter was intended to initiate consultation between DWR and the Paso Robles Subbasin GSAs in advance of issuance of a plan adequacy determination. The letter indicates that DWR had identified deficiencies which may result in an incomplete determination. The letter also presents two potential corrective actions that, if addressed sufficiently, may result in GSP approval. On January 21, 2022, DWR released an official 'incomplete' determination for the Paso Robles Subbasin GSP. The Paso Robles Subbasin GSAs retained a consultant to address the deficiencies identified in the GSP and resubmitted the revised GSP to DWR before the July 20, 2022 deadline. The final determination from DWR on the adequacy of the revised GSP is outstanding as of the date of this WY 2022 Annual Report.

8.5.2 Subsidence

Land subsidence is the lowering of the land surface. As described in the GSP, several human-induced and natural causes of subsidence exist, but the only process applicable to SGMA are those due to permanently lowered ground surface elevations caused by groundwater pumping (M&A, 2020). Historical 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 documents minor subsidence in the Subbasin using data provided by DWR depicting the difference in InSAR measured ground surface elevations between June 2015 and June 2018. These data show that subsidence of up to 0.025 feet may have occurred over this three-year period in a few small, isolated areas of the Subbasin (M&A, 2020).

Updated Interferometric Synthetic Aperture Radar (InSAR) data has been provided by DWR through October 2022, allowing for analysis of potential land subsidence for both WY 2021 and WY 2022. As discussed in the GSP, there is a potential error of 0.1 feet (or 1.2 inches) associated with the InSAR measurement and reporting methods. A land surface change of less than 0.1 feet is therefore within the noise of the data and is equivalent to no evidence of subsidence. Considering this range of potential error, examination of the October 2020 through October 2021 InSAR and also the October 2021 through October 2022 InSAR data show that zero land subsidence has occurred since October 2020. These data indicate that there is no indication of an undesirable result. The GSAs will continue to monitor and report annual subsidence as more data become available.

8.5.3 Interconnected Surface Water

Ephemeral surface water flows in the Subbasin make it difficult to assess the interconnectivity of surface water and groundwater and to quantify the degree to which surface water depletion has occurred. The revised GSP submitted to DWR in July 2022 identifies potential surface water/alluvial groundwater connection along certain sections of the Salinas River, along the middle reach of the Estrella River (from Shedd Canyon to Martingale Circle) and along San Juan Creek upstream of Spring Creek (Paso Robles Subbasin GSAs, 2022). There is no evidence that the Salinas River surface water flows are connected to the underlying Paso Robles Formation Aquifer (Paso Robles Subbasin GSAs, 2022). The potential connection between the surface water system along the middle reach of the Estrella River (from Shedd Canyon to Martingale Circle) and along San Juan Creek upstream of Spring Creek, and the underlying Paso Robles Formation Aquifer is unknown but sufficient evidence exists that there could potentially be a connection, and therefore further investigation in these areas is recommended (Paso Robles Subbasin GSAs, 2022). At this time, there are insufficient data available to adequately assess the interconnectivity of surface water and groundwater and the potential depletion of interconnected surface water. Although there is at present only a single Alluvial Aquifer RMS well in the Subbasin, seven existing alluvial wells are monitored including three wells along the Salinas River, one well next to the Estrella River near Jardine Road and one well next to San Juan Creek about 7 miles above Shandon (Paso Robles Subbasin GSAs, 2022). Additional Alluvial Aquifer wells will need to be established in the monitoring network before groundwater/surface water interaction can be more robustly analyzed. The revised GSP submitted to DWR in July 2022 identifies key data gaps that need to be filled before a sufficiently robust annual assessment of interconnected surface water can occur.

8.5.4 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, groundwater quality in the Subbasin is generally suitable for both drinking water and agricultural purposes (M&A, 2020). Eight 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 salinity (as indicated by electrical conductivity), total dissolved solids (TDS), sodium, chloride, nitrate, sulfate, boron, and gross alpha. For this WY 2022 Annual Report, trends of concentrations of these eight COCs were analyzed through WY 2022 using data from the GeoTracker GAMA database (GAMA, 2023). All COCs reviewed show a steady concentration trend since 2016.

Overall, there are no significant changes to groundwater quality since 2016, as documented in the GSP, preceding annual reports, and this WY 2022 Annual Report. Implementation of sustainability projects and/or management actions, as presented in the GSP, in this WY 2022 Annual Report, or in future reports or GSP updates, are not anticipated to result in degraded groundwater quality in the Subbasin. Any potential changes in groundwater quality will be documented in future annual reports and GSP updates.

8.5.5 Summary of Changes in Basin Conditions

The above-average rainfall water years of 2017 and 2019 improved groundwater conditions in the Subbasin. However, three consecutive below average rainfall years since 2019 have resulted in a reversal of this trend.

Although the groundwater elevations in one of the Paso Robles Formation Aquifer RMS wells is recovering in the past few years, groundwater elevations in several of the RMS wells are continuing to trend downward. Groundwater pumping continues to exceed the estimated future sustainable yield and the projects and management actions described in the GSP and in this Water Year 2022 Annual Report will be necessary in order to bring the Subbasin into sustainability.

8.5.6 Summary of Impacts of Projects and Management Actions

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 Water Year 2022 Annual Report are a good start towards reaching the sustainability goals laid out in the GSP. 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 Subbasin to reach the necessary sustainability goals.

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FIGURES

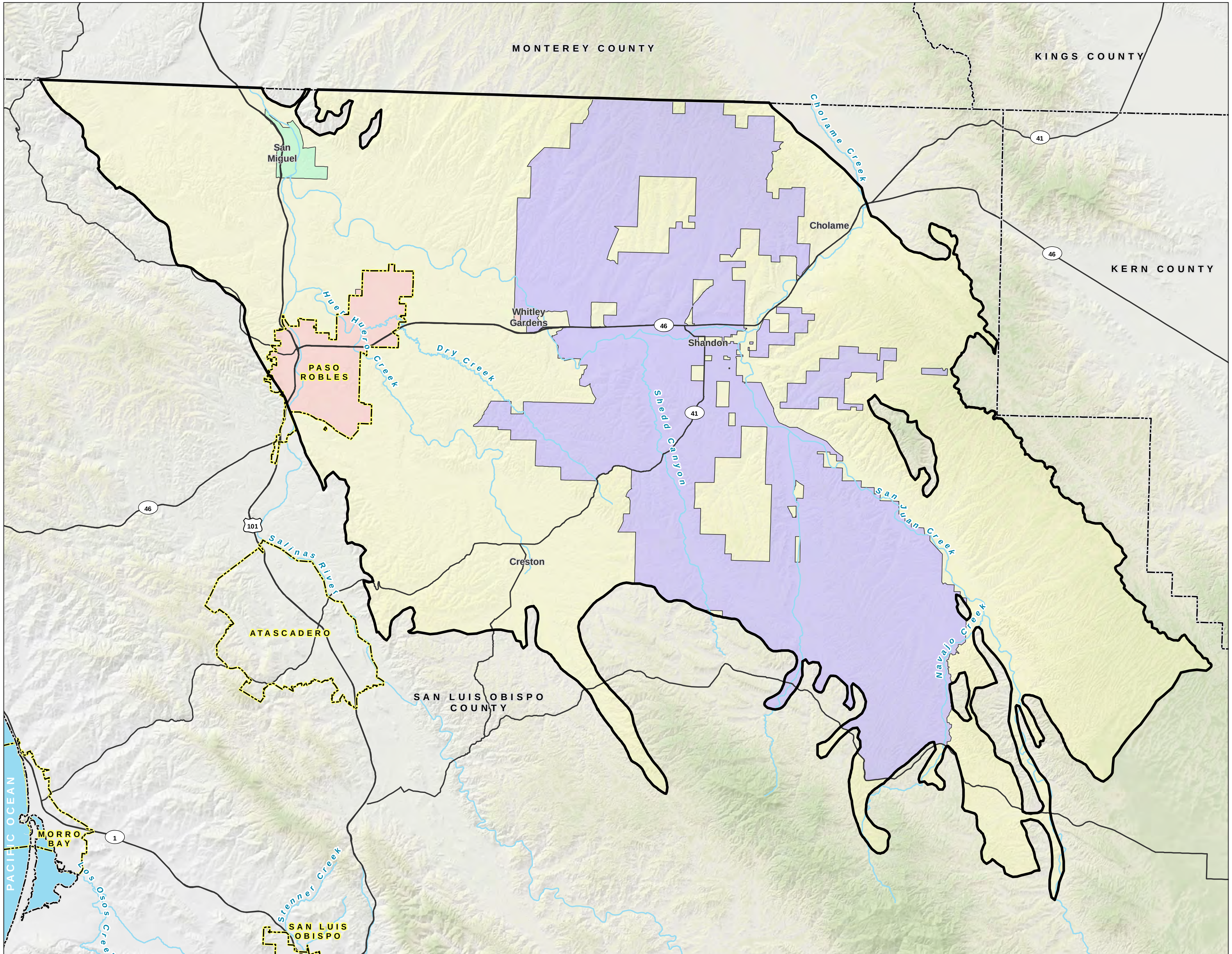

FIGURE 1

Extent of the Paso Robles Subbasin and Exclusive Groundwater Sustainability Agencies

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

Paso Robles Subbasin

Exclusive Groundwater Sustainability Agencies

- San Miguel Community Services District
- City of Paso Robles
- Shandon- San Juan Water District
- Paso Basin - County of San Luis Obispo

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: February 2, 2023
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure1_Paso_Robles_Subbasin_and_Exclusive_GW_Sust_Agencies.mxd

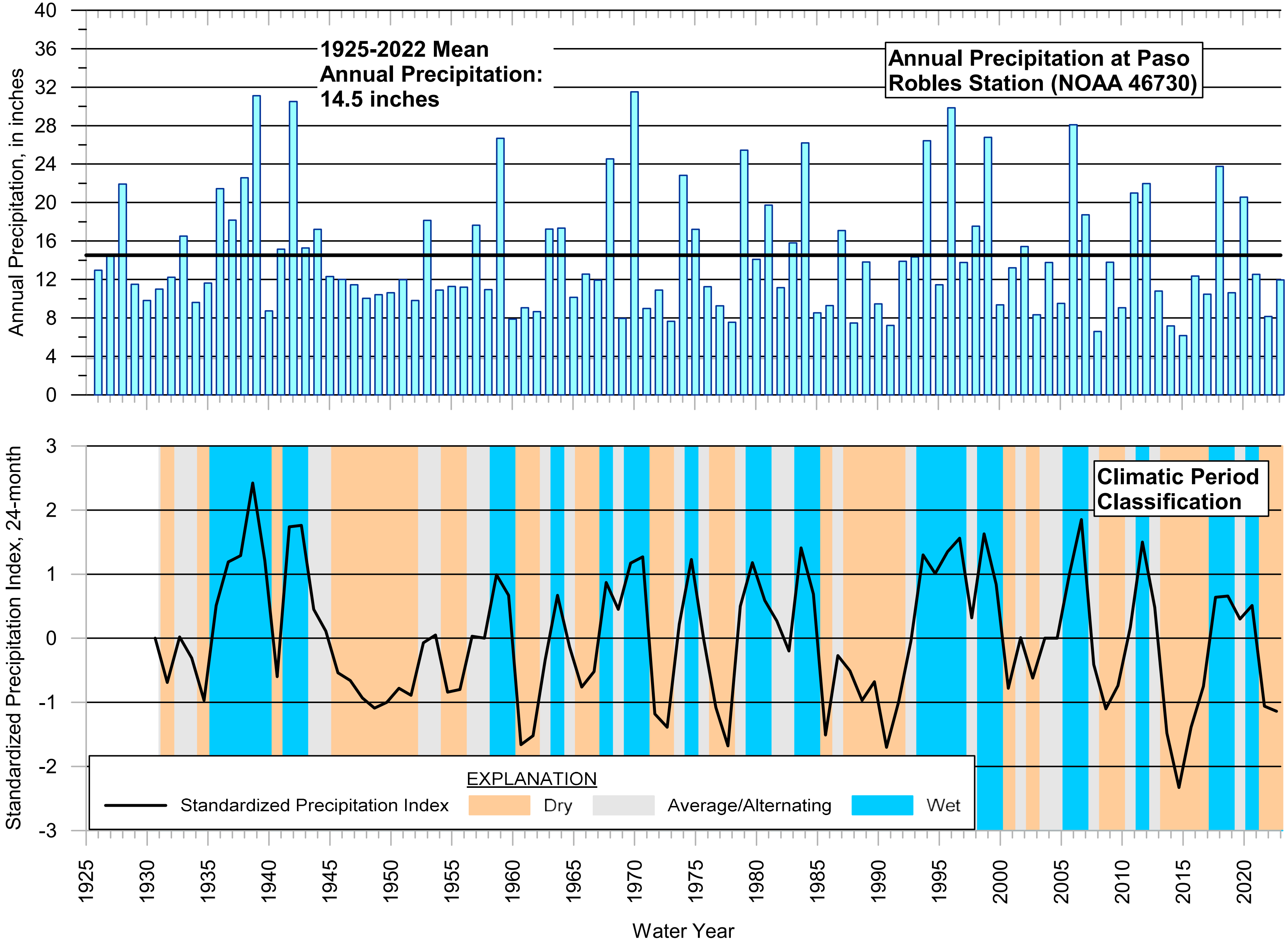

FIGURE 2

Annual Precipitation and Climatic Periods in the Paso Robles Subbasin

Paso Robles Subbasin Water Year 2022 Annual Report

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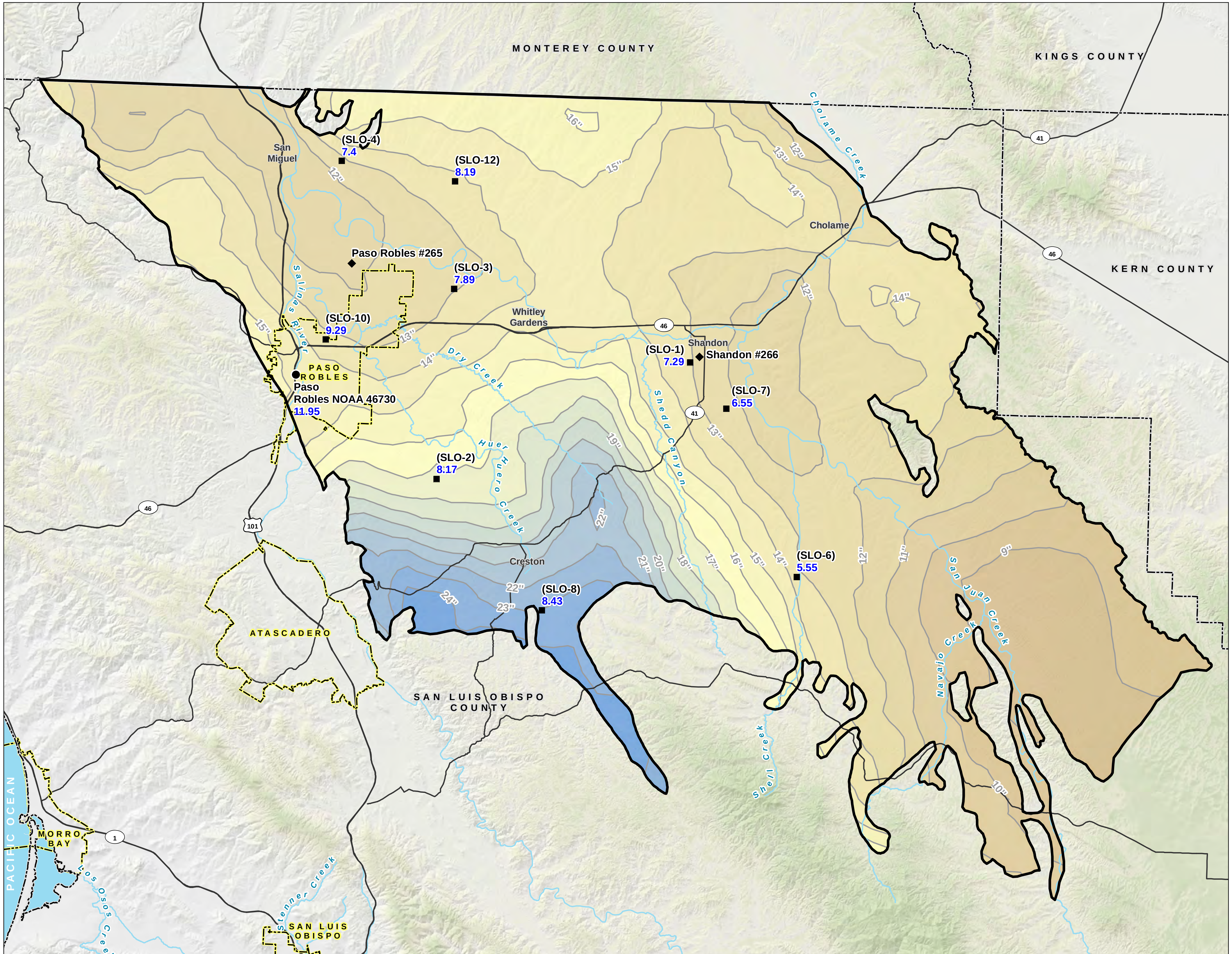

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FIGURE 3

Water Year 2022 Precipitation Totals and Average Distribution of Annual Precipitation in the Paso Robles Subbasin

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

- *Paso Robles NOAA Precipitation Station* / *WY 2022 Precipitation Total (inches)*
- *UCCE Precipitation Station* / *WY 2022 Precipitation Total (inches)*
- CIMIS stations installed during WY 2022
- Paso Robles Subbasin
- 1 in. Precipitation Contour

Annual Precipitation (in.)

- 8 - 9
- 9 - 10
- 10 - 11
- 11 - 12
- 12 - 13
- 13 - 14
- 14 - 15
- 15 - 16
- 16 - 17
- 17 - 18
- 18 - 19
- 19 - 20
- 20 - 21
- 21 - 22
- 22 - 23
- 23 - 24
- 24 - 25

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTES

Average distribution of annual precipitation based on 30-year normal PRISM data calibrated to the Paso Robles Station (NOAA 46730).

CIMIS: California Irrigation Management Information System
UCCE: University of California Cooperative Extension

N

0 10,000 20,000 30,000
Feet

Date: February 28, 2023
Data Sources: CA DWR, SLO Co., USGS, PRISM (OregonState), NOAA, UCCE

GSI Water Solutions, Inc.

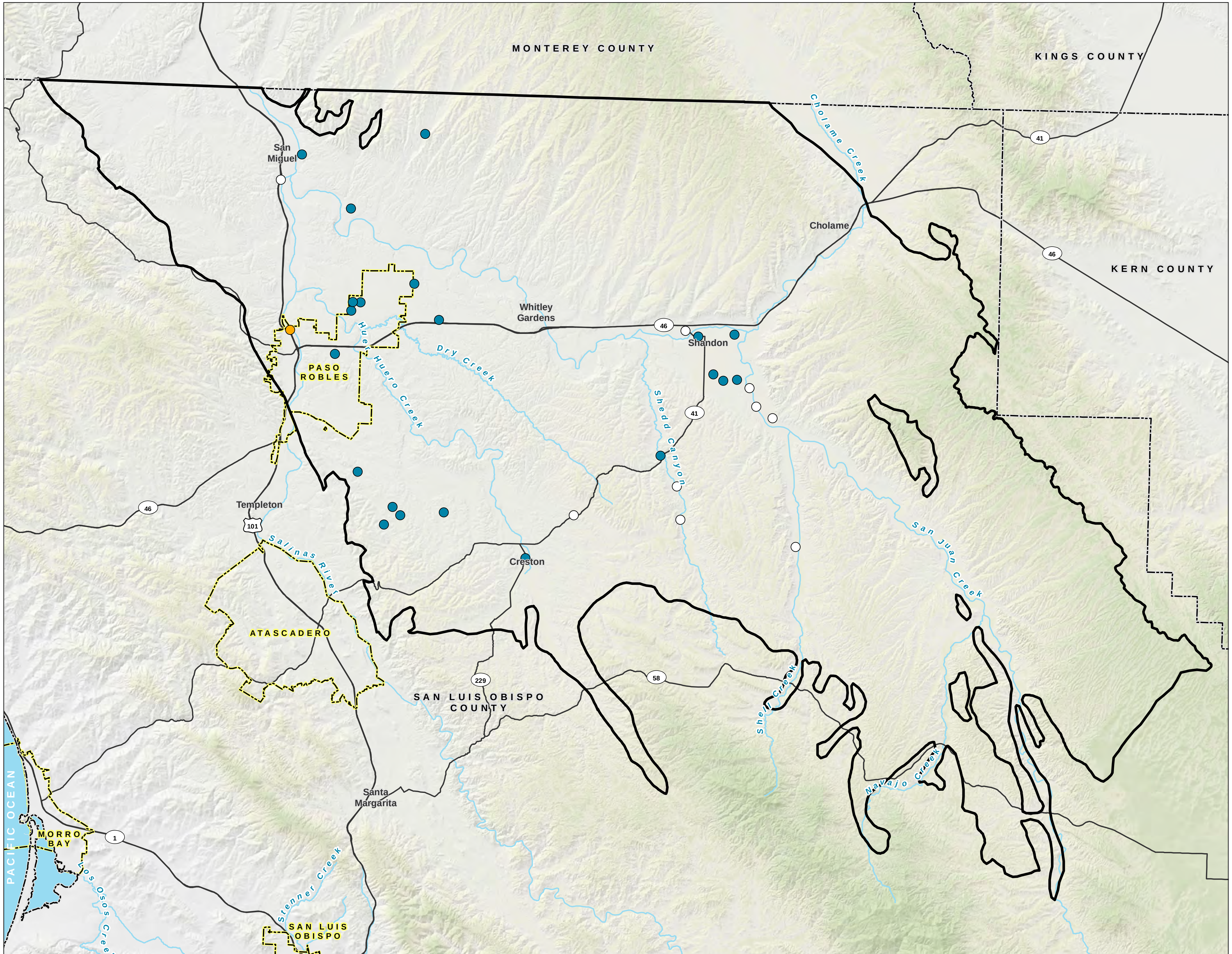

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FIGURE 4

Groundwater Elevation Monitoring Well Network in the Paso Robles Subbasin

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

Paso Robles Subbasin

Wells

- Paso Robles Formation
- Alluvial Aquifer
- Potential Future Monitoring Well

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

Date: February 2, 2023
Data Sources: CA DWR, SLO Co., City of Paso Robles, USGS

GSI Water Solutions, Inc.

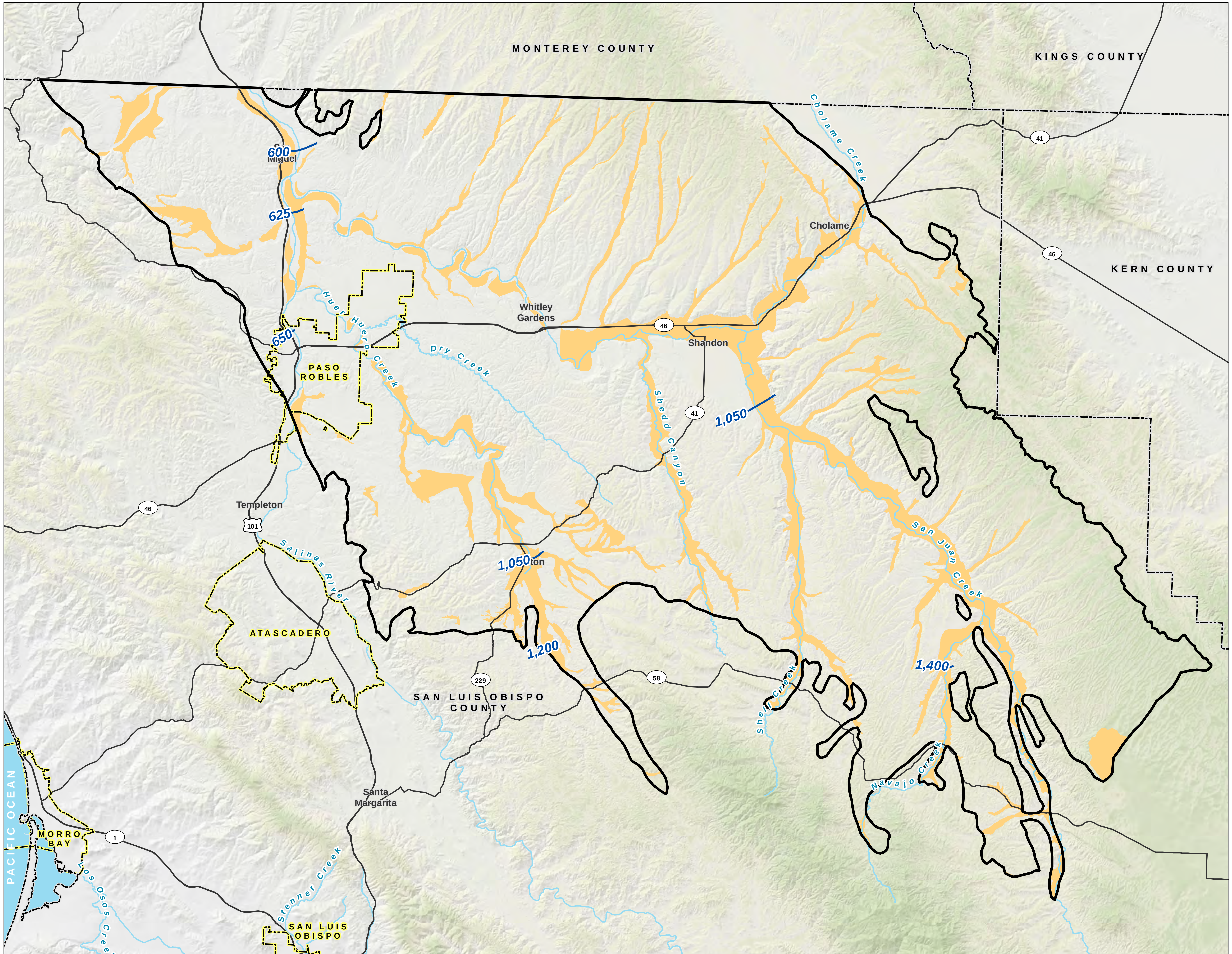


FIGURE 5

Alluvial Aquifer Groundwater Elevation Contours

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

- Alluvial Groundwater Elevation Contour, in feet above mean sea level
- Paso Robles Subbasin

Geologic Alluvial Units

- Qal: Alluvial Deposits

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: February 2, 2023
Data Sources: CA DWR, SLO Co., Montgomery, USGS

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure5_Alluvial_Aquifer_GW_Elev_Contours.mxd

