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UPPER SAN LUIS REY VALLEY GROUNDWATER SUSTAINABILITY PLAN
2027 PERIODIC EVALUATION

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Acronyms, Abbreviations, and Initialisms

Abbrev.	Description
acre-ft/yr	acre-feet per year
amsl	above mean sea level
ASR	aquifer storage and recovery
Basin Plan	Water Quality Control Plan for the San Diego Basin
bgs	below ground surface
BMP	best management practices
CalWATRS	California Water Accounting, Tracking, and Reporting System
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CIMIS	California Irrigation Management Information System
CLIP	California Laboratory Intake Portal
County	County of San Diego
CSD	Community Services District
DDW	Division of Drinking Water
DTW	depth to water
DWR	California Department of Water Resources
ET	evapotranspiration
eWRIMS	Electronic Water Rights Information Management System
ft	foot, or feet
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	groundwater dependent ecosystem
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	hydrogeologic conceptual model
IM	interim milestone
InSAR	Interferometric Synthetic Aperture Radar
ISW	interconnected surface water
MCL	maximum contaminant level
Metropolitan	Metropolitan Water District of Southern California
mg/L	milligrams per liter
µg/L	micrograms per liter
MNM	Monitoring Network Module
MO	Measurable Objective
MT	Minimum Threshold

MWD	Municipal Water District
N	nitrogen
N/A	not applicable
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration
OSWCR	Online System for Well Completion Reports
PDWW	Public Drinking Water Watch
PMA	project and management action
PMWD	Pauma Municipal Water District
PVCSD	Pauma Valley Community Services District
PVGSA	Pauma Valley Groundwater Sustainability Agency
RCA	Recommended Corrective Action
Regional Board	California Regional Water Quality Control Board
RMS	Representative Monitoring Site
RPMWC	Rancho Pauma Municipal Water Company
SDWIS	Safe Drinking Water Information System
SGMA	Sustainable Groundwater Management Act
SLRMWD	San Luis Rey Municipal Water District
SMC	sustainable management criteria
SMCL	secondary maximum contaminant level
SWRCB	California State Water Resources Control Board (aka Water Board)
TBD	to be determined
TDS	total dissolved solids
USLR	Upper San Luis Rey
USLRGMA	Upper San Luis Rey Groundwater Management Authority
USLRRCD	Upper San Luis Rey Resource Conservation District
VID	Vista Irrigation District
Water Authority	San Diego County Water Authority
Water Board	California State Water Resources Control Board (aka SWRCB)
WY	Water Year
YMWD	Yuima Municipal Water District

UPPER SAN LUIS REY VALLEY GROUNDWATER SUSTAINABILITY PLAN 2027 PERIODIC EVALUATION

0.0 Executive Summary

The Upper San Luis Rey Groundwater Management Authority (USLRGMA) prepared this first Periodic Evaluation of the Upper San Luis Rey (USLR) Valley Groundwater Sustainability Plan (GSP) in accordance with the Sustainable Groundwater Management Act (SGMA) and GSP Regulations. The original GSP was submitted to the California Department of Water Resources (DWR) on January 31, 2022, and approved by DWR on January 18, 2024. This Periodic Evaluation assesses GSP implementation and groundwater conditions during water years (WY) 2021 through 2025, including progress toward achieving the Subbasin's sustainability goal, implementation of projects and management actions (PMAs), new information developed since GSP adoption, changes to monitoring networks and the basin setting, and the USLRGMA's response to DWR's Recommended Corrective Actions (RCAs). The Periodic Evaluation was prepared concurrently with the 2027 GSP Amendment, which incorporates revisions identified through the evaluation process.

Overall, GSP implementation is proceeding in a manner consistent with achieving and maintaining the sustainability goal for the USLR Valley Groundwater Subbasin. During the evaluation period, the Subbasin remained within the updated estimate of sustainable yield, groundwater elevations generally increased, groundwater in storage generally increased, and no undesirable results were identified for the applicable sustainability indicators. Average groundwater pumping during WY 2021 through 2025 was approximately 10,900 acre-feet per year (acre-ft/yr), compared with an updated long-term historical sustainable yield estimate of approximately 11,100 acre-ft/yr. The current-period water budget indicates an average increase in groundwater storage of approximately 1,500 acre-ft/yr. These conditions reflect, in part, the occurrence of average hydrologic conditions, including two wet/above normal years during WY 2023 and WY 2024 and dry conditions in WY 2021 and WY 2022, and continued supplemental use of imported water.

New information collected during the evaluation period substantially improved the technical basis for evaluating Subbasin conditions. Nine wells were added to the groundwater level monitoring network, including two dedicated clustered monitoring wells installed near the San Luis Rey River in Pauma Valley. Monitoring from the clustered wells confirmed that perched groundwater conditions occur locally above the principal alluvial aquifer, resulting in refinement of the hydrogeologic conceptual model. Additional groundwater quality, pumping, surface water diversion, well construction, and aquifer property information was also collected and evaluated. The integrated watershed and groundwater models were updated and recalibrated through WY 2025. Major model refinements included improved characterization of bedrock and aquitard geometry and addition of a bedrock model layer so that groundwater production from both the alluvial aquifer and underlying bedrock could be represented. The updated models were used to revise historical, current, and projected water budgets, estimates of

groundwater pumping, groundwater in storage, sustainable yield, and the evaluation of interconnected surface water (ISW).

Groundwater conditions during the evaluation period were assessed relative to the revised sustainable management criteria (SMCs) incorporated into the 2027 GSP Amendment. Key findings include:

- **Chronic lowering of groundwater levels and reduction of groundwater in storage**: No groundwater level Representative Monitoring Site (RMS) declined below its minimum threshold (MT) during WY 2021 through WY 2025, and groundwater levels at all but two RMSs were above measurable objectives (MOs) by the end of the evaluation period. No dry-well reports were received during the evaluation period. Because groundwater elevations are used as a proxy for groundwater storage, these conditions also indicate that no undesirable results related to reduction of groundwater in storage occurred. Model results similarly indicate that groundwater in storage generally increased during GSP implementation.
- **Degraded groundwater quality:** No undesirable results related to degraded groundwater quality were identified. The 2027 GSP Amendment establishes revised, constituent-specific SMCs and RMS networks for total dissolved solids (TDS), nitrate, and perchlorate. No TDS RMS exceeded its MT during the evaluation period. Nitrate concentrations exceeded applicable MTs at two RMSs, MW-19 and MW-41; however, these wells represent approximately 15 percent of the nitrate RMS network and therefore did not meet the quantitative criteria for a potential undesirable result. Elevated nitrate and perchlorate remain concentrated primarily within the identified Upper Pauma Nitrate/Perchlorate-Affected Area and will continue to be monitored to distinguish existing localized impairment from future degradation or migration. Perchlorate concentrations at the applicable RMSs remained below assigned MTs during the evaluation period.
- **Depletion of interconnected surface water:** No undesirable results for ISW depletion were identified during the evaluation period. Additional modeling was completed to evaluate the location, quantity, and timing of pumping-induced ISW depletion along the San Luis Rey River. Because no active streamflow gage exists within the Subbasin and shallow groundwater and pumping data remain limited, the 2027 GSP Amendment establishes ISW SMCs using groundwater elevations at five near-river monitoring wells as proxy indicators. During WY 2021 through WY 2025, groundwater levels at these sites did not indicate persistent declines below the MTs, hydrologic conditions were within the expected range for the seasonal and intermittent river system, and no known significant adverse effects to downstream beneficial users or potential groundwater dependent ecosystems (GDEs) were identified. Continued reduction of ISW data gaps remains a priority for the next implementation period and ISW SMCs will be reevaluated during the next Periodic Evaluation.
- **Land subsidence:** No confirmed land-subsidence MT exceedances or undesirable results occurred during the evaluation period. The 2027 GSP Amendment establishes a land-subsidence RMS network using DWR-provided Interferometric Synthetic Aperture Radar (InSAR) data and quantitative criteria for evaluating potential pumping-induced subsidence.

- **Seawater intrusion:** Seawater intrusion remains an inapplicable sustainability indicator because of the Subbasin's inland and hydraulically upgradient location relative to coastal groundwater basins.

The USLRGMA also made substantial progress in implementing the administrative, monitoring, and management framework established by the GSP. A local California Irrigation Management Information System (CIMIS) station was installed in Pauma Valley in 2025; groundwater level and water quality monitoring continued throughout the evaluation period; agricultural water-use efficiency and conservation activities continued; and procedures were established with the County of San Diego for GSA review of new groundwater production well applications. In 2024, the USLRGMA adopted groundwater extraction fees that provide a recurring local source of funding for routine GSP administration, monitoring, reporting, and outreach and also encourage water conservation and the reporting of groundwater extraction information.

Several important implementation needs remain. The USLRGMA had anticipated using a SGMA Implementation Grant to support a well registration and metering program and additional surface water monitoring, but the USLR Valley Groundwater Subbasin was not included in the final grant award. As a result, implementation of some monitoring improvements has been delayed and remains dependent on outside funding or technical assistance. Priority future actions include improving groundwater extraction records; installing a streamflow or stage gage and additional monitoring locations along the San Luis Rey River; installing transducers at ISW monitoring wells; conducting recurring field observations of wetted river conditions; evaluating remote-sensing tools for ISW and potential GDEs; and implementing additional groundwater quality actions, including evaluation of domestic well vulnerability within the Upper Pauma Nitrate/Perchlorate-Affected Area.

The 2027 GSP Amendment incorporates the information and lessons learned during the first implementation period and addresses the majority of DWR's RCAs. RCAs related to administrative information, water budgets, groundwater levels, degraded groundwater quality, and land subsidence have been addressed through the updated GSP. Work related to ISW remains ongoing because direct streamflow and shallow groundwater data remain limited; however, additional modeling, new monitoring wells, quantitative SMCs, and a defined monitoring improvement strategy provide a framework for continued progress. Table 0-1 summarizes the status of each RCA and the principal actions completed or planned.

Table 0-1. Summary of Recommended Corrective Actions

Recommended Corrective Action Summary	Current Progress and Next Steps

RCA 1 – Administrative Information
• Update the USLRGMA's administrative information.
• Update GSA spatial coverage to clearly show area covered by GSP.
• Describe how groundwater management considers tribal interests and fully respects existing federal water rights.
	Complete
	What's Been Done:
	• Updated administrative information for the USLRGMA, including the governance structure and decision-making was provided in WY 2023 annual report as Appendix A. This information is also included in the 2027 GSP amendment.
	• Agency information and associated maps were updated for the online SGMA Portal.
	• Continued efforts to coordinate with the Tribes and to better understand their water demands.
	  ○ GSA informs the San Luis Rey Indian Water Authority (SLRIWA) of all Board meetings, projects and management action (PMA) efforts, etc.
	  ○ Estimates of tribal pumping (both on and off reservation land) have been included in the water budgets for the USLR Valley Groundwater Subbasin in lieu of actual pumping data.
	  ○ The GSA is unaware of any dry wells on reservation lands.
	  ○ Monitoring points have been established upgradient and downgradient of reservation land, where possible.
	  ○ Interactive Tribal Work Group efforts will be renewed.

RCA 2 – Water Budget • Provide water budgets for both groundwater and surface water systems. • Continue stakeholder outreach. • Update estimates of water budget and develop management approach to achieve sustainability notwithstanding lack of data or jurisdiction over federally reserved lands.	**Complete** What's Been Done: • Data gaps continue to be filled as basin stakeholders provide information on groundwater pumping and surface water use. An updated discussion of data gaps is provided in this Periodic Evaluation and the 2027 GSP Amendment. • Ongoing communication with basin stakeholders occurs at quarterly USLRGMA meetings and as needed, regarding important GSP notifications and implementation topics. Information is also posted to the USLRGMA's website for public information, which includes meeting minutes and announcements. • Updated surface water and groundwater budgets are provided in the 2027 GSP Amendment, following incorporation of new data and a model update.

Recommended Corrective Action Summary	Current Progress and Next Steps
RCA 3 – Sustainability Indicators for Groundwater Levels • Refine sustainable management criteria (SMC) for groundwater levels and clarify definition of undesirable results. • Conduct well impact analysis to evaluate if selected minimum thresholds (MTs) are protective of domestic wells. • Describe how development of MTs for groundwater levels considered potential impacts to beneficial users and use, including tribal interests. • Describe how MTs for groundwater levels will avoid undesirable results for other sustainability indicators.	**Complete** What's Been Done: • An analysis of potential well impacts was conducted as part of this periodic evaluation and is included in the 2027 GSP Amendment. • SMC for groundwater level and groundwater storage were reevaluated and revised in the 2027 GSP Amendment in light of recent data to meet SGMA regulations/best management practices and to be more consistent with observed historical low elevations and to further protect beneficial use and users. A discussion of hydrologic conditions relative to the updated SMCs are also provided in this Periodic Evaluation.
RCA 4 – Sustainability Indicators for Degraded Water Quality • Define significant and undesirable effects related to groundwater quality and define undesirable results based on MT exceedance.	**Complete** What's Been Done: • Groundwater quality conditions were re-evaluated and updated in the 2027 GSP Amendment. • SMCs were set for new RMS networks for TDS, nitrate, and perchlorate. • Undesirable effects from degraded groundwater quality were clarified/redefined in the 2027 GSP Amendment.
RCA 5 – Sustainability Indicators for Land Subsidence • Establish SMC for land subsidence, incorporating review of InSAR data.	**Complete** What's Been Done: • SMCs for land subsidence were redefined in the 2027 GSP amendment. • An RMS network consisting of InSAR grid locations throughout the Subbasin was established and will be evaluated annually.

Recommended Corrective Action Summary	Current Progress and Next Steps
RCA 6 – Sustainability Indicators for Interconnected Surface Water • Establish specific SMC for depletions of interconnected surface water. • Continue to address data gaps related to interconnected surface water, including location and timing. • Collaborate/coordinate with local, state, and federal regulatory agencies and interested parties to understand beneficial uses and users that may be impacted by pumping induced surface water depletion.	**In Progress** What's Been Done: • Two new monitoring wells were drilled in WY 2023 (USLR MW-1S and USLR MW-1D) near the San Luis Rey River in the Pauma Subbasin. • The recalibrated watershed and groundwater flow models were used to compare baseline conditions to a no-groundwater-pumping scenario and estimate the location, quantity, and timing of potential pumping-induced ISW depletion, per new DWR guidance documents. • SMCs for ISW are established in the 2027 GSP Amendment, using groundwater elevations at selected near-river monitoring wells as proxy indicators of near-river groundwater conditions. • The USLRGMA is currently exploring potential partnership opportunities, technical assistance, and funding options for establishing at least one surface water monitoring gage in the Subbasin. • Additional future PMAs were identified to improve ISW data resolution, including alternative or additional ISW monitoring sites, transducers, field observations of wetted conditions, and feasibility evaluation of imagery-based tools. What's Left to Do: • Continue implementing monitoring improvements to reduce ISW data gaps. • Reevaluate ISW SMCs during the next periodic evaluation and model update, with the goal of determining whether sufficient data exist to support a more direct depletion-volume SMC framework.

The 2027 GSP Amendment also reorganizes and updates the GSP to provide a more complete and internally consistent framework for future implementation. In particular, the SMC section was updated and reorganized so that the complete framework for each sustainability indicator—including RMSs, undesirable results, MTs, MOs, interim milestones (IMs), and supporting technical rationale—is presented within the same subsection. Monitoring networks, PMAs, water budgets, basin setting information, and the implementation framework were also updated to reflect current conditions and experience gained during the first five years of implementation. These revisions do not change the fundamental sustainability goal or adaptive management approach established in the 2022 GSP; rather, they provide improved technical and management tools for maintaining groundwater sustainability during the next implementation period.

1.0 Introduction

The California Code of Regulations Title 23 (23 CCR) §356.4 requires Groundwater Sustainability Agencies (GSAs) in subbasins with a California Department of Water Resources (DWR)-approved Groundwater Sustainability Plan (GSP or Plan) to evaluate their Plan at least every five years and whenever the Plan is amended, and to provide a Periodic Evaluation to DWR at that time. The Periodic Evaluation is a written assessment describing whether implementation of the Plan, including implementation of projects and management actions (PMAs), is meeting the Subbasin's sustainability goal and whether it continues to meet the requirements of SGMA and the GSP regulations. Specific requirements of Periodic Evaluations are described in 23 CCR §356.4. The Upper San Luis Rey Groundwater Management Authority (USLRGMA), as GSA for the Upper San Luis Rey (USLR) Valley Groundwater Subbasin, has therefore prepared this first Periodic Evaluation of the USLR Valley GSP, which accompanies the 2027 Amendment of the USLR Valley GSP.

The USLR Valley Groundwater Subbasin is the upper portion of the larger San Luis Rey Valley Groundwater Basin, located in San Diego County, which extends from the confluence of the San Luis Rey River and Paradise Creek, continuing downstream through four valleys (Pauma, Pala, Bonsall, and Mission), and ending at the Pacific Ocean in the City of Oceanside (Figure 1). The USLR Valley Groundwater Subbasin (DWR subbasin 9-007.01) can be further subdivided into two subbasins: the Pauma Subbasin and the Pala Subbasin. The Pauma Subbasin extends from the confluence of the San Luis Rey River and Paradise Creek to the Agua Tibia Narrows near the confluence of the San Luis Rey River and Frey Creek. The Pala Subbasin extends from the Agua Tibia Narrows to Monserate Narrows. Based on prior decisions by the State of California, groundwater in Pala Subbasin, located downstream of Frey Creek, has been determined to be a subterranean stream flowing through known and definite channels (SWRCB, 2002). While subterranean streams are generally excluded from SGMA, Assembly Bill 1944 was put forth to include the area of the subbasin downstream from Frey Creek (i.e., Pala Subbasin) as part of SGMA for the purposes of groundwater sustainability. AB 1944 does not alter any existing water right. Therefore, the USLR Valley GSP components address both the Pauma and Pala Subbasins.

The USLR Valley GSP (PVGSA, 2022) was submitted to DWR on January 31, 2022, and was approved by DWR on January 18, 2024. The GSP reported on groundwater conditions through 2020. The 2027 Periodic Evaluation provides an assessment of conditions in the Subbasin and describes Plan implementation activities and an assessment of groundwater condition changes since the GSP was submitted, representing the period from water year (WY) 2021 through 2025. It also provides DWR, interested parties, and the public with the progress the USLRGMA has made on implementing the GSP. Specifically, this Periodic Evaluation summarizes and assesses:

- Responses to DWR Recommended Corrective Actions (RCAs)
- New and significant information and data
- Groundwater conditions for each applicable sustainability indicator identified in the approved GSP
- Status of projects and management actions
- Updates to the basin setting
- Monitoring network updates
- The authorities and actions taken by the USLRGMA during this evaluation cycle

- Outreach, engagement, and coordination activities
- A summary of proposed or completed revisions to the 2027 GSP Amendment.

This Periodic Evaluation is also being prepared concurrently with an amended GSP for the USLR Valley Groundwater Subbasin. The 2027 GSP Amendment and this Periodic Evaluation have been timely noticed to stakeholders and the County of San Diego (County) and will be considered for adoption by the Upper San Luis Rey Groundwater Management Authority as part of the same public process. Following adoption, both documents will be submitted to DWR by January 31, 2027.

2.0 Response to DWR Recommended Corrective Actions

DWR issued approval of the GSP for the USLR Valley Groundwater Subbasin on January 18, 2024, and provided Recommended Corrective Actions (RCAs) to enhance the GSP and facilitate future evaluations (DWR, 2024a). DWR strongly encouraged the USLRGMA to consider these RCAs prior to the first periodic evaluation (this report). The following subsections present a summary of each RCA and how the USLRGMA has addressed or plans to address each one.

2.1 Administrative Information

DWR's RCA 1 directed the USLRGMA to update the administrative information for the agency, including the current governance structure and decision-making process, in the annual report following their determination letter as well as in the next plan amendment/periodic evaluation. DWR also recommended that the USLRGMA coordinate with DWR to update agency information and associated geospatial files on the SGMA Portal to clearly identify the portions of the Subbasin the USLRGMA has jurisdiction over and intends to manage under the GSP. In addition, DWR recommended that the USLRGMA describe how groundwater management considers the interests of tribal nations and respects existing federal reserved water rights.

The USLRGMA addressed the majority of this corrective action in the WY 2023 Annual Report (USLRGMA, 2024) by including updated administrative information for the USLRGMA in Appendix A. The appendix describes the transition from the Pauma Valley GSA (PVGSA) to the USLRGMA, which was formed through a Joint Powers Agreement after submittal of the 2022 GSP. The appendix also identifies the USLRGMA's member agencies, mailing address, legal authority, governance structure, and decision-making process.

As described in the WY 2023 Annual Report, the USLRGMA consists of the same member agencies that participated in the original GSA structure: Yuima Municipal Water District (YMWD), Pauma Valley Community Services District (PVCSD), Pauma Municipal Water District (PMWD), San Luis Rey Municipal Water District (SLRMWD), and the Upper San Luis Rey Resource Conservation District (USLRRCD). The updated decision-making process identifies the USLRGMA Board of Directors as the decision-making body for GSP implementation.

The updated administrative information has also been incorporated into the 2027 GSP Amendment in Sections 1.3 and 2.5. In addition, the USLRGMA updated agency information in the online SGMA Portal and coordinated with DWR regarding the appropriate agency information and spatial coverage for the Subbasin. These updates clarify the current governance structure responsible for GSP implementation and address DWR's recommendation to correct outdated administrative information from the original GSP.

The 2027 GSP Amendment also includes updated discussion of the USLRGMA's role in managing the Subbasin under SGMA while recognizing the presence of tribal lands and the limitations of the USLRGMA's jurisdiction (GSP Amendment Section 1.3.3.1). The USLRGMA has a generalized understanding of tribal water demands based upon the amount of acreage under cultivation on reservation and other tribal-owned lands, casino demands, etc., and have included these estimates in the groundwater budgets for

the Subbasin and estimates of sustainable yield. The SLRIWA website[1] was also reviewed for updated details or information regarding the Tribal Settlement Act. The USLRGMA continues to recognize that SGMA does not determine or alter water rights and that federally reserved water rights must be respected in full. The USLRGMA has considered tribal interests through continued recognition of tribal lands, tribal beneficial uses and users, and the need for continued coordination during GSP implementation.

2.2 Water Budget

DWR's RCA 2 directed the USLRGMA to provide additional water budget information for the USLR Valley Groundwater Subbasin. In its GSP determination, DWR noted that the 2022 GSP provided historical, current, and projected water budgets for the groundwater system, but did not provide a corresponding surface water budget that quantified surface water entering and leaving the Subbasin by water source type. DWR recommended that the USLRGMA provide historical, current, and projected water budgets for both groundwater and surface water systems, use DWR's Water Budget Best Management Practices (BMP) as appropriate, and continue coordinating with groundwater extractors and beneficial users to develop the most accurate and realistic water budget estimates practicable.

The USLRGMA has been working on addressing items related to this corrective action since implementation of the GSP. The annual reports provide an opportunity to assess imported water use, groundwater pumping, and surface water diversion information from basin stakeholders and evaluate changes in hydrologic conditions related to the water budgets. Data gaps continue to be filled as basin stakeholders provide information on groundwater pumping, surface water use, well location and construction information, and other feedback on hydrologic conditions. The USLRGMA continues to request and incorporate available data from basin pumpers, public water systems, agricultural water users, and other stakeholders. These data are used to refine estimates of groundwater pumping, surface water use, imported water use, groundwater elevation contours, and changes in groundwater storage. It is anticipated that the adoption of pumping fees in 2024 will generate the submittal of additional pumping records through associated self-certification and reporting forms. The USLRGMA has also identified the need to enact a well registration and meter installation program for mandatory metering of pumping in the Subbasin. This PMA was slated to be completed during this last evaluation period, but funding to support it was not able to be secured (see Section 10.2 for more details). The USLRGMA continues to evaluate the potential for implementing this PMA.

The USLRGMA also continues to support stakeholder outreach and coordination through regular USLRGMA meetings, direct communication with basin stakeholders, and public posting of information on the USLRGMA's website. These communications provide opportunities to discuss GSP implementation, water budget data needs, monitoring activities, and other topics relevant to sustainable groundwater management. Ongoing communication with stakeholders is particularly important because reliable water budget estimates depend on continued reporting or voluntary sharing of groundwater pumping and surface water diversion data. The recent implementation of pumping fees is anticipated to result in even more records of groundwater pumping, as there have been several requests from private pumpers for self-certification forms to report pumping and surface water use.

[1] https://www.slriwa.org/#top

The 2027 GSP Amendment (Section 3.3.5) further addresses RCA 2 by providing updated surface water and groundwater budgets for the Subbasin. The updated budgets incorporate new data collected during GSP implementation, including information provided by basin stakeholders and collected to support annual reporting. The updated budgets also incorporate results from the updated and recalibrated surface water and groundwater flow models. These refinements improve the technical basis for evaluating basin inflows, outflows, groundwater pumping, local surface water use, imported water use, recharge, subsurface flow, and changes in groundwater storage.

The Periodic Evaluation (Section 7.0) and 2027 GSP Amendment (Section 5.3) also include an updated discussion of remaining data gaps and the steps being taken to address them. The USLRGMA recognizes that some uncertainty remains in water budget components where direct measurement is incomplete or where data depend on voluntary reporting. However, the updated water budgets represent the best available information and provide a more complete accounting of both groundwater and surface water conditions than was available in the 2022 GSP. The GSA will continue to refine water budget estimates through annual reporting, model updates, stakeholder coordination, and incorporation of new data as it becomes available.

The USLRGMA also recognizes DWR's recommendation to develop a management approach that can achieve sustainability despite remaining data gaps and the GSA's limited jurisdiction over tribal areas. The USLRGMA does not have authority to require data collection or reporting on federally reserved lands and does not regulate groundwater use within those areas. However, the 2027 GSP Amendment incorporates a management approach that uses available monitoring locations upgradient and/or downgradient of areas where direct monitoring access is limited. In particular, the revised monitoring network includes water level and water quality monitoring locations on either side of the Pala Reservation, which allows the USLRGMA to evaluate groundwater conditions entering and leaving that portion of the Subbasin. Monitoring locations are also located on either side of the Pauma Reservation. Through the establishment of appropriate SMCs at these near-tribal boundary monitoring locations, groundwater conditions in the intervening area are anticipated to remain protective of beneficial uses and users to the extent such conditions are influenced by groundwater management activities within areas subject to USLRGMA monitoring and management authority. Although the Rincon and La Jolla Reservations also remain outside the USLRGMA's direct monitoring and management authority, they are located in upgradient portions of the Subbasin and are therefore not expected to experience significant adverse effects from downgradient groundwater management activities that remain compliant with established SMCs at downgradient Representative Monitoring Sites (RMSs). This approach allows the USLRGMA to continue implementing the GSP using the best available data while respecting jurisdictional limitations and federally reserved water rights.

2.3 Sustainability Indicators for Groundwater Levels

DWR's RCA 3 directed the USLRGMA to provide additional information supporting the SMC for chronic lowering of groundwater levels. DWR identified three primary concerns. First, the 2022 GSP included more than one description of the undesirable result definition for groundwater levels, creating ambiguity regarding the conditions that would constitute an undesirable result. Second, DWR recommended that the USLRGMA perform a well impact analysis using best available well information, including information available through DWR's Online System for Well Completion Reports (OSWCR), to evaluate whether the

groundwater level minimum thresholds (MTs) are protective of domestic wells and other beneficial uses and users. Third, DWR recommended that the USLRGMA explain how the groundwater level MTs were developed with consideration of beneficial uses and users, including tribal interests.

The USLRGMA addresses this corrective action through the Periodic Evaluation and 2027 GSP Amendment. As part of this effort, the USLRGMA reevaluated the groundwater level SMCs and revised them as necessary to provide a clearer and more technically supported framework for evaluating chronic lowering of groundwater levels. The 2027 GSP Amendment provides a consistent undesirable result definition for groundwater levels and presents an updated RMS network used to evaluate groundwater level conditions (GSP Amendment Section 4.2). The revised groundwater level SMCs also include updated MTs and management objectives (MOs). In addition, the 2027 GSP Amendment establishes interim milestones (IMs) for groundwater levels (GSP Amendment Section 4.2.5). The 2022 GSP did not establish IMs because the Subbasin was already operating between MOs and MTs at the start of GSP implementation. In response to DWR's recommendation, IMs in the 2027 GSP Amendment have been set at the MO for each groundwater level RMS. This provides a clear benchmark for evaluating progress during future annual reports and periodic evaluations.

The groundwater level RMS network needed to be updated due to change in access at some of the original monitoring sites (i.e., MW-1, MW-2, MW-26, MW-27, and MW-28). Replacement RMS wells were identified where necessary and where monitoring points that met RMS criteria were available. Other RMS wells were revised to improve spatial distribution throughout the Subbasin. These revisions, discussed below in Sections 4.4 and 7.1, improve the USLRGMA's ability to evaluate groundwater level conditions in areas where beneficial uses and users may be affected by declining groundwater levels.

Water level SMCs were reevaluated in the context of historical water level data, model-simulated groundwater elevations, and hydrologic conditions. Specifically, the period surrounding the 2012 through 2016 drought was identified, which represents the most severe recent dry period stress condition in the available monitoring record. It consists of a below normal year in 2012, critical years in 2013 and 2014, and below normal years in 2015 and 2016 (see Figure 2). Groundwater levels in many wells throughout the Subbasin with water level data were at or near historical lows around October 2016 for the available period of record, and basin pumpers reported that irrigation schedules and pumping operations had to be modified in response to low water levels. Water level SMCs were therefore revised in existing RMS wells and established in new RMS wells within the context of these historical groundwater conditions. These revisions further avoid undesirable results to beneficial use and users.

To support the reevaluation of water level SMCs, an analysis of potential well impacts was conducted. Results of this analysis are presented in Appendix 4a to the 2027 GSP Amendment and are summarized in the subsection below. The analysis used available well information to evaluate whether the groundwater level MTs are protective of beneficial uses and users, including domestic, agricultural, and municipal groundwater users. The revised groundwater level SMCs also support evaluation of groundwater storage because groundwater levels are used as a proxy for reduction of groundwater in storage. Accordingly, the groundwater level SMC revisions included in Section 4.2 of the 2027 GSP Amendment address both chronic lowering of groundwater levels and the groundwater level proxy used for groundwater storage.

This Periodic Evaluation assesses current hydrologic conditions relative to the updated groundwater level SMCs. Based on available data through WY 2025, groundwater levels at the groundwater level RMS wells

remained above MTs. Therefore, no discernible undesirable results related to chronic lowering of groundwater levels occurred during the evaluation cycle. Additionally, the GSA received no reports of dry wells during the WY 2021 through 2025 period. Groundwater levels generally also remained above MOs and current IMs, indicating that groundwater level conditions are consistent with the sustainability goals established for the Subbasin. The USLRGMA will continue to evaluate groundwater level conditions through routine monitoring, annual reporting, and future periodic evaluations, and will refine the monitoring network or SMCs as needed based on new data.

2.3.1 Analysis of Potential Well Impacts

In order to evaluate the protectiveness of water level MTs for selected RMS wells at other wells in the Subbasin, an analysis of potential well impacts was conducted. The analysis compares simulated groundwater elevations in October 2016, representing low (Fall) groundwater elevations following the 2012 through 2016 drought, to available well construction information (i.e., screened intervals and total depths) for wells throughout the Pauma and Pala Subbasins. This water level roughly coincides with predicted groundwater conditions when water levels in RMS wells would be nearing or crossing selected MTs.

There is some uncertainty inherent in this analysis. Well location is one of the greatest sources of uncertainty, as locations are often provided to the nearest center of section based on State well numbers. During this Periodic Evaluation, available well logs were reviewed in detail and locations were updated based on information provided on each log, if available. Screened intervals were used where available. Where missing, the analysis relied on total depth. Pump intake depths were not used as they are generally unavailable. Wells without any construction or locational information were not able to be used. Abandoned, destroyed, and inactive wells were also excluded from the analysis. However, well status is uncertain for many records and age was not used to exclude wells; some wells incorporated in this analysis may be old wells past their useful life and are no longer used, despite maintaining an “active” status. Furthermore, the model-simulated water levels used for the analysis are dependent on the accuracy of the model. In particular, model uncertainty is greater near basin boundaries and in areas with limited control points.

Simulated water levels were evaluated at 252 wells as follows:

- Low Apparent Vulnerability = >20% saturated screen / depth interval
- High Vulnerability = <20% saturated screen / depth interval but above bottom of well / screen
- Potentially Dry = Modeled groundwater elevation is below the bottom of the known screen / depth interval

The well impact analysis indicates that the Fall 2016 dry period reference condition, used as a proxy for a water level surface representing selected MTs at RMS wells, does not result in extensive modeled well impacts within the Subbasin (84% of wells have low apparent vulnerability of becoming dry; Figure 3). The results are summarized in the following table.

Table 2-1. Summary of Potential Well Impacts

Condition	Number of Wells in Pauma Subbasin				Number of Wells in Pala Subbasin			
	Municipal/ Public	Private (Domestic)	Irrigation	Other/ Unknown	Municipal/ Public	Private (Domestic)	Irrigation	Other/ Unknown
Low Apparent Vulnerability	51	**7**	38	59	6	**11**	17	22
High Vulnerability	4	**0**	1	2	0	**2**	0	0
Potentially Dry	1	**3**	2	23*	0	**1**	1	1

*The number of potential dry wells is likely overestimated due to: locational uncertainty (many of these wells are located within the center of the section), model uncertainty (well located near the model boundaries and/or in areas with little water level control to guide model calibration have higher uncertainty), unknown well status, and no reports of dry wells despite the analysis assuming water levels approximating a historical condition.

Most wells (84%) with available construction information retain more than 20% saturated screen or depth interval under the simulated Fall 2016 groundwater level condition. A limited number of wells are identified as potentially dry (13%) or highly vulnerable (3%) (Figure 4). Potentially dry wells are concentrated primarily in Pauma and near basin margins or areas where model uncertainty is higher due to boundary conditions, limited nearby control points, and uncertainty in well location[2], construction or operational status. Due to the uncertainties listed above, these results are interpreted as potential impacts rather than confirmed dry wells. The uncertainty in predicted potentially dry wells is further demonstrated by the fact that no verified dry well reports are known to the GSA that may have been received by local water purveyors for the 2012 through 2016 dry period, despite lower groundwater elevations. While the USLRGMA recognizes that the absence of reported impacts does not eliminate the potential for impacts to private or undocumented wells, the results are used to identify potential problem areas for the development of adaptive management responses for the potential for groundwater levels to approach the Fall 2016 condition after a future drought period. Overall, the analysis of potential well impacts indicates that revised MTs based on Fall 2016 conditions will generally prevent depletion of domestic well supply. Current groundwater levels remain above MOs in all wells but two as of Fall 2025, indicating that basin conditions are substantially above levels associated with potential well impacts.

A more complete summary of this analysis of potential well impacts is provided in the 2027 GSP Amendment as Appendix 4a.

2.4 Sustainability Indicators for Degraded Water Quality

DWR's RCA 4 directed the USLRGMA to provide additional information supporting the SMC for degraded groundwater quality. DWR recommended that the USLRGMA clarify undesirable results for degraded groundwater quality and define undesirable results so that exceedances of MTs caused by groundwater extraction, or by implementation of the USLRGMA's PMAs, are considered in the assessment of

[2] 23 of the potentially dry wells (72%) are located in the centroid of Section, meaning the model-predicted reference elevation could be significantly different than at each well's actual (unknown) location.

undesirable results in the Subbasin. The USLRGMA has addressed this corrective action through continued collection and evaluation of annual groundwater quality data, reevaluation of groundwater quality conditions, and revision of the degraded groundwater quality SMCs in the 2027 GSP Amendment (Section 4.4). Groundwater quality data continue to be collected and reviewed through annual reporting, including available data from public supply wells and that collected from supplemental monitoring locations. These data are used to evaluate trends and spatial patterns in groundwater quality and to support continued assessment of whether GSP implementation is causing significant and unreasonable degradation.

As part of the 2027 GSP Amendment, the USLRGMA reevaluated groundwater quality conditions in the Subbasin and revised the degraded groundwater quality SMC framework, which is summarized below in Section 4.6. Rather than relying on a single basin-wide ambient quality criterion, the revised approach establishes constituent-specific SMCs. The revised SMC framework also clarifies the distinction between groundwater management under SGMA and regulatory water quality programs administered by other agencies. The USLRGMA's role is to manage groundwater conditions to avoid significant and unreasonable degradation caused by groundwater management activities, including migration of degraded groundwater into areas where constituent concentrations are currently below applicable standards or objectives. The GSP does not establish cleanup levels, waste discharge requirements, drinking water compliance obligations, or remediation requirements for water quality impacts caused by historical land use, ongoing permitted agricultural activity, septic systems, imported-water quality, or other sources outside the USLRGMA's authority.

Undesirable results for degraded groundwater quality were clarified and redefined in Section 4.4 of the 2027 GSP Amendment. The revised definitions are based on exceedances of constituent-specific MTs at each RMS well. The new RMS network focuses on groundwater monitoring wells with available water quality data, including active public supply wells where data are routinely collected and reported through existing drinking water monitoring programs. A few other wells for which water quality data are not available were also selected for the water quality monitoring network to provide coverage of otherwise data gap areas or provide resolution in key areas. This network will be used to evaluate total dissolved solids (TDS), nitrate, and perchlorate on an annual basis. Perchlorate was added as a constituent of concern in the 2027 GSP Amendment to improve monitoring of known or potential affected areas and to evaluate whether groundwater management activities could contribute to material worsening or migration of perchlorate-affected groundwater.

The Periodic Evaluation also summarizes groundwater quality conditions during the evaluation cycle and evaluates available data relative to the revised SMCs (see Section 4.6). Supporting figures include chemographs showing concentration trends and maps showing the locations of TDS, nitrate, and perchlorate monitoring points. These data provide the basis for evaluating whether groundwater quality conditions have degraded during GSP implementation and whether any observed exceedances represent undesirable results under the revised framework. The USLRGMA will continue to evaluate groundwater quality data during annual reporting and future periodic evaluations and will coordinate with affected users and appropriate regulatory agencies if exceedances, increasing trends, or potential migration of degraded groundwater are identified.

2.5 Sustainability Indicators for Land Subsidence

DWR's RCA 5 directed the USLRGMA to establish SMC for land subsidence based on direct measurements of land elevation changes. DWR acknowledged that the 2022 GSP identified land subsidence as a low-risk indicator in the Subbasin and noted that available Interferometric Synthetic Aperture Radar (InSAR) data had not recorded subsidence between 2016 and 2021. However, DWR also stated that undesirable results related to land subsidence could occur in the future because the GSP's groundwater management strategy allowed groundwater levels to decline below historical lows. DWR therefore recommended that land subsidence SMCs be established as part of the first periodic evaluation and plan amendment.

The USLRGMA addressed this corrective action in the 2027 GSP Amendment by redefining the SMCs for land subsidence and establishing a subsidence RMS network, as summarized in Sections 4.8 and 7.5 of this Periodic Evaluation and Section 4.6 of the 2027 GSP Amendment. The revised land subsidence SMCs are based on direct measurements of vertical land surface displacement using InSAR data at selected InSAR grid locations distributed throughout the Subbasin. The network includes locations in the main Pauma pumping and Paleo Lake Pauma areas (coinciding with the only significant clay layer in the subbasin, where subsidence risk would theoretically be the likeliest to occur), and locations near major infrastructure areas, including the Pala Casino, Casino Pauma, and Harrah's Resort. The land subsidence RMS network will be evaluated annually going forward, using DWR-provided InSAR data.

Consistent with DWR's recommendation, subsidence SMCs are intended to identify and avoid significant and unreasonable land subsidence caused by groundwater extraction that substantially interferes with land use, infrastructure, drainage, surface water conveyance, or other beneficial uses of the Subbasin. Annual reporting includes review of vertical displacement at the selected InSAR monitoring points and evaluation of whether any apparent displacement exceeds the screening thresholds established in the 2027 GSP Amendment. Where a potential exceedance is identified, the USLRGMA will evaluate whether the signal is persistent, spatially confirmed, and associated with groundwater-level decline.

2.6 Sustainability Indicators for Interconnected Surface Water

DWR's RCA 6 directed the USLRGMA to continue improving the technical basis for evaluating depletions[3] of interconnected surface water (ISW) caused by groundwater pumping. The 2022 GSP identified data gaps related to monitoring, quantification of streamflow depletion, timing and location of interconnection, and potential impacts to beneficial uses and users that limited the ability to define undesirable results. DWR recommended that the USLRGMA continue to fill data gaps, collect additional monitoring data, coordinate with resource agencies and interested parties, better understand beneficial uses and users that may be affected by pumping-induced depletion, and refine the ISW SMCs as appropriate.

The USLRGMA has partially addressed this corrective action through additional modeling, the development of an updated ISW SMC framework in the 2027 GSP Amendment (Section 4.5),

[3] Depletion of ISW due to groundwater pumping can occur through reduction of inflow to ISW from groundwater or an increase in outflow from ISW to groundwater. While modeled depletion occurs in the USLR Valley Groundwater Subbasin due to groundwater pumping, it should only be considered undesirable if it significantly and unreasonably impacts beneficial use of surface water (DWR, 2024b).

establishment of a shallow monitoring well near the San Luis Rey River in Pauma Subbasin, and identification of ISW monitoring improvements. Because no active, permanent streamflow gage currently exists within the Subbasin, and because shallow groundwater monitoring and pumping data remain limited, direct measurement of pumping-induced streamflow depletion is not currently feasible. The 2027 GSP Amendment therefore uses the recalibrated watershed and groundwater flow models to support evaluation of ISW depletion. Specifically, simulated streamflow under baseline calibration conditions was compared to simulated streamflow under a no-groundwater-pumping scenario for the same period. The difference between the two scenarios provides a model-estimated indication of the location, quantity, and timing of streamflow depletion caused by groundwater pumping, as summarized in subsection 2.6.1 below. To improve the spatial resolution of the ISW analysis, the San Luis Rey River was divided into six evaluation reaches: three in the Pauma Subbasin and three in the Pala Subbasin. The reach-based analysis provides a more detailed understanding of where modeled depletion occurs and supports identification of priority areas for future monitoring and refinement of SMCs.

Although the model analysis provides useful information regarding the relative location, quantity, and timing of potential depletion, model-estimated depletion volumes are not currently appropriate as the sole enforceable SMC metric for ISW. This determination reflects the intermittent and seasonal nature of streamflow in the Subbasin[4], the absence of active streamflow gages within the Subbasin, limited shallow groundwater monitoring near potentially interconnected reaches, and uncertainty in estimated pumping and model-estimated streamflow and baseflow conditions. For these reasons, the 2027 GSP Amendment establishes ISW SMCs using groundwater elevations at selected monitoring wells located along or near the San Luis Rey River as proxy indicators of near-river groundwater conditions. The proxy framework allows ISW conditions to be evaluated annually using available monitoring data, while preserving a path toward future refinement of the SMCs as additional streamflow, shallow groundwater, pumping, and field observation data become available. The revised SMC framework is discussed in Section 4.7 of this Periodic Evaluation and Section 4.5 of the 2027 GSP Amendment.

The updated analysis supports continued emphasis on the Pala Subbasin as the higher-priority area for future ISW monitoring and refinement because of its hydrogeologic setting, classification as a subterranean stream, downstream connection to the Bonsall and Mission Subbasins, and the presence of surface water toward the downgradient end of the Subbasin. The Pauma Subbasin continues to be interpreted as including losing or seasonally disconnected reaches under many conditions; however, the revised model analysis indicates that pumping can contribute to simulated depletion in portions of Pauma, primarily through interception of baseflow or groundwater discharge that would otherwise support the river or shallow alluvial system when surface water is present. This updated understanding is incorporated into the revised framework by retaining Pauma in the ISW evaluation while recognizing that the timing and magnitude of potential effects are constrained by streamflow availability, localized shallow groundwater conditions, and the intermittent nature of flow.

Potential GDEs and downstream beneficial uses are considered as part of the broader ISW evaluation. The 2027 GSP Amendment continues to treat mapped potential GDE areas as screening-level information because groundwater dependency has not been field verified and some riparian vegetation may rely on

[4] The USLRGMA does not have any control over releases from Henshaw Dam.

seasonal surface water, rainfall, ambient soil moisture, perched water, or water associated with bedrock fractures rather than groundwater from the principal aquifer system. The USLRGMA will continue to address ISW-related data gaps through proposed monitoring and data-resolution improvements, including surface water monitoring, investigation of alternative or additional ISW monitoring sites, transducer installation, field observations of wetted conditions, and exploring the feasibility of using imagery-based tools. These efforts are intended to improve the technical basis for evaluating ISW and support potential development of a more direct depletion-volume SMC framework during future periodic evaluations, if sufficient data and funding become available.

2.6.1 Location and Timing of Depletion

The updated and recalibrated USLR watershed and groundwater flow models were used to estimate the portion of streamflow depletion attributable to groundwater pumping by comparing net stream gains for six segments along the San Luis Rey River over baseline model conditions (representing the calibration period from 1991 through September 2025) with a no-groundwater-pumping scenario for the same time period. This model-based comparison provides a quantitative basis for evaluating the location, quantity, and timing of streamflow depletion caused by groundwater pumping. For this evaluation, the San Luis Rey River was divided into six reaches: three reaches in the Pauma Subbasin and three reaches in the Pala Subbasin. The reach-based analysis provides a more detailed understanding of where modeled depletion occurs along the river. The six reaches evaluated for this analysis, shown in Figure 5, include:

- **Pauma Reach 1:** from the upgradient boundary of the USLR Valley Groundwater Subbasin to just before the confluence with Yuima and Potrero Creeks.
- **Pauma Reach 2:** from the confluence with Yuima and Potrero Creeks to just before the confluence with Pauma Creek.
- **Pauma Reach 3:** from the confluence with Pauma Creek to just before the confluence with Frey Creek (generally representing the boundary between the Pauma and Pala Subbasins).
- **Pala Reach 1:** from the confluence with Frey Creek to just before the confluence with Marion Creek.
- **Pala Reach 2**: from the confluence with Marion Creek to just before the confluence with Pala Creek.
- **Pala Reach 3:** from the confluence with Pala Creek to the downgradient boundary of the USLR Valley Groundwater Subbasin at the Monserate Narrows.

The net stream gain for the Pauma and Pala Subbasin reaches is shown in Figures 6 and 7, respectively. This represents the amount of water entering the stream from the aquifer (baseflow), minus the streamflow entering the aquifer system through streambed percolation. On these plots, positive values indicate a gaining stream (i.e., the contribution of water from the groundwater system is greater than the lost streamflow through percolation), while negative values indicate a losing stream (i.e., streambed percolation is greater than inflow from the surrounding aquifer system). Annual depletion of ISW for the Pauma and Pala Subbasin reaches, which represents the difference between the without pumping and with pumping scenarios, is shown in Figures 8 and 9, respectively.

The model results indicate that from the top of the basin down, the San Luis Rey River passes through three regimes. All of the Pauma reaches as well as Pala Reach 1 are losing under real-world conditions (i.e., with pumping) and no-pumping conditions. This confirms the conceptual model that this stretch of the San Luis Rey River is naturally losing – as evidence by ephemeral streamflow and lower groundwater elevations relative to the streambed elevation. Here, pumping deepens an existing loss rather than reversing a gain. Pala Reach 2 represents a transition reach. Without groundwater pumping, this reach is a gaining reach. With groundwater pumping, this reach is primarily a losing reach. Pala Reach 3 at the end of the groundwater Subbasin is a persistently gaining reach, both with and without pumping. These conditions are reflected physically through shallow groundwater, standing water, and increased riparian vegetation.

The results also indicate that groundwater pumping results in simulated depletion of surface water in both the Pauma and Pala Subbasins, even in the continually losing reach. This depletion, however, is not distributed evenly along the river. In the Pauma Subbasin, modeled depletion is concentrated primarily in Pauma Reach 2, which accounts for the largest modeled depletion of the six reaches, averaging approximately 3,200 acre-ft/yr during the calibration period. Pauma Reach 3 also contributes to the modeled depletion, averaging approximately 1,000 acre-ft/yr, while Pauma Reach 1 contributes a smaller portion, averaging approximately 400 acre-ft/yr. The cumulative modeled depletion at the downstream end of the Pauma Subbasin averages approximately 4,600 acre-ft/yr during the calibration period.

In the Pala Subbasin, modeled depletion is concentrated primarily in Pala Reach 2 and Pala Reach 3. Pala Reach 2 averages approximately 2,600 acre-ft/yr of modeled depletion while Pala Reach 3 averages approximately 1,700 acre-ft/yr. Pala Reach 1 is more variable and generally contributes a smaller portion of total modeled depletion. The Pala reaches collectively average approximately 5,000 acre-ft/yr of modeled depletion, and total modeled depletion at the downstream end of the Pala Subbasin averages approximately 9,600 acre-ft/yr during the calibration period. Pala reach depletion compared to pumping in the Pala Subbasin and associated reach zones indicates that all of this depletion cannot be caused by Pala pumping alone.

The timing of modeled depletion varies by hydrologic condition. Average annual depletion is highest during wet years and generally lower during dry and critical years, as shown in Figure 10. This pattern indicates that modeled depletion is not controlled solely by annual groundwater pumping. Rather, it appears to be influenced by the availability of surface flow, streambed leakage, antecedent groundwater conditions, the spatial distribution of pumping, and lagged groundwater/surface water response. During wetter years, more surface water is available in the river system and the model simulates greater potential for stream-aquifer exchange and pumping-induced depletion. Depletion is lower in critical years because there is no surface water to deplete. The same relationship is true with seasonal depletion: pumping peaks in July and is lowest in December, while pumping-induced ISW depletion peaks in March and is lowest in October or November. This is because, particularly in the disconnected or losing reaches, depletion requires water in the stream. Therefore, management strategies keyed to particular water year types are unlikely to be effective for the connected reaches.

The model results also indicate that annual depletion does not have a reliable direct relationship with reach zone or total annual Subbasin pumping. Furthermore, a plot of cumulative USLR Valley Groundwater Subbasin pumping and cumulative annual surface water depletion suggests that depletion may lag behind pumping and may persist over multi-year periods (Figure 11). This lagged response is an important

consideration for the ISW SMC framework because a single-year depletion value may reflect prior pumping and antecedent conditions rather than current-year management alone.

2.6.2 Data Gaps

The primary data gap associated with ISW in the USLR Valley Groundwater Subbasin is the lack of streamflow gages along the San Luis Rey River in the Subbasin and shallow monitoring points near the river. To continue to address these data gaps, the USLRGMA is exploring potential partnerships, technical assistance, and funding opportunities to establish at least one surface-water monitoring gage in the Subbasin. A permanent stream-stage or streamflow gage would provide direct data needed to improve understanding of the timing, duration, and magnitude of surface-water flow in the San Luis Rey River. The USLRGMA is evaluating potential coordination opportunities with agencies and organizations that may be able to support gage installation, operation, data management, or technical interpretation.

Since there are no active streamflow gages within the Subbasin and the ISW modeling analysis indicated no direct correlation between ISW depletion and groundwater pumping, the evaluation of ISW necessitates the establishment of proxy SMCs based on results from the groundwater modeling. The annual evaluation of ISW depletion will make use of available water level information from existing and potential future groundwater monitoring locations, observations of field conditions, measured annual precipitation, estimated groundwater pumping, streamflow at the Oceanside gage (USGS Gage 11042000), and whether any stakeholder complaints or downstream water right concerns were received. These SMCs and groundwater level monitoring locations are discussed below in Sections 4.7 and 7.4.

One monitoring point near the lower Pauma stream reach was specifically installed in WY 2023 to provide groundwater level information near the river corridor, including water level differences between the perched aquifer and deeper principal aquifer. This point includes two new clustered monitoring wells, USLR MW-1S and USLR MW-1D, which provide resolution on shallow perched water levels (USLR MW-1S) and groundwater conditions in the deeper principal alluvial aquifer (USLR MW-1D) (see Figure 12). They have been incorporated into the GSP groundwater level monitoring network through the 2027 GSP Amendment and the deeper well represents one of the RMSs for ISW (with the shallower well providing supporting information). As part of the ongoing management action to address data gaps, the USLRGMA will be exploring funding for the installation of pressure transducers in these two wells, and other ISW proxy monitoring wells, to improve the temporal resolution of groundwater level data near the San Luis Rey River (see Section 5.3). Continuous or higher-frequency groundwater level data from these wells and other wells designated for the ISW monitoring network would improve the ability to evaluate short-term groundwater level responses to precipitation, streamflow events, pumping, and seasonal hydrologic conditions. The USLRGMA is also currently exploring the feasibility of installing additional shallow monitoring wells or piezometers in areas of suspected ISW, particularly along the Pala segment of the San Luis Rey River. Priority will be placed on a new groundwater monitoring location near gaining reaches in the lower part of Pala Subbasin.

The USLRGMA will continue to fill ISW data gaps, coordinate with interested parties and resource agencies, evaluate potential effects on beneficial uses and users, and refine ISW SMCs as additional monitoring data and model results become available.

3.0 New Information Collected

This section presents new and significant information acquired since development of the 2022 GSP. Information deemed new and significant is summarized in Table 3-1, along with section references to affected portions of the 2027 Plan Amendment (though these information sources may also be applicable to other portions of the Plan Amendment). Further details regarding specific sources are provided in the subsections below. This information has informed updates for the 2027 Plan Amendment and this Periodic Evaluation.