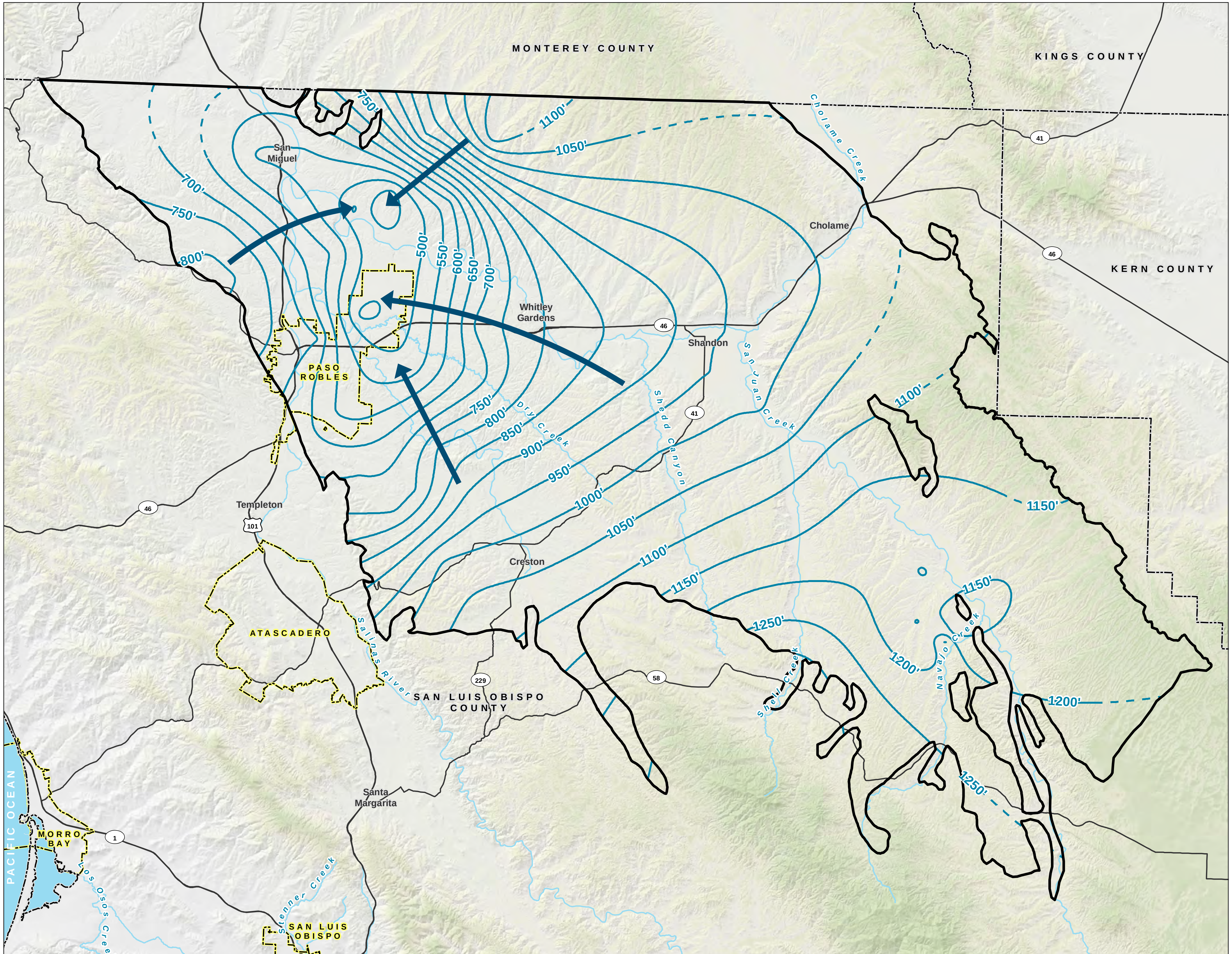


FIGURE 6

Paso Robles Formation Aquifer Spring 2022 Groundwater Elevation Contours

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

- Spring 2022 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

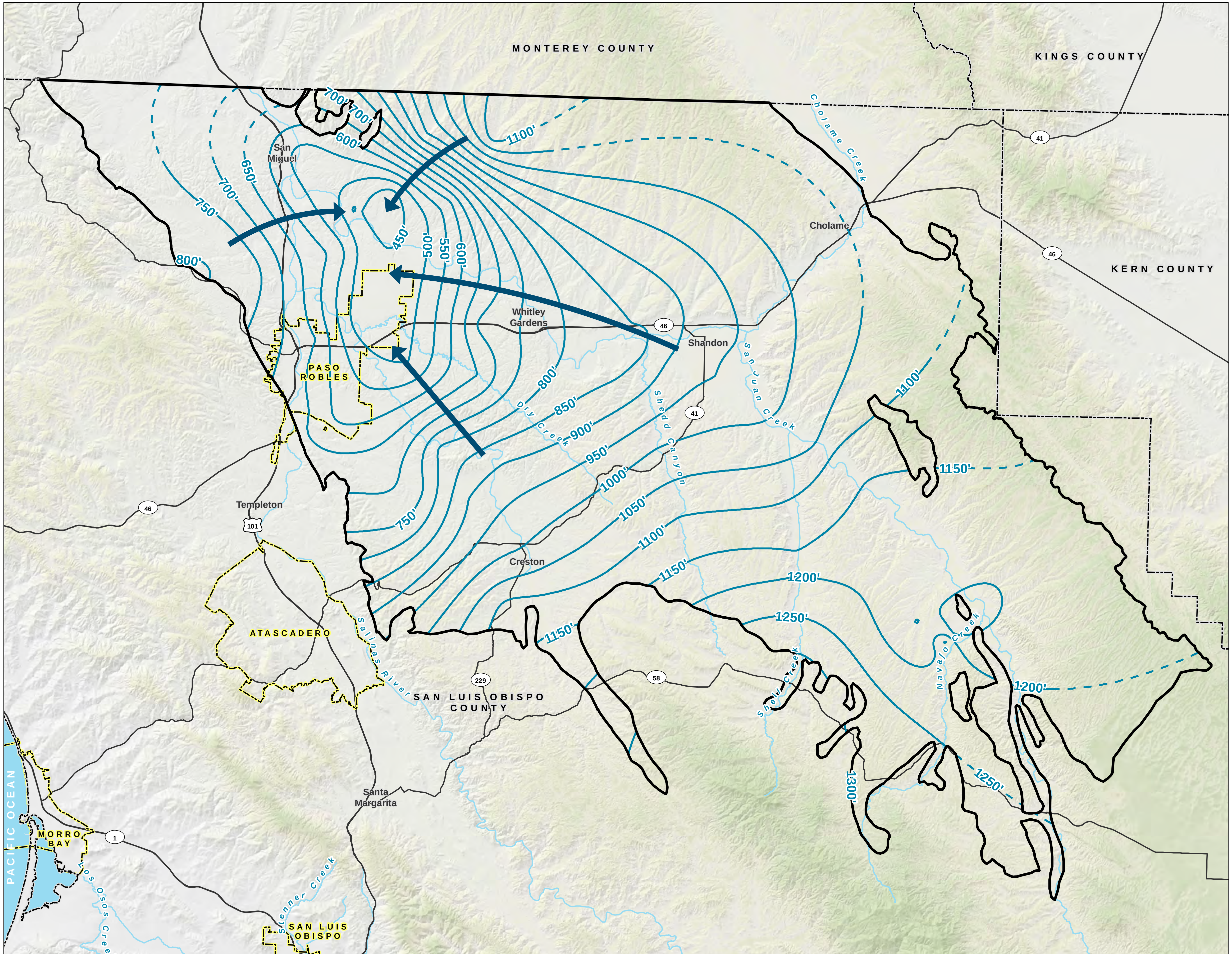
Date: February 2, 2023
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

FIGURE 7

Paso Robles Formation Aquifer Fall 2022 Groundwater Elevation Contours

Paso Robles Subbasin
Water Year 2022 Annual Report



LEGEND

- Fall 2022 Groundwater Elevation Contour in feet above mean sea level; dashed where inferred
- Inferred Groundwater Flow Direction
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: February 2, 2023
Data Sources: CA DWR, SLO Co., USGS

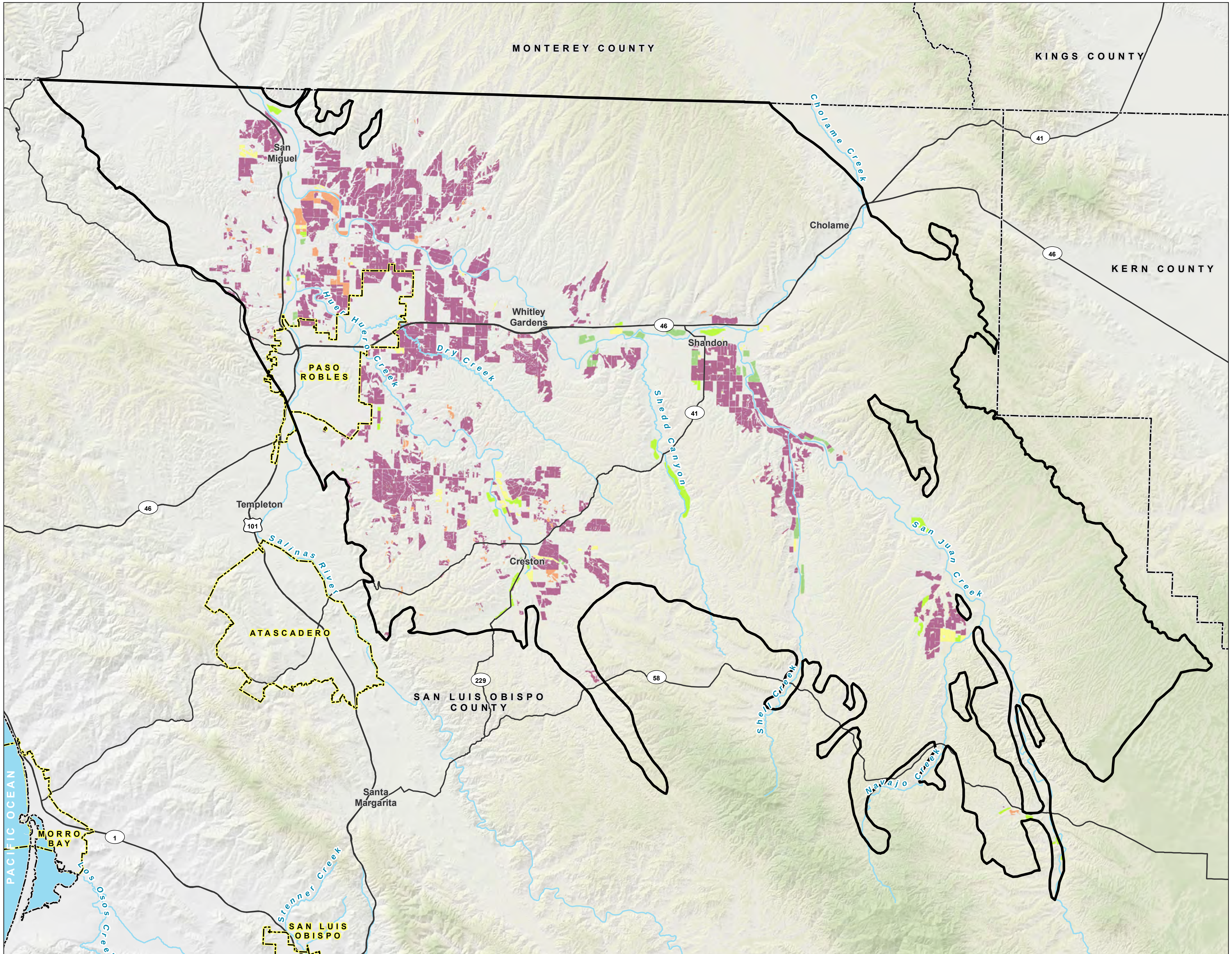
GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure7_Fall_2022_GW_Contours.mxd

FIGURE 8

Irrigated Agriculture – Water Year 2022

Paso Robles Subbasin
Water Year 2022 Annual Report



LEGEND

Paso Robles Subbasin

2022 Irrigated Agriculture by Crop Type

Orchard
Pasture
Alfalfa
Vegetable
Vineyard

All Other Features

County Boundary
City Boundary
Major Road
Watercourse
Waterbody

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., LandIQ (2022), USGS

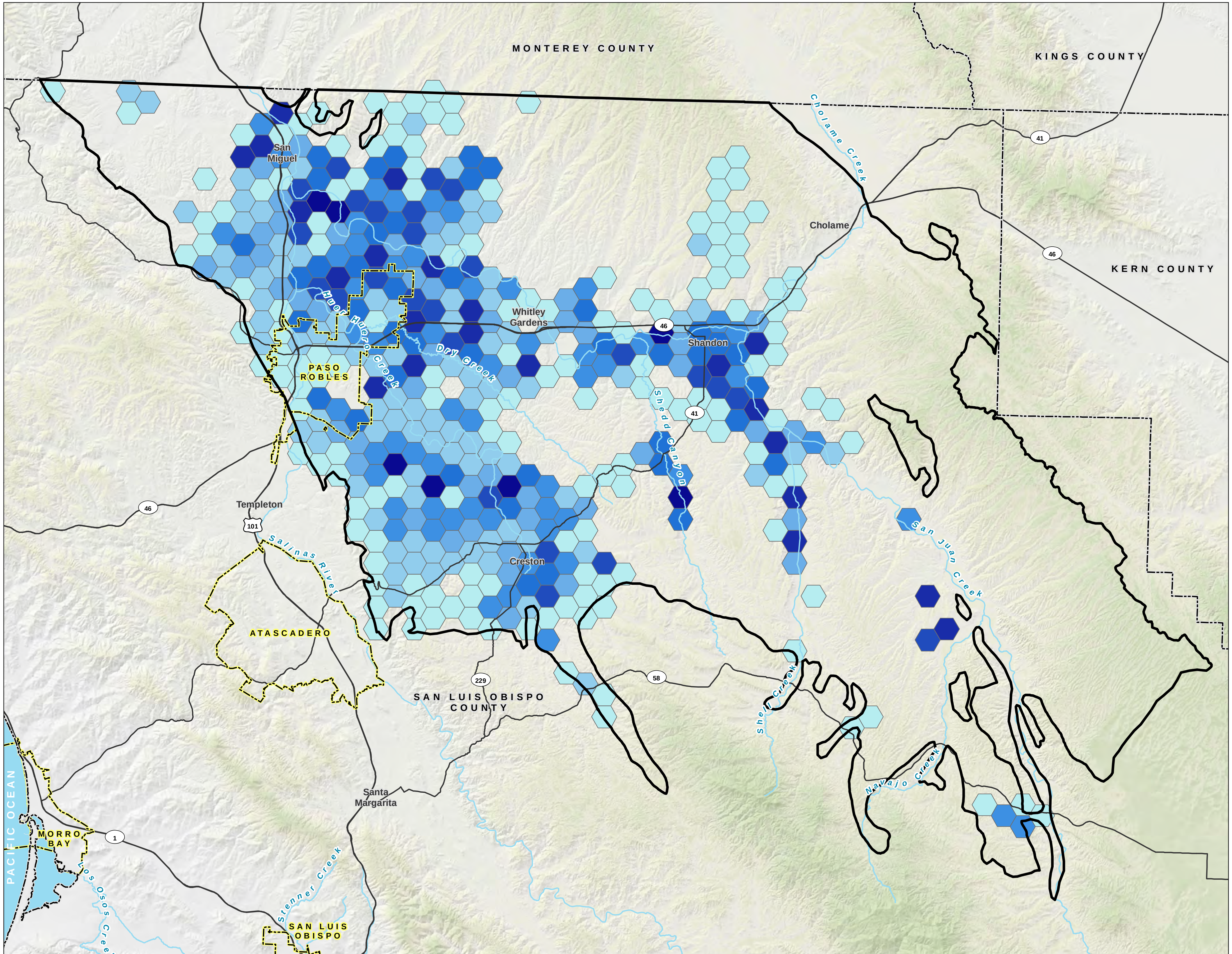
GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure8_Irrigated_Ag.mxd

FIGURE 9

General Locations and Volumes of Groundwater Extraction

Paso Robles Subbasin
Water Year 2022 Annual Report



LEGEND

Paso Robles Subbasin

Water Year 2022 Groundwater Extraction (AFY)

- 1 - 27
- 28 - 89
- 90 - 183
- 184 - 308
- 309 - 496
- 497 - 744
- 745 - 1172
- 1173 - 1948

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

AFY: Acre-Feet per Year

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., Soil Water Balance Model, USGS

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure9_General_Locs_and_Volumes_of_GW_Extractions.mxd

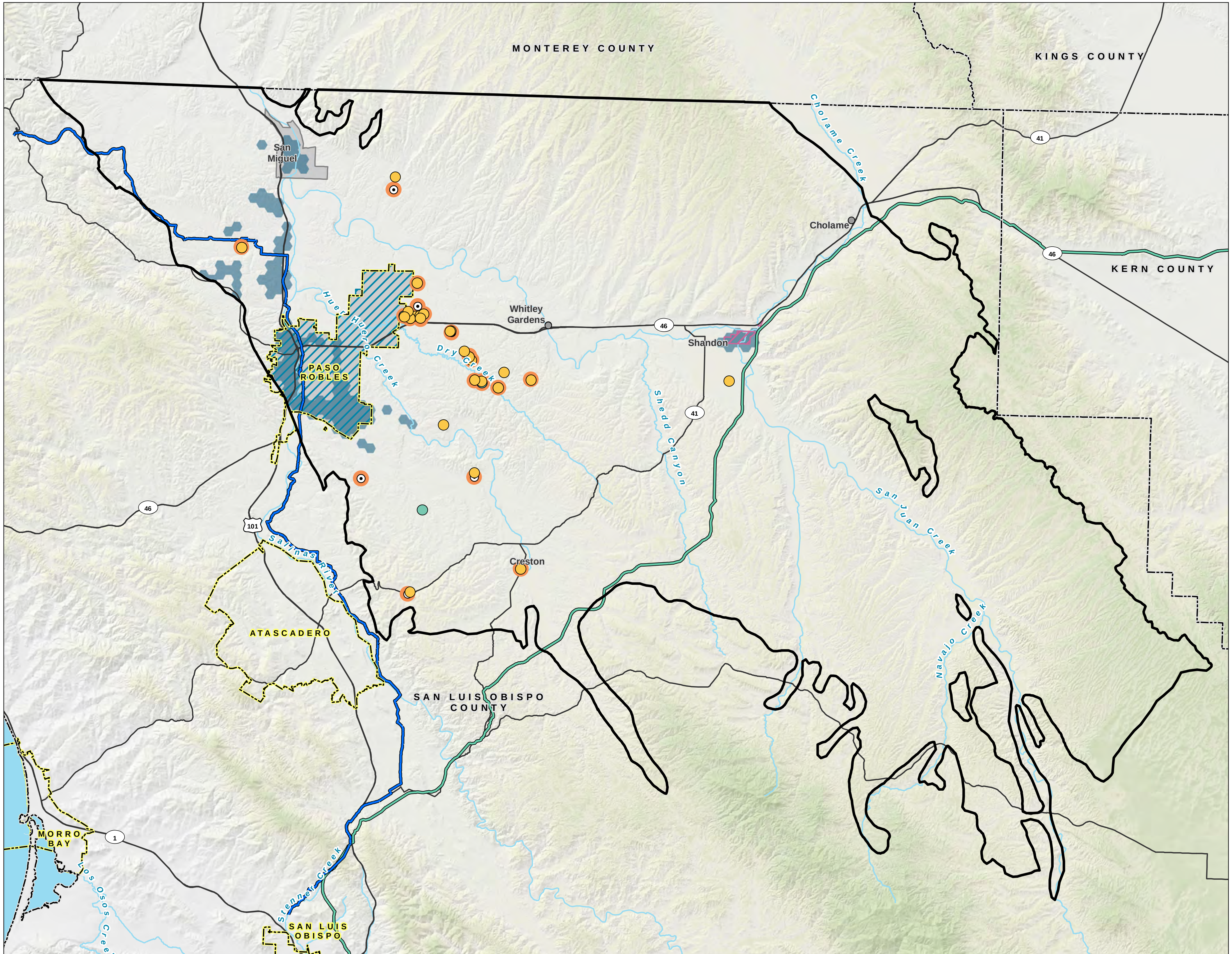


FIGURE 10

Communities Dependent on Groundwater and with Access to Surface Water

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

- Disadvantaged Communities (DACs)
- DWR Well Report: Reduction in water pressure, lower flows
- DWR Well Report: Well is dry (no longer producing water)
- County Dry Well Reports (WY 2022)
- Nacimiento Water Project Pipeline
- State Water Project Pipeline
- Community Dependent Solely on Groundwater
- Community Served by Groundwater and Nacimiento Water Project
- Community Served by Groundwater and State Water Project
- Paso Robles Subbasin

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

DWR: California Department of Water Resources

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., USGS, SLOCOG (2022)

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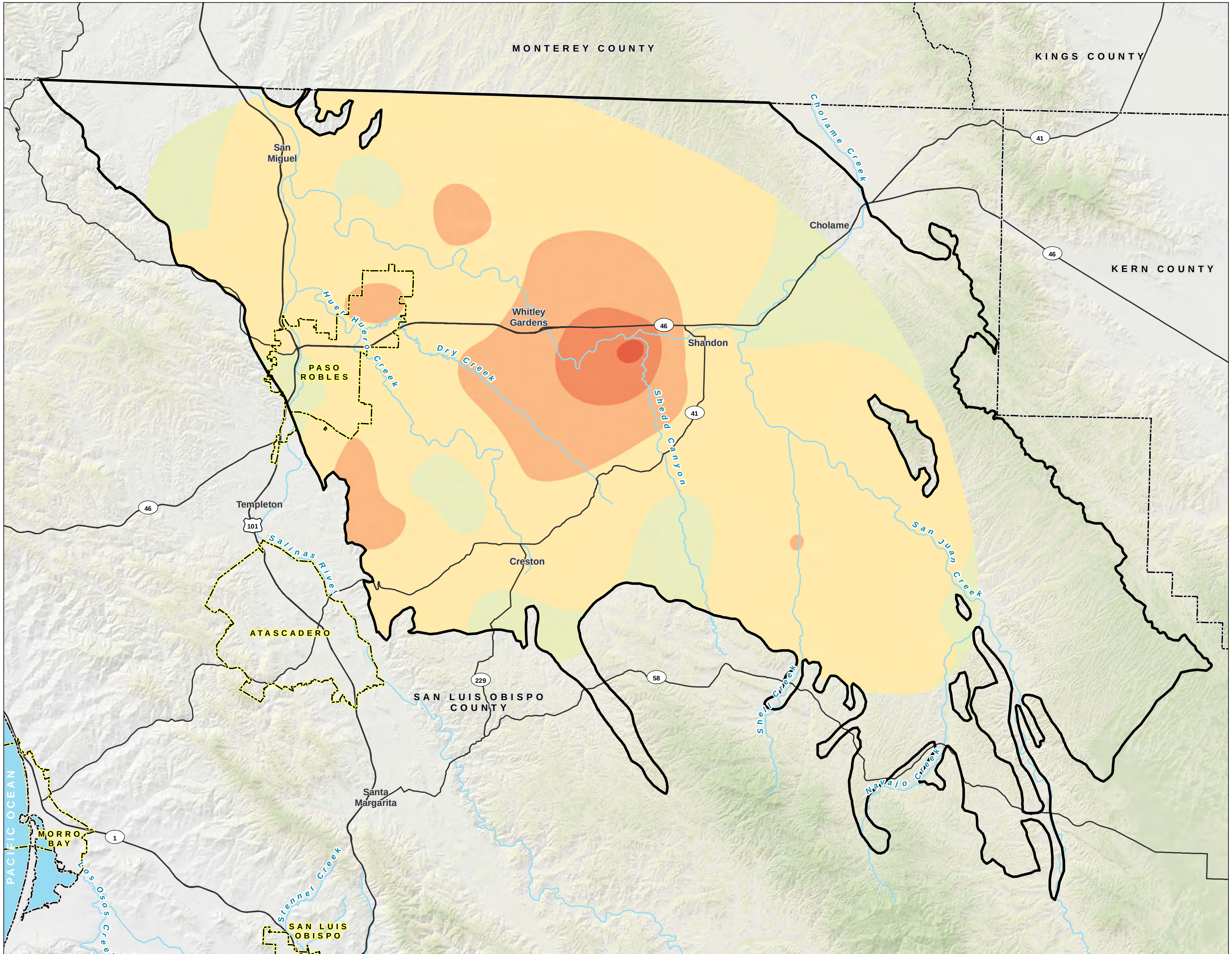

FIGURE 11

Paso Robles Formation Aquifer Change in Groundwater Elevation Fall 2021 to Fall 2022

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

Paso Robles Subbasin

Fall 2021 to Fall 2022

- < -40 feet
- -40 to -30 feet
- -30 to -20 feet
- -20 to -10 feet
- -10 to 0 feet
- 0 to 10 feet
- 10 to 20 feet
- 20 to 30 feet
- 30 to 40 feet
- > 40 feet

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., USGS

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure11_Change_in_GW_Elev_Fall2021_2022.mxd

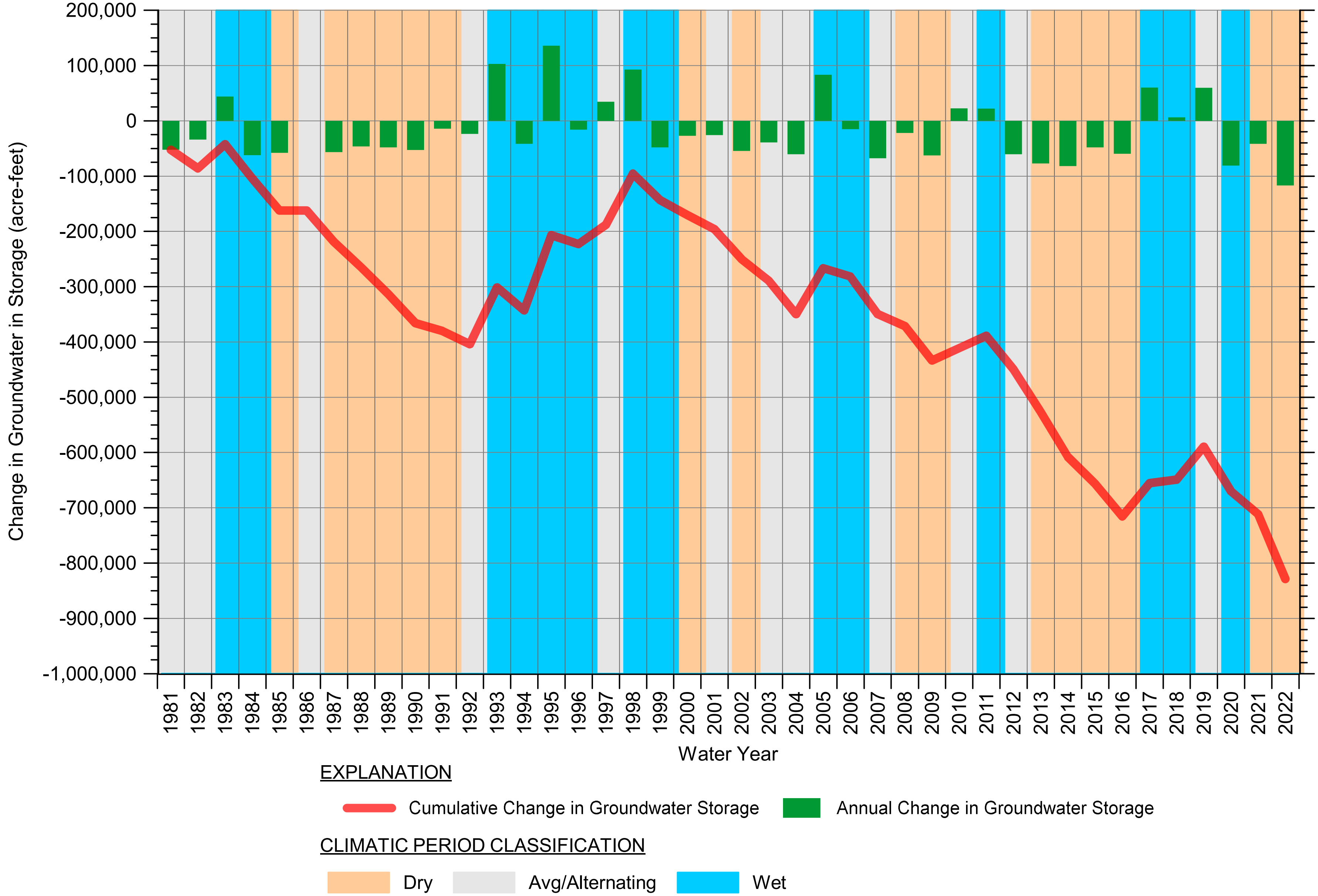

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FIGURE 12

Estimated Annual and Cumulative Change in Groundwater in Storage in the Paso Robles Subbasin

Paso Robles Subbasin Water Year 2022 Annual Report

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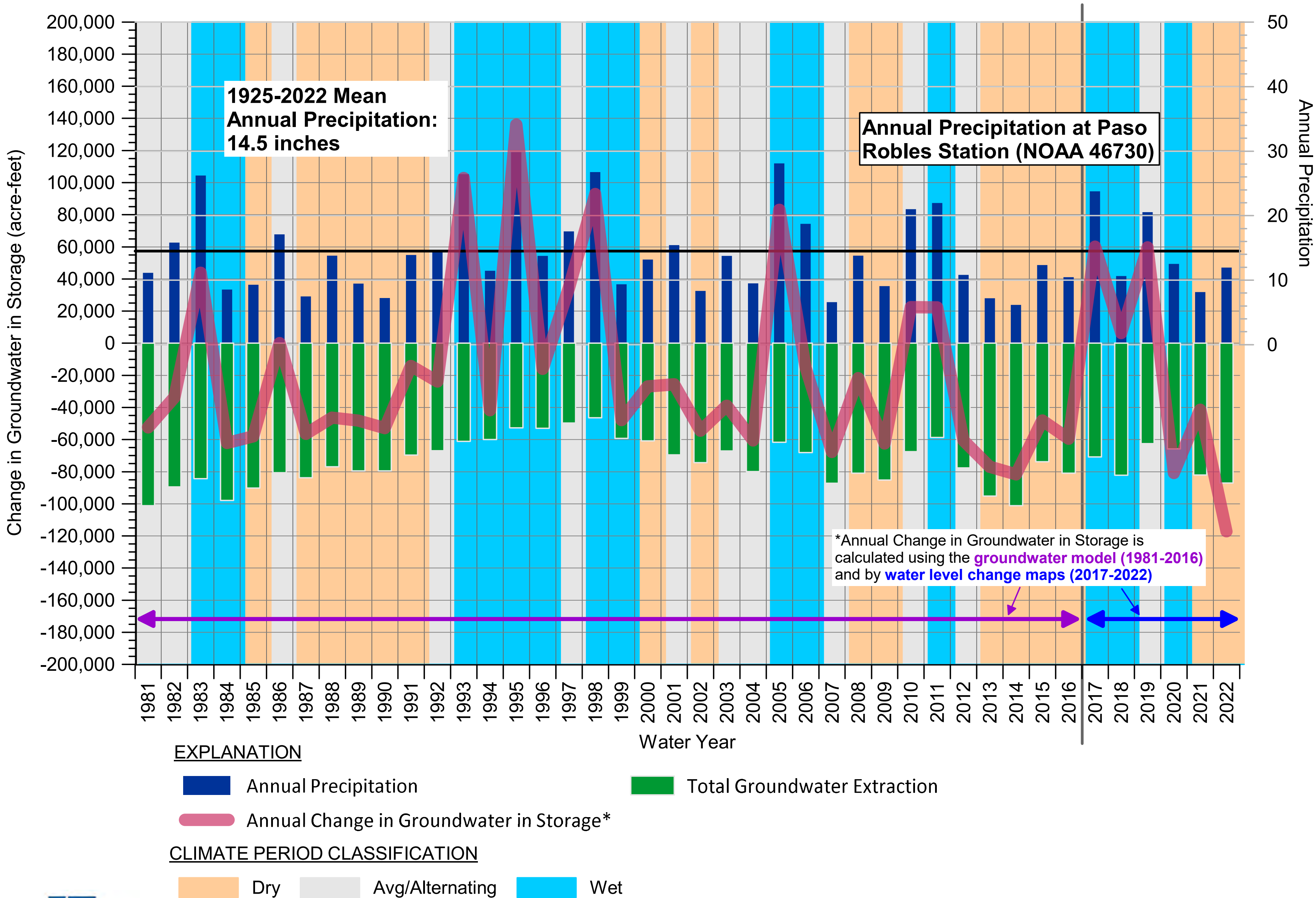

GSI Water Solutions, Inc.