Table 3-1. Summary of New Information Since GSP Implementation

Significant New Information	Description	Aspects of Plan Affected	Warrant Change to Any Aspects of the Plan
New monitoring data	The GSP water level monitoring network was revised as part of the 2027 Plan Amendment to provide replacement monitoring locations for previous wells with lost access since GSP implementation and to provide additional resolution in data gap areas. Nine new wells were added to the network, including two clustered monitoring wells (see below). RMSs for water level were updated as well. Additional water quality data from public datasets and supplemental USLRGMA sampling was used to reevaluate water quality conditions in the basin and revise the SMC framework. New monitoring data were used to update and recalibrate the integrated watershed and groundwater flow model for the USLR Valley Subbasin through WY 2025, which were used to generate updated surface and groundwater budgets, estimate change in groundwater storage, and sustainable yield.	Basin Setting, RMSs, Monitoring Network	Yes; Sections 3.3.2, 3.3.4, 3.3.5, 4.2.1, 4.3.1, 4.4.1, 4.5.1, 5.2-5.5
Drilling and monitoring data from installation of clustered monitoring wells	Two new dedicated clustered monitoring wells were installed in the Pauma Valley area of the USLR Valley Groundwater Subbasin, near the San Luis Rey River. These monitoring wells represent the first dedicated monitoring wells designed and installed within the Subbasin to provide information specific to SGMA. The wells were installed in May and June of 2023 through YMWD SGMA grant funding. The wells were designed to provide information on discrete zones within the alluvial basin; a shallow well was drilled and completed above the clay layer found throughout much of Pauma Valley, while a deeper monitoring well was completed from below the clay layer to bedrock (Figure 12). The well construction summary report was provided as an appendix to the WY 2023 Annual Report (USLRGMA, 2024). Since the USLR Valley Groundwater Subbasin is relatively shallow, available well information has not been able to provide information on potential perched or shallow groundwater conditions – particularly in the central Pauma Subbasin area where the presence of a clay layer from a paleo lake is well documented. These wells therefore provide information on differences between shallow and deeper groundwater conditions within the Pauma Valley, helping to fill data gaps within this portion of the Subbasin and increasing the hydrogeologic understanding of the area and providing important information on specific conditions for future inclusion to updates of the GSP. Monitoring information since installation of the clustered wells has indicated that perched conditions do exist, at least locally, within Pauma Subbasin – as evidenced by an approximately 20-ft groundwater elevation difference. This allowed the hydrogeologic conceptual model (HCM) of the Pauma Valley to be updated in the	Basin Setting (Groundwater Occurrence and Aquifer Systems), RMSs for ISW, Monitoring Network	Yes; Sections 3.3.2, 4.5.1, 5.2

Significant New Information	Description	Aspects of Plan Affected	Warrant Change to Any Aspects of the Plan
	2027 Plan Amendment to include both a perched aquifer and a regional (principal) aquifer.		
Reports from DWR	Documents from DWR provided additional guidance for GSP implementation. Guidance was considered for the refinement of SMCs, such as water level, ISW, and subsidence. These documents included: Guidance Documents for Considerations for Identifying and Addressing Drinking Water Well Impacts (DWR, 2023a), a Guide to Annual Reports Periodic Evaluations, and Plan Amendments (DWR, 2023b), Depletions of ISW (DWR, 2024b) Techniques for Estimating ISW Depletion Caused by Groundwater Use (DWR, 2024c), and Examples of Estimating ISW Caused by Groundwater Use (DWR, 2024d); and Best Management Practices for Land Subsidence (DWR, 2026a).	SMCs, Monitoring Network, Projects and Management Actions, Reporting	Yes; Sections 4.2, 4.5, 4.6, 5.2-5.5, 6.3.1, 7.4-7.5
Aquifer Test	Aquifer testing was conducted at YMWD Well 20 in May/June 2023 to develop updated aquifer parameter information for future groundwater model refinement and basin management. The test included a 48-hour constant-rate pumping test, with YMWD Well 19 used as an observation well approximately 250 feet from the pumping well. Although nearby pumping interference appeared to affect the test response (water levels began recovering during the pumping period), the results provided useful estimates of aquifer transmissivity and storativity. Estimates of transmissivity ranged from approximately 18,000 to 40,200 gpd/ft, depending on assumed aquifer conditions and method. Estimated storativity was 0.0007. These results provide additional aquifer property data for the Pauma Subbasin and were considered during the model update.	Results were consulted for groundwater model update.	None
Analysis of potential well impacts	An analysis of potential well impacts was conducted using the updated groundwater model and available well construction information to evaluate whether groundwater level MTs are protective of beneficial uses and users (Geoscience, 2026a). The analysis compared simulated Fall 2016 groundwater elevations, representing low groundwater conditions following the 2012–2016 drought, to available screened intervals or total well depths for 252 wells in the Pauma and Pala Subbasins. Results indicate that most wells retain more than 20 percent saturated screen or depth interval under the simulated reference condition, and that revised MTs based on Fall 2016 conditions are not expected to result in extensive depletion of supply. The analysis is included in the 2027 GSP Amendment and was used to support refinement of groundwater level SMCs and identify areas where additional review, monitoring, outreach, or adaptive management may be warranted during future drought conditions.	SMCs for water level	Yes; Section 4.2, Appendix 4a
Reported pumping and surface water diversions	The USLRGMA continues to request pumping and surface water diversion use every year to facilitate annual reporting and an evaluation of Subbasin conditions. Currently, the submission of pumping data is voluntary and known pumping has been represented by a consistent group of public water supply agencies and agricultural users since the development of the GSP in 2022. However, pumping data for additional groundwater users has been obtained through recent annual reporting efforts. These data were used in the updated groundwater flow model. Part of the effort for this Periodic Evaluation involved searching the updated California State Water Resources Control Board's (Water Board) California Water Accounting, Tracking, and Reporting System	Water Source Types, Water Budgets	Yes; Sections 2.1.2, 3.3.5

Significant New Information	Description	Aspects of Plan Affected	Warrant Change to Any Aspects of the Plan
	(CalWATRS) website for diversion records within the Subbasin. This information was used to revise estimates of local surface water use.		
Watershed and Groundwater Model update	The integrated watershed and groundwater flow model for the USLR Valley Subbasin was updated through WY 2025. Several hydrogeologic conceptual model refinements were incorporated as well, including an updated bedrock surface and a bedrock layer, as summarized in Section 6.3. Both models were recalibrated and used to generate revised surface water and groundwater budgets. The modeling addendum is included as Appendix 3e of the 2027 Plan Amendment (Geoscience, 2026b).	Water Budgets	Yes; Section 3.3.5
Data provided by DWR	InSAR data is collected by the European Space Agency's Sentinel-1 satellites and processed for DWR as part of its SGMA technical assistance program. In DWR's SGMA Data Viewer, the dataset is presented as maps and time series of vertical displacement beginning in 2015, including monthly estimates with quarterly updates, and point values that represent the average displacement within a 100-meter by 100-meter area (DWR, 2026b). The dataset shows how the land surface is changing over time and allows the USLRGMA to evaluate both short-term rates of change and cumulative displacement at selected representative locations across the Subbasin. Annual DWR InSAR dataset supports establishment of RMSs for subsidence and the evaluation of SMCs.	SMCs for land subsidence	Yes; Sections 4.6, 5.2, 5.4

4.0 Groundwater Conditions Relative to Sustainable Management Criteria

The purpose of this section is to evaluate recent groundwater conditions (i.e., WY 2021 through 2025) for each applicable sustainability indicator relative to the SMC established and described in the 2027 GSP Amendment. Applicable updates for each sustainability indicator are provided in the subsections below, including revisions made in response to DWR RCAs, revised SMCs, current conditions relative to each SMC, progress towards achieving sustainability in the basin, and impacts to beneficial uses and users.

4.1 Sustainability Goal

The sustainability goal for the USLR Valley Groundwater Subbasin, as established in the GSP, is: "to manage and preserve its groundwater resource as a sustainable water supply" (PVGSA, 2022). Additionally, the goal is "to preserve historic operations of beneficial use in the basin as well as allow for future planned uses as conceived by the GSA and basin stakeholders". Based on groundwater conditions observed during the evaluation period (presented below), implementation of the GSP is on track to meet this sustainability goal. The Subbasin is being operated within the estimated sustainable yield, and groundwater levels and groundwater storage have generally increased during the evaluation period. In addition, monitoring protocols and updated SMCs have been established or refined for the applicable sustainability indicators to support continued evaluation of basin conditions. As described in this Periodic Evaluation, no undesirable results have been identified during the evaluation period. Therefore, GSP implementation is proceeding in a manner consistent with achieving and maintaining the sustainability goal for the USLR Valley Groundwater Subbasin.

4.2 Sustainability Approach

The approach utilized by the USLRGMA to maintain sustainability in the USLR Valley Groundwater Subbasin is one of adaptive groundwater management. It includes:

- Operating the USLR Valley Groundwater Subbasin groundwater resource within the sustainable yield;
- Implementing PMAs as needed to reduce USLR Valley Groundwater Subbasin groundwater demands, increase efficient use of current supplies, maximize use of supplemental water supplies, and mitigate undesirable results; and
- Actively monitoring the USLR Valley Groundwater Subbasin and adaptively managing PMAs to ensure the GSP is effective and that undesirable results are avoided.

4.3 Sustainability Indicators

4.4 Chronic Lowering of Groundwater Levels

Groundwater level SMC have been refined as part of the 2027 Plan Amendment (see Section 4.2 in the amended plan). Due to issues with continued access at some of the initial monitoring sites, replacement RMSs have had to be established. A few of the RMSs were also replaced with alternate wells to provide a more even distribution of RMSs throughout the Pauma Subbasin. Two new RMSs were also added to the

Pala Subbasin. Wells screened within the principal alluvial aquifer were prioritized, but the availability of wells to monitor limited the ability to do this in certain areas of the basin. The revised monitoring network and RMS locations for water level are shown in Figure 13 and summarized in the following table. Additional details regarding the monitoring network are provided in Section 7.1 below and Section 5.0 of the 2027 GSP Amendment. In order to encourage participation in the monitoring program, wells selected for GSP monitoring use a unique ID to maintain confidentiality of the well owners.

Table 4-1. Summary of Groundwater Level Monitoring Network

GSP Well ID	Subbasin	Aquifer[1]	RMS	GSP Well ID	Subbasin	Aquifer[1]	RMS
MW-3	Pauma	A/B*		MW-23	Pauma	A/B*	X
MW-5	Pauma	A/B*	X	MW-24	Pauma	B	
MW-6	Pauma	A		MW-25	Pauma	B	X
MW-7	Pauma	A/B		MW-29	Pala	A/B*	
MW-8	Pauma	A		MW-30	Pala	A	
MW-9	Pauma	A	X	MW-31	Pauma	A*	
MW-10	Pauma	A/B	X	MW-32	Pauma	P	
MW-11	Pauma	A		MW-33	Pauma	A	
MW-12	Pauma	A	X	MW-34	Pauma	A/B*	X
MW-13	Pauma	A	X	MW-35	Pauma	A	X
MW-14	Pauma	A		MW-36	Pauma	A*	
MW-15	Pauma	P		MW-37	Pauma	A*	X
MW-16	Pauma	P		MW-38	Pauma	A	
MW-17	Pauma	P		MW-39	Pauma	B	
MW-18	Pauma	B		MW-40	Pauma	B	
MW-19	Pauma	A	X	MW-41	Pauma	A*	X
MW-20	Pauma	A		MW-42	Pala	A	X
MW-21	Pauma	B		MW-43	Pala	A*	X
MW-22	Pauma	A					

[1] A = Alluvial (principal) aquifer, B = bedrock, P = Perched, * = aquifer assumed

4.4.1 Current Groundwater Level Conditions Relative to Sustainable Management Criteria

The methodology for setting the MOs and MTs has changed slightly from the 2022 GSP. MTs in the 2022 GSP were set to represent the minimum elevation for each well to operate successfully based on past

experiences during drought conditions. For the 2027 GSP Amendment, water levels during these drought conditions were reevaluated to assess whether previously set SMCs were still appropriate. In particular, the recent drought from 2012 through 2016 was used to guide development of new SMCs and reevaluate existing SMCs, since this condition reflects a recent, sustained dry period stress in which groundwater levels approached historical lows and pumping operations were affected, but no verified dry-well reports were received by the GSA.

The updated and recalibrated USLR Groundwater Model was used to verify that proposed MTs did not adversely affect other nearby wells, especially domestic wells. Results of this analysis of potential well impacts are summarized in Section 2.3.1 of this Periodic Evaluation and provided in Appendix 4a of the 2027 Plan Amendment. Overall, the analysis of potential well impacts indicates that revised MTs based on Fall 2016 conditions will prevent extensive depletion of supply, particularly to domestic wells. Of the 252 wells evaluated, approximately 13% were predicted to be potentially dry. However, the majority of these wells have locational uncertainty related to actual well location (72% of these wells are located by centroid of section) and/or model accuracy. Of the private or domestic wells with potential impacts, all but one are located within a public water supplier service area and are able to receive alternative water supply. The one outside service area coverage is located in the along the northeast basin boundary of Pala Subbasin.

As described in Section 4.2.3 of the 2027 GSP Amendment, undesirable results related to the chronic lowering of groundwater levels may be indicated when two consecutive exceedances occur in each of two consecutive years, in 25 percent or more of the RMSs. Data through WY 2025 is provided in both tabular and graphical formats in the USLR Valley GSP annual reports, submitted to DWR in April of each year. MOs for groundwater level are set at groundwater elevations that coincide with approximately three years of operational storage for the basin above MTs. These values were also updated based on the refined water level SMC and using the updated and recalibrated USLR Groundwater Model.

Since the Subbasin was already operating between MOs and MTs at the start of Plan implementation, with many of the RMSs already above MOs (7 of 13), no IMs were set in the initial GSP (PVGSA, 2022). However, DWR recommended the establishment of IMs in five-year intervals in their 2024 determination letter. Since recent water levels are also at or above MOs for water level, IMs for water level in the 2027 Plan Amendment have been set at the MO for each RMS.

Groundwater elevations are characterized in annual reporting using seasonal low (i.e., fall) and seasonal high (i.e., spring) measurements for each WY. Groundwater elevations, relative to SMC, are summarized in the following table for water level RMSs while hydrographs are provided in Figures 14 and 15.

Table 4-2. Water Level Summary (WY 2021-2025)

GSP Well ID	MT (ft amsl)	MO (ft amsl)	IM (ft amsl)	Measured Static (ft amsl)		
				Minimum	Maximum	Average
MW-5	757	807	807	*769*	898	813
MW-9	661	711	711	*682*	745	715
MW-10	656	706	706	*662*	722	*691*
MW-12	622	672	672	*629*	697	*662*
MW-13	593	643	643	*600*	674	*635*
MW-19	549	609	609	*556*	650	*603*
MW-23	577	627	627	*583*	634	*612*
MW-25	521	570	570	*526*	590	557
MW-34	903	953	953	*922*	1,190	1,008
MW-35	670	720	720	*707*	782	738
MW-37	560	610	610	*567*	675	634
MW-41	530	580	580	*571*	628	602
MW-42	439	465	465	*444*	484	*462*
MW-43	270	273	273	*273*	276	274

Note: Italicized values are above the MT but below the MO.

4.4.2 Evaluation of Groundwater Level Sustainable Management Criteria

Groundwater pumping, hydrology, and imported water use all influence groundwater levels in the USLR Valley Groundwater Subbasin (PVGSA, 2022). Groundwater elevations in the Subbasin have generally increased since implementation of the GSP in 2022. This is due in part to wet and above normal WYs in 2023 and 2024 (see Figure 2). Since 2022, the USLR Valley Groundwater Subbasin received an average of 26.3 inches of precipitation per water year, which is higher than the long-term (WY 1943 through 2025) average precipitation of 24.3 inches per water year (USLRGMA, 2026).

Water level measurements indicate that the USLR Valley Groundwater Subbasin is very responsive to hydrology; water levels decline over drier periods and recover significantly in wet or above average precipitation years. Operational flexibility for water levels in the Subbasin is provided by the SMCs established in the 2027 Plan Amendment. The goal of keeping groundwater elevations at or above MOs allows water levels in the basin to fall below MOs during drier periods, when there is more demand on groundwater resources, without causing undesirable results.

Based on reporting through WY 2025, there are no RMS wells within the basin that have declined below water level MTs. Therefore, no undesirable results for groundwater level have occurred. In addition, water levels in all but two of the RMSs are above MOs and meeting current IMs. There were also no reports of

dry wells during the evaluation cycle. GSP implementation has therefore not affected beneficial use and users. In addition, no impacts to other sustainability indicators have been identified. The USLRGMA will continue to monitor these levels closely and note how they respond to future hydrologic conditions. Continued application of agricultural best management practices, water conservation activities, limited development of new (non-replacement) groundwater production wells, and use of imported water will help ensure continued sustainability.

4.5 Reduction of Groundwater in Storage

Groundwater elevations are used as a proxy for groundwater storage in the USLR Valley Groundwater Subbasin. Therefore, SMCs for the reduction of groundwater in storage are evaluated using the groundwater level SMCs described in Section 4.4 above (see also 2027 GSP Amendment Section 4.3).

Because groundwater storage is evaluated through the groundwater level proxy, exceedances of groundwater level MTs would indicate potential undesirable results related to reduction of groundwater in storage. Conversely, groundwater elevations maintained above MTs, and particularly above MOs, indicate that groundwater in storage remains sufficient to avoid significant and unreasonable effects.

4.5.1 Current Groundwater in Storage Conditions Relative to Sustainable Management Criteria

Current groundwater in storage conditions are evaluated based on groundwater elevations measured at the RMSs identified for chronic lowering of groundwater levels. As described in Section 4.4.1, data available from WY 2021 through WY 2025 indicate that no RMS wells within the Subbasin declined below groundwater level MTs. In addition, the maximum groundwater levels in all RMSs were above MOs during the evaluation period and were meeting current IMs. The absence of groundwater level MT exceedances indicates that undesirable results related to reduction of groundwater in storage have not occurred during the evaluation cycle. Current groundwater level conditions also indicate that groundwater storage conditions remain above the level represented by the MOs established in the 2027 GSP Amendment in all but two wells.

The annual reports prepared during the evaluation cycle provide additional context for current groundwater storage conditions. Change in groundwater storage for the annual reports was estimated by subtracting the contoured fall (i.e., seasonal low) water level surface for a given water year from the previous fall water level surface and multiplying by the specific yield from the calibrated groundwater model. While this method allows an annual evaluation of change in groundwater storage, uncertainty increases in low data resolution areas. Therefore, the updated and recalibrated USLR Groundwater Model was used to recompute change in groundwater storage for the period since 2015. The change in groundwater storage from Fall 2020 (i.e., start of WY 2021) through Fall 2025 (i.e., end of WY 2025) is shown in Figure 16. On this figure, gray areas represent areas where groundwater in storage has gone down, while blue areas represent areas that experienced an increase in groundwater storage. Results are summarized in the following table and compared to previous estimates of change in groundwater storage. The cumulative change in groundwater storage, as calculated by the recalibrated groundwater model, is also presented as Figure 17.

Table 4-3. Annual Change in Groundwater Storage (WY 2015 – 2025)

Water Year	Water Year Type	Change in Groundwater Storage[1] [acre-ft/yr]	Cumulative Change in Groundwater Storage [acre-ft]
2015	Below Normal	-3,623	-3,623
2016	Below Normal	-2,545	-6,168
2017	Wet	10,393	4,225
2018	Critical	-5,502	-1,277
2019	Wet	5,933	4,656
2020	Wet	197	4,853
2021	Dry	-7,458	-2,605
2022	Dry	-2,564	-5,169
2023	Wet	18,814	13,645
2024	Above Normal	2,284	15,929
2025	Dry	-3,465	12,464
Average (2015-2025) Average (2021-2025)	-	1,133 1,522	3,357 6,853

[1] Change in groundwater storage was recalculated using the 2027 version of the groundwater model.

The annual storage estimates are consistent with observed groundwater level conditions and the results indicate that groundwater in storage has generally increased since GSP implementation began. Current groundwater storage conditions remain above applicable SMCs.

4.5.2 Evaluation of Groundwater in Storage Sustainable Management Criteria

Reduction of groundwater in storage is closely linked to groundwater level trends in the USLR Valley Groundwater Subbasin. Groundwater elevations in the Subbasin are responsive to hydrologic conditions, declining during drier periods and recovering during wet or above-normal years. As described in Section 4.4.2 above, groundwater elevations have generally increased since implementation of the GSP in 2022, due in part to wet and above normal WYs in 2023 and 2024.

The use of groundwater levels as a proxy for groundwater storage remains appropriate for evaluating this sustainability indicator because changes in groundwater storage are reflected in changes in groundwater elevations. The groundwater level SMCs therefore provide an objective basis for evaluating whether reductions in groundwater storage may result in significant and unreasonable effects. Since groundwater levels remained above MTs and MOs during the evaluation cycle, the groundwater level proxy indicates that no undesirable results related to reduction of groundwater in storage have occurred.

Estimates of groundwater storage from the annual reporting and updated groundwater model further support this conclusion. Although the Subbasin experienced minor estimated decreases in storage during WY 2022 and WY 2025, those decreases were offset by larger estimated increases in WY 2023 and WY 2024. The resulting net positive estimated change in groundwater storage over the evaluation cycle indicates that GSP implementation has not resulted in a long-term reduction of groundwater storage. Continued monitoring, annual reporting, and model refinement will support ongoing evaluation of groundwater storage conditions and allow the USLRGMA to assess whether future hydrologic conditions or pumping patterns result in adverse storage trends.

4.6 Degraded Groundwater Quality

This section summarizes groundwater quality conditions in the USLR Valley Groundwater Subbasin during the evaluation cycle and describes updates to SMCs for water quality included in the 2027 Plan Amendment. The 2022 GSP established water quality SMCs using a basin-wide ambient groundwater quality approach. In response to DWR's RCA 4 regarding groundwater quality, the 2027 Plan Amendment revises the monitoring network and SMC framework to evaluate groundwater quality at specific RMSs, distinguish known localized impairment from basin-wide degradation, and provide quantitative exceedance triggers for determining whether undesirable results have occurred (see Section 4.4 of the 2027 GSP Amendment).

The constituents of concern for degraded groundwater quality in the 2027 Plan Amendment are total dissolved solids (TDS), nitrate as nitrogen (nitrate as N), and perchlorate. TDS and nitrate were included in the 2022 GSP; perchlorate has been added based on its occurrence in portions of the Subbasin and the need to evaluate whether groundwater management activities could contribute to material worsening or migration of perchlorate-affected groundwater. Groundwater quality in the Subbasin is influenced by historical and ongoing land uses, imported water quality, septic system loading, agricultural practices, evapoconcentration, and reduced natural recharge associated with surface water diversions outside the direct control of the USLRGMA. The water quality SMC are therefore intended to identify and respond to significant and unreasonable degradation associated with groundwater conditions managed under the GSP. They are not intended to establish a regulatory cleanup program, supersede the authority of the Regional Water Quality Control Board (Regional Board), Water Board Division of Drinking Water (DDW), San Diego County (County) Environmental Health, or other regulatory agencies, or require the USLRGMA to remediate water quality impacts caused by historical land use, ongoing permitted activities, septic systems, imported water quality, or other sources outside the USLRGMA's authorities.

The revised SMC framework is based primarily on applicable drinking water regulations and San Diego Basin Plan water quality objectives. However, the framework also recognizes that portions of the Subbasin contain existing or legacy water quality impairment. In these areas, continued exceedance of a drinking water benchmark in an already affected well is not, by itself, interpreted as a new SGMA undesirable result. Instead, already affected wells are evaluated using site-specific degradation thresholds and sentinel monitoring to determine whether conditions are materially worsening or whether affected groundwater is migrating into areas where water quality is currently less affected. Specifically, the 2027 Plan Amendment identifies an Upper Pauma Nitrate/Perchlorate-Affected Area to support interpretation of degraded water quality SMC. The affected area is delineated based on historical and recent detections of elevated nitrate and perchlorate in connection with an observed relationship between increasing

nitrate concentrations and increasing groundwater elevations. This affected area is not established as a separate SGMA management area under 23 CCR § 354.20. Rather, it is a technical evaluation and SMC accounting area used to distinguish known localized groundwater quality impairment from basin-wide degradation.

The revised water quality RMS network is shown in Figure 18 and summarized in Table 4-4. Additional details regarding the monitoring network are provided in Section 7.3 below and Section 5.0 of the 2027 GSP Amendment. The network consists primarily of active public supply wells completed in the principal alluvial aquifer and subject to existing drinking water monitoring obligations. DDW-reported TDS, nitrate, and perchlorate data from these wells will be used when available. Supplemental USLRGMA sampling will be conducted, as needed, during the fall monitoring event when DDW data are not available for a given year, when a required constituent is not included in DDW reporting, or when confirmation, follow-up, or sentinel monitoring is needed following an exceedance or management trigger.

Table 4-4. Summary of Degraded Water Quality Monitoring Network

GSP Well ID	SDWIS Primary Station Code	TDS	Nitrate	Perchlorate	Role/Category
MW-5	CA3700938_047_047	x	x	x	Upper Pauma Affected Area
MW-7	CA3710012_031_031	x	x		Standard RMS
MW-8	CA3710012_010_010	x	x		Standard RMS
MW-11	CA3710012_033_033	x	x		Standard RMS
MW-19	-	x	x		Standard RMS
MW-25	CA3700936_010_010	x	x	x	Standard RMS/ Perchlorate RMS
MW-30	-	x	x		Standard RMS
MW-31	-	x	x	x	Standard RMS/ Perchlorate Sentinel Well
MW-34	CA3700938_005_005	x	x	x	Upper Pauma Affected Area
MW-35	CA3700937_004_004	x	x	x	Standard RMS/ Perchlorate Sentinel Well
MW-37	-	x	x		Standard RMS
MW-38	CA3701408_016_016	x	x		Standard RMS
MW-41	CA3700934_004_004	x	x		Standard RMS
MW-43	-	x	x		Standard RMS

Figures 19 through 23 show time-series chemographs for TDS, nitrate as N, and perchlorate at the revised RMS wells. The average groundwater quality over the evaluation cycle for other wells throughout the Subbasin is also shown in the figures. Groundwater quality conditions during the evaluation cycle were

evaluated using available DDW, public-supply, and GSA water quality data. The following subsections summarize conditions for each constituent relative to the revised SMC framework.

4.6.1 TDS

4.6.1.1 Current TDS Conditions Relative to Sustainable Management Criteria

TDS concentrations in the Subbasin vary spatially and reflect both natural and anthropogenic influences. In general, TDS tends to increase downgradient, indicating gradual accumulation of salts with distance from recharge sources. Available chemographs also indicate that TDS is generally increasing through time at many wells (Figures 19 and 20). Gradual increases in TDS are likely related to a combination of reduced freshwater recharge, imported-water salinity, agricultural return flows, septic loading, evapoconcentration, and historical land use. These processes are not solely controlled by groundwater extraction and cannot be fully mitigated through GSA action alone. In particular, the reduction of historical freshwater recharge associated with surface water diversions from Henshaw Dam has reduced the Subbasin's dilution capacity and may contribute to long-term accumulation of salts and nitrate. These conditions are part of the basin setting and water budget. The USLRGMA does not have the authority to modify surface water diversions or restore pre-1920s recharge conditions. The USLRGMA will continue to monitor and evaluate TDS trends, coordinate with appropriate agencies and water users, and implement feasible groundwater management actions within its authority and funding capacity.

The revised SMC framework evaluates TDS at specific RMS wells rather than using a single basin-wide ambient groundwater quality value. For most TDS RMS wells, the MT is set at 1,000 milligrams per liter (mg/L), corresponding to the upper secondary maximum contaminant level (SMCL) for TDS. The MO represents the applicable San Diego Basin Plan water quality objective for the relevant subbasin, which is 800 mg/L in the Pauma Subbasin and 900 mg/L in the Pala Subbasin (Regional Board, 1994). Recognizing that the USLRGMA has little, if any, control over TDS drivers in the Subbasin, the IM for each RMS well has been set equal to the MO for the duration of the implementation period. This approach reflects the USLRGMA's objective to maintain groundwater quality at or below the applicable Basin Plan water quality objective where feasible and to avoid significant and unreasonable degradation toward the MT. However, the IMs are not intended to represent a GSA commitment to actively reduce TDS concentrations through remediation or treatment. Exceedance of an IM will therefore be used as an indicator for continued monitoring, trend evaluation, and coordination, but will not constitute an undesirable result unless the applicable MT and undesirable result criteria are met. Undesirable results for TDS may be indicated when the average annual concentrations at 25 percent or more of the RMSs exceed MTs for two consecutive annual monitoring events over at least two years, after confirmation sampling and data review.

TDS concentrations during the period from WY 2021 through 2025 relative to water quality SMCs are summarized in Table 4-5 below.

Table 4-5. TDS Water Quality Summary (WY 2021-2025)

GSP Well ID	MT[1] (mg/L)	MO[2] (mg/L)	IM[3] (mg/L)	Measured TDS (mg/L)		
				Minimum	Maximum	Average
MW-5	1,000	800	800	*830*	*840*	*837*
MW-7	1,000	800	800	390	400	395
MW-8	1,000	800	800	770	770	770
MW-11	1,000	800	800	640	740	680
MW-19	1,000	800	800	560	660	600
MW-25	1,000	800	800	370	430	407
MW-30	1,000	900	900	180	600	303
MW-31	1,000	800	800	330	450	375
MW-34	1,000	800	800	650	650	650
MW-35	1,000	800	800	N/A	N/A	N/A
MW-37	1,000[4]	800	800	N/A	N/A	N/A
MW-38	1,000	800	800	370	370	370
MW-41	1,000	800	800	790	790	790
MW-43	TBD[5]	900	900	N/A	N/A	N/A

Notes:

[1] The MT for TDS RMSs represents the upper limit for the SMCL for TDS.

[2] The MO for TDS RMSs represents the water quality objective from the Basin Plan, which is different for Pala Subbasin (900 mg/L) and Pauma Subbasin (800 mg/L).

[3] The IM for TDS RMSs represents the MO. The IMs are not intended to represent a commitment to actively reduce TDS concentrations through remediation or treatment.

[4] No water quality data is available for this well. However, based on TDS measurements in the area, 1,000 mg/L should be an appropriate MT. Future monitoring data will be used to confirm this assumption.

[5] No recent water quality data is available in the vicinity of this well. Therefore, data collected during future monitoring will be used to evaluate TDS conditions and set an appropriate MT.

Italicized values are above the MO but below the MT.

As shown in the table above, TDS concentrations from WY 2021 through 2025 are all below the assigned MTs and generally below the target MOs. TDS in MW-5 is the exception, with an average TDS concentration of 837 mg/L. Several other monitoring wells are near the MO of 800 mg/L for Pauma Subbasin, including MW-8, with a TDS concentration of 770 mg/L, and MW-41, with a TDS concentration of 790 mg/L. These wells will continue to be monitored and trends evaluated for potential future exceedances.

4.6.1.2 Evaluation of TDS Sustainable Management Criteria

The revised TDS SMC framework is intended to improve the USLRGMA's ability to identify localized or regional salinity degradation using RMS-specific data. TDS trends will be evaluated annually using available DDW, public supply, and USLRGMA monitoring data. An undesirable result for TDS will occur when 25 percent or more of the TDS RMS wells exceed the MT in two consecutive annual monitoring events over at least two years, after confirmation sampling or data review, and the exceedances are determined to represent significant and unreasonable groundwater-quality degradation rather than an isolated sampling anomaly, well-specific condition, or condition outside the USLRGMA's authority. An average annual concentration will be used where multiple measurement readings exist for a given water year. Since the TDS monitoring network includes 14 wells, the 25 percent trigger would correspond to four or more RMS exceedances. Where a management trigger occurs, the USLRGMA will evaluate potential causes and available management responses within its authorities. Potential responses may include confirmation sampling, evaluation of groundwater gradients and pumping patterns, coordination with affected well owners and water suppliers, and coordination with DDW, County Environmental Health, the Regional Board, or other appropriate agencies. The response will be scaled to the nature of the exceedance and the USLRGMA's authority and funding capacity.

Based on data available through the evaluation cycle, summarized in Table 4-5, significant and unreasonable degradation of groundwater quality relative to TDS has not been identified. None of the TDS RMS wells with available data exceeded the TDS MT of 1,000 mg/L during WY 2021 through WY 2025. Most RMSs were also below the applicable MO. MW-5 was above the Pauma Subbasin MO of 800 mg/L during the evaluation cycle but remained below the MT. This indicates that TDS at MW-5 should continue to be tracked as an early-warning condition, but available data do not indicate an MT exceedance or undesirable result for TDS.

The revised TDS SMC are not expected to interfere with SMC for other sustainability indicators. Continued evaluation of groundwater levels, pumping patterns, recharge, and water quality trends will help determine whether future groundwater management activities could influence salinity degradation or migration of higher-TDS groundwater.

4.6.2 Nitrate

4.6.2.1 Current Nitrate Conditions Relative to Sustainable Management Criteria

Nitrate concentrations vary substantially across the Subbasin and are understood to reflect a combination of legacy (pre-2015) nitrate stored in the unsaturated zone, changing groundwater levels, agricultural land use, septic loading, and groundwater flow conditions. Chemographs showing historical nitrate as N concentrations at the identified RMS wells are shown in Figures 21 through 22. Also shown on the figures are average nitrate concentrations over the evaluation cycle for other wells with available water quality data.

The highest nitrate concentrations occur in the upper portion of the Pauma Subbasin, generally above Sycamore Canyon. The 2027 Plan Amendment identifies this area as the Upper Pauma Nitrate/Perchlorate-Affected Area based on historical (pre-2015) and recent nitrate and perchlorate data showing elevated concentrations in this localized portion of the Subbasin. Public supply wells in this area have historically required blending, operational changes, or other management actions to address

elevated nitrate. Some public supply wells in this area have also recently been disconnected from potable supply networks or leased for agricultural use, and YMWD has begun evaluating the feasibility of a nitrate treatment facility for wells in the area. The Upper Pauma Nitrate/Perchlorate-Affected Area is used in the 2027 Plan Amendment to provide a technically appropriate framework for distinguishing known localized groundwater-quality impairment from basin-wide degradation or migration of affected groundwater into currently less-affected areas. The affected area is not a separate SGMA management area. It is a water-quality evaluation and SMC accounting area used to support RMS-specific thresholds, sentinel monitoring, and adaptive management (see Section 5.3 for discussion of new PMAs related to groundwater quality, particularly within this affected area).

Within the affected area shown on Figures 21 and 22, nitrate concentrations are elevated relative to the rest of the Subbasin and typically exceed the drinking water maximum contaminant level (MCL) of 10 mg/L as N. Review of available nitrate and groundwater level data indicates that increasing nitrate trends in several wells in this area are correlated with rising groundwater levels (Figure 24). This relationship suggests that at least a portion of the observed nitrate increase may reflect remobilization of nitrate stored in the vadose zone from historical and ongoing agricultural and septic sources as the water table rises. Under this conceptual model, rising groundwater levels can intersect or mobilize nitrate-bearing pore water that accumulated in the unsaturated zone during prior periods of agricultural land use and lower groundwater elevations.

The USLRGMA recognizes that nitrate concentrations above 10 mg/L as N represent impaired raw groundwater quality for direct potable use. However, the observed relationship between nitrate and groundwater levels indicates that some post-2015 increases in nitrate may represent expression or remobilization of preexisting nitrate mass in the subsurface, rather than a new source of degradation caused by USLRGMA groundwater management. Therefore, continued exceedance of the nitrate MCL in already affected RMS wells within the Upper Pauma Nitrate/Perchlorate-Affected Area is not, by itself, interpreted as a potential new SGMA undesirable result. Instead, the 2027 Plan Amendment establishes site-specific SMC based on material degradation relative to recent observed conditions and potential migration beyond the affected area.

For nitrate RMS wells outside the Upper Pauma Nitrate/Perchlorate-Affected Area, the MT is set at 10 mg/L as N, which is the primary drinking water MCL and is equivalent to the San Diego Basin Plan objective of 45 mg/L nitrate as NO_3. For RMS wells within the affected area that already exceed 10 mg/L as N, the MT is a site-specific degradation threshold based on maximum observed conditions. The MO for nitrate is the MCL/Basin Plan objective of 10 mg/L as N for all RMS wells, recognizing that wells already above the MCL will require long-term tracking and that the MO may not be immediately achievable at affected-area wells. As with TDS, the IM for each RMS well has been set equal to the MO for the duration of the implementation period. This approach reflects the USLRGMA's objective to maintain groundwater quality at or below the applicable Basin Plan water quality objective where feasible and to avoid significant and unreasonable degradation toward the MT. However, the IMs are not intended to represent a GSA commitment to actively reduce nitrate concentrations through remediation or treatment. Exceedance of an IM will therefore be used as an indicator for continued monitoring, trend evaluation, and coordination, but will not constitute an undesirable result unless the applicable MT and undesirable result criteria are met. Undesirable results for nitrate may be indicated when the average annual concentrations at 25

percent or more of the RMSs exceed MTs for two consecutive annual monitoring events over at least two years, after confirmation sampling and data review.

Nitrate as N concentrations during the period from WY 2021 through 2025 relative to water quality SMCs are summarized in Table 4-6 below.

Table 4-6. Nitrate Water Quality Summary (WY 2021-2025)

GSP Well ID	MT[1] (mg/L)	MO[2] (mg/L)	IM[3] (mg/L)	Measured Nitrate (as N) (mg/L)		
				Minimum	Maximum	Average
MW-5	39	10	10	*23*	*39*	*31.5*
MW-7	10	10	10	1.1	2.9	1.9
MW-8	10	10	10	0.7	1.0	0.9
MW-11	10	10	10	0.8	2.5	1.5
MW-19	10	10	10	9.8	**12**	**11.1**
MW-25	10	10	10	0.8	5.6	2.2
MW-30	10	10	10	ND	5.7	3.6
MW-31	10	10	10	0.2	1.1	0.7
MW-34	28	10	10	*16*	*28*	*20.9*
MW-35	10	10	10	0.9	2.8	1.9
MW-37	10[4]	10	10	N/A	N/A	N/A
MW-38	10	10	10	2.7	6.9	6.0
MW-41	10	10	10	7.4	**12**	**10.4**
MW-43	TBD[5]	10	10	N/A	N/A	N/A

Notes:

[1] The MT for nitrate RMSs not in the Upper Pauma Nitrate/Perchlorate-Affected Area represents the National Primary Drinking Water Regulations MCL for nitrate (as N). Within the identified area, the MT is set to the recent water quality reading, based on the observed correlation of nitrate concentrations with water level rises.

[2] The MO for nitrate RMSs represents the water quality objective from the Basin Plan (Regional Board, 1994), which is 45 mg/L nitrate (as NO_3) and is consistent with a nitrate (as N) concentration of 10 mg/L.

[3] The IM for nitrate RMSs represents the MO. The IMs are not intended to represent a commitment to actively reduce nitrate concentrations through remediation or treatment.

[4] No water quality data is available for this well. However, based on nitrate (as N) measurements in the area, 10 mg/L should be an appropriate MT. Future monitoring data will be used to confirm this assumption.

[5] No recent water quality data is available in the vicinity of this well. Therefore, data collected during future monitoring will be used to evaluate nitrate conditions and set an appropriate MT.

ND = Non-detect

Bolded values are above the MT, italicized values are above the MO but above the MT.

As shown in the table above, nitrate as N concentrations from WY 2021 through 2025 are below the assigned MTs at all wells except two: MW-19 (with an average concentration during this period of 11.1

mg/L) and MW-41 (with an average concentration of 10.4 mg/L). MW 19 exceeded the MT for four consecutive years, from WY 2022 through 2025, while MW-41 exceeded the MT for two consecutive years in WY 2023 and 2024. However, these two wells only represent 15% of the RMSs and this therefore does not constitute an undesirable result. Of the remaining wells, all but MW-5 and MW-34 are below MOs as well. These two wells are located within the Upper Pauma Nitrate/Perchlorate-Affected Area and the exceedance of the MO is therefore not unexpected. These wells will continue to be monitored and trends evaluated for potential future exceedances.

4.6.2.2 Evaluation of Nitrate Sustainable Management Criteria

The revised approach for evaluating nitrated in the USLR Valley Groundwater Subbasin, as outlined in the 2027 Plan Amendment, preserves the MCL as the drinking water benchmark while recognizing that SGMA compliance should focus on significant and unreasonable degradation associated with groundwater conditions managed under the GSP, rather than on remediation of preexisting nitrate mass outside the USLRGMA's direct control and for which the USLRGMA is not responsible to remediate under SGMA. Based on data available through the evaluation cycle, summarized in Table 4-6, most nitrate RMS wells were below the applicable nitrate MT. Several wells outside the Upper Pauma Nitrate/Perchlorate-Affected Area were below 10 mg/L as N and provide useful sentinel or standard RMS coverage for areas where groundwater currently remains below the nitrate MCL. MW-19 and MW-41 had concentrations near or above 10 mg/L as N during the evaluation cycle. These wells warrant continued annual evaluation.

An undesirable result for nitrate will potentially occur when 25 percent or more of the nitrate RMS wells exceed their applicable nitrate MTs in two consecutive annual monitoring events over at least two years, after confirmation sampling or data review, and the exceedances are determined to represent significant and unreasonable degradation of groundwater quality. An average annual concentration will be used where multiple measurement readings exist for a given water year. For RMS wells outside the Upper Pauma Nitrate/Perchlorate-Affected Area, an exceedance means nitrate above 10 mg/L as N. For already affected RMS wells within the affected area, an exceedance means nitrate above the site-specific degradation MT. Where nitrate concentrations exceed an MT or show a sustained increasing trend not supported by water level data, the USLRGMA will evaluate potential causes and available management responses within its authorities. This evaluation may include review of groundwater elevations, the nitrate-water-level relationship, pumping and hydraulic gradients, recharge conditions, well construction, and land use. The USLRGMA may coordinate with affected well owners, public water suppliers, agricultural operators, DDW, County Environmental Health, the Regional Board, or other appropriate agencies as needed.

Because the USLRGMA does not regulate agricultural nutrient application, septic systems, imported water quality, or historical nitrate stored in the vadose zone as a result of historical land use, response actions will focus on feasible SGMA-related actions such as monitoring, confirmation sampling, sentinel well evaluation, domestic well vulnerability assessment, public supply coordination, grant seeking, and evaluation of whether pumping patterns or groundwater gradients could contribute to migration of nitrate-affected groundwater. Based on currently available data, the USLRGMA has not identified significant and unreasonable nitrate degradation caused by GSP implementation during the evaluation cycle; however, the revised RMS network and affected-area framework will provide a more focused basis for future annual evaluations and periodic reviews.

4.6.3 Perchlorate

4.6.3.1 Current Perchlorate Conditions Relative to Sustainable Management Criteria

Perchlorate has been added as a constituent of concern in the 2027 Plan Amendment based on detections in portions of the Subbasin, particularly within the upper Pauma area where measured concentrations have exceeded the MCL of 6 micrograms per liter (µg/L; see Figure 23). The co-occurrence of elevated nitrate and perchlorate in the Upper Pauma Nitrate/Perchlorate-Affected Area is consistent with a common or related agricultural source. Perchlorate has been associated in other basins with historical use of imported natural nitrate fertilizers derived from Chilean nitrate deposits, and such fertilizers may also contribute nitrate to the subsurface. Based on the available information, the USLRGMA interprets elevated nitrate and perchlorate in the upper Pauma area as likely associated, at least in part, with historical fertilizer use and subsequent storage and transport of nitrate- and perchlorate-bearing water in the vadose zone and alluvial groundwater system. Ongoing agricultural activity may continue to contribute nitrate and salts over time; however, such source loading is regulated primarily through authorities outside SGMA.

Unlike nitrate, available perchlorate data in the Upper Pauma Nitrate/Perchlorate-Affected Area do not show a clear relationship with groundwater levels. Instead, perchlorate concentrations appear to be generally stable or decreasing (Figure 23). These trends are consistent with cessation or substantial reduction of historical perchlorate loading and possible natural attenuation processes. Because perchlorate is highly soluble and mobile in groundwater, continued monitoring is warranted to confirm that perchlorate-affected groundwater is not materially worsening or expanding downgradient or laterally beyond the known affected area.

Perchlorate has also been detected at concentrations below the MCL at a downgradient monitoring well within the Pauma Subbasin (MW-25; see Figure 23). At this location, perchlorate shows an increasing trend, although the cause of the trend is not yet clear. Future monitoring data will be used to assess whether the trend represents a localized or temporal condition. Because nearby wells downgradient of MW-25 are limited and not available for monitoring, the USLRGMA will evaluate DDW-reported data from wells that currently report perchlorate to the State, when available, to identify new detections or material changes in downgradient concentrations.

For perchlorate RMS wells within the Upper Pauma Nitrate/Perchlorate-Affected Area, the MT is set at a site-specific degradation threshold based on maximum observed conditions, which represent pre-2015 (existing) conditions. The MO for these wells was set at 6 µg/L, which is the primary drinking water MCL. It is also recognized that wells within the affected area are already occasionally above the MCL; long-term tracking will be required, and the MO may not be immediately achievable at these wells. For RMS wells downgradient of the affected area, MTs and MOs were set to non-detect. For the downgradient well with measurable perchlorate below the MCL, the MTs was set to the MCL of 6 µg/L while the MO was set to non-detect. In California, the detection level for perchlorate is 1 µg/L, so concentrations at the downgradient MW-25 are very near to this limit. As with TDS and nitrate, the IM for each perchlorate RMS well has been set equal to the MO for the duration of the implementation period. This approach reflects the USLRGMA's objective to maintain groundwater quality at or below the applicable Basin Plan water quality objective where feasible and to avoid significant and unreasonable degradation toward the MT. However, the IMs are not intended to represent a GSA commitment to actively reduce perchlorate

concentrations through remediation or treatment. Exceedance of an IM will therefore be used as an indicator for continued monitoring, trend evaluation, and coordination, but will not constitute an undesirable result unless the applicable MT and undesirable result criteria are met. Undesirable results for perchlorate may be indicated when the average annual concentrations at 25 percent or more of the RMSs exceed MTs for two consecutive annual monitoring events over at least two years, after confirmation sampling and data review.

Perchlorate concentrations during the period from WY 2021 through 2025 relative to water quality SMCs are summarized in Table 4-7 below.

Table 4-7. Perchlorate Water Quality Summary (WY 2021-2025)

GSP Well ID	MT[1] (µg/L)	MO[2] (µg/L)	IM[3] (µg/L)	Measured Perchlorate (µg/L)		
				Minimum	Maximum	Average
MW-5	7.1	6.0	6.0	1.1	*6.3*[4]	5.0
MW-25	6.0	ND	ND	ND	1.6	1.0
MW-31	ND	ND	ND	ND	ND	ND
MW-34	7.9	6.0	6.0	4.1	*7.5*	5.5
MW-35	ND	ND	ND	ND	ND	ND

Notes:

[1] The MT for perchlorate RMSs within the Upper Pauma Nitrate/Perchlorate-Affected Area represents the maximum historical water quality reading. The MT for the two sentinel wells downgradient of the identified management zone is non-detect (ND). The MT for the well in lower Pauma Subbasin represents the National Primary Drinking Water Regulations MCL for perchlorate.

[2] The MO for perchlorate RMSs represents the National Primary Drinking Water Regulations MCL, except for the downgradient sentinel wells (set at ND).

[3] The IM for perchlorate RMSs represents the MO. The IMs are not intended to represent a commitment to actively reduce perchlorate concentrations through remediation or treatment.

[4] The reading for 7/11/23 of 16 (µg/L) is assumed to be an outlier.

Italicized values are above the MO but below MT.

As shown in the table above, perchlorate concentrations from WY 2021 through 2025 are all below the assigned MTs and generally below the target MOs. While the MW-5 maximum observed concentration is above MOs, the average annual concentration each year is below the MO of 6 µg/L. Similarly, while concentrations in MW-25 exceed the MO, they periodically dip below the detection threshold of 1.0 µg/L. The average annual perchlorate concentration for MW-34 exceeded the MO for WY 2022 and 2023 (at 6.1 and 6.0 µg/L, respectively). These two wells are located within the Upper Pauma Nitrate/Perchlorate-Affected Area and the exceedance of the MO is therefore not unexpected. Perchlorate-affected wells will continue to be monitored and trends evaluated for potential future exceedances.

4.6.3.2 Evaluation of Perchlorate Sustainable Management Criteria

The perchlorate SMC framework differs from the nitrate framework because available perchlorate data do not show the same clear relationship with rising groundwater levels, and because the primary SGMA concern is whether perchlorate-affected groundwater is materially worsening or migrating beyond the

known affected area. For affected-area RMS wells, continued detection of perchlorate – even in excess of the MCL – is not by itself interpreted as a new potential SGMA undesirable result. Instead, an MT exceedance occurs if perchlorate materially worsens above the site-specific degradation threshold, representing the maximum historical concentration. Since these wells show a decreasing or stable trend, these maximum values are reflective of conditions prior to 2015. For sentinel wells where perchlorate is currently non-detect (MW-31 and MW-35), the SMC are intended to identify new detections that may indicate migration or expansion of perchlorate-affected groundwater and MTs are therefore set to the detection level. An undesirable result for perchlorate will potentially occur if perchlorate materially worsens in affected-area RMS wells, is confirmed in designated sentinel wells where perchlorate has historically been non-detect, or otherwise meets the quantitative undesirable-result criteria established in the 2027 GSP Amendment.

If a perchlorate MT exceedance, new sentinel detection, or increasing trend occurs, the USLRGMA will evaluate potential causes and available management responses within its authorities. A single low-level detection in a sentinel well should trigger confirmation sampling and data-quality review. Confirmed detections in one or more sentinel wells, particularly if repeated or accompanied by increasing trends, will trigger evaluation of potential migration, reassessment of the affected-area boundary, and coordination with affected well owners and regulatory agencies. This evaluation may include review of perchlorate and nitrate co-occurrence, groundwater elevations, hydraulic gradients, pumping patterns, well construction, land use, and other nearby detections. An undesirable result for perchlorate will potentially occur when 25 percent or more of the perchlorate RMS wells exceed their applicable perchlorate MTs in two consecutive annual monitoring events over at least two years, after confirmation sampling or data review. An average annual concentration will be used where multiple measurement readings exist for a given water year.

Based on data available through the evaluation cycle, summarized in Table 4-7, significant and unreasonable degradation of groundwater quality relative to perchlorate has not been identified. MW-5 and MW-34, which are located within the Upper Pauma Nitrate/Perchlorate-Affected Area, had perchlorate detections near or above the MCL during the evaluation cycle, but available data indicate that concentrations are generally stable to decreasing and did not exceed the proposed site-specific perchlorate MTs.

The revised perchlorate SMC are not expected to interfere with SMC for other sustainability indicators. Continued evaluation of groundwater levels, pumping patterns, and perchlorate trends will help determine whether groundwater management activities could influence migration of perchlorate-affected groundwater in the future. Based on currently available data, the USLRGMA has not identified significant and unreasonable perchlorate degradation caused by GSP implementation during the evaluation cycle; however, the addition of perchlorate to the SMC framework, identification of affected-area and sentinel wells, and continued review of constituent-specific chemographs will improve future groundwater quality evaluations.

4.7 Depletion of Interconnected Surface Water

This section summarizes the current understanding of ISW conditions in the USLR Valley Groundwater Subbasin and describes the approach developed in the 2027 GSP Amendment to refine the SMCs for ISW. The revised approach is intended to address DWR's RCA 6 by improving the technical basis for evaluating

the location, quantity, and timing of streamflow depletion associated with groundwater pumping, to the extent practicable using available data and tools. The revised approach also recognizes that the Subbasin currently lacks the streamflow, shallow groundwater, and pumping data resolution needed to establish meaningful and enforceable ISW SMCs directly from modeled depletion volumes with a high degree of confidence.

Streamflow conditions are affected by precipitation, runoff, evapotranspiration, surface water diversions, releases and operations associated with the operation of Henshaw Dam and the Escondido diversion, streambed infiltration, and groundwater pumping. Surface flow is intermittent and seasonal throughout much of the Subbasin, and streams commonly go dry for several months each year, particularly in Pauma Subbasin and upper Pala Subbasin. However, there is currently no active, permanent streamflow gage within the Subbasin to provide continuous data suitable for direct measurement of streamflow depletion caused by groundwater pumping.

The 2027 GSP Amendment uses the USLR watershed and groundwater flow models to support the evaluation of ISW depletion. The recalibrated models were used to compare simulated baseline conditions, representing the calibration period from 1991 through September 2025, to a no-groundwater-pumping scenario covering the same time period. The difference between these scenarios provides a model-estimated indication of the location, quantity, and timing of potential pumping-induced depletion in the San Luis Rey River, consistent with DWR's recommended technical approach for evaluating ISW depletion where direct measurement is not available (DWR, 2024c). Results of this analysis are discussed in Section 2.6.1 of this Periodic Evaluation and in Section 3.3.4.4 of the 2027 GSP Amendment.

Although the model analysis provides useful information regarding the relative location and timing of potential depletion, model-estimated depletion volumes are not the sole enforceable SMC metric for ISW. This determination is based on the intermittent and seasonal nature of streamflow in the Subbasin, the absence of active streamflow gages within the Subbasin, limited shallow groundwater monitoring near potentially interconnected reaches, uncertainty in estimated groundwater pumping volumes, and uncertainty associated with model-estimated streamflow and baseflow conditions[5]. These limitations result in a relatively large margin of uncertainty around model-estimated depletion rates and volumes. Accordingly, defining a specific rate or volume of streamflow depletion that would result in significant and unreasonable impacts to downstream beneficial users, potential GDEs, or habitat areas is not currently supported by the available monitoring data. Nor would a quantification of ISW depletion be possible for the annual review of conditions relative to SMCs without updating and rerunning the groundwater model with and without groundwater pumping.