FIGURE 13

Annual Precipitation and Groundwater Extraction vs Annual Change in Groundwater in Storage

Paso Robles Subbasin Water Year 2022 Annual Report

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\ChangeInStorage\Annual Precipitation and Groundwater Extraction vs Annual Change in Groundwater in Storage.gpj

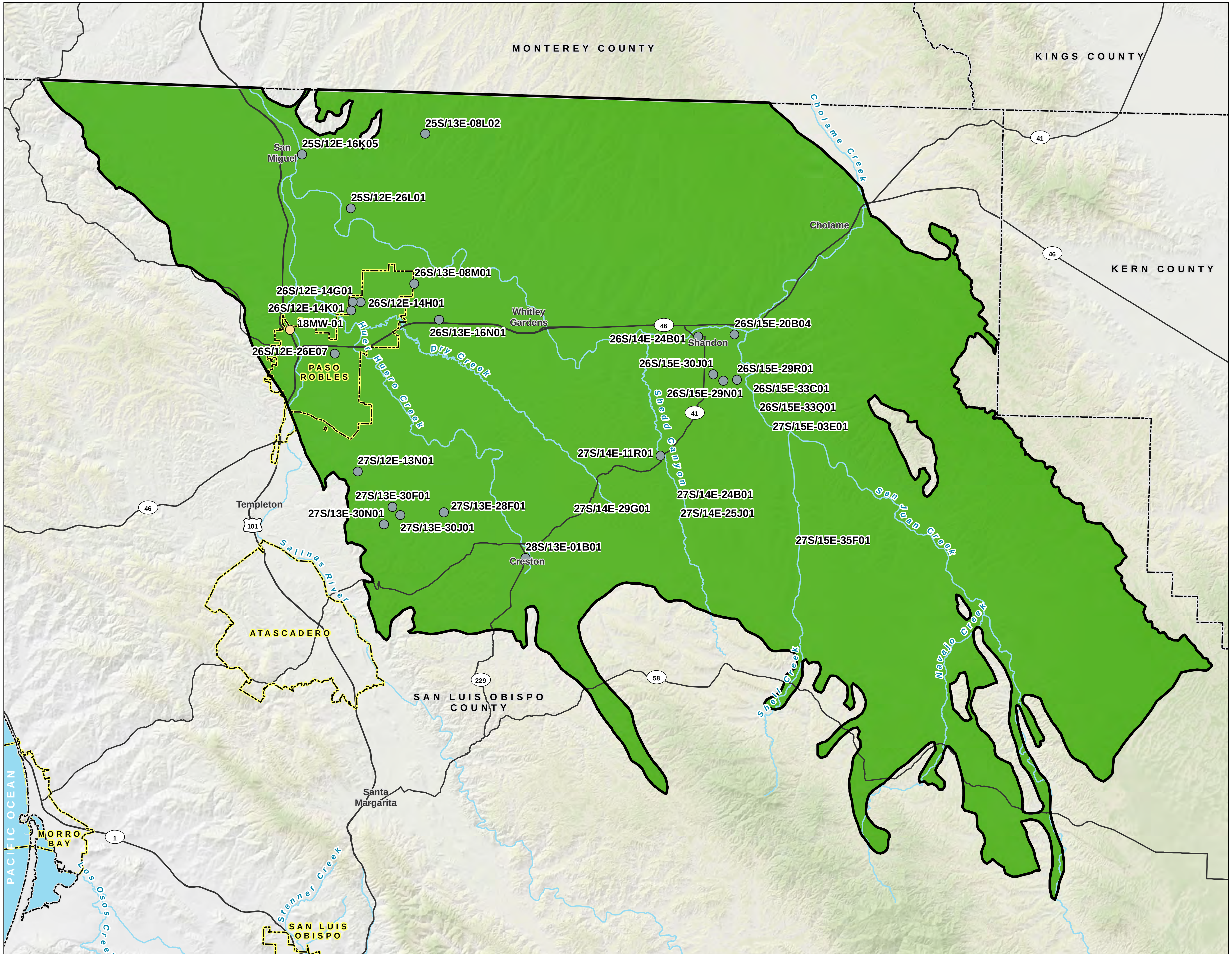

FIGURE 14

Land Subsidence Measured by InSAR (October 2020 - October 2021)

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

Paso Robles Subbasin

Wells

- Paso Robles Formation
- Alluvial Aquifer

Estimated Subsidence (decimal ft)

October 2020 - October 2021

- -0.1 - 0.1

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

InSAR: Interferometric Synthetic Aperture Radar

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., City of Paso Robles, USGS, TRE Altamira InSAR dataset

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure14_Land_Subsidence_InSAR_Oct20_21.mxd

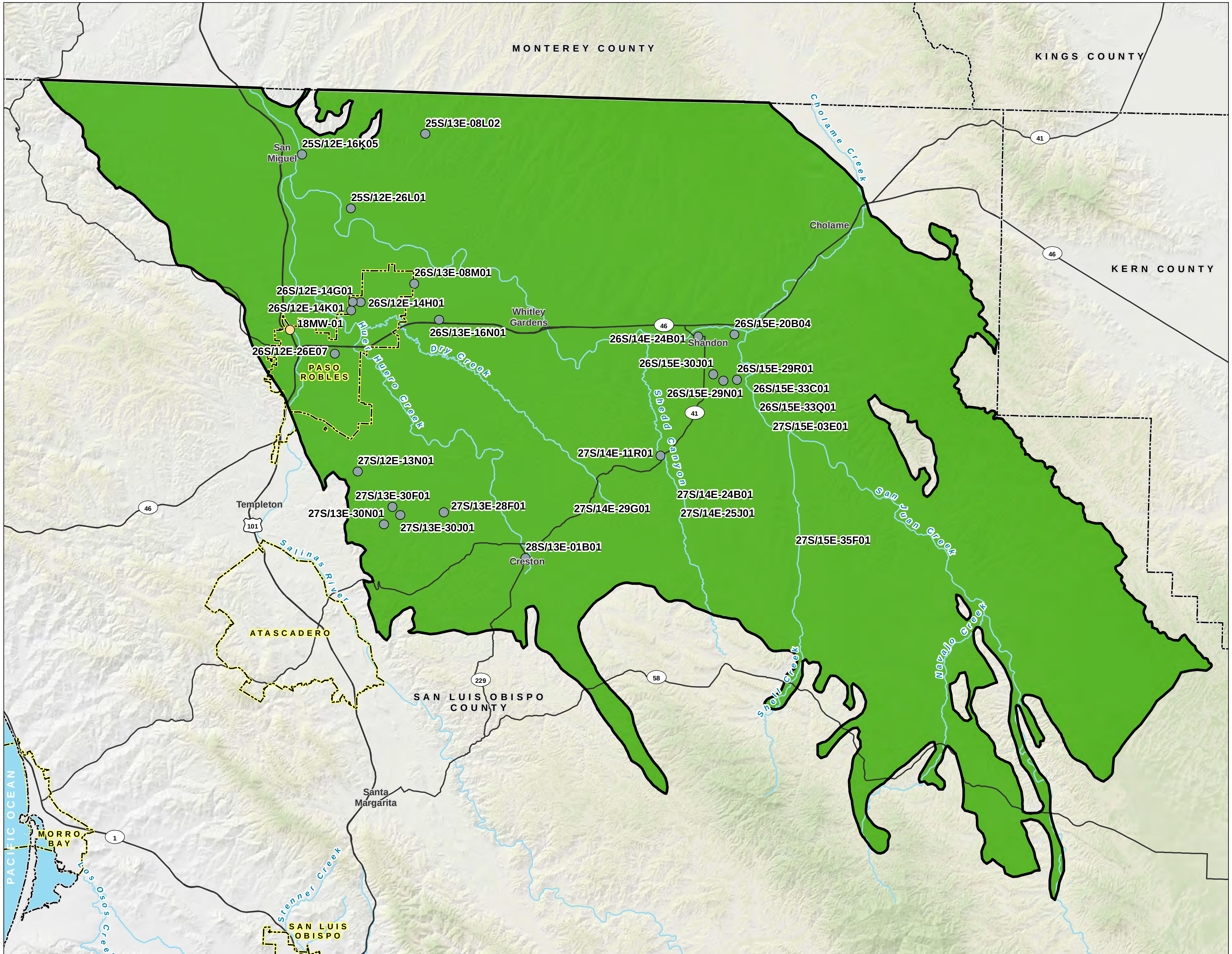

FIGURE 15

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

Paso Robles Subbasin
Water Year 2022 Annual Report

LEGEND

Paso Robles Subbasin

Wells

- Paso Robles Formation
- Alluvial Aquifer

Estimated Subsidence (decimal ft)

October 2021 - October 2022

- -0.1 - 0.1

All Other Features

- County Boundary
- City Boundary
- Major Road
- Watercourse
- Waterbody

NOTE

InSAR: Interferometric Synthetic Aperture Radar

N

0 10,000 20,000 30,000
Feet

Date: February 27, 2023
Data Sources: CA DWR, SLO Co., City of Paso Robles, USGS, TRE Altamira InSAR dataset

GSI Water Solutions, Inc.

Document Path: Y:\0667_County_of_San_Luis_Obisbo\Source_Figures\025_PasoBasin22_23\Annual_Report_2022\Figure15_Land_Subsidence_InSAR_Oct21_22.mxd

APPENDIX A

GSP Regulations for Annual Reports

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§ 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

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Monthly Precipitation at the Paso Robles Station (NOAA 46730)

(inches)

Source: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6730

Source: https://www.prcity.com/462/Rainfall-Totals

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	WY Total
1925	0.34	2.44	2.57	2.01	2.41	0.08	0.09	0.12	0.02	0.17	0.21	1.98	**12.95**
1926	2.13	6.26	0.27	3.52	0.00	0.02	0.00	0.00	0.00	0.25	7.14	0.90	**14.56**
1927	1.84	9.04	1.45	1.27	0.00	0.02	0.00	0.00	0.00	1.33	2.02	1.63	**21.91**
1928	0.23	2.87	2.76	0.37	0.29	0.00	0.00	0.00	0.00	0.01	1.82	2.87	**11.50**
1929	1.27	1.65	1.22	0.49	0.00	0.49	0.00	0.00	-----	0.00	0.00	0.24	**9.82**
1930	4.32	1.80	3.00	0.54	1.01	0.04	0.00	0.00	0.04	0.00	1.64	0.16	**10.99**
1931	4.58	1.87	0.39	0.56	2.01	0.93	0.00	0.09	0.00	0.01	1.89	7.04	**12.23**
1932	2.74	3.89	0.50	0.30	0.13	0.00	0.00	0.00	0.00	0.04	0.11	1.28	**16.50**
1933	6.05	0.08	0.84	0.22	0.32	0.68	0.00	0.00	0.00	0.64	0.00	4.26	**9.62**
1934	2.06	3.75	0.04	0.00	0.12	0.75	0.00	0.00	0.00	1.56	2.61	2.66	**11.62**
1935	6.23	0.65	4.08	3.41	0.02	0.00	0.00	0.16	0.07	0.18	1.58	1.66	**21.45**
1936	0.61	11.07	1.24	1.52	0.01	0.04	0.25	0.00	0.00	1.93	0.00	6.10	**18.16**
1937	4.59	4.54	5.25	0.16	0.00	0.00	0.00	0.00	0.00	0.16	0.66	7.40	**22.57**
1938	1.73	12.74	6.77	0.93	0.30	0.00	0.00	0.00	0.41	0.23	0.33	1.45	**31.10**
1939	3.11	1.45	1.58	0.05	0.09	0.00	0.00	0.00	0.43	0.55	0.78	1.29	**8.72**
1940	5.28	5.57	1.13	0.54	0.00	0.00	0.00	0.00	0.00	0.19	0.13	8.18	**15.14**
1941	4.73	8.16	6.14	2.76	0.19	0.00	0.00	0.02	0.00	1.34	0.70	5.15	**30.50**
1942	2.40	0.76	1.77	3.01	0.15	0.00	0.00	0.00	0.00	0.58	1.01	1.64	**15.28**
1943	8.00	1.68	3.63	0.72	0.00	0.00	0.00	0.00	0.00	0.34	0.12	3.38	**17.26**
1944	0.94	5.96	0.64	0.65	0.13	0.00	0.00	0.00	0.00	0.26	2.64	1.38	**12.16**
1945	0.80	4.17	2.76	0.26	0.04	0.00	0.00	0.00	0.00	1.09	0.49	1.72	**12.31**
1946	0.31	1.64	3.01	0.05	0.72	0.00	0.26	0.00	0.10	0.00	4.57	2.17	**9.39**
1947	0.56	0.97	1.14	0.13	0.28	0.00	0.00	0.00	0.04	0.32	0.18	0.62	**9.86**
1948	0.00	1.85	3.51	3.50	0.45	0.00	0.00	0.00	0.00	0.06	0.00	3.04	**10.43**
1949	1.09	1.95	3.73	0.36	0.38	0.00	0.00	0.00	0.00	0.78	0.78	2.33	**10.61**
1950	2.39	2.43	1.65	0.89	0.05	0.00	0.68	0.00	0.00	1.24	1.18	2.50	**11.98**
1951	2.50	0.68	0.58	1.11	0.00	0.00	0.00	0.00	0.03	0.33	1.94	4.64	**9.82**
1952	5.54	0.20	3.92	1.50	0.03	0.00	0.07	0.00	0.02	0.02	1.76	4.78	**18.19**
1953	1.71	0.00	0.66	1.90	0.06	0.01	0.00	0.00	0.00	0.00	2.46	0.00	**10.90**
1954	3.06	1.89	3.12	0.64	0.10	0.00	0.00	0.00	0.00	0.00	1.29	1.51	**11.27**
1955	3.57	1.85	0.37	1.16	1.31	0.00	0.00	0.13	0.00	0.00	1.36	8.14	**11.19**
1956	3.82	1.00	0.01	1.87	1.45	0.00	0.00	0.00	0.00	1.07	0.00	0.17	**17.65**
1957	4.77	1.90	0.31	1.63	0.71	0.47	0.00	0.00	0.02	0.62	0.30	3.30	**11.05**
1958	2.93	6.02	6.35	5.22	0.37	0.00	0.00	0.38	1.20	0.00	0.13	0.48	**26.69**
1959	1.69	4.53	0.03	0.44	0.05	0.00	0.00	0.00	0.52	0.00	0.00	0.31	**7.87**
1960	2.42	4.20	0.70	1.40	0.04	0.00	0.00	0.00	0.00	0.10	3.63	1.17	**9.07**
1961	1.72	0.20	0.88	0.22	0.74	0.00	0.00	0.00	0.00	0.01	1.99	2.59	**8.66**
1962	2.05	8.49	1.98	0.00	0.12	0.00	0.00	0.00	0.00	0.79	0.01	2.52	**17.23**
1963	4.41	3.79	2.10	3.32	0.17	0.01	0.00	0.00	0.24	1.00	4.25	0.01	**17.36**
1964	1.87	0.15	1.46	0.68	0.55	0.06	0.00	0.08	0.03	1.05	2.27	2.37	**10.14**
1965	2.50	0.51	1.16	2.48	0.00	0.00	0.04	0.03	0.15	0.00	6.43	3.24	**12.56**
1966	1.17	0.68	0.08	0.00	0.01	0.14	0.08	0.00	0.11	0.00	2.43	8.60	**11.94**
1967	3.93	0.35	3.99	4.41	0.03	0.02	0.00	0.00	0.79	0.14	1.74	1.70	**24.55**
1968	1.19	0.68	1.76	0.70	0.04	0.00	0.00	0.00	0.00	1.83	1.14	3.13	**7.95**
1969	13.93	9.12	0.35	1.68	0.06	0.01	0.25	0.00	0.00	0.24	0.44	0.68	**31.50**
1970	3.71	1.66	1.83	0.37	0.00	0.04	0.00	0.00	0.00	0.08	3.14	4.56	**8.97**
1971	1.08	0.24	0.85	0.69	0.21	0.00	0.00	0.00	0.05	0.29	0.88	4.27	**10.90**
1972	1.35	0.30	0.00	0.53	0.00	0.00	0.00	0.00	0.03	1.68	4.14	0.85	**7.65**
1973	6.54	6.95	2.60	0.01	0.06	0.00	0.00	0.00	0.00	0.68	3.09	1.61	**22.83**
1974	6.39	0.05	4.56	0.91	0.00	0.00	0.00	0.00	0.00	0.64	0.43	2.33	**17.29**
1975	0.01	4.12	2.81	0.89	0.00	0.00	0.00	0.01	0.00	0.76	0.03	0.10	**11.24**

Monthly Precipitation at the Paso Robles Station (NOAA 46730)

(inches)

Source: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6730

Source: https://www.prcity.com/462/Rainfall-Totals

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	WY Total
1976	0.00	2.61	1.09	0.66	0.00	0.08	0.00	1.02	2.90	0.58	0.55	1.80	9.25
1977	1.47	0.03	1.41	0.00	1.71	0.00	0.00	0.00	0.00	0.08	0.25	5.25	7.55
1978	5.77	7.31	3.10	2.77	0.00	0.00	0.00	0.00	0.92	0.00	2.47	1.04	25.45
1979	4.70	3.52	2.30	0.00	0.00	0.00	0.00	0.00	0.06	0.93	0.85	2.31	14.09
1980	4.47	8.05	1.88	0.65	0.24	0.00	0.35	0.00	0.00	0.00	0.02	0.44	19.73
1981	4.00	1.60	4.52	0.56	0.00	0.00	0.00	0.00	0.00	1.01	1.44	0.62	11.14
1982	2.65	0.88	5.10	3.05	0.00	0.02	0.00	0.00	1.04	0.90	3.98	1.96	15.81
1983	5.86	4.53	4.69	3.35	0.05	0.00	0.00	0.52	0.37	1.34	2.07	3.68	26.21
1984	0.20	0.24	0.66	0.35	0.00	0.00	0.00	0.00	0.00	0.38	2.10	3.01	8.54
1985	0.52	0.92	2.11	0.19	0.00	0.00	0.02	0.00	0.04	0.40	1.07	0.97	9.29
1986	2.11	6.73	4.64	0.32	0.00	0.00	0.03	0.00	0.62	0.02	0.15	0.64	16.89
1987	0.88	2.01	3.40	0.14	0.06	0.07	0.00	0.00	0.00	1.50	2.63	2.73	7.37
1988	1.94	2.54	0.10	2.02	0.21	0.14	0.00	0.00	0.00	0.00	1.16	2.87	13.81
1989	0.98	1.59	0.71	0.37	0.07	0.00	0.00	0.00	1.59	0.97	0.22	0.00	9.34
1990	3.02	1.48	0.24	0.12	0.66	0.00	0.00	0.00	0.51	0.00	0.14	0.20	7.22
1991	0.63	2.17	10.25	0.08	0.03	0.20	0.00	0.10	0.10	0.50	0.16	3.00	13.90
1992	1.44	6.09	2.99	0.10	0.00	0.03	0.03	0.00	0.01	0.79	0.00	3.59	14.35
1993	9.63	6.96	3.43	0.06	0.01	0.14	0.00	0.00	0.00	0.17	0.86	1.28	24.61
1994	1.90	3.37	1.16	0.49	1.05	0.00	0.00	0.00	1.17	0.70	2.32	0.93	11.45
1995	11.51	1.42	12.31	0.09	0.44	0.14	0.00	0.00	0.00	0.00	0.12	1.92	29.86
1996	1.84	6.52	2.03	0.72	0.55	0.00	0.00	0.00	0.00	1.78	1.52	5.78	13.70
1997	7.93	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.10	0.07	4.05	3.93	17.17
1998	2.99	9.06	2.71	1.96	2.05	0.11	0.00	0.00	0.08	0.21	0.99	0.73	27.01
1999	1.84	1.26	2.68	1.19	0.00	0.00	0.00	0.00	0.47	0.00	0.71	0.22	9.37
2000	3.16	5.89	1.55	1.56	0.05	0.04	0.00	0.00	0.03	1.34	0.05	0.16	13.21
2001	4.43	5.14	3.59	1.08	0.00	0.00	0.04	0.00	0.00	0.24	2.81	2.19	15.83
2002	0.87	0.33	1.40	0.23	0.25	0.00	0.00	0.00	0.00	0.00	2.54	4.52	8.32
2003	0.13	2.10	1.86	1.70	1.18	0.00	0.16	0.03	0.00	0.00	1.36	2.31	14.22
2004	0.91	4.31	0.30	0.32	0.00	0.00	0.00	0.00	0.00	5.11	1.39	6.75	9.51
2005	4.81	5.02	3.07	0.76	1.10	0.01	0.00	0.08	0.00	0.02	0.46	2.54	28.10
2006	5.78	1.23	4.50	2.92	1.48	0.00	0.00	0.00	0.00	0.61	0.28	1.13	18.93
2007	0.74	2.98	0.13	0.37	0.00	0.00	0.00	0.31	0.04	0.96	0.00	2.23	6.59
2008	8.44	1.83	0.00	0.33	0.01	0.00	0.00	0.00	0.00	0.14	1.26	1.13	13.80
2009	0.91	3.89	1.37	0.17	0.12	0.02	0.00	0.00	0.05	4.04	0.02	3.96	9.06
2010	6.09	3.38	0.64	2.75	0.12	0.00	0.03	0.00	0.00	1.06	1.57	7.14	21.03
2011	2.07	3.05	5.29	0.28	0.95	0.53	0.00	0.00	0.03	0.90	1.93	0.12	21.97
2012	2.38	0.25	2.44	2.60	0.18	0.00	0.00	0.00	0.00	0.28	0.75	3.94	10.80
2013	1.02	0.28	0.69	0.07	0.15	0.00	0.00	0.00	0.00	0.01	0.26	0.30	7.18
2014	0.00	2.75	1.96	0.85	0.00	0.00	0.03	0.00	0.00	0.00	1.00	5.48	6.16
2015	0.32	2.16	0.10	0.37	0.05	0.00	2.82	0.00	0.05	0.07	1.45	0.89	12.35
2016	4.13	0.85	2.92	0.15	0.00	0.00	0.00	0.00	0.00	1.61	1.46	1.80	10.46
2017	9.50	6.44	0.92	1.45	0.24	0.00	0.00	0.00	0.16	0.08	0.22	0.04	23.58
2018	2.08	0.25	7.74	0.21	0.00	0.00	0.00	0.00	0.00	0.28	3.23	1.12	10.62
2019	5.30	6.72	3.01	0.08	0.82	0.00	0.00	0.00	0.00	0.00	1.40	5.22	20.56
2020	0.65	0.00	3.53	1.59	0.03	0.00	0.00	0.11	0.00	0.00	0.29	0.89	12.53
2021	6.07	0.01	0.90	0.00	0.00	0.00	0.00	0.00	0.00	2.02	0.05	7.70	8.16
2022	0.11	0.11	1.25	0.42	0.00	0.00	0.00	0.00	0.29	0.00	0.89	6.77	11.95
												Water Year Average (1925 - 2022):	14.50

University of California Cooperative Extension Weather Stations in Paso Robles Subbasin
Total Monthly Precipitation for Water Year 2022

(inches)

Source: https://ucce-slo.westernweathergroup.com/

WY 2022	Shandon (SLO-1)	Creston Rd (SLO-2)	NE Paso Robles (SLO-3)	Cross Canyon Rd (SLO-4)	Shell Creek Rd (SLO-6)	South Shandon (SLO-7)	South Creston (SLO-8)	Experimental Station (SLO-10)	Von Dollen Road (SLO-12)
OCT	1.14	1.33	1.23	1.36	0.94	1.16	1.48	1.72	1.41
NOV	0.02	0.02	0.00	0.04	0.05	0.03	0.01	0.01	0.04
DEC	4.15	5.23	4.78	4.58	3.43	3.80	4.98	6.09	4.99
JAN	0.10	0.01	0.21	0.00	0.14	0.11	0.01	0.03	0.06
FEB	0.03	0.08	0.02	0.04	0.03	0.07	0.00	0.05	0.12
MAR	0.57	0.95	1.10	1.12	0.34	0.42	0.87	1.02	1.00
APR	0.15	0.23	0.22	0.15	0.15	0.16	0.31	0.20	0.22
MAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
JUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
JUL	0.05	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00
AUG	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEP	0.94	0.32	0.33	0.11	0.47	0.74	0.77	0.17	0.35
WY Total	**7.29**	**8.17**	**7.89**	**7.40**	**5.55**	**6.55**	**8.43**	**9.29**	**8.19**

APPENDIX C

Groundwater Level and Groundwater Storage Monitoring Well Network

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Table C-1 – Groundwater Level and Groundwater Storage Monitoring Well Network

Well ID (alt ID)	Well Depth (feet)	Screen Interval(s) (feet bls)	Reference Point Elevation (feet AMSL)	First Year of Data	Last Year of Data	Years Measured	Number of Measurement	Aquifer
18MW-0191[1]	50	10-50	672 (LSE)	2018	2018	<1	1	Qa
25S/12E-16K05 (PASO-0345)	350	300-310, 330-340	669.8	1992	2019	27	56	PR
25S/12E-26L01 (PASO-0205)	400	200-400	719.72	1970	2019	49	107	PR
25S/13E-08L02 (PASO-0195)	270	110-270	1,033.81	2012	2019	7	15	PR
26S/12E-14G01 (PASO-0048)	740	---	789.3	1969	2019	50	121	PR
26S/12E-14G02 (PASO-0017)	840	640-840	787	1993	2019	26	28	PR
26S/12E-14H01 (PASO-0184)	1230	180-?	790	1969	2019	50	48	PR
26S/12E-14K01 (PASO-0238)	1100	---	786	1979	2019	40	84	PR
26S/12E-26E07 (PASO-0124)	400	---	835	1958	2018	60	131	PR
26S/13E-08M01 (PASO-0164)	400	260-400	827.92	2013	2019	6	16	PR
26S/13E-16N01 (PASO-0282)	400	200-400	890.17	2012	2019	7	16	PR
26S/15E-19E01 (PASO-0073)	512	223-512	1,020	1987	2019	32	56	PR
26S/15E-20B04 (PASO-0401)	461	297-461	1,036.36	1984	2019	35	71	PR
26S/15E-29N01 (PASO-0226)	350	---	1,135	1958	2019	61	127	PR
26S/15E-29R01 (PASO-0406)	600	180-600	1,109.5	2012	2019	7	12	PR
26S/15E-30J01 (PASO-0393)	605	195-605	1,123.3	1970	2019	49	83	PR
27S/12E-13N01 (PASO-0223)	295	195-295	972.42	2012	2019	7	15	PR
27S/13E-28F01 (PASO-0243)	230	118-212	1,072	1969	2019	50	108	PR
27S/13E-30F01 (PASO-0355)	310	200-310	1,043.2	2012	2019	7	14	PR
27S/13E-30J01 (PASO-0423)	685	225-685	1,095	2012	2019	7	10	PR
27S/13E-30N01 (PASO-0086)	355	215-235, 275-355	1,086.73	2012	2016	4	6	PR
27S/14E-11R01 (PASO-0392)	630	180-630	1,160.5	1974	2019	45	75	PR
28S/13E-01B01 (PASO-0066)	254	154-254	1,099.93	2012	2019	7	17	PR

NOTES: New alluvial monitoring well information provided by City of Paso Robles; well not included in County database.