For these reasons, the 2027 GSP Amendment establishes ISW SMCs using groundwater elevations at selected RMSs located along or near the San Luis Rey River as a proxy. Groundwater levels are the most reliable, repeatable, and currently available monitoring data for evaluating whether groundwater conditions near potentially interconnected reaches are worsening. Maintaining groundwater levels above historical low conditions (represented by Fall 2016 conditions) at water level RMSs and at these selected

[5] Limited streamflow data for model calibration was only available from the USGS 11039800 San Luis Rey River Near Pala gage (1986-1993) and the USGS 11036700 San Luis Rey River Near Pauma Valley gage (2008-2009).

sites is expected to prevent material worsening of hydraulic conditions that could increase depletion of ISW relative to the range of conditions experienced historically and during GSP implementation.

This proxy-based SMC framework is supported by the current conceptual understanding of the Subbasin. Groundwater pumping can increase depletion of ISW where groundwater and surface water are hydraulically connected. The ISW depletion analysis showed that groundwater pumping can also cause increased ISW depletion in disconnected reaches through the interception of baseflow. In the USLR Valley Groundwater Subbasin, where direct measurement of streamflow depletion is not available, groundwater elevations provide the most practical indicator of whether groundwater conditions near the river are declining in a manner that could increase the risk of ISW depletion. Maintaining groundwater levels above historical low conditions is therefore used as an indicator that pumping-induced depletion is not materially worsening beyond historical conditions.

With this approach, the revised model analysis is used as supporting information rather than as the enforceable SMC metric. The model results indicate that potential pumping-induced depletion is not uniformly distributed along the San Luis Rey River and that modeled depletion varies by reach, season, WY type, and groundwater conditions. The model results also indicate that depletion may be lagged relative to groundwater pumping and is surface water supply limited (depletion is generally higher in wetter years, when more surface water is available for potential stream-aquifer exchange, and lower in dry or critical years, when surface flow is limited). These results support the use of groundwater levels and hydrologic context as annual indicators, rather than relying on a single annual model-estimated depletion volume for compliance.

Potential GDEs are also considered as part of the evaluation of ISW because riparian vegetation and associated habitat may depend on shallow groundwater, surface water flow, or a combination of both. The 2022 GSP identified areas of potentially groundwater-dependent vegetation, primarily along the San Luis Rey River and tributary drainages. These areas were identified through desktop review and were further screened using the 2022 version of the USLR Groundwater Model to identify locations where simulated groundwater levels since 2015 were less than approximately 20 to 30 ft bgs. These depths were used as screening thresholds because 20 ft bgs is commonly considered an extinction depth for most deep-rooted riparian vegetation in the southwest, and 30 ft bgs is used in available guidance as a screening depth for identifying potential GDEs. However, these areas have not been confirmed to be groundwater dependent; some of the mapped riparian vegetation may rely on seasonal surface water, rainfall, ambient soil moisture, or water from bedrock fractures and fault splays rather than groundwater from the Subbasin. In addition, some drainages were considered too incised or located in topographic settings too steep to support groundwater-dependent vegetation. Future monitoring improvements described in the following subsection and Section 5.3 are intended to improve the ability to evaluate whether proposed groundwater management could adversely affect ISW or associated GDEs and to support the establishment of a depletion volume SMC framework during the next periodic evaluation

4.7.1 Current Interconnected Surface Water Conditions Relative to Sustainable Management Criteria

The 2027 GSP Amendment revises the ISW SMC framework by establishing groundwater elevations at selected ISW RMSs as the quantitative SMC metric. These sites are part of the broader groundwater level monitoring network and are located along or near the San Luis Rey River where available monitoring

points provide the best existing information regarding groundwater conditions near the river. The ISW proxy monitoring sites are identified in Table 4-8 below and shown in Figure 25. The ISW SMCs are consistent with the groundwater level SMCs established for the corresponding RMSs[6]. The MTs are based on historical low groundwater level conditions from the drought period ending in Fall 2016 and are intended to avoid groundwater level declines beyond the historical range evaluated for potential effects on beneficial users. The ISW MOs provide a margin of operational flexibility above the MTs to account for dry periods when water levels in the Subbasin would generally fall. The ISW IMs are also tied to the groundwater level IMs for these monitoring sites.

Until more comprehensive data are collected, undesirable results for depletion of ISW are indicated when groundwater elevations fall below the ISW proxy MTs for two consecutive monitoring events in each of two consecutive water years in either:

- Three or more of the five ISW proxy wells,
- Both Pala ISW proxy wells, or
- Two or more of the three Pauma ISW proxy wells, when supported by field observations or other evidence suggesting potential effects on ISW.

A single well below its proxy MT, or two isolated exceedances that do not represent the same management reach or are not supported by other evidence of potential ISW effects, would not constitute a potential undesirable result. Such conditions would instead trigger additional review, including verification of the water level measurement, review of recent hydrologic conditions, evaluation of available pumping information, review of field observations of surface water conditions, and consideration of whether additional monitoring is warranted.

Table 4-8. Water Level Summary Near the San Luis Rey River (WY 2021-2025)

GSP Well ID	Stream Reach	MT (ft amsl)	MO (ft amsl)	IM (ft amsl)	Measured Static (ft amsl)		
					Minimum	Maximum	Average
MW-31	Pauma Reach 1/ Pauma Reach 2	725	775	775	*768*	815	796
MW-13	Pauma Reach 2	593	643	643	*600*	674	*635*
MW-33	Pauma Reach 3	583	633	633	648	658	652
MW-42	Pala Reach 1	439	465	465	*444*	484	*462*
MW-43	Pala Reach 3	270	273	273	*273*	276	274

Note: Italicized values are above the MT but below the MO.

In addition to water levels at the proxy monitoring sites, supporting hydrologic data will be reviewed annually to support interpretation of ISW compliance, including WY type, estimated groundwater

[6] MW-31 and MW-33 are not water level RMSs. MTs and MOs were established for these ISW wells using the same approach used to establish MTs for groundwater level.

pumping, streamflow at the Oceanside gage (USGS Gage 11042000), field observations, and any complaints or other evidence that may indicate potential effects on ISW. Hydrologic conditions during the evaluation period were variable and included both dry and wet conditions, as summarized in Table 4-9 below. Annual precipitation and WY type provide important context for interpreting ISW conditions because streamflow in the Subbasin is strongly controlled by precipitation and runoff. Lower surface flow is expected during dry years, with lower rates of ISW depletion, and higher surface flow and ISW depletion are expected during wet years.

Estimated groundwater pumping was also reviewed as part of the annual ISW assessment. Though the ISW modeling analysis does not indicate a reliable direct relationship between total annual subbasin pumping and modeled annual depletion, groundwater pumping provides important management context because pumping and groundwater level decline are the primary mechanisms by which groundwater use could increase ISW depletion. Estimated pumping is also shown in Table 4-9.

In addition to hydrology and groundwater pumping, the downstream USGS San Luis Rey River at Oceanside gage was also reviewed because it is the only gage along the San Luis Rey River and has a long period of record. Average monthly streamflow at this gage is shown in Figure 26 and summarized in Table 4-9. While it provides a regional hydrologic context, it cannot be used to directly assess ISW depletion because it is located approximately 15 miles downgradient of the Subbasin and is affected by groundwater management and use in the intervening reaches (Bonsall and Mission Subbasins), which is outside the jurisdiction of the USLRGMA.

Table 4-9. Summary of Contextual Factors for Surface Water Depletion (WY 2021-2025)

Water Year	Water Year Type	Estimated Pumping (Total USLR Subbasin) [acre-ft]	Average Monthly Flow at Oceanside Gage [cfs]		
			Minimum	Maximum	Average
2021	Dry	11,541	0.0	20	5
2022	Dry	10,913	0.0	9	3
2023	Wet	9,915	0.0	355	60
2024	Above Normal	11,003	0.2	233	38
2025	Dry	10,935	0.0	36	6

No known complaints have been submitted to the USLRGMA or the Water Board alleging that groundwater management in the USLR Valley Groundwater Subbasin impaired downstream surface water diversions, reduced the ability of downstream water right holders to beneficially use water, or adversely affected ISW-related beneficial uses. The absence of known complaints does not by itself demonstrate that ISW impacts are absent, but it provides relevant context for evaluating whether significant and unreasonable effects have been observed or reported.

Updated potential GDE areas are shown in Figure 27, based on model-estimated depth to groundwater during dry conditions (represented by Fall 2016) and wet conditions (represented by Spring 2023). Water

level data has indicated a general increase of groundwater elevations since the dry period from 2012 through 2016, particularly through WY 2023.

Based on the available information, current ISW conditions during WY 2021 through WY 2025 were within the range of conditions contemplated by the proxy SMC framework. Groundwater levels at selected ISW proxy monitoring sites did not indicate persistent groundwater level decline below the established MTs (on the contrary, due to increases in groundwater levels over the last 10 years, many of the RMS wells are currently above MOs), hydrologic conditions were consistent with the expected variability of a seasonal and intermittent river system, and no known adverse effects to downstream beneficial users or confirmed GDEs were identified. Undesirable results for ISW depletion were therefore not identified during this periodic evaluation period. This conclusion is also consistent with the broader groundwater level evaluation, which indicates that groundwater conditions in the Subbasin are healthy, with the majority of water level RMSs at or above MOs.

4.7.2 Evaluation of Interconnected Surface Water Sustainable Management Criteria

As described above, the revised ISW SMC framework presented in the 2027 GSP Amendment uses a groundwater level proxy, supported by model-estimated depletion and a monitoring improvement plan. The model-derived depletion analysis is the current technical basis for identifying the location, timing, and quantity of depletion and supports the future path toward establishing more formal ISW SMCs based on a rate or volume of surface water depletion caused by groundwater use. However, due to limited data and uncertainty, meaningful volume-based SMCs that can be reasonably evaluated on an annual basis are unable to be supported by available monitoring data. Therefore, use of SMCs associated with an ISW proxy water level monitoring network provides the best quantitative solution for annual assessment while additional monitoring points are established.

The revised ISW SMCs are appropriate given available information, but they should be considered adaptive. Important data gaps remain, including the absence of an active streamflow gage within the Subbasin, limited shallow groundwater monitoring near the river, limited access to monitoring locations, incomplete pumping data, and limited information on the location of a substantial portion of estimated pumping. These limitations prevent direct confirmation of the model-estimated depletion volumes and limit the ability to independently evaluate annual depletion conditions. Accordingly, annual reports will use a weight-of-evidence approach that considers hydrology, available groundwater level data, available pumping and surface water use estimates, field observations, downstream gage context, and any stakeholder or water right complaints. More detailed quantitative comparison to the model-derived ISW SMCs will occur during the next periodic evaluation and model update.

Because groundwater dependency has not been field verified and the monitoring network does not yet include sufficient streamflow or shallow groundwater data, the evaluation of potential GDE effects remains a data gap to be addressed through future monitoring and model refinement. The USLRGMA will revisit the potential GDE evaluation as additional monitoring data, field observations, and model results become available. If future data indicate that mapped potential GDE areas are supported by groundwater from the Subbasin and are sensitive to pumping-induced streamflow depletion or shallow groundwater declines, the USLRGMA will consider whether additional monitoring, SMC refinements, or management actions are warranted.

The USLRGMA will continue to address data gaps related to the depletion of ISW and possible impacts to potential GDEs through proposed PMAs listed in Section 5.3. These include:

- Installation of streamflow gage in the USLR Valley Groundwater Subbasin
- Investigation of potential alternative monitoring sites for ISW
- Installation of transducers in wells being used to monitor ISW
- Initiation of field observations of standing water and wetted area within the San Luis Rey River
- Explore the feasibility of using remote sensing or aerial imagery to evaluate riparian vegetation as an indicator of surface water/shallow groundwater

The Pala Subbasin remains the higher priority area for future ISW monitoring and refinement of the SMCs. This prioritization is appropriate because the Pala Subbasin has poorer data resolution, is classified as a subterranean stream, includes reaches where surface water is present near the downstream end of the Subbasin, and is directly upgradient of the Bonsall and Mission Subbasins. The reach-based model results also indicate that Pala Reach 2 and Pala Reach 3 account for a substantial portion of modeled depletion. Future monitoring improvements should therefore prioritize these reaches where feasible.

The revised ISW SMC framework is not expected to conflict with SMCs for other sustainability indicators. Maintaining groundwater levels above the thresholds described in Section 4.4 and avoiding long-term reductions in groundwater storage described in Section 4.5 should also reduce the potential for increased streamflow depletion. Additionally, the SMCs consider potential effects of groundwater management in the Upper San Luis Rey Valley Groundwater Subbasin on downstream surface water conditions and adjacent groundwater basins. The USLRGMA recognizes that downstream water-right holders, including the City of Oceanside[7], rely on water resources associated with the lower San Luis Rey River. While the USLRGMA is not aware of any historical complaints alleging that downstream senior water rights holders were unable to divert sufficient surface water because of groundwater management in the USLR Valley Groundwater Subbasin, flow at the Oceanside gage and record of future complaints will be reviewed periodically. Continued monitoring of groundwater levels, pumping, and modeled stream-aquifer interaction will be used to evaluate whether implementation of the GSP is likely to avoid significant and unreasonable adverse impacts to beneficial uses of surface water.

4.8 Land Subsidence

This section summarizes land subsidence conditions in the USLR Valley Groundwater Subbasin during the evaluation cycle and describes the refined SMC for land subsidence included in the 2027 Plan Amendment. In the 2022 GSP, no land subsidence SMCs were established. Because of the lack of significant thickness of compressible fine-grained sediments and the overall shallow character of the alluvial basin, land subsidence was not considered a threat. However, based on DWR's RCA 5 and the fact that water level MTs in some RMSs are set below historical lows, the 2027 Plan Amendment includes new SMCs for land subsidence. The land subsidence SMCs are established to avoid significant and unreasonable subsidence

[7] The City of Oceanside holds a pre-1914 appropriative right to divert up to 7,250 acre-feet/yr, as well as Water Board Permit 5229 to appropriate 1,250 acre-feet/yr.

caused by groundwater extraction that substantially interferes with land use, surface water conveyance, flood control, drainage, roads, utilities, structures, or other critical infrastructure.

Consistent with DWR guidance for areas with no history of subsidence, the MT for land subsidence is set to a low value that accounts for potential measurement error and also considers a cumulative amount of subsidence over a longer period. The MO and IM for land subsidence is set at an average annual vertical displacement of 0.0 ft, to maintain stable land surface conditions such that no significant and unreasonable groundwater pumping-induced land subsidence occurs within the Subbasin and no confirmed MT exceedance is observed at any proxy monitoring area. Land subsidence is evaluated using DWR-provided InSAR data at selected proxy monitoring points. These monitoring points represent 100 meter by 100 meter TRE Altamira InSAR Dataset grid cells located in areas where subsidence would be most relevant to groundwater management, including areas with relatively higher groundwater pumping, areas underlain by finer-grained deposits, and areas near major infrastructure. The representative InSAR monitoring points are shown in Figure 28 and listed in Table 4-10.

Table 4-10. InSAR Monitoring Points for Land Subsidence RMS Network

Monitoring Area	InSAR Point ID	Basis for Selection
Pala Casino	ACXL41F	Major infrastructure area
Casino Pauma	ACC5IBP	Major infrastructure area
Harrah's Resort	AB72LLX	Major infrastructure area
Paleo Lake Pauma Area	ACDCDIV AC2MKN6 ABOC650	Pumping area within extent of documented fine-grained deposit

4.8.1 Current Land Subsidence Conditions

Land subsidence conditions during the evaluation cycle were evaluated using DWR-provided InSAR data at the identified RMSs in areas with the greatest potential relevance to groundwater management, including the main Pauma pumping area, the Paleo Lake Pauma area, and major infrastructure areas near Casino Pauma, Pala Casino, and Harrah's Resort. Vertical displacement at these locations is summarized in Table 4-11 below.

The MT for each RMS is a vertical displacement of greater than 0.1 ft in one year or 0.2 ft cumulatively over five years. A confirmed exceedance occurs only if the apparent subsidence signal persists through repeated review and is associated with groundwater level decline. In addition, to ensure that potential observed subsidence is representative of groundwater extraction and not an isolated, non-pumping related issue, the observed displacement must cover an area greater than 20 acres, or approximately nine of the InSAR grid cells. This approach allows the USLRGMA to identify isolated anomalous points while retaining the ability to detect subsidence near sensitive infrastructure. The land subsidence undesirable

result is defined as confirmed inelastic land subsidence caused by groundwater pumping that exceeds the land subsidence MT and substantially interferes with land use, critical infrastructure, drainage, flood control, surface water conveyance, or other beneficial uses of the Subbasin. This may be considered to occur when confirmed MT exceedances occur at two or more RMS locations, or when a confirmed exceedance at a single RMS causes or is reasonably expected to cause significant and unreasonable impacts to major infrastructure, drainage, flood-control features, or other beneficial uses of the land surface. MOs for subsidence are set to 0.0 ft, consistent with DWR guidance. In addition, because of the lack of observed pumping-induced subsidence, Ims have also been set at 0.0 ft.

InSAR vertical displacement from DWR's SGMA Data Viewer, relative to the start date, is shown on Figures 29 through 34 for 2015 (or 2024 in the case of AC2MKN6) through present. The range of observed displacement for the evaluation period is summarized in Table 4-11 below.

Table 4-11. Land Subsidence Summary (WY 2021-2025)

InSAR Point ID	MT (ft)	MO (ft)	IM (ft)	Measured Vertical Displacement (ft)			
				Annual Minimum	Annual Maximum	Annual Average	WY 2021-2025 Total
ACXL41F	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	-0.006	0.029	0.005	0.032
ACC5IBP	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	-0.010	0.027	0.002	0.017
AB72LLX	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	-0.005	0.035	0.006	0.036
ACDCDIV[1]	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	0.000	0.013	0.006	N/A
AC2MKN6[2]	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	-0.003	0.011	0.004	N/A
ABOC650[3]	0.1 ft in 1 yr or 0.2 ft over 5 yrs	0.0	0.0	-0.005	0.039	0.018	N/A

Notes:

[1] Multiple data gaps and two suspected reference resets exist in the dataset during the evaluation period, making it inappropriate to calculate a five-year total. Annual statistics use WY 2024 and WY 2025 only.

[2] Record begins in WY 2024 and contains a suspected reference reset; a five-year total was therefore not calculated. Annual statistics use WY 2024 and WY 2025 only.

[3] Multiple data gaps and a suspected reference reset exist in the dataset during the evaluation period, making it inappropriate to calculate a five-year total. Annual statistics use WY 2021 through 2023 only.

4.8.2 Evaluation of Land Subsidence Sustainable Management Criteria

The 2027 Plan Amendment refines the land subsidence SMCs to provide a quantitative and reproducible method for evaluating land subsidence using InSAR data. The RMS network for land subsidence was established to focus on locations where subsidence would be most likely to occur or most likely to affect beneficial uses and users. The three Paleo Lake Pauma monitoring points provide coverage of areas with relatively higher pumping and potentially thicker fine-grained deposits. The three casino-area monitoring points provide coverage near major infrastructure and public-use areas. Together, these six locations provide a focused monitoring network for identifying potential subsidence related to groundwater management.

Since the basin has no history of land subsidence and is considered a low risk, the MT, MO, and IMs are set to represent essentially zero inelastic land subsidence caused by groundwater pumping. An undesirable result for land subsidence occurs when a confirmed exceedance of the land subsidence MT is caused by groundwater pumping and results in significant and unreasonable effects on land use, infrastructure, drainage, flood control, surface water conveyance, or other beneficial uses. Because InSAR data may show small apparent changes in ground surface elevation that are not caused by groundwater pumping, the SMC framework includes screening and confirmation criteria. These criteria distinguish between apparent InSAR displacement and confirmed groundwater pumping-induced inelastic subsidence. No undesirable result occurs where apparent displacement is not persistent, is not associated with groundwater level decline, is not spatially confirmed or located at a sensitive monitoring point, or is attributable to non-groundwater causes. This may include apparent displacement caused by construction, grading, slope movement, shallow soil processes, vegetation or atmospheric artifacts, measurement noise, or other non-groundwater-related causes. Similarly, elastic seasonal ground surface movement that does not represent permanent inelastic compaction is not considered an undesirable result. This approach reflects the management objective of avoiding permanent compaction of aquifer materials and avoiding damage or interference with infrastructure and other land uses.

Groundwater level data provide supporting context for the InSAR evaluation. As described in Section 4.4, no RMS wells declined below groundwater level MTs during the evaluation cycle, groundwater levels in all but two RMS wells were above MOs, and no undesirable results related to chronic lowering of groundwater levels occurred. These groundwater level conditions do not indicate the sustained groundwater level declines typically associated with groundwater pumping-induced inelastic subsidence. However, groundwater levels are used only as supporting information for this sustainability indicator; InSAR data remain the primary basis for evaluating land subsidence.

Based on the InSAR data reviewed for the evaluation cycle, no confirmed exceedances of the land subsidence MT occurred in the Subbasin. Therefore, based on the available InSAR data and supporting groundwater level information, no undesirable results related to land subsidence occurred during the evaluation cycle. The refined InSAR monitoring network, screening thresholds, and confirmation process provide a clear framework for future evaluation of this sustainability indicator.

The land subsidence SMCs are not expected to interfere with the SMCs for other sustainability indicators. Maintaining groundwater levels above the thresholds described in Section 4.4 and avoiding long-term reductions in groundwater storage described in Section 4.5 reduces the potential for compaction of compressible aquifer materials. Continued InSAR review and groundwater level monitoring provide an appropriate basis for identifying and responding to potential land subsidence during future annual reporting and periodic evaluations.

4.9 Seawater Intrusion

The 2022 GSP determined that seawater intrusion is not of concern because the downgradient boundary of the Subbasin is located a substantial distance inland from the Pacific Ocean. The GSP also recognized that seawater intrusion has historically occurred in the downgradient Lower San Luis Rey Groundwater Subbasin; however, minimum threshold groundwater elevations designed to maintain a seaward groundwater gradient are being implemented in the Mission Subbasin to protect inland areas from further seawater intrusion. Therefore, seawater intrusion is not applicable to the USLR Valley Groundwater

Subbasin and no seawater-intrusion SMCs were established in the 2022 GSP. DWR agreed with this conclusion and did not provide an RCA for seawater intrusion in its GSP determination.

Conditions during this evaluation cycle do not indicate that seawater intrusion has become applicable to the USLR Valley Groundwater Subbasin. The Subbasin remains inland and hydraulically upgradient of the coastal groundwater basins where seawater intrusion has historically been a concern. As such, no seawater intrusion SMCs are proposed as part of the 2027 GSP Amendment. The USLRGMA will continue to evaluate basin conditions through groundwater level monitoring and annual reporting to confirm that seawater intrusion remains not applicable during future implementation periods.

5.0 Status of Projects and Management Actions

The 2022 GSP identified several PMAs that could be pursued in the event of undesirable conditions and implemented on an as-needed basis. Proposed projects will be prioritized by considering potential cost, available funding, and anticipated benefits to groundwater levels, storage, water quality, and/or ISW. For planning purposes, proposed PMAs have been grouped into four tiers, generally corresponding to the order of potential implementation (i.e., projects and management actions in Tier 1 are anticipated to be considered before those in Tier 2, etc.). Potential projects are summarized by tier below, in Tables 5-1 through 5-4, with additional explanation provided in the following subsections. The Subbasin is not considered to be in overdraft so many of the listed potential projects have not been necessary. Given that projects and management actions are to be implemented with an as-needed approach, estimated project costs will be developed as the need to implement a particular project or management action arises.

Table 5-1. Tier 1 Project and Management Action Summary

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Convene an Interactive Tribal Work Group	This working group would encourage tribal participation, promote basin balancing maintenance activities, and ensure that federal reserve water rights are protected.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Planning	Outreach occurred in 2023	Working collaborative relationship with tribal entities to support ongoing sustainable management of the Subbasin.	Working collaborative relationship with tribal entities to allow for exchange of data that supports ongoing sustainable management of the USLR Valley Groundwater Subbasin. Coordination between tribal entities on additional studies that may be needed to better estimate or collect data that is valuable in supporting continued sustainable management of the Subbasin.
Convene a Drought Resilience Work Group	The group would review the current understanding of drought in the USLR Valley Groundwater Subbasin, identify any data gaps, and develop a reliable recovery plan.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Initiated	Met in 2023 but requires funding for project planning	Initiated working group and identified potential topics. The group will generate discussion and new ideas for how to handle declines in groundwater levels due to drought conditions.	Working relationships to identify avenues to obtain resiliency, minimize impacts of drought conditions on sustainability criteria, and develop long-term plans to facilitate groundwater conservation in the subbasin.

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Adaptive Groundwater Management	Adaptive management refers to the ongoing review and reaction to groundwater conditions in the subbasin.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Ongoing	Ongoing with no anticipated end date	Annual monitoring and 5-year reporting on the Subbasin's progress towards sustainability will provide consistent updates to the USLRGMA.	Frequent evaluation will allow the USLRGMA to react to changing conditions, enact projects and/or management actions as necessary before undesirable results occur, and assess the success or failure of enacted projects and management actions implemented in the USLR Valley Groundwater Subbasin.
Groundwater Level and Water Quality Monitoring	Ongoing collection of groundwater elevations and water quality data	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Ongoing	Ongoing with no anticipated end date	The collection of water level and water quality data provides important information to evaluate the effects of other projects and management actions, or to determine if additional management actions are necessary to maintain sustainability.	Ongoing collection of data will provide a tangible measurement of the health of the Subbasin. Should additional projects or management actions be enacted, monitoring data provide important information to be able to help assess the benefit of each project or action and ongoing operational effects on groundwater conditions.
Agricultural Management Plan and Best Management Practices	Conservation techniques for efficient agricultural water use, such as using micro sprinklers/drip for irrigation, adjusting watering timing/schedules, regulating irrigation system pressure, and the removal or canopy reduction of low-producing areas.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Ongoing	Ongoing with no anticipated end date	Efficiency of groundwater usage and reduction of nutrient loading. San Diego Water Authorities Agricultural Irrigation Efficiency Program alone has resulted in 220 acre-ft/yr of water savings from 2021 through 2025.	Further efficiency of groundwater usage and reduction of nutrient loading.

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Local CIMIS Station	Installation of a local California Irrigation Management Information System (CIMIS) station to measure local climatic data.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Complete	Completed in Spring 2025	Allow agricultural users in the subbasin to adjust their irrigation system timing – leading to increased efficiency and reduced water demand, as encompassed within the agricultural management plan and best management practices.	More accurate evapotranspiration (ET) estimates and other climatic data for the USLR Valley Groundwater Subbasin microclimate.
Water Conservation Activities	Policies and programs promoting and incentivizing conservation and the efficient use of water, including community outreach and irrigation efficiency/ best management practices. The establishment of pumping fees by the USLRGMA in 2024 will also incentivize water conservation.	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW • Subsidence	Ongoing	Ongoing and as-needed with no anticipated end date	Water demand reduction and efficient water practices.	Reduced stress on groundwater aquifers and surface water sources. Water conservation actions would assist with achievement of the USLR Valley Groundwater Subbasin sustainability goal.
Outreach to San Diego County for GSA Collaboration	GSA collaboration with County procedures involving groundwater management.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Ongoing	As-needed	Developed a well permit notification communication system to ensure any proposed new well or well modification aligns with the GSP and does not hinder the achievement of sustainability goals.	Allow the USLRGMA (and potential other San Diego GSAs) to more efficiently manage groundwater conditions in the USLR Valley Groundwater Subbasin.

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Pumping Record Collection	Collection of pumping records for pumpers within the Subbasin, with the exception of de minimis users.	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW	Ongoing	Ongoing with no anticipated end date.	Provides data to understand the amount of groundwater pumping in the Subbasin and contextualizes changes in groundwater conditions relative to established SMCs.	Transition from voluntary to mandatory reporting will reduce uncertainty in groundwater pumping, facilitate collection of appropriate pumping fees, and increase understanding of sustainable yield.
Well Registration and Meter Installation	Mandatory metering of all pumping entities and pumping, with the exception of de minimis users and federally reserved tribal lands.	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW	Planning	Planning began in 2021, funding currently unavailable	Verified data to understand the amount of groundwater pumping in the Subbasin and contextualizes changes in groundwater conditions relative to established SMCs.	Reduce uncertainty in groundwater pumping, facilitate collection of appropriate pumping fees, and increase understanding of sustainable yield.

Table 5-2. Tier 2 Project and Management Action Summary

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Water Conservation Activities	Policies and programs promoting and incentivizing conservation and the efficient use of water, including rebate programs, rainwater capture, crop swap programs, low impact development standards for new or retrofitted construction, leak detection assessment, voluntary fallowing, and identifying sources of funding for potential management actions.	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW • Subsidence	Preplanning	As-Needed	Water demand reduction and efficient water practices.	Reduced stress on groundwater aquifers and surface water sources. Water conservation actions would assist with achievement of the USLR Valley Groundwater Subbasin sustainability goal.
Indirect Recharge through Decreased ET	Removal of Arundo or other invasive plants in riparian areas	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW	Ongoing	As-Needed	Reduced consumption of surface water by invasive plants.	Increased recharge through streambed percolation.

Table 5-3. Tier 3 Project and Management Action Summary

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
In-Lieu Groundwater Recharge	"Storing" of local groundwater by utilizing surface water "in-lieu" of groundwater pumping.	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW • Subsidence	Preplanning	As-Needed	Ongoing in-lieu use of imported water reduces groundwater demand. Increasing imported water usage in the basin, as needed, will allow any MT exceedances to be addressed using an already established infrastructure and water supply system.	In-lieu use of other supplemental water supplies (e.g., surface water from Vista Irrigation District (VID)/City of Escondido) may also be explored to reduce groundwater demand.
Outreach to VID/City of Escondido/Rincon to Explore Potential Supplemental Water Supplies for In-Lieu Use or Managed Recharge	Exploration of the feasibility of obtaining local surface water from VID/City of Escondido/Rincon to supplement water supply in the Subbasin.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Preplanning	As-Needed	Reduction of groundwater demand.	Reduction of groundwater demand, increase of groundwater quality.
Stormwater and/or Dry Weather Capture	Capture of stormwater and/or dry weather runoff using in-channel or off-channel recharge basins.	• Chronic lowering of groundwater levels • Reduction in storage • Degradation of water quality • Depletions of ISW • Subsidence	Preplanning	As-Needed	Enhance infiltration of surface water.	Increased groundwater recharge.

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Aquifer Storage and Recovery (ASR) / Managed Aquifer Recharge	Recharge of surplus imported water, when available, to increase groundwater in storage	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW • Subsidence	Preplanning	As-Needed	Help maintain groundwater levels above MOs and provide resiliency during drought periods.	Increase sustainable yield, thereby increasing the volume of groundwater that can be pumped sustainably.

Table 5-4. Tier 4 Project and Management Action Summary

Project or Management Action Name	Project or Management Action Description	Targeted Sustainability Indicator	Project Status	Expected Schedule	Benefits Observed to Date or Anticipated Benefits	Estimated Accrued Benefits at Completion
Groundwater Pumping Curtailment/ Allocation	Groundwater pumping curtailment or restrictions	• Chronic lowering of groundwater levels • Reduction in storage • Depletions of ISW • Subsidence	Preplanning	Last Resort	Halts or lessens the decline of groundwater levels.	Allows water levels to recover and groundwater storage to increase.

5.1 Ongoing or Completed Projects and Management Actions

Ongoing or completed projects and management actions include:

- **Installation of a local CIMIS station (Completed):** The USLRGMA successfully installed a local CIMIS station in spring of 2025, near the 5th hole of the Pauma Valley County Club golf course. The next closest CIMIS station, Station 62 in Temecula, stopped recording at the end of 2024. The new Pauma Valley station therefore provides coverage of ET and other climatic data for the USLR Valley Groundwater Subbasin microclimate. This station provides more accurate ET estimates and average annual data collected from the station will allow agricultural users in the subbasin to adjust their irrigation system timing. This in turn leads to increased irrigation efficiency and reduced water demand, as encompassed within the agricultural management plan and best management practices.
- **Adaptive groundwater management (Ongoing):** The continued regular review of hydrologic conditions in the Subbasin and assessment of progress towards maintaining sustainability will allow the USLRGMA to proactively enact management actions and/or projects as needed to curb any potential issues before they lead to undesirable results. If basin monitoring indicates that additional action is necessary, the feasibility of implementing supplementary management actions and/or projects will be researched. Proposed projects will be prioritized by considering potential cost, available funding, and anticipated benefits to groundwater levels, storage, water quality, ISW, and/or subsidence. Annual monitoring and Periodic Evaluations provide an avenue through which to discuss the Subbasin's progress towards sustainability and provide consistent updates to the USLRGMA. Additional monitoring and evaluation may be pursued as necessary.
- **Groundwater level and water quality monitoring (Ongoing):** A previously existing well in the southern Pauma Subbasin and two dedicated monitoring wells near the San Luis Rey River were incorporated into GSP monitoring efforts in May 2023. Monitoring at these three locations continued through the periodic evaluation cycle. Water level data from the wells provide important upgradient and near-river groundwater information, including information on shallow groundwater conditions and potential groundwater/surface water interactions. Additionally, the water level and water quality monitoring networks were updated as part of the 2027 Plan Amendment process to provide better data coverage throughout the Subbasin (see Section 7.1 below). RMSs and associated SMCs were also refined to improve the protection of beneficial use and users (Section 4.4). Groundwater monitoring for water level will continue to occur at least twice a year and water quality sampling at least once a year, during routine GSP monitoring events. The data provides important information regarding hydrologic conditions and trends in the basin and provides the foundation with which to evaluate the effects of GSP implementation or to determine if additional management actions are necessary to maintain sustainability.
- **Agricultural management plan and best management practices (Ongoing):** Agricultural irrigation best management practices continue to be enacted within the USLR Valley Groundwater Subbasin. The efficient of groundwater reduces pumping and water use demand while other best management practices help reduce nutrient loading in groundwater. Information from the

completed CIMIS station may lead to additional increases in efficiency by allowing agricultural users in the Subbasin to adjust their irrigation system timing.

From 2021 through 2025, growers in the basin have also participated in the San Diego Water Authorities Agricultural Irrigation Efficiency Program. Irrigation improvements completed under this program have demonstrated 220 acre-ft of water saved per year based on USLRRCD calculations.

Funding for irrigation evaluations for growers has been secured through the US Department of Agriculture (USDA) for fiscal year 2026-27.

- **Tier 1 water conservation activities (Ongoing):** The San Diego Regional Agricultural Water Management Plan outlines policies to help conserve water during drought periods and water shortages. Ordinance No. 100-08 sets up four levels of drought rules that get stricter as water supplies drop, ranging from voluntary to mandatory. Ongoing conservation outreach focuses on public education and simple tips, informing the public of opportunities for conservation savings and/or funding (i.e., rebate programs, grant funding opportunities, etc.), and other opportunities for the public to become involved in basin sustainability efforts. Reduced water demand alleviates basin pumping and helps improve overall water levels in the groundwater basin.

  In addition, the USLRGMA adopted groundwater extraction fees and a policy to implement them on July 16, 2024. As of fiscal year 2024-2025, Subbasin pumpers (excluding those on federally reserved tribal lands) are charged an annual wellhead fee and a pumping fee based on assumed or reported pumping. These annual fees are anticipated to further incentivize water conservation and best management practices.
- **Outreach to San Diego County for GSA Collaboration (Ongoing):** The USLRGMA has been in contact with the County regarding GSP implementation. The Governor's Executive Order N-7-22 required the County of San Diego to obtain written verification from the USLRGMA, as the GSA, prior to approving new well applications within the USLR Valley Groundwater Subbasin to verify the proposed well would not be inconsistent with sustainable groundwater management. In response, the USLRGMA developed new protocols and an application template to facilitate coordination with the County and the assessment of potential impacts from any new proposed groundwater production well in the Subbasin. The well permitting provisions of Executive Order N-7-22 were subsequently superseded by Executive Order N-3-23 and ultimately rescinded in September 2024 by Executive Order N-3-24; however, the coordination established between the County and USLRGMA during the evaluation period improved communication between the agencies regarding new groundwater development in the Subbasin.
- **Pumping Record Collection (Ongoing):** The collection of pumping records within the USLR Valley Groundwater Subbasin is currently voluntary and occurs at least annually. Not only do these records support understanding of groundwater pumping for annual reporting and sustainability tracking purposes, but they are now being used for the collection of groundwater extraction fees and associated charges to create a local source of funding for ongoing GSP implementation. Pumpers are provided a self-certification form to document their groundwater pumping or are charged per best-estimate assumptions outlined in the 2024 Cost-of-Service Study (included in

the WY 2024 annual report; USLRGMA, 2025). It is anticipated that this will enhance the submission of pumping information, which has up to now been largely limited to the main water supply agencies and several agricultural pumping entities.

- **Indirect Recharge through Decreased ET (Ongoing):** This PMA would involve the removal of invasive, non-native riparian vegetation, such as Arundo, that have high water use requirements and can consume significant amounts of shallow groundwater. The USLRRCD already has agreements in place to remove Arundo. Annual reporting from their biological consultant has indicated that invasives were under control within the area of the two Arroyo Toad easements.

In addition to the projects listed above, the USLRGMA recently hired a new Administrator. This Administrator has extensive experience with grant funding processes and will help the GSA find and secure funding to advance various projects and management actions. The Point of Contact information has been updated on the SGMA Portal to reflect this change.

5.2 Projects and Management Actions being Planned or Developed

Projects and management actions in the planning phase include:

- **Convening an Interactive Tribal Work Group:** The USLRGMA voted to approve establishment of this work group in WY 2023 with the goal of encouraging tribal participation, promoting basin balancing maintenance activities, and ensuring that federal reserve water rights are protected. Several attempts were made to organize a meeting with key tribal members in 2023, but no response was received. The San Luis Rey Indian Water Authority (SLRIWA) is also directly invited to every USLRGMA Board meeting. In the meantime, the USLRGMA will continue to monitor the USLR Valley Groundwater Subbasin with available data and monitoring coverage to maintain sustainability for all beneficial uses and users, including tribal entities.
- **Convening a Drought Resilience Work Group:** The USLRGMA voted to approve establishment of this work group in WY 2023 with the goal of helping to identify avenues for increased resiliency, ways to minimize impacts of drought conditions on sustainability criteria, and how to develop long-term plans to facilitate groundwater conservation in the Subbasin. This work group met in 2023 to discuss potential funding mechanisms for recharge projects within the Subbasin.
- **Well registration and meter installation:** In WY 2023, the USLRGMA applied for and received preliminary approval for a SGMA Implementation Grant for $1.6 million to fund additional management actions critical for advancing basin understanding and tracking sustainability. However, the USLR Valley Groundwater Subbasin was not included in the final award list. Several management actions were slated to be covered under this grant, including the well registration and meter installation program and installation of surface flow gage(s) in the Subbasin. Mandatory metering of all pumping entities and pumping, as allowable under SGMA (excepting de minimis domestic users), would allow the USLRGMA to definitively understand the amount of groundwater pumping occurring in the subbasin, refine estimates of sustainable yield, and assist with sustainable management. The USLRGMA continues to explore funding options for this project and management action and will continue to rely on voluntary reporting in the meantime.

5.3 Identified Future Projects and Management Actions

Several new and potential future projects and management actions have been identified since the development of the GSP in 2022. These include:

- **Domestic well vulnerability assessment for wells in the Upper Pauma Nitrate/Perchlorate-Affected Area:** YMWD is currently exploring a nitrate treatment system for some of their wells within the Upper Pauma Nitrate/Perchlorate-Affected Area. The proposed nitrate treatment system does not address nitrate loading or change the raw groundwater nitrate concentration, but it will address nitrate compliance for public water supply and will allow these wells to continue being used for beneficial use and to provide water to municipal and agricultural users within the YMWD service area. The GSP will continue to evaluate raw groundwater quality at RMS wells to evaluate changes in groundwater conditions within the affected area.

  To address domestic well users within the Upper Pauma Nitrate/Perchlorate-Affected Area, the USLRGMA will conduct a domestic well vulnerability assessment. This domestic well assessment will include: a well inventory based on County records, DWR well completion records, parcel/use data, and local knowledge; identification of domestic wells within the affected area that may have high concentrations of nitrate and perchlorate, outreach to well owners through mailers or direct contact to inform owners of groundwater quality conditions within the area and convey any water quality testing opportunities; and one-time nitrate and perchlorate sampling for domestic wells within the affected area (pending funding). If nitrate or perchlorate exceedances are identified in domestic wells, the USLRGMA will coordinate with appropriate regulatory and assistance programs and evaluate whether the results indicate expansion of nitrate-affected groundwater requiring revision of the monitoring network, affected-area boundary, or SMC. Anonymized results will be summarized in the annual report following the assessment, which is anticipated to be WY 2027. The USLRGMA will also explore funding opportunities to support the private well sampling effort.
- **Outreach and coordination with the Irrigated Lands Group/ San Diego Farm Bureau:** To address gradual increases in TDS and nitrate concentrations in the Subbasin, the USLRGMA will initiate coordination with the San Diego Region Irrigated Lands Group and the San Diego County Farm Bureau within the first year following submittal of this Periodic Evaluation. The purpose of this coordination will be to identify existing agricultural water quality programs, technical assistance, monitoring resources, grower outreach opportunities, and potential grant or partner funding that may help reduce or better characterize nitrate and salt loading associated with irrigated agriculture. This management action recognizes that the USLRGMA does not regulate fertilizer application, irrigation practices, or agricultural discharges. Accordingly, the USLRGMA's role will be limited to coordination, information sharing, and evaluation of feasible voluntary actions that could support SGMA implementation and protect beneficial uses and users. Any follow-up actions, including expanded outreach, grower workshops, focused monitoring, nutrient-management assistance, or implementation of specific practices, would be dependent on available funding, partner participation, and GSA approval.

- **Installation of streamflow gage in the USLR Valley Groundwater Subbasin:** Preliminary outreach regarding the installation of a streamflow gage in the Subbasin occurred after implementation of the GSP in 2022, and installation was slated to be covered under grant funding. However, funding was lost and no further progress was made towards establishing a streamflow gage in the Subbasin. Efforts to coordinate with appropriate entities (e.g., USGS and/or DWR) will be reinitiated with the goal of having a streamflow monitoring point for the next periodic evaluation (i.e., 2032). In particular, the USLRGMA will be evaluating the feasibility of reinstating an existing gaging station, either Station 11036700 San Luis Rey River Near Pauma Valley, or Station 11039800 San Luis Rey River Near Pala. Alternate locations will be considered as appropriate.
- **Investigate potential alternative monitoring sites for ISW:** As discussed in Section 4.7 above and Section 7.4 below, monitoring sites have been adopted in the 2027 GSP Amendment to evaluate conditions relative to the depletion of ISW. For lack of a stream flow gage in the basin and dedicated monitoring sites near the San Luis Rey River that reflect conditions in the shallow and deeper alluvial materials in Pala and Pauma Subbasins, the best-available, near-river alluvial wells in the existing groundwater monitoring network have been selected as monitoring sites. The proxy ISW monitoring network provides decent coverage of the upper, middle, and lower reaches of the San Luis Rey River in the Pauma Subbasin, but the middle reach of the Pala Subbasin would benefit from a monitoring site. The USLRGSA will be reaching out to basin stakeholders in that area to see if a suitable monitoring point representing an existing well can be secured. However, monitoring points or potential monitoring points in the USLR Valley Groundwater Subbasin largely represent production wells, since very few true monitoring wells exist. Therefore, as part of this effort, the USLRGMA will also be exploring the feasibility of installing some additional dedicated monitoring sites throughout the Subbasin that could provide near-river information for the evaluation of ISW. Installing these monitoring sites would require the GSA to be able to secure appropriate site access or property rights at strategically selected locations throughout the basin to install, operate, maintain, and periodically monitor dedicated groundwater monitoring wells. The USLRGMA would also need to identify project-specific funding for well design, permitting, drilling, construction, instrumentation, and related implementation costs.
- **Installation of transducers in wells being used to monitor ISW:** To better understand the response of near-river water levels to precipitation and streamflow events, the USLRGMA plans to install pressure transducers in the wells being used to monitor conditions relative to ISW. Priority should be granted to monitoring locations within the Pala Subbasin where model results indicate greater groundwater/surface water interconnectivity. The increased measurement frequency will improve understanding of changes in water level in these wells due to storms or periods of increased pumping demand associated with heat spells. Data from the transducers will be downloaded and processed as part of the routine monitoring in the basin, but the equipment purchase, initial setup, and deployment would require additional funding.
- **Initiation of field observations of standing water and wetted area within the San Luis Rey River:** The USLRGMA will initiate recurring field observations of surface water conditions along the San Luis Rey River within the USLR Valley Groundwater Subbasin, where access and field conditions

allow. Observations would be conducted at least four times per year, generally representing spring, summer, fall, and winter conditions, to document the presence or absence of surface water, standing or ponded water, wetted channel extent, and visible flow conditions. Field observations may include standardized photo points, GPS documentation of wetted or dry channel segments, notes regarding recent precipitation or stormflow, and observations of riparian vegetation condition. This effort is intended to provide a cost-effective screening tool for tracking changes in river corridor conditions and identifying priority areas for future field verification and monitoring. These observations would not replace a streamflow gage or provide direct measurement of pumping-induced depletion, but would improve the understanding of seasonal surface water patterns, support the annual interpretation of modeled ISW depletion, and provide additional information for future periodic evaluations and SMC refinement.

- **Explore the feasibility of using remote sensing or aerial imagery to evaluate riparian vegetation as an indicator of surface water/shallow groundwater:** The USLRGMA will evaluate the feasibility of using remote sensing, aerial imagery, infrared or near-infrared imagery, vegetation indices, and/or related geospatial tools to support future assessment of riparian vegetation as an indicator of surface water conditions along the San Luis Rey River. This task would include identifying available public and commercial datasets, reviewing their spatial and temporal resolution, evaluating how frequently data are collected, and determining whether the available imagery or analytical tools can reliably identify changes in riparian vegetation health, vegetation footprint area, and the presence or extent of standing water, which would provide information on shallow groundwater conditions. The feasibility evaluation would also include an assessment of cost, data processing requirements, technical limitations, and the expected value of the information that could be gained relative to the level of investment required. The purpose of this task is to allow the USLRGMA to determine whether imagery-based monitoring would provide useful information for future ISW evaluations and SMC refinement. Implementation of any identified remote sensing or imagery-based monitoring tool would depend on securing sufficient funding.

6.0 Basin Setting Based on New Information or Changes in Water Use

This section describes significant changes in the understanding of the basin setting, such as changes attributed to water use and supply, climate variations, successes and failures of projects and management actions, or significant new data that causes changes in model assumptions and results.

6.1 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model (HCM) presented in the 2022 GSP discussed the physical setting, hydrogeologic characteristics, and recharge and discharge processes that govern groundwater within the USLR Valley Groundwater Subbasin. Several updates to the Subbasin HCM were made in the 2027 GSP Amendment and are described in Section 3.0 (Basin Setting) of the 2027 Plan Amendment to both incorporate new data and understanding of the hydrogeologic system that have become available over the last five years and to address DWR's RCA 2 regarding the water budgets.

6.1.1 Groundwater Occurrence and Aquifer Systems

As discussed in Section 3.0 above, water level data from the drilling of two dedicated clustered monitoring wells in the Pauma Subbasin indicate the presence of a perched aquifer above the clay layer found throughout much of Pauma Valley. Higher recorded groundwater elevations for monitoring wells near the Pauma Valley Treatment Plant (MW-15, MW-16, and MW-17) are also considered to be more reflective of mounding within this perched aquifer. These examples of water level difference between the perched and principal aquifers are shown in Figure 35.

In response to this updated understanding, the discussion of groundwater occurrence and aquifer systems in the 2027 GSP Amendment (Section 3.3.2) was revised to indicate the existence of a perched aquifer, which is separate from the more regional principal aquifer. While the perched aquifer has a separate water level signature (approximately 20 ft higher than the underlying principal aquifer), production wells in the Pauma Subbasin are generally completed at greater depths. The perched aquifer is therefore not considered to be a main source of groundwater supply, though some wells may be cross-screened in this aquifer and receive some contribution from it. The 2027 GSP Amendment was also revised throughout the document, as appropriate, to clarify the presence and definition of the principal aquifer, per recommendations from DWR.

6.1.2 Interconnected Surface Water

As discussed in Section 2.6.1, model scenarios were conducted to evaluate the location, quantity, and timing of pumping-induced depletion of ISW. The results indicate that pumping-induced depletion occurs in both Pala and Pauma Subbasins, but that depletion is not evenly distributed along the river. The updated model results refine, but do not fundamentally overturn, the HCM described in the 2022 GSP. Within the Pauma Subbasin, the San Luis Rey River is still generally interpreted as a losing or seasonally disconnected system under many conditions. In these reaches, modeled ISW depletion is controlled in large part by hydrology because the amount of depletion that can occur is limited by the availability of surface flow in the river. Where flow is absent, depletion of surface flow cannot occur in the same manner as in a perennial gaining reach. Where flow is present, however, groundwater pumping may reduce groundwater discharge, intercept baseflow, or increase streambed losses relative to the no-pumping

condition. The first reach of the Pala Subbasin also exhibits losing-reach characteristics, while the downstream Pala reaches show greater potential for groundwater/surface water interaction due to the hydrogeologic constriction near the downgradient end of the Subbasin.

The Pala Subbasin continues to be understood as having greater potential sensitivity to ISW depletion because of its hydrogeologic setting and data limitations. The Pala Subbasin has been determined to be a subterranean stream flowing through known and definite channels (SWRCB, 2002). In addition, rising groundwater is present toward the downgradient end of the Pala Subbasin, near the Monserate Narrows, due to narrowing of the alluvial valley and shallowing of bedrock. This setting increases the potential for groundwater/surface water interaction relative to other portions of the Subbasin. Combined with poorer data resolution, limited shallow monitoring locations, and the potential for downstream effects on the Bonsall and Mission Subbasins, these conditions continue to support treating the Pala Subbasin as the higher-priority area for ISW monitoring, SMC development, and future refinement.

Results of the modeling exercise were used to refine the understanding of when and where ISW depletion occurs and define a new SMC framework for ISW using the tools and data available to the USLRGMA now. This new framework includes several PMAs to advance understanding of ISW conditions in the Subbasin, including the installation of a surface gage (see Section 5.3 of this Periodic Evaluation for additional information). Updated ISW information was incorporated in the 2027 GSP Amendment in Sections 3.3.4.4, 4.5, 5.5, and 6.3.

6.1.3 Surface Water and Groundwater Budgets

As discussed in Section 2.2 above, DWR RCA 2 requested updated historical, current, and projected water budgets for both groundwater and surface water systems. These are provided in the 2027 GSP Amendment in Section 3.3.5 based on the updated and recalibrated watershed and groundwater flow models (see Section 6.3 below for additional discussion). The updated models incorporate new data collected during GSP implementation, including information provided by basin stakeholders and collected to support annual reporting, and refinements to the hydrogeologic conceptual model. In particular, bedrock and aquitard surfaces/layers were revised based on a more in-depth review of well logs. The inclusion of a separate bedrock layer allows groundwater pumping to be simulated from both the alluvial aquifer system and the underlying bedrock. This represents an improvement over the 2022 model because it better reflects observed basin conditions and operations.

The updated model resulted in changes to several water budget components. In general, mountain-front recharge decreased relative to prior estimates, while streambed percolation increased. The model update also indicated that initial pumping estimates based on land use and crop type, described in the 2027 GSP Amendment in Section 3.3.5.3.1 and in the modeling report and addendum (2027 GSP Amendment Appendices 3d and 3e), are likely too high. The reduced pumping estimates suggested by the updated model are consistent with independent estimates of groundwater pumping developed for the USLRGMA cost-of-service study, providing additional support for the revised pumping estimates used in the 2027 GSP Amendment.

As discussed in Section 6.4.2 below, the estimated long-term sustainable yield decreased approximately 1,700 acre-ft/yr from 2022 estimates, which represents an updated understanding of the Subbasin through additional data collection, model refinement, and recalibration. However, given the reduced estimate of groundwater pumping also derived through model calibration, the overall conclusions

regarding conditions in the Subbasin remain unchanged. Current groundwater pumping is within the updated estimated sustainable yield and the Subbasin is therefore not currently operating in overdraft. This is reflected by increases in groundwater levels and estimated groundwater in storage.

The updated water budgets represent the best available estimate of basin conditions using currently available data and the updated modeling tools. However, the understanding of surface water and groundwater budgets derived from the models continues to rely on the availability of input data. Uncertainty is introduced through continued data gaps related to unmetered or unreported pumping, limited groundwater level measurements in Pala Subbasin and prior to 2016 in Pauma Subbasin, and the availability of streamflow data within the Subbasin. In particular, while the amount of pumping data received through annual data requests has generally increased with each successive annual report, unreported pumping is still estimated to represent approximately 40% of the total estimated groundwater pumping in the basin. This is a data gap the USLRGMA intended to address during this evaluation cycle, with the initiation of a well registration and metering program, but the funding for this project was withdrawn (see Section 10.2). Increased reporting of groundwater pumping is still anticipated in the future due to annual pumping fees established in 2024. surface water and groundwater budgets will also continue to be updated through future annual reports, periodic evaluations, and model refinements as additional groundwater pumping records, surface water diversion data, streamflow data, groundwater level data, and other hydrologic information become available.