"—" = unknown; AMSL – above mean sea level; PR Paso Robles Formation Aquifer; Qa Alluvial Aquifer

APPENDIX D

Potential Future Groundwater Monitoring Wells

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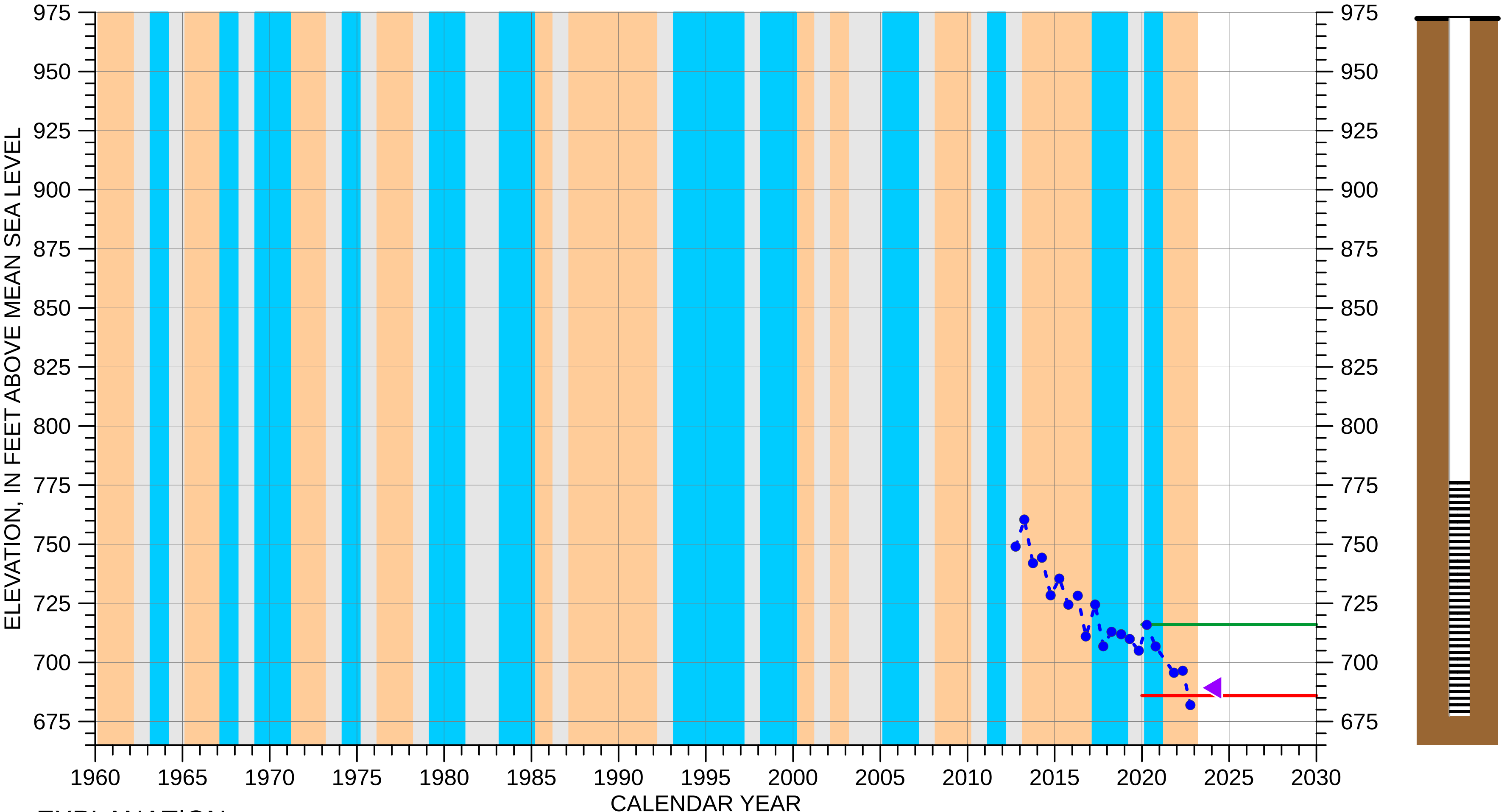
Table D-1 – Potential Future Groundwater Monitoring Wells

Well ID (alt ID)	Well Depth (feet)	Screen Interval(s) (feet bls)	Reference Point Elevation (feet AMSL)	First Year of Data	Last Year of Data	Years Measured (years)	Number of Measurements	Aquifer
25S/12E-20K03 (PASO-0304)	---	---	625	1974	2019	45	86	---
26S/14E-24B01 (PASO-0302)	---	---	1001	1962	2019	57	99	---
26S/15E-33C01 (PASO-0314)	---	---	1095	1973	2019	46	80	---
26S/15E-33Q01 (PASO-0381)	---	---	1102	1973	2019	46	82	---
27S/15E-03E01 (PASO-0277)	---	---	1120.8	1968	2019	51	109	---
27S/14E-24B01 (PASO-0391)	---	---	1180.5	1973	2019	46	74	---
27S/14E-25J01 (PASO-0074)	---	---	1,225.5	1972	2019	47	72	--
27S/14E-29G01 (PASO-0041)	---	---	1201.5	1974	2019	45	78	---
27S/15E-35F01 (PASO-0053)	---	---	1230	1965	2019	54	82	---

NOTES: "—" = unknown

APPENDIX E
Hydrographs

Paso Robles Formation Aquifer Hydrographs



EXPLANATION

Groundwater Elevation

Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

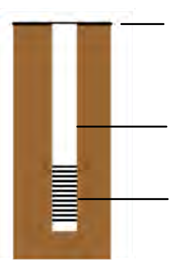
Minimum Threshold

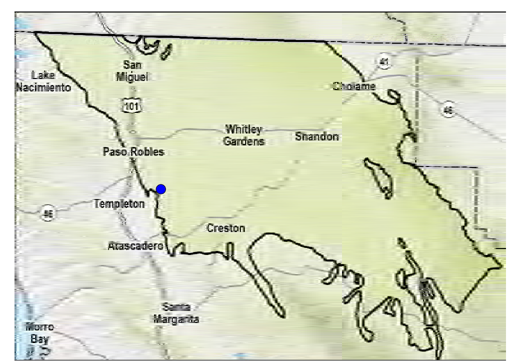
CLIMATE PERIOD CLASSIFICATION

Dry | Avg/Alternating | Wet

Well Depth: 295 feet
Screened Interval: 195-295 feet below ground surface
Reference Point Elevation: 972.4 feet above mean sea level

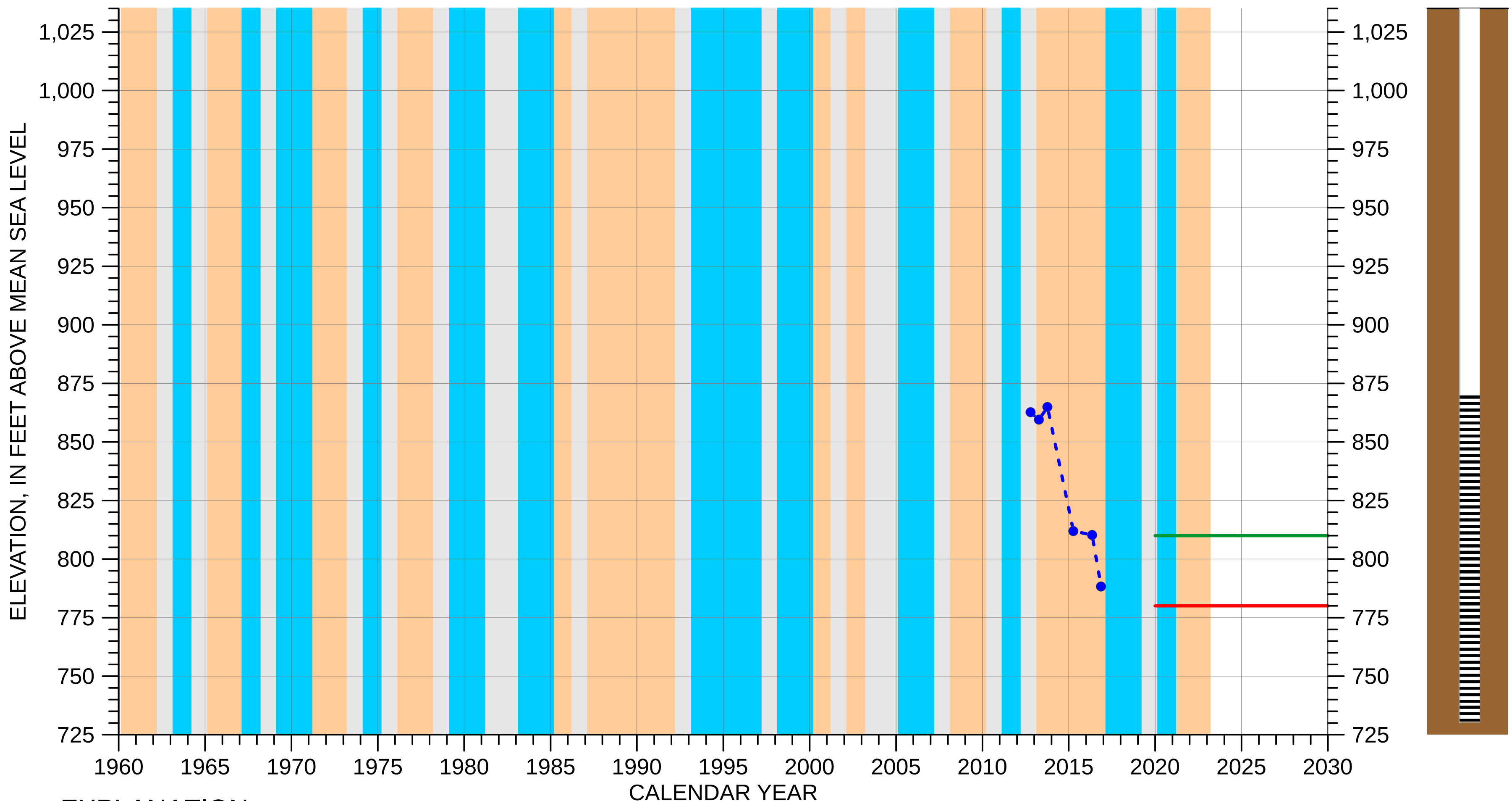
* Measurement reported as not static





HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/12E-13N01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_12E-13N01.grf



EXPLANATION

Groundwater Elevation

Measurable Objective

Measurement Not Verified*

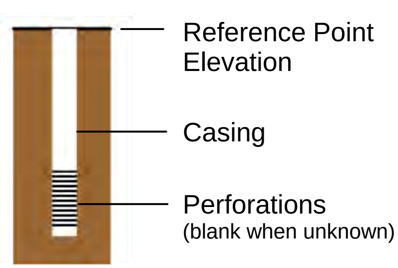
Minimum Threshold

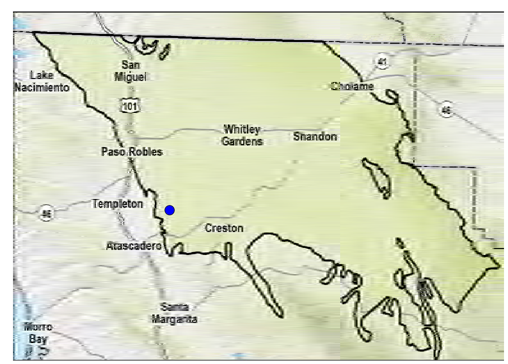
CLIMATE PERIOD CLASSIFICATION

Dry

Avg/Alternating

Wet



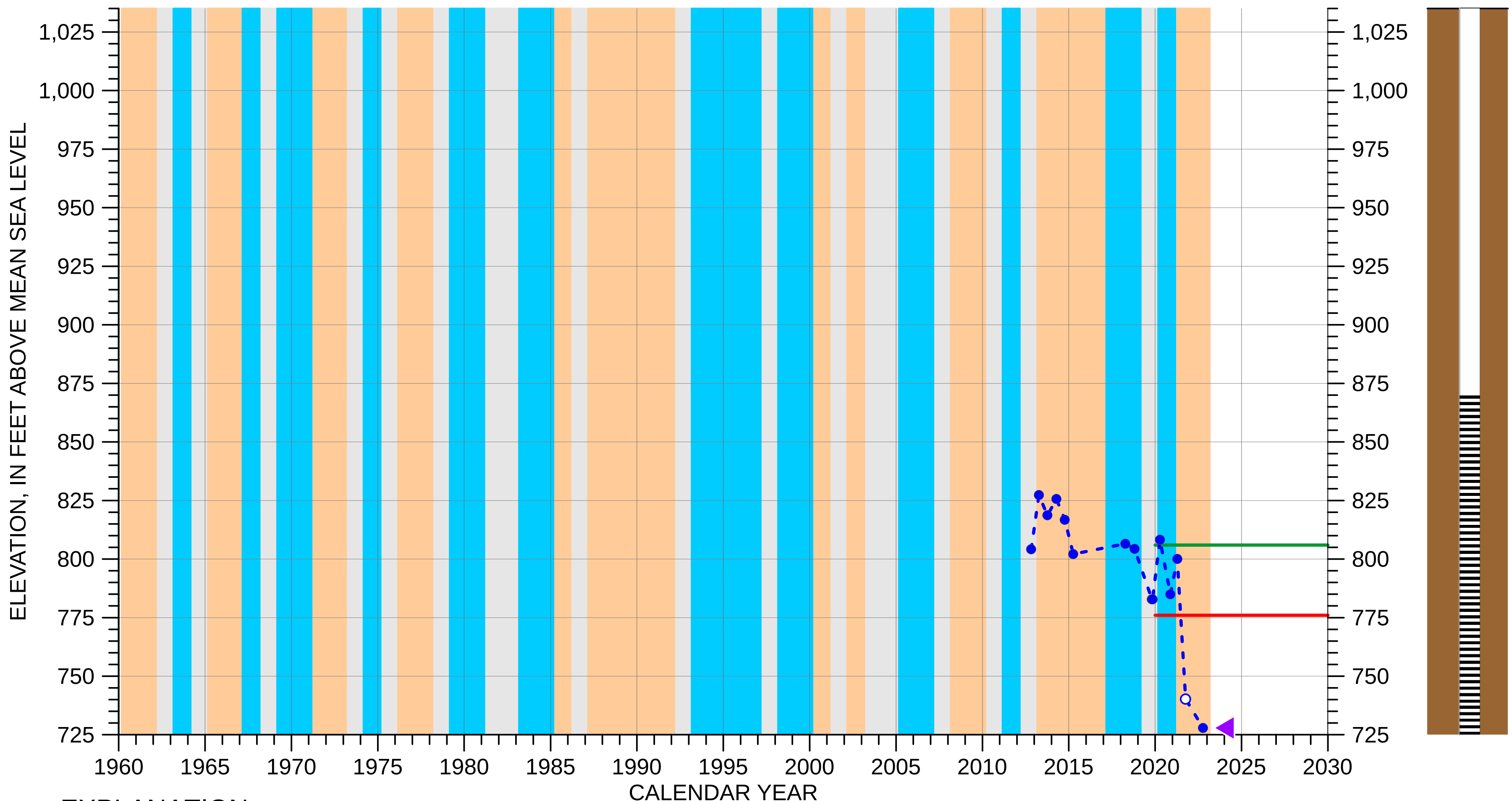


Well Depth: 355 feet
Screened Interval: 215-235, 275-355 feet below ground surface
Reference Point Elevation: 1086.7 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30N01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_13E-30N01.grf



EXPLANATION

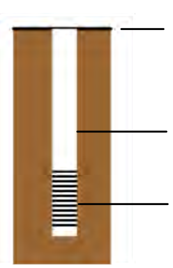
Groundwater Elevation

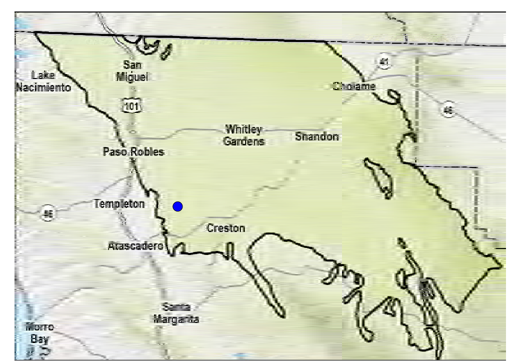
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

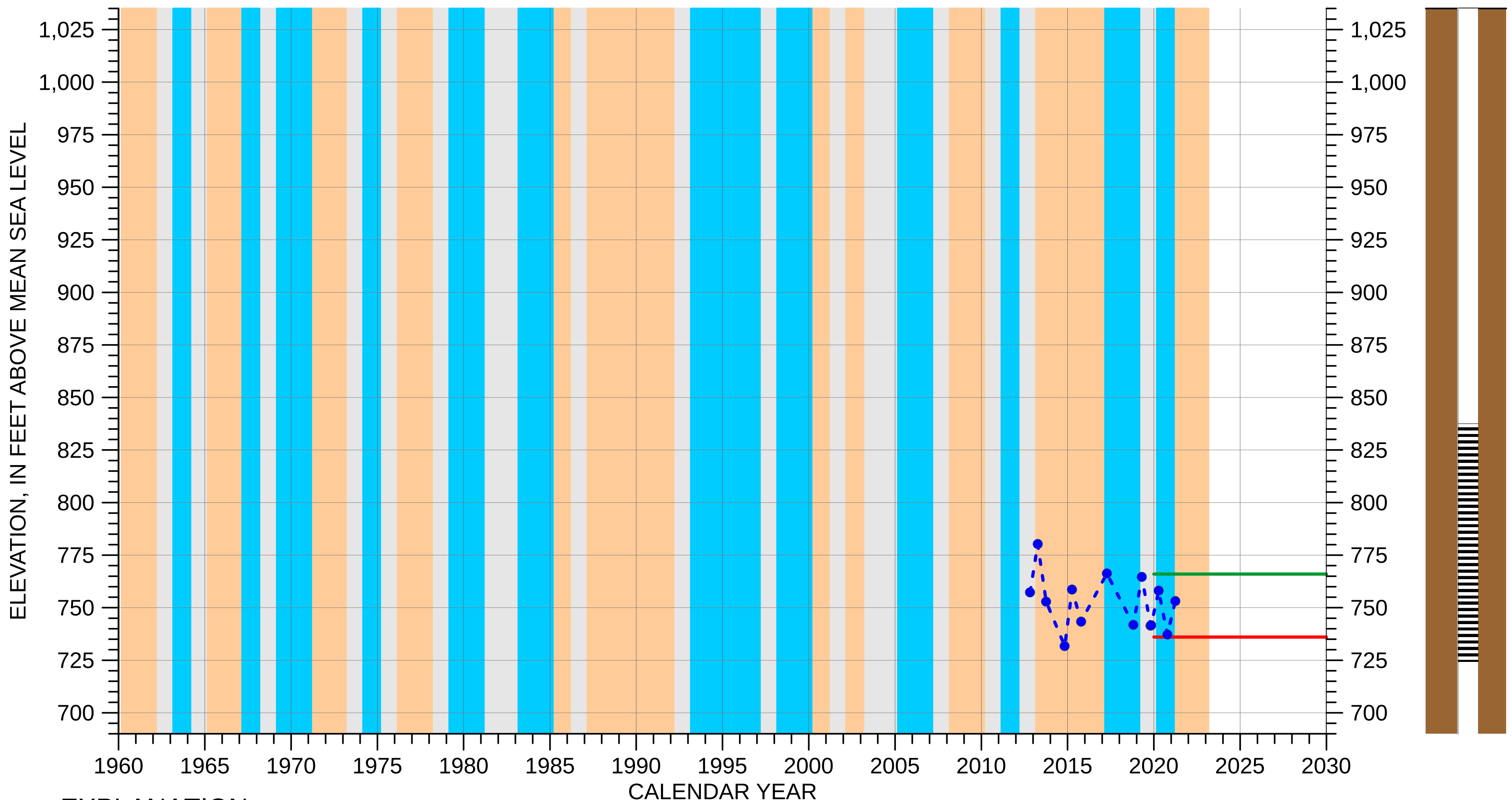
Dry Avg/Alternating Wet

Well Depth: 685 feet
Screened Interval: 225-685 feet below ground surface
Reference Point Elevation: 1095 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30J01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_13E-30J01.grf



EXPLANATION

Groundwater Elevation

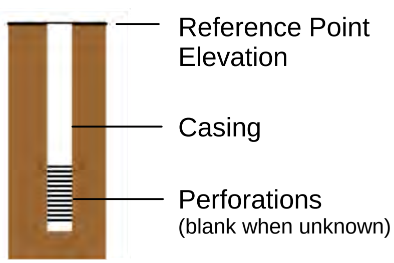
Measurement Not Verified*

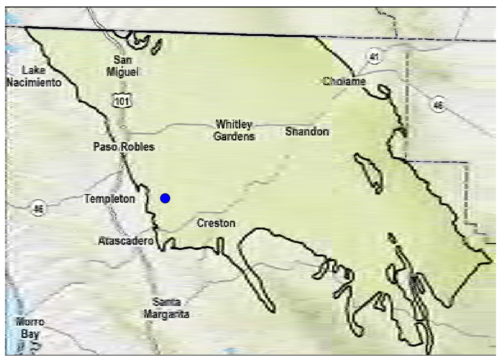
Measurable Objective

Minimum Threshold

CLIMATE PERIOD CLASSIFICATION

Dry | Avg/Alternating | Wet



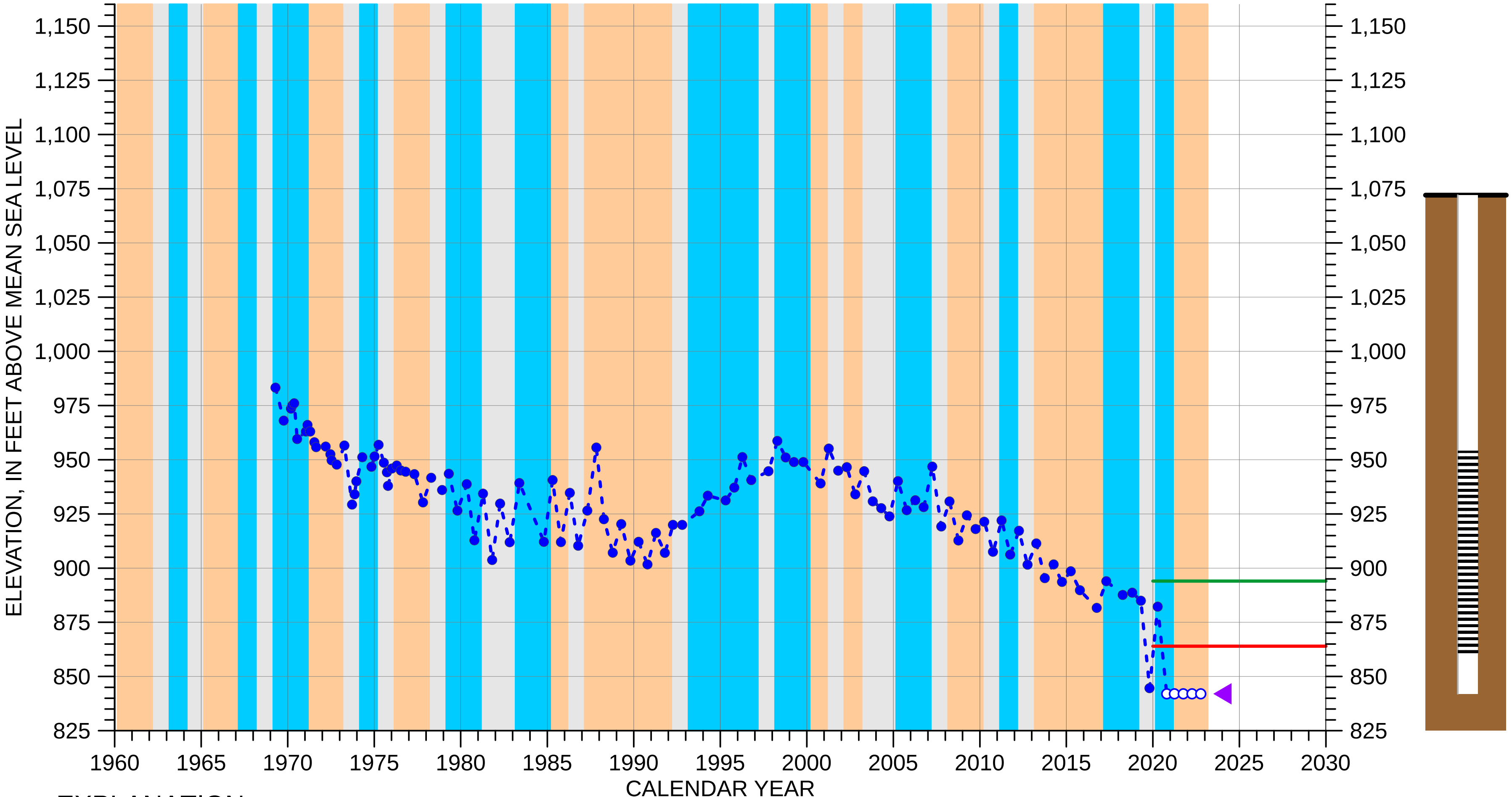


Well Depth: 310 feet
Screened Interval: 200-310 feet below ground surface
Reference Point Elevation: 1043.2 feet above mean sea level

* Measurement recorded at elevation below reported bottom of well.

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-30F01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_13E-30F01.grf



EXPLANATION

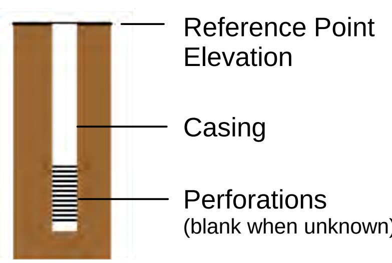
Groundwater Elevation

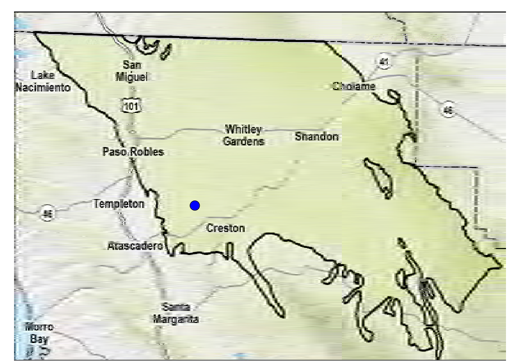
Measurement Not Verified*

Measurable Objective

Minimum Threshold

Average of spring and fall 2022 water elevations





CLIMATE PERIOD CLASSIFICATION

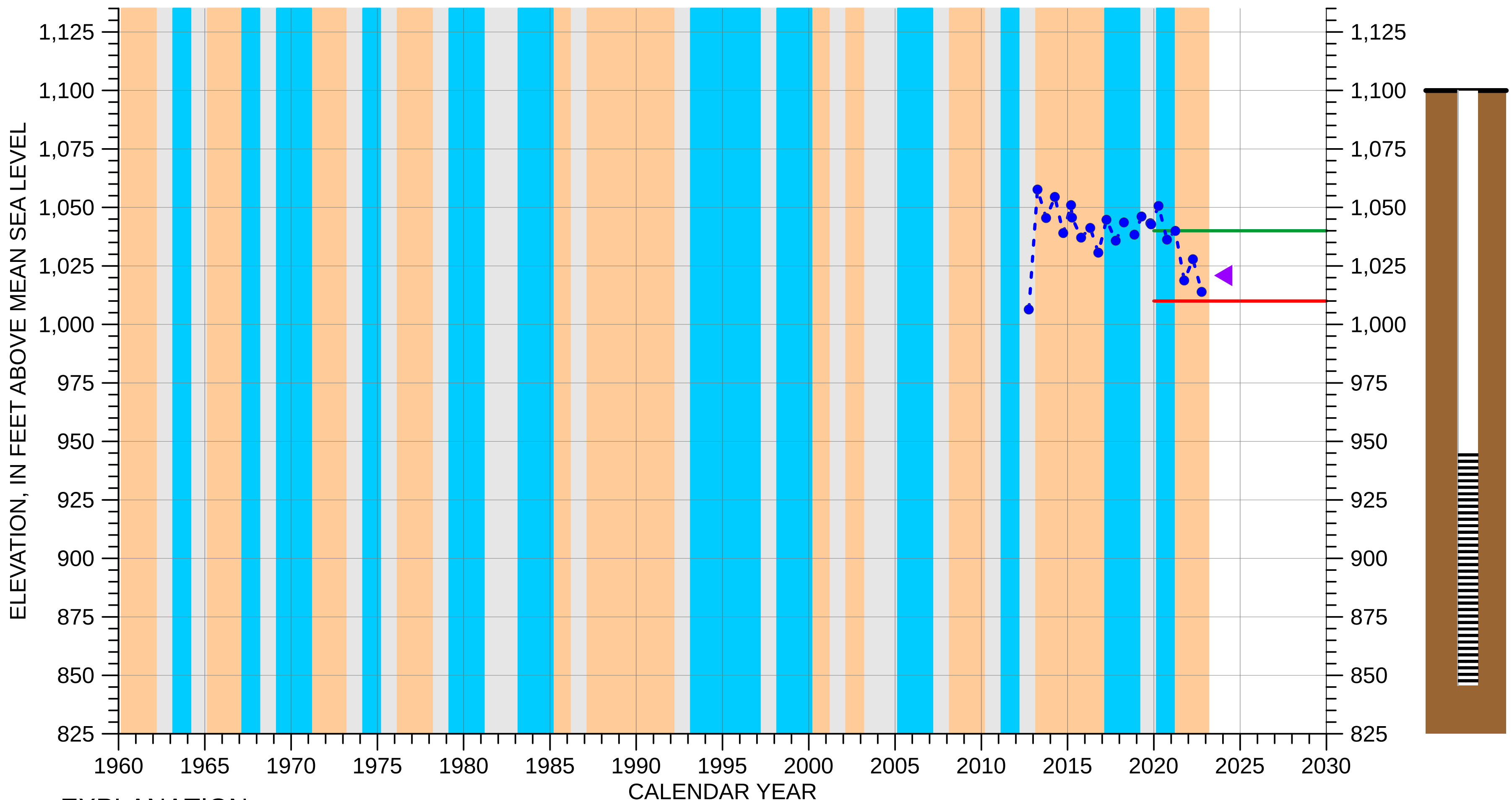
Dry Avg/Alternating Wet

Well Depth: 212 feet
Screened Interval: 118-212 feet below ground surface
Reference Point Elevation: 1072 feet above mean sea level

* Measurement recorded at bottom of well (dry well). Actual elevation may be lower.

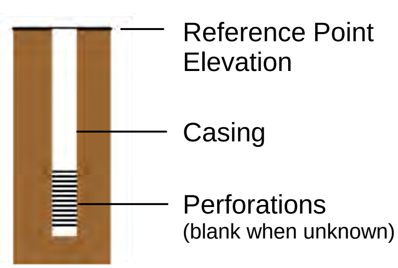
HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/13E-28F01

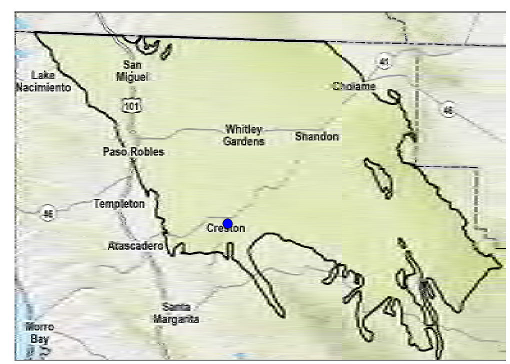
P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_13E-28F01.grf



EXPLANATION

- Groundwater Elevation
- Measurable Objective
- Average of spring and fall 2022 water elevations
- Measurement Not Verified*
- Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

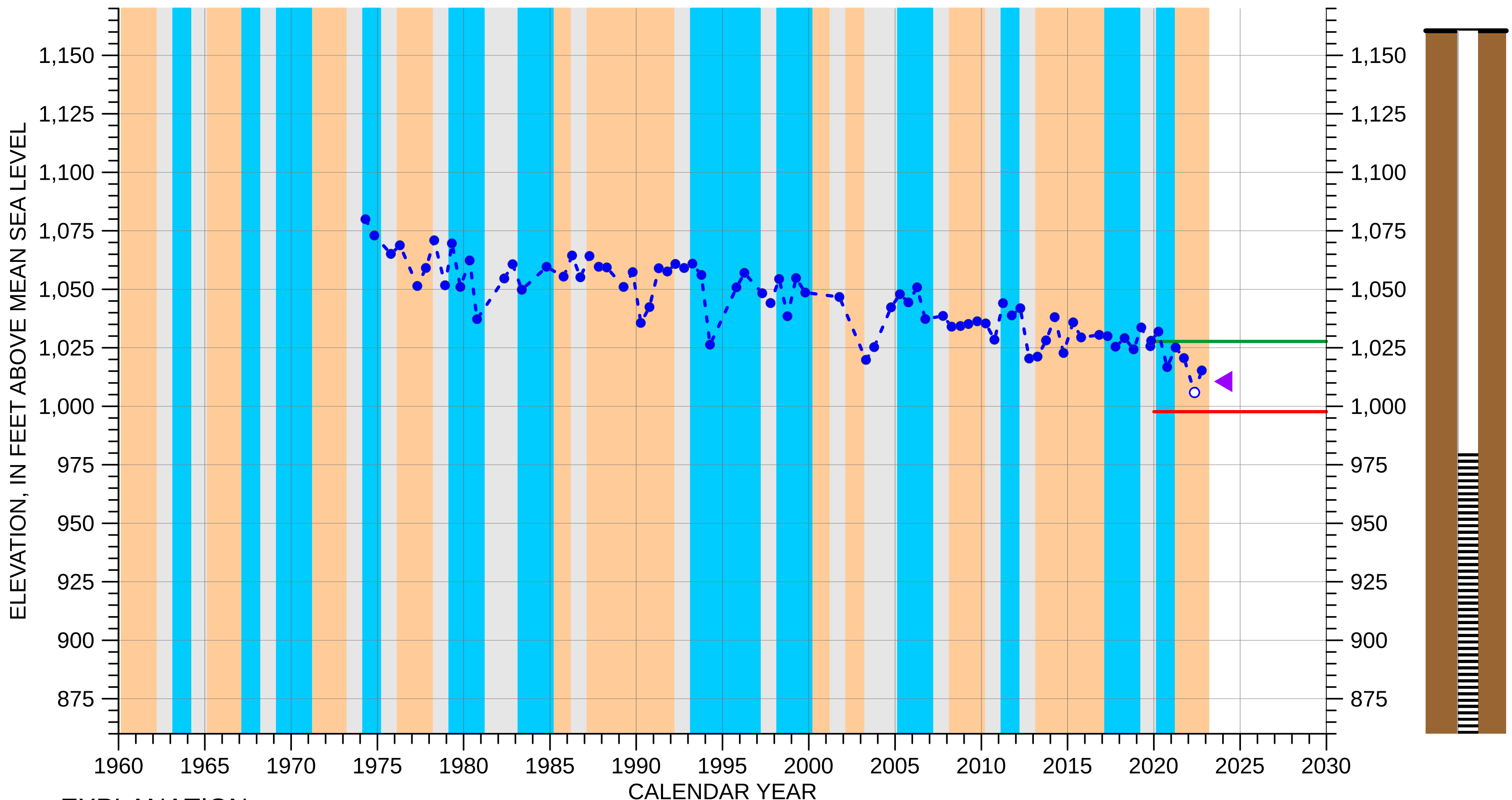
Dry | Avg/Alternating | Wet

Well Depth: 254 feet
Screened Interval: 154-254 feet below ground surface
Reference Point Elevation: 1099.9 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 28S/13E-01B01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_28S_13E-01B01.grf



EXPLANATION

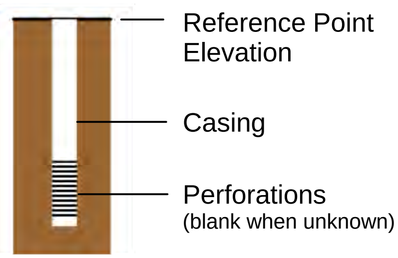
Groundwater Elevation

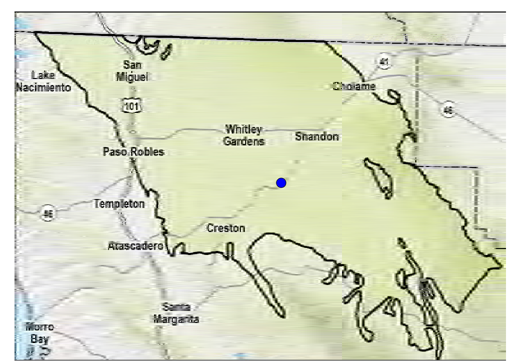
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

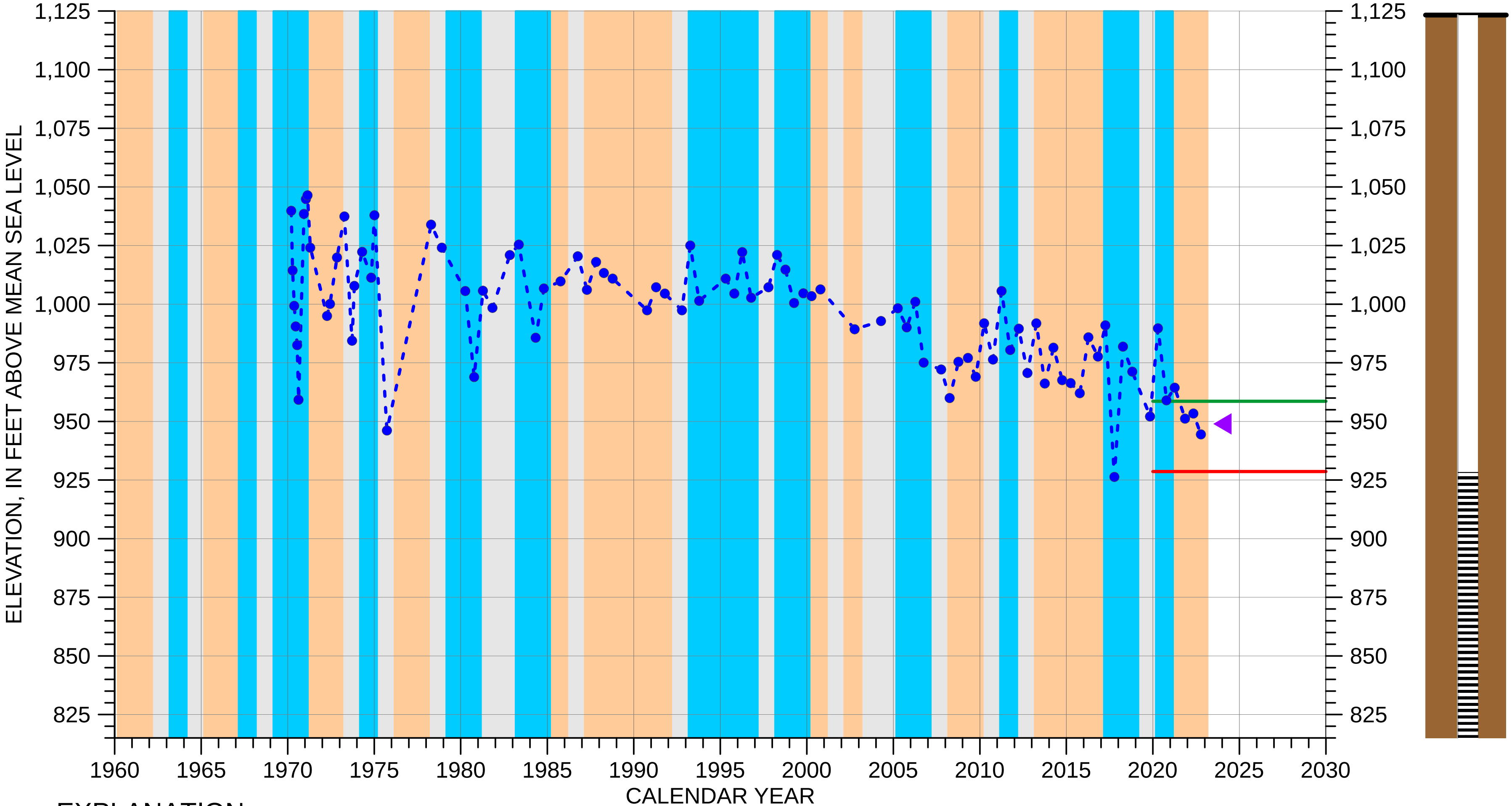
Dry | Avg/Alternating | Wet

Well Depth: 630 feet
Screened Interval: 180-630 feet below ground surface
Reference Point Elevation: 1160.5 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 27S/14E-11R01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_27S_14E-11R01.grf



EXPLANATION

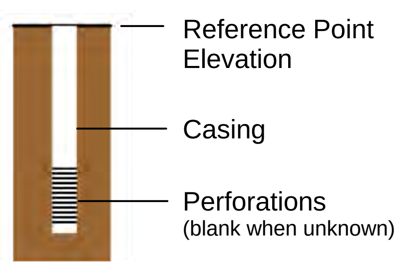
Groundwater Elevation

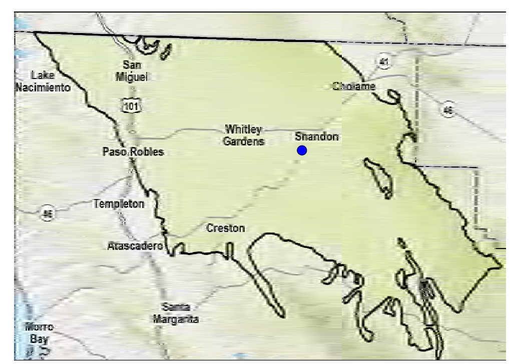
Measurement Not Verified*

Measurable Objective

Minimum Threshold

Average of spring and fall 2022 water elevations





CLIMATE PERIOD CLASSIFICATION

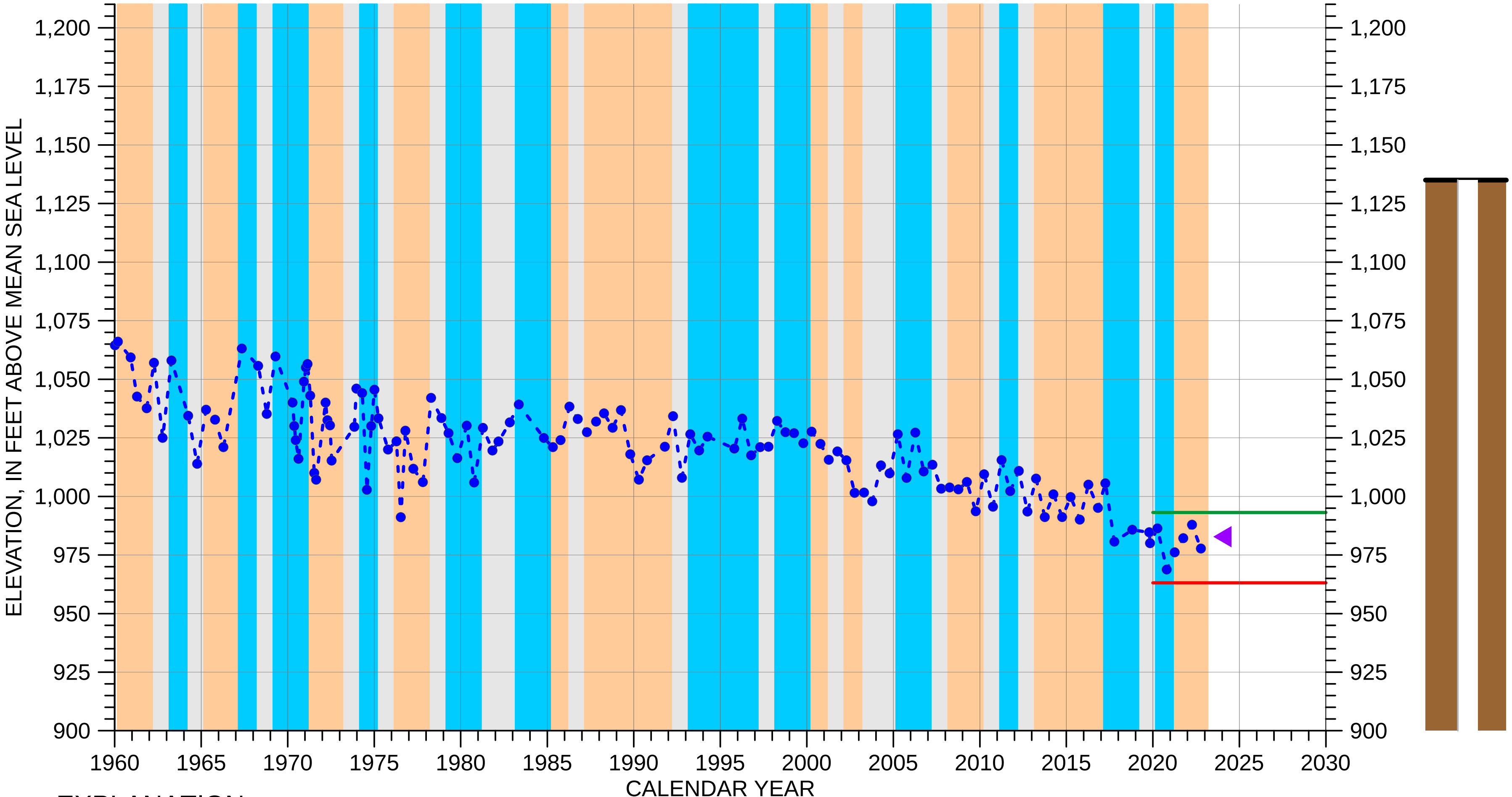
Dry | Avg/Alternating | Wet

Well Depth: 605 feet
Screened Interval: 195-605 feet below ground surface
Reference Point Elevation: 1123.3 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-30J01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_15E-30J01.grf



EXPLANATION

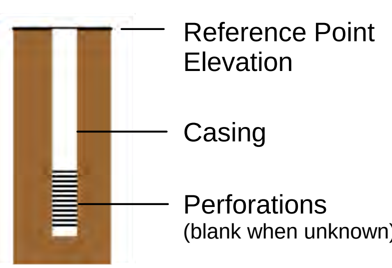
Groundwater Elevation

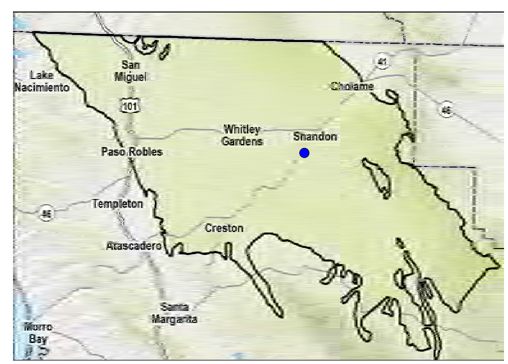
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

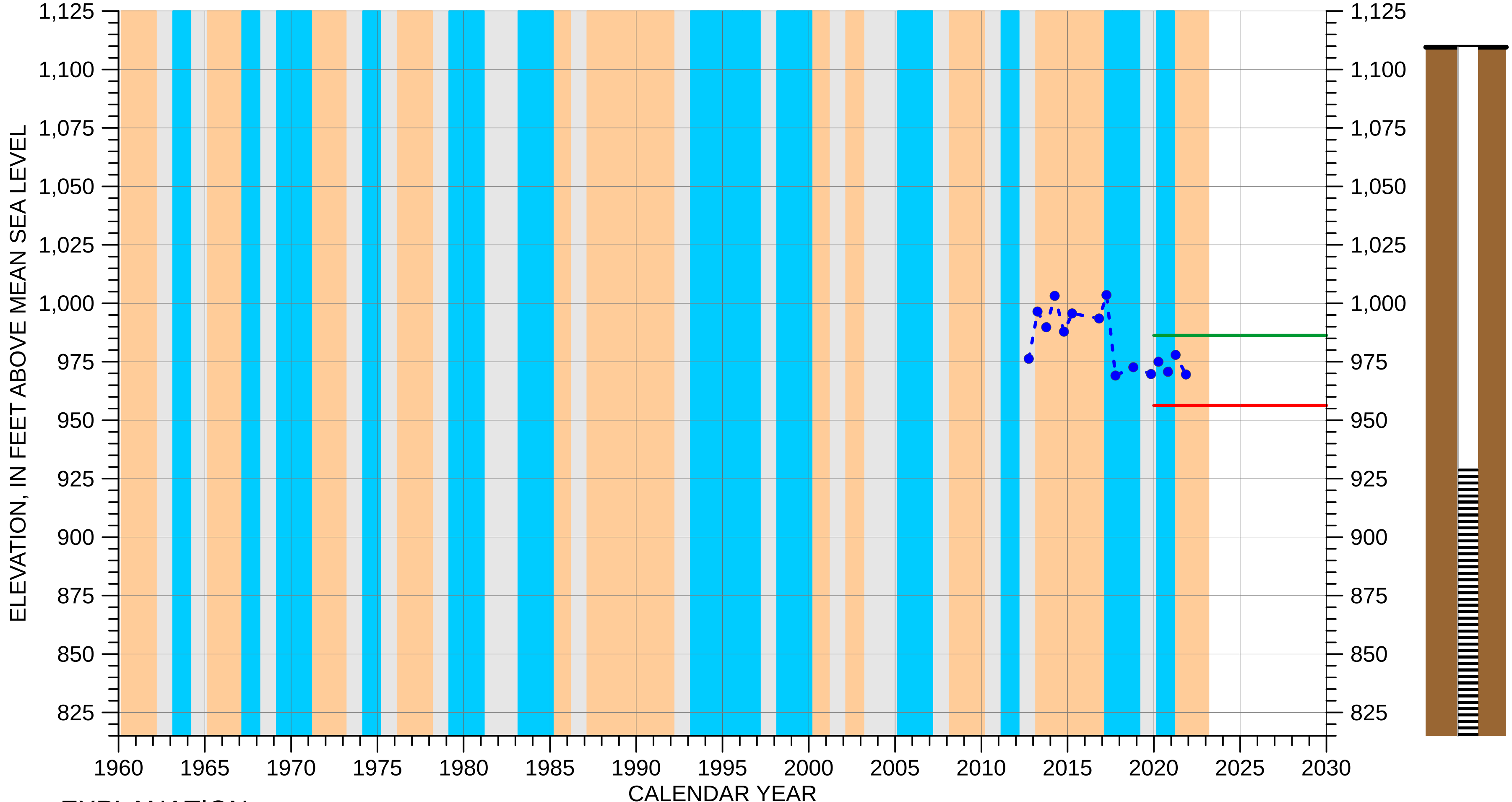
Dry | Avg/Alternating | Wet

Well Depth: 350 feet
Screened Interval: unknown
Reference Point Elevation: 1135 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-29N01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_15E-29N01.grf



EXPLANATION

Groundwater Elevation

Measurement Not Verified*

Measurable Objective

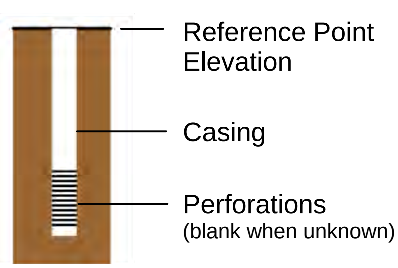
Minimum Threshold

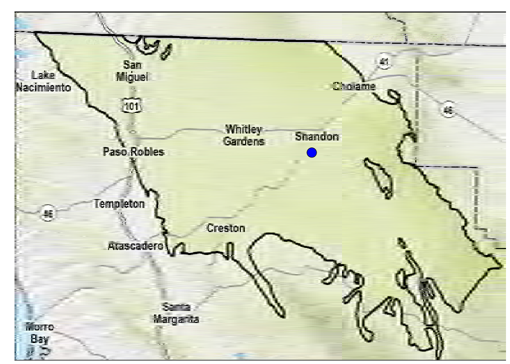
CLIMATE PERIOD CLASSIFICATION

Dry

Avg/Alternating

Wet



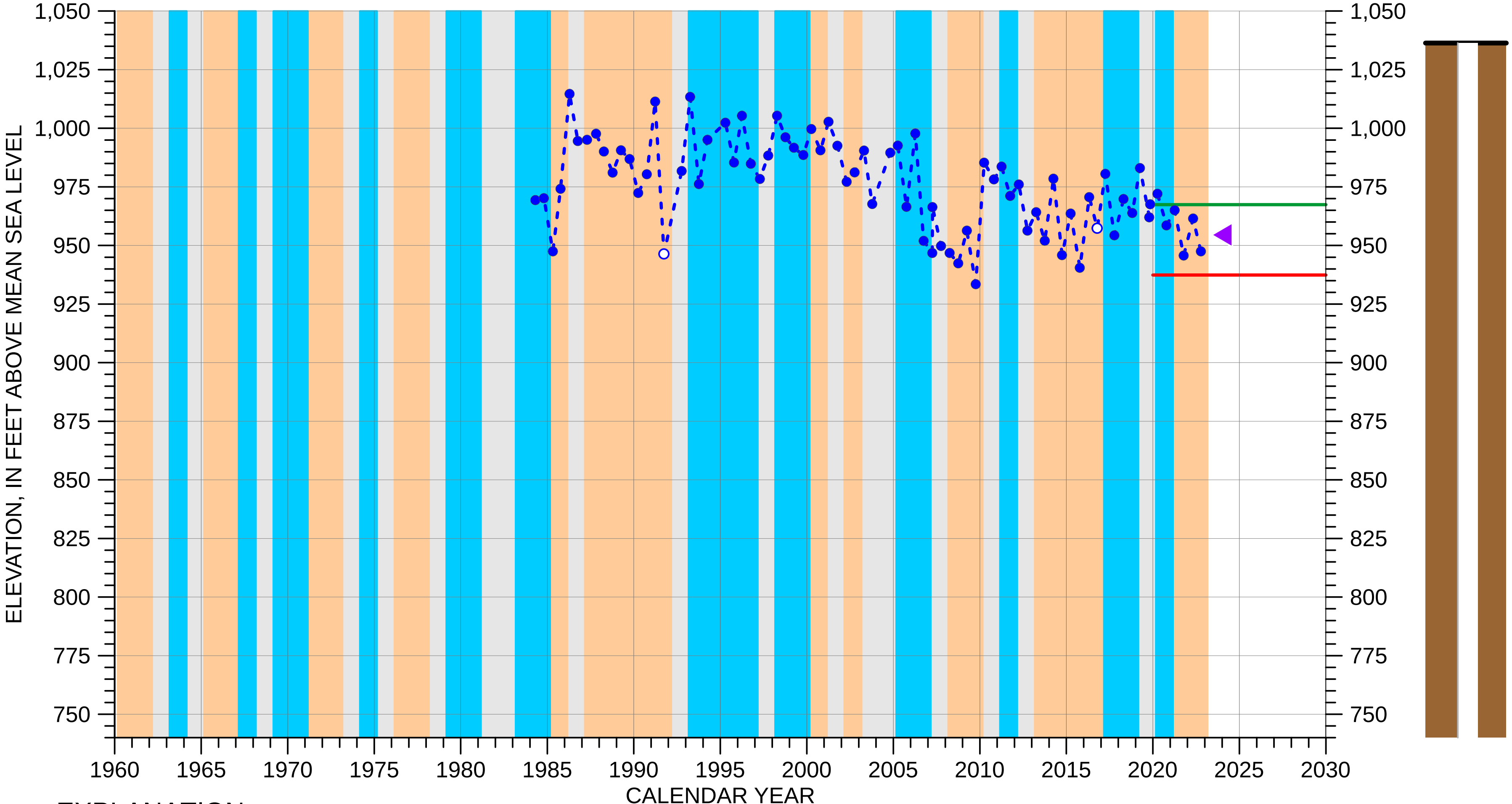


Well Depth: 600 feet
Screened Interval: 180-600 feet below ground surface
Reference Point Elevation: 1109.5 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-29R01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_15E-29R01.grf