6.2 Groundwater Conditions

Updates to the Subbasin groundwater conditions were made and are discussed in Section 3.0 (Basin Setting) of the 2027 GSP Amendment incorporating new data collected over the last five years. Significant updates were made to the following groundwater conditions sections of the 2027 GSP Amendment:

- Groundwater Elevations (Section 3.3.4.1)
- Groundwater Storage (Section 3.3.4.2)
- Groundwater Quality (Section 3.3.4.3)
- Interconnected Surface Water Systems (Section 3.3.4.4)
- Groundwater Dependent Ecosystems (Section 3.3.4.5)
- Land Subsidence Conditions (Section 3.3.4.7)
- Change in Groundwater Storage (Section 3.3.5.4)
- Historical Groundwater Budget (Section 3.3.5.5)
- Current Groundwater Budget (Section 3.3.5.6)
- Projected Groundwater Budget (Section 3.3.5.7)
- Estimate of Sustainable Yield (Section 3.3.5.8)

Some minor revisions were also made in other sections.

6.2.1 Groundwater Elevation

The understanding of regional groundwater conditions has not significantly changed in the past five years. The 2022 GSP recognized stable to recovering water level trends (primarily in Pauma Subbasin since there are very few water level readings available in Pala Subbasin – see PVGSA, 2022, Section 7.1.2) since

approximately 2012 or 2016. This was attributed largely to a stabilization in land use and the increasing use of supplemental water through imported water deliveries. Over the last five years, water levels have generally continued to increase. In particular, significant increases in water level were seen in response to above average rainfall conditions in WY 2023 and WY 2024.

6.2.2 Groundwater Quality

Water quality data from online databases, including the Safe Drinking Water Information System's (SDWIS's) Public Drinking Water Watch (PDWW), the Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program, and the State Board's California Laboratory Intake Portal (CLIP), and supplemental GSP sampling were reassessed to support the 2027 GSP Amendment. During this evaluation, areas of the basin with elevated perchlorate readings were identified. In particular, the Upper Pauma Nitrate/Perchlorate-Affected Area, along Highway 76, contains several wells with recorded perchlorate in excess of the MCL of 6 µg/L. Perchlorate was therefore added as a constituent of concern in the 2027 GSP Amendment. A new perchlorate monitoring network and SMCs were also developed, as discussed in Section 4.6.3 above and in the 2027 GSP Amendment in Sections 4.4 and 5.2.

The evaluation of SMCs for water quality also increased understanding of some of the trends in water quality in certain portions of the basin, which varies by water quality constituent. In general, TDS concentrations in the basin show a gradual increase through time. In many wells, TDS concentrations seem insensitive to changes in recharge or hydrology. In other wells, TDS seems to increase more during drier periods and decrease in response to wetter years – indicating a potential dilution effect from increased recharge.

There seems to be a stronger correlation between nitrate and water level, which is particularly apparent in the Upper Pauma Valley area. Review of available nitrate and groundwater level data indicates that nitrate concentrations in several wells in this area have increased during periods of rising groundwater levels. Examples of these trends are shown in Figure 24. This relationship suggests that at least a portion of the observed nitrate increase may reflect remobilization of nitrate stored in the vadose zone from historical and ongoing agricultural and septic sources as the water table rises. Under this conceptual model, rising groundwater levels may intersect or mobilize nitrate-bearing pore water that accumulated in the unsaturated zone during prior periods of agricultural land use and lower groundwater elevations. This observed relationship supported the designation of the Upper Pauma Nitrate/Perchlorate-Affected Area, as described in Section 4.6.2 above. The co-occurrence of elevated nitrate and perchlorate in this upper Pauma area suggests a common or related agricultural source – likely the historical use of a perchlorate-bearing fertilizer.

Unlike TDS and nitrate, available perchlorate data do not show the same clear increasing relationship through time or in association with rises in groundwater levels. Perchlorate concentrations appear generally stable or decreasing. This trend is consistent with the cessation or substantial reduction of perchlorate loading and possible natural attenuation processes. Continued monitoring in this area and throughout the basin will be used to continue to evaluate trends in groundwater quality and correlation with water levels.

6.3 Model Updates

The integrated Upper San Luis Rey watershed and groundwater model was updated and recalibrated as part of the 2027 GSP Amendment and Periodic Evaluation. The simulation and calibration period was extended from January 1991 through December 2020 to January 1991 through September 2025. This added approximately five years to the model period and includes the dry conditions of WYs 2020 through 2022 and the above average precipitation conditions of WYs 2023 and 2024. As a result, the updated model calibration period represents a broader range of hydrologic conditions than the original GSP model. However, the purpose of the model remains consistent with the original 2022 GSP model: to provide a technical tool for evaluating groundwater budgets, individual recharge and discharge terms, groundwater level response, and future basin management actions needed to support sustainability.

A key structural change to the groundwater model was the addition of Model Layer 4 to represent weathered and fractured bedrock beneath and adjacent to the alluvial aquifer system. The 2022 GSP model terminated at the base of the alluvium, requiring pumping from bedrock wells to be assigned to overlying alluvial layers. The updated model explicitly simulates bedrock production at the approximate depth where it occurs and allows vertical exchange between the bedrock and overlying alluvium to be evaluated. Model layer geometry and basement elevations were also revised. A basin-wide well inventory was compiled from DWR and USGS well completion report databases, and an additional 90 wells were incorporated into the analysis. These data were used to refine the elevations of the model layers and basement surface. Well logs identifying bedrock completions were also used to support development of the new bedrock layer.

The calibration dataset was substantially expanded. The transient groundwater level calibration target set increased from 2,590 groundwater level measurements at 52 wells in the 2022 GSP model to 5,926 measurements at 91 wells in the updated 2027 model. Model calibration used the industry-standard history-matching approach, in which hydrogeologic parameters were manually adjusted within reasonable ranges to improve agreement between measured and model-calculated groundwater levels. The updated calibration included adjustments to horizontal and vertical hydraulic conductivity, specific yield and storativity, the parameters assigned to the new bedrock layer, vertical conductance between the alluvium and bedrock, and general-head and streambed conductance. Mountain front recharge was also adjusted to provide a better fit for simulated groundwater elevations and streamflow.

The updated groundwater model calibration indicates a good match between measured and model-calculated groundwater levels. Model-calculated water levels generally match measured groundwater-level trends, and the calibration scatter plot shows that calibration measurements are generally clustered around the line of equal measured and simulated water levels. The updated calibration has a relative error of 4.5 percent, which is within the generally accepted criterion of less than 10 percent for a good model fit.

The updated and recalibrated models were used to recompute surface water and groundwater budgets for the extended calibration period, which are presented in this Periodic Evaluation in Section 6.4.2 and in the 2027 GSP Amendment Section 3.3.5. The USLR model was also used to estimate projected water budgets that assume a continuation of current water use (average pumping, imported water use, and associated return flows from the past five years) and average hydrologic conditions using historical

precipitation from 1991 through 2024, repeated twice and minus the last 8 years to provide a 60-year projection.

Although the updated USLR watershed and groundwater models provide improved tools for evaluating Subbasin conditions, they remain simplified representations of a complex hydrogeologic system. While progress was made toward improving the simulation of the USLR Valley Groundwater Subbasin to be consistent with the current understanding of groundwater pumping and other water use throughout the Subbasin, additional areas of improvement were identified and recommendations have been made for future model updates. Additional detail about the model update, assumptions, and recommendations are provided in a modeling addendum report in the 2027 GSP Amendment, as Appendix 3e.

6.4 Water Use Changes and Associated Water Budget

6.4.1 Basin Water Use

Land use in the USLR Valley Groundwater Subbasin is primarily agriculture, with some urban and rural residential areas. Land use changes between 2017 and 2024, based on coverages from the San Diego Association of Government and summarized in Table 6-1 below, were relatively minor in both the Pauma and Pala Subbasins and do not indicate a substantial shift in basin land use or water demand. Overall, the land use comparison indicates that irrigated agricultural and similar outdoor water-use areas decreased slightly between 2017 and 2024, while low-density residential acreage increased modestly. These changes suggest that total basin water use has not increased substantially due to land use change during the evaluation period. Any increase in residential water demand associated with low-density residential growth is expected to be limited relative to the overall basin water budget and is likely offset by the small reduction in agricultural acreage. Therefore, recent land use changes do not indicate a significant new stress on groundwater resources.

Table 6-1. Changes in Land Use within the Upper San Luis Rey Valley Groundwater Subbasin

Land Use	Pauma Subbasin				Pala Subbasin			
	2017 (acres)	2024 (acres)	Difference (acres)	Percent Change	2017 (acres)	2024 (acres)	Difference (acres)	Percent Change
Open / Dry Ag / Water	3,669	3,567	-101	-3%	2,698	2,764	66	2%
Ag / Parks / Golf	6,361	6,329	-32	-1%	2,283	2,199	-84	-4%
Commercial / Industrial	477	510	33	7%	537	495	-42	-8%
Residential (Low Density)	2,368	2,473	105	4%	660	715	55	8%
Residential (Med Density)	39	40	1	4%	54	54	0	0%
Residential (High Density)	58	52	-6	-11%	0	4	4	NA

Groundwater pumped from the Pauma and Pala Subbasins is used for domestic, agricultural, commercial, and municipal water supply purposes. The majority of urban areas are supplied with water by water

agencies but there are some private wells that provide water for domestic use. Residential water uses include household consumption, irrigation of landscape and/or agricultural crops, watering horses or other livestock, and pumping water to fill swimming pools or ponds. Commercial uses include store front and retail trade strip malls, low-rise office buildings, post offices, and fire and police stations. Industrial uses include extractive industry (mining), light industrial, and warehousing/public storage. The majority of pumping, private or public, is used for agricultural irrigation.

Surface water use includes imported water and local surface water diversions. Within the subbasin, YMWD receives imported water through Metropolitan Water District of Southern California (Metropolitan) and the San Diego County Water Authority (Water Authority). The use of imported water in the basin has increased since imported water deliveries began in 1947, allowing reduced groundwater pumping. This increased use of imported water, along with some recent wet years, has contributed to the increase in groundwater levels within the last ten years. These water level and groundwater storage increases are particularly apparent over the last evaluation cycle (see Section 6.2.1).

Local surface water diversion data is requested annually by the USLRGMA to support annual reporting and estimates of water use. Currently, the submission of water use data is voluntary and reported diversions are limited. Part of the effort for this Periodic Evaluation involved searching the updated California State Water Resources Control Board's (Water Board) California Water Accounting, Tracking, and Reporting System (CalWATRS) website for diversion records within the Subbasin. This information was used to revise the estimates of local surface water use provided in Table 6-2 below.

No new changes in surface water reliability were identified during the evaluation cycle. In fact, due to conservation efforts, a County-wide reduction in water use, and the Water Authority's investment in multiple water projects such as the Carlsbad desalination plant and Pure Water programs, the current Urban Water Management Plan confirms that the Authority will be able to meet the region's water needs through 2050, even during multiple dry years (Water Authority, 2026). The Water Authority has even begun selling thousands of acre-feet to neighboring agencies in Riverside County and is exploring out-of-state transfers[8]. The availability of local surface water diversions continues to remain dependent on precipitation.

Estimated water use during the evaluation cycle is summarized in the following table and shown in Figure 36.

[8] https://www.sdcwa.org/water-transfers/

Table 6-2. Total Water Use in Upper San Luis Rey Valley Groundwater Subbasin (WY 2021-2025)

Water Year	Groundwater[1] [acre-ft]	Imported Water[2] [acre-ft]	Surface Water Diversions[3] [acre-ft]	ET[4] [acre-ft]	Total [acre-ft]
2021	11,541	5,546	561	1,616	19,264
2022	10,913	5,031	291	1,467	17,702
2023	9,915	3,239	1,149	1,865	16,168
2024	11,003	4,063	1,410	2,021	18,497
2025	10,935	3,886	812	1,816	17,449
Average	**10,861**	**4,353**	**845**	**1,757**	**17,816**

Notes:
[1] Estimates of groundwater pumping come from the updated and recalibrated (2027) groundwater model and represent all pumping in the Subbasin, including pumping on tribal-owned lands.
[2] Records of imported water are provided by YMWD.
[3] Updated estimates of local surface water use based on diversion records reported to CalWATRS.
[4] Estimates of ET from riparian vegetation come from the updated and recalibrated (2027) groundwater model.

6.4.2 Groundwater and Surface Water Budgets

A water budget is an accounting of all water that flows into and out of a specified area (i.e., recharge and discharge), including any resulting water storage change. Water budgets were developed using the updated surface and groundwater models for the USLR Valley Groundwater Subbasin. The historical water budget for the USLR Valley Groundwater Subbasin was evaluated over the model calibration period from WY 1992 through 2025. The current water budget represents the average of the last five years, which is consistent with this evaluation period (WY 2021 through 2025).

The projected water budget needs to account for water demands based on long-term water supply planning by basin stakeholders. For this, the water budget was evaluated using average pumping and associated return flows from the past five years (WY 2021 through 2025) and average hydrologic conditions using historical precipitation from WY 1992 through 2025, repeated approximately 1.5 times, to provide a 50-year projection. These were considered appropriate assumptions since land and water use in the subbasin is not anticipated to change greatly in the future; it will remain predominantly agricultural and projected residential increases are expected to have negligible effect on overall water demand. No changes in surface water supply are also anticipated, considering the surplus of water available through the Water Authority discussed above.

The updated groundwater budgets are presented in attached Tables 1 and 2. The surface water budget is also provided as Tables 3 and 4. Furthermore, groundwater and surface water budgets are summarized in the tables below. Additional information about water budgets and the model update can be found in Section 3.3.5 and Appendices 3d and 3e of the 2027 GSP Amendment. Variability in the annual water budgets is largely driven by hydrologic conditions, as mountain front recharge and streambed percolation increase with annual precipitation. Changes in groundwater pumping are also related to precipitation, with greater pumping generally occurring in drier years.

Table 6-3. Upper San Luis Rey Valley Groundwater Subbasin – Average Annual Groundwater Budgets

	Term	Historical (WY 1992-2025) [acre-ft/yr]	Current (WY 2021-2025) [acre-ft/yr]	Projected (WY 2026-2075) [acre-ft/yr]
Inflow	Recharge from Mountain Front Runoff	2,976	3,289	3,297
	Areal Recharge from Precipitation	3,184	3,194	3,028
	Streambed Percolation	8,297	9,573	8,515
	Return Flow from Applied Water	2,610	2,125	2,287
	Recycled Water Spreading	243	321	321
	Total Inflow	**17,309**	**18,502**	**17,450**
Outflow	Groundwater Pumping*	12,969	10,861	11,131
	Subsurface Outflow	4,316	4,361	4,378
	Evapotranspiration (ET)	1,942	1,757	1,911
	Total Outflow	**19,227**	**16,979**	**17,421**
	Change in Groundwater Storage	**-1,918**	**1,522**	**27**

* Pumping is inclusive of the entire Subbasin, including pumping on tribal-owned lands.

Table 6-4. Upper San Luis Rey Valley Groundwater Subbasin – Average Annual Surface Water Budgets

	Term	Historical (WY 1992-2025) [acre-ft/yr]	Current (WY 2021-2025) [acre-ft/yr]	Projected (WY 2026-2075) [acre-ft/yr]
Inflow	Tributary Inflow	15,147	16,351	16,191
	Runoff	9,702	9,771	9,845
	Rising Groundwater	4,888	4,110	4,830
	Total Inflow	**29,737**	**30,231**	**30,866**
Outflow	Streambed Percolation	13,184	13,683	13,345
	Stream Outflow	16,552	16,547	17.521
	Total Outflow	**29,736**	**30,230**	**30,866**

Sustainable yield[9] for the USLR Valley Groundwater Subbasin is considered to be the amount of groundwater pumping achievable with no change in groundwater storage. This can be calculated from the groundwater budgets as the pumping plus or minus the change in groundwater storage. Estimated sustainable yield from the water budgets summarized in Table 6-4 are presented in the following table.

Table 6-5. Estimates of Sustainable Yield for the Upper San Luis Rey Valley Groundwater Subbasin

Period	Groundwater Pumping	Change in Storage [acre-ft/yr]	Sustainable Yield
Historical Period (1992 – 2025)	13,000	-1,900	11,100
Current Period (2021 – 2025)	10,900	1,500	12,400
Projected Period (2026 – 2075)	11,100	0	11,100

The long-term (historical) sustainable yield decreased slightly, from 12,700 acre-ft/yr in the 2022 GSP to 11,100 acre-ft/yr in the 2027 GSP Amendment. However, the sustainable yield is influenced by all of the water budget variables summarized in the groundwater budgets above (Table 6-3). Each of these terms have a level of uncertainty associated with them. In particular, missing pumping records necessitate the estimation of pumping. This estimate was updated through using the recalibrated watershed and groundwater flow models. The model calibration indicated that previous estimates of pumping were too high. Therefore, while the sustainable yield estimate went down, so did the estimated pumping. Estimated pumping during the evaluation period (WY 2021 through 2025) was approximately 10,900 acre-ft/yr, which is within the estimated sustainable yield. Since the USLR Valley Groundwater Subbasin is therefore not in overdraft, there is no current need to assess measures to mitigate that overdraft.

7.0 Monitoring Networks

7.1 Groundwater Levels

7.1.1 Overview of Monitoring Network

As part of the 2027 GSP Amendment, a comprehensive review of the groundwater level monitoring network and RMSs was conducted, and the network was updated as necessary. The groundwater level monitoring network presented in the 2027 GSP Amendment includes 37 wells: 33 in Pauma Subbasin and four in Pala Subbasin. Changes from the 2022 GSP monitoring network include:

- **Removal of wells with discontinued access**. Over the last few years, several water level monitoring locations have become inaccessible due to well transfers. This includes MW-1, MW-2,

[9] Sustainable yield is defined by SGMA (Water Code, section 10721(w)) as the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.

MW-3, MW-26, MW-27, and MW-28, shown in Figure 39. No replacement wells are readily available in the majority of these locations, though MW-34 was added near MW-3.

- **Addition of wells in Pauma Subbasin.** The GSA started monitoring three additional wells in WY 2023 during routine GSP monitoring events (MW-31, MW-32, and MW-33; see Figure 39). MW-31 represents a previously existing well in the southern Pauma area, which was offered as a monitoring point to the USLRGMA to further understanding of basin conditions. This well provides important upgradient and near-river groundwater information in a previously identified data gap area that was recommended for a new monitoring location in the 2022 GSP. MW-32 and MW-33 are located near the end of Pauma Subbasin and represent the first dedicated monitoring wells designed and installed to provide information specific to SGMA. The wells were installed in May and June of 2023 through YMWD SGMA grant funding. The wells are clustered near the San Luis Rey River and were constructed at different depths (one shallow, one deep) to provide discrete information on differences in shallow and deep groundwater conditions. Since the USLR Subbasin is relatively shallow, available well information has not been able to provide information on potential perched or shallow groundwater conditions – particularly in the central Pauma Subbasin area where the presence of a clay layer from a paleo lake is well documented. These three wells were formally added to the groundwater level monitoring network in the 2027 GSP Amendment.

  Several new wells in Pauma Subbasin were also added as part of the 2027 GSP Amendment to increase spatial coverage of groundwater level measurements, with initial monitoring occurring in fall 2026. These wells are also shown in Figure 39 and include MW-35 through 41. Four of these wells (MW-36, MW-37, MW-39, and MW-40) are located in the alluvial fan areas previously identified as data gap areas. However, while MW-39, and MW-40 provide important information in the northeastern Pauma alluvial fan area, they are completed in bedrock and it's unclear if the water levels will be reflective of alluvial conditions.

- **Addition of wells in Pala Subbasin.** Current groundwater level data are insufficient to reliably characterize conditions in Pala Subbasin. Groundwater level information for the last five years has generally been limited to GSP monitoring locations in the upper Pala Subbasin (MW-29 and MW-30). Supplemental information has also been available at California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring wells 06F02 at the very end of Pala Subbasin and the Wilderness Gardens well (WG-1), in the upper Pala area. The USLRGMA has recently obtained access to the downgradient well (MW-43; see Figure 39) will continue to monitor this location as part of the routine water level monitoring efforts. Access to the WG-1 well has also been requested. In addition, MW-42 was added to the GSP groundwater level monitoring network, which is adjacent to MW-30. This well was added to the network because well construction information is known for this well, allowing it to be used as an RMS (see additional discussion on RMSs below).

- **Refinement of water level RMSs**. Four of the six monitoring wells with lost access were previously used as RMSs for water level. As such, new wells were designated as RMSs. During this process, previous RMSs were also reevaluated and some were removed in preference of more representative wells (alluvial wells instead of bedrock wells) and a better spatial distribution throughout the Subbasin. The addition of new monitoring points within Pala Subbasin also allowed for the establishment of RMSs in this part of the USLR Valley Groundwater Subbasin,

which was unable to be done in the 2022 GSP. The new set of RMSs for water level is shown in Figure 13. The RMS network incorporates 14 monitoring points (same as in the 2022 GSP), 12 of which are within Pauma Subbasin and two within Pala Subbasin.

Changes to the groundwater level monitoring network are reflected in the SGMA Monitoring Network Module. Well information is also updated as needed during routine water level measurement uploads.

7.1.2 Data Gaps

The changes made to the groundwater level monitoring network, described above, help improve the spatial coverage of water level measurements, providing additional control and improving the ability to interpret groundwater conditions – particularly within Pauma Subbasin where the majority of monitoring points are available. The USLRGMA has successfully incorporated new monitoring points in previously identified data gap areas, including the area just downgradient of the Rincon Reservation (MW-31; see Figure 39), within the alluvial fan area along the western half of the Subbasin (MW-36, MW-37, MW-39, and MW-40), and within a central gap area (MW-38). However, the loss of monitoring locations in upper Pauma Subbasin (MW-1 and MW-2) and lower Pauma Subbasin (MW-26, MW-27, and MW-28) produces new data gap areas in these areas of Pauma. The USLRGMA will continue to look for appropriate replacement monitoring points in these areas. The Rincon Reservation also remains a data gap area.

Some progress was also made addressing water level data gaps within Pala Subbasin, with the addition of MW-42 and MW-43. While these upgradient and downgradient monitoring locations at least provide an indication of gradient through the Pala Subbasin, the middle of the basin – which includes the Pala Reservation – remains a data gap. Tribal cooperation and data sharing with regards to tribal wells and groundwater levels will be important if the USLRGMA is to evaluate and prevent undesirable results while fully respecting Federal Reserved Water Rights in the Pala and Pauma Subbasins.

The USLRGMA will continue to assess the groundwater level monitoring network and replace wells as needed, or fill in data gap areas as access to new wells becomes available.

7.2 Groundwater Storage

The groundwater storage monitoring network is the same as the groundwater level monitoring network.

7.3 Groundwater Quality

7.3.1 Overview of Monitoring Network

Water quality information used for the 2022 GSP and last five annual reports primarily came from State databases and supplemental sampling at GSP monitoring locations. Supplemental water quality sampling over the last five years focused on non-public water supply wells, for which no State-reported data were available. With the revised approach to evaluating degraded groundwater quality and the establishment of new SMCs discussed in Section 4.6, the water quality monitoring network was also refined. The groundwater quality monitoring network for TDS and nitrate presented in the 2027 GSP Amendment includes 14 wells: 12 within the Pauma Subbasin and two within the Pala Subbasin. The perchlorate monitoring network includes a subset of four of these wells, all in Pauma Subbasin. Well locations are shown in Figure 18.

Routine groundwater-quality monitoring will be conducted annually during the fall monitoring event. The USLRGMA will work with public water suppliers to determine whether or not they plan to submit water quality data to the State for any given year. Supplemental sampling by the USLRGMA will occur in years for which water quality for the designated monitoring wells will not be submitted and available online. Annual monitoring is appropriate for the Subbasin because the constituents of concern — TDS, nitrate, and perchlorate — are expected to vary primarily over multi-year periods in response to recharge, pumping, irrigation return flows, imported water use, and septic loading, rather than requiring seasonal characterization for purposes of SGMA compliance. The USLRGMA may conduct additional confirmation or focused sampling if an RMS exceeds an MT, if a sentinel well detects perchlorate where it was previously non-detect, if data quality concerns are identified, or if available DDW data are insufficient for GSP reporting. Temporary increased monitoring will not be construed as a permanent expansion of the monitoring program unless adopted through a future GSP update or periodic evaluation.

7.3.2 Data Gaps

Since there are no public water supply agencies in the Pala Subbasin, apart from the Pala Water Program that does not have to report to the State, very little water quality data is available in that area and almost no recent water quality data. Water quality data is currently restricted to the upper portion of Pala Subbasin, at GSP monitoring wells MW-29 and MW-30. The USLRGMA is exploring the feasibility of collecting water quality at the two former CASGEM wells in Pala Subbasin, which will provide some additional detail of the upper and lower reaches. However, the center portion of the basin remains a data gap area. The Rincon Reservation in Pauma Subbasin also remains a data gap area. The USLRGMA will continue to request available water level and water quality data from stakeholders to support the sustainable management of groundwater resources in the USLR Valley Groundwater Subbasin.

7.4 Interconnected Surface Water

7.4.1 Overview of Monitoring Network

The current proxy monitoring network for depletion of ISW consists of selected groundwater level monitoring sites located along or near the San Luis Rey River, supplemented by hydrologic context from available surface water data, field observations, and model results. Because there is no active, permanent streamflow gage within the USLR Valley Groundwater Subbasin, the proxy monitoring network does not directly measure pumping-induced streamflow depletion. Instead, the 2027 GSP Amendment establishes an ISW monitoring approach based on groundwater elevations at selected near-river alluvial wells that provide the best available annual indicators of groundwater conditions near potentially interconnected reaches.

The ISW monitoring sites were selected from the broader groundwater level monitoring network based on their location within the alluvial aquifer and proximity to the San Luis Rey River. These wells are intended to serve as proxy monitoring sites for evaluating whether near-river groundwater conditions are declining below historical low conditions in a manner that could increase the potential for depletion of ISW. The current ISW proxy monitoring network includes five wells distributed along the San Luis Rey River corridor: MW-31, MW-13, and MW-33 in the Pauma Subbasin, and MW-42 and MW-43 in the Pala Subbasin, as shown in Figure 25. These wells provide coverage of key river reaches where existing monitoring access is available, including Pauma Reaches 1 through 3 and Pala Reaches 1 and 3. The ISW

monitoring network also incorporates supporting information reviewed as part of annual reporting and periodic evaluations.