EXPLANATION

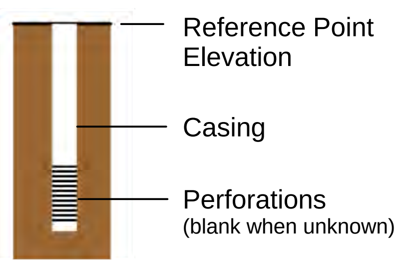
Groundwater Elevation

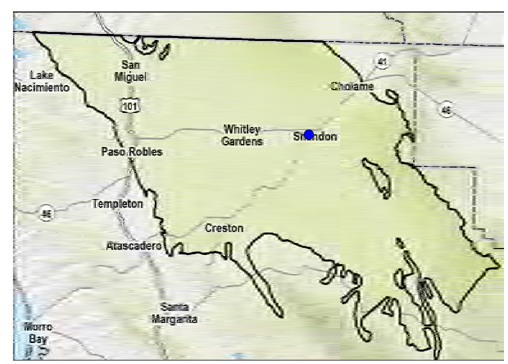
Measurement Not Verified*

Measurable Objective

Minimum Threshold

Average of spring and fall 2022 water elevations





CLIMATE PERIOD CLASSIFICATION

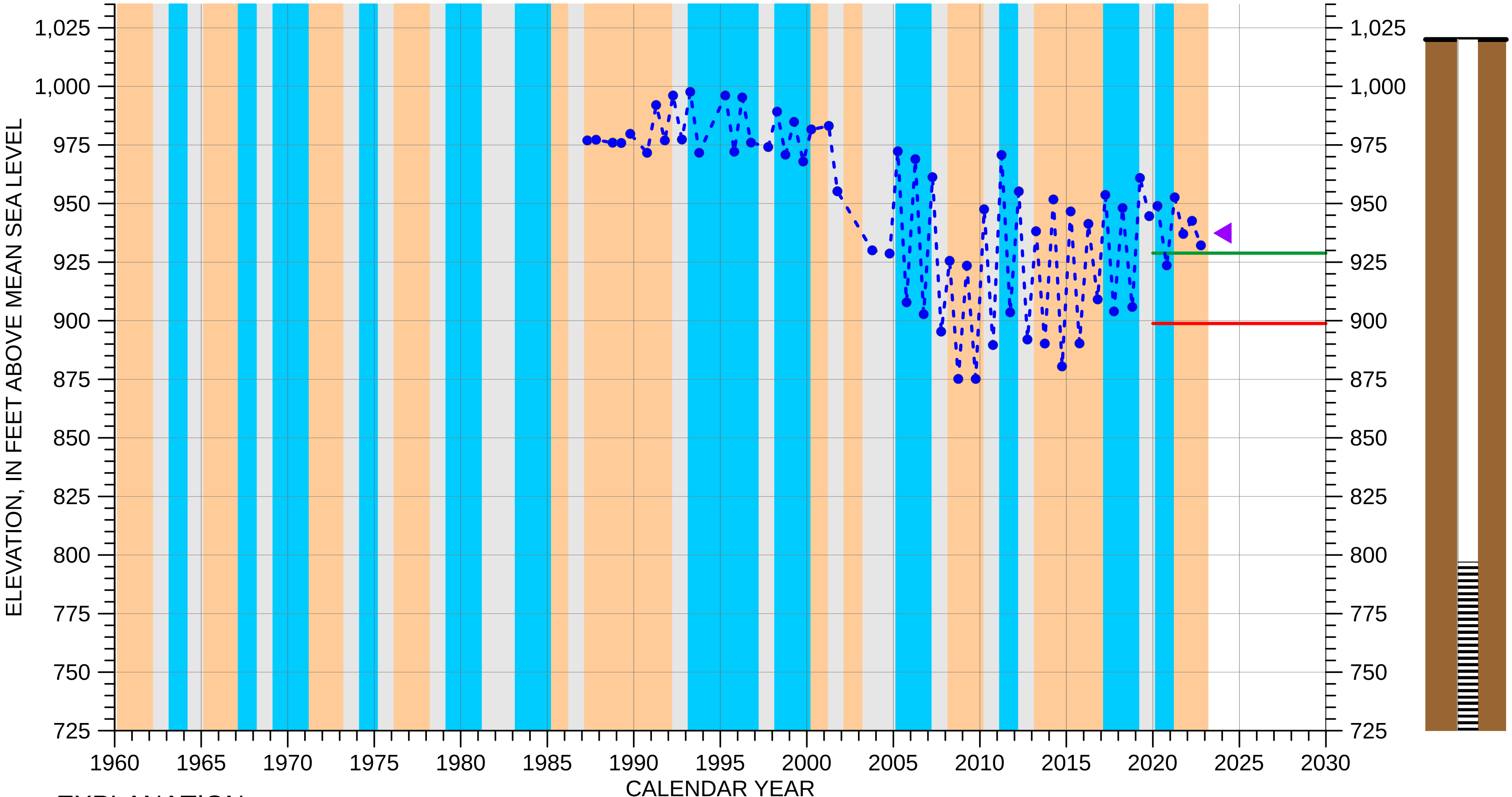
Dry | Avg/Alternating | Wet

Well Depth: 461 feet
Screened Interval: 297-461 feet below ground surface
Reference Point Elevation: 1036.36 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-20B04

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_15E-20B04.grf



EXPLANATION

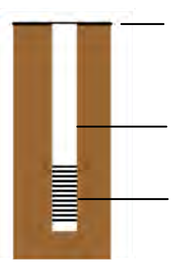
Groundwater Elevation

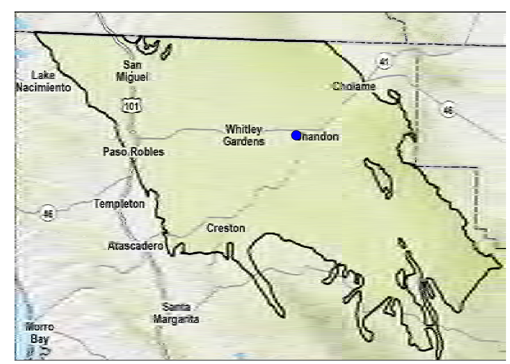
Measurement Not Verified*

Measurable Objective

Minimum Threshold

Average of spring and fall 2022 water elevations





CLIMATE PERIOD CLASSIFICATION

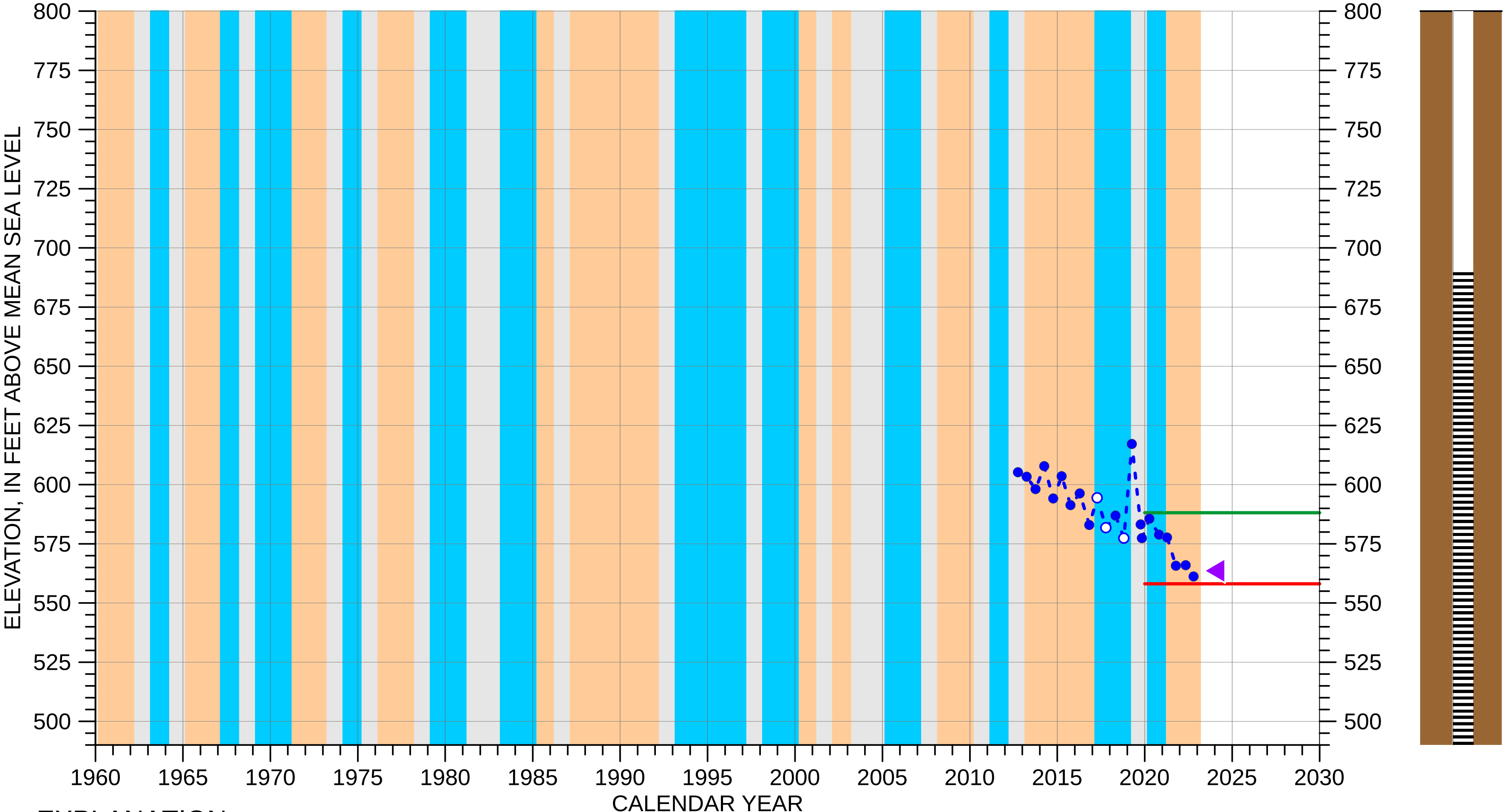
Dry | Avg/Alternating | Wet

Well Depth: 512 feet
Screened Interval: 223-512 feet below ground surface
Reference Point Elevation: 1020 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/15E-19E01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_15E-19E01.grf



EXPLANATION

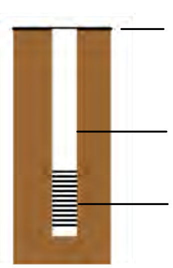
Groundwater Elevation

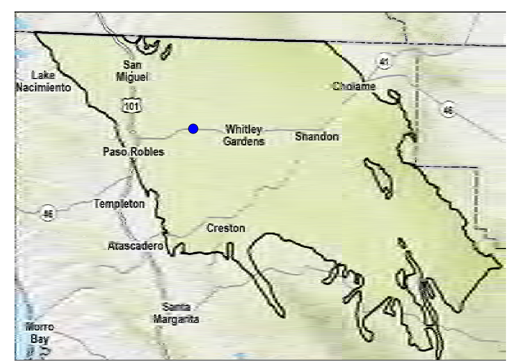
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

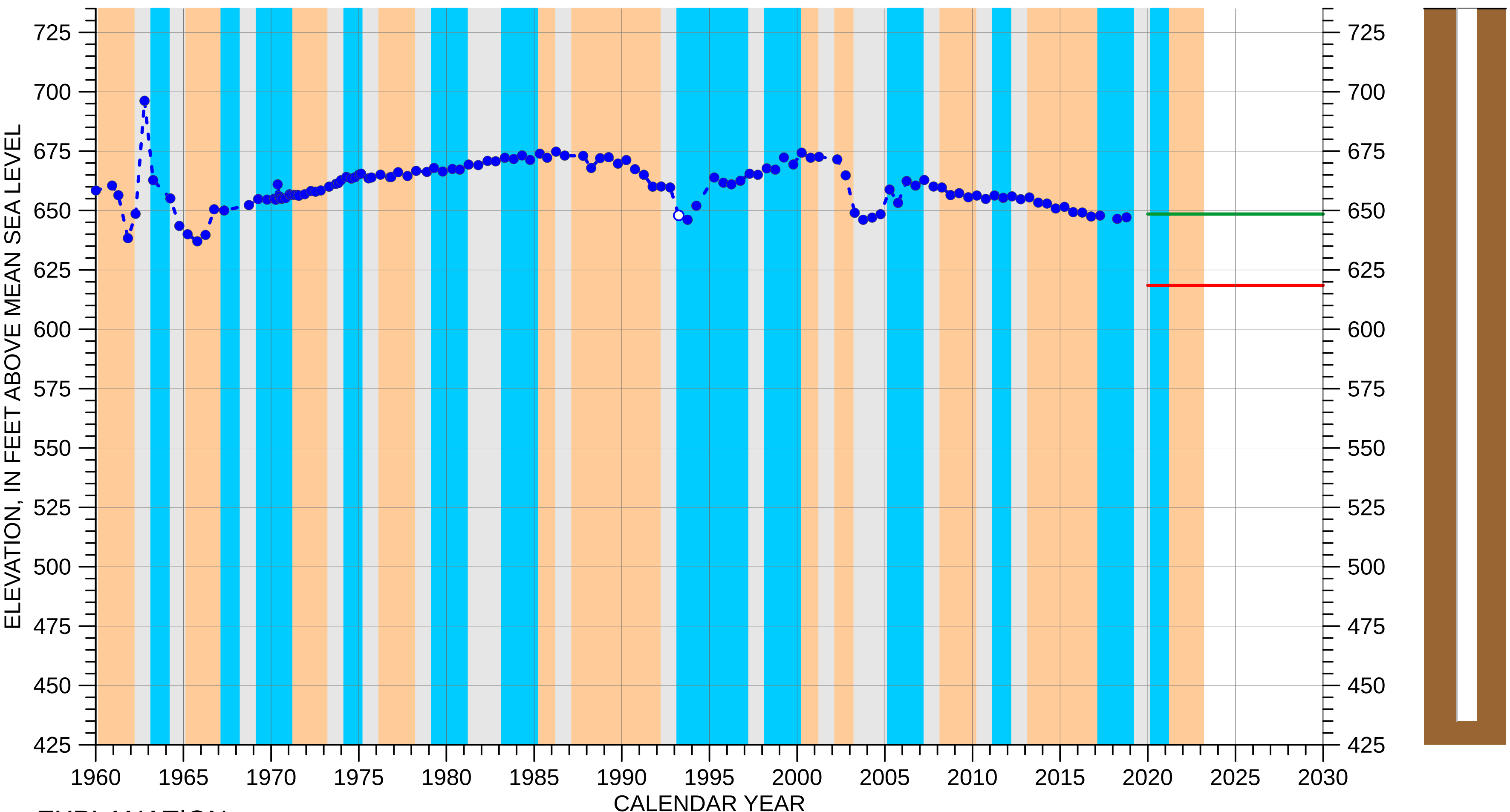
Dry | Avg/Alternating | Wet

Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 890.2 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/13E-16N01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_13E-16N01.grf



EXPLANATION

Groundwater Elevation

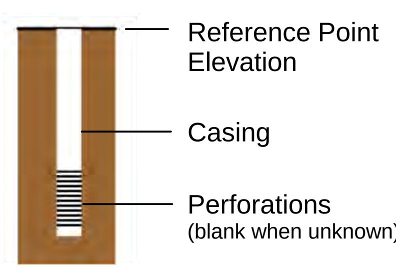
Measurable Objective

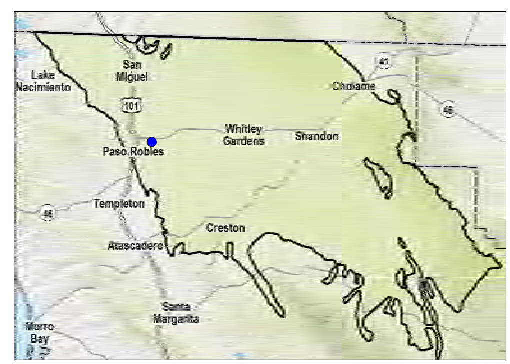
Measurement Not Verified*

Minimum Threshold

CLIMATE PERIOD CLASSIFICATION

Dry | Avg/Alternating | Wet



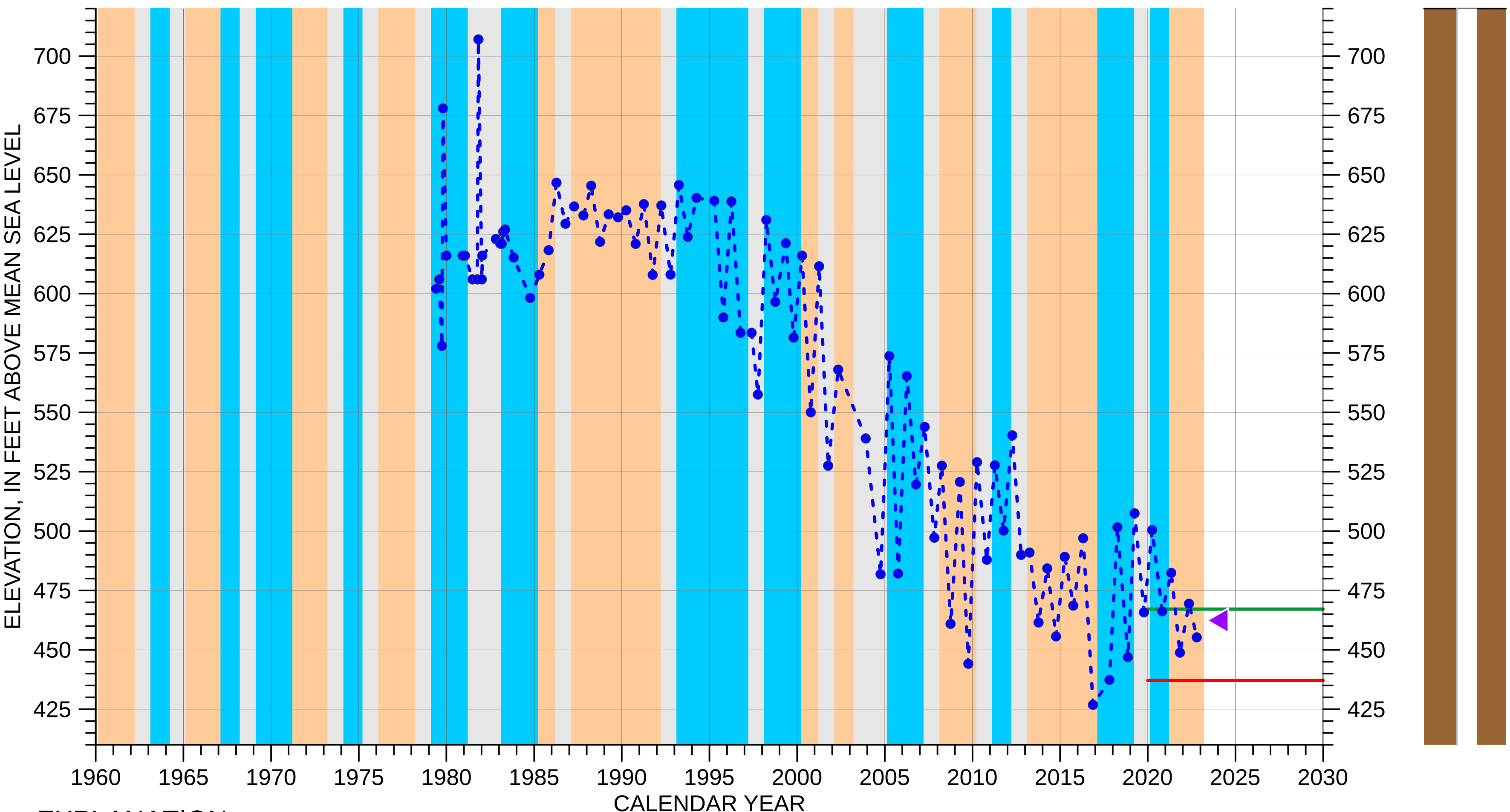


Well Depth: 400 feet
Screened Interval: unknown
Reference Point Elevation: 835 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-26E07

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_12E-26E07.grf



EXPLANATION

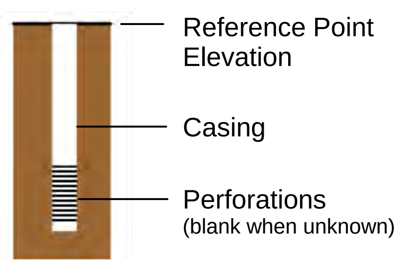
Groundwater Elevation

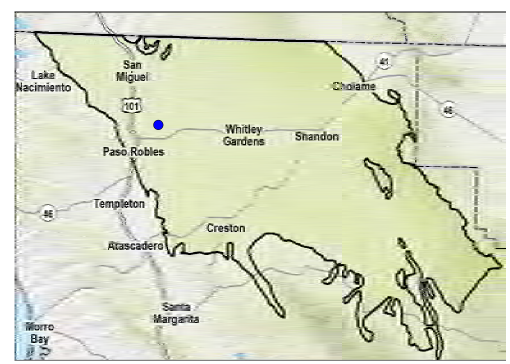
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

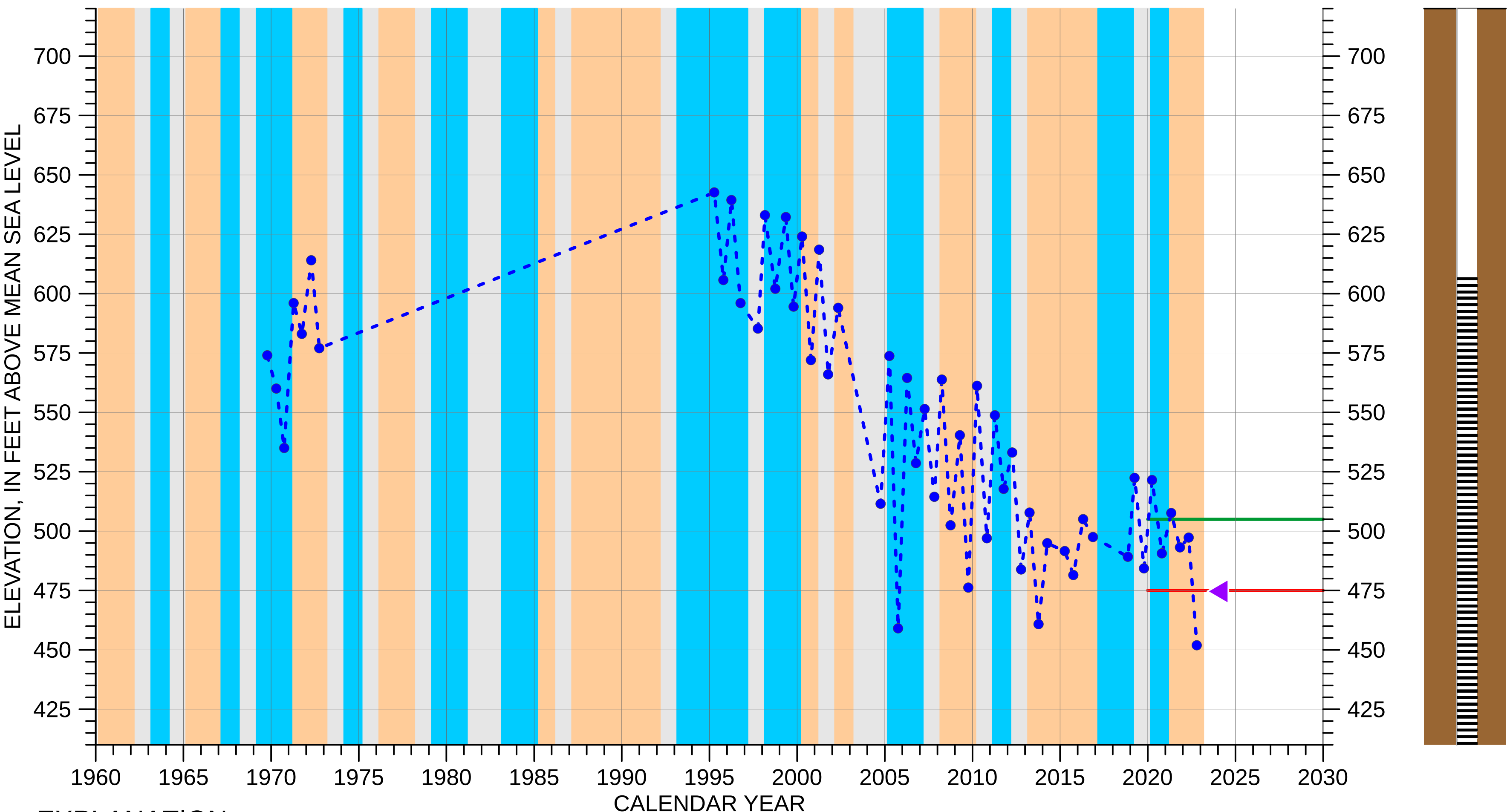
Dry Avg/Alternating Wet

Well Depth: 1100 feet
Screened Interval: unknown
Reference Point Elevation: 786 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14K01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_12E-14K01.grf