7.4.2 Data Gaps

The existing ISW monitoring network has important limitations. There is no active streamflow gage within the Subbasin, shallow groundwater monitoring near the river is limited, access to potential monitoring locations is constrained, and available pumping data are incomplete and often lack sufficient spatial resolution to evaluate pumping effects by river reach. These limitations prevent direct confirmation of model-estimated depletion volumes and limit the ability to independently evaluate annual depletion conditions. Accordingly, the current monitoring network will be refined as additional data, access, and funding become available. Future improvements to the ISW monitoring network are expected to focus on increasing data resolution in priority reaches, particularly in the Pala Subbasin and other areas where the model indicates greater potential for pumping-induced depletion.

The 2027 Plan Amendment includes PMAs to improve the monitoring network for ISW. These actions include pursuing funding for a permanent or semi-permanent stream-stage or streamflow gage in the Pala Subbasin, investigating potential alternative or additional monitoring sites along priority reaches (especially within Pala Subbasin), installing transducers in wells used to monitor ISW, conducting recurring field observations of standing water and wetted channel extent, and evaluating the potential use of remote sensing or aerial imagery tools to assess riparian vegetation as an indicator of surface water/shallow groundwater. These improvements, which are discussed in more detail in Section 5.3, are intended to support future refinement of the ISW monitoring network and, if sufficient data become available, development of a more direct depletion-volume SMC framework during future periodic evaluations. Due to the data resolution issues, data gaps associated with ISW should take funding priority for monitoring network improvements.

7.5 Land Subsidence

7.5.1 Overview of Monitoring Network

The USLR Valley Groundwater Subbasin's land subsidence monitoring network was established in the 2027 GSP Amendment using the DWR statewide InSAR dataset available through the SGMA Data Viewer and related DWR data services. The InSAR data provide vertical ground surface displacement estimates for 100-meter by 100-meter areas derived from satellite data, with a record beginning in 2015 for most areas within the Subbasin and periodic updates over time. This dataset provides a practical and cost-effective means of monitoring subsidence conditions in the Subbasin, particularly because the Subbasin has no active survey monuments, extensometers, or other dedicated ground-based subsidence monitoring infrastructure.

The subsidence monitoring network consists of six representative InSAR points selected to provide coverage of the areas within the Subbasin where subsidence, if it were to occur, would be most likely to develop or would be of greatest management concern (Figure 28). Three points were selected in major infrastructure areas: Pala Casino (ACXL41F), Casino Pauma (ACC5IBP), and Harrah's Resort (AB72LLX). Three additional points were selected in the Paleo Lake Pauma area (ACDCDIV, AC2MKN6, and ABOC650), which represents a pumping area within the extent of a documented fine-grained deposit and therefore

an area of relatively greater theoretical susceptibility to compaction than the rest of the Subbasin. Together, these locations provide a targeted network that captures the primary areas of infrastructure concern and the area with the greatest apparent geologic susceptibility, while remaining appropriately scaled to a small basin with no known history of significant pumping-induced land subsidence. This monitoring approach is consistent with current DWR guidance.

The USLRGMA will use these representative InSAR points to evaluate IMs, MTs, and long-term trends in land surface elevation change. InSAR data will be reviewed annually in conjunction with groundwater level data to assess whether any land surface lowering is persistent, spatially coherent, and plausibly related to groundwater conditions, rather than an isolated anomaly or unrelated surface activity. This annual evaluation frequency is appropriate for the Basin given the low apparent risk of subsidence and the absence of any known historical subsidence impacts.

7.5.2 Data Gaps

As stated, the USLR Valley Groundwater Subbasin does not currently contain active survey benchmarks or extensometers specifically used to measure land surface elevation change. As a result, the monitoring network relies on DWR's statewide InSAR dataset as the primary source of subsidence information. This is considered appropriate at present because the Basin has no known record of significant pumping-induced subsidence, is relatively shallow, and does not contain the broad, thick, regionally extensive compressible clay deposits that characterize many of the basins where subsidence has been a major management issue. Installation of field-based subsidence monitoring infrastructure is not considered warranted at this time. Nevertheless, the USLRGMA may consider refinement of the monitoring network in future plan updates or annual reporting cycles, as appropriate.

7.6 Seawater Intrusion

This sustainability indicator does not apply to the USLR Valley Groundwater Subbasin.

7.7 Other Data Gaps

7.7.1 Groundwater Pumping Records

The majority of groundwater pumping records collected for the development and implementation of the GSP have been from municipal or public water supply entities and a handful of agricultural users in Pauma Subbasin. Unrecorded pumping for the rest of the Subbasin, including that from tribal-owned lands, was estimated based on land use, crop coverages, and previous studies. The USLRGMA intended to initiate a well inventory and metering program within the first five years of GSP implementation, but the funding identified for this effort was withdrawn and no progress has therefore been made. The USLRGMA continues to rely on voluntary submission of pumping records in response to data requests sent to basin stakeholders annually. Of particular note, almost no pumping records are available in Pala Subbasin, including within tribal areas, despite repeated requests for information. The Rincon Reservation in Pauma Subbasin also remains a data gap area. Tribal cooperation and data sharing with regards to tribal pumping will be important if the USLRGMA is to evaluate and prevent undesirable results while fully respecting Federal Reserved Water Rights in the USLR Valley Groundwater Subbasin.

7.7.2 Well Construction and Location Information

Well information primarily comes from online databases, including DWR's Online System of Well Completion Reports (OSWCR) and County records. However, electronic information about wells can be incomplete and locations are often to the nearest center of section based on State well numbers. Available well logs throughout the USLR Valley Groundwater Subbasin were reviewed for this periodic evaluation. Information from the logs was used to refine well locations, catalogue well screen intervals and construction information, and determine depth to bedrock. This information was used to increase understanding of well characteristics, inform the well impact assessment, appropriately modify SMCs for water level, and refine groundwater pumping in the updated model. Well information – particularly well locations within the subbasin and well status – will continue to be refined as additional information becomes available. A well inventory program was identified in the 2022 GSP PMAs to help address this need.

This effort increases understanding of well construction and use within the Subbasin, partially addressing a data gap identified in the 2022 GSP regarding domestic wells and associated depth uncertainty. The information also facilitated the analysis of potential well impacts conducted as part of this Periodic Evaluation and GSP Amendment (as summarized in Section 2.3.1 of this report and detailed in Appendix 4a of the 2027 GSP Amendment).

7.7.3 Surface Water Diversion Records

Several entities within the USLR Valley Groundwater Subbasin hold active surface water diversion rights and some of these are reported to the GSA through annual data request events or retrieved from the Water Board Division of Water Rights' California Water Accounting, Tracking, and Reporting System (CalWATRS) (which recently replaced the Electronic Water Rights Management System (eWRIMS)). Listed points of diversion within the USLR Valley Groundwater Subbasin were also searched through CalWATRS to obtain updated estimates of surface flow for the Periodic Evaluation and plan amendment. However, additional diversions are likely occurring in the Subbasin that are not reported. This in turn impacts estimates of unreported pumping, since water demand may be offset by the use of surface water. While additional records of diversions have been attained since the 2022 GSP, this data gap continues to exist basin-wide.

7.7.4 Local Climate Information

Due to the length and completeness of its data record, the National Oceanic and Atmospheric Administration (NOAA) precipitation station at Henshaw Dam is used to classify water years and assess trends in annual precipitation. The NOAA stations at Palomar Mountain Observatory and Vista, as well as PRISM data, are also used for the watershed model to define precipitation contours and calculate recharge and runoff. The nearest CIMIS station for estimating ET was in Temecula, with an additional station in Escondido. However, while there are some local precipitation records in the USLR Valley Groundwater Subbasin collected by local agencies or stakeholders, there was no official climate information station within the Subbasin when the GSP was developed in 2021/2022. The GSA installed a local CIMIS station in spring of 2025. Information from this system will allow the refinement of local ET and precipitation for future groundwater and watershed model updates and allow local farmers to improve irrigation efficiency.

8.0 GSA Authorities and Enforcement Actions

During the WY 2021 through WY 2025 evaluation period, the USLRGMA continued to exercise its authorities as the GSA for the USLR Valley Groundwater Subbasin to implement the GSP. Agency actions during the evaluation period focused on establishing the administrative, technical, financial, and data-management framework necessary to implement the GSP and achieve the Subbasin's sustainability goal. In December 2023, the Board adopted Resolution No. 11-2023 ratifying prior actions approving and submitting the GSP to DWR. In March 2024, the Board adopted Resolution No. 12-2024 establishing rules governing USLRGMA meetings, records, procedures, administration, and staffing. These actions provided an administrative framework for implementation of the GSP. The USLRGMA also exercised its authority to contract for technical and professional services, adopt annual operating budgets, perform required financial audits, and administer grant-funded GSP implementation activities.

A major focus during the evaluation period was development of a sustainable funding mechanism for long-term GSP implementation. Beginning in 2023, the USLRGMA initiated a cost-of-service and rate-development process to evaluate groundwater extraction fees. The process included development of the rate methodology, consideration of fixed and volumetric fee components, evaluation of OpenET and other information for estimating groundwater use, development of parcel and well information, consideration of fees, and stakeholder outreach. In May 2024, the Agency adopted Resolution No. 13-2024 establishing a methodology and confidentiality provisions for groundwater extraction and landowner information and Resolution No. 14-2024 setting a Proposition 218 public hearing on the proposed groundwater extraction fees. In June 2024, the Board directed that wells, excepting those on Federally reserved lands and de minimis users, be assessed an annual fee consisting of a $300 per operating well plus a volumetric component of $24.59 per acre-foot. The USLRGMA adopted the proposed groundwater extraction fees and an associated implementation policy in July 2024. The fee program represented the USLRGMA’s principal enforcement and compliance mechanism developed during the evaluation period because it establishes an enforceable financial obligation associated with groundwater extraction, which provides a recurring source of revenue to support GSP implementation. Collection and administration of these fees primarily fund annual monitoring, reporting, administration, outreach, and other associated activities necessary to achieve and maintain groundwater sustainability. In March 2025, the USLRGMA further formalized the program through Resolution No. 18-2025, which adopted groundwater extraction fees and charges and a Groundwater Extraction Fee Policy.

No enforcement-related litigation or other legal enforcement action undertaken by the USLRGMA specifically to compel pumping reductions or compliance with the GSP occurred during the evaluation period.

9.0 Outreach, Engagement, and Coordination with Other Agencies

9.1 Public Outreach and Engagement

The outreach framework established during GSP development emphasized coordination among the GSA, its member agencies, groundwater users, Tribes, public agencies, environmental interests, disadvantaged communities, domestic well owners, and other beneficial uses and users of groundwater. The GSP process included stakeholder outreach meetings, publicly noticed GSA meetings, opportunities to submit written comments, a public hearing prior to GSP adoption, maintenance of a project website, and direct communication with interested parties.

The USLRGMA conducted stakeholder outreach during preparation of the GSP, including stakeholder outreach meetings in 2021, and provided a formal local public review period between November 23, 2021, and January 7, 2022. A public hearing on GSP adoption was subsequently held on January 24, 2022. Comments received during this period are included in the GSP as Appendix 2b. Following submittal of the GSP on January 31, 2022, DWR posted the Plan for an additional State public comment period that concluded on April 30, 2022. The GSA website continues to provide access to GSP development materials and comment letters from the San Luis Rey Indian Water Authority (SLRIWA), California Department of Fish and Wildlife, The Nature Conservancy, National Marine Fisheries Service, City of Oceanside, Valley Center Municipal Water District, and others.

Comments received since GSP implementation were submitted through the SGMA Portal by the California Department of Fish and Wildlife, the Nature Conservancy and others, and the SLRIWA and its member Bands. GSA responses to the SLRIWA comments are also provided on the SGMA Portal. With respect to tribal interests, the GSA stated that it would continue to seek engagement with the IWA and member Bands and recognized that federally reserved tribal water rights must be respected in full, consistent with SGMA. These issues have remained relevant during GSP implementation and preparation of this Periodic Evaluation. In particular, implementation activities undertaken during WY 2021 through WY 2025 have improved the information available to address several issues raised through the public comment process. These activities include continued groundwater level and water quality monitoring, construction of two additional monitoring wells, completion of an aquifer study, collection and evaluation of groundwater extraction information, development of groundwater user self-certification procedures, and well-impact and GSP evaluation studies related to this periodic evaluation. The USLRGMA will continue to use information obtained through these activities to evaluate basin conditions and potential effects on beneficial uses and users and to refine GSP implementation as warranted. To facilitate communication with tribal entities, the Board established an Interactive Tribal Workgroup in 2023. The Workgroup was tasked with supporting engagement with tribal representatives, but efforts to arrange discussions with tribal representatives were unsuccessful. Maintaining this direct channel of communication is consistent with the original GSP outreach commitments and remains an appropriate component of GSP implementation. The GSA intends to continue to extend invitations to tribes in Subbasin to participate in GSP-related meetings.

The other outreach and engagement methods identified in the GSP remain generally relevant to implementation. These methods have continued during implementation. The USLRGMA maintains a

public website[10] containing GSP documents, annual reports, Board agendas and meeting packets, approved minutes, groundwater user forms, extraction fee information, and other implementation materials. Regular and special Board meetings provide an ongoing public forum for discussion of GSP implementation, annual reporting, monitoring, technical studies, fees, grant-funded projects, and other management actions. In particular, two main activities by the USLRGMA have been discussed in multiple GSA meetings and communications:

- The 2023-2024 cost-of-service process included public Board discussions regarding the rate methodology, groundwater use estimates, fixed and volumetric charges, treatment of de minimis extractors, parcel and well information, and methods for estimating groundwater use. The Proposition 218 process included formal notice and a public hearing before adoption of the extraction fees. This process provided groundwater users with an additional opportunity to comment on how GSP implementation costs would be allocated and how groundwater extraction information would be collected and applied. The meetings were attended by several members of the public. Several follow-up and general questions regarding the fees and payment specifics have been received and answered by the USLRGMA, along with several requests for self-certification forms for reporting annual production.
- The Periodic Evaluation and GSP Amendment process itself provides an opportunity to convey updates to the GSP and solicit stakeholder feedback. Comments on this draft Periodic Evaluation report will be included as an appendix. Comments on the draft 2027 GSP Amendment are included in the amendment as Appendix 2c.

Following GSP adoption and submittal in January 2022, the GSA has held regular Board meetings open to the public. Meeting agendas and associated information are made available on the USLRGMA website for stakeholder and tribal review. These meetings have included:

- September 20, 2022
- October 18, 2022
- November 15, 2022
- December 20, 2022
- January 17, 2023
- February 21, 2023
- April 18, 2023
- June 20, 2023
- August 15, 2023
- September 19, 2023
- October 17, 2023
- December 5, 2023
- January 16, 2024
- February 20, 2024
- March 19, 2024
- April 16, 2024
- May 21, 2024
- June 18, 2024
- July 16, 2024
- February 25, 2025
- March 18, 2025
- June 17, 2025
- September 16, 2025
- December 16, 2025
- March 17, 2026
- May 19, 2026
- June 16, 2026
- August 18, 2026
- October 20, 2026

Overall, the GSA has maintained the principal engagement mechanisms contemplated by the GSP while adapting them to the needs of implementation. Continued emphasis should be placed on transparent

[10] https://uslrgma.com/

Board proceedings; ready public access to technical and administrative information; meaningful communication with the IWA and individual Bands; engagement of groundwater extractors, domestic well owners, disadvantaged communities, and environmental interests; and documentation of how stakeholder input influences future GSP implementation decisions. These efforts will allow the USLRGMA to identify potential impacts to beneficial uses and users at an early stage and incorporate appropriate technical studies, monitoring changes, management actions, or Plan amendments as necessary to maintain groundwater sustainability.

9.2 Coordination with Other Agencies

During the evaluation period, the USLRGMA coordinated with the County, the local agency responsible for issuing groundwater well drilling permits, to establish a procedure for reviewing proposed new wells within the USLR Valley Groundwater Subbasin. This coordination was undertaken in response to Governor Newsom's Executive Order N-7-22, issued March 28, 2022, which established additional requirements for permitting new or altered groundwater wells during drought conditions. Among other provisions, Paragraph 9 of Executive Order N-7-22 required local well permitting agencies, before approving a permit for a new groundwater well or alteration of an existing well within a medium- or high-priority basin, to obtain written verification from the applicable GSA that the proposed well would be consistent with the applicable GSP and would not decrease the likelihood of achieving the basin's sustainability goal. The Executive Order also required the permitting agency to determine that extraction from the proposed well would not be likely to interfere with nearby wells or cause subsidence that could damage nearby infrastructure.

To implement these requirements locally, the USLRGMA worked with the County to establish a GSA well-permit verification process for proposed wells within the Subbasin. In January 2023, the USLRGMA Board reviewed and approved, with revisions, a well-permit verification application and directed staff to develop appropriate review procedures and fees. Under this coordinated process, the County retained its authority to issue well drilling permits, while the USLRGMA provided the SGMA-related review necessary to evaluate consistency of proposed groundwater extraction with the GSP and the Subbasin's sustainability objectives. This coordination provided an important mechanism for integrating County land use and well permitting responsibilities with sustainable groundwater management and allowed the GSA to consider potential effects of new groundwater development on existing groundwater users and basin conditions before County permit issuance. The well permitting provisions of Executive Order N-7-22 were subsequently superseded by Executive Order N-3-23 and ultimately rescinded in September 2024 by Executive Order N-3-24; however, the coordination established between the County and USLRGMA during the evaluation period improved communication between the agencies regarding new groundwater development in the Subbasin.

10.0 Other Information

10.1 Consideration of Adjacent Basins

There are no upgradient groundwater basins adjacent to the USLR Valley Groundwater Subbasin. Therefore, consideration of adjacent basins would include downgradient areas along the San Luis Rey River, including the Bonsall and Mission subbasins. These downgradient subbasins are not subject to SGMA; however, the USLRGMA recognizes that groundwater conditions and stream-aquifer interaction in the USLR Valley Groundwater Subbasin may affect downstream surface water and groundwater resources associated with the lower San Luis Rey River. Therefore, the USLRGMA considered downgradient conditions as part of the development and refinement of SMCs for ISW. This approach recognizes that downstream water-right holders, including the City of Oceanside, rely on water resources associated with the lower San Luis Rey River. Accordingly, the evaluation of ISW is guided by historical records of streamflow at the Oceanside stream gage.

Current groundwater conditions indicate that management of the USLR Valley Groundwater Subbasin is not affecting the management of downgradient basins. The USLRGMA will continue to evaluate groundwater levels, groundwater storage, pumping, and modeled streamflow depletion as part of GSP implementation and future periodic evaluations. These efforts provide a basis for assessing whether groundwater management within the USLR Valley Groundwater Subbasin is likely to adversely affect downgradient conditions or downstream water users.

10.2 Challenges Not Previously Discussed

The primary challenges not previously discussed are related to funding limitations, the high cost of GSP implementation, and the technical complexity of addressing remaining data gaps in a small basin with a limited stakeholder base. The USLRGMA has continued to implement the GSP using available local funding and in-kind support; however, the cost of required monitoring, annual reporting, technical studies, model updates, periodic evaluations, and plan amendments is substantial relative to the number of groundwater users available to support those costs.

In WY 2023, the USLRGMA applied for and received preliminary approval for a SGMA Implementation Grant totaling approximately $1.6 million. The grant would have supported management actions that are important for improving basin understanding and tracking sustainability, including a well registration and meter installation program, installation of surface-water flow gage(s) within the Subbasin, and technical support for the Periodic Evaluation and GSP Amendment. However, the USLR Valley Groundwater Subbasin was not included in the final grant award list. The USLRGMA understands that comments submitted during the grant review process may have affected the final funding decision; however, the USLRGMA was not provided an opportunity to review or respond to those comments before the final award list was issued. Since the loss of this anticipated grant funding limited the USLRGMA's ability to implement several planned projects and management actions, these projects have been delayed and were not able to be completed during the evaluation period. These projects, and others identified in the 2027 GSP Amendment, remain important to future GSP implementation, but their timing depends on the availability of outside funding, technical assistance, or a funding structure that does not impose undue financial burdens on local groundwater users.

Funding constraints are especially important in the USLR Valley Groundwater Subbasin because the cost of SGMA compliance is distributed among a relatively small number of stakeholders, many of whom are agricultural operators with narrow profit margins. Continued increases in GSP implementation costs could create a disproportionate financial burden on remaining agricultural users. Additionally, the potential reclassification of tribal-owned land currently held in ordinary fee title (i.e., outside of the federal reservation boundary) to tribal trust land would further reduce the funding base for GSA actions. If agricultural operations are forced to reduce or cease production because of increased compliance costs and/or additional land is put in tribal trust, the cost burden could shift to an even smaller group of remaining stakeholders, creating a cascading effect that could further reduce the local funding base available to support GSP implementation. The USLRGMA therefore continues to need financial and technical assistance to complete priority implementation actions, including installation and maintenance of surface water monitoring gage(s), installation of transducers in key monitoring wells, continued model refinement, exploration of management and/or mitigation options for increasing TDS and nitrate concentrations in the Subbasin, and future evaluation of ISW and potential GDEs.

The GSP is not expected to adversely affect relevant city or County general plans, water resources planning programs, natural resources planning programs, or land use planning programs. The Subbasin is primarily rural and agricultural, and no major development is currently planned within the Subbasin that would be affected by GSP implementation. The GSP and 2027 GSP Amendment are intended to support sustainable groundwater management while maintaining existing beneficial uses and users, including agricultural, municipal, domestic, tribal, environmental, and downstream water users. The USLRGMA will continue to coordinate with local agencies and stakeholders as needed if future land use changes, development proposals, or water resources planning efforts create new considerations for GSP implementation.

10.3 Legal Challenges

Legal and jurisdictional issues associated with tribal water rights and the SLRIWA remain an important consideration for GSP implementation in the USLR Valley Groundwater Subbasin. During GSP development, the GSA and SLRIWA expressed differing views regarding the appropriate treatment and analysis of water rights within the GSP. Discussions between SLRIWA/the Bands and the GSA reached an impasse over whether the GSA should investigate water rights in the basin—including potentially quantifying federally reserved surface water and groundwater rights claimed by the Bands. The GSA elected not to investigate or quantify those rights as part of the GSP, after which the Bands and SLRIWA stopped participating in GSP development and implementation. The final GSP, as well as the 2027 GSP Amendment, recognized that SGMA does not determine, alter, or limit water rights, including federally reserved rights, and that federally reserved tribal water rights must be respected in full. The USLRGMA's approach is therefore to manage the Subbasin toward sustainability without purporting to quantify or regulate federally reserved tribal water rights and to incorporate improved information regarding groundwater use, land use, and basin conditions as such information becomes available.

11.0 Summary of Completed Revisions to Plan Elements

The USLR Valley Groundwater Subbasin 2027 GSP Amendment was prepared concurrently with this Periodic Evaluation to incorporate significant new information collected during the first five years of GSP implementation, address DWR's RCAs, update the Plan to reflect current basin conditions and GSA administration, and refine elements of the GSP where additional information or experience gained during implementation warranted revisions. The Amendment retains the overall sustainability goal and adaptive management approach established in the 2022 GSP; however, several Plan elements were updated or expanded to improve the technical basis for sustainable groundwater management and facilitate future evaluation of GSP implementation. The 2027 GSP Amendment replaces the original 2022 GSP.

At a high level, revisions to the GSP include the following:

- **Administrative information and Plan Area:** Sections 1 and 2 of the GSP were updated to reflect formation of the USLRGMA following submittal of the 2022 GSP, including the current governance structure, agency contact information, decision-making process, and legal authority. Additional discussion was incorporated regarding the USLRGMA's jurisdiction and its obligation to fully respect federally reserved water rights. Plan Area information was also updated, where appropriate, to reflect more recent land use, disadvantaged communities, water use, legal, regulatory, and planning information.
- **Basin setting, groundwater conditions, modeling, and water budgets**: Section 3 was updated using information collected since preparation of the 2022 GSP. This included refinements to the hydrogeologic conceptual model based on new well and monitoring information, including recognition of locally perched groundwater conditions and improved characterization of bedrock and aquitard geometry. The integrated watershed and groundwater models were updated and recalibrated through WY 2025, including addition of a bedrock model layer, and were used to update historical, current, and projected groundwater conditions, groundwater storage, surface water and groundwater budgets, and estimates of sustainable yield.
- **Sustainable Management Criteria**: Section 4 was substantially revised in response to DWR's RCAs and information developed during GSP implementation. In addition to technical revisions, the section was reorganized so that the complete SMC framework for each sustainability indicator is discussed together within the same subsection, rather than discussing undesirable results, MTs, MOs, IMs, and other SMC components separately across the section. This organization provides a more direct connection between the significant and unreasonable conditions being avoided, the applicable RMSs, quantitative thresholds and objectives, and the technical basis for each sustainability indicator. The Amendment refines groundwater level and groundwater storage SMCs and establishes IMs; replaces the previous basin-wide groundwater quality approach with constituent- and RMS-specific criteria for TDS, nitrate, and perchlorate; establishes a groundwater level proxy framework for depletion of ISW; and establishes quantitative land subsidence SMCs using selected InSAR monitoring locations. Seawater intrusion remains not applicable to the Subbasin.

- **Monitoring networks and data gaps:** Section 5 was revised to reflect monitoring conducted during GSP implementation, changes in well access, newly available monitoring locations, and the revised SMC frameworks. The groundwater level network and associated RMSs were refined to replace unavailable wells and improve spatial coverage. Separate monitoring frameworks were established or refined for groundwater quality, ISW, and land subsidence, and the discussion of remaining data gaps and recommended monitoring improvements was updated accordingly.
- **Projects and Management Actions:** Section 6 was updated to reflect the status of PMAs identified in the 2022 GSP and to incorporate additional actions identified through implementation and this Periodic Evaluation. New or expanded actions generally focus on reducing remaining data gaps, protecting beneficial uses and users, addressing groundwater quality concerns, improving the understanding of ISW and potential GDEs, enhancing water use efficiency, and maintaining the GSA's ability to adaptively respond to changing basin conditions. These include additional groundwater and surface water monitoring, ISW monitoring improvements, groundwater quality related actions, and continued efforts to improve groundwater extraction information.
- **Plan implementation:** Section 7 was updated to reflect experience gained during the first five years of implementation, including current USLRGMA administration, monitoring and reporting activities, implementation priorities, and funding considerations. The implementation schedule was revised to focus the next implementation period on continued data collection, reduction of identified data gaps, stakeholder coordination, and implementation of priority PMAs as funding and resources allow.

Collectively, these revisions incorporate the best available information developed since adoption of the 2022 GSP and provide a more complete and internally consistent framework for evaluating sustainable groundwater management during the next implementation period. The technical bases and details supporting individual revisions are provided in the applicable sections of this Periodic Evaluation and the 2027 GSP Amendment and are therefore not repeated here. As discussed throughout this Periodic Evaluation, the revisions do not change the fundamental sustainability goal for the USLR Valley Groundwater Subbasin; rather, they refine the tools, criteria, monitoring programs, and management framework used by the USLRGMA to evaluate progress toward and maintain that goal. The Periodic Evaluation concludes that implementation remains consistent with achieving and maintaining the Subbasin's sustainability goal.

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