EXPLANATION

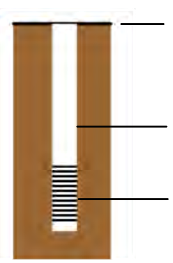
Groundwater Elevation

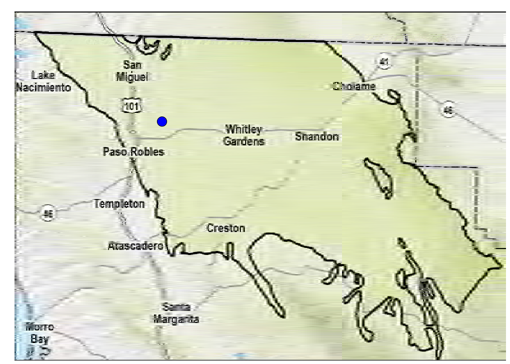
Measurement Not Verified*

Measurable Objective

Minimum Threshold

Average of spring and fall 2022 water elevations





CLIMATE PERIOD CLASSIFICATION

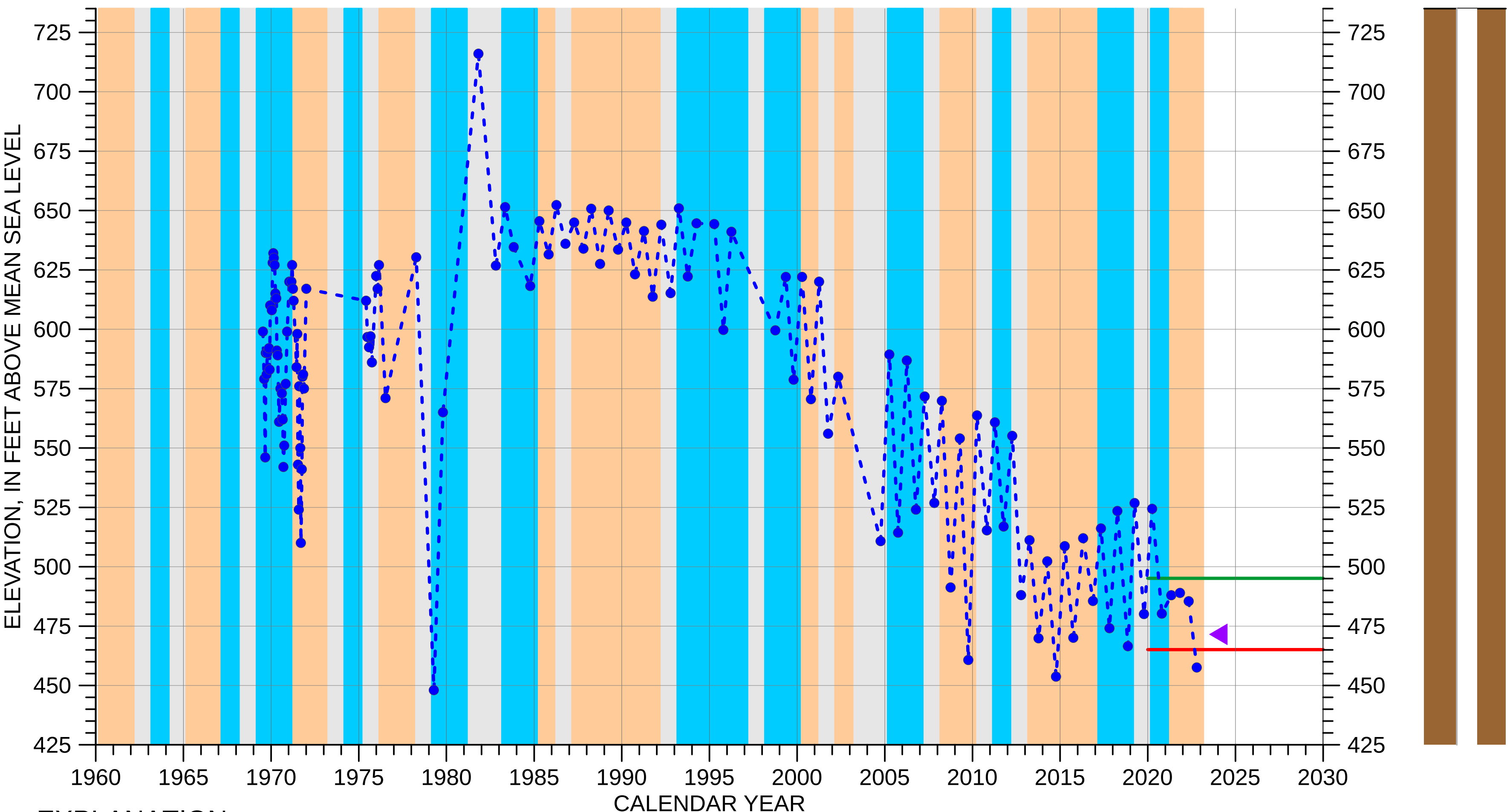
Dry Avg/Alternating Wet

Well Depth: 1230 feet
Screened Interval: 180-1230 feet below ground surface
Reference Point Elevation: 790 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14H01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_12E-14H01.grf



EXPLANATION

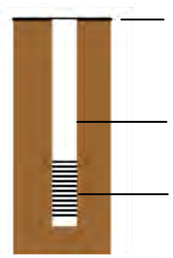
Groundwater Elevation

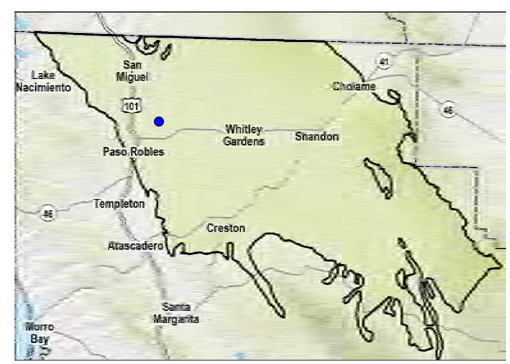
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

Dry

Avg/Alternating

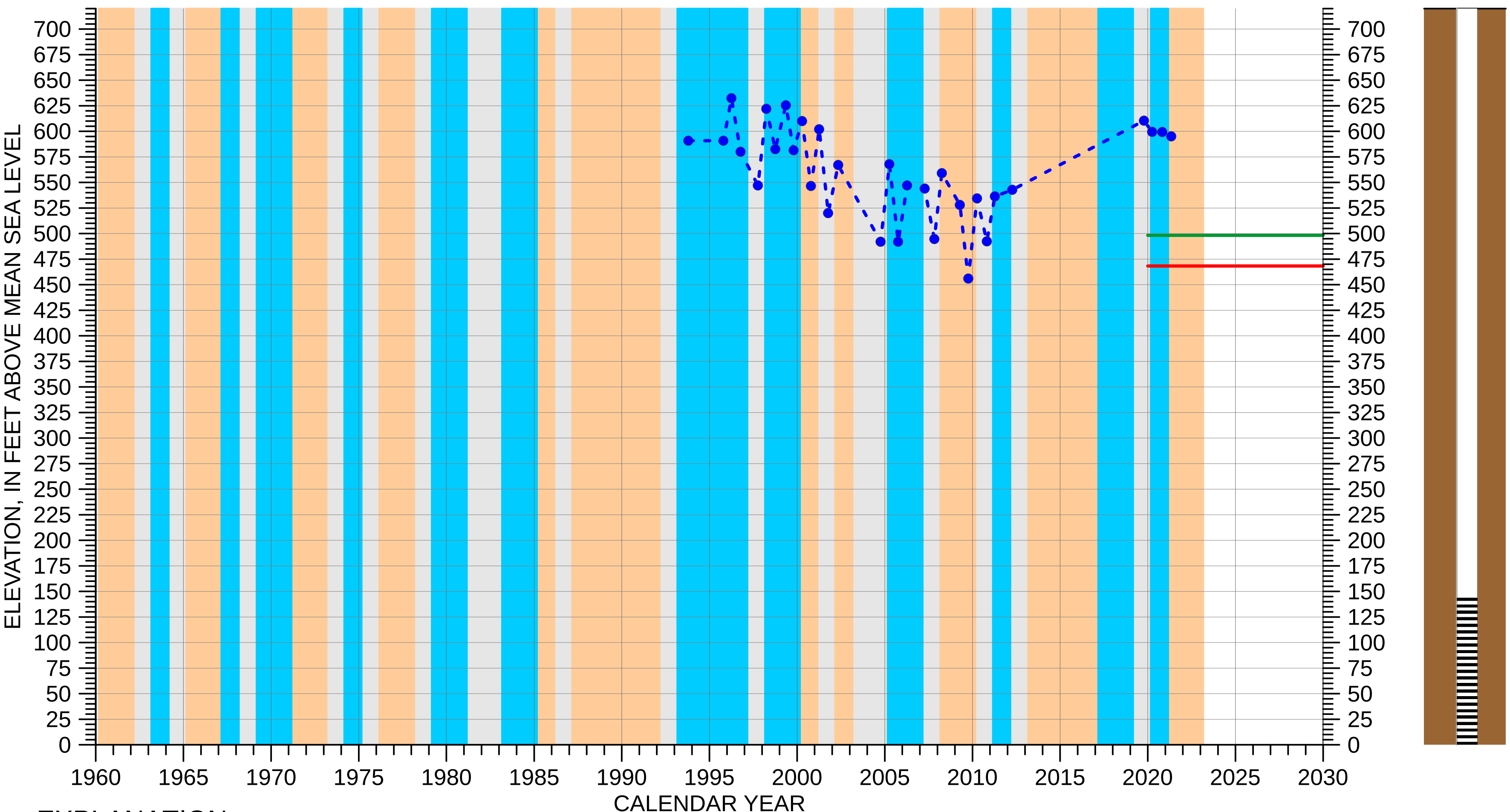
Wet

Well Depth: 740 feet
Screened Interval: unknown
Reference Point Elevation: 789.3 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14G01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_12E-14G01.grf



EXPLANATION

Groundwater Elevation

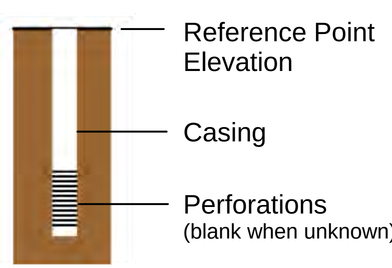
Measurement Not Verified*

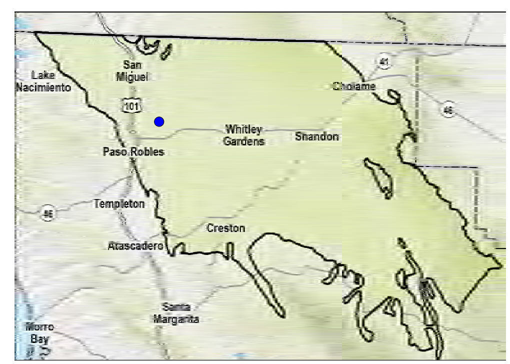
Measurable Objective

Minimum Threshold

CLIMATE PERIOD CLASSIFICATION

Dry | Avg/Alternating | Wet



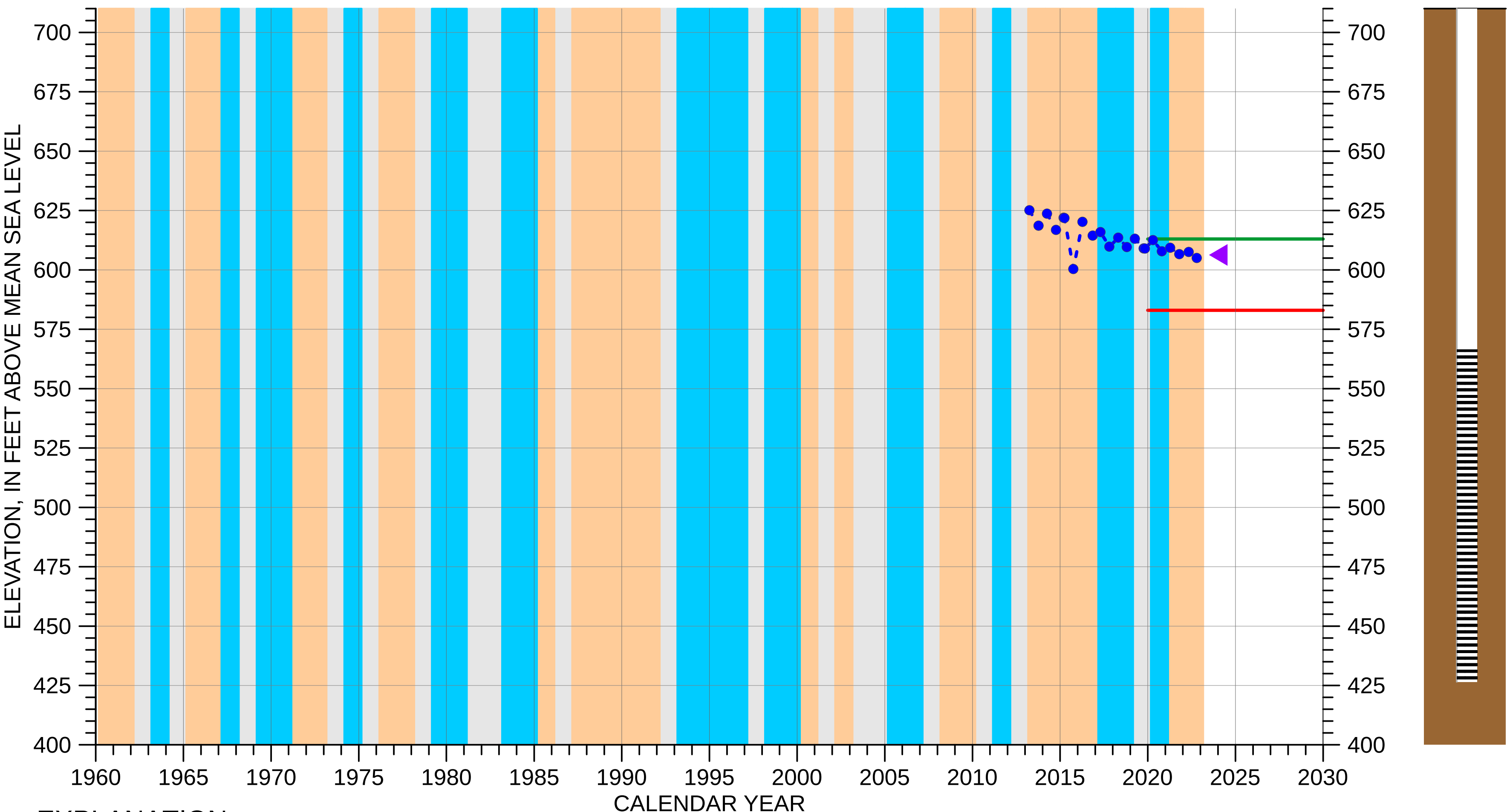


Well Depth: 840 feet
Screened Interval: 640-840 feet below ground surface
Reference Point Elevation: 787 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/12E-14G02

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_12E-14G02.grf



EXPLANATION

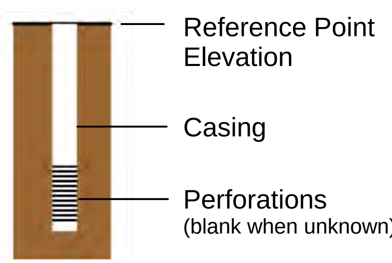
Groundwater Elevation

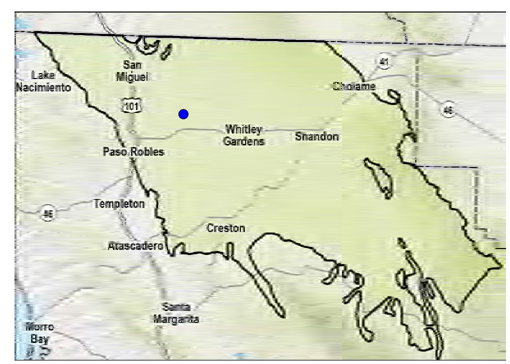
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

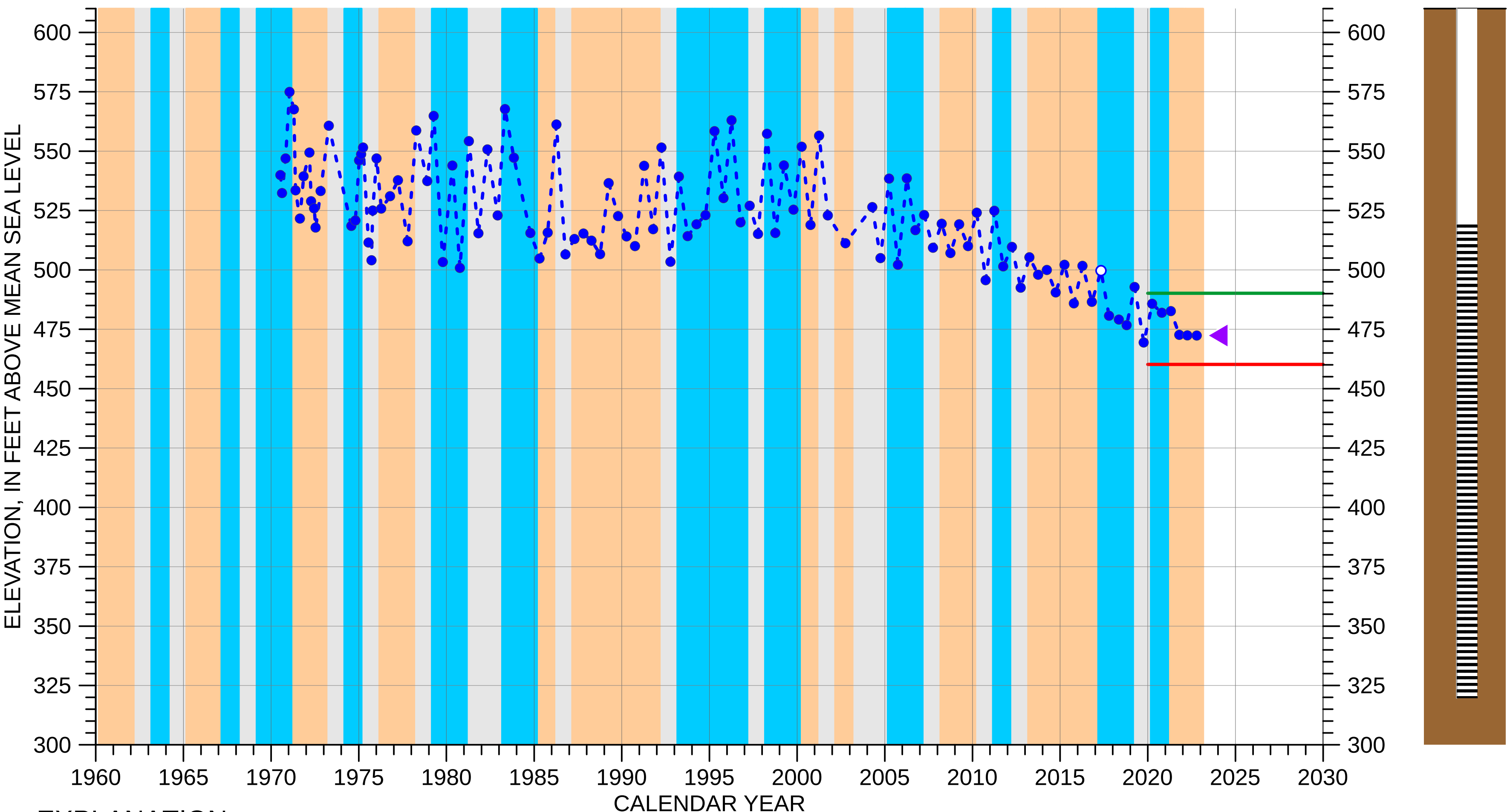
Dry | Avg/Alternating | Wet

Well Depth: 400 feet
Screened Interval: 260-400 feet below ground surface
Reference Point Elevation: 827.9 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 26S/13E-08M01

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_26S_13E-08M01.grf



EXPLANATION

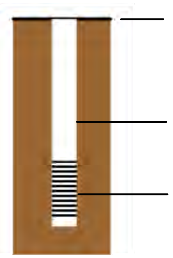
Groundwater Elevation

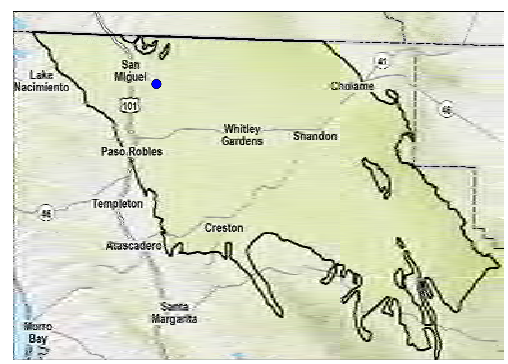
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

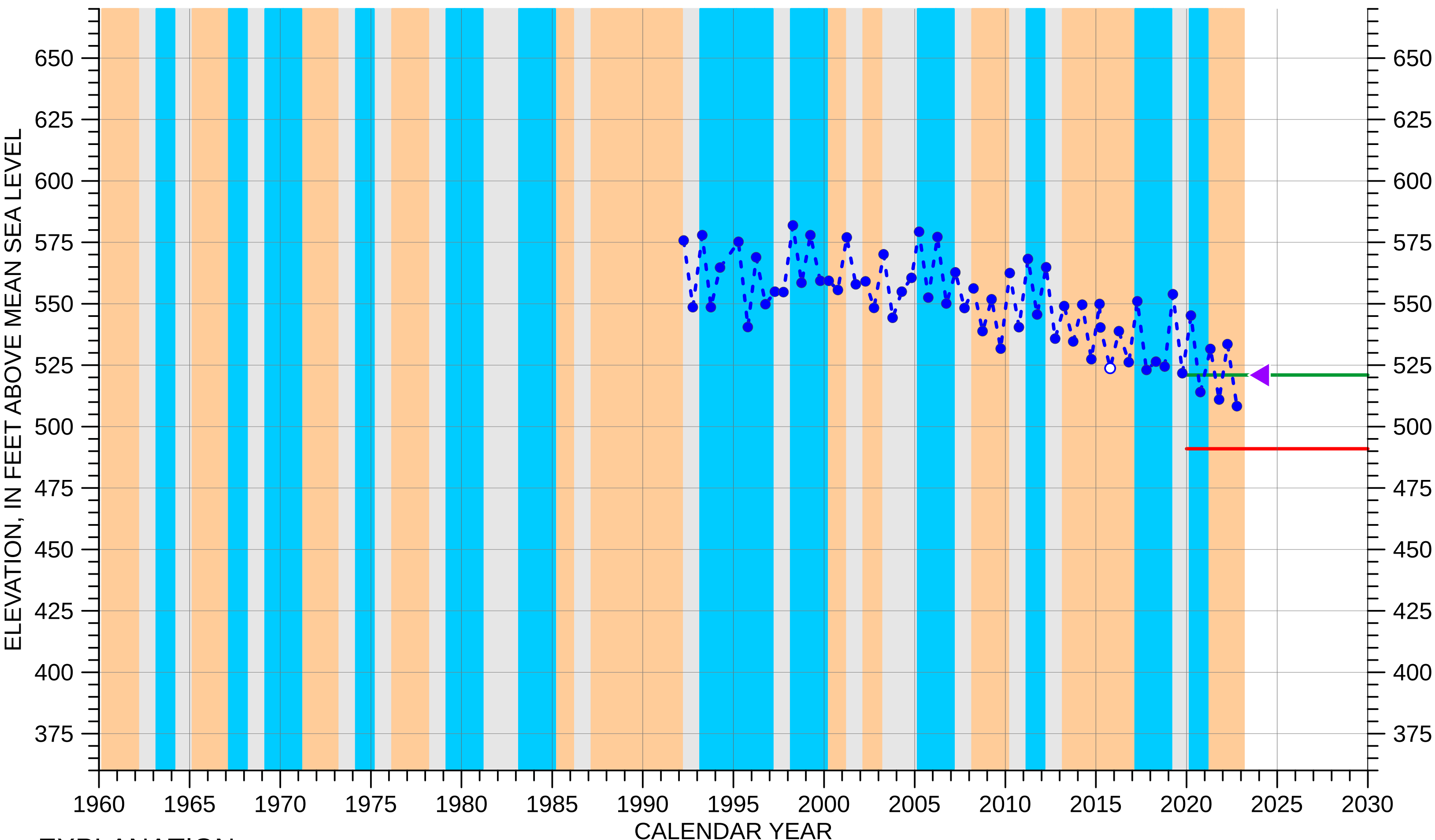
Dry | Avg/Alternating | Wet

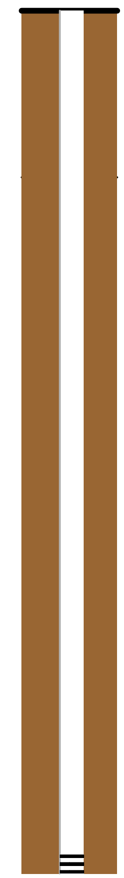
Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 719.7 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/12E-26L01

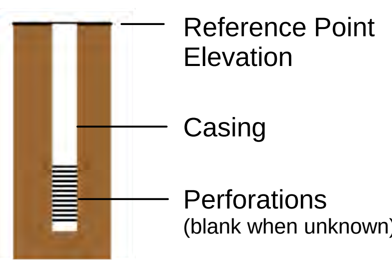
P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_25S_12E-26L01.gpj

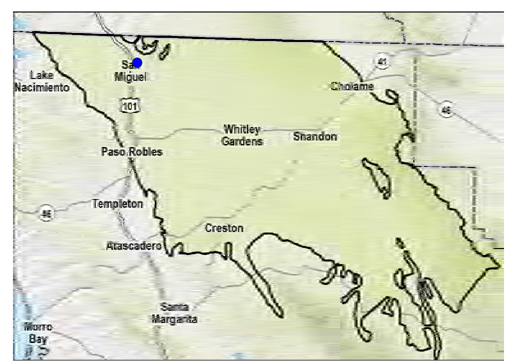




EXPLANATION

- Groundwater Elevation
- Measurable Objective
- Average of spring and fall 2022 water elevations
- Measurement Not Verified*
- Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

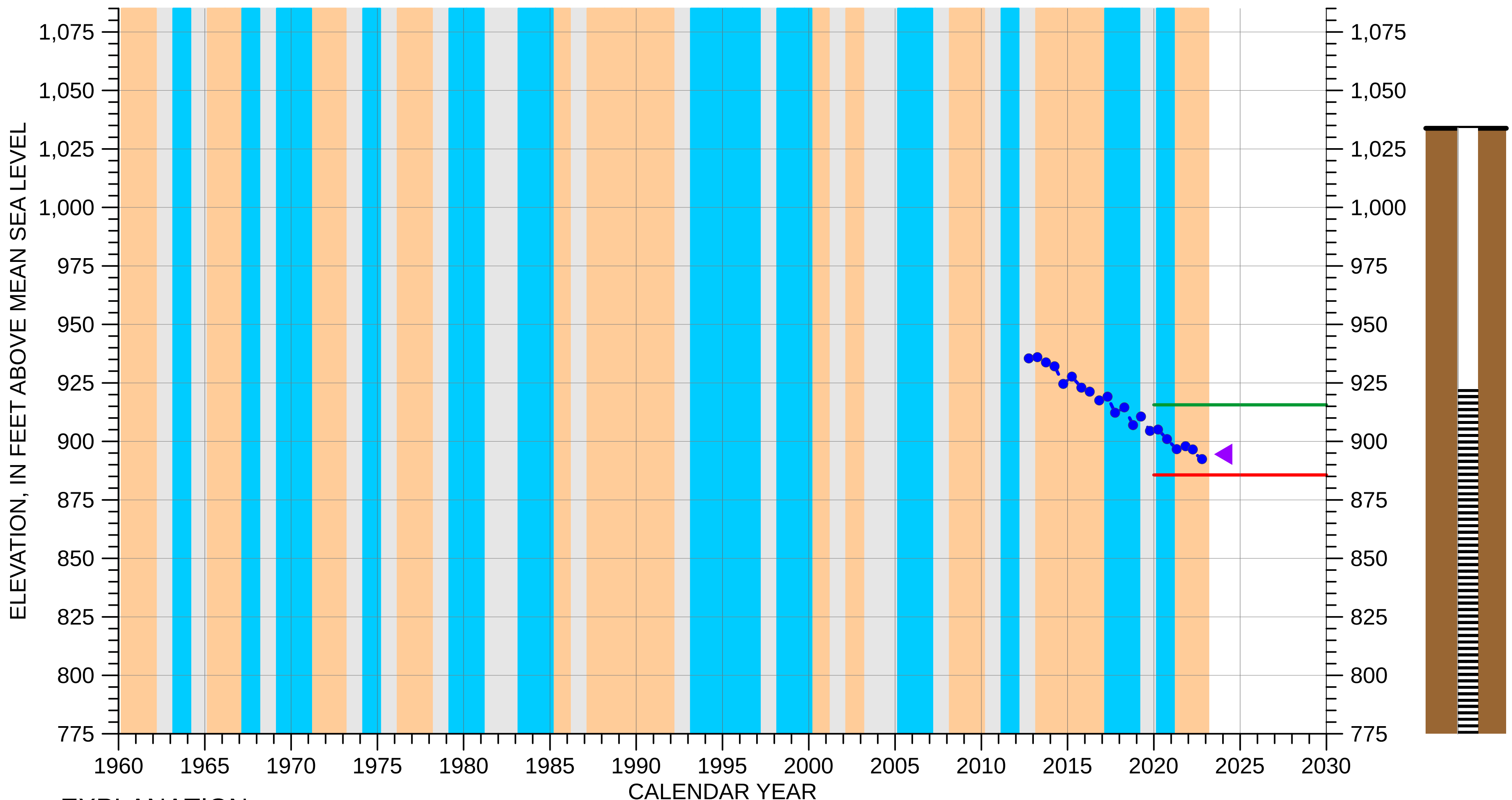
Dry Avg/Alternating Wet

Well Depth: 350 feet
Screened Interval: 300-310, 330-340 feet below ground surface
Reference Point Elevation: 669.8 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/12E-16K05

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_25S_12E-16K05.gpj



EXPLANATION

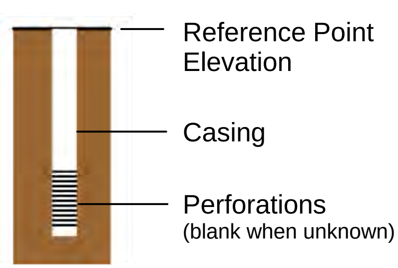
Groundwater Elevation

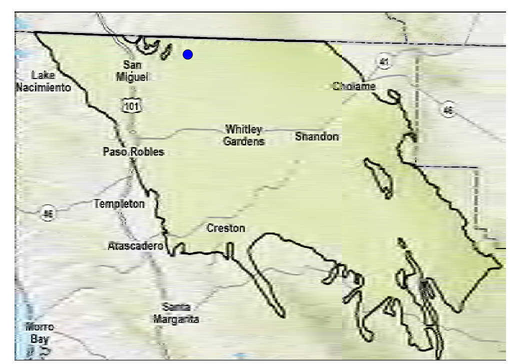
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

Dry | Avg/Alternating | Wet

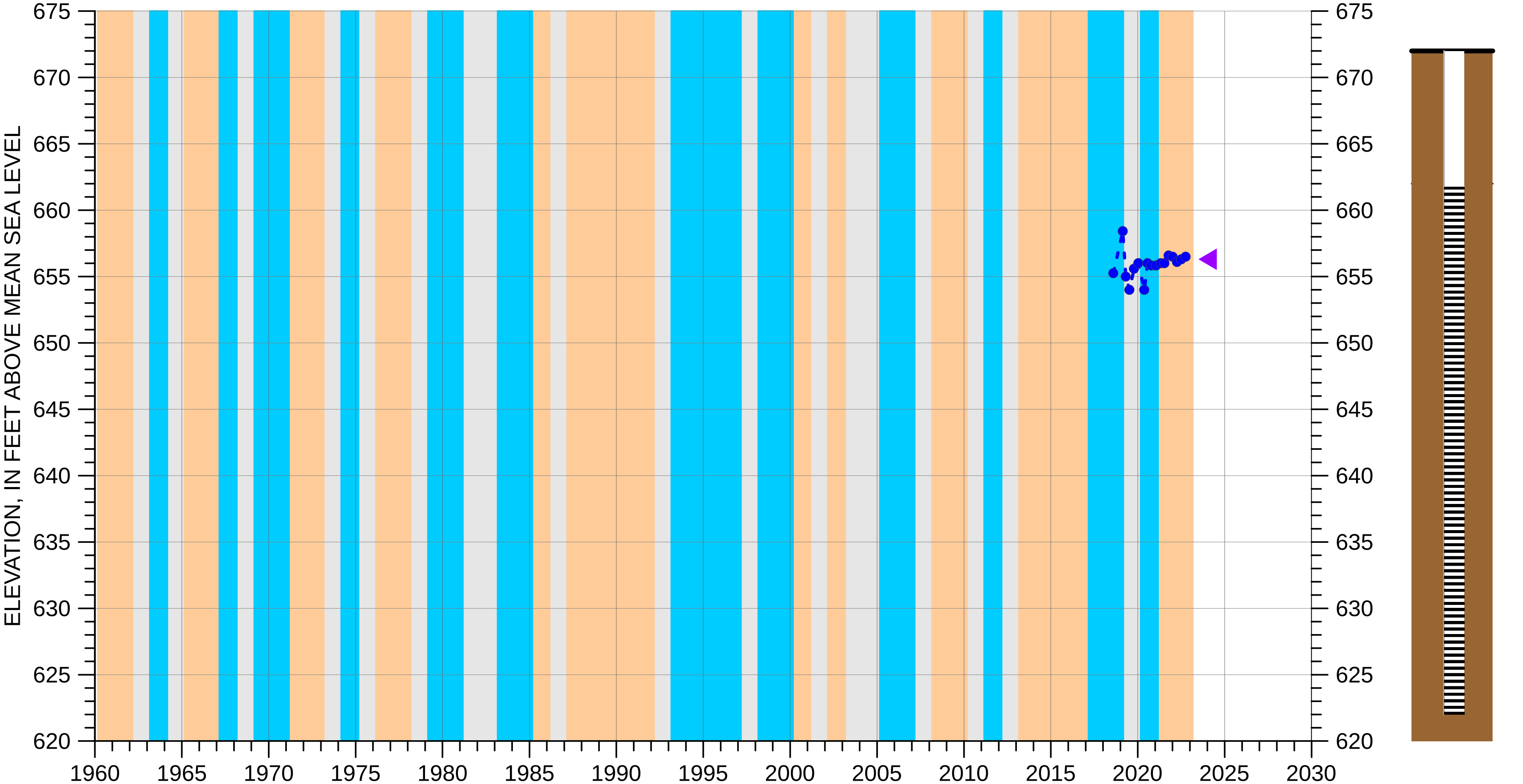
Well Depth: 270 feet
Screened Interval: 110-270 feet below ground surface
Reference Point Elevation: 1033.8 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 25S/13E-08L02

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\Hydr_25S_13E-08L02.gpj

Alluvial Aquifer Hydrographs



EXPLANATION

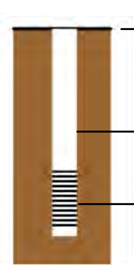
Groundwater Elevation

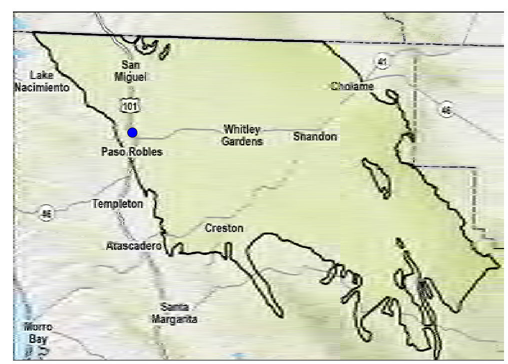
Measurable Objective

Average of spring and fall 2022 water elevations

Measurement Not Verified*

Minimum Threshold





CLIMATE PERIOD CLASSIFICATION

Dry   Avg/Alternating   Wet

Well Depth: 50 feet
Screened Interval: 10-50 feet below ground surface
Reference Point Elevation: 672 feet above mean sea level

* Measurement reported as not static

HYDROGRAPH OF MEASURED GROUNDWATER ELEVATION FOR 18MW-0191

P:\Portland\667-County of San Luis Obispo\025-PasoBasinAR_WYs22-23\Analysis\Hydrographs\Grapher\18MW-0191.gpj

APPENDIX F

Paso Robles Formation Aquifer Storage Coefficient Derivation and Sensitivity Analysis (GSI, 2020)

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Paso Robles Formation Aquifer Storage Coefficient Derivation and Sensitivity Analysis

The annual changes in groundwater in storage calculated for water years 2017, 2018, and 2019 in the Paso Robles Formation Aquifer presented in this first annual report are based on a fixed storage coefficient (S) value derived from groundwater modeling and groundwater elevation data presented in the Groundwater Sustainability Plan (GSP) for water year 2016. The derivation of S for the Paso Robles Formation Aquifer and a sensitivity analysis are presented below. It should be noted that while the GSP groundwater model utilizes a spatially variable S (both laterally and vertically) the S value derived here and used in this first annual report is a single average value representing the Paso Robles Formation Aquifer within the Subbasin.

1.1 Derivation of the Storage Coefficient Term

Derivation of S was accomplished through a back calculation using the change in groundwater in storage in the Paso Robles Formation Aquifer determined from the GSP groundwater model for water year 2016 and the total volume change represented by a Paso Robles Formation Aquifer groundwater elevation change map prepared for water year 2016. The change in groundwater in storage for water year 2016 in the Paso Robles Formation Aquifer is -59,459 acre-feet (AF) based on the GSP groundwater model.

The Paso Robles Formation Aquifer groundwater elevation change map for water year 2016 was prepared for this annual report by comparing the fall 2015 groundwater elevation contour map to the fall 2016 groundwater elevation contour map. The fall 2015 groundwater elevations were subtracted from the fall 2016 groundwater elevations resulting in a map depicting the changes in groundwater elevations in the Paso Robles Formation Aquifer that occurred during the 2016 water year (not pictured, but similar to Figures 12, 13, and 14 in this first annual report).

The groundwater elevation change map for water year 2016 represents a total volume change within the Paso Robles Formation Aquifer of -807,490 AF. As described in Section 7.2 of this annual report, this total volume change includes the volume displaced by the aquifer material and the volume of groundwater stored within the void space of the aquifer. The portion of void space in the aquifer that can be utilized for groundwater storage is represented by S. The change in groundwater in storage is equivalent to the product of S and the total volume change, as shown here:

$$Change\ of\ Groundwater\ in\ Storage = S \times Total\ Volume\ Change$$

This equation can be re-arranged and solved for S:

$$S = \frac{Change\ of\ Groundwater\ in\ Storage}{Total\ Volume\ Change} = \frac{-59{,}459\ AF}{-807{,}490\ AF} = 0.07$$

Therefore, based on analysis of data for water year 2016, an average S value for the Paso Robles Formation Aquifer in the Paso Robles Subbasin is 0.07.

1.2 Sensitivity Analysis

The annual changes in groundwater in storage in the Paso Robles Formation Aquifer calculated for water years 2017, 2018, and 2019 presented in this first annual report are 60,106, 6,398, and 59,682 AF, respectively. These values, calculated using an S value of 0.07, appear reasonable when compared to historical changes in groundwater in storage (see Figure 15 in this first annual report). While the calculated value of S, presented above, is based on sound science and using the best readily available information, it is necessary to acknowledge that the true value of S in the Paso Robles Formation Aquifer is spatially variable (as indicated in the GSP groundwater model) and ranges in value both above and below the calculated value of 0.07. A sensitivity analysis was performed to demonstrate the range of annual changes in groundwater in storage that result from using a range of S values. Table F1 shows that the annual change in groundwater in storage volumes can range from 27 percent less to 27 percent more than presented in this first annual report based on S values ranging from 0.05 to 0.09. This shows the sensitivity of the S value to determination of annual change in groundwater in storage. However, neither the 27 percent lower nor the 27 percent higher annual change in groundwater in storage volumes seem reasonable when compared to historical changes in groundwater in storage (as shown in Figure 15 in this first annual report). Based on this sensitivity analysis, GSI believes that the calculated value of S (0.07) is reasonable and defensible for the purposes of this first annual report.

Table F 1. Change in Groundwater in Storage Sensitivity Analysis

Water Year	Total Volume of Change (AF)	Change in Groundwater in Storage (AF), based on:							
		S = 0.05		S = 0.06		Calculated S [0.07]	S = 0.08		S = 0.09	
		(AF)	% Diff	(AF)	% Diff	(AF)	(AF)	% Diff	(AF)	% Diff
2017	816,274	43,781	-27%	51,943	-14%	60,106	68,269	14%	76,432	27%
2018	86,885	4,660		5,529		6,398	7,267		8,135	
2019	810,508	43,471		51,577		59,682	67,787		75,892	

notes:

AF = acre-feet, S = storage coefficient, % Diff = percent difference from calculated S

APPENDIX G

San Luis Obispo County Ordinance 3456

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ORDINANCE NO. 3456

AN ORDINANCE AMENDING TITLE 22 OF THE SAN LUIS OBISPO COUNTY CODE, THE LAND USE ORDINANCE, BY AMENDING SECTION 22.30.204 AGRICULTURAL OFFSET REQUIREMENTS TO EXTEND THE TERMINATION DATE AND CHANGE TABLE GRAPES WATER DUTY FACTOR

The Board of Supervisors of the County of San Luis Obispo, State of California, does ordain as follows:

SECTION I: That Section 22.30.204 of Title 22 of the San Luis Obispo County Code be amended as follows:

Chapter 22.30.204 – New or Expanded Irrigated Crop Production Using Water from the Paso Robles Groundwater Basin, Excluding the Atascadero Sub-basin.

Table 2 – Crop Group and Commodities Used for the Agricultural Demand Analysis

Crop Group	Primary Commodities
Alfalfa	Alfalfa
Nursery	Christmas trees, miscellaneous nursery plants, flowers
Pasture	Miscellaneous grasses, mixed pastures
Citrus	Avocados, grapefruits, lemons, oranges, olives, kiwis, pomegranates (non-deciduous)
Deciduous	Apples, apricots, berries, peaches, nectarines, plums, figs, pistachios, persimmons, pears, quinces
Strawberries	Strawberries
Vegetables	Artichokes, beans, miscellaneous vegetables, mushrooms, onions, peas, peppers, tomatoes
CBD Hemp	Field Grown CBD Hemp
~~Vineyard~~	~~Wine grapes, table grapes~~
Wine grapes	Wine grapes
Table grapes	Table grapes

Supplementally Irrigated Dry Cropland*	Barley, wheat, oat, grain/forage hay, safflower

Source: Table 3 of the Agricultural Water Offset Program, Paso Robles Groundwater Basin, October 2014.

**San Luis Obispo County General Plan Agriculture Element*

Table 3 – Existing Crop-Specific Applied Water by Crop Type

Crop Group	Applied Water (AF/Ac/Yr)
Alfalfa	4.5
Citrus	2.3
Deciduous	3.5
Strawberries	2.3(1)
Nursery	2.5
Pasture	4.8
Vegetables	1.9
CBD Hemp	1.5(2)
~~Vineyard~~ Wine Grapes	1.25**(1)**
Table Grapes	3.0 (4)
Supplementally Irrigated Dry Cropland	0.1(3)

1. Information obtained from RCD Program, UCCE, UC Davis (Strawberries 2011 data)

2. Information obtained from UCCE, San Luis Obispo County Cooperative Extension, April 2019

3. Supplementally irrigated Dry Cropland application requirements outlined per Section G.3.C above.

4. Information obtained from UCCE, San Luis Obispo County Cooperative Extension, April 2021

Source: *Table 9 of the Agricultural Water Offset Program, Paso Robles Groundwater Basin, October 2014.*

H. **Termination.** The provisions of this section for the Paso Robles Groundwater Basin (excluding the Atascadero Sub-basin) shall expire on ~~January 1, 2022~~ August 31, 2022.

SECTION II: If any section, subsection, clause, phrase or portion of this ordinance is for any reason held to be invalid or unconstitutional by the decision of a court of competent jurisdiction, such decision shall not affect the validity or constitutionality of the remaining portion of this ordinance. The Board of Supervisors hereby declares that it would have passed this ordinance and each section, subsection, clause, phrase or portion thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, phrases or portions be declared invalid or unconstitutional.

SECTION III: This ordinance shall take effect and be in full force and effect thirty (30) days after its passage and before the expiration of fifteen (15) days after passage of this ordinance, it shall be published once with the names of the members of the Board of Supervisors voting for and against the ordinance in a newspaper of general circulation published in the County of San Luis Obispo, State of California.

SECTION IV: An addendum to the Supplemental Environmental Impact Report (SEIR) (SCH 2014081056) certified for the Countywide Water Conservation Program in 2015 was prepared in accordance with the applicable provisions of the California Environmental Quality Act, Public Resources Code Section 21000 et. seq. for the proposed changes to the County Code Section 22.30.204.

SECTION V: In accordance with Government Code Section 25131, after reading the title of this Ordinance, further reading of the Ordinance in full is waived.

Partially recommended at a regular meeting of the San Luis Obispo County Planning Commission held on the 19th day of September, 2019, introduced at a regular meeting of the Board of Supervisors held on the 10th day of August, 2021, and passed and adopted by the Board of Supervisors of the County of San Luis Obispo, State of California, on the 24th day of August, 2021, by the following roll call to vote, to wit:

AYES: Supervisors John Peschong, Dawn Ortiz-Legg, Bruce S. Gibson, and

Chairperson Lynn Compton

NOES: Supervisor Debbie Arnold

ABSENT: None

ABSTAINING: None

____
Lynn Compton
Chairperson of the Board of Supervisors,
County of San Luis Obispo, State of California

ATTEST:

WADE HORTON
Ex-Officio Clerk of the Board of Supervisors,
County of San Luis Obispo State of California

By: ______________________________
Deputy Clerk

APPENDIX H

WORK PLAN: Paso Robles Basin Groundwater Level Monitoring Network Expansion and Investigation of the El Pomar Junction Area

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WORK PLAN

Paso Robles Basin Groundwater Level Monitoring Network Expansion and Investigation of the El Pomar Junction Area

To:	Blaine Reely, Groundwater Sustainability Director, County of San Luis Obispo
From:	GSI Water Solutions, Inc. Nate Page, PG, Managing Hydrogeologist, Lee Knudtson, Staff Hydrologist Dave O'Rourke, PG, CHG, Principal Hydrogeologist
Date:	November 30, 2022

GSI is pleased to present this work plan to expand and refine the existing groundwater monitoring network in the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin (Basin) and to investigate the hydrogeology in the El Pomar Junction area. The purpose of the groundwater monitoring network expansion portion of the work plan is two-fold; 1) to refine the set of monitoring wells throughout the Basin that are measured manually in April and October and 2) establish a subset of wells equipped with continuous water level monitoring devices to better understand the hydrogeology of the Basin and to capture the annual high and low groundwater elevations in each well, which are often at some date other than April and October.

The chronic lowering of groundwater elevation undesirable result identified in Representative Monitoring Site (RMS) well 27S/13E-28F01 in the Paso Robles Subbasin Water Year 2021 Annual Report requires an investigation to determine if this undesirable result is a localized or Basin-wide issue[1]. This work plan details a hydrogeologic investigation of the El Pomar Junction area to satisfy this requirement and to generally improve upon the hydrogeologic understanding of the area. Details from this investigation shall be incorporated into the expansion and refinement of the groundwater monitoring network.

The ultimate goal of this work plan is to identify a refined set of RMS wells equipped with continuous water level monitoring devices that are ideally suited to annually evaluate the Basin condition in regard to the six undesirable results[2]. The refined RMS well network shall be spatially distributed to minimize data gap areas.

Background

This work plan is presented in conjunction with a master spreadsheet of existing historically monitored wells in the Basin and geographic information systems (GIS) mapping of these same wells. These datasets are the culmination of a desktop study performed by GSI Water Solutions, Inc. (GSI) to compile existing datasets and identify key wells in the Basin for ongoing manual measurements and continuous monitoring device utilization. A set of 102 key wells have been preliminarily identified based on their spatial distribution, historical water level

[1] This investigation is required according to Section 8.4.5.1 of the GSP.
[2] California Water Code 10721 (x)
https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=10721.&lawCode=WAT

data, and representativeness of groundwater conditions within a localized area. These key wells are discussed in further detail below.

The existing historically monitored wells in the Basin include:

- San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD) groundwater monitoring program wells[3] [252 total, 104 have recent measurements],
- The Paso Robles Basin Groundwater Sustainability Plan (GSP) Representative Monitoring Sites (RMS) wells[4] [23 wells],
- City of Paso Robles Supplemental Environmental Project (SEP) wells [4 wells],
- Wells monitored by the Shandon-San Juan Water District (SSJWD)[5] [65 wells], and
- Wells monitored by the Estrella-El Pomar-Creston Water District (EPCWD)[6] [35 wells].

Priorities in expanding and refining the Basin groundwater monitoring network include infilling spatial data gap areas, addressing monitoring deficiencies in the alluvial aquifer (key to determining surface water-groundwater interactions), and addressing deficiencies associated with ongoing Dry Well[7] occurrences, generally reported for rural domestic wells. While GSI's selection of key wells take these issues into consideration, the key wells list only includes historically and currently monitored wells. As specified below in the work plan scope, additional wells will need to be identified within areas of concern and added to the monitoring network. These may include existing wells that have not been previously monitored and/or new dedicated monitoring wells, such as the potential new well locations identified by Todd Groundwater in developing the revised GSP, and the proposed additional SEP wells.

During review of well completion reports provided by San Luis Obispo County Environmental Health Services (EHS), GSI discovered compelling lithologic evidence suggesting that several wells located in the El Pomar Junction area, some of which are active irrigation wells, are completed either partially or completely within the Santa Margarita Formation, a non-Basin aquifer that underlies the Paso Robles Formation[8]. Among these wells are three of the existing RMS wells (27S/12E-13N01, 27S/13E-30J01, and 27S/13E-30N01), which each appear to be completed entirely within the Santa Margarita Formation. Further work is required to assess these findings, as specified below. The reason that this assessment is important is that, if verified, these Santa Margarita Formation wells should be removed from the RMS network as these wells would not be representative of the Paso Robles Formation aquifer (and therefore not representative of the Basin).

An additional task described in this work plan is to develop a separate work plan to assess the connectivity between the non-Basin Santa Margarita Formation aquifer and the Paso Robles Formation aquifer within the El Pomar Junction area to inform future monitoring efforts and groundwater management decisions.

Key Wells

Manual Measurements

GSI has preliminarily identified 102 key wells among the historically and currently monitored wells in the Basin. In general, the currently monitored wells are considered the most likely pool from which to select a refined set of

[3] These include wells monitored by the City of Paso Robles.
[4] Nearly all of the existing RMS wells are included in the SLOFCWCD groundwater monitoring program (all except for the single alluvial well 18MW-01 in the City of Paso Robles)
[5] As many as 13 wells monitored by SSJWD are also included in the SLOFCWCD groundwater monitoring program (three of these 13 wells are possible matches to wells in the SLOFCWCD program and need to be verified).
[6] A single well monitored by EPCWD is also included in the SLOFCWCD groundwater monitoring program (26S/12E-03H04).
[7] https://mydrywell.water.ca.gov/report/publicpage
[8] The Paso Robles Formation is the defined bottom of the Basin.

RMS wells due to existing well owner land access agreements. The key wells identified for manual measurements are presented with three levels of priority:

1. [83 wells] Priority 1 wells are all currently monitored wells in either the SLOFCWCD program, the SSJWD program, or the EPCWD program (with six exceptions[9]). These wells exhibit the following criteria:
    a. Are evenly distributed spatially throughout the Basin or are currently monitored alluvial wells,
    b. Appear to represent groundwater conditions within a localized area (i.e. similar trends are exhibited in neighboring wells),
    c. Historical water level hydrographs generally show a significant period of record and/or tell an interesting/important story (applies specifically to SLOFCWCD wells),
2. [7 wells] Priority 2 wells include seven historically monitored alluvial wells in the SLOFCWCD program.
3. [12 wells] Priority 3 wells include historically monitored SLOFCWCD program wells that further infill spatial gaps.

Continuous Monitoring

Instrumenting as many key wells as possible with continuous monitoring devices will improve the understanding of the Basin hydrogeology. GSI recommends that the 83 Priority 1 key wells are assessed for continuous monitoring. It is likely that many of these wells will be found to be inappropriate for continuous monitoring due to issues ranging from well owners opting out to physical limitations of the well or wellhead construction or lack of access to cellular signal or wireless internet. For these reasons GSI recommends starting with this large list, with the assumption that the actual number of devices ultimately installed will be far less. One important purpose of instrumenting as many key wells as possible with continuous monitoring devices is to refine our understanding of the timing and degree to which groundwater levels fluctuate annually within the Basin. Based on the availability of several private continuous monitoring device datasets and private monitoring programs it is known that the bi-annual manual groundwater level measurements recorded by the SLOFCWCD program often do not capture the high and low groundwater elevations of the year. This can result in an 'apples to oranges' comparison of groundwater conditions from one year to the next. Because the condition of the Basin, assessed annually, is largely based on groundwater elevation measurements it is in the best interest of all stakeholders to identify the true nature and timing of groundwater elevation fluctuations throughout the year.

Work Plan Scope Items

Task 1 – Identify Current Well Owners

The provided compilation of existing historically monitored wells contains legacy well ownership information, inherited from the SLOFCWCD project as well as ownership information provided by SSJWD and EPCWD programs. The compilation of historically monitored wells will be overlaid with an up-to-date Assessor's Parcel Number (APN) dataset in GIS to verify and/or identify current well owners for each of the wells contained in the dataset. It is assumed that the APN dataset will be made available by the County of San Luis Obispo Groundwater Sustainability Department (GSD). An inventory will be compiled of well owner information, including contact information for well owners and property managers, and other information necessary to access the wells.

[9] Six exceptions to this include the four newly installed City of Paso Robles SEP wells and two historically monitored SLOFCWCD program wells located near reported Dry Wells on Jardine Road (https://mydrywell.water.ca.gov/report/publicpage).

Task 2 – Establish Communication with Well Owners

With priority given to the Key Wells identified in the provided materials, the next step is to contact the current well owners and gather the following information:

- Verify the well information on file to the best ability of the landowner
- Document how the well is used. If a pumping well, determine how often the well is pumping and inquire if there are periods when the well can be shut down for 24-hours prior to taking a water level measurement,
- Review their current well monitoring agreement or if they don't have one, discuss creating an agreement via a consent form,
- Discuss data privacy concerns, if any, and encourage public sharing of data[10],
- Inquire if the well already has a private continuous monitoring device, if so ask if they willing to share the data,
- Make a plan to visit each well.

Task 3 – Research Missing Well Information

If well completion information is missing in the materials provided and the well owner is unable to provide a well completion report (WCR) then use the County EHS dataset to look for potential WCR matches to the well in question. If a WCR is identified with high to moderate confidence (primarily based on spatial proximity) review the lithologic log and the perforated interval to determine aquifer of completion, record in the master spreadsheet and GIS, and print a copy of the WCR to bring to the field (Task 4).

Task 4 – Field Investigation

Each well identified in Task 2 shall be visited to evaluate suitability for manual water level monitoring and for continuous monitoring based on the physical characteristics of the well and wellhead. The field visit shall be documented with photography and detailed notes. While in the field, the well shall be evaluated for monitoring potential as follows:

- Document access to the well including identification of private roads and gates
- Document size of access port(s),
- Determine if a sounding tube exists,
- Document well-head configuration including dimensions of discharge pipes and relative locations of well-head infrastructure to access ports to ensure enough space is available for manual monitoring and/or installation of continuous monitoring equipment,
- Document telemetry feasibility by identifying available cell service or local internet,
- Document site for well-head modification feasibility for well servicer.

Task 5 – Identify Additional Wells in Areas of Concern

This task is meant to address monitoring deficiencies in the alluvial aquifer (key to determining surface water-groundwater interactions), and to address monitoring deficiencies associated with ongoing Dry Well[7] occurrences, generally reported for rural domestic wells. Additional wells, beyond the key wells listed above, will need to be identified within areas of concern and added to the monitoring network. The areas of concern for monitoring the alluvial aquifer include areas adjacent to the Salinas River, Huer Huero Creek, Estrella Creek, Cholame Creek, and San Juan Creek. The areas of concern for Dry Wells are indicated by the distribution of dry well reports, primarily in the Almond Drive, Jardine Road, Geneseo Road, and Ground Squirrel Hollow areas. These additional wells may include wells that have been previously monitored by SLOFCWCD, existing wells that have not been previously monitored and/or new dedicated monitoring wells, such as the potential new well locations identified by Todd Groundwater in developing the revised GSP, and the proposed additional SEP wells.

[10] Wells with confidentiality agreements can still be monitored but are not RMS well candidates.

For any existing wells added to the monitoring network, a workflow similar to that specified in Tasks 1 through 4 will be followed. Any additional wells identified shall be added to the master spreadsheet and GIS.

Task 6 – Investigate El Pomar Junction Area

During review of WCRs provided by County EHS, GSI discovered compelling lithologic evidence indicating that several wells located in the El Pomar Junction area, including active irrigation wells, are completed either partially or completely within the Santa Margarita Formation, a non-Basin aquifer. Among these wells are three of the existing RMS wells (27S/12E-13N01, 27S/13E-30J01, and 27S/13E-30N01), which each appear to be completed entirely within the Santa Margarita Formation. In this task further review of El Pomar Junction area WCRs and any other discoverable hydrogeologic information shall be undertaken to verify these findings and more clearly identify distinct sets of Paso Robles Formation wells, Santa Margarita Formation wells, and wells that straddle both aquifers. In addition, a separate work plan shall be developed to assess the connectivity between the non-Basin Santa Margarita Formation aquifer and the Paso Robles Formation aquifer within this area to inform future monitoring efforts and groundwater management decisions.

Task 7 – Recommend a Refined RMS Network and Associated Sustainable Management Criteria

The ultimate goal of this work plan is to identify a refined set of RMS wells equipped with continuous monitoring devices that are ideally suited to annually evaluate the Basin condition in regard to the six undesirable results. The refined RMS well network shall be spatially distributed to minimize data gap areas. This work product will be a culmination of the prior tasks and will require input and coordination with Basin stakeholders and Groundwater Sustainability Agencies (GSA) staff and executive committee. It is assumed that sustainable management criteria (SMCs) established for the refined RMS network will be subject to future revisions as new water level datasets are developed and the understanding of Basin hydrogeology improves.

We value this opportunity to provide you with this work plan, and we look forward to continuing to serve you on this important project. Please contact us if you have any questions